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ABSTRACT BOOK

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Prof. Dr. Ahmet Ruhi Mermut

President ECSSS

Respected Soil Scientists, Colleagues,

At the time of our world facing great difficulties and problems, we were very pleased to welcome you, even with limited number of people, in our Historical Great City Istanbul, the cradle of the world civilization and culture. We were delighted and very glad to see and host you in our country. Terrorism is the unlawful use or threat of violence especially against the state or the public as a politically motivated means of attack. We unfortunately were forced to postpone the Congress as we had one at the Istanbul Ataturk Airport.

As you all know very well, soils are the natural part of our environment where the life starts, ends and recycled. References to life giving soils are mentioned in all the monotheistic religions. Farmers and public at large see the soils as an environment where they can grow agricultural crops and therefore their distribution and establishment of their characteristics became very important.

Soils degrade very rapidly, especially in European Context, when they are miss treated and used. We need to develop ways and means to determine soil characteristics accurately and reliably for better use and management. Soil degradation in rural areas creates great economic problems. About 33% of world soils are considered to be degraded, therefore, international politicians, scientists and United Nations should work together to manage world soil resources. Rapid growth in technological advancements cause environmental pollution. This together with soil degradation increase the importance of soil science to feed the mankind. Based on these realities, primarily Ministries of Agriculture around the world, together with International Union of Soil Sciences and Civil Societies, NGOs are charged to work together to advance our knowledge.

Today the two very important subject matters are discussed in international arena are human health and food security. We cannot discuss human health before we talk about the food security. Thus we need to share all the information about why soils are important for mankind and life on earth with politicians and decision making bodies. World population of today is about 7 billions 340 million within which European countries make about 832 million, which is about 11.3% of the world. In 1950 the world population was just about 2.5 billion, which is 1/3 of population today. In 2050 it will be 9 billion and this would mean that the need for food production continue to rise.

In addition, there is a strong need for closer international cooperation and develop laws. Almost every day somewhere in the world meetings, workshops, conferences and congresses are organized. Recently in 2012 FAO of the UN with the permission of 193 member countries has established a **Global Soil partnership** (GSP) and we, the Soil Scientists together with the Turkish Ministry of Food Agriculture and Livestock, give top priority to this new initiative.

Thank you very much to all of you especially who were brave enough to join us and enlighten the 5th Congress of European Soil Science Society. All the best.

President of Soil Science Society of Turkey

Prof. Dr. Ayten NAMLI

This abstract book contains the summaries of oral and poster presentations given at the Eurosoil 2016 Istanbul. Following the announcement of the Congress, a total of 1,050 applications were submitted for oral and poster presentations for sessions on 55 different topics. We were delightfully excited during our work on long-term preparations. We have conducted all of our plans and preparations with the excitement of knowing that we will be hosting experts that are to discuss the details and specifics in relation to soil science in Turkey.

The world has not yet reached the level of a peaceful and prosperous environment that humanity has always longed for; it continues to be a stage for violence, regional wars, and merciless acts of terror that do not recognize rules and borders. Our country has taken its share as a result of this, and has been a victim to the violence stemming from acts of terror. Consequently, such periods have had a negative impact on our Eurosoil Congress. Despite all the negative developments, and the inability to conduct the Congress on the initially announced date (July 16th), the Congress was successfully held in the Istanbul Wow Convention Center on the new dates of October 16-22 upon the decision to hold the Congress in Istanbul.

A total of 51 sessions were arranged for the Congress with participants attending from 36 different countries. With presentations from 6 guest speakers (Prof. Winfried Blum, Prof. Nicola Senesi, Prof. Rainer Horn and Prof. Yang Jae) at the Congress, 132 poster presentations were conducted within 3 days. The top 3 posters selected from a panel of jurors were awarded with a plaque. In addition, the Young Forum was arranged for one day, during which the representatives of the participating countries expressed their views on 3 topics (1. Soil Management, “Sustainable soil management for soil conservation and sustainable productivity”; 2. Awareness raising; Enhancing technical cooperation, policy, education, awareness and extension in soil; 3. Interactions between Climate Change, Carbon Cycle and Food Security), and upon presenting a joint declaration, they shared their views with participants at the Congress’ closing meeting.

The Young Forum was supported by TAGEM (General Directorate of Agricultural Research and Policies) of the Ministry of Food, Agriculture and Livestock. On the 3rd day of the Congress, a technical visit was arranged for the Istanbul Belgrade Forest with the support of the General Directorate of Combating Desertification and Erosion and the Ministry of Forestry and Water Affairs. Profile evaluations were conducted during the technical visit. The welcome party was held on October 16th, and the gala dinner was held on October 21st. Bosphorus cruise by boat was organized within the scope of the gala dinner.

On the final day of the Congress, Prof. Ahmet Mermut, the President of the European Confederation of Soil Science Societies, evaluated the Congress, poster awards were distributed, a statement on the outcome of the Young Forum was read, and lastly, a new president to take over for the following Confederation was selected. It was unanimously decided that the 6th Eurosoil Congress is to take place in Switzerland in 2020.

50 abstracts to be selected by the Congress Scientific Committee from the oral and poster presentations given during the Congress will be printed as a special issue in Toprak Su magazine, which are. In addition, 10 abstracts will be selected for full text publication in the Eurasian Journal of Soil Science. **This abstract book will be mailed to the participants' e-mail addresses and will also be on the Congress' website** (www.eurosoil2016istanbul.org), and the website of the Soil Science Society of Turkey (www.toprak.org.tr) for one year. The Congress was supported by the Ministry of Food, Agriculture and Livestock, the General Directorate of Agricultural Reform, the General Directorate of Agricultural Research and Policies, the Ministry of Forestry and Water Affairs, the General Directorate of Combating Desertification and Erosion, the General Directorate of Çaykur, and the General Directorate of Gübretaş. Among the sponsors were UMS AG & Decagon Devices & Bilmar A.Ş., Sem Laboratuar Cihazları & Agilent & Midi Inc., Tekafos, and the Istanbul Convention and Visitors Bureau, all of which exhibited at the Congress.

Finally, we sincerely thank all the invited speakers, scientific committee members, conveners and co-conveners, poster evaluation jury, authors and participants without their cooperation and timely inputs this Congress would not have been possible.

ORAL PRESENTATION ABSTRACTS

A - Best Management Practices For Protection of Environmental Resources

Convener : Joseph Sewards - USA
Co - Convener : Hayriye Ibrikci - Türkiye
Ayten Namlı – Türkiye

Monday 17 October 2016

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Florida-Friendly Landscaping Green Industries Best Management Practices Program Extension Outreach to Prevent Water Polllution
Joseph Sewards - Bushnell, Fl , USA

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Training and licensing of pesticide applicators; an IPM best management practice
Joseph Sewards - Bushnell, Fl , USA

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Best-Management Practices for Sustainable Landscapes: Water Conservation in the Residential
Landscape
Joseph Sewards - Bushnell, Fl , USA

A – 796
Adsorption of heavy metals on the clays and calcareous soils
Ayşe Dilek Atasoy – Şanlıurfa, Turkey

Florida-Friendly Landscaping™ Green Industries Best Management Practices Program – Extension Outreach to Prevent Water Pollution

Esen Momol, Don Rainey, Cj Bain, Jennifer Marvin, Laurie Trenholm, Gail Hansen, Laura Warner, Taylor Clem, John Bossart
114 Mehrhof Hall,Environmental Horticulture Department, University of Florida, Gainesville, FL 32611

Fertilizer and pesticide runoff has historically contributed more than 60 percent of the nonpoint source pollution in Florida. However, for more than 20 years, a partnership addressing fertilizer and pesticide use has evolved between the Florida landscaping industry, or "green industries", the Florida Department of Environmental Protection (FDEP) and the University of Florida Institute of Food and Agricultural Sciences (UF/IFAS). Today, the Green Industries Best Management Practices (GI-BMP) Program is a state-sponsored educational outreach program that provides science-based training for urban landscape maintenance professionals. GI-BMP training focuses on proper landscape design (right plant – right place), soil analysis, irrigation design and operation, equipment use and calibration, proper fertilizer application, and minimizing pesticide use through integrated pest management.

Currently, the Florida legislature mandates GI-BMP training and certification for all professional landscapers who apply fertilizer commercially. Implemented through the UF/IFAS Extension, course delivery is through in-person classes, online, or by DVD; with training available in English, Spanish or Haitian Creole. GI-BMP training includes five core modules (an overview, landscape design, soil analysis and plant selection, irrigation, fertilizer, and pesticides), plus supporting materials (an introduction, instructions, tests). In-person classes are six hours long, but students set their own pace for online and DVD courses. An official training manual contains the GI-BMP course content. Students take a certification exam upon course completion and those who pass with a score of 75% or higher receive GI-BMP certification and a hard copy certificate. Certificates are stamped and numbered to prevent unauthorized duplication. Passing rates are approximately 90 percent.

Currently, UF/IFAS coordinates over 240 active instructors who have trained over 41,000 individuals and issued over 33,000 certifications. Follow-up surveys conducted six and 12 months after course completion indicated a majority of these professionals were incorporating the BMP methodologies into their standard procedures.

Keywords: Best Management Practices, outreach, nonpoint source pollution, fertilizer runoff, Water pollution

Training and licensing of pesticide applicators; an IPM best management practice

Lloyd Singleton
UF/IFAS Extension, Sumter County

Objective:
Florida is the third most populous state in the United States with over 20 million residents, continuing to grow at a rate of 800+ new residents every day. The state's karst topography, sandy soils and abundant surface waters make freshwater sources particularly susceptible to pollutant leaching and runoff. This poses a health concern for the growing population's demands on limited freshwater resources. Integrated Pest Management is the strategy promoted statewide; the last course of action is chemical controls. Basic competency standards are written into the Florida Pesticide Law to address environmental contamination concerns. These standards provide a foundation for educational programs by University of Florida's Extension educators targeting certification and licensing of Florida's pesticide applicator community.

Materials-Methods:
Florida has over 34,400 licensed pesticide applicators in its 67 counties; six central Florida county Extension offices work together to offer frequent training and testing for several pesticide license categories. This team approach keeps the full day program interesting and effective for the clientele.

Results:
In 2015, these six county Extension offices trained 225 individuals for 4 landscape related pesticide licenses. In a follow up survey (n=200), 42 respondents reported:
• Did the training make you more familiar with Florida pesticide laws, rules, regulations and any recent changes? Yes, 93%
• Did the training help you in selecting the proper PPE (personal protection equipment)? Yes, 88%
• Did the training make you more aware of the importance of keeping pesticides out of bodies of water? Yes, 90%
• Did you learn about pesticide resistance and how to rotate pesticides if resistance is suspected? Yes, 90%
• As a result of the training, are you better able to read, interpret and follow pesticide labels? Yes, 90%
Conclusions:
Pesticide applicator training is an effective way to promote proper management techniques for pesticides to prevent water pollution.

Keywords: IPM, Integrated Pest Management, Pesticide, Pesticide training, Pesticide applicator training, Pesticide Licensing, Best Management Practice, BMP

Best-Management Practices for Sustainable Landscapes: Water Conservation in the Residential Landscape

Taylor Clem, Gail Hansen, Esen Momol, Chris Harchick, John Bossart
114 Mehrhof Hall, Environmental Horticulture Department, University of Florida, Gainesville, FL 32611

Coupled with increasing population, an increasing demand for natural resources threatens urban ecosystem vitality and longevity. Many of Florida's residential landscapes are resource consumptive, prompting a growing concern for excessive water consumption and related environmental stressors. Unsustainable irrigation practices spurred research in assessing the benefits of best-management practices (BMPs) for residential landscape irrigation. These BMPs are promoted by the Florida-Friendly Landscaping™ program, a water quality and conservation program implemented through the University of Florida (UF) Institute of Food and Agricultural Sciences (IFAS) Extension, in partnership with the Florida Department of Environmental Protection. To assess the BMPs, a research team from the UF/IFAS Center for Landscape Conservation and Ecology is monitoring several sites for case-study research on residential landscape water consumption. Landscapes were redeveloped, implementing different water-saving management practices to reduce water use. Case studies include several Florida communities and sustainable landscape research plots designed with best-management principles. Results show that adopting different irrigation schedules or using water saving irrigation technologies reduced water use. For example, a 35-home community reduced annual water consumption by 3,360,000 gallons (12,719 cubic meters), with other communities replicating similar results. Additionally, researchers realized water conservation translated into less fertilizer and pesticide use, which provided additional cost savings and reduced potential pollutant loading. Based on previous research on nonpoint source pollution, reductions in water consumption improve soil and water quality health. Initial data from the ongoing research shows that continued community outreach, social marketing campaigns, Extension programs, and supporting policy development increase the probability of adopting water saving behaviors, increase the prevalence of sustainable residential landscapes in Florida, and help reduce water consumption in Florida's residential landscapes.

Keywords: Best Management Practices, Resource Efficiency, Water Conservation, Landscape Irrigation, Irrigation Modifications, Residential Landscapes, Urban Landscapes

Adsorption of heavy metals on the clays and calcareous soils

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[2]Department of Soil Science Harran University Sanliurfa Turkey

Heavy metal contaminations are important environmental problems in all over the world. Toxic heavy metals discharged into the environment as industrial or mine wastes are considered dangerous because of their potential toxic effects. Contaminated waters contain dissolved metals, such as iron, zinc, copper, aluminum, and manganese. Sorption is one of the key processes affecting the fate of heavy metals in the sediment-water–soil environments. Adsorption of contaminants in the soil reduces their mobility and leaching potential through the soil profile. The leaching of heavy metal is inversely related to adsorption and that the sorption controls the mobility of contaminant in the soil. The objectives of this study were:
- to investigate the adsorption of copper (Cu)-zinc (Zn) and iron (Fe)-manganese (Mn) on the montmorillonite-bauxite and calcareous soils, respectively.
- to discuss the usability of these adsorbents in the environmental applications.
The adsorption capacities of metals were investigated by batch method. Copper, zinc and manganese adsorption isotherms fitted well with both Freundlich and Langmuir models. Iron adsorption did not fit well with both isotherm models. High adsorption capacities were found on all of the adsorbents for the studied metals. Studied adsorbents as raw materials have the potential to be effectively used for production of low cost sorbents for copper, zinc, iron and manganese removal from wastewaters.

Keywords: Heavy metal, adsorption, batch method, isotherms

B – Biochar

Convener : John Ryan
Co-Convener : İbrahim Ortaş

Monday 17 October 2016

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The role of mycorrhizae and biochar application on carbon fixation
Ibrahim Ortas - Adana, Turkey

B – 654
Biochar and ligninolytic fungi: two birds with one stone ?
Eren Taskin - Bari, Italy

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Biochar's effect on C sequestration and N2O emissions depends on soil type and biochar substrate
Mehmet Senbayram – Şanlıurfa, Turkey

B – 270
Effects of biochar and garden soil as amendments on the physicochemical characteristics of contaminated soils and on the growth and the potential use of 6 Salix species for phytoremediation
Manhattan Lebrun - Orléans, France

B – 434
Biochar and compost for mitigation of elevated copper concentrations in vineyard soils
Gerhard Soja – Wien, Austria

The role of mycorrhizae and biochar application on carbon fixation

Ibrahim Ortas, Ibrahim Ahmed, Alexandra Bykova, Ilay Çevik, Hasan Akgöl, Mazhar Rafique
Çukurova University

Mycorrhizae fungi are the major soil microorganism which is helping plant nutrient and water uptake. Since plant root and mycorrhizal fungi are demanding more carbon, plant is fixing more atmospheric carbon dioxide CO2 via natural processes of photosynthesis in the soil and biota. Mycorrhizae also play a key role in the soil aggregate formation and aggregates can keep carbon in soil.
We try to determine the high concentration of C content and nutrient contents of biochar. Also, we work on soil and crop management effect of mycorrhizal development and soil organic carbon accumulation.
The hypothesis is testing in our lab is mycorrhiza and biochar dual application can contribute C fixation through soil development.
In order to test our hypothesis, several pot experiments were conducted under greenhouse conditions.
In order to determine the effect of the application of mycorrhizae and biochar on the growth of sour orange seedlings, a pot experiment was conducted with four mycorrhizae species: Glomus mosseae, G. etunicatum, G. clarium, G. intraradices and a consortia of these species were treated with 40 ton ha-1 biochar produced from Phragmites feedstock. At harvest, plant height, shoot weight and root dry weight were measured.
The obtained results showed that G. mosseae, G. etunicatum and G. intraradices inoculated sour orange plants exhibited significantly higher plant height, and fresh and dry weight than the non-inoculated control and biochar alone application.
In other experiment under two soil series, effect of different biochar material and mycorrhiza species (G. mosseae, G. etunicatum and G. intraradices) on plant growth and carbon fixation were tested by using sorghum plant.
In general, the contribution of mycorrhizae seems to be higher than the biochar contribution. In particular, G. mosseae-inoculated plants produced more shoot dry weight compared with other mycorrhizae species.

Bu makale TÜBİTAK-TOVAG -112O785 nolu proje tarafından desteklenmektedir.

Keywords: Soil organic carbon dynamics, soil development, mycorrhizae and carbon fixation, Biochar production

Biochar and ligninolytic fungi: two birds with one stone ?

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Fungi have biogeochemical importance in terrestrial ecosystems because they are critical for nutrient cycles, bio-weathering and decomposition processes of natural and xenobiotic organic materials. Ligninolytic species, that were specialized in lignin degradation, have also been used for bioremediation of various matrices from phenolic and non-phenolic compounds. Their functions are partly attributable to fungal enzymes with low substrate specificity, namely lignin peroxidases, manganese peroxidases and laccase. Biochar (BC) has recently been proposed as a soil amendment that may contribute to mitigation of climate change via carbon sequestration in soil. Studies have demonstrated BC's use as a potent adsorbent, soil conditioner and plant systemic resistance inducer. Moreover, *in vitro* decontamination studies have demonstrated the consecutive use of high adsorbent capacity of BC and the decomposition capacity of ligninolytic fungi towards several persistent organic pollutants. However, pyrolysis conditions and feedstock materials affect BC characteristics and may eventually influence BC's impact on ecosystems. To date, the impact of BC on soil microorganisms and especially on ligninolytic fungi have not yet been studied well. The objective of this *in vitro* study was to assess the impact of BC and of the pH alteration caused by BC on the ligninolytic fungi *Trametes versicolor*, *Pleurotus ostreatus*, *Bjerkandera adusta*, *Irpex lacteus*, *Stereum hirsitum* and *Phanerochaete chrysosporium*. The BC sample used in this study was obtained from red spruce pellets pyrolysed at 550 °C, and it was added to the PDA medium directly at doses of 2 g L^{-1} and 10 g L^{-1}. The experiments were conducted with both pH-adjusted and non-adjusted controls. Radial mycelial growth was measured, and the results showed fungal growth responses dependent on species and BC doses. The response of some species was found to be pH dependent. The effects of BC application on ligninolytic enzymes under different culture conditions are currently under investigation.

Keywords: Biochar, Ligninolytic fungi, Fungal growth, Ligninolytic enzymes

Biochar's effect on C sequestration and N2O emissions depends on soil type and biochar substrate

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Carbon sequestration to agricultural soils as biochar has been increasingly advocated as a means to mitigate increasing atmospheric carbon dioxide (CO2) levels. It is also speculated that amending soils with biochar could also mitigate soil born greenhouse gas N2O, although at present the effects of biochar on soil properties and greenhouse gas (GHG) emissions are not completely understood. We conducted three laboratory experiments with the objective of investigating biochar's effect on C sequestration and N2O emissions from two contrasting soil types (loamy soil with pH 7.8 from Harran plain Turkey and sandy loam soil with pH 5.3 from central Germany) upon fertilizer application in a fully automated continuous-flow incubation system. Soils were amended with four different biochar (olive pomace (OiP), maize cobs (MaC), cotton stalk (CsC), pistachio shell (PsC)) in conjunction with or without N fertilizers. Overall, cumulative CO2 fluxes were significantly higher in loamy than in sandy loam. Higher CO2 fluxes in loamy soil were accompanied by higher activities of xylanase and β-glucosidase, and lower activities of peroxidase. During the initial phase of the experiment (0-100 h), daily CO2 fluxes in all biochar amended soils (except OiP in sandy loam soil) were significantly lower than in the N fertilized control soil. The latter clearly indicates biochar induced negative priming of soil organic carbon (5-10% depends on biochar type) in both soil types. Amendment of all biochar types decreased daily N2O fluxes up to 35%, however, only during the initial phase of the experiment. About 400h after onset of treatments, daily N2O fluxes increased significantly in all biochar amended soils (more pronounced in OiP amended sandy loam). The latter clearly suggests that amending soils with biochar may be an effective proxy for increasing carbon sequestration to agricultural soils. However, its effect on N2O fluxes seems to be more complicated.

Keywords: Biochar, CO2, N2O, pH, nitrogen

Effects of biochar and garden soil as amendments on the physicochemical characteristics of contaminated soils and on the growth and the potential use of 6 Salix species for phytoremediation

Tonia Lomaglio[1], Nour Hattab[1], Florie Miard[1], Francis Cottard[2], Marie Gaillard[3], Stéphane Sabatier[3], Mikael Motelica Heino[4], Sylvain Bourgerie[1], Domenico Morabito[1]
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Soil contamination by metal(loid)s has become a major matter of concern in Europe. Due to environmental hazards and public health issues, the remediation of these contaminated sites is an important issue. Given the cost of conventional techniques, a growing interest has focused on soil metal phytostabilization. Salicaceae, willows and poplars, have been shown to have a high phytostabilisation potential since they present a high and rapid biomass production associated to a metal(loid)s tolerance, due to the metal(loid)s confinement in their roots. Moreover this phytostabilization capacity can be improved by using soil amendments, to promote the development of the plant and the soil metal(loid)s stabilization. Two amendments were chosen, a garden soil and a biochar produced from woody species biomass pyrolysis. Biochar is a rich-carbonaceous product, porous and presenting a large specific surface area. Many studies have shown its positive effects on the soil agronomic properties as well as good metal(oid)s stabilization properties.
Our study focused on a former silver-lead mine extraction site soils located at Pongibaud (France), contaminated mainly with high concentration levels of lead and arsenic and with no vegetation. The goals of the study were (1) to investigate the effects of various biochar-garden soil mixtures on metal(loid)s (phyto)availability and (2) to assess the tolerance of different willow species. Tested Salix genotypes were grown on different amended technosols: two concentrations of biochar (2 and 5%) associated to soil garden mixing up to 50% were prepared. Soils and soil pore water characteristics (pH, EC, DOC, total dissolved metal(loid)s concentration) as well as Salix biomass and metal(loid)s plant repartition were determined. We identified which amendments and Salix species are most promising as remediation tools for the tested contaminated technosols

Keywords: Biochar, Metal(loid)s, Phytostabilization, Mine waste, Technosols, Phytoavailability, Arsenic, Lead

Biochar and compost for mitigation of elevated copper concentrations in vineyard soils

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Since the 19th century, copper-based fungicides have been used in vineyards to counter downy mildew. In organic viticulture, copper fungicides are even nowadays the only effective option to avoid severe yield losses. The high Cu-application rates that have been used many decades ago in traditional wine-growing regions have led to copper concentrations of locally >200 mg kg-1. Such concentrations may lead to ecotoxic effects for soil microbiology and for the plant roots of vegetation cover plants. For improving this awkward situation, the objective of the study presented here was to reduce copper bioavailability and its ecotoxic effects in vineyard soils by organic soil amendments.
Soils with elevated copper concentrations were selected from different Austrian winegrowing regions. Main differences were pH and Corg as basic soil characteristics relevant for copper availability. Incubation experiments were installed to analyze sorption characteristics and microbiological effects of different biochar and compost amendments to the copper-impacted soil. Microlysimeter experiments with grapevine plants and soil with different amendments should illuminate the efficacy of the amendments for reducing copper in leachate water and plant uptake of copper.
Preliminary results have shown that in different soil types different amendment strategies are most promising. In acidic soils liming may reduce both bioavailability and ecotoxicity of copper. In neutral or slightly alkaline soil compost amendments may significantly enhance the soluble fraction of copper, even in combination with biochar. Pure biochar, especially in a modified carboxylated form, may decrease the fraction of ionic Cu2+. Thus the exotoxicologically most relevant form of copper may be more effectively reduced than the total soluble copper concentrations that occur in organically complexed form.
For mitigation of elevated copper concentrations in vineyard soils the efficacy of soil amendments should not only be assessed by analyzing the mobile fractions but also the speciation of copper.

Keywords: Copper, vineyard, Vitis vinifera, immobilization, biochar

C - Climate Change, Sustainable Agriculture and Soil Quality: A systems approach to improve Agroecosystem Services

Convener : Taşkın Öztaş – Turkey

Monday 17 October 2016

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Making the Sahara desert green - design of the system for sustainable transport of bottom lake sediments via pipelines to produce new agriculture land from desert
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C - Climate Change, Sustainable Agriculture and Soil Quality: A systems approach to improve Agroecosystem Services

Convener : Taşkın Öztaş – Turkey

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Comparing the Fertility of Soils in an Arid Region with Soil Quality Index Calculated by Expert Opinion and Principal Component Analyses
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The Effect of Zeolite on Nitrogen Use Efficiency of Wheat in Coarse Textured Soils
Enise Sukuşu – Isparta, Turkey

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Silicon uptake in a repeated wheat cropping system: effect of soil type, Si pool and diatomite addition
Catherine Keller - Aix En Provence, France

Modelling the impact of historical to current (1800-2010) intensive agriculture on carbon, nitrogen & phosphorus cycling in the UK

Shibu Muhammed[1], Kevin Coleman[1], Lianhai Wu[1], Jess Davies[2], Vicky Bell[3], Edward Carnell[4], Sam Tomlinson[4], Tony Dore[4], Ulli Dragosits[4], Pam Naden[3], Andy Whitmore[1], Edward Tipping[5]
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Understanding the processes of C, N & P cycling processes in the 'past to the present' is important to make long-term forecasts to manage their supply and utilisation in a sustainable agricultural system. The objective of this work is to develop a model to estimate the nutrient import and export to and from the UK's agricultural system taken as a whole. The agricultural model simulates soil and landuse processes by incorporating the interaction between plant, nutrients and livestock. The model was run on 5x5 km grids across the whole UK on a monthly time-step. Historical land cover and landuse (crop and livestock) data starting from 1800 were collated and synthesised from various sources. We used gridded weather data from Met office, UK and soil data from Harmonised World Soil Database. A number of outputs were produced by the model which include carbon input to the soil and its loss by decomposition, loss of nutrients such as NO_3-N, NH_4-N, dissolved inorganic phosphorus (DIP) and dissolved organic carbon (DOC), nitrogen (DON) and phosphorus (DOP) by leaching, runoff and soil erosion. The mean annual SOC change for whole UK during 1800-50, 1850-1900, 1900-50 and 1950-2010 show that there is a decrease in mean annual loss from 1800-50 (0.3 t $ha^{-1}y^{-1}$) to 1950-2010 (0.09 t $ha^{-1}y^{-1}$) under arable and a build-up of carbon under grass (0.05 to 0.44 t $ha^{-1}y^{-1}$) during the same periods. The mean annual NO_3-N loss increased from 7.0 and 10 in 1800-50 to 18 and 14 kg N $ha^{-1}y^{-1}$ in 1950-2010 under arable and grass land systems, respectively. Simulated nutrient fluxes were compared with river observations from Harmonised Monitoring Sites (HMS), which is a sampling network of 230 sites across the whole UK. The model was also run for future (2011-2100) scenarios of climate (A2), atmospheric deposition and agricultural intensification.

Keywords: Soil, Nitrate, leaching, runoff, erosion, Scenario, climate, Agricultural intensification

SoilGen2 a tool to assess soil evolution induced by global change

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Today with the increase in population, human activities are imposing severe changes to the environment including soils. To preserve the soil, it is necessary to take into account both natural and anthropogenic process which affect soil evolution, through mechanistic modelling. To simulate the impact of climate and land use change on soil, a model has to take into account physical, geochemical and biological processes altogether and, particularly, to consider water flux and matter redistribution through soil profile. To our knowledge such modelling approaches are still rare and the only one model that meets the two requirements is SoilGen2.24 (Finke et al, 2012). This model simulates the depth distribution through time of a large range of soil characteristics. In this study we test the ability of the SoilGen2.24 model to build up soil projection scenarios of the vertical distribution of four major soil characteristics: clay content (<2µm), organic carbon content, bulk density and pH. We focused on these properties as they play an important role in determining soil functionalities and are considered susceptible to evolve over a time scale compatible with human activities. We first tested the model sensitivity to probable variations of climate, land-use and agricultural practices. We then tested its ability to reproduce soil formation of three Luvisol anthroposequences that differ by their land-uses and agricultural practices. Finally we proposed an approach in terms of anomalies for the predictions of soil evolution, on the basis of the anthroposequences analysis. The results show that the model can reproduce the trend of soil evolution over different land uses and agricultural practices. The model is also proved to be sensitive to variations of climate in the range of climate change scenarios for the next 100 years.

Keywords: Soil genesis, modelling, climate change, land use change, soil characteristics

Influence of Sugarcane Production on the Clay Mineral Assemblage in sugarcane fields of Khuzestan Province (IRAN)

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OBJECTIVE OF THE STUDY
Sugarcane is widely cultivated in Khuzestan province of Iran. Several factors such as long period of seasonal growth of sugarcane, the consumption of vast amounts of water for irrigation and using the heavy agricultural machinaries in different stages of the sugarcane cultivation can affect soil properties. This study was designed to examines the influence of sugarcane production on mineralogical properties of soils in comparison with adjacent uncultivated soils and soils under rotation cropping cultivation.
MATERIAL AND METHODS
The research was conducted in Amir kabir Agro-industry company in southwest of Iran. Soil profiles described in fields that were under sugarcane cultivation about 20 years and then mineralogical properties of their soils were determined by XRD. This operation was performed for adjacent uncultivated soils and for Soil profiles from about 100 years of rotation cultivation. Moreover Some physical and chemical properties consist of available and cation exchange capacity determined.
RESULTS
Expandable minerals were abundant in the Ap horizon of the cultivated soils, unlike in the uncultivated soils, while only small amounts were found in C horizons of cultivated soils. This trend agrees with changes in soil physico-, chemical properties. Results also showed that the subsurface horizons of the cultivated soils contained more palygorskite than the surface.
Conclusion
It can be concluded that intensive cropping and strong irrigation over a long time could resulted to changes from micaceous and palygorskite minerals to expandable minerals in sugarecane cultivation and cropping rotation.

Keywords: Clay Mineral Assemblage, Cropping rotation, Expandable minerals, Sugarcane

Making the Sahara desert green - design of the system for sustainable transport of bottom lake sediments via pipelines to produce new agriculture land from desert

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In a world which will be home to 9 billion people by 2050, providing enough food and other vital resources will be a great challenge for humanity. Egypt being the third most populous country in the fastest growing continent, Africa, is not excluded from this struggle. Egypt's population, which is at present above 80 million, is predicted to rise to 113-200 million (depending on the source) by 2050. However, Egypt's arable land is less than 4% of its 1,001,450 km2 area, and is manly concentrated in the Nile Valley. A huge rise in population, coupled with mass migration towards the cities and urbanisation, has already led to the great loss of arable land. To feed the growing population Egypt will need to make new agricultural land away from the urbanised Nile Valley. The alluvium that once was Egypt's natural fertiliser is being sedimented behind the Aswan High Dam, producing the 'sediment phenomenon' which has so far resulted in 7 billion tons of silt. By using the silt accumulated on the bottom of Lake Nasser, with an additional 135 million tons coming each year, we can make new land from desert. With careful planning, designing and by using a pipeline system designed for this unique purpose, we can transport the fertile silt mixture through desert without any evaporation loss. Egypt's 'New Valley' can be formed by using a permaculture and ecoscaping approach as a foundation and the Moringa Genus as a carrier tree/crop to pave the way for other more sensitive plants, which will allow for an independent sustainable agroforestry system to develop. This will provide new sustainable habitats for the rising population, while inducing the micro climate change that will through afforestation have an influence on the global climate and trigger a positive shift in the Sahel–Sahara relation.

Keywords: de-silting, alluvium pipeline, green Sahara, sustainable transport, logistics, resilience, Aswan High Dam reservoir

Past human interactions with agroecosystems and the impact they have on current agroecosystem services in the UK

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The soil is a vital part of every agroecosystem and interacts with many other ecosystems within an environmental and an anthropogenic context. Debate surrounding what is a 'healthy' soil or a 'sustainable' soil suggests that a number of measurable soil properties are entwined and include biological, chemical and physical properties. These properties can often be measured at certain resolutions, but are these resolutions high enough to produce useful agroecosystem analysis within the landscape?

Research into ecosystems often neglects to consider the effect and nature of human impact on those ecosystems and how they may have changed throughout time. In the UK there is well recorded knowledge of the location of archaeological sites and the general character of those sites but not how they impact on soils, and thus on the spatial and temporal variations in agroecosystem services.

This research has identified case study sites to understand more about how archaeological sites have altered and continue to alter the soil profile, the soil geochemistry, geobiology and geophysics. In understanding more about the variability of soils from not only a geological or topographical perspective, but also with a geoarchaeological perspective, these studies suggest that archaeological sites could also contribute to the agroecosystem services in terms of nutrient management, soil drainage, and soil structure.

In a secondary sense archaeological sites may also enhance agroecosystem services by introducing factors such as cultural heritage management and wider land management perspectives along with the traditional scientific studies that relate to agroecosystem services.

It is vital to not only know the effects of soils on agroecosystems, but also the nature of variabilities within the soil to understand how these may affect those services. Archaeological knowledge of past human interactions with the environment is undervalued in such discussions.

Keywords: Human impact, archaeology, soil variability, cultural heritage, agroecosystems

Changes in soil bulk density with hazelnut husk compost (HHC) application: main effects of soil texture and sampling time

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Our aim was to assess changes in bulk density (BD) of soils by different doses (0, 1.25, 2.5, 5.0, 7.5 and 10 ton da-1) of hazelnut husk compost (HHC) application in different sampling time (spring, summer, fall and winter) and in two hazelnut orchard with different textures such as sandy loam (SL) and clay loam (CL). In the end of the each sampling period, soil bulk densities were determined according to core method. The bulk density was affected by HHC application, soil texture and sampling time statistically. Our results showed that there were significant differences in different soil texture and sampling time. The best HHC application choice was 5 ton da-1 to increase the organic matter content by 2% level.

Keywords: Hazelnut, compost, soil, soil bulk density

Comparing the Fertility of Soils in an Arid Region with Soil Quality Index Calculated by Expert Opinion and Principal Component Analyses

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Integrating key soil attribute information into a single index provides useful information on the effects of management practices applied and monitor the quality of soils in time. The purpose of this study was to determine and compare the level of fertility function for non-cultivated soils due to the salinity, sodicity and boron toxicity problems and cultivated soils using soil management assessment framework (SMAF). The scores of fertility function of soils were computed by both expert opinion and principal component analyses (PCA). Two hundred surface (0-20cm) soil samples were collected and characterized for texture, bulk density, aggregate stability, available water content, water filled pore space, total organic carbon, pH, electrical conductivity, sodium adsorption ratio, available phosphorus and potassium. The fertility of soils was defined by nutrient cycling (NC), water relations, physical stability and support (PSS) and resistance and resilience functions (RRF). The results of previous studies were based to determine the indicators used to define each of functions for expert opinion and PCA. The difference in quality scores were compared with a paired t-test. The fertility scores were 76% and 65% for the cultivated and non-cultivated fields, respectively. The highest score in cultivated fields was 78% for NC function and the lowest was 72% for RRF. The reason for a lower fertility score (48%) in non-cultivated fields was the low score of RRF function. Although, fertility scores obtained with expert opinion and PCA approaches were not significantly differed from each other. Leaching fraction with each of irrigation event, organic matter amendment with animal manure and crop rotation resulted increased the ability of soil fertility. The expert opinion approach can be used for PCA, because experts will know the area of interest.

Keywords: Soil Management Assessment Framework, SMAF, expert opinion, PCA, soil quality

The Effect of Zeolite on Nitrogen Use Efficiency of Wheat in Coarse Textured Soils

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Since coarse textured soils have very low cation exchange capacity and excessive aeration, a significant portion of nitrogen in fertilizers are leached away from the effective root zone as NO3 anion. The aim of this study was to fix ammonium nitrogen on clinoptilolite-zeolite to decrease the environmental risks and increase plant uptake and yield in wheat in three differing soils with changing physico-chemical properties.

A pot experiment was set up in completely randomized design in 3x4x3 factorial arrangement in triplicates. The pots were filled with equivalent of 3 kg oven dry soils passed through 4 mm sieve and mixed thoroughly with 0, 0.5, 1, and 2% clinoptilolite in 700-425, 425-106, and < 106 µm diameter. The available phosphorus and potassium concentration of the soils were fixed by additional fertilization. 100 mg kg-1 nitrogen was applied to the soils in two portion: 1/3 at sowing and 2/3 before stem extension. Three bread-wheat (Triticum aestivum) plants were grown in each pots to the maturity. Along with yield and some yield components, nitrogen concentration of grain and straw were measured to determine the effect of clinoptilolite on nitrogen use efficiency.

The effect of clinoptilolite on biomass was significantly related to the application rate, the size of zeolite and soil properties. As the diameter of clinoptilolite decreased smaller application rates were able to maintain higher yield and nitrogen use efficiency. Higher application rates resulted in differing degrees of nitrogen deficiency symptom in early growth stages but it was overcome after application of the second portion of nitrogen fertilizer.

Different sizes clinoptilolite may be used to reduce nitrate leaching and increase the nitrogen use efficiency in coarse textured soils. Consequently, economically feasible and environmentally friendly crop cultivation may be practiced in such problematic soils.

Keywords: clinoptilolite, coarse texture, nitrogen fertilization, nitrate leaching

Silicon uptake in a repeated wheat cropping system: effect of soil type, Si pool and diatomite addition

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Recent studies have suggested that agriculture can modify the Si cycle through depletion of soil available Si. The extent of the perturbation is not known yet but may be a critical factor for maintaining high yields of crops that are Si accumulators i.e. most of the cereals. It may also impact plant tolerance to various stresses including those associated with climate change. One of the objective of the BIOSiSOl project (ANR-14-CE01-0002) is to test the hypothesis that repeated cropping (wheat) affect the Si pools in soil. In order to evaluate the effect of pH and soil type, wheat cultivation was performed 9 times in a row in pots, on three different soils: an Andosol, a Podzol and a Calcisol. We measured Si concentration in plants, soil solution, and Si extracted by the 1% Na2CO3 for estimating the plant available Si pool (PASiP). We found a decrease in Si concentration in soil solution with wheat cultivation depending on soil types. However, although PASiP was four times higher in the Andosol than in the two other soils, Si concentration in shoots of wheat grown on the Andosol was only twice larger. Interestingly, PASiP was the lowest in the Calcisol but Si concentration in soil solution and shoots remained constant across the 9 runs. Calculation showed that after 9 runs, the amount of Si taken up by plants was at most 16% of PASiP. For the 9th run, we added amorphous silica (diatomite) to all soils and found that Si amounts taken up by wheat were pH-dependent. As Si concentrations reached in wheat were between 0.2 and 3%, it is likely that either PASiP was not similarly phytoavailable in the three soils or plants were able to access only part of the Na2CO3-extractable Si or a different Si pool.

Keywords: silicon, wheat, bioavailability, andosol, calcisol, podzol

CAL – FitzPatrick's vision on soil: Calcretes: Formation, Distribution and Anthropogenic

Convener : Muhsin Eren
Co Convener : S. Kadir
Claudio Zucca

Tuesday 18 October 2016

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Anthropo-calcretisation in archaeological mounds (tells) - A case study of Tell Maresha, Israel

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Anthropo-calcretisation is formed by human actions which cause or enhance the accumulation of calcium carbonate in a regolith. The objective of this study was to test whether such is the case in archaeological mounds ('tells'), considering that they are formed through repeated inhabitation, accompanied by natural sedimentation and erosive processes. We used Tell Maresha as a case study due to its location in the semi-arid climate zone of Israel - an area with vast distribution of nari (calcrete). The building materials used at this site were derived from the local bedrocks; chalk, nari and limestone. The field observations show a pale grey ('rendzinic') colour and loamy silt texture, resembling the high carbonate Pale Rendzina soil that typically overlies chalk in this area. Also, the effect of carbonate materials on the formation of Tell Maresha is clearly evident in its matrix. The accumulation of secondary calcium carbonate in the tell's host was further observed and analysed by soil micromorphology, showing early stage calcretisation with vuggy microstructure, calcitic crystallitic b-fabric, partly weathered sub-angular and rounded chalk fragments, foraminifera and organic material. It is interpreted that the architectural remnants that are embedded within the tell are the major parent material for the anthropo-calcretisation in this site. Based on current knowledge of calcrete formation, we assume that if the local environment maintains its calcretisation-prone conditions for at least the next 10 millennia, a well developed anthropo-calcrete will most likely form in Tell Maresha, as well as in the numerous tells in this range. The study of the anthropogenic influence on the formation of pedogenic calcium carbonate can enable a better estimate of modern anthropo-calcretisation. This will improve our understanding of the formation of calcrete in the Anthropocene.

Keywords: Anthropo-calcretisation, calcrete, soil micromorphology, archaeological mounds, Anthropocene

Biogenic (β-fabric) constituents within the hard laminated crust (calcrete hardpan) in the Mersin-Adana regions, southern Turkey

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In the Mersin and Adana regions, Quaternary calcretes are widespread and occur in a variety of forms such as powdery, nodular, tubular, fracture-infill, laminar crust, hard laminated crust (hardpan), conglomeratic crust, and pisolithic crust. Biogenic (β-fabric) constituents are common in the hard laminated crust in both regions. Beta fabric originated by biogenic activity, and is represented by rhizoliths (root petrification, root mould, root cast), alveolar septal fabric, calcite needles, calcified filaments, spherical calcites, spherulite-like structures (microcodium) and vadose (calcrete) pisoliths. Rhizoliths are organo-sedimentary structures produced by petrification of roots, and often show cellular cortex structures. Alveolar septal fabric is represented by a complex network of cylindrical to irregular root-voids surrounded by micrite or a bundle of parallel to subparallel oriented calcite needles with a length of generally 20–50 μm. The calcified filaments are straight to curved in shape, and some show small internal tubes, surrounded by an irregular coat of microcrystalline calcite.The filaments
are 1.5–5 μm in diameter and up to 90 μm in length, their walls consist of micrite-sized calcite crystals. On some filaments isolated spherical calcite bodies with diameters up to 5 μm are present. Some calcite needles are associated with the calcified filaments where the calcite needles are randomly oriented and perpendicular to the filaments. Spherulite-like structures are observed in some thin-sections. They are circular or elliptical in shape with a size of 20–70 μm, exhibiting radial-fibrous calcite crystals radiating from a central cavity. Calcrete (vadose) pisoliths are composed of irregularly coated microbial laminae around a nucleus showing a downward elongation that indicates an in-situ formation. Their size varies from 0.3 to 3 mm. All these biogenic features indicate a pedogenic origin for calcretes in the regions and formation in vadose environment.

Keywords: β-fabric, rhizolith, alveolar septal fabric, calcite needles, calcified filaments, spherical calcites, spherulite-like structures (microcodium), vadose pisoliths

Genesis of palygorskite and calcretes in the Pliocene sedimentary units of the Eskişehir basin, west central Anatolia, Turkey

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Quaternary calcretes are widespread in the Eskişehir province and occur in a variety of forms, such as nodule, tube, and laminar crust. They are white in color, and developed at the upper levels of the reddish-brown colored mudstones of the Pliocene sedimentary units. Calcrete profiles are immature in character and consist of isolated calcrete occurences within the mudstones. Palygorskite occurs abundantly as beige colored layer within the mudstone or minor component in calcretes. The thickness of the calcrete profiles ranges from 1 to 5 m. The nodules are roughly spherical to elipsoidal shapes with diameters of 1–12 cm. Petrographic studies reveal that the calcrete is composed mainly of micrite, with microsparite and sparite locally present. These calcretes have “floating” detrital quartz and feldspar grains in micrite, circumgranular and crumbly fractures, and rhizolitic-mat. Calcrete samples are composed mainly of calcite associated with minor palygorskite, quartz, feldspar, smectite, chlorite and locally illite and amphibole. The SEM/TEM images show that palygorskite fibers formed as bundles, and meshes in dissolution voids between smectite flakes, developed by flushing of meteoric fluids through the open pore system of the sediments close to the surface. Based on micromorphological features, the palygorskite is presumed to have formed authigenically by direct precipitation in a lacustrine environment following precipitation of calcite in vadose zone and alteration of detrital smectite. Enrichment of Ba±Sr, Ni and LREE relative to MREE+HREE, with a distinct negative Eu anomaly, are responses to the fractionation of volcanogenic feldspar and hornblende and ophiolitic materals under influence of the meteoric water. The palygorskite associated with calcretes was precipitated from alkaline water rich in Si, Al, Fe and Mg having Mg-rich character: (Si7.94Al0.06)(Al0.99Fe0.31Mg2.96)(Ca0.12K0.01). The required elements for palygorskite and calcite precipitation were most likely derived from the ophiolitic mélange and metamorphic basement units, volcanic rocks and smectitic materials.

Keywords: Calcrete, Eskişehir, mudstone, Pliocene, palygorskite, Turkey

Preliminary microscopic and mineralogical characterization of relict calcretes in Morocco

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The objective of this study is a micromorphological and mineralogical characterization of the calcretes outcropping in the area of central Morocco where these formations show an interesting variability of both macro and microscopic features. The study site is located west to the city of Marrakech and includes part of the El Haouz Plain and of the Jebilet range. The plain is dominated by Quaternary sedimentary formations including layers cemented by carbonate and widespread calcareous crusts at the surface. The Jebilet hills are dominated by Paleozoic metamorphic formations, above which discontinuous and relict calcrete layers often outcrop on piedmonts, on valley bottoms, and on hill sides. Calcrete samples were collected along an ideal transect including, from south to north, the Oued N'fis river bed and banks (350 m a.s.l.), the plain between this river and the Oued Tensift river, and the Jebilet hill sides up to around 600 m a.s.l. The present climate of the study site is arid to semi-arid. The mineralogies of the calcrete samples collected from the study site in Morocco were examined using polarized microscopy, X-ray diffractometry and scanning-electron microscopy (SEM-EDX) methods. Calcrete samples were found to be abundant in calcite associated mainly with palygorskite, quartz and minor of illite/mica, feldspar and chlorite. SEM observations indicate that palygorskite occurs as fibers, fiber bundles and networks mainly grown on and/or enclosing calcite rhombohedrons. The EDX spectra of the palygorskite fibers exhibit strong peaks of Si followed by Al, Mg and Fe peaks. The EDX analysis of calcite rhombic crystals exhibits strong peaks of Ca followed by weak/faint peaks of Si, Mg, Al and Fe suggesting association of minor and/or very fine palygorskite. Based on micromorhological features, the palygorskite is presumed to have formed authigenically during and following precipitation of calcite from percolating soil-derived water in a near-surface setting.

Keywords: Calcrete, palygorskite, calcite, mineralogy, micromorphology, Morocco

Soil Degration as a Result of the Influence of Antropogen Factors on Mil-Garabagh Plain

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Introduction
Soil degradation is a loss of the soil function, aggravation of the structure and peculiarities and weakening of natural economic value as a result of joint influence of the natural and anthropogenic factors. As a result of anthropogenic influence the soil fertility can weaken and can be completely lost. And the soil fertility loss causes degradation of the cultural and animal world, ground and surface waters and also soil forming rocks. We should note that it is difficult to define the borders of the natural and anthropogenic degradation under real circumstances.

Keywords: Cadastral, Land, Soil, Errosion, Degradation

CS1 – Can Sustainable Land Management mitigate desertification in drylands?

Convener : Claudio Zucca

Thursday 20 October 2016

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Reclamation of salt effected soils in the Iğdır Plain - Turkey: A critical review
Nazmi Oruç-Eskişehir, Türkiye

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Elisabeth Van Den Akker-Addis Ababa, Ethiopia

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Biophysical and Econometric analysis of adoption of soil and water conservation techniques in the semiarid region of Sidi Bouzid (Central Tunisia)
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Assessing the impact of soil and water conservation structures in the Ethiopian highlands. A case study from the Lake Tana Basin
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Short-term effects of Olive-mill wastewater spreading on chemical properties of soils in arid Lands, Study case from Southern Tunisia
Donia Jendoubi-Bern, Switzerland

Investigation of rhizobia nodulating faba bean (Vicia fabaL.) in Morocco

Youmna Hajjam[1], Imane Thami Alami[2], Sripada Udupa[3], Souad Cherkaoui[1]
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The biological nitrogen fixing rhizobia process in sustainable agriculture represents a great improvement of soil and legume crop management especially in arid regions. Indeed, Faba bean (Vicia faba L.) is one of legumes crop involved in this process worldwide. Rhizobium symbiosis with legumes is nowadays, an efficient strategy used to cope with the excessive use of chemical N fertilizers that induce depletion and soil pollution. This biological process is explained by the ability of rhizobia to induce nodules formation on Faba bean plants to achieve N2 fixation which improves soil fertility. However, Both faba bean and Rhizobium are affected by different stresses such as: salinity, drought, pH, heavy metal, and the release of inorganic phosphate compounds. Therefore, the aim throughout this study was to investigate phenotypic diversity among the faba bean rhizobial isolates and to select the most performant strains that can fix N2 under environmental constraints for inoculation particularly in affected soils. Result have shown that over than 50 % of isolates are fast growing, whereas 35% of isolates are slow growing in vitro. Moreover, 30% of these isolates were resistant to heavy metals (ZnCl2, HgCl2,PbCl2) and 77% were able to solubilize inorganic phosphate Ca3(PO4)2 and the efficiency of solubilization varied from 25 to 55%.The resistance to extreme temperature,pH, water stress and antibiotics allowed us to range rhizobial isolates into different groups and compare them among smapling sites. Most rhizobial isolates showed a significant symbiotic effectiveness on faba bean plants under greenhouse conditions. These assessments may lead us to enhance the biological nitrogen fixation process on one hand, and to test the strains performance based on their phenotypic diversity, under environmental constraints various areas on the other hand.

Keywords: Rhizobia, vicia faba, nitrogen fixation, environmental constrains, phenotypic

Soil trafficability mapping in Estonia

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Mapping of trafficability of unpaved surfaces is a field of interest in agriculture, exploration, construction, recreation and military applications. Frequent problems accompanied with the vehicle operations on landscape are destruction of soil and plant cover, formation of tracks and entrapment of vehicles, causing damages to the nature and not allowing vehicles to perform their tasks. However, if in the interest of the agriculture is not to destroy the soil and formation of tracks is not acceptable, than for military or rescue operations the tracks are acceptable as long it allows to perform their tasks. That fore different criteria of soil bearing capacity should be used in different purposes. In years 2012–2015 the study of Estonian soils trafficability for non-agricultural vehicles was conducted. The different methods, such measurement of precompression stress, soil cohesion, angle of internal friction and vehicle cone index (US Waterway Experiment Station (WES) model) were run to find soils bearing capacity and formation of tracks. The study was focused on natural areas (except forest) with limited traffic and thus previous compaction; however, samples were collected from different agricultural soils as well and tested at different water status. For creating the maps, the 1:10 000 digital soil map as the basis was used. To distinguish land use and drainage conditions the basic map of Estonia and drainage maps were used. After taking into account land use, drainage, soil type, texture and water regime the bearing capacity was calculated for different vehicles. The results of modelling were tested in field conditions. The results revealed good correlation between estimated and measured trafficability for tested vehicles. However, the boundaries in which we consider the soil trafficable or un-trafficable should be still clarified in more accuracy in the future.

Keywords: Estonia, soil, trafficability, map, heavy vehicles

Rehabilitating degraded landscapes through soil and water harvesting: water-spreading weirs in Afar Region, Ethiopia

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Pastoralists and agro-pastoralists in the Afar region of Ethiopia are exposed to severe soil degradation and reduced access to water. The main cause of the increasing degradation of natural resources is their excessive use due to strong population growth, high livestock density and reduced access to land leading to contested land rights. Degradation of soil, vegetation cover and water accessibility leads to lower yields. Pasture land for herds is diminishing; some areas are no longer utilizable at all, and endogenous fodder plants decrease both in quantity and quality. Soil surface without vegetation cover reduces water infiltration and increases runoff. This causes deep erosion gullies through which the water quickly drains off the land. Groundwater levels also drop, making less water available for all users. The interplay between droughts and floods is increasing leading to crop failure and loss of animals. This results in acute malnutrition in the Afar Region. In order to halt vegetation and soil degradation, German development cooperation implements a new approach to Ethiopia, building small-scale soil and water harvesting infrastructure successfully tested in the Sahel. In degraded dry river valley areas, the effects of strong runoff of rain water and sporadic flash floods carrying eroded soil are reversed by constructing a system of water-spreading weirs. They are terracing flood plains while depositing fertile soil and increasing soil moisture. This intervention leads to the rehabilitation of valleys for food and fodder production and to provide access to water for people, livestock and environment. At the same time, through the weirs groundwater levels are recharged and allow the local population to farm up to three cycles per year (rainfed, dryland and irrigated). This soil and water harvesting approach is successful because specifically adapted to the parameters of a given landscape, climate and people.

Keywords: Soil and water harvesting, Soil rehabilitation, Rehabilitation of degraded dry land, Food security, Conflicts mitigation, Pastoralism

Biophysical and Econometric analysis of adoption of soil and water conservation techniques in the semiarid region of Sidi Bouzid (Central Tunisia)

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A rapid depletion of natural resources, together with land degradation is of both historical and contemporary concern for Tunisia. Notwithstanding the impact on sustainability of agricultural production and sectoral development, there are significant concerns related to social welfare and well-being within rural communities. The adoption of soil and water conservation technology (SWCT) has, therefore, received much attention from both the research community and policy makers given that declining soil nutrient, erosion, and moisture stress have implications for agricultural productivity and thereby national food security and stability of rural communities. Yet, despite notable success in the adoption of SWCT in Tunisia, broad uptake has been less than desired. Given a dearth of empirical evidence on potential causes for low adoption, it is both timely and imperative for research aimed at evaluating the impact of SWCT uptake by resource-poor Tunisian farmers; and to identify potential avenues for enhancing broad uptake. The main objective of this study, therefore, is to identify and analyze those factors which have affected the adoption of SWCT in the Sidi Bouzid governorate of Central Tunisia, which we feel is representative of resource-poor environments within Tunisia. Employing a binary logistic regression model, with data obtained through a survey of 250 farmers, our results suggest that socio-economic and institutional factors have played an important role in the uptake of SWCT. Farmer experience and membership in a cooperative were found to have significantly positive effects on adoption. Somewhat surprisingly, however, farmers' participation in trainings were found to be negatively correlated with adoption. Equally important was a finding that farmers with livestock holdings were less likely to adopt SWCT. This would suggest that linear processes of knowledge generation and dissemination, through training and extension, will need to be augmented with more dynamic engagement of inclusive innovation systems which necessarily include rural institutions.

Keywords: adoption, soil and water conservation, physical conservation, biological conservation, logistic regression, Tunisia

Assessing the impact of soil and water conservation structures in the Ethiopian highlands. A case study from the Lake Tana Basin

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Without well planned adaptation efforts climate change is predicted to affect the agricultural sector in Eastern Africa and to ultimately reduce agricultural yields and hamper efforts to achieve food security and reduce hunger. Sustainable watershed management can support improved land and water management and effective actions on climate change adaptation.
Various soil and water conservation (SWC) interventions across the Ethiopian farmlands have been extensively applied to prevent soil erosion and land degradation. Stone bunds are among the most widespread. In some cases the SWC structures, implemented according to relatively standardized schemes, don't seem to be adapted to the local field conditions and their effectiveness is questioned. Therefore, in the Gumara-Maksegnit watershed in Lake Tana Basin, field experiments were conducted to evaluate the impact of on-site interventions (graded stone bunds) on surface runoff and sediment yield, and to generate indications to enhance their impact and for support upscaling.
Plot scale experiments were initially carried out in 2013 to compare the erosion processes taking place on treated and untreated slopes. The experiments indicated considerable conservation effects, with consistent decrease in runoff (up to around 60 %) and sediment yield (up to around 40 %) after stone bund treatment). Scale dependence of the results, and influence of the experimental layout were however observed. E.g., over-spilling or percolation of water at the bund may sequentially influence the down-hill fields. A second measurement campaign was performed in 2015 with modified experimental setting to investigate different scale effects considering stone bund cascade effects and cumulative runoff effects along the bunds. Preliminary results upheld the relative conservation impact of the structures, but also confirmed that absolute soil loss rates remain high after treatment, calling attention to the need to improve and adapt SWC design.

Keywords: Erosion, runoff, stone bunds, tracers

Short-term effects of Olive-mill wastewater spreading on chemical properties of soils in arid Lands, Study case from Southern Tunisia

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Olive mill wastewater (OMW) is the main residual product of olive processing and its disposal can represent a relevant environmental issue in Mediterranean countries, where olive oil production is large and concentrated in a short-lasting period. OMW is characterized by high pollutant load, salinity and phytotoxic levels of polyphenols, but also by a high amount of organic compounds and plant mineral nutrients. OMW field spreading may represent a low cost contribution to crop fertilization and soil amendment. This work has been carried out aiming to study the effect of olive oil mill wastewaters spreading on the chemical properties of soils in arid regions. Amendments with OMW were applied on two different soils in arid regions from Southern Tunisia in a completely randomized experimental set.
The main objective of this work is to identify the short–term effect of OMW on fertility of sandy soil, for the supply of soil on organic carbon, inorganic nitrogen, available phosphorus and exchangeable potassium during 2010. As well as assessment of its effect on pH, salinity of soils in arid regions. Obtained results show that under the conditions of our experiment, applying of this organic effluent has changed significantly the content of exchangeable potassium, mineral nitrogen, phosphorus and organic matter in soil. Consequently OMW is considered as a rich organic material and may constitute a potential potassic amendment for dryland soils poor in this element, which has the tendency to increase the content of major elements and the soil organic stocks. OMW application did not cause a significant change in soil pH as expected. This is due to the low quantity of OMW used in the soil. But it is crucial to highlight the value of OMW as an organic amendment that requires further study on optimizing used doses to avoid the risks that may cause.

Keywords: Olive mill wastewater, Soil, fertility, arid regions, monitoring

D – Climate Change and Agricultural Systems

Convener : İnci Tekeli

Thursday 20 October 2016

D – 987
Sensitivity of potential soil evaporation and reference evapotranspiration to climate change in Southern Turkey
Mehmet Aydın - Chuncheon, South Korea

D – 950
Comparison of soil CO_2 flux from an agrıcultural land surface under arıd condıtıons
Elif Didem Gülle Sakin-Şanlıurfa,Türkiye

Sensitivity of potential soil evaporation and reference evapotranspiration to climate change in Southern Turkey

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The quantification of potential soil evaporation (Ep) and reference evapotranspiration (ETo) is crucial for soil hydrology. Climate data generated by a regional climate model under the A2 scenario were used to quantify the evaporative demand of the atmosphere in the Çukurova Region of Turkey for a baseline period (1994-2003) and the future (2070-2079). The daily Ep and ETo were computed using the Penman-Monteith type equations for both periods. The derivative approach was used to create the sensitivity functions and then the non-dimensional relative sensitivity coefficients were calculated to assess the impact of the major climatic variables on Ep and ETo.
On the average of decades, solar radiation, air temperature, and wind-speed were projected to increase from 16.084 to 16.324 MJ m-2 day-1, from 19.3 to 20.7 oC, and from 0.75 to 0.77 m s-1, respectively, by the period of 2070-2079 when compared to the baseline period. In contrast, the relative humidity is expected to decrease from 68.1 to 67.5% (equivalent to a 0.9% reduction). ETo and Ep are projected to increase by 92.0 mm year-1 and 68.6 mm year-1, respectively, by the 2070s. ETo was more sensitive to the net radiation in all seasons; followed by the air temperature in the summer months, and by the relative humidity in the winter months both under the present and future conditions. Ep responded better to the changes in climatic variables than ETo in terms of the sensitivity coefficients. The sensitivity of Ep to the key climatic elements varied with seasons: the net radiation was the most causative variable in the summer, whereas the air temperature and relative humidity were the most influential variables in the winter. The mean sensitivity coefficients for air temperature and wind-speed are projected to increase from 0.40 to 0.45 and from 0.15 to 0.19, respectively, by the period of 2070–2079. A slight change in the sensitivity coefficient for relative humidity is projected. The relative contribution of the net radiation to Ep would decrease in the future with a coefficient decreasing from 0.84 to 0.80. This outcome can be attributed to the proportionally higher increases in air temperature and wind-speed in the future, which would reduce the relative portion of the net radiation. It can be concluded that for proper quantification of the effect of climate change on evaporation/evapotranspiration, the sensitivity analysis of the equations used is essential.

Keywords: Climate change, Soil evaporation, Evapotranspiration, Sensitivity analysis

Comparison of soil CO2 flux from an agrıcultural land surface under arıd condıtıons

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Greenhouse gas emissions into the atmosphere have been increasing sharply with the industrial revolution. Greenhouse gases are one of the most critical variables on climate researches. In the global carbon budget, CO2 exchange between atmosphere and soil play an important role because the amount of carbon stored in the soil is approximately three times that of the atmosphere. Soil CO2 flux is affected by agricultural management like crop rotation, fertilizing, cultivation, and meteorological factors. Reducing carbon emission from soil to atmosphere is an essential subject in global and national greenhouse gas budgets. Traditional methods do not allow continuous measurements. Therefore, CO2 emissions from soils are needed to measure in short time interval and continuously and also investigate relationships between meteorological variables. In this study, soil CO2 fluxes are directly and continuously measured over uncultivated soil, cultivated soil and irrigated maize which is handled by GAP Agricultural Research Institute Directorate in Şanlıurfa. In addition, relationships between some of meteorological variables and soil CO2 fluxes were analyzed. Data received first occurred from the soil surface CO2 flux average value 0,03 g CO2-C / h (0.72 g C m-2 gün-1) maximum 0.13 g CO2-C / h (3.12 g C m-2 gün-1) and minimum -0.31 g CO2-C / h (0 g C m-2 gün-1) is designated as.

Keywords: Soil CO2 emission, meteorological variables, Şanlıurfa, Turkey

DS1 – Distribution of soil biodiversity and related ecosystem services from local to global scale

Convener : Petr Hedenec
Co Convener : Eren Taşkın

Monday 17 October 2016

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Distribution of Mites (Acari-Oribatida) and Their Relationship With Ecological Factors
Ghezali Djelloul-Algers, Algeria

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Effects of wood ants (Formica rufa group) on abundance of soil microarthropods and litter decomposition
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Structure and functional responses of soil bacterial communities to acidification and alkalization under laboratory conditions
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Distribution of Mites (Acari-Oribatida) and Their Relationship With Ecological Factors

Ghezali Djelloul, Benlameur Zahia, Oussalah Narimen, Fekkoun Soumeya, Harkat Hafsa
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The soil fauna is an important source of biodiversity which has to be preserved because these organisms have essential roles in maintaining the soil quality. it is involved in the decomposition of organic matter and nutrient availability for plants and soil.Microorganisms. it also plays a part in the creation and conservation of soil structure. The present study consists on comparing between results of two methods to evaluate the situation of soils in Algeria. The first is teledetection (remote sensing) (Albido, Map rainfall, NDVI and sensitivity map of desertification) which, through satellite images, allows to observe the soils. The second is the analysis of acarologic fauna through the dispersion of species, their presence and their absence permet to give an image of soil situation. The analysis of the acarologic fauna is realized in different places in Algeria, which are grouped according to bioclimatic floors. The results of the geographical distribution of mites collected during this study show a dispersion that is perfectly correlated with that of the vegetation. Indeed it should be noted that the abundance of mites is very important for large values of NDVI and for low values of albido. The combination of the values of Albido with temperature shows that the mites are available in areas with water regulation, with availability of moisture and a good surface temperature

Keywords: Biodiversity, Organic matter, Acarologic fauna, NDVI, Albido

Effects of wood ants (Formica rufa group) on abundance of soil microarthropods and litter decomposition

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Wood ants are dominating ecosystem elements of the temperate region due to their wide and abundant occurrence. They often collect large amounts of organic material from the surrounding forest floor for building large above-ground mounds. These mounds have higher temperature and lower water content than the surrounding forest floor which in turn may effect the soil fauna and decomposition processes.

The aim of this study was to test the effect of wood ants (*Formica rufa* group) on the abundance of the soil microarthropods and litter decomposition. This, is the first study in Turkey, to understand the ecological role of wood ants on soil microarthropods and litter decomposition processes.

The study conducted on four selected ant nests of same sizes in a *Pinus nigr*a stand at Cankiri Karatekin University Faculty of Forestry Research Forest. Decomposition was determined by fiber litterbags, containing approximately 2g of air-dried *Pinus nigra* needles. A total of 288 litterbags were placed near to and 10m away from the ant nests. Litterbag collection and soil microarthropods sampling were performed bimonthly from October 2014 to September 2015. During each sampling, three replicates of soil samples for microarthropods and litterbags were taken randomly from each plot. The samples represent soil cores. Soil microarthropods was extracted using modified Berlese-Tullgren funnels and then sorted, identified and counted under stereoscopic microscope.

This ongoing study, as well as previous studies, have revealed non-significant effects of wood ants on the abundance of soil microarthropod community and litter mass loss. Accordingly wood ants not key-stone predators on soil microarthropods in this temperate coniferous forest.

Keywords: Wood ant, Formica rufa, microarthropods, collembola, acarina, litter, decomposition

Structure and functional responses of soil bacterial communities to acidification and alkalization under laboratory conditions

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1. Objective of the Study:
Our study was aimed on following questions: (i) Does pH gradient changes of greenhouse gasses emission during three months incubation under laboratory conditions? (ii) Do various pH changes in diversity of soil prokaryotic community during three months incubation under laboratory attempts? (iii) How is functional response of soil bacterial community to various pH´s during three month incubation? (iv) Does pH gradient effect on ecological functions of soil microbiota?
2. Material-Methods:
We used soil from mountain grassland ecosystem situated in Hongyuan County. Soil samples were amended by various pH´s (from acidic to alkaline) and incubated under laboratory conditions for three months. Emission of methane, carbon dioxide and nitrous oxide were measured per week during three months incubation and samples for DNA isolation were taken each month. 16S rRNA gene was amplified using PCR method. PCR amplicons were sequenced using Miseq sequencing platform at Chengdu Institute of Biology.
3. Results:
Results of our research indicated strong temporal effect of pH on microbial activity. Emission of methane showed increasing along elevated pH gradient. Alpha-diversity of soil prokaryotes was strongly driven by pH among sampling times while beta diversity significantly altered only within increased incubation time. Relative abundance of soil bacteria varied along elevated pH gradient among sampling times. Oligotrophs were strongly driven by pH during time while copiotrophs did not showed changes in relative abundances among sampling times. Soil bacterial community is sensitive to elevated pH gradient.
4. Conclusions:
Soil bacterial community is sensitive to changes of pH during incubation time as well as among sampling times, however, taxa with relative lower abundance seemed to be resistant to pH. To fully understand of functional response of soil microbiota to environmental stress, main research effort should be focused to diversity and structure of functional genes.

Keywords: pH gradient, prokaryotic community, phylogenetic structure, Miseq sequencer, diversity, functional response

Soil Properties And Plant Diversity As Affected By Slope Aspect In A Semi-Arid Grasland In North Central Anatolia

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Semi-arid areas comprise a considerable area in Turkey and the vegetation cover is very weak in these areas. This study was conducted in a typical semi-arid sloping grassland near Çankırı Karatekin University Campus for the purpose of analyzing differences in relationship between soil properties and plant diversity (PD), which is an important indicator for desertification studies. Two slope aspects, north-east and south-west, taken on a small hill in the study area. Soil samples were taken from 5-m apart on a vertical and a horizontal transect on the aspects and number species per square meter was determined at each sampling site. The soil samples were analyzed for soil physical (sand, silt, clay, bulk density, field capacity, wilting point, plant available water content, aggregation index) and chemical (pH, electrical conductivity, organic matter and CaCO3 contents) properties. Depth of topsoil was also measured at the sampling. Descriptive statistics were calculated for the soil variables and PD. The results showed that the PD was similar in mean and coefficient of variation on both aspects. Correlation analyses were conducted between soil properties and PD. The results of correlation analysis showed that only bulk density was correlated significantly with PD in northeast, while plat available water, wilting point, amounts of CaCO3, clay, and silt, and topsoil depths were correlated significantly ($P<0.05$) with PD on southwest slope. Compared to south slope, on northeast slope, greater clay content of the soils generated serious surface runoff that resulted in shallower soils. In addition, greater amounts of gypsum presented in soils decreased PD and this resulted in increased runoff on the northeast slope. Presence of high gypsum in soils on north slope would mask the correlations between soil properties and PD.

Keywords: Plant diversity, slope aspect, semi-arid grassland, central Anatolia, topsoil depth

The impact of various land cover flows on the capacity of soils to act as soil biodiversity pool

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Soil biodiversity refers to all organisms living in the soil. The Convention on Biological Diversity defines it as "the variation in soil life, from genes to communities, and the ecological complexes of which they are part, that is from soil micro-habitats to landscapes". Soil is one of the most diverse habitats on earth and contains the most diverse assemblages of living organisms.
Land take and in particular soil sealing has already been identified as one of the major threats to soils/soil degradation processes in the 2002 EC Communication "Towards a Thematic Strategy on Soil Protection" (Soil Thematic Strategy). One of the main reasons is that it contributes to the loss of valuable soil functions, such as biomass production, provision of raw materials and hosting the biodiversity pool.
Therefore we started from the concept of ecological potentials and compared the potential use (i.e. the theoretical potential of how the land resource could be used) with the actual use of the resource aiming at analyzing potential loss of productive land. In this study, the impact of a number of land cover flows (LCFs) on the productivity of soils with a good, average and poor potential for biodiversity pool have been assessed and analyzed in EU scale. The most relevant LCFs per soil functions were taken into account; "land take" flows (urban residential sprawl and industrial and infrastructure related sprawl, resp.), combinations of the more agriculture-related flows LCF4 and LCF6 (agriculture internal conversions and withdrawal of farming, resp.) and combining sub-flows of LCFs6 and 7 (withdrawal of farming/forest creation and forest creation and management.)

Keywords: Soil biodiversity, EU scale, land cover flows, biodiversity pool, soil functions

Role of myrmecological fauna (Hymenoptera: Formicidae) in nitrous oxide emissions from humid tropical rainforest soils

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Tropical rainforest soils are important emission sources of atmospheric nitrous oxide (N2O), primarily being produced by nitrification and denitrification processes. However, regulation of these microbial processes is influenced by certain edaphic spatio-temporal heterogeneities created by different soil macrofauna. Epigeal ant mounds, for example, are one of the main features of tropical ecosystems. It is hypothesized that ant mounds of humid tropical forests could be hotspots of N2O emissions. Principal objectives of study were to determine the extent to which ant mounds could contribute to local soil N2O emissions and to find out main microbial process involved in these emissions? N2O flux was determined in-vitro from live ant individuals, ant-processed mound soils and surrounding control soils for two trophically distinct ant species i.e. leaf-cutting Atta mexicana and omnivorous Solenopsis geminata ants. Moreover, some physicochemical (pH, total C and N, mineral N and moisture contents) and microbiological (nitrifier and denitrifier genes abundance) parameters were also assessed. Mound soils of both species emitted 2-fold more N2O than that of control soils while this emission enhanced significantly to 5-fold in the presence of acetylene (C2H2), indicating that i) denitrification was the major N2O-genic microbial process and that besides N2O, N2 was also emanated from these mound soils. It is estimated that these ant mounds could contribute approximately from 0.1 to 11.7% of total soil N2O emissions from tropical rainforests. Mineral N (NH4+ and NO3-) and moisture contents were higher while other factors (pH, total C and N) were lower in ant mound soils than those of control soils. Similarly, abundances of all targeted genes were higher in mound soils than control soils, although the difference was more significant for A. mexicana ant species. Nitrifier and denitrifier gene abundances were about 3.4-fold and 16-fold higher in mound soils than respective control soils.

Keywords: Tropical soils, ant mounds, N2O, denitrification, nitrification, Leaf-cutting ants, Omnivorous ants

The Effects Of Ammonia Fertilization On Co2 Production, Dehydrogenase Enzyme Activity And Ph Changes Under Wheat Vegetation Undertaken By The Injection Method (Cultan)

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In this study (first in Turkey), the effect of ammonia fertilization on CO2 production and activation of dehydrogenase enzyme (DHA) and pH were investigated in comparison to CULTAN and conventional fertilization methods. The aim of this study was to determine the microbiological activity (CO2 production, DHA) based on the injection of liquid ammonia into the soil in comparison to conventionally applied fertilization in the widely spread wheat cultivation areas of Turkey (Cukurova). According to the results however there were no statistical significant differences between the applications in terms of CO2 production. The highest CO2 production was obtained in the %100 CULTAN application (14.36 mgCO2/100 gkt 24 h.) on the injection point and the lowest CO2 production was obtained in the %70 conventional application (13.02 mgCO2/100 gds 24 h.) on the fertilization band. In terms of DHA the highest values were detected in the %70 CULTAN application (303.5 µg TPF/10 gds) on the injection point and the lowest values were detected in the control plots between the wheat lines. On the other hand there were no significant results determined between the other applications. In terms of pH change the lowest pH value was obtained in%70 CULTAN application by the injection method as 7.71.

Keywords: CULTAN, CO2 production, DHA, wheat

DSS – Decision Support System (DSS) For Soil Management, Case Study: Integrated Agricultural Information System

Convener : İlhami Bayramin
Co – Convener : Tülay Tunçay

Tuesday 18 October 2016

DSS – 944
Spatial Distribution of the some Soil Properties Using GIS
Ilhami Bayramin-Ankara, Türkiye

DSS – 395
A comparative study of three land evaluation system (LCC, STORIE, INSID) in North of Algeria
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Spatial Distribution of the some Soil Properties Using GIS

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This study was carried out Altınova State Farm soils at the selected 64 km2 (8 km * 8 km) test site. Soil samples were collected with 500 m interval at 287 locations. Total of 1036 soil samples were collected per 20 cm until 1 m soil depth. Some soil analyses; such as soil pH, electrical conductivity, carbonate content were exerted to soil samples. The descriptive statistics were computed according to soil analyses results, and spatial distribution of the soil properties were determined geostatistically using kriging method. Appropriate variogram modeling was performed with parameters (nugget effect (C0), the threshold value (C0+C), the structural distance (A0) for each soil properties and soil depths. Maps were generated using GIS software for each soil properties and depths with variogram parameters.

Keywords: Soil properties, kriging, geostatistic, GIS

A comparative study of three land evaluation system (LCC, STORIE, INSID) in North of Algeria

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The main purpose of this work is to establish a comparison between the land evaluation system adopted by INSID Algeria (National Institute of Soil, Irrigation and Drainage) and the two American systems, the index of STORIE and land classifying skills LCC (land capability classification) USDA (United States Department of Agriculture), in order to improve the INSID system, by Applying these three evaluation systems on the Eastern plain of Mitidja Rouiba - (Algiers). Geographic Information System (GIS) had been done using the MapInfo software in order to make a map of the land suitability and a presentation of the results of land evaluations obtained by each land evaluation system studied.
According to the results of the three systems that have been illustrated by land suitability maps obtained by the GIS, they show that, according to LCC system, 99% of land are suitable for agriculture, 97% are ranked suitable by STORIE and only 47% of land are classified as suitable for agriculture by the system adopted by INSID.
Therefore, we have noticed that there is a difference between the results obtained by LCC, INSID and STORIE. However there is a closeness between the results obtained by LCC (97%) and STORIE (99%) evaluation systems, these results were illustrated by suitability maps produced using GIS.
The statistical results shows that the correlation is not significant between LCC and INSID ($r = 0.19$; $p = 0.01$), on the other hand it is significant between INSID and STORIE ($r = 0.64$; $p = 0.01$), Moreover, this difference is due to the high number of variables considered by the INSID, particularly those concerning the interrelated properties.

Keywords: Land evaluation systems, LCC, STORIE, INSID, Geographic information system (GIS), Land suitability

Principles of the integrated system of agricultural soils for policy makers

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Objective of this study: Integrated Agricultural integrated system for policy makers. The basic system configuration is based on observation of the applicable framework for major soil and climatic conditions, which distinguishes the majority way of action on land productive function of soil. This framework allows to capture the main differences in the physical characteristics of the soil and crop yields. For setting up an integrated system, the paper evaluated the relations of production and the environment. We used monitoring the soil and climatic conditions in the Czech Republic in 2004 - 2011. Based on the analysis of the effects of land and subsequent monitoring of the development of technology, price-cost relations in the Czech Republic in 2014 created the following requirements for the basic pillars of the integrated system Agriculture: i) creation of conditions for maintaining or improving soil quality, ii) economic evaluation of production on the ground to decide on further promoting the desired direction of farming iii) quantification of food production in a given soil and climatic conditions. Improve soil quality can be reflected in both the degradation processes and factors in the production capacity of the soil. For this purpose should be a network of soil quality indicators that can differentiate changes in the soil. According to the results of monitoring is the major soil and climatic factors affected crop yields in the range of 50 - 80%, for example 55% of winter wheat, winter barley 70%, 53% winter rape, sugar beet 80%. The remaining stake to 100% is a technological process which, while causing much less impact on yield, this fact is not affected by adapting the technological process of soil and climatic conditions. From environmental point of wiew, it is advisable for example acreage of intercrops or the extent of damage caused by erosion.

Keywords: system, soil, productivity, yield, environment

Chemical Weathering in Semiarid Region: Evaluation in the Mineralogy and Geochemistry of Soils Developed on Different Parent Material

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Chemical weathering involves the biochemical breakdown of rocks and minerals into different products and compounds. In general, soils has distinct physical and chemical properties that allow it to be distinguished from the underlying parent material. Moreover, parent material is one of the state factors and the influence of its on soil properties has long been recognized. Different parent material affect the morphology and chemistry of soils under the same condition, such as topography and vegetation, especially in arid and semiarid regions. The objective of this study was to examine the effects of parent material on the physical, chemical, mineralogical and morphological properties of Altınova State Farm soils. For this purpose, physical, chemical and mineralogical characteristics of six soil developed on three different parent material such as limestone, marl and marl/limestone were studied to determine the effect of parent material on the soil characteristics in semiarid region in the Middle Anatolia Region of Turkey. The study soils were classified as Xeric Petrocalcid, Xeric Haplocalcid, and Xeric Haplocambid in pedological evaluation. Hence, this study deals with the derivation of five chemical index of alteration (CIA), chemical index of weathering (CIW), weathering index of Parker (WIP), plagioclase index of alteration (PIA), and Vogt's residual index (V). The results showed that parent material affect soil physicochemical, mineralogical, and morphological properties in the local region. That conclusion was also promoted by chemical weathering indices in the study.

Keywords: Soil formation, weathering indices, major and minor elements, parent material

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Hydrology of Gypsisols

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Gypsum is a one of the principal components of soils in arid and semi-arid regions. The solubility of gypsum controls its translocations in soils and its solubility is generally low in low precipitation areas. Therefore, gypsum in semi-arid landscapes affects soil physical and chemical conditions, plant growth, and crop production. Studies on the morphology and genesis of gypsiferous soils have been carried out by many researchers in recent years. However, behavior of gypsum in soils is not fully understood. In gypsisols, many factors, including solubility of gypsum, time of contact between gypsum and soil water, dispersion and mineralogy of clays, ion exchange processes, and composition of soil solution affect hydrological properties. In addition to parametric properties, morphological features of gypsiferous soils may have a considerable control on water flow in these soils. Therefore, new methods and advanced techniques may help understanding behavior of gypsum in semi-arid soils. In this study, we discussed different aspects of gypsisols, including their formation, hydropedology, management, and degradation in semi-arid landscapes.

Keywords: gypsisols, soil chemistry, clay dispersion, gypsum solubility, soil solution

Clay-Calcareous Aggregate Formation in a Calcic Haploxerept

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We studied clay mineralogy, morphology and composition of soil microaggregates, and carbonate build-ups in alluvial calcareous soils (calcic haploxerepts) in Cumra, Central Anatolia, Turkey, using X-ray diffractometry, raster electron microscopy, and energy-dispersive analysis. Calcite and layered minerals were principal components of fine fraction of the studied soils. Clay, silt, and sand contents were 45, 54, and 1% respectively. Illite was the dominant clay type in the clay fraction, and smectite amount was negligible. High infiltration rate, plant water availability, and good aeration of these soils were attributed to illitization processes, which is typical for soils with similar clay fraction in arid areas and to microaggregation of the soil solid phase by pedogenetic calcite that resulted in formation of calcite clay-salt ultra microaggregates. Including micromorphology in the study of soil physics may improve the understanding and evaluation of soil physical quality in similar soil conditions.

Key Words: clay-calcerous soils, aggregate formation, raster electron microscopy, calcite.

Saturated Hydraulic Conductivity Differences as Affected by Slope Properties and Soil Horizonation in Gypsic Haplustepts

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Gypsic Haplustepts are generally found in large areas of semi-arid regions in Turkey. Soil hydraulic properties vary in Gypsic Haplustepts and changes in topography may further boost this variation. The properties such as hydraulic conductivity (Ks) mainly control runoff in these soils, but little is known on the mechanism behind this control. The saturated hydraulic conductivity can vary both horizontally and vertically on a landscape. The aim of this study was to investigate the vertical and horizontal variation in Ks as affected by soil layering, slope steepness and aspect in Gypsic Haplustepts. We measured Ks on a transect stretching a valley with a pair of north facing and south facing slopes, having topslope, shoulder, backslope, footslope, and toeslope (a typical hillslope model). Soil profiles were open and described at each slope position along the slopes (10 soil profiles). The Ks was measured with a Guelph permeameter at five points at every soil horizon in each slope position across the south facing and north facing slopes. The data were analyzed by ANOVA test and the means were grouped by LSD technique to evaluate effect of slope position, slope aspect, and soil horizonation on Ks variability. The results showed that slope position, slope aspect, and soil horizonation affected the Ks significantly. We further evaluated data by dummy variables in regression. The results showed that slope position and aspect described 45% of the total variation in Ks. In hillslope hydropedology works in Gypsic Haplustepts, soil layering, slope steepness, and slope aspect should be included in the list of variables to be studied.

Keywords: Hillslope, slope aspect, soil horizonation, hydropedology, saturated hydraulic conductivity

Effect of land use on physical soil properties of riparian zone of Andirin river, Kahramanmaras, Turkey

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Riparian areas are ecosystems which are distinctly different from surrounding lands because of unique soil and land use characteristics that are strongly influenced by the presence of clean water. The objective of this research is to investigate the effect of land use/land cover on the physical characteristics of riparian zone by using geographic information systems (GIS) and remote sensing (RS) techniques. Firstly, we determined river network characteristics by GIS and RS and then we collected soil samples from transects characterized their vegetation and topography. Some soil physical properties were measured such as particle size distribution, saturated hydraulic conductivity (Ksat) and wet aggregate stability (WAS). In the end of the analyses, Ksat values changed between 0.66-3.75 cm/h, average sandy rate found as 76%, WAS values changed between 3.08-54.23%. According to the research results, particularly in agricultural areas, the width of the river bed tends to increase depending on the slope decreases. Accordingly, it was found found that there was more alluvial deposition on these areas. In these areas, sand content (S %) and Ksat values were measured as high while WAS values were lower. Farther from the edge of water, S content significantly decreased in all land uses. Our results pointed out that there is a configuration requirement for optimal land uses policy because we determined differences amongst riparian buffer zones in terms of measured physical soil properties in the study area.

Keywords: Physical soil properties, Land use, Riparian zone, Mediterranean Region

Effect of land use on chemical properties of soil of riparian zone of Andirin river, Kahramanmaras, Turkey

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Riparian zones located on transition places between aquatic and terrestrial ecosystems have both rich biodiversity and high tolerance for habitat. The purpose of our study was to investigate the effect of land use/land cover such as agricultural fields (irrigated and rainfed) and forests (broad leaved and coniferous) on riparian buffer zone. Remote sensing (RS) techniques and geographic information systems (GIS) were used in the study. In order to perform the chemical evaluation, soil samples were collected from each transects section. Some chemical soil properties such as soil reactions (pH), total organic matter concentration (OM), total lime (CaCO3), electrical conductivity (EC25ºC), extractable potassium (K) and phosphorous (P) with ammonium acetate were measured. Results showed that OM tended to increase in the riparian buffer zones of coniferous forests and pH values gradually decreased with distace away from the river's bank. This case showed that successions process occurred in riparian buffer zones and the effects of the river bank proceed into the interior of the buffer zones. The high pH values were determined in the river bank in agricultural areas. OM was low in the first zone, while it was the highest in the second zone. Also, OM had declining trend in the third zone. It has revealed the necessity to be managed of the riparian buffer zones with different soil and forest management policies out of the riparian buffer zones have different chemical soil properties.

Keywords: Chemical soil properties, Land use, Riparian zone, GIS and Remote sensing

A consistent set of thermodynamic data for iron, reevaluation of green rusts and fougerite solubilities and determination of the solubility product of ferrous hydroxide

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A consistent set of thermodynamic data for Fe is proposed to improve knowledge on iron dynamics in soils and sediments. Data are critically evaluated and incorporated in geochemical model Phreeqc using specific interaction theory, by modifying the sit.dat database. Gibbs free energies of formation of green rusts and natural green rust, fougerite, a mineral typical of gleysols are reevaluated. Reevaluated data are better correlated with the electronegativity of the compensating anion than previously. A new value is proposed for fougerite. Most data depend on the Gibbs free energy of formation of ferrous hydroxide, which is poorly constrained. New experiments were conducted to assess it more precisely. The solubility product of ferrous hydroxide (Fe(OH)2,cr) has been studied for 50 years by many authors. At acidic to neutral pH (<8) different databases agree, the dominant form of iron being ferrous ion. However, at basic pH (from 8 to 14), large discrepancies are found in the literature. Experiments were thus conducted at high pH, and in a glove box to avoid contact of ferrous hydroxide with air. Ferrous hydroxide was precipitated and solutions were analyzed for pH and total soluble iron. There is no evidence for the existence of Fe (OH)32- at pH close to 14. Recalculation of the solubility of ferrous hydroxide in the whole range of pH variation from 8 to 14 allows for precisely assessing the minimum of the solubility curve, close to pH = 11, and the different equilibrium constants of the various Fe(II) species in solution.

Keywords: solubility, Fe, pH, ferrous hydroxide, green rusts, fougerite, geochemistry

Evaluation of Soil Hydropedelogical Properties By Factor Analysis

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Hydropedology bridges pedology and hydrology in soil formation and soil and water management studies. This study was conducted describe relations between soil morphological properties and saturated hydraulic conductivity (Ks). Undisturbed soil samples were collected from topsoil (60 samples, 0-15 cm) and subsoil (60 samples,15-30 cm) of a paddy field and adjacent grassland (Ustorthends and Ustifluvents) with a core sampler. Disturbed soil samples were taken from the same sites and depths for basic soil analyses of soil texture, bulk density, soil reaction, specific surface area, cation exchange capacity, aggregate stability, field capacity, wilting point, linear expansion coefficient, organic matter content, and calcium carbonate content. The Ks was measured on the undisturbed soil column with a constant-head permeameter. Following Ks-measurements the columns were left for drying for three days at room temperature and subssamples was taken for bulk density. Penetration resistance was measured on the remaining undisturbed soil in the columns. Then, the soils were disturbed and morphological properties of soil color, structure, pores, roots, mottless, consistency, stickiness, and plasticity were described with standard soil description charts used in soil survey studies. Data of Ks and basic soil properties were subjected to factor analysis. Laboratory measured Ks-values had a mean of 0.83 cm h-1, maximum of 2.71 cm h-1, and minimum of 0.0036 cm h-1. In the topsoil (0-15 cm), four factors, namely soil hydropedology, roots and CaCO3, silt and color, and mootles described 80% of the total variation. In the subsoil, four factors defined approximately 80% of the total variation, and the factors were named as soil hydropedology, roots and silt, aggregate stability, bulk density and pH factor. In both cases, soil morphological and hydrological properties were loaded in the first factor that described the majority of the total variation. The results suggested that Ks-soil morphology relations may be important in studies of hydropedology in paddy and grassland soils in semi-arid conditions.

Keywords: factor analysis, soil hydropedology, hydraulic conductivity, hydrological properties, soil mechanics

Soil Moisture Simulations under the Climate Change Projections in Aydin Region of Turkey

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Climate change due to global warming is one of the most important events that will affect natural habitat, economy and human activities for next 50 years. Agriculture is one of the sectors which will be most affected by climate change and variability in a number of different ways. This study mainly focuses on how the climate change will affect the soil moisture balance in agricultural land in Aydin region located at Mediterranean basin of Western Turkey. According to the possible changes foreseen, the variations on evaporation demand of atmosphere and potential evapotranspiration were estimated in this study. Additionally, some climate change scenario analyses were performed by an agro-hydrological model to simulate soil water balance for a plot representing the main valley of Aydin region. SWAP model was used with the data set of soil – atmosphere and vegetation of cotton crop to represent the water movement in the soil. During the summer cultivation period in the year of 2012, the soil moisture was monitored according to physical properties of the soil layers in the selected area. Different soil moisture balances were simulated in the light of observed values in this year and climate change projections which are based on the most likely Climate Change Scenario of A1B in the future. According to the results, it was estimated that evaporation and transpiration will increase potentially and there will be a water movement upward from relatively high water table towards to the unsaturated root zone to meet the increasing demand.

Keywords: Aydin, climate change, soil moisture, SWAP model

Daily and monthly precipitation concentration over western Turkey

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Global warming associated with the increase of greenhouse gases in the atmosphere can lead to changes not only in the total amount of precipitation but also in extreme precipitation events. Extreme precipitation events may have an influence on erosion, agriculture, water supply, storm water drainage, energy production, etc. Precipitation homogeneity indices can be used to understand and evaluate spatial and temporal variabilities of extreme precipitation events. In this study, two types of indices (daily and monthly precipitation concentration indices) have been used to quantify precipitation homogeneity in Western Turkey. The results showed higher values of daily precipitation concentration index (DPCI) in northwestern and southern parts, and lower values in western-central, central, eastern and northeastern parts. Monthly precipitation concentration index (MPCI) values showed a seasonal precipitation regime over the whole study area, and exhibited a pattern decreasing from southwest to northeast, which implies a more uniform distribution of monthly rainfall in a year toward the northeast. Moreover, the southern part was the most critical part of the study area, with the highest values of DPCI, MPCI and annual total precipitation, but the lowest number of rainy days. Trend analysis demonstrated mostly non-significant decreasing trends for all indices, implying a very slight tendency toward a more regular precipitation distribution in a year over western Turkey.

Keywords: Daily precipitation concentration index, monthly precipitation concentration index, western Turkey, trend analysis

Drought analysis from irrigation perspective in western Turkey

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The planning and design activities in irrigation engineering need accurate evaluation of hydrological and meteorological data for better irrigation systems' management. Precipitation is the most important parameter among meteorological parameters for irrigation purposes. In recent decades, rainfall amounts have shown temporally and spatially great variability due to global climate change. For this reason, expected dependable rainfall amount of a dry year should be used in order to determine the capacity of an irrigation system that will be constructed in any area. Also, for proper operation of irrigation systems', the dependable annual rainfall values for a dry, a normal and a wet year are needed. These values are also used in arranging future irrigation scheduling programs for different regions. The importance of optimum irrigation scheduling is better understood and widely implemented in the areas suffering from drought. In this research, annual rainfall data for years 1966 – 2011 observed totally in 28 meteorological stations located in the western part of Turkey are used and the yearly dependable rainfall amounts were determined by using RAINBOW software for wet, normal, and dry years for western Turkey.

Keywords: Dependable rainfall, Western Turkey, irrigation, RAINBOW, drought

ELD – Economics of land degradation: Soil dimension

Convener : Pavel Krasilnikov

Monday 17 October 2016

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Sustainable soil management: a decision making guide
Pavel Krasilnikov-Moscow, Russia

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Assessment of the areas under risk of land degradation in Europe
Ece Aksoy, Türkiye

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Sustainable soil management: a decision making guide

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Economics of land degradation (ELD) is a challengeing initiative focused on the motivation of the decision makers to pay attention to land and soil degradation and thus promote sustainable land management approaches in land use. At the initial stage of its development the initiative provided global and regional overviews of the extent of land degradation and its economic effect, taking into account the loss of the major ecosistem services besides agricultural food production. The economic arguments had a significant impact on administrators, but concrete actions to be taken were not clearly described until recently. Current approach to the ELD focuses mainly on the decision making on farm level. At this scale the responsibility of expert is high, and many factors should be taken into account to provide guidance for the optimal land use and soil management. We also discuss the additional conditions for using the ELD Methodology: most landscapes are already transformed by humans, and we should take into account that the lands are already degraded, and investment would be needed for land reclamation before application of sustainable soil management practices. We recommend to follow several steps for assessing the economic effect of sustainable land use vs. "traditional" land management: (1) the estimation of the feasibility of ecological restoration of the land, (2) the evaluation of the cost of land reclamation, (3) the assessment of the cost of "action" (sustainable land management) vs. "inaction" (agriculture "as usual"), and (4) the comparison of the cost of land reclamation with the potential benefit from sustainable land use for a given planning horizon. Unfortunately, the inclusion of the "accumulated harm" of the degraded lands significantly decreases the area of the soils siutable for profitable sustainable management.

Keywords: economics of land degradation, sustainable soil management, accumulated harm, decision making, ecosystem services

Assessment of the areas under risk of land degradation in Europe

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RIO+20 target of 'neutrality' aims to prevent land degradation and restore degraded lands if the land is not inevitable degraded. It's been known that almost all EU Member States are affected by declining land productivity to some degree, therefore, identifying where and why land productivity is changing, where threats are greatest and where conditions are improving, what is the level of land degradation and the spatial location of the degraded land, are very important issues to fulfill the land degradation neutral EU target.
In this study, we tried to consider the most descriptive spatial indicators which might show the effect and the risk of degraded land to assess the areas possibly under risk of land degradation in Europe. Therefore, we used 10 descriptive indicators including soil loss by water (RUSLE 2015), land susceptibility to wind erosion, natural soil susceptibility to compaction, landslide Susceptibility, drought, organic carbon pool soil function, soil biomass productivity on croplands, land-use intensity on croplands, land cover, land cover flows. The conditions of these selected indicators were described by taking into account the worst situations of the land. The map of the areas under risk of land degradation in terms of those 10 spatial indicators and the number of the factors possibly contributing to land degradation was achieved by overlaying the spatial layers. We manage to see general picture of the lands which are more vulnerable in terms of degradation in Europe scale. According to the results, nearly 36% of the whole Europe has not any of above listed 10 land degradation risks; however, %37 of the study area has at least 1 of those mentioned land degradation risks.

Keywords: Land degradation, soil degradation, Europe scale, spatial indicators

Ecological-economic assessment of soil degradation in Russia, taking into consideration ecosystem services

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The degradation of soils results in degradation of the entire landscape and decreasing the quality of human life. Economic evaluation of the causes and consequences of soil degradation is very important for the development of optimal land management algorithm. Currently in the assessment of soil degradation damage cost we should include loss of a wide range of ecosystem (soil) services. Within the conducted research the scheme, allowing to determine the entire possible range of soil services has proposed (soil services are derived from the functions performed by soil in nature). Also it has developed the criteria for selection of a sufficient set of services in each evaluation case (the purpose of the study and the object of study impose restrictions on the specific choice of services to assess). It has shown that there are 3 generalized criteria of economic interpretation of ecosystem services: 1) converting of ecosystem services in money terms is carried out by means of search in the market of adequate analog in the conditions of local economy and at the current time; 2) the valuation of ecosystem services is possible only in the case when the analyzed ecosystem has a utility for man; 3) in each case of valuation, we have to determine the specific range of ecosystem services and to evaluate them, basing on the economic realities of the region. It has shown that there is the connection between methods of damage cost assessment and the method of the cost comparison of activity and inactivity during degradation processes (von Braun et al., 2013), which were previously considered as unlinked ("activity and inactivity" method can be considered as a verification of land recultivation expediency). Ecological-economic evaluation of soil degradation in conditions of different geographical zones of Russia and different agricultural management situations was performed.

Keywords: Soil degradation, ecosistem services, ecological-aconomic evaluation, evaluation methods

Comparing regression results land degradation drivers for Russia

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The analysis of two Russian regions is presented: Moskovskaya oblast' and Tul'skaya oblast'. On the quantitative side we use regression analysis. For dependent variable we use the Soil Institutes' questionnaire results, where experts pointed what is the share of degraded agricultural land in the districts of observable regions. For independent variables we use the economic data of Russian statistical agency for large and medium agricultural enterprises for these districts respectively. Regression results show that for Moskovskaya oblast' the statistically significant variables are: total cropland, fallow land, grain and potato yields. All with positive signs. For Tul'skaya oblast' the total cropland and fallow land variables are statistically insignificant, but particularly grain yields and grain crop area are statistically significant and positively influence the increase of degradation areas inside region's districts. We also should mention that total costs per 1 hectare of cropland are statistically insignificant for Moskovskaya oblast' and statistically significant for Tul'skaya oblast'. This is due to the fact that Tul'skaya oblast' is a more developed agricultural region with grain specialization. Moskovskaya oblast' is also has developed agricultural farms, but due to high costs of land and other inputs they are loosing their competitiveness to farm products from other Russian regions, thus the number of farms is decreasing. For Tul'skaya oblast' the land degradation drivers come from agricultural activities. But for Moskovskaya oblast' land degradation is a result of using the land for building cottage instead of agriculture. On the qualitative side we analyze literature and see that for Moskovskaya oblast' the increase of poisonous cow-parsnip areas, not typical for this region, is also a land degradation factor. And for Tul'skaya oblast' we learned that manufacture and chemical pollution are a danger for the lands in the region.

Keywords: land degradation, economic factors, cropland, intensification, environmental pollution

F – Detection, risk assessment and remediation of polluted soils from mining and smelting areas

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Remediation of Cadmium Soils By Means of Hyper Accumulator Plants and Efficiency of Fertilizer, Humic Acid and Chelate Applications

Kürşad Özbek[1], Ilhami Ünver[2]
[1]Central Research of Field Crops Institue
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The objective of this study was to determine accumulated Cd amounts of Sinapis Alba L. in different conditions. Cadmium accumulation capacity of Sinapis Alba L. were tested on artificially contaminated cadmium containing soils by setting up preliminary trials with the seeds collected from nature. Cd is not a known essential element for any living organisms. Nevertheless its high solubility and ability to imitate Zn make it one of the most toxic heavy metals. Limited number of Cd hyperaccumulating plants (known only 4 among more than 500 hyperaccumulator plants), and their several drawbacks including slow growth rate, low biomass, selective environmental requirements indicate the urgent necessity of expansion requirement of the Cd accumulator plant list. We thought that Sinapis Alba is a promising Cd hyperaccumulator candidates.

Effect of humic acid, chelate, fertilizer and their combinations on cadmium accumulation capacity of Sinapis alba L. grown in soil containing different doses of cadmium were also examined under controlled conditions. S. alba accumulated 134 mg kg-1 cadmium in its above ground parts with 20 mg kg-1 available cadmium, humic acid and chelate application; and 48 mg kg-1 at root system with humic acid, chelate and fertilizer combination. Applications had no significant effect on water saturation, electrical conductivity and pH while humic acid applications determined to improve soil organic matter.

Keywords: S. alba, cadmium, hyperaccumulation, humic acid, chelate

Risk reduction with cost-efficient interventions at the abandoned mining site Kruvashan

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Environmental problems related to mining activities and abandoned mining sites is still an issue. Insufficient mining legislations, lack of best practice standards and money results in inadequate closure practices and poor disposal facilities. Kruvashan is one of the important copper mines in Artvin Turkey abandoned in 1978. It was first operated by Siemens under the name Caucasus Copper Limited between 1905 and 1928 and was handed over to Etibank Copper Works in the 1930's. Initial investigations at the former copper smelter and mine tailing sites reflected higher values than 4 mg Ni/kg, 36 mg Cr/kg, 5192 mg Cu/kg, 5974 mg Pb/kg and 4808 mg Zn/kg. Water samples, which were also taken, presented acidic conditions with elevated copper and zinc levels. In order to reduce the risk from this abandoned site to human health and the environment, sustainable remedial measures are needed. A detailed evaluation of hydrology and hydrogeology will contribute to a clearer understanding of the dynamics within the Coruh River catchment. The Blacksea Region of Turkey receives high amounts of precipitation, therefore a proper water management (e.g. discharge ditches) will avoid the entrance of surface runoff into the site. Additionally, tailings with higher heavy metal levels should be covered with low permeable compacted layer together with a capillary break and a vegetation support layer. This specially constructed cap and the ditches will reduce the contact of clean surface water with tailings. Landscaping with slope reduction and contoured furrowing are also proper measures to reduce erosion as much as possible. Sustainable/passive treatment of influenced water sources and acid drainage water in ponds will reduce potential pollutant migration and thus the risk. Periodic monitoring of water resources is also recommended. This study basically formulate remedial action scenarios for the abandoned mining site Kruvashan.

Keywords: Abandoned copper mine, risk reduction, remedial measures, sustainability

Carbon dynamics and sequestration in restored minesoils

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Extensive areas of coal mine spoils exist in the UK. Many of these sites have been reclaimed to grassland or woodland with varying success. There have been few longer-term studies of how soil development on these sites affects re-vegetation success and how this relates in particular to soil organic matter dynamics. We surveyed restored grassland and woodland sites up to 30 years after reclamation and measured a range of soil physiochemical properties. We also estimated soil C stocks, characterised these stocks using FT-IR and measured a range of C parameters (microbial biomass, respiration and soluble C) indicative of C dynamics. Results indicated a significant potential for C sequestration in these minesoils but this potential was affected by soil physiochemical conditions and variations in soil organic matter composition.

Keywords: minesoils, carbon, microbial respiration, FT-IR, sequestration

Phospholipid fatty acids analysis-fatty acid methyl ester changes during bioremediation of crude oil contamination soil

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This study aims to develop certain perspectives based on the principle of on-site remediation of the soil through biological means known as "bioremediation" against soil pollution issues resulting from fuel contamination in our country and to reveal the fatty acid profile in the final soils. The fatty acid profile of the soils was pointed out by testing the activity of three basic bioremediation applications (biological multiplication, biological excitation and the combined application of these two approaches) established in the laboratory condition. Under biological multiplication applications, six of the selected bacterial strains (Pseudomons aeruginosa, Pseudomonas putida biotype A, Citrobacter amalonaticus-GC subgroup A, Acinetobacter genomospecies) exhibit the highest growth in crude oil environment isolated from oil-contaminated soils of Adana, Batman and Adıyaman, and they also have the highest levels of crude oil degradation. The highest level of oil degradation, being 56%, occurred under biological multiplication applications where the bacteria mixture was applied. Under biological excitation conditions where various organic materials were applied to the contaminated soil, degradation to 18% was observed. In combined applications, oil degradation was achieved to 30%. The most common fatty acids were found to be 15:0 iso, 15:0 anteiso, 16:0, 16:1 w7c, 17:0ai, 18:2w6,9 and 18:1w9c fatty acids detected in both unpolluted and oil-contaminated soils. Determination of high level 18:1w9c fatty acid in oil contaminated and clean soils may indicate the presence of Pseudomonas spp. However, fatty acid 15:0 anteiso was determined to be higher in oil-contaminated soils than in unpolluted soils. It may be explained that Gram positive bacteria were predominant in oil-contaminated environment.

Keywords: Soil, crude oil, bacteria, bioremediation, phospholipid fatty acids analysis-fatty acid methyl ester (PLFA-FAME)

Detection of polluted soils from historical processing of Zn-Pb ore deposits using geoelectrical methods

Marta Kondracka
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The areas of mining and smelting non-ferrous metal such as zinc, lead or copper carried out large-scale processing of ore flotation which generate significant amounts of waste rich in iron sulfides and various mineral phases containing heavy metals and metalloids. The introduction of heavy metals into the soil causes its chemical degradation leading to a chemical imbalance and changes the properties of the soil. These changes can be recorded by various geophysical methods like electrical or electromagnetical methods. Aim of this study was to present the possibility of field and laboratory measurements of electrical resistivity as a tool for detection soil contamination. The measurements were carried out on the area of postmining waste dump of zinc and lead processing located in Southern Poland. Physical, physico-chemical and chemical of stored waste, contaminated and uncontaminated soils were analyzed. Electrical resistivity of samples was measured in the field and laboratory conditions. The field geoelectrical measurements provided information about the electrical properties of the ground and its structure depending on the degree of pollution. Comparing the results from uncontaminated and contaminated area show clear image of the electrical properties changing in the soil and allow to determine the influence of the heavy metals migration on the properties of the ground. Measurements allowed the determination of soil contamination and the range of the changes with depth. Results of geophysical surveys were confirmed by heavy metals content. Electrical resistivity of soils decrease with increasing of cation exchange capacity, electrical conductivity, high content of heavy metals and organic substances and depend on the degree of pollution.

Keywords: soil contamination, postmining waste dump, remediation, geophysical methods, electrical resistivity

FOR – Forensic Soil and Enthomologic Studies

Convener : Murat Mert

Friday 21 October 2016

FOR – 893
Entomological analysis of old soil samples recovered underneath a pig carcass (Sus scrofa domestica)
Halide Nihal Açıkgöz-Ankara, Türkiye

Entomological analysis of old soil samples recovered underneath a pig carcass (Sus scrofa domestica)

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After death all carcasses undergo putrefaction depending on endogenous and exogenous factors. Decomposition accompanies the putrefaction is more complex such as autolysis, proteins, carbohydrates and lipids breakdown. During decomposition, odors and gases are released from carcasses and this attracts insects, especially Dipteran species. Insect colonization occurs on carcasses and different species are attracted in each different decomposition stage. This postmortem cycle ends with the merge and vanishing of all remains of carcasses in the soil.
In order to observe the end of this process in this study, soil samples were collected in 2004 under pig carrion (Sus scrofa domestica) left to decay on a field in 2003, Bala, Ankara. Entomological specimens were obtained from the soil samples, kept in the laboratory and examined.
These entomological specimens identified under a stereozoom microscope using two identification key for Diptera species. Diptera and Coleoptera specimens were detected. Besides, Hymenoptera Formicidae was also detected.
While collecting the evidence from a crime scene, it is beneficial and necessary to collect specimens from the soil to solve active and old forensic cases.
We believe that this makes a huge contribution to find out whether a dumped body was shredded by scavengers and rodents or removed from its original place.

Keywords: Forensic entomology, soil samples, insects, pig carrion

G – Soil Information System for Sustainable Soil Management

Convener : Suat Akgül
İlhami Bayramin
Co-convener : Tülay Tunçay

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G – Soil Information System for Sustainable Soil Management

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Determination of available micronutrients in DTPA extracted soils using the Agilent 4210 MP-AES
Mehmet Balcı –Turkey

Soil degradation evaluation in the Czech Republic, focusing on water erosion

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The rural landscape of the Czech Republic (CZ) has changed, to a large extent, due to intensive farming approaches, which have also influenced soils. For the purpose of assessing the current state of soil degradation we have developed an overall indicator of land vulnerability to the threat of soil degradation on the basis of individual factors. Individual degradation factors were divided into two groups: physical (water erosion, wind erosion, and compaction) and chemical degradation (heavy metals, acidification, and loss of organic matter). The first step in creating the model was to select the most appropriate indicators of a degradation threat. In our research we chose the indicators monitored on a long-term basis by various CZ scientific organizations. On the basis of principal component analysis, individual degradation factors were assigned a specific weight of influence. With the use of a GIS, the input factors of degradation were combined to create maps of chemical and physical soil degradation, and consequently a map of overall degradation-threatened soils for CZ, along with a map of areas differentiated according to the prevailing type of degradation. At present, about 51% of agricultural land in CZ is moderately threatened by much more serious physical factors of degradation than chemical factors. According to PCA, the most serious threat is water erosion (33%). The second highest is that of soil compaction, which is not as widespread and prevalent as water erosion. Loss of organic matter prevails in 25% of all cadastres. The resulting maps of degradation also confirm the presumption that the most endangered agricultural soils include the most productive soils. Detailed research focuses on these areas and specific examples of soil degradation, with accent on soil erosion, will be presented. For these examples aerial photos, simulations and soil analysis results were used.

Keywords: soil degradation, modelling, erosion, organic matter, aerial photos

The structure and principles of functioning of the Russian National Soil Information Institute

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The Plan of Action as part of FAO Global Soil Partnership developed for the creation of distributed International Network of Soil Information Institutes (INSII). It is supposed to use the experience, gained in such international projects as INSPIRE and GlobalSoilMap, and such basic principles as distributed accumulation of soil data at the locations with best maintenance, information interchanging based on a "response on demand" principles, and ensuring the compatibility of the soil data using harmonization algorithms for all kinds of soil data.
The structure and operation of National Soil Information Institutes is not specified at the FAO program, and depends on the peculiar properties of each country.
Specifity of Russia consists of wide variety of natural zones presented on its vast territory. Well-organized structure of 110 regional offices of the Ministry of agriculture operates more than 50 years. The soil fertility monitoring observations are conducted regularly. Despite of standard set of soil properties analytical measurements, there are difficulties in harmonization of soil information associated with used methods and data format presentation. This may be due to use different soil classifications and different techniques of soil sampling.
The present work describes the structure and principles of functioning of the National Network of Regional Soil Information Institutions (NNRSII), based on the principles set out for INSII. The scheme of organization and functioning of RSII composing from several organizations is created and tested for several agricultural regions of Russia. The main generator and the accumulator of soil information (points, profiles) is regional agrochemical center. Local agricultural universities and research institutes generate vectorized legacy maps, processing algorithms for remote sensing data, pedotransfer functions and grids. One of these organizations should also play the role of soil data aggregator and harmonizer for the National Soil Spatial Data Infrastructure Centre (NSSDIC).

Keywords: FAO, soil, global, map

Exposing Vocabularies for Soil as Linked Open Data

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Standards to describe soil properties are well established, with many ISO specifications and a few international thesauri available for specific applications. Besides, in recent years, the European directive on "Infrastructure for Spatial Information in the European Community (INSPIRE)" has brought together most of the existing standards into a well defined model. However, the adoption of these standards so far has not reached the level of semantic interoperability, defined in the paper, which would facilitate the building of data services that reuse and combine data from different sources.
This paper reviews standards for describing soil data and reports on the work done within the EC funded agINFRA project to apply Linked Data technologies to existing standards and data in order to improve the interoperability of soil datasets. The main result of this work is twofold. First, an RDF vocabulary for soil concepts based on the UML INSPIRE model was published. Second, a KOS (Knowledge Organization System) for soil data was published and mapped to existing relevant KOS, based on the analysis of the SISI database of the CREA of Italy. This work also has a methodological value, in that it proposes and applies a methodology to standardize metadata used in local scientific databases, a very common situation in the scientific domain. Finally, this work aims at contributing towards a wider adoption of the INSPIRE directive, by providing an RDF version of it.

Keywords: Agriculture, Soil, Knowledge Organization Systems, Vocabularies, Resource Description Framework, Linked Open Data, INSPIRE

Application of the Soil and Terrain Information System and the EPIC model for Sustainable Management of River Oases along the Tarim River, China

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The Tarim River Basin is the largest continental basin in China. It is characterized by an extreme continental desert climate with little rainfall combined with high evaporation. The region is affected severely by climate change.
The Soil and Terrain Information System based on the SOTER approach (ISRIC, 1986) was developed for regional modelling in the basin at various scales. Several layers of maps (soil maps, geological maps, DEM) were overlaid to delineate homogenous map units. 50 soil profiles were dug, analyzed, described and classified in order to characterize the soils in the region. Landsat images were applied for soil and land use mapping. An additional database for climate data, land management and crop information were linked to the system. The whole system provides the input data for the EPIC model (Environmental Policy Integrated Climate). The model was run for cotton crop.
Soil types affected by salinity and waterlogging were the dominant soils in the region. For the EPIC model calibration some parameters were adjusted so that the modeled cotton yield matched the measured yield on filed scale. The validation of the modeling results was achieved through Landsat images.
The simulated cotton yield varied according to soil type and salinity level. The soil salinity was the main limiting factor. After the calibration and validation of the EPIC model several management and climate scenarios were constructed to estimate the effect of climate change and alternative land management on cotton yield.
The applied Soil and Terrain Information System can be a framework for storage and quarry of soil and terrain data at various scales. The EPIC model can assess the impact of climate change and management strategies. The remote sensed data and the EPIC model can be effective tools for regional planning and serve the decision support system on a regional scale.

Keywords: SOTER, EPIC Model, Soil Salinity, Cotton, Tarim Basin, Remote Sensing

A spatial data infrastructure for storing and exchanging global soil data

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The demand for soil data for agro-ecological and other environmental applications at national, regional and global level is growing; establishing a spatial data infrastructure (SDI) for global soil data is key for connecting soil data holders and serving the user community effectively. Organizations investing in a flexible soil SDI can efficiently contribute to and benefit from international collaborative initiatives while consolidating their role as mandated soil data holder. ISRIC–World Soil Information has been investing in the development of new geo-information technologies with the objective to improve and increase global soil data exchange and use. Here we describe main components of ISRIC's evolving global soil SDI.

First step of building an SDI is data organization and modelling. WoSIS1 (World Soil Information Service) is ISRIC's enterprise database based on PostgreSQL, in which (harmonized) soil profile data and polygon maps are stored under a common standard using a uniform model that is flexible enough to integrate into web-services. This database can serve as a node in the global soil data infrastructure foreseen by the Global Soil Partnership.

Second step is the development of web-services, both generic and specialized, for access and exchange of data. Generic web-services implement standards of the Open Geospatial Consortium (OGC) like WMS (Web Mapping Service), WCS (Web Coverage Service) and WFS (Web Feature Service). Such services are building blocks for web-interfaces, such as ISRIC's SoilGrids2, that visualise and serve quality-assessed soil data. Specialized web-services, like REST (Representational State Transfer), provide support for mobile apps, such as ISRIC's SoilInfo3 app, and allow users to stream, query and download data4. As mobile phones and tablet use is surpassing the traditional desktop computer it is important for a soil SDI to be represented in such platforms, taking into account situations where bandwidth is limited. Specialized web-services can also serve soil data in specific formats such as the upcoming soilML standard for interoperable data exchange.

Keywords: spatial, data, infrastructure, soil

Soil Information Systems in Republic of Turkey Ministry of Forestry and Water Affairs

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Soil takes an important place among natural wealth of a country. The base of socio-economic development of countries depends on the richness of its natural wealth and their use policies.. For land users and managers interested in the conservation of land resources, rational and sustainable land use is an important subject for the sake of current and coming population. One of the most important resources used in land planning studies are soil maps. Soil maps are used in agriculture, forestry and pasture planning, modelling of environmental impacts, various engineering and planning and conserving studies of integrated natural resources. One of the most substantial uses of national planning related to iprovement of soil resources is taking inventory of resources. Otherwise, it is important to analyse soil resources qualitatively and quantitatively, specify the potentials of available resources and compose database and maps in paralel with developing technology before passing to local, regional and national planning. In this context, Soil Database was established within the Ministry of Forestry and Water Affairs by the General Directorate of Desertification and Erosion.The soil database was established in 2013 and its system was designed by taking into consideration the requirements of agriculture and forestry.Soil database was developed in harmony with up to date GIS and database management systems. Data is entered by synchronizing the soil datum used in previous projects with the soil database standarts. The soil datum acquired in new projects are transferred to the soil database simultanously and according to certain standarts. Up to date soil datum compatible with GIS acquired from this system will set up a substructure for agriculture and forestry studies

Keywords: gis, database, soil, information

Geospatial Modelling of Soil Carbon Fractions

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Identifying labile and recalcitrace soil carbon (C) fractions across diverse land uses, soils and climatic gradients is particularly essential to assess short-term carbon loss and long term carbon budget. However, upscaling soil C fractions to a coarser scale is rarely found in literature. Research in digital soil mapping and modeling that elaborates the large-scale deterministic spatial variation as a function of a certain set of soil-environmental variables and small-scale stochastic variation as a function of distance between soil samples is just emerging. This evoked our motivation to investigate soil C fractions in the State of Florida covering about 150,000 km2. Our spesific goals were to (i) identify most important environmental factors relevant to soil C fractions, (ii) compare different soil C pool models that quanitify stochastic and/or deterministic components, (iii) assess the prediction performance of soil C models, (iv) investigate the spatial autocorrelation of soil C model residuals.
We used soil data (0-20 cm) collected at 1,014 georeferenced sites including measured bulk density (BD), recalcitrant carbon (RC), labile (hot-water extractable) carbon (HC) and TC. These were identified using a random-stratified sampling design with landuse-soil suborders strata. A comprehensive set of 327 geospatial soil-environmental variables was aquired within a Geographic Information System. The Boruta method was employed to identify “all-relevant” soil-environmental predictor variables and the most parsimonious model for soil RC, HC and TC. We employed eight methods - Classification and Regression Tree (CaRT), Bagged Regression Tree (BaRT), Boosted Regression Tree (BoRT), Random Forest (RF), Support Vector Machine (SVM), Partial Least Square Regression (PLSR), Regression Kriging (RK), and Ordinary Kriging (OK) – to predict soil C fractions and TC. The accuracy of each method was assessed from 304 randomly chosen samples that were used for validation
Overall, 36, 20 and 25 predictors stood out as “all-relevant” to estimate TC, RC and HC, respectively. We predicted a mean of 5.39 ± 3.74 kg TC m-2 in the top 20 cm with the best model. The prediction performance assessed by the Ratio of Prediction Error to Inter-quartile Range for TC stocks was as follows: RF > SVM > BoRT > BaRT > PLSR > RK > CART > OK. The best models explained 71.6%, 71.7% and 30.5% of the total variation for TC, RC and HC, respectively. Biotic and hydro-pedological factors explained most of the variation in soil C pools and TC, lithologic and climatic factors showed some relationships to soil C pools and TC, whereas topographic factors faded from soil C models.

Asessment of Spatial Distribution Patterns of Soil Properties at the Experimental Fields of Igdir University

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Assessment of spatial distribution patterns of soil properties are important for developing sustainable soil management strategies. The objective of this study was to define spatial variability characteristics of physical and chemical properties of soil at the experimental fields of Igdir University. The study area with a size of 10 ha was gridded by 50x60 m in the N-S and E-W directions, respectively and totally 35 soil samples (both disturbed and undisturbed) were collected from 0-30 cm soil depth at each intersection of the grid system. Undisturbed soil samples were used for obtaining bulk density and hydraulic conductivity, and disturbed soil samples for texture, CaCO3, organic matter, cation exchange capacity (CEC), exchangeable cations, electrical conductivity (EC), soil reaction (pH) and exchangeable sodium percentage (ESP) determinations. Semivariogram analysis was performed for defining spatial variability and Kriging analysis was used for enterpolation and mapping of measured soil properties. Most of the soil properties showed isotropic distributions. Distribution maps were produced, compared and evaluated. The soils at the experimental fields were mainly medium textured (CL and L) with a clay content changing from 18% to 39%. Spatial distribution patterns indicated that there was salinity and alkalinity problems in local levels. On the average soil pH, EC and ESP were 8.54, 6,48 dS m-1 and 18.7%, respectively.

Keywords: Igdir soils, spatial variability, alkalinity, salinity

Soil testing system – basic tool for rational nutrient management in agriculture

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Some of the selected basic parameters of soil fertility are observed in the Czech Republic in long term system of agrochemical soil testing. More than 500 thousand hectares agricultural soil are tested every year and take away almost 80 thousand soil samples. The results of determination of soil reaction and contents of available essential nutrients (P, K, Mg, Ca) are used for determination of most suitable application rates of nutrients for the best nutrient management – i.e. rates for high yields and quality of production and simultaneously rates friendly to environment. The testing system is improved and developed by determination next elements – sulphur and micronutrients through uniform analytical method Mehlich 3.
All results of this testing system are stored in Land Parcel Information System (LPIS) - system based on the actual use of land in a geographic information database.
Ministry of Agriculture of the Czech Republic uses LPIS as an administrative tool in control system and LPIS also functions as a service for the farmers themselves.

Keywords: soil testing system, available nutrients determination, nutrient management, Mehlich 3 method, Land Parcel Information System

Determination of available micronutrients in DTPA extracted soils using the Agilent 4210 MP-AES

Mehmet Balcı
AGILENT TECHNOLOGIES

The elemental content of soils can impact plant development and crop yields as well as the safety of plant-based produce. Consequently, soil testing of micronutrients is commonly conducted to assess soil fertility, while heavy metals are analyzed to identify any potential toxicity issues.
Depending on the elements of interest in soils, different extraction methods and analytical techniques are employed. Soil extracting solutions containing chelating agents such as diethylenetriaminepentaacetic acid (DTPA) are often used for the extraction of micronutrients. The extracted solutions can be analyzed by MP-AES because the technique provides low cost of analysis and the wide concentration ranges required for soil testing, making it ideal for high throughput agricultural labs.

Keywords: Mıd IR, Agilent, Soil, NIR, spectroscopy, MIR, Total Organic Carbon, handheld MIR, Soil Management

H – Carbon Sequestration to Mitigate Climate Change

Convener : Gönül Aydın

Monday 17 October 2016

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Carbon sequestration on a long chronosequence of landslides in the Outer Western Carpathians

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Landslide creates a new surface of exposed rock where soil development can be observed. Long-term soil dynamics are scarcely studied since it is difficult to determine the age of older natural soils. Therefore, the capacity of soils to store carbon is still not well understood. On landslides, newly exposed rock surfaces are colonized by plants in the process of primary succession which takes place when disturbance leaves little or no biological legacy (Walker & Shiels 2013). Beside landslides, also other disturbances initiate primary succession (e.g. volcanoes, retreating glaciers, floods, or mining) and can be used in chronosequence studies. Using a chronosequence (a set of sites of different age on similar parent material) is a useful tool to study soil or ecosystem development on longer time-scales (Walker et al. 2010). Unfortunately, most of the chronosequence studies carried out in the past years have focused on sites located in rather extreme climatic and/or parent rock environments. These include landslides in tropical mountains of Puerto Rico (Walker et al. 2013), exposed morrains after retreating glaciers at Glacier Bay, Alaska (Crocker & Major 1955), or montane rainforests on volcanic islands in Hawai (Crews et al. 1995). Extrapolating findings of such studies to European natural soils is questionable. Moreover, few researchers have addressed the problem of soil development on millenial time-scales and these studies were restricted to volcanic islands (Crews et al. 1995).
The aim of the study was to describe long-term soil carbon, nitrogen and phosphorus dynamics using a chronosequence of 23 landslides ranging in age from 4 to 11 000 years located near the border of Czech Republic and Slovakia. Total soil carbon, nitrogen, and phosphorus content was measured on landslides as well as in adjacent undisturbed sites. The soil carbon was also fractionated into labile, stabilized, and resistant pools.

Keywords: soil organic matter, fractionation, phosphorus, nitrogen

Effects of climate change on carbon sequestration in different plant-soil systems

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Climatic changes, such as increasing global temperatures as well as occurrence of drought periods are supposed to effect individual plants and/or plant communities by affecting their carbon sequestration potentials. The objective of this study was to elucidate the impact of drought stress on carbon (C) sequestration and rhizosphere-mediated CO2 fluxes of plant-soil system. It also included the combined effect of drought stress and plant types on C sequestration in different soil aggregate fractions. The conceptual approach included repetitive 14CO2 pulse labeling of plants grown under drought and optimum moisture levels in order to follow above and belowground C allocation. Impact of plant type was studied by growing maize (Zea mays) and sorghum (Sorghum bicolor) as monoculture and as mixture. Drought conditions changed the source sink relationship of maize plants and as a result, relatively higher portion of C assimilates were translocated towards roots compared to water sufficient plants. In continuation, drought increased the release of root exudates that enhanced the rhizomicrobial respiration (14CO2) in maize plants. In contrast, drought did not cause any significant change in 14C incorporation in plant biomass as well as rhizomicrobial respiration for sorghum monoculture and mixture of both crops. Under drought stress, increase in 14C incorporation in microbial biomass and decrease in DNA showed active respiration under drought stress. Due to drought stress, there was increase in micro-aggregate formation in planted soils and higher fresh carbon assimilates (14C) into the micro-aggregate fractions confirmed that higher root exudation due to drought stress helped in micro-aggregate formation under drought stress. Thus maize plants performed quick adaptive response to drought stress by maintaining their biomass and translocating higher photosynthates towards roots for efficient water uptake. Plant type may modify the impact of climatic changes on carbon sequestration and belowground carbon fluxes.

Keywords: Climate change, Drought stress, Carbon sequestration, 14C pulse labeling, Plant community composition

Mapping and Estimating Carbon Stock of Diyarbakır's Soils By Using GIS Analysis

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Terrestrial ecosystems contain carbon in the form of plants, animals, soils and microorganisms. Plants and soils are by far the largest section. Most of the carbon in terrestrial ecosystems exists in organic forms. Soils contain a stock of carbon that is about twice as large as that in the atmosphere and about three times that in vegetation.
There are uncertainties in any estimate of soil carbon stocks at local and national scale. Data scarcity often prevents the estimate of regional and national scale of soil organic carbon stock and its spatial distribution.
The aim of this research is to map and estimate the carbon stock of soils of Diyarbakır City by using GIS analyses capabilities.
Diyarbakır city comprises totaly 1535500 hectares that is approximately 2 % of total lands of Turkey. The area is under semi arid climate conditions.
In order to mapping of carbon stock of Diyarbakır city, 238 soil samples collected from 0-30 cm depth were used. Sampling depth, total area, organic carbon and bulk density values were analysed in ArcGIS media to estimate corbon stock of 0-30 cm soil depth for Diyarbakır city.
Collecting soil samples from the plant root zone give a valuable data for soil carbon stock. According to GIS analysis, the organic carbon stock of Diyarbakir city for 0-30 cm depth was estimated as 26 Tg.

Keywords: Soil, Carbon, Stock, GIS, Mapping

The effect of different tillage technices on N-acetyl β- D Glucosaminidase and β-Glucosadase enzyme activities in soil

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The present study was conducted under semi-arid climatical conditions in Central Anatolia region Turkey. Two different crop rotations, fallow-wheat and legumes-wheat, under two different tillage systems, reduced tillage and no- tillage were studied in order to evaluate the effect of crop rotations under different tillage systems on the content of soil organic carbon, β-glukosidase, and N-acetyl-β-D-glucosaminidase (NAGaz) enzyme activities. Field experiment was conducted by General Directorate of Agricultural Enterprises in Polatli. We used Triticum aestivum and Gökçe Chickpea. The experiment was initiated at 2011 and will continue for the following 5 years. The samples were taken in October 2011, April 2012 and July 2012, from two different depth (0-7,5 and 7.5-15 cm).

The results showed that higher organic carbon content and enzyme activities were recorded under fallow- wheat rotation, compared to only fallow ($P<0,05$). On the other hand, total N content did not show a significant difference between two rotations. In fallow and fallow-wheat rotation cycles under different tillage systems an increasing had been observed in soil enzymatic activity under both rotation (No-till and reduced tillage) systems comparing to conventional tillage system, especially in the top layer of the soil (7.5 cm). Even though that wheat yields did not show a statistical significance but numerically the highest yields were obtained in No-Till plots. The results that we have obtained from Legumes-Wheat rotation cycles showed the opposite of what was obtained from Fallow and Fallow-wheat rotations, chickpea plots comparing to chickpea-wheat did not show a significant difference in organic carbon content, β-glukosidase and N-acetyl-β- Dglukosaminidase (except for April sample at the top layer), while the results showed a significant difference between chickpea plots and chickpea-wheat in nitrogen content.

Keywords: Soil, enzyme activity, carbon cycle, tillage technices, crop rotation

Reduced soil tillage practices as the contribution to the mitigation of CO2-fluxes from soil to the atmosphere

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The CO2-fluxes and selected microbial characteristics and organic carbon contents were determined in field experiments in Prague – Ruzyně (Czech Republic) with conventional (CT), reduced (RT) and no-tillage (NT) practices. The CO2–fluxes were determined in regular intervals during spring and after ploughing in the years 2008-2014. The crops were oil seed rape and winter wheat. The CO2-fluxes were determined using the LI-COR 8100 equipment (USA). The seasonal effects were well determined after early ploughing in August needed for sowing of oil seed rape. Warm and wet weather increased CO2-fluxes under CT, lower CO2-fluxes were found under RT and NT. Hot and dry weather decreased CO2-fluxes under all tillage practices. However, the lowest CO2-fluxes were found under RT, whereas higher CO2-fluxes under NT in comparison to RT appeared due to higher soil moisture hold in no-tilled soil. Later ploughing in September (soil preparation for winter wheat sowing) generally decreased CO2-fluxes from soils. The adoption of RT and NT increased in comparison with CT the microbial characteristics and soil organic carbon contents in the surface layer of the soil profile and consequently in the soil profile 0-30 cm. The clear stratification and of soil microbial characteristics within the soil profile was observed. The reduction of soil tillage practices lead to the carbon sequestration in soils, decrease of CO2-fluxes. The soil operations as deep ploughing is risky in summer period as it can increase CO2-fluxes from soil. The crops needing early sowing should be therefore grown under reduced tillage practices.

Keywords: Soil tillage practices, CO2-fluxes, microbial characteristics, organic carbon

Soil Organic Carbon Management in Turkey

Gönül Aydın[1], Emrah Hakkı Erdoğan[2], Alper Yorulmaz[3], Selim Kapur[4], Rattan Lal[5]
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Comparing the economic, social, and greenhouse gas (GHG) emission parameters indicates that Turkey stands in strong contrast to those of the developed nations with regards to GHG emissions. The per capita GHG emissions of Turkey are about one third of those of the OECD countries. Inter-sectorial comparisons show that the emissions of GHG have remained constant for agriculture and waste management since 2005.
The total emissions from the agricultural sector (25,7 Tg, Tg=teragram=1012g=1 million metric ton) of CO2 in 2005 (Turkish Statistical Institute, 2011) are about 7 % of the national emissions of 369.7 Tg in 2009 (Republic of Turkey, Ministry of Environment and Urban Planning, 2010). Drastic changes in land use and the attendant degradation of soil quality have depleted the C reserves in the managed ecosystems of Turkey. In this respect, soils and vegetation (forests) of Turkey have low organic matter reserves. Consequently, there exists a vast potential to sequester C through the restoration of soil quality and improvement in vegetation cover of the different biomes of Turkey. The changes in agricultural management practices can alter the content of SOC. If proper cultivation and management systems are used cultivated soils can have a greater potential to restore atmospheric carbon dioxide (CO2). Carbon pools in soils must be accurately estimated to reduce the contribution to atmospheric CO2 and increase the soil organic carbon stock. Thus, it is important to take the necessary measures for improving land management in order to increase the amount of organic carbon and improve soil quality in agricultural lands as a follow-up.
The objective of this study is to present an overview on the impact of the present land use system and management practices and the contemporary SOC on Turkish soils.

Keywords: SOC Mapping, CO2, SLM, CDM, Turkey-Anatolia

Negative CO_2 emissions in desert soils

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Desert ecosystems have been considered a sink of atmospheric CO_2. Although the uptake of atmospheric CO_2 into soil during the night time is detected at the desert and oasis cotton fields in Xinjiang, current understanding of the underlying mechanisms remains elusive. Using ^{14}C labeling and the Barometric Process Separation (BaPs) machine with incubations depending on different initial CO_2 concentrations, we elucidated the processes of CO_2 flux into the desert soils. The very fast CO_2 absorption was dependend on soils salinity, alkalinity and land use. The carbonate recrystallization (one of the processes for CO_2 exchange between atmosphere and $CaCO_3$ containing soils) increased with the CO_2 concentration. Carbonate recrystallization rate linearly increased with the EC and decreased with pH with 4% CO_2 initial concentration. High CO_2concentration, common in soils, can 10 to 100 times shorten the full recrystallization of the primary carbonates compared to CO_2 concentration in the atmosphere. Compared with sterilization und un-sterilization result, the microbial process without plant increased the ^{14}C in CO_2 and decreased the ^{14}C in $CaCO_3$ crystallization. The results from the field and lab experiments together show, the microbial and root respiration, affecting CO_2 concentration in soil, are the most important drivers of $CaCO_3$recrystallization. We conclude, that physicochemical (carbon in soil air, soil water and carbonate) and biological (root and microorganism growth) processes are responsible for the CO_2 fluxes from and in desert soils in the Northwestern China.

Keywords: desert soils, CO_2, $CaCO_3$ recrystallization, ^{14}C isotopic, BaPs

Impact of Manure Application on Greenhouse Gas Emissions and Soil Microbial Activity under a Long-term Corn-Soybean Rotation in South Dakota

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Global climate change is an essential threat and there are many factors those are responsible for this climate change. Increased greenhouse gases (GHGs) emissions are the major source that is impacting the climate change. Manipulating manure management can affect these GHGs from agricultural land. Also, application of organic manure is a very important agricultural practice to get sustainable microbial activities. The objective of this research was to assess the impact of different rates of organic manure applications soil microbial activity, and GHG emissions. This study site was located at Brookings, South Dakota. Two fertilizer and three organic manure rates were applied in the field under a corn(Zea mays L.)-Soybean(Glycine max L.) rotation. The average crop P removal was used to calculate manure P rate. Similarly, the soil test nitrate-N from the N manure treatment was used to calculate the manure needed for that treatment. Both the P and nitrate-N soil tests were used from the fertilizer treatments to make the P and N recommendations for the fertilizer treatment. Study treatments included:(i)recommended fertilizer (recommended fertilizer rate determined from soil test and yield goal),(ii)175kg manure,(iii)385kg manure,(iv)835kg manure,(v) double rate of fertilizer, and (vi) control. The manure was incorporated with a disc one to three days after application. Treatments were laid down in a randomized complete block design with four replications. Soil samples were collected from surface 0-5 cm depth of the field to analyze soil microbial activity just after the planting, one month after the planting and after the harvesting of soybean crop. GHGs emissions were collected and analyzed by using static chamber method. Data show that manure increased soil organic matter and the GHG emissions. This is an ongoing study and data will be collected in 2016 to assess the long-term manure management impacts on soil microbial and GHG emissions.

Keywords: Greenhouse gas emissions, Soil Microbial Activity, The Manure, Global climate change

Impacts of Grazing Cover Crops on Soil Health Parameters and Corn Yield

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Introducing livestock into traditional croplands can improve nutrient cycling, soil health and provide economic benefits. The present study was conducted to evaluate the impacts of integrated crop-livestock systems on soils properties. The study treatments were include grazing and non-grazing beef cattle under corn-soybean-rye and cover crops rotation. The diverse cover crop mixture was used in this study which can provide increased biomass on the surface that can alleviate the compaction created by cattle. The cover crops were grazed in this study. The soil samples were collected from 0-5, 5-10, 10-15 and 15-30 cm depth before the grazing and similar samples were collected after the grazing. Water infiltration was also conducted in these treatments. In addition, intact core samples were taken from two depths 0-5 and 5-10 cm depths for measuring bulk density. The data from this study showed that short-term grazing did not impact the soils, however, a detailed analysis of the soil parameters yet to be analyzed. The future work will be conducted that will assess the grazing impacts on the following corn yield.

Keywords: Cover Crops, Grazing, Soil Health, Crop Yield

Carbonates in soil: source of bias or important factor in carbon sequestration?

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Mine soils are soils developing on overburden or deposited topsoil after open-cast mining of coal or oil shale. Much research over the past years has been focused on carbon sequestration in mine soils as a possibility to mitigate the rising atmospheric CO2 levels and to improve mine soil quality (Vindušková and Frouz, 2013). Moreover, these soils offer an unique opportunity to study soil carbon dynamics using the chronosequence approach (using a set of sites of different age on similar parent material). Our study focuses on the role of inorganic carbon in mine soil development using Sokolov basin (Czech Republic) as a model. Inorganic carbon in these soils is present mainly as siderite (FeCO3), calcite (CaCO3) and dolomite (CaMg(CO3)2). All of these carbonates are often found in the overburden of coal seams thus being a common constituent of post-mining soils in the world. These minerals substantially affect quantification of sequestered carbon and carbon isotope analysis of soil organic matter (SOM). Soil carbonates enter complex processes such as weathering, migration, secondary mineral formation, cation release and interaction with SOM. Both minerals may affect soil pH, aggregate stability, stability of SOM and the overall soil development. Detailed study on these minerals in post mining soils have been scarce and were entirely missing in Czech Republic owing to methodological issues connected with their study. However, preliminary measurements of selected post-mining soils suggest that carbonate content in samples is highly variable (2-18%) as well as the relative content of siderite and calcite. We propose a methodology for identification and quantification of inorganic carbon of highly variable origin and content, as well as for carbonate removal before carbon isotope analysis and use these new methods to investigate the role of calcite and siderite in the post-mining soil development.

Keywords: soil organic matter, mining, stabilization, organic carbon

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Co-Convener : Mehmet Ali Çullu

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Effects Of Rıce Husk Compost On Water Use Effıcıency And Yıeld Of Tomato

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In this study, the effects of rice husk compost (RHC) application on evapotranspiration (ET), total water use efficiency (TWUE) and yield of tomato were investigated under field conditions. Rice husk was composted with sheep manure for 13 months under aerobic conditions. In the study, carried out at the experimental field of Agricultural Faculty in Ondokuz Mayıs University between June and August 2010, RHC was applied to surface soil (0-20 cm) at 0, 3, 6 and 9% doses with three replications in a randomized plot experimental design. Alsancak RN F1 tomato variety was used as a plant material. Tomato seedlings were planted to 1 x 2 m2 plots with 50 cm of inter and intra-row spacing. Daily soil moisture content in each plot was measured using Field Scout 300 TDR instrument. Irrigation practices in each plot was made according to the TDR measurement, when 30% of available water content in each plot decreased. While ET values decreased with RHC application according to control, TWUE and yield values increased. ET values changed between 313.81 mm in the 9% RHC application and 426.01 mm in the control. Cumulative ET values according to the control reduced 3.38% in 3% RHC, 11.38% in 6% RHC and 26.34% in 9% RHC applications. The highest increase in the tomato yield according to control was 24.24% in 6% RHC application. WUE values according to control significantly increased with RHC applications. The highest increase for WUE according to the control was determined as 43.60% in 9% RHC application. Also the highest irrigation water saving (118 mm or 1180.8 ton/ha) was obtained with 9% RHC application. While RHC was decreased ET values, WUE and yield of tomato significantly increased.

Keywords: Rice husk compost, evapotranspiration, water use efficiency, tomato, yield

Strategies on Pastures with Environmental Concerns - Case Study Turkey and China-

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In this study, it is targeted to reflect the strategies of the Turkish Ministry of Food, Agriculture and Livestock (MoFAL) on management and improvement of pastures with environmental concerns as well as considering the main features of Chinese pasture management system. The results are based on analysis of main planning documents of the Ministry for implementation of agriculture and rural development policy and the research visit in China funded by Confucius Institute.

There are two measures aiming at increasing the fertility, stimulating the growth of forage plants, protection of biodiversity and preventing the effects of the drought and hence to enable the sustainability of pastures in the Strategic Plan of the MoFAL. The first intervention is to rehabilitate and improve the pastures by implementing a government supported project through controlled fertilization. The second is to rent the pastures on the condition that the tenant takes the measures for sustainable use of pastures. Strategic Plan also envisages the measures related to sustainable use of soil and water resources.

The main reasons for degradation of grassland in China are conversion of grassland into urban areas, desertification of grassland resulted from both climate variations and human activities. Overgrazing which is an important degrader of grassland condition, especially when animals are confined to small grazing plots without rotation.
The Turkish policies on pastures can be regarded as the reflection of the EU accession policies as for being a candidate country as well as implementing a rural development programme for EU accession called IPARD Programme. On the other hand since China has no prospects for European Union membership, the effects of any European Union policy may be projected. However globalization is a common factor certainly affecting the strategies of both Countries in particular the adverse effects of global warming.

Keywords: Pastures, soil resources, land management, environment, Strategic Plan, IPARD Programme, China, Turkey

Night Irrigation: Learning from Traditions for Efficient Water Use in Semi-Arid Region, Southeast Turkey

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Irrigation demand in semi-arid regions are beyond the potential of water sources. This necessitates efficient water use not only by taking engineering measures but also employing social aspects. Water use efficiency even state-of-the-art technologies are used cannot be at desired level due to various factors particularly in areas where modern irrigation recently introduced as is the case of Şanlıurfa, southeast Turkey. The region is hosting one of the huge irrigation projects of the world initiated in late 1990s, namely Southeastern Anatolian Development Project (Turkish acronym GAP). Furrow irrigation was introduced in early stages of the GAP and farmers easily adopted due to its easy application for irrigating cash crops. However, high evaporation rate in Şanlıurfa (>2000mm.yr-1) and low level of farmers awareness in sustainable irrigation resulted excess use of water sources. Locals complain about high water prices and increasing fertilizer use following irrigation which actually is an unsustainable land management. Modern systems such as drip irrigation are introduced for overcoming these issues however lack of sufficient economic status of farmers and infrastructure did not yield sound outcomes. Thus, recent social research revealed traditional land use advantages. For example in Şanlıurfa where irrigation was performed via ground water or creeks before GAP, people used to irrigate fields at night due to limited water. Also low water demanding crops as lentil and chickpea were cultivated. Changing crop pattern is not easy due to farmers experience for the last 20 years. So, night irrigation is jointly launched in Cullap water user association (an NGO) for cotton irrigation. Following two years of monitoring about 12% yield increase is achieved along with annual 1 M liters water saving. Traditional knowledge of locals on land use when coupled with appropriate modern technology, success is most likely to be achieved because action is socially internalized

Keywords: Night irrigation, stakeholders, traditional knowledge, southeast Turkey

Adaptive governance of irrigation in the GAP Region, Turkey – From the transdisciplinary viewpoint

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This study seeks for better governance of irrigation, based on the case study analysis of the Southeast Anatolia (GAP) Region in Turkey. In this region, overuse of water and fertilizer causes severe salinity problems on farmlands. What was worse was little communication between government side and farmers. This was how we decided to adopt transdisciplinary approach, which aims at well-collaboration between stakeholders and scientists. First of all, this study identifies several major problems of irrigation governance in GAP region through stakeholder workshop. Second, we introduce our activity called "Night Irrigation Project (NIP)" in the context of transdisciplinary approach, which means we scientists collaborated with NGO and farmers for saving water.

Materials and Methods

This research is characterized by transdisciplinary approach (D.J. Lang, et al., 2012). This means we executed this study in collaboration with societal stakeholders, such as government and local officials, NGOs, water users associations (WUAs), farmers, and so on. First of all, in order to identify actual problems and discuss solutions, we held the workshops with stakeholders. After that, we implemented NIP as a practice of transdisciplinary approach.

Results and Discussion

The workshops revealed both government and farmers thought water use efficiency the most important, but neither of them takes action for solving problems. This is why we conducted NIP, and we found out farmers became willing to participate and cooperate for us once they succeeded in saving water and increasing in their yield. One of the key to success was confidence between farmers and scientists. Thus, we found it important for public sector, too, to visit farmers, communicate with them and work together for the better agriculture and water management.

Conclusions

Finally, this study concludes irrigation governance in Turkey should include more communication between public and private sector for better mutual understandings.

Keywords: adaptive governance, transdisciplinary approach, Southeast Turkey (GAP), stakeholders workshop

Application of electromagnetic induction technique for soil salinity monitoring in a large-scale irrigated catchment in Turkey

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Soil salinization is inherently inevitable phenomenon in the irrigated agriculture. Accordingly, it is considered as the major environmental problem that affects the crop yield and consequently the socio-economic situation of the farming community. However, conventional soil salinity monitoring is not an easy task in large scale irrigation projects; it requires a number of soil samples. Objectives of this study were to: 1) introduce electromagnetic induction technique in soil salinity monitoring in a large-scale irrigation catchment, 2) determine likely salt accumulation in the root-zone due to irrigation application, 3) figure out if the soil salinity in the root-zone (0-1 m) and deeper layers (0-2 m) is time-invariance or not. The study was conducted in a sub-catchment (9 495 ha) of the Lower Seyhan Plain located in the Mediterranean region of Turkey. In line with the objectives, the EM38 instrument coupled with GPS device was introduced to determine soil salinity in-situ. Horizontal and vertical apparent electrical conductivity readings for 0-1 m and 0-2 m soil layers, respectively, were done four times in 2014, i.e., at 186 locations in rainy season, at 206 locations before irrigation season, at 256 locations in the peak irrigation season and at 212 locations at the end of irrigation season (late September). Anderson-Darling goodness-of-fit statistics indicated that all soil salinity readings values were not normally distributed over the study area. No salinity risk (ECe<0.95 dS/m) was found in the monitoring period because farmers used excessive good quality irrigation water. Kruskal-Wallis test statistics revealed that salinity profile was normal increasing with depth. Mann-Whitney test results suggested that salinity development in the root-zone and deeper profiles was not time invariance. Salt accumulation at the end of season was statistically significant in the root-zone and deeper layers. EM38 has great potential to be fully operational in salinity mapping.

Keywords: Salinity profile, nonparametric statistics, lower Seyhan plain, irrigation season, EM38, in-situ salinity measurement

Testing mitigation scenarios for high water table in the southern part of Harran Plain, Turkey

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Harran Plain in the eastern Turkey was the first irrigation project implementation receiving water from Ataturk Dam in the Southeast Anatolian Project (GAP). Harran Plain has a total irrigated area of 140,000 ha, inclined from north to south with the maximum elevation difference of 100 m. Main crops are cotton maize and wheat. Only five years after its implementation in 1995, salinity problems started to arise in the southern end of the command area. The main cause of salinity problem was excessive irrigation in the command area inducing high water table in the low lying area. To quantitatively diagnose the water budget structure and to test scenarios for improvements, a distributed ecohydrology model was applied. The ecohydrology model is a combination of the SWAP for one dimensional flow in the unsaturated zone and a two dimensional water balance module for the saturated zone. The model is able to represent systematic water loss, occurring at canals and at tail ends as well as evapotranspiration and soil moisture changes at each field. Cropping pattern at every plot was classified using a combination of multiple Landsat images each year.
The model was calibrated to represent the land use, inflow and outflow of the system from 1998 to 2013. With only gross irrigation intake known, model parameter were optimized manually to represent water table fluctuation measured in different points in the plain. As a result, in 2007 for an example the plain was receiving in average more than 1200 mm of irrigation water with nearly 700 mm of water being lost as seepage from canals and tail water. The model was then used to test mitigation scenarios for high water table. Both increase of subsurface drainage and decrease of irrigation amount all over the plain turned out to be effective.

Keywords: Harran Plain, Ecohydrology, SWAP, Irrigation efficiency, salinity

Determination of soil series effects on actual evapotranspiration by nonparametric statistical techniques

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Estimation of reference evapotranspiration (ETo) is necessary to determine actual or crop evapotranspiration (ETc) from agricultural landscapes. Evapotranspiration contribution is very significant in water balance works at the catchment level. However, areal-wise estimates of ETc is are more preferable than pointwise estimates in mass balance works. The SWAT model is one of the many GIS-integrated hydrologic models estimating ETo using Penman–Monteith equations and ETc. The main objectives of this work were to: (1) determine daily actual evapotranspiration of wheat, cotton, corn and citrus growing in five soil series, (2) perform nonparametric statistical tests to figure out if real differences of daily ETc for a determined crop exist between any of the five groups, i.e., soil series. To this aim, the research was conducted in the Akarsu Irrigation District (9 495 ha), located in the Mediterranean region of Turkey, in 2009 and 2010 hydrological years. SWAT model was calibrated with SWAT-CUP(Calibration and Uncertainty Programs) by using SUFI-2 (Sequential Uncertainty Fitting)algorithm. Based on the growing period of each crop, daily ETc values for the five crops were simulated for two years, and daily ETc means were obtained for determined crops. Kruskal–Wallis H-test results indicated that soil series had no influence on the mean ETc of corn, wheat and citrus. However, there was statistically significant difference in ETc of cotton by soil series. Post hoc tests of Mann-Whitney U revealed that Incirlik and Yenice soil series constituted a group, and Arikli, Canakci and Gemisure soil series were another group. On the other hand, it was found that significant differences existed between actual evapotranspiration values of four crops. The results from the Mann–Whitney U-test indicated that while corn and cotton ETc values were not significantly different, wheat and citrus constituted two different groups in five soil series regardless of soil type.

Keywords: Akarsu Irrigation District, SWAT, Kruskal–Wallis H-test, multiple comparisons, post-hoc analysis

Assessment of Urban Sprawl Impact on the Agricultural Lands Using Remote Sensing and GIS

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The rapid urbanization and industrialization experienced in Globe as well as Turkey especially in the last 30 years, causes a constant demand for new land. On the other hand, the requirement for an increase in food production caused by increasing population requires preservation of agricultural lands. Unfortunately, up until today, the balance of land protection has been lost in favor of industrialization and urban housing, and thus agricultural land has been irrevocably lost. In addition to this, land utilization goals in master plans drawn for future indicate that agricultural land will keep decreasing.
This study aims to document the land degradation and the consequent agricultural land loss caused by misuse of agricultural land in the entirety of Izmir province.
In this study, the land use changes occurred in the entirety of Izmir province between the years 1981-2013 has been analyzed by using remote sensing and geographical information system techniques.
According to the study, it has been determined that from 1981 to present day in the entirety of Izmir province, approximately 11.000 hectares of land has been repurposed for non agricultural utilization, as the land use capability classes (LUCC) of these lands is evaluated, it can be seen that the land classes I., II., III., and IV with their respective distributions %13, %10, %11, %12 and VI., VII., VIII. classes have a distribution of %20, %32, %2 respectively. Further examination of the agricultural land repurposed demonstrates that %36 of it was taken from grazing lands, %18 from shrub lands, %14 from olive groves, %14 from fallow land, %7 from irrigated farmlands, %5 from dry farming land and the rest from forest areas.

Keywords: Land degradation, Land misuse, Remote sensing, Izmir city, GIS

IUS – Industrial Use of Soils

Convener : Erhan Akça
Co Convener : Emrah Hakkı Erdoğan

Tuesday 18 October 2016

IUS – 332
Promoting the conversion of phytoremediation biomass
Nicolas Brosse-Vandoeuvre, France

IUS – 968
Ceramic and Brick Raw Materials in Adıyaman, Southeast Turkey
Ahmet Çelik-Adıyaman, Türkiye

Promoting the conversion of phytoremediation biomass

Nicolas Brosse, Zahra Menana, Mohamad Asad
Université de Lorraine

The lignocellulosic biomass has an obvious potential as a renewable starting material for the production of biofuels and biomaterials. Nevertheless, a major drawback of the biorefinery philosophy is the availability and the cost of the feedstock. In this context, the utilization contaminated sites and of metal enriched biomass produced on these sites as starting material for the production of cellulosic bioethanol and biomaterials can be partial solution of this worldwide problem, and it also represent a new strategy for valorisation of contaminated biomass which constitutes a real threat for ecosystem. This approach is a part of the LORVER project. The objective is decontaminating soil by phytoremediation and produce biomass for industrial uses. Among all the technologies studied for the production of bioethanol from wood and lignocellulosic biomasses, the organosolv process is one of the most promising. Organosolv pre-treatment not only produces cellulosic substrate with a good enzymatic digestibility but also a large amount of high-quality lignin. This lignin side stream could find future applications in the fields of green materials or antioxidants. Thus, in this paper we described the pre-treatment and detoxification of metal enriched lignocellulosic biomass with chelating agents (EDTA, NTA and EDDS). The influence of the reaction parameters on the composition in metals of the cellulosic residue, the aqueous stream and the lignin fraction was examined. The benefits and limitations related to the use/conversion of biomasses grown on metal contaminated lands will be evaluated.

Keywords: Phytoremediation, biomass, biofuel, lignin, detoxification, LORVER project

Ceramic and Brick Raw Materials in Adıyaman, Southeast Turkey

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Soil is raw material not only usable for agriculture but also usable for various purposes. Specially, tile& brick and ceramic industry is solely dependent on soil stock. In addition, the soils that will be used in these industries should be extracted from non-arable areas and should have the desired technical characteristics. On this basis the aforementioned raw material existence has been researched in Adıyaman which is located on a socioeconomically growing region. In this research the samples that represents the potential raw material sources have been extracted from Adıyaman-center, Besni, Kahta, Samsat regions. Mineralogical and technological series of analysis have been performed in 13 different sample. Eight different primary mineral and five different clay mineral has been detected. In these samples, being the dominant clay mineral as smectite, primary mineral as calcite, also having high plasticity properties in accordance to Pfefferkorn method, has put forward that these regional clay can be used in brick-tile manufacture but not suitable for ceramic manufacturing. These results show that clay sources in the region can be used in ceramic manufacturing as an additive for increasing plasticity of main ceramic ingredients

Keywords: Adıyaman, Plasticity, Clay, Brick, Pfefferkorn, Non-arable

J – Soil Classification

Convener *:* Aldis Karklins-Jelgava, Latvia

Monday 17 October 2016

J – 173
National soil classification and WRB – Latvia case studies
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Mapping Soil Organic Carbon (SOC) Stocks in Turkey
Gönül Aydın-Aydın, Türkiye

National soil classification and WRB – Latvia case studies

Aldis Karklins
Latvia University of Agriculture

The WRB is considered to fulfill at least three main functions: (1) to be as a medium for studies on correlation among existing national classification systems; (2) to serve as a communication tool for compilation of transnational (regional, global) soil databases; (3) and to be used for the inventory and monitoring of the world's soil resources. The national soil classification systems having great diversity in logics, architecture and methodology should first of all find the way to compare their taxonomic units with the WRB. Depending on the layout of the national system and the availability and quality of supplementary data, it can be either a relatively easy task or a difficult one which produces a more or less accurate final result. As the WRB is used for several international applications (e.g. EU soil information domain, methodology for greenhouse gas emission assessment, soil degradation estimation, etc.), data conversion, validation and use in the international dimension are indispensable for each country now. Traditionally, the genetic approach used for soil classification in Latvia is far away from the WRB concept. To separate soil taxonomic units, mainly an understanding of the processes that develop certain soil features is used, but quantitative morphological (analytical) criteria are less important. Therefore, subjective propositions about the possible soil development processes and the environmental factors influencing them have great importance. Regardless of distinctions, a correlation scheme for comparison of the Latvian soil classification system and the WRB has been proposed. The scheme was developed mainly for conversion of historical soil data sets (e.g. large-scale soil maps) where any updates are impossible to a modern format. A set of necessary soil parameters obtainable in a soil survey has been recommended for an easier and more accurate soil taxa correlation in the future.

Keywords: WRB, correlation studies, soil diagnosis, soil data sets

Mapping Soil Organic Carbon (SOC) Stocks in Turkey

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The primary step in mapping the soil organic carbon (SOC) stocks of the soils of Turkey was conducted by the partial renovation of the previous soil maps prepared by the General Directorate of Agricultural Reform (the GDAR, the previous GD Rural Affairs and GD Soil and Water) of the Ministry of Food, Agriculture and Livestock of Turkey. The renovation process was accomplished via recent site-specific field work, profile descriptions and soil analyses. The selection of the new profile sites was undertaken by the soil-carbon team of the GDAR and staff members of the Universities of Adnan Menderes, Çukurova, Harran, Ege, Onsekiz Mart, Ondokuz Mayıs, Akdeniz. Following the map renovation process, recently accomplished 5368 SOM analyses, of the 0-20 cm layer, by the modified Walkley Black Method (4), for soils of the different slightly modified Köppen-Geiger climatic regions of Turkey (Central, Western, Eastern, South Eastern and Northern Anatolian regions and the region of the Mediterranean-Aegean-Northern Marmara) (Köppen and Geiger, (5) and Türkeş, (6) were compiled for C-Stock calculations. In addition, land use and plant cover characteristics were integrated in the SOM database. The SOM values of the WRB soil classes were extended country-wide for each of the six geographical soil regions by means of GIS, i.e., the SOM values of each WRB soil groups of a specific region were extended/assigned (pedo-transferred via local expert knowledge and the soil team) to the similar soils of that geographical region.

Keywords: SOC Mapping, CO2, SLM, CDM, Turkey-Anatolia

K – Forest Soils

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Co-Convener : Oktay Yıldız

Monday 17 October 2016

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Wildfire effects on soil enzyme activities and carbon dynamics in an oak-pine mixed forest

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The need for restricting carbon emission has drawn attention of the scientists to the effects forest fires have. This study was on β-D glucosidase and urease activities takes roles in carbon and nitrogen cycling after a wildfire.
The soil samples were taken from burnt oak-pine mixed site and adjacent unburnt, in Safranbolu transition zone extended from Black Sea to Central Anatolia regions. The changes occured in selected soil characteristics were investigated in different forest conditions in a sampling period from spring to autumn, between the conditions for burnt areas with residual trees and without residual trees against to control area soils. Sampling belongs to fifteen days after the fire (I. period), winter (February), spring (May), summer (September), one year later after the fire (November) (II, III., IV., and V. periods) and two years later after the fire (VI. period) were compared. Statistical evoluation for burnt and unburnt (control) areas was made according to two-way anova analysis with SPSS 21.
β-D glucosidase was decreased while, C/N, Cmic and Cmic/Corg were increased significantly. The difference between control and the burnt site from where residual trees removed was bigger than between the control and the site was of residual trees. It can be pointed out that the process of removing the residual trees from the area may cause the increase of labile carbon fractions in the soil. Removing of trees in stages through a few years instead of immediate intervention to restrict the carbon emission from the soil can be suggested.

Keywords: Enzyme activities, soil nitrogen, soil carbon, soil microbial biomass carbon

Soil organic carbon and organic matter contents of beech & chestnut mixed forests in Black Sea Region of Turkey

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The aim of this study is to determine soil organic carbon (SOC) and organic matter (SOM) contents in eastern beech (*Fagus orientalis* Lipsky) and Sweet chestnut (*Castanea sativa* Mill.) mixed stands in Duzce-Akçakoca located in Western Black Sea Region of Turkey. The mean annual temperature in this area is 13 °C and it receives more than 1070 mm mean annual precipitation. The growing season is about 6 months. Soil texture ranged from clay and clay loam to sandy loam. The overstorey of the mixed stands was primarily a closed canopy of eastern beech and sweet chestnut was contributed 25-35 % of the canopy's crown composition.
Total SOM and SOC were estimated 235 and 92.1 Mg ha-1 respectively in this ecosystem. Mean SOC and SOM concentrations on west aspect were 55 and 79% more, respectively, than those on east aspect. Total SOC amount was 39% more for west aspect, when compared to east aspect. Mean SOM and SOC concentrations did not differ significantly among the elevations. Total SOM amount on the highest elevation level was 70% more than lowest elevation level. Total SOC amount did not differ among the elevation levels. Mean SOM and SOC concentrations were significantly different among various soil depts. Mean SOM and SOC concentrations reduced about 75 and 84% from upper soil to lower soil depths. Total SOM and SOC amounts were 78 and 89% decreased from upper soil to lower soil depths. SOM and SOC contents may be used for similar ecosystems and submitted to global estimations made by various organizations. Additionally, data obtained from these ecosystems may be stored for long-term monitoring and evaluation.

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Keywords: Soil Organic Carbon, Soil Organic Matter, Beech, Chestnut, Black Sea Region of Turkey

Logging intensities influence carbon content in soil and soil characteristics in fir-beech forests of the Dinaric mountain chain

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Fir-beech forests of the Dinaric mountain chain represent one of the most frequent forest ecosystems in the region. Such forests extend in high karst plateaus from the eastern Alps in SE Slovenia to the northern Albania massifs at the altitudes from 700 to 1200 (1500) m a.s.l. The dominant bedrock consists of limestone and occasionally of dolomite limestone and dolomite. There are various soil conditions, where in a few square meters, a mosaic of rendzic Leptosols, chromic Cambisol and chromic Luvisols occure. Past researches on the long-term effects of forest management and intensity of logging on soil organic matter quality and carbon stocks in the forest soils are scarce. Therefore, we implemented different intensities of forest logging on the plots of the size of 0.4-0.5 ha: 0%, 15-20%, 50% and 100% of logged growing stock. Results of our research prove that different measures or intensities of logging influence forest soil quality. As expected, high logging intensities influence the most the upper, organic layers of soil. Those layers are in the forest soils the most important, especially for the processes, related to the decomposition of organic matter, and hence for the growth of forests. This was mainly proved on research plots where 100% of growing stock was removed.
The carbon dynamics and soil respiration were also monitored. We monitored the plot situation with 100% logging intensity and at the control plot – with no logging. Due to changes in temperature, which were higher for up to 6 °C on sunny slopes, and due to the abundant dead underground biomass (roots), the respiratory activity of the soil in the plots with 100% of logging compared to the control plots increased to 2.16 µmol CO2 m2/s, as calculated mean 82 kg more released CO2 /ha/day.

Keywords: fir-beech forest, Dinaric mountains, forest soil, logging influence, carbon dynamics, soil respiration

Comparison of different approaches for assessing atmospheric deposition of metals to forest soils

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This study is a comparison of different approaches to assess the supply of potentially toxic elements from anthropogenic sources to forest soils. Study sites in Poland and Norway were selected primarily in areas with known present or past exposure to air pollution from domestic or international industrial activities. Soil profiles were collected down to 15-30 cm depth and separated according to master horizons. After air drying, homogenizing, and sieving soil samples of about 0.3 g each were decomposed with 7M nitric acid at high pressure and temperature and subsequently diluted 20-fold before determination of 60 elements by ICP-MS. Separate aliquots of the samples were subjected to magnetic susceptibility measurements.
Contribution from atmospheric deposition to the surface soils was assessed by analysis of peat cores from ombrotrophic bogs in the same areas, collected at 3-cm increments down to 50 cm depth. Age of peat samples from different depths was determined by the 14C method. Element concentrations along peat profiles generally agree with those of corresponding soil profiles, and temporal and spatial distributions are in accordance with the general pollution history of the region originating from local sources. However, surface peat from one peat bog located in south Norway shows similar levels of elements typical of air pollution as corresponding peat cores from a peat bog in southwest Poland affected by emissions from coal-fired power plants located in east Germany. As pollution with toxic trace elements from local sources was never high in south Norway, the present peat data confirm strong influence of long-range atmospheric transport from areas elsewhere in Europe on metal composition of natural soils in this region.
This work received funding from the Polish-Norwegian Research Programme operated by the National Centre for R&D under the Norwegian Financial mechanism 2009-2014 in the framework of Project Contract No. Pol-Nor/199338/45/2013.

Keywords: Air pollution, toxic metals, forest soils, peat cores, chemical data, magnetic susceptibility, local pollution sources, long range atmospheric transport, temporal trends

Effect of *Picea abies L.* trees on topsoil properties of former agricultural lands in boreo-nemoral region

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The aim of this study was to clarify the impact of Norway spruce (*Picea abies L.*) trees on sandy and loamy sand topsoil physical and chemical properties of former agricultural lands in boreo-nemoral region.
Soil was sampled under 15-year-old Norway spruce (*Picea abies L.*) trees and in former agricultural lands in Vidzeme upland, Latvia, where soil parent material is formed by glacial till deposits.
Soil samples (20x20 cm) were obtained at depths 0-10 cm and 11-20 cm along 5-m transects with step 20 cm running from the tree stem along cardinal compass directions (north, east, south, west). Roots of Norway spruce (*Picea abies L.*) and herbs were separated from each soil sample and mass of roots was determined by weighing scale.
The physical (bulk density) and chemical analysis (soil pH value, content (%) of total nitrogen and total organic carbon (%), exchangeable cations (Ca^{2+}, Mg^{2+}, K^{+}, Na^{+}, Fe^{3+}, Al^{3+}, Mn^{2+}) (mg kg^{-1})) of soil samples was conducted according to standard methods used in International Co-operative Programme Forest monitoring.
This study demonstrates the mechanisms responsible for the changes of soil properties and quality due to afforestation of Norway spruce (*Picea abies L.*). Significant decrease of herbal root mass was established under Norway spruce.
The study results showed that afforestation of Norway spruce influence topsoil bulk density and chemical properties (exchangeable cations, pH value). In particular, the most pronounced changes were detected for K^{+}. The highest concentration of K^{+} was found close to tree stem compared outside the canopy in former agricultural land. Higher concentrations were observed also in Ca^{2+}, Mg^{2+}, Fe^{2+}, while lower concentrations were detected in Al^{3+} and Mn^{2+}, as well as lower content of total organic carbon and total nitrogen close to tree stem, that probably could be explained by influence of roots and precipitation etc. factors.

Keywords: Land abandonment, *Picea abies L.*, afforestation, glacial till, soil properties

Using Chemical Amendments on Restoration of Saline-Sodic Soil of Central Anatolian Region of Turkey

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Significant amount of bottomland in Central Anatolian region of Turkey has saline-sodic soil properties. The aim of the current study is to ameliorate these bottomland soils by draining excess sodium with gypsum and sulphur applications. Following soil treatments salt cedar (Tamarix), Russian-olive (Elaeagnus angustifolia) and Silver-poplar (Populus alba) seedlings were planted to the sites to evaluate the effects of these treatments on survival and growth performance of these species.
In the summer of 2012, four abandoned afforestation sites with saline-sodic soil properties were designated for the study. For each species in each block, there are 1 gypsum + 1 sulfur application plots with a control plots adjacent to them. Based on soil analysis, approximate amount of gypsum and sulfur were applied to the soil surface as treatments. After the applications of amendments, water was given to the each experimental unit to drain the excessive sodium.
In fall of 2013, three years old seedlings were planted on each plots. The survival rates were determined and height and diameter were measured at the end of September 2015.
Second year infiltration measurements (double-ring) indicates that both chemical treatments had significant effects on infiltration capacity of the soil.
Infiltration capacity of soil in gypsum applied sites was about 75% higher that that of the sulphur application sites. At the end of the second growing season cedar, with 80 %, had the highest survival rates. On the otherhand silver-poplar had 40 % survival rates across the treatments. Due to high variations among the experimental units height and diameter variables of seedlings did not showed a significant differences among treatments.

This study is funded by TÜBİTAK (The Scientific and Technological Research Council of Turkey) through a project no: 113O793 and titled as “İç Anadolu Sodik Sahalarında Jips ve Kükürt Uygulamasının Ağaçlandırma Başarısına Etkisi”

Keywords: Aridland, Turkey, afforestation, sodic-soils

Soil structural stability index (SSI): A geostatistical study from Ordu district in Turkey

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In present study, geostatistical techniques was applied to assess the spatial variability of soil structural stability index (SSI), in the center of Ordu district of eastern of Turkey. Study area (approximately 40137.75 ha) was divided into grids with 2500 x 2500 m spacing that included 67 sampling points from 0-0.2 m in depth. Soil reaction (pH) was the least variable property while the saturated hydraulic conductivity was the most variable. The range of influence occurred as 4350 m with the spherical isotropic semi-variogram model for SSI.

Keywords: structural stability index, soil, spatial variability, site specific management

Soils of Ataturk Arboretum and Belgrade Forest (Istanbul)

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Located in the north of Istanbul, Belgrade Forest is the most important historical and ecological green area of the city. From the Byzantine period, Belgrade Forest is the most important watershed of Istanbul, so 7 dams for transmission of their water to center of Istanbul were constructed by the Ottomans in their period. Belgrade Forest is named after the Serbian population positioned here after 1521. From time to time, the forest used for forest wood production purposes, then in 1953, it has been classified as a preserved and protected forest. Atatürk Arboretum, which is formed by Belgrade Forest, was established in 1949. Today, Belgrade Forest has 5522.3 hectares of area that consist 5240.1 hectares of forested and 282.2 hectares of non-forested land. The area of Atatürk Arboretum is 295.2 hectares. It is stated that in both areas, around 450 taxa are naturally distributed. Also, brought from different regions of the world and Turkey, around 1500 plants are exhibited in Atatürk Arboretum.

There are generally two different bedrocks in Belgrade Forest and Atatürk Arboretum. These are the greywacke schists of the Carboniferous period and Pliocene I sediments which belong to the Neogene period but not petrified yet. Pliocene I sediments are formed as a result of the packing materials carried by the rivers and they are usually has a cross layer. The soils formed from this parent material can be sandy, loamy or heavy loam in terms of soil texture. However, both at Belgrade Forest and Ataturk Arboretum, the textures of the soils located on this parent material can be clay loam or clayey. With a depth of more than stone-free 1 m, these soils do not contain lime and pH is between 4.5 to 7.0 pH. According to FAO/WRB classification system, the most common reference soil group here is Luvisol. However, there are also places for Alisol and Acrisol. Due to the high clay content of the soils, drainage problems can be occurred on straight or slightly curved areas, so Stagnosol soils can be improved.

The soil texture of the soils formed from Carboniferous shales is generally heavy loam. However, unlike the Pliocene I residues, their depths are less and stoniness are more. Stoniness of the soils formed from Carboniferous shales is increasing with depth. As in soils formed from Pliocene I sediments, soils formed from Carboniferous shales doesn't contain lime and pH values ranged from 4.5 to 7.0. According to the FAO/WRB classification system, there are Luvisols and Cambisols on Carboniferous shales. Also Regosols slightly can be found.

Keywords: Belgrade Forest, Atatürk Arboretum, Soil classification, FAO/WRB

Effects of Istanbul-Durusu (Terkos) Afforestations on Some Soil Properties

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Having up to 47 thousand hectares of coastal dunes, Turkey is one of the countries in Europe with the most sand dune areas. Since the 1950s, there have been many studies aimed at preventing the obtained invasive nature of the sand dunes by various factors, such as being driven by the prevailing winds and causing agricultural or residential damages or threatening reservoirs of drinking water. One of these studies was initiated as a result of an emergency that could pose a threat to Durusu (Terkos) Lake to be filled with the sands of northern dunes nearby. As a result of preliminary studies, it was determined that maritime pines and umbrella pines were successful species for plantations and they both have been used intensively since 1960s. Nowadays, there are 1674 ha of maritime pine and 371 ha of umbrella pine plantations located at Durusu coastal dune. The characteristics of soils on afforested dune fields are investigated with this ongoing research, which is supported by TUBITAK. 15 sample plots from each development stage (determined according to their DBH of 0-8 cm; 8-20 cm; 20-36 cm and <36, with abbreviations ‘a’, ‘b’, ‘c’ and ‘cd’ respectively) of studied species (maritime pine and umbrella pine), thus a total of 120 sample plots plus 25 sample plots from non-forested areas were selected for digging a dig soil profile apiece. It is observed that there is no profile development in the field except for an Ah horizon. For this reason, soil sampling procedure is done by taking soil samples of constant depths (0-5 cm, 5-15 cm, 15-30 cm, 30-50 cm, 50-70 cm and 70-100 cm). According to the results, the dune plantations seem to have an effect on the soil, especially on the 0-5 cm depth levels. Soil organic carbon has been found to increase associated with the plantations, while the bulk density, pH and EC values are decreased.

Keywords: Maritime pine, umbrella pine, coastal dune, soil properties

L – Use of Green Technologies for Soil Remediation

Convener : Rocio Millán
Co-convener : Araceli Perez Sanz

Tuesday 18 October 2016

L – 309
Decontamination of a fuel contaminated site by the implementation of phytotechnologies combined with other biological and chemical techniques
Roccio Millan-Madrid, Spain

L – 837
Phytoremediation potential of Thlaspi and Eriophorum species growing in Norway (Røros) copper mines
Gülriz Bayçu-Istanbul, Türkiye

Decontamination of a fuel contaminated site by the implementation of phytotechnologies combined with other biological and chemical techniques

María José Sierra, Olga Escolano, Manuel Rodríguez Rastrero, Javier Rodríguez Alonso, Francisco Javier Díaz Puente, Nerea Arévalo, María Guirado, Rocio Millán
CENTRO DE INVESTIGACIONES ENERGÉTICAS, MEDIOAMBIENTALES Y TECNOLÓGICAS (CIEMAT), DEPARTMENT OF ENVIRONMENT, MADRID, SPAIN

The environmental impact of organic pollutants is a global concern. In particular fuel spills could affect soil and water and this problem needs innovative, environmental and friendly solutions. In the framework of the Life Bioxisoil Project (Life ENV 11/ES/505), the objective of this work is to test combinations of chemical and biological technologies on aged hydrocarbon contaminated site within a military location situated in SW of Spain, in order to reach an optimal environment restauration. For it, the synergies and antagonisms among the technologies were evaluated at different scales. These techniques were: "in situ" chemical oxidation, surfactant, biostimulation and phytotechnology given that the rhizosphere is a favourable environment for growing of microorganisms that could increase final efficiency of organic decontamination. In the study area, five species (*Populus nigra*, *Tamarix gallica*, *Salix purpurea*, *Pistacia lentiscus* and *Populus alba*) were grown and different combinations of the techniques were applied. Furthermore, two of the plant species (*Pistacia lentiscus* and *Tamarix gallica*) grown in field were chosen to cultivate under greenhouse conditions to study the effects of combination between phytotechnology and the other technologies in a more controlled way. Therefore, it was applied three treatments per species (surfactant, biostimulation and surfactant + biostimulation) to evaluate the combination effect versus control pots (plant without any treatment). In general, the results showed an increase of hydrocarbon biodegradation in the rhizosphere with respect to bulk soil. Only the presence of plants or its combination with whatever technology had a positive effect in the hydrocarbon decontamination. The obtained data will be the base in order to develop an adequate protocol to recuperate this site that can be extrapolated to similar contaminated areas.

Keywords: Fuel contamination, soil decontamination, phytotechnology, chemical technology, biological technology

Phytoremediation potential of *Thlaspi* and *Eriophorum* species growing in Norway (Røros) copper mines

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Seeds of the naturally growing Thlaspi (Noccaea caerulescens), Eriophorum vaginatum and Eriophorum scheuchzeri plants were collected from the Røros Copper Mine sites in Norway. Seeds were germinated in petri dishes and the obtained seedlings were transferred into hydroponic cultures. Plants were grown in the phytotron conditions for 24 weeks and different concentrations of Zn, Cu and Cd were applied for 10 days. Morphological and ecophysiological changes were detected and metal concentrations of plant organs were measured by ICP-OES. Depending on the different metal treatments, several variations were observed in total chlorophyll contents and in the amount of phenolic substances. High levels of metal accumulation in the roots suggest that the investigated plants might be used to clean-up soil and sediments with phytostabilization processes, prevent erosion and create eco-restoration.

Keywords: Mine sites, heavy metal pollution, metal stress, hyperaccumulation, phytoremediation

M – Biofertilizers

Convener : Metin Turan
Co Convener : Nurgül Kıtır

Tuesday 18 October 2016

M – 623
The Effects of Mycorrhiza and Planting Design on Basic Quality Traits of Tomato
Mustafa Emre Özeren-Çanakkale, Türkiye

M – 875
Interactive effect of bacteria and biochar on phosphorus uptake in maize (Zea mays L.)
Mazhar Rafique-Adana, Türkiye

M– 857
Use of antibiotics in medicine of bacteria isolated from soil, a review
Veysel Turan-Bingol, Türkiye

M – 904
Effects of PGPR and Humic Acid Applications on Antioxidante Enzyme Activity and Physiological Parameters of Spinach (Spinacia oleracea L.)
Adem Gunes-Kayseri, Türkiye

M – 960
Plant Growth Promoting Rhizobacteria as Alleviators for Soil Degradation
Metin Turan-Istanbul, Türkiye

The Effects of Mycorrhiza and Planting Design on Basic Quality Traits of Tomato

Mustafa Emre Özeren[1], Seçkin Kaya[2], Cafer Türkmen[3]
[1]Mustafa Emre ÖZEREN
[2]Seçkin KAYA
[3]Cafer TÜRKMEN

However Mycorrhiza and its effects on plant nutrition are studied many times, it is important to determine the effects on fruit quality and further studies are required. On the other hand, benefits and detriments of planting according to the golden ratio scale need to be better explained. In this paper, one growing season of field experiment was conducted to assess the effects of two planting design and Arbuscular mycorrhiza inoculated to roots of tomato seedlings. Planting modalities are designed as standard (S) which the seedlings were planted 0.66 m x 1.40 m in row spacing and golden ratio (GR) which the seedlings were planted according to the constant ratio number 1.618 between the spaces of other two plants. Research was carried out, mycorrhiza under planting design, as randomized split-plot block with 3 repetitions in Dardanos, Çanakkale. The results showed that, fruit weight was affected by the planting design. Standard planting gave the higher fruit weights compared to Golden ratio planting and mycorrhiza factor found insignificant statistically on fruit weights. The increase on the fruit weight affected the fruit size of tomato either. While standard planting design gave the higher fruit diameter and fruit length, mycorrhiza factor found insignificant statistically. Neither planting design nor mycorrhiza factor affected on fruit exterior color parameters. Furthermore, total soluble solid content (SSC%) and titrable acidity (TA%) did not effected by the planting design and mycorrhiza factor. As a result, it was determined that golden ratio planting design did not give the desired success. It is considered that the spaces between tomato plants are inadequate in that planting design.

Keywords: Planting design, Golden ratio, Mycorrhiza, Tomato, Fruit quality

Interactive effect of bacteria and biochar on phosphorus uptake in maize (*Zea mays* L.)

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Interactive effect of bacteria and biochar on phosphorus uptake in maize (Zea mays L.)

Soil is the living epidermis of the planet. It regulates microbial activities and nutrient availability for the plants. Primary nutrients always remained the limiting factor for plant growth and microbial population. Phosphorus is one of the primary and limiting factor in governing yield of plants. In this study, maize seeds were inoculated with two phosphorus solubilizing bacterial strains in presence of biochar. Moreover, effect of biochar and bacterial strains were also observed in separate treatments. Two types of feedstock were used in biochar making at the pyrolytic temperature of 300ºC. Feedstocks were baggase (remaining of sugarcane) and saw dust. Two phosphorus strains were used. Results showed that soil amended with biochar improved soil physicochemical properties and root biomass. While the seeds inoculated with bacterial strains also performed good in comparison to the control. Besides that sawdust biochar was more effect creating on plants in association to the bagasse. Bacterial interaction with biochar was better than the control treatment. This study can be used as foot step to understand the behavior of bacteria in combination with biochar application in maize for phosphorus uptake.

Keywords: Phosphorus, bacteria, biochar, maize

Use of antibiotics in medicine of bacteria isolated from soil, a review

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The appearance of soil microbes and survival strategies that create a large variation includes a wide range of microhabitats. Using a technique they helped to develop, they identified around 3,000 antibiotic resistance genes in the soil bacteria. However, they were not situated close to mobility elements in the bacteria's DNA Soil bacteria have strategies for fighting antibiotics that we're only just starting to learn about. We need to make sure the genes that make these strategies possible aren't shared with infectious bacteria, because they could make the problem of drug-resistant infections much worse (Paddock, K., 2014). Looking to the soil for antibiotics did not stop with Dr. Waksman's retirement. Vancomycin, an antibiotic isolated in 1956 from a species of actinomycete found in Indian and Indonesian soils, is extremely powerful and the current last line of defense for the treatment of bacterial infections. However, as with all other antibiotics, strains of bacteria resistant to vancomycin recently have been discovered. This means that some bacteria are now impervious to all known treatments. This is a scary reality, but rest assured that scientists are already at work in the soil, trying to find the microbe that will provide the next miracle medicine (Waksman, S., 1956).

Keywords: antibiotics in medicine, soil bacteria, drug, soil DNA

Effects of PGPR and Humic Acid Applications on Antioxidante Enzyme Activity and Physiological Parameters of Spinach (Spinacia oleracea L.)

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Spinach shoots and leaves are eaten either fresh or after various processes. It is a significant nutrient in human nutrition. Spinach can also uptake significant amount of nitrate from the soil. Therefore, fertilizers used to improve spinach yield and quality should be selected very carefully. The present study was conducted to investigate the effects of PGR + humic acid treatments on yield and nutrient content of spinach. Five different humic acid doses (0, 3, 6, 9, and 12 lt da-1), 2 different PGPR bacteria (Bacillus megatarium RC07 and Bacillus M3), and 3 different application methods (soil, leaf and soil+leaf) were applied to pots filled with 4 kg of soil. Experiments were conducted in 3 replications in 90 pots. Bacteria were inoculated into PGPR treated plants and then sowing was performed. Humic acid treatments were applied before sowing the seeds to soil, leaf application in four leaves stage. Mineral fertilization was not performed to see the effects of PGR and humic acid treatments on spinach antioxidante enzyme activity and physiological parameters. Initial soil sampling was performed to identify initial physical and chemical soil characteristics. Plants were harvested at the end of experimental period and fresh plant weights, antioxidante enzyme activity and physiological parameters were investigated. Results revealed that PGPR and humic acid treatments increased antioxidante enzyme activity and physiological parameters of spinach plants, specially soil application of PGPR and humic acid.

Keywords: Spinach, humic acid, chlorophyll, PGPR

Plant Growth Promoting Rhizobacteria as Alleviators for Soil Degradation

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The long-term development of global socio-economic systems requires the sustainable use of natural resources. The sustainable use of soil resources depends on three factors:soil characteristics, environmental conditions and land use.The latter comprises important concerns related to eutrophication of surface water, contamination of groundwater, and emissions of trace gases (CO2, CH4, N2O, and NOx) from terrestrial/aquatic ecosystems to the atmosphere.Soil structure is the important property that affects all three degradation processes. Thus, land degradation is a biophysical process driven by socioeconomic and political causes. Farmland degradation can also have important negative effects of the farm, including deposition of eroded soil in streams or behind dams, contamination of drinking water by agrochemicals, and loss of habitat. Existing estimates of the current global extent and severity of the problem should be considered indicative at best. The Global Land Assessment of Degradation, based only on the impressions of experts, estimates that nearly two billion ha worldwide (22% of all cropland, pasture, forest, and woodland) have been degraded since mid-century.
Around 3.5% of the two billion totals are estimated to have been degraded so severely that the degradation is reversible only through costly engineering measures, if at all. Just over 10% has been moderately degraded, and this degradation is reversible only through major on-farm investments. Of the nearly 1.5 billion ha in cropland worldwide, about 38% is degraded to some degree. Various sources suggest that 5–10 million ha are being lost annually due to severe land degradation. If this trend continues, 1.4–2.8% of total cropland, pasture, and forest land will lost by 2020. Declining yields (or increasing input requirements to maintain yields) could be expected over a much larger area. These data are, however, likely to overestimate the problem, as they don't account for the effects of land improvements, which also appear to be widespread.

Keywords: Plant Growth Promoting Rhizobacteria, Soil degradation, Sustainable agriculturd, organic agriculture

MCS – Mycorrhiza and Carbon Sequestration Related With Soil Quality

Convener : İbrahim Ortaş
Co-Convener : Ömer Faruk Demir

Tuesday 18 October 2016

MCS – 310
Effect of Gyttja and Nitrogen Applications on Red Pepper (Capsicum annum L.) Plant Growth in the Soils Formed on The Different Parent Materials
Ömer Faruk Demir- Kahramanmaraş, Türkiye

MCS – 618
Research On The Impact Of Fungus, Algea And Lichens On Soil Aggregate Stability And Its Fertility In Agricultural Land Of Gaziantep
Erdihan Tunç-Gaziantep, Türkiye

MCS – 532
Effects of Soil and Forest Management Systems under Mediterranean Soil Conditions on Soil and Plant Carbon Capture
Ibrahim Ortas-Adana, Türkiye

EFFECT of GYTTJA and NITROGEN APPLICATIONS on RED PEPPER (Capsicum annum L.) PLANT GROWTH in the SOILS FORMED on THE DIFFERENT PARENT MATERIALS

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This study was carried out to determine the effects of gyttja (0, 1, 2, and 4%) and nitrogen (0, 70, 140, and 210 mgkg-1) applications on the growth, and nutrient uptake of red pepper plants grown in the soils formed on the different parent materials (basalt, serpantine, and limestone) which were taken from the East Mediterranean Agricultural Basin. The findings showed that soil formed on basaltic parent material had highest plant available P, K, and Zn, while soil formed on a limestone had highest plant available Ca, Na, and Cu and serpentine soil was the richest in plant available Mg and Mn among the soils formed on the three parent materials. Plant weights significantly increased at 4% gyttja application but fruit yield was not affected with gyttja applications. Nitrogen application at 140 mg kg-1 dose significantly increased root, stem, and fruit weights but a decrease was observed for the number of fruits per plant with N applications. Gyttja applications significantly increased phosphorus and calcium levels of plants and soils. Micronutrient contents of soil and plants were not improved with gyttja applications. In fact, soil Mn availability and plant tissue Zn concentrations decreased with gyttja applications. The results also revealed that gyttja applications increased soil pH, organic matter, and lime content of soils.

Keywords: Gyttja, Nitrogen, Serpantine, Basalt, Limestone

Research On The Impact Of Fungus, Algea And Lichens On Soil Aggregate Stability And Its Fertility In Agricultural Land Of Gaziantep

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While aggreagation in soil effects the main characteristics of the soil such as; aeration, water-holding capacity, movement of the air/water, root growth/distribution, the activity of microbial communities, the aggregate stability has an effect mainly on the prevention of soil erosion. Aggregate stability is an indicator of the amount of organic matter, biological activity and the nutrient cycle in the soil. The changes in the soil aggregate stability serves as an early indicator of soil degredation. In this study, the effect of algea, fungi found in the soils of Gaziantep Region and lichens obtained from Germany Maulenwald Region to the soil fertility and aggregate stability (via percolation) was investigated. For this purpose, soil samples with and without fungi, lichens and algea were collected from each locality and content of nutritional elements and aggregate stability of the samples were determined and compared.
By determining the aggregate stability and nutrient content of the natural flora of algea, fungi and lichen in Gaziantep soil, it will be possible to plan studies aiming to increase these values and to render the soil resistant to erosion.

Keywords: Aggregate Stability, Soil Fertility, Soil Algea, Fungi, Lichen, Percolation

Effects of Soil and Forest Management Systems under Mediterranean Soil Conditions on Soil and Plant Carbon Capture

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Forest ecosystems store a significant amount of C as lignin and other relatively resistant C compounds. Also forest soils are keeping organic carbon as organic material. It is important to keep the atmospheric CO2 in the plant tissue for long term sequestration. The forest C is sequestered not only in the harvestable timber and other branched. Since there is a relationship between atmospheric CO2 and climate change, more work is done on C fixation through photosynthesis to keep more carbon in the soil.
We conducted a long term eucalyptus (E. camaldulensis) forest and soil management experiment which was carried out on three age groups 5, 7 and 10 years old eucalyptus plantation. There were three different treatments such as shaved and ploughed, shaved and without plowing, and without shaving control treatments.
During three years Three year soil, plant, and residue sample were collected. Soil mycorrhizae spore, carbon, nitrogen, potassium, iron, copper, manganese and zinc concentration were determined. Also soil and plant carbon fixation was determined. Also during 20 mounts soil microbial activity and CO2 flux were determined.

The resulted are showing that 10 years old three plants have more biomass and fixed more carbon. The soil organic carbon (SOC) stock was calculated for each ages and management systems. Soils have collected at 5 years old eucalyptus plantation have total 40.46 ton ha-1 SOC, and respectively to 7 and 10 years old plantations they have accumulated 56.04 and 82.66 ton ha-1 SOC. SOC through the soil profile decreased, which is depending on root development. Also mycorrhiza spores decreased with soil depth through the soil profile.

Bu makale TÜBİTAK-TOVAG -109O027 nolu proje trafından desteklenmektedir.

Keywords: Forest ecosystems, soil organic carbon, mycorrhizae, eucalyptus, carbon sequastraton

N – Soil Science and Food Security

Convener : Pavel Krasilnikov

Thursday 20 October 2016

N – 880
Food security: challenges for agriculture and soil science
Pavel Krasilnikov -Moscow, Russia

Food security: challenges for agriculture and soil science

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Food security is the major challenge for the 21st century. According to the estimations of FAO, the agricultural production should de increased 70% until 2050 to ensure food security in the world. The task is complex, especially taking into account continuous decrease in the area of fertile arable land due to soil degradation and urban sprawl. It is estimated that until 2050 the area of agricultural land per person would reduce to less than 0.2 hectare. Soil degradation is a global phenomenon, but there is certain disproportion in its geographical distribution. It is believed that the main hotspots are Sub-Saharian Africa, South-East Asia and Central America. Northern Eurasia, including Russia, has been considered as a relatively stable territory with minor impact of land degradation. However, soil degradation is active in Russia, as it is driven by a complex of natural and socio-economic factors. The basic requirements of food security are stability of food production and sustainability of its increase along with increasing population, reducing poverty and improving nutrition. Agriculturalists face the challenge of the demand for increasing production with reducing arable land area, taking into account a requirement for reduced agrochemicals use. Soil scientists should develop new landscape adapted technologies to contribute to the sustainable intensification of agriculture, especially in the developing countries. The main trends of the development of agriculture in the future would be, on the one hand, smart land use planning and construction of artificial soilscapes, and, on the other hand, the use of new generations of biochemical fertilizers such as humates, biochar, etc. Closer interaction between the stakeholders is needed to improve physical availability of food in a global scale.

Keywords: sustainable intensification, physical availability of food, landscape adaptive agriculture, smart land use planning, innovative fertilizers

NANO – Nanomaterials in Soil Environment

Convener : Mehmet Öğüt

Thursday 20 October 2016

NANO – 976
Introduce to PBAT (poly butylene adipate-co-terephthalate) usage as a nanocomposite fertilizer in agricultural activities
Muhittin Onur Akça- Ankara, Turkey

Introduce to PBAT (poly butylene adipate-co-terephthalate) usage as a nanocomposite fertilizer in agricultural activities

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Today, the studies on the use of biodegradable polymeric microspheres infused with medicine/ion. Especially, controlling the physiochemical features of synthetic biodegradable polymeric substances draws the attention of different fields, out of the industrial and clinic applications; for example, it attracts in terms of being able to use waste management of the plastic materials. There is a gap about the agricultural applications of the poly butylene adipate-co-terephthalate (PBAT) nanocomposites. Within the context of this subject, so as to comprehensively state the potential in the controllable ion release of the PBAT nanoparticles, which have the feature of being biodegradable a hundred percent in soil, this will give information about the opportunities to use these nanocomposites in agriculture. In order to fill this gap, being able to use PBAT material as fertilizer can be an up to date approach. The application of new generation fertilizers, which can be degraded a hundred percent in nature, are considered to be economical because of their having one or some of the features such as high degradability, concentration efficiency, with the aspects of durability and efficiency, controlled release, low ecotoxicity and removing the obligation of repeating application through effective distribution, which are needed for them to have high efficiency.

As the result of this, it will be discussed whether the efficiency of a fertilizer that is alternative to our own fertilizer, which is used conventionally and produced by using new technologies for the agriculture of our country, on the soil is possible to determine, by gaining knowledge and experience in these subjects, and whether the risk of environmental pollution decrease because the fertilizer, to be developed, will allow lesser amounts of fertilizer consumption, in case it is successful, and whether it will also make contribution to the economy of the country.

Keywords: PBAT (poly butylene adipate-co-terephthalate), Polymer, Nanocomposite, Biodegredable, Fertilizer, Agriculture

NW – New water saving Technologies for conserving water in the soil

Convener : Yasemin Kavdır

Thursday 20 October 2016

NW – 193
Use Of Soil Water Retention Technology (SWRT) in Canakkale, Turkey
Yasemin Kavdır-Çanakkale, Türkiye

NW – 954
A Mechanized Soil Water Retention Technology (SWRT) Increases Yields of Maize and Vegetables in Iran, Iraq and the USA
Yasemin Kavdır-Çanakkale, Türkiye

NW – 964
Precise Irrigation Scheduling Using Soil Moisture Sensors
Ali Ibrahim Akın-Ankara, Türkiye

USE of SOIL WATER RETENTION TECHNOLOGY (SWRT) in CANAKKALE, TURKEY

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Effects of soil water retention technology (SWRT) on perennial ryegrass (Lolium perenne c.v Caddieshack) root development and chlorophyll content were investigated in Çanakkale. Treatments consisted of SWRT applications at two different soil depths (30 and 40 cm) and three different irrigation levels in sandy soil. The best turfgrass quality was obtained with placement of SWRT at 30 and 40 cm depth together with 0% and 34% water deficit, compared to control treatment. Application of 33% available water contents reduced plant chlorophyll content and root development. Using SWRT in sandy soils of Canakkale saved water and increased turfgrass quality.

Keywords: Soil water retention technology, barriers, chlorophyll, turfgrass, root development

A Mechanized Soil Water Retention Technology (SWRT) Increases Yields of Maize and Vegetables in Iran, Iraq and the USA

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FAO projects global human population will increase to 10 billion by 2050. This population increase along with additional animals will require 70% more food with at least 40% more water at current water use efficiencies. Since the majority of highly productive soils are currently farmed, innovative approaches are needed to convert large tracts of highly permeable sands into long-term sustainable agriculture production. Current projections of localized droughts combined with reductions in stored surface water and receding groundwater levels demand new water storage technologies for improving water use efficiency. Subsurface water retention membranes have been engineered and installed into sands to double soil water holding capacities in plant root zones. Greater quantities of plant available water in root zones provide drought resilience to plants in high rainfall and irrigated arid regions. Consequently a new Soil Water Retention Technology (SWRT) was designed at Michigan State University. During the past four years SWRT membranes have been tested to improve soil water contents in laboratory and field studies located in four states in the USA, two locations in Iraq, Iran, China and earlier in Turkey. These projects have been established to address the growing demands for food production while using less water. This presentation will report how doubling the water holding capacity of sand soil increases production of irrigated vegetables by 44%, maize yields are increased by 120% to 277% and rainfed cotton by 500% in the USA. In Iraq tomato production was increased 86% with half the irrigation water. In Iran, combinations of SWRT membranes and surface mulching significantly increased maize yields.

Keywords: Water retention, Polyethylene membranes, Doubles root zone water, sandy soils

Precise Irrigation Scheduling Using Soil Moisture Sensors

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The efficient use of irrigation water requires several kinds of information. One element of an efficient irrigation scheduling is monitoring the soil to assure that the crop irrigation goals are being met. Various soil moisture measuring devices have been tested for irrigation scheduling in silt loam and sandy loam. Aquaflex, Gro-Point, Moisture-Point, neutron probe, tensiometer, Watermark soil moisture sensor and Gopher probes were compared. Several sensors were tested as read automatically by a datalogger and read manually with a hand-held meter. Practical suggestions are provided to use soil moisture sensors to the benefit of crop production and water conservation.

Precise irrigation scheduling is necessary to optimize marketable yield of high value crops while conserving water and protecting water quality. Irrigation scheduling is greatly facilitated by any soil moisture sensor which can provide timely and responsive information on soil water or soil water potential status. For a particular sensor to be useful for a particular crop and soil, it needs to respond rapidly and reliably to the range of variation of water status in that soil which is important for marketable yield. Several sensors were tested for their responsiveness and usefulness for irrigation scheduling in soils typical of the Treasure Valley of the Snake River Plain of Oregon and Idaho.

Keywords: soil water, irrigation scheduling, responsiveness, soil moisture sensor

O – Soil Biota In Land Use Systems – Assessing The Importance Of Functions And Services Provided By Soil Organisms In Sustainable Soil Management

Convener : İbrahim Ortaş
Co Convener : Oğuz Can Turgay

Thursday 20 October 2016

O – 369
Does long term organic farming have a positive effect on epigeic soil macrofauna?
Borivoj Sarapatka-Olomouc, Czech Republic

O – 261
Soil microbial community functioning under anthropogenic transformation of terrestrial ecosystems
Nadezhda Dmitrievna Ananyeva-Pushchino, Russia

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Linking of sol food web and soil carbon models
Jan Frouz-Prague, Czech Republic

O – 810
Assessment of oil contaminated soils of West Siberia middle taiga (Khanty-Mansiysk region)
Ekaterina Kovaleva-Moscow, Russia

Does long term organic farming have a positive effect on epigeic soil macrofauna?

Borivoj Sarapatka, Vojtech Chmelik, Ivan H. Tuf, Ondrej Machac
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Contemporary agriculture significantly affects soil quality, species diversity and structure of communities within the landscape. One of the solutions, in terms of minimizing negative influence, may be organic agriculture (OA). While some studies show the strong positive effect of OA on some groups of soil fauna, other comparisons found little or no difference in soil biota (incl. ground beetles or spiders) between organic and conventional fields. In our study we focused on a comparison of the influence of both these farming systems on the abundance of soil fauna. We studied invertebrates on fields knowing that the same crop rotation and agricultural system (conventional or organic) has been used on the given plot for more than the past 15 years. Within the crop rotation system our 4 year study focused on the growth of winter rape and winter wheat. A statistically significant higher number of specimens were caught in the conventional variant of both crops. Ground beetles (carabids) and spiders were the most abundant groups: in the studied area carabids tended to prefer the conventional system, while spiders preferred organically managed fields. We compared the results obtained in terms of farm management used: the carabid communities were significantly affected by springtime mechanical interventions (harrowing and hoeing). Compared to harrowing, hoeing was a more intensive and deeper intervention to the soil environment. Our results can be used in making recommendations for the timing of mechanical interventions, either as early as possible (while respecting other circumstances), or later, when carabids are in the imago stage. These interventions did not have a statistically significant impact on spiders as some spider species winter in field margins and others spread very well by air – and are thus able to colonize agroecosystems quite quickly.

Keywords: Soil fauna, Carabidae, Araneae, Myriapoda, Farming system, Soil tillage

Soil microbial community functioning under anthropogenic transformation of terrestrial ecosystems

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Anthropogenic transformation of terrestrial ecosystems affects soil microbial community functioning. This research was focused on analyzing parameters of microbial community functioning in Chernozems typical (European Russia, Kursk region) of undisturbed (virgin steppe, oak forest) and disturbed (bare fallow, urban) ecosystems. In each ecosystem (5 spatially distributed sites), the soil CO_2 emission and the portion of microbial respiration (MR) was assessed (Li-820, May-June-July, 2015). In soil samples (0-10 cm) microbial biomass carbon (C_{mic}), basal respiration (BR) and fungi-to-bacteria ratio were measured, and specific microbial respiration (qCO_2=BR / C_{mic}) was calculated. The highest soil CO_2 emission was found for steppe, and the lowest was for fallow. The high C_{mic} and BR were found in undisturbed ecosystems, the low ones in anthropogenic transformed. The qCO_2 values of urban soil were in average by 2-3 times more than corresponding analogues. The fungi portion in urban soil and steppe was about the same (82-85%), however fungi portion in soil organic carbon content in urban soil were 2.4 times less than those of steppe. The MR portion in soil CO_2 emission made up from 27 to 91%. The high MR contribution was found in the forest (in average 71%), the low MR was in steppe and urban (in average 48 and 52%, respectively). The contribution of MR for different months was not significantly differed for each studied ecosystem. Between MR (*in situ*) and BR (*lab test*) was revealed the relationship (R^2=0.57). The first axis (PCA) produce 47% of experimental data variation (C_{mic}, BR, CO_2 emission, soil temperature and moisture) and the second axis was 22% (qCO_2). The first axis can be considered as the gradient of ecosystem changes. It was found the essential "deterioration" of soil microbial community functioning under anthropogenic impact.

Keywords: soil, microbial biomass, microbial respiration, CO_2 emission, land use

Linking of sol food web and soil carbon models

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Soil macrofauna digest only small portion of organic matter they consumed. Majority of the organic matter return back to soil and can be subject of feeding by other member of food web. This feces flow is usually not included in food web models. However this organic matter transformed in to macrofauna feces, substantially change its structure in terms of organic matter availability and decomposability and attract different members of soil food web than the litter which was eaten. This may cause engineering effect of soil fauna namely earthworms but also litter transforming fauna. Several examples of food web changes after arrival ecosystem engineers are presented. When earthworms arrive, mix litter into the mineral soil and form an organo-mineral topsoil, which is beneficial for bacteria and enhances the bacterial food web channel, hence earthworm change whole for web organization despite fact that amount of energy passed thru biomass of earthworms is rather low and changes are rather due to engineering effect and change in environment. Those examples include complex food web study in chronosequence of post-mining sites, comparison different tree species and laboratory manipulation experiment. The best predictor of fungal bacterial ratio in these examples is thickness of fermentation layer, this correspond with changes in topsoil microstructure driven by engineering effects of earthworms. At the same time we illustrated changes in individual pools of organic matter in these system. Conceptual model how to incorporate this engineering effect in food web models is presented.

Keywords: soil organic matter, ecosystem engineers, food web, decomposition, macrofauna

Assessment of oil contaminated soils of West Siberia middle taiga (Khanty-Mansiysk region)

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This study discusses the quality assessment of oil contaminated soils and seeks to find oil permissible norms, allowing the soil system to perform its ecological functions. The soil contamination can occur at all oil extraction stages (the spillage of oil, highly mineralized water, drilling waste disposal). The negative impact of oil extraction to soils means the soil degradation, pollutants migration into adjacent environment. Polluted soils (peat soils, podzol soils), water sediments and their background analogues of west Siberia middle taiga region (Khanty-Mansiysk) were studied using chemical parameters to characterize the peculiarities and the contamination. The biological parameters were measured to assess the oil extraction impact to soil quality and ecological functions. Limit loads were calculated as a function of the critical points, approximating the pollutant dose – biological effect; logistic curve was used to approximate the regression equation. Results confirm the oil extraction stages impacting the neighboring environment; downward movement in the profile and lateral migration of pollutants (oil products, chlorides, sodium, calcium and a variety of heavy metals, including Zn, Ni, and Cu) from pollutant sources, causing changes in the properties of soils and bottom sediments of water bodies are revealed. Thus, average content of oil products varies from 13 g/kg to 461 g/kg in soils, from 1 to 32 g/kg in the sediments studied. The different sensitivity of test organisms to pollutants, contaminated soils, in bioassay was revealed. Biological parameters: earthworms (*Enchytraeus albidus*), catalase activity have been sensitive to oil products ($R=0.87-0.96$, $\rho<0.05$). The significant correlation between CO_2 emission and Cl and Na was defined. The limit norms of oil products have been determined as 75 g/kg in peat soils, 6 g/kg in podzol soils; the determined loads allow soils to perform their ecological functions and no pollutant migration into the adjacent environment is found.

Keywords: podzol, peat soils, oil pollution, assessment, bioassay, earthworms, enzymatic activity

P1 – Paleosols and polygenetic soils
Convener : Daniela Sauer
Co-Convener : Edoardo A. C. Costantini

Thursday 20 October 2016

P1 – 256
Loess soils of Italy, a bridge between glacial and desert loess
Edoardo A.c. Costantini-Firenze, Italy

P1 – 917
A Late Pleistocene sediment-palaeosol succession in north-western Sardinia
Claudio Zucca-Amman, Jordan

P1 – 491
A Petric Calcisol with Memories of its Time under Rain Forest
Karl Stahr-Stuttgart, Germany

P1 – 928
Soil-forming processes in the Vestfold Podzol chronosequence (SE Norway) observed through thin section analysis
Daniela Sauer-Goettingen, Germany

Loess soils of Italy, a bridge between glacial and desert loess

Edoardo A.c. Costantini[1], Roberto Barbetti[1], Giovanni L'abate[1], Fikrat Feyziyev[2], Simone Priori[1]
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Loess addition to soils represents an important pedogenic process, especially in the Mediterranean, since its effects include re-carbonatation, fertilization, and enhanced carbon sequestration capacity. Identifying and characterizing recent and ancient dust in soils may help to identify sources, modes of transport and phases of increased dust deposition that can be correlated to climate changes and anthropic modifications of the landscape. The aim of this paper is to present the Italian distribution of soils with loess belonging to both past glacial and dry environments.
Within this paper, we define “loess soils” as soils having pedogenized aeolian sediments, not directly related to volcanic eruptions or coastal dunes. Our focus was on the inland deposits which aeolian nature can be clearly recognized, although they might be reworked by local slope and anthropic processes, and possibly mixed with other materials.
We created an original database that works on spreadsheets. Data were collected from both published papers and the national soil database. A subset of soil sample underwent visible and near infrared (VIS-NIR) spectrometry. Presence of loess was either ascertained from the studies conducted in the published papers, or inferred by similarity in setting, physical or chemical features, of soils from the national database.
Soil information in the database is organized in profiles and horizons and includes particle size distribution (PSD) and chemical data, like pH, lime, cation exchange capacity, base saturation, and soil organic matter. Site information, like geomorphic and geologic setting, land use, elevation, is considered. Soil main field features and classification are also provided, as well as iron forms analysis, redness rating and age, when present. Information about nature of soil parent materials occurring in the profiles is also provided.

Keywords: Loess, soil, Vis-NIR, glacial, desert, database, GIS, Mediterranean, Italy

A Late Pleistocene sediment-palaeosol succession in north-western Sardinia

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Late Pleistocene pollen records on the southern Italian peninsula point to a vegetation cover fluctuating between forest steppe and open steppe conditions. However, only few sediment-palaeosol records of this period have been reported in the literature so far. Such records would allow for gaining insight also into spatial patterns of vegetation in the landscape during this period that should have formed, e.g., according to relief, elevation, and continentality gradient (related to the different coastline during the last glacial period).
Therefore, a 6-7 m thick Late Pleistocene sediment-palaeosol succession that is exposed along the north-western coast of Sardinia (Italy), around 1.5 km north of Porto Palmas was subjected to palaeopedological analysis. The succession has developed in alluvial fan deposits that are constrained in a narrow valley, thus forming a valley infilling. Where the valley opens into the sea, this infilling is exposed in a high cliff. The sediment-palaeosol succession is sandwiched in between marine deposits at the bottom (attributed to MIS 5c), and a sandy cover on top, dated to 23±4 ka by OSL. A total number of 39 horizons was described and sampled for chemical and micromorphological analyses. 14C dating was performed on charcoal fragments that were abundant in several horizons.
Interestingly, in contrast to two other sediment-palaeosol successions that were previously investigated in the Reggio di Calabria region (Sauer et al., 2013), the palaeosols exposed in NW Sardinia do not represent dark steppe and forest steppe soils. Instead, the NW Sardinian Late Pleistocene palaeosols are brownish, suggesting rather forest environments in this region.

Sauer, D., Zwanzig, L., Scarciglia, F., Kadereit, A., Brauer, A., Al-Sharif, R., Brückner, H., 2013. Steppe to forest steppe ecosystems during the last glacial period in S Italy – evidence from sediment-paleosol sequences, compared to lacustrine archives and marine data. Geophysical Research Abstracts, Vol. 15, EGU2013-7409-1.

Keywords: Late Pleistocene, alluvial deposits, Sardinia, 14C

A Petric Calcisol with Memories of its Time under Rain Forest

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In the semidesert of Central Australia we find well developed Petric Calcisols in a landscape dominated by dune sands. The loose topsoil is partially underlain by a calcrete. The contribution will analyse the phases of development of these calcretes.
Besides the dune sand mainly consisting of quartz grains swimming in a calcitic matrix, we observed fragments of iron oxide concretions which might trace back to a former Plinthosol. Goethite, hematite and maghemite can also be found. Features of dissolution of silica as well as clay-skins complete the picture of a soil with paleosolic features inherited a time under far more humid conditions.

Keywords: Calcrete, dune sand, iron oxides, climate memories, Central Australia

Soil-forming processes in the Vestfold Podzol chronosequence (SE Norway) observed through thin section analysis

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SE Norway has undergone steady glacio-isostatic uplift over the Holocene. Hence, in the coastal areas land surface age continuously increases with elevation, providing ideal conditions for studying progressing pedogenesis. A soil chronosequence on beach sand and sandy river terraces was studied in Vestfold, on the western side of the Oslofjord. 31 pedons with soil ages of 85 years to 10,150 years were analysed. The mean annual temperature is 5.3-6.3 °C and mean annual precipitation amounts to 909-1150 mm. Initial podzolisation becomes visible after 800-1200 years, major Podzols form within about 6000 years. Micromorphological changes of the Bh and Bs horizons with soil age include accumulation of dark fine material in the Bh horizons and cloudy, iron-rich fine material in the Bs horizons. These accumulations turn the originally coarse monic c/f-related distribution into chitonic and enaulic. The reddish colour of the granules of fine material in the Bs horizons becomes more intense with soil age. Micromorphological analysis also shows that clay translocation took place prior to podzolisation in many profiles. In rare cases, clay coatings are observed even on top of spodic material, suggesting that clay translocation may take place even contemporarily to podzolisation. This can be explained by different depths of mobilisation of metal-organic complexes and clay. Apparently, even when the upper part of the soils is already subject to podzolisation, acidification and Al saturation at some depth are still not as advanced as further up in the profile and still allow for clay mobilisation. In addition, cappings of coarse clay and fine silt on top of larger grains suggest that water flushing through the coarse voids of the sandy material may sweep down also clay particles in a not completely dispersed state. Thus, clay translocation might take place also outside the typical pH range.

Keywords: soil chronosequence, pedogenesis, Podzols, Norway, micromorphology, clay migration, podzolisation, silt cappings

P2 – Pedogenesis in Extreme Environments

Convener : Muhsin Eren

Thursday 20 October 2016

P2 – 500
Soil formation, carbon exchange, and soil metabolite profiles along a vegetation gradient at King George Island, Maritime Antarctica
Olga Shibistova-Hannover, Germany

P2 – 559
Paleocrygenic stages of extreme pedogenesis in the geological history of the Earth
Alexander Makeev-Moscow, Russia

P2 – 972
Physical and Chemical Transformation of the Quartz Grains Surfaces in Endogleic Fluvisol from Żuławy (Poland)
Józef Chojnicki-Warsaw, Poland

Soil formation, carbon exchange, and soil metabolite profiles along a vegetation gradient at King George Island, Maritime Antarctica

Olga Shibistova[1], Vladimir Ossipov[3], Mauricio Aguirre Morales[4], Diana Boy[1], Robert Mikutta[5], Roberto Godoy[6], Jens Boy[1], Georg Guggenberger[1], Olga Shibistova[2]
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Objective of the Study
Glacier retreat chronosequences define sites that represent an increasing level of trophic complexity as a result of vegetation development. Our goal was to quantify soil carbon stocks and exchange with the atmosphere along a vegetation gradient, and to link this to the in vivo soil biological activity.

Material and Methods
We have chosen a rock outcrop of the Collins glacier, King Georg Island, representing a deglaciation chronosequence ranging from <200 to ~7200 yr B.P., with pronounced succession from algaea/cyanobacteria over lichens and mosses to the evolutionary younger vascular plant Deschampsia antarctica. Along this chronosequence, soils were described, soil organic carbon and total nitrogen stocks were determined, and net ecosystem exchange and soil CO2 efflux was measured. Soil metabolites were extracted by a chloroform/methanol/water mix and measured as TMS derivatives.

Results
Soil organic carbon stock increased from 0.2 kg m-2 at the bare soil to 3.6 kg m-2 under D. antarctica. An increasing photosynthetic activity from algae and cyanobacteria to D. antarctica is mirrored by increasing soil CO2 efflux rates along the chronosequence from 0.2 ± 0.1 to 2.8 ± 0.9 µmol m-2 s-1. Of 386 metabolites identified, multivariate statistics allowed selecting 57 metabolites as potential markers discriminating sites and soil horizons. Metabolite profiles of different soil horizons along the succession gradient revealed a prominent difference in the composition and relative content of plant and microbial metabolites. The contribution of vascular plants on the soil metabolome could be clearly determined.

Conclusion
Our study revealed that even under extreme environmental conditions vascular plants add

considerably to soil development, large soil carbon storage and a relatively high rate of CO2 efflux. Further, metabolomics showed to be promising to assess the biological activity of soil in vivo and to distinguish the contribution of plants and microorganisms to soil formation processes.

Keywords: Antarctica, autotrophs succession, carbon flux, metabolomics, soil chronosequence

Paleocrygenic stages of extreme pedogenesis in the geological history of the Earth

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Cryogenic soils (Cryosols and long season frozen soils) are formed in extreme environments, when pedogenesis is limited to a very short period with positive temperatures, and soil horizonation is influenced by cryogenic processes. The study of paleosols leads to the development of a new research area – paleocryogenic studies. Cold biospheres constitute about 4% of the geologic history of the Earth. Nevertheless plate tectonics and shifting of the poles result in extension of paleocryogenic soils in the geological record of all thermal belts of the Earth, including tropical. During cold biospheres the glaciers could occupy up to one third of the Earth terrain with periglacial zones even wider. Frost features in paleosols could be correlated with modern features and for this reason paleocryogenic soils are one of the most reliable indicators of cold environments. Frost features in soils helps to reconstruct the former land surface (especially when soil profile is truncated), position of permafrost table and the depth of seasonal freezing. So paleocryogenic soils are important for stratigraphy.
Frost features in soils appear at all morphological levels - at the level of the soil cover, on the macro-, meso, and micro- and sub-micro levels. Frost impact also influences chemical features of paleosols. Frost features may be syngenetic to pedogenesis. However quite often in paleosols a complex relationship is recorded between temperate pedogenic and frost features that may precede each other. So that frost features could affect temperate soils and temperate pedogenesis could be superimposed on frost features appeared in the preceding cold period.
Paleocryogenic soils are currently recorded starting from Paleo-proterozoic. They are extensively spread in the Quaternary glacial and periglacial sediments and could often influence surface soils of the Upper Pleistocene glacial and periglacial areas.

Keywords: extreme pedogenesis, paleosols, paleocryogenic soils, geological history, frost features

Physical and Chemical Transformation of the Quartz Grains Surfaces in Endogleic Fluvisol from Żuławy (Poland)

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The purpose of the research was the determination of quantitative and qualitative physical and chemical transformations on the surface of quartz grains (0.5 – 0.25 mm in diameter) in cultivated Endogleic Fluvisols (classified according to the WRB). The study soil is developed from alluvial sediments, has a silt loam texture, and is located in the Żuławy area – the Vistula River delta.
The research was conducted using Bull's method (1978) with employment of a scanning electron microscope (SEM), and qualitative – quantitative microchemical analysis of the chemical composition of the quartz grains surfaces using an energy dispersive spectrometry (EDS) microprobe. Field work and basic analysis of the soils were elaborated using methods commonly applied in soil science laboratories.
In comparison to physical transformations, more intense and differentiated chemical transformations were observed on the quartz grains surfaces in all diagnostic – genetic horizons of the soil. In the humus horizon, the processes of chemical transformation on the quartz grains surfaces, such as etching and corrosion understood as "destruction" processes quantitatively predominate over incrustation and encrustation considered as "accumulation" processes. In deeper horizons, incrustation and encrustation quantitatively predominate over etching and corrosion.
Microchemical analysis of the chemical composition has indicated the highest contents of aluminum, iron, magnesium, and potassium on the quartz grains surfaces. The smallest contents of iron and manganese in the oxidation-reduction (Gor) horizon, despite the distinct accumulation of free and amorphous forms of these elements, could be caused by the gleying soil-forming process. Probably in the Gor horizon, iron and manganese forms were accumulated mainly in concretions, but not in the incrustations and encrustations covering the quartz grains surfaces.

Keywords: ultractructure, quartz, grains, surface, endogleic, fluvisols, SEM

R – Constraints and New Challenges for Recovery of Degraded Soils under Arid and Semiarid Conditions

Convener : Mehmet Ali Çullu
Co Convener : Sabit Erşahin

Thursday 20 October 2016

R – 103
What soil properties influence the stability of intensively cultivated sandy loam topsoil?
Abbas Hameed Almajmaie-Hobart, Australia

R – 104
Differences in aggregate stability due to different methods and mechanisms of aggregate breakdown
Abbas Hameed Almajmaie-Hobart, Australia

R – 183
The effect of sodicity on the reversibility of hydraulic conductivity in non saline condition
Louadj Yacine-Setif, Algeria

R – 712
Land degredation neutrality- turkish experience
Sevilay Ozcelik Sonmez-Ankara, Türkiye

R – 765
Role of gibberellic acid and glycinebetaine in alleviating salinity stress in mungbean
Ghulam Hassan Abbasi-Bahawalpur, Pakistan

What soil properties influence the stability of intensively cultivated sandy loam topsoil?

Abbas Hameed Almajmaie[1], Marcus Hardie[1], Colin Birch[2], Tina Acuna[1]
[1]school of land and food, university of Tasmania
[2]Agricultural and food Sciences, university of Queensland

Intensive cultivation, spraying, irrigation and fertilizer application associated with packet lettuce production has led to the degradation of topsoils in Tasmania, Australia. This paper explores the influence of soil chemical, physical and mineralogical properties on the stability of intensively cultivated sandy loam top soils. Soil aggregates were collected from a depth of 0-5 cm from 20 sites. The stability of 2 – 4.75 mm aggregates was determined by rainfall simulation (RS) and wet sieving (WS) at both air dried moisture content (40 Co for 24 hours) and field capacity (-10 kPa). Clay dispersion was measured by mechanical dispersion. Soil attributes including exchangeable cation ratios, pH, soluble cations, Fe, Al, mineralogy and particle size were determined by commercial analytical laboratories. Results were explored using Spearman correlation (SC), linear regression (LR) and regression tree (RT) analysis. The effect of soil attributes on aggregate stability varied between analytical and statistical procedures. Aggregate stability by RS was highly correlated with exchangeable Ca++ and exchangeable CEC. Exchangeable potassium percentage (EPP) and exchangeable cation ratio (ECR) were indicated by SC to be correlated with RS. Aggregate stability by WS was consistently correlated with quartz % and organic carbon. Wet sieving also indicated that EPP and mono valiant cation adsorption ratio (MCAR) were related to aggregate stability. Clay dispersion was consistently correlated with quartz % and soil pH. Unexpectedly, aggregate stability by RS was not significantly related to organic carbon determined by wet oxidation or hot and cold water extractable carbon. However, aggregate stability by WS was related to organic carbon determined by wet oxidation. Similarity, aggregate stability determined by RS and WS was not significantly related to exchangeable sodium percentage (ESP) and sodium adsorption ratio (SAR). Limited confidence that aggregate stability can be improved as aggregate breakdown was highly related to inherent soil properties

Keywords: aggregate stability, exchangeable cations, organic carbon, ESP, inherent soil properties, cation ratios

Differences in aggregate stability due to different methods and mechanisms of aggregate breakdown

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Aggregate stability is routinely used to assess soil health and resilience to structural decline and crusting. However, measurement of aggregate stability is highly variable as it relies on subjective procedure and thresholds, which are difficult to relate to processes of aggregate breakdown in the field. This paper investigated the influence of methodology on measured values of aggregate stability and the mechanisms responsible for aggregate breakdown of a range of intensively cultivated sandy loam soils in Tasmania, Australia. Aggregate stability was measured by rainfall simulation (RS), wet sieving (WS), ultrasonic vibration (UV) and clay dispersion (CD) on the 2-0 – 4.75 mm size fraction of aggregates. Aggregates were pre –treated to be at either air dry moisture content (40 Co for 24 h) or field capacity (-10 kPa). The influence of different mechanisms on aggregate breakdown was investigated by wetting aggregates with irrigation water, 0.2 M CaCl2, sodium heximetaphosphate (50g/l) and kerosene. The correlation between aggregate stability approaches was unexpectedly poor ranging from 0.307* between RS and UV for aggregates at field capacity to 0.749** between RS and WS at air dried aggregates, whilst no correlation existed between RS and WS for aggregates at field capacity. The poor correlation between methods demonstrates that the procedures mimicked different mechanisms of aggregate breakdown. Comparison among procedures indicated breakdown of aggregates at air dried moisture content principally resulted from slaking by clay swelling, followed by physico-chemical dispersion and then raindrop impact. Slaking by air compression had the least effect on aggregate stability. Results indicate that using different apparatus, fluids and initial moisture content enables the influence of different aggregate breakdown mechanisms to be ranked.

Keywords: aggregate stability, clay dispersion, mechanisms, aggregate breakdown, soil crusting

The effect of sodicity on the reversibility of hydraulic conductivity in non saline condition

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The salinization of the soil often goes along with soil sodification in arid and semi arid region. This sodification of the soil produces a degradation of soil structure. The aim of this experimental research is to assess the effect of sodicity on the reversibility of hydraulic conductivity in non-saline condition (20 mmolec /L). The sodicity is characterized by increasing and decreasing increment (5, 15, 30).
The equilibrium between soil sample and different salt solution was attained after 4 to 16 pore volume. The result obtained has shown that increasing sodicity at different increments (+ 5, + 15 + 30) induce a significant reduction of saturated hydraulic conductivity. The decreasing of sodicity at different increments (- 5, - 15, - 30) don't produce a significant increase in saturated hydraulic conductivity. The mean pore radius is inversely proportional to the increase in sodicity of salts solutions. Finally, the saturated hydraulic conductivity is not reversible in our experimental condition.

Keywords: Saturated hydraulic conductivity, reversibility, Sodicity, pore volume, pore radius, soil structure degradation

Land degredation neutrality- Turkish experience

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Land degradation is a complex and dynamic process, besides that it is difficult to monitor and assess. With the awareness importance of land degradation issue, Sustainable Development Goal 15.3. aim to "by 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world". With the purpose of achieve land degradation neutral world, LDN project conducted by UNCCD secretariat in 2015, before COP 12 (12TH Session of the Conference of Parties to the United Nations Convention to Combat Desertification). Project has implemented by 15 countries also in Turkey. The project aims to monitor 3 parameters (changing of land use and land cover, trends in land productivity and situation of soil organic carbon stocks) for determine land degradation situation in the countries. Turkey was carried out in two adjacent micro catchments located at the Gediz Basin. Rapid demographic changes, urbanization, industrialization, tourism and inefficient agricultural implementations are the main causes of land degradation in Gediz Basin.
The purpose of the statement, giving information about Land Degradation Neutrality approach and sharing experiences and lessons learned of pilot area study. And also UNCCD's methodological approach of Land Degradation Neutrality and Turkey's critics and proposals about it.

Keywords: UNCCD, Desertification, Land Degradation Neutrality Parameters, Gediz Basin

Role of gibberellic acid and glycinebetaine in alleviating salinity stress in mungbean

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Salinity is the biggest environmental constrains which drastically declined the production of crops worldwide. In order to evaluate the ameliorative role of gibberellic acid (GA3) and glycinebetaine (GB) to diminish hazardous effects of salinity in mungbean, a hydroponic experiment was conducted with five treatments comprising of T1: control, T2: 100 mM NaCl, T3: 100 mM NaCl+5 µM GA3, T4: 100 mM NaCl +5 µM GB and T5: 100 mM NaCl+5 µM GA3+5 µM GB. Half strength Hoagland solution was used as nutrient source and harvesting was done after four week of stress. Results revealed that salt stress negatively affected the root length, shoot length, root fresh and dry weight, shoot fresh and dry weight, relative water content, membrane stability index, chlorophyll a, chlorophyll b and K+ concentration in root and shoot but reverse is true in case of Na+ concentration which was significantly enhanced both in root and shoot after salt stress. Application of GA3 and GB significantly alleviates the hazardous effect of salinity. However, the greatest values of these attributes were obtained when GA3 and GB was applied in combined form under saline environment. Present study results accomplishes that GA3 and GB application could be used as an ameliorative strategies to overcome the problem of salinity in mungbean crop.

Keywords: Mungbean, salinity stress, gibberellic acid, glycinebetaine

RAD – Radioactive Contamination in the Environment - Lessons From Nuclear Disasters

Convener : Oğuz Can Turgay
Co – Convener : Naoki Harada

Tuesday 18 October 2016

RAD – 792
Cesium-137 contamination in mulberry (Morus alba) after the Fukushima Daiichi Nuclear Power Plant (FDNPP) accident: Status and countermeasures
Naoki Harada-Niigata, Japan

RAD – 956
Nuclear Disasters, Usage of Domestic Radiation Sensors as an Early Cautions Systems and Determining the Safety Places after Disasters
Ercan Yilmaz-Bolu, Türkiye

RAD – 980
Radiocesium Concentrations in Forest Soils of Mount Ida in Turkey
Hidayet Karakurt-Kocaeli, Türkiye

Cesium-137 contamination in mulberry (*Morus alba*) after the Fukushima Daiichi Nuclear Power Plant (FDNPP) accident: Status and countermeasures

Naoki Harada[1], Yusuke Kowata[2], Masanori Nonaka[1]
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[2]Faculty of Agriculture, Niigata University

1. Objective of the Study
Mulberry (*Morus alba*) are sometimes utilized for human consumption as tea, cakes, jam, etc. After the Fukushima Daiichi Nuclear Power Plant (FDNPP) accident, radioactive cesium (rCs) over 100 Bq/kg-fresh weight was detected in mulberry leaves produced in some area in the Fukushima Prefecture. In this study, we investigated rCs distribution in mulberry trees and tried to reduce leaf rCs by replanting.
2. Material and Methods
1) Mulberry trees sampled in Towa district, Nihonmatsu City, in Fukushima Prefecture, were divided into leaves, branches, trunk and roots and Cs-137 activities were determined. 2) Twenty-five mulberry plantations in Towa district were grouped to those within 1 year after replanting (R1), those within 2 years after replanting (R2), and those grown before the FDNPP accident (R25). Leaf samples were collected at 10-30 cm apart from the end of a branch and Cs-137 activities were compared.
3. Results
1) Mulberry leaves near the end of a branch (0-30 cm) contained higher Cs-137 than the others. Trunk showed highest Cs-137 activity, while root Cs-137 concentration was relatively low. Autoradiographic studies revealed that radioactive substances were deposited onto bark. Leaf radioactive contamination could be due to translocation of Cs-137 from trunk. 2) The transfer factors (TFs) in R1, R2 and R25 ranged between 0.000-0.093, 0.000-0.041 and 0.002-0.067, respectively. R25 showed significantly higher TFs than R1 and R2 ($P<0.05$, Tukey method). Ammonium acetate-exchangeable K concentrations in soil more than 50 mg-K2O/100g-dw soil tended to reduce leaf TFs in R1 and R2, but not in R25.
4. Conclusion
Trunk surface of mulberry trees was contaminated with rCs from the FDNPP, which could be translocated to leaves. Replanting can be an effective option to reduce leaf rCs. Soil exchangeable K concentration is likely to affect mulberry leaf rCs.

Keywords: Distribution, Cesium-137, *Morus alba*, Replanting

Nuclear Disasters, Usage of Domestic Radiation Sensors as an Early Cautions Systems and Determining the Safety Places after Disasters

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Abant Izzet Baysal University Center for Nuclear Radiation Detectors Research and Applications

Due to technological development and energy consumptions. the use of radioactive materials in energy, health and safety practices is increasing. However it is even still a major problem to store or destroy the nuclear wastes. Carelessness or natural catastrophes on nuclear energy planet may cause fatal nuclear disasters such as, Chernobyl and Fukushima. The early cautions systems and the detection of radiation with suitable sensors may prevent and/or minimize possible radiation damage for human and environment. The rapid development of nuclear instruments and their wide use, have brought about many problems. However active electronic dosimeters will help a nation to prevent nuclear contraband in their country, and due to this preventive they may have a free radiation environment and also detect the escaped doses and protect the user from the harmful effects of radiation by tracking changes in exposure and keeping an ongoing record of the user's dose over time. Combined with access control systems, it is possible to limit total exposure to radiation and control access to radiological areas. The important characteristic of nuclear radiation sensors is their efficiency and probability of the registration of a particle upon entry into the effective volume of the detectors, so it reduces the problem of storage and destruction of the nuclear waste, and it is easy to manage due to their small size. The idea is that by encouraging countries to use an unique dosimetry protocol, together with an instrument whose calibration which is in line with national standards, dosimetry or the determination of radiation doses will be desirable. The national Nuclear Radiation Sensors (NürFETs) fabricated in Abant Izzet Baysal University Center for Nuclear Radiation Detectors Research and Applications can be actively used in above explained issues.

Keywords: Nuclear Disasters, Radiation Safety, Dosimeters, Detection of Irradiations

Radiocesium Concentrations in Forest Soils of Mount Ida in Turkey

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Mount Ida (Kazdağı) located between Balıkesir and Çanakkale in the northwestern part of Turkey. The region is considered as one of the most important historical, natural and touristic location. In 2010-2012, about 26 years after the Chernobyl accident comprehensive study was performed in forest sites of Mount Ida, Edremit in Turkey. The radioactivity concentrations 137Cs activity concentrations were determined by gamma-ray spectrometry in the forest soil layers (OL, OF + OH and A horizons) separately. Based on 341 surface soil samples from 118 soil profiles, activity concentrations of 137Cs in OL horizons varied between 0.25 ± 0.14 and 70 ± 1 Bq kg-1, while the ranges of 137Cs activity concentrations in OF + OH and A horizons were 13 ± 1 - 555 ± 3 Bq kg-1 and 2 ± 1 - 253 ± 2 Bq kg-1, respectively. Cesium-137 deposition in the study area was estimated to be in the range of 1 - 39 kBq m-2 and a linear relationship between the deposition of 137Cs and the elevation was observed. The distributions of 137Cs activities in OL, OF + OH and A horizons throughout the region were mapped in detail. The highest 137Cs activity concentrations were found in OF + OH horizons, with markedly lower 137Cs activity in mineral horizons of soil profiles. It is observed that 137Cs content of humus layer increases with the thickness of the humus layer for coniferous forest sites. The 137Cs activity concentrations were higher than the recommended screening limits (150 Bq kg-1) at some of the studied sites. The current activity concentration of top soil layers shows that over many years since the initial deposition, 137Cs activity still remains high in the organic horizons of the forest ecosystems' soils of Mount Ida.

Keywords: radioactivity, radiocesium, radioactive contamination, radioactive fallout, forest ecosystems, forest soils, humus layer, chernobyl disaster, Mount Ida, Kaz Dağı

S – Mineral-Organic Associations: Relevance for the Biogeochemical Cycling of Major and Trace Elements

Convener : Nazmi Oruç

S – 221
Phosphorus Sorption by Gyttja and Its Behaviors in Acidic Soils
Kadir Saltali-Kahramanmaras, Türkiye

S – 583
The Effect of Soil Organic Matter and Humic Acid to the Iodine Adsorption and Desorption in a Soil Formed on Calcareous Parent Material
Muhittin Onur Akça-Ankara, Türkiye

Phosphorus Sorption by Gyttja and Its Behaviors in Acidic Soils

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Tea and hazelnuts production are of a great importance in Black Sea Region having acidic soils in Turkey. Phosphorus (P) fertilizers which are used at soils with low pH are converted to unavailable forms for plants. It is thought that applying of P fertilizers sorbed to gyttja will reduce the sorption of P by Fe, Al and Mn compounds at acidic soils. Gyttja is a mixture containing the high amounts of organic matter (35-50%) and lime (30-40%), and its reserve was estimated 4.7 billion tones in Afsin-Elbistan Coal Basin in Turkey. The aims of this study were to determine the sorption capacity of P by gyttja, and behaviors of gyttja-P materials in acidic soil conditions. In this study, the batch assay method was used for sorption experiments. The optimum P sorption conditions (pH, temperature, adsorbent amount and shaking time) of gyttja were determined. According to optimum conditions, Langmuir, Freunlich and Dubinin-Redushkevich (D-R) coefficient were obtained at different P concentrations. The maximum P sorption capacity and the sorption tendency (chemical or physically) of gyttja were determined by using linear Langmuir and D-R isotherms, respectively. The maximum sorption capacity of the gyttja (qmax) was found as 1.58 mgg-1. Then, P adsorbed gyttja according to qmax value were used as an experiment material. The P sorbed gyttja and not sorbed gyttja were applied to acidic soil with nearly pH 5, and incubated. The incubation experiments were carried randomized blocks designs with five replications as pot experiments. The samples were taken at the different dates between 1 and 180 days and available phosphorus contents were determined at the samples. The obtained data from the present research give remarkable viewpoints about the sustainable P nutrition strategy in acidic soils.

Keywords: acidic soils, gyttja, sorption, phosphorus

The Effect of Soil Organic Matter and Humic Acid to the Iodine Adsorption and Desorption in a Soil Formed on Calcareous Parent Material

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Iodine is an important nutrient which is required for normal human and animal growth and development. It is a trace element which is taken from outside with water and nutrients. Due to human and animal health problems arisen from iodine, this element is intensively researched in our country and abroad. This study focuses on the behavior of iodine in the soil, which has an important effect on human health and which leads to goiter if deficient in the soil. In this study, the effect of soil organic matter and humic acid on the adsorption/desorption characteristics of iodine in a soil formed on calcareous parent material. Despite both isotherm models conformed reasonably the sorption data, Langmuir isotherm (R2=0, 9376) described better than Freundlich isotherm (R2=0, 7626). The Langmuir adsorption maximum of is found to be 19,80 mg kg-1. The Freundlich isotherm's parameters were found as n=0, 89 and Kf=2,1. When the organic matter of the soil was removed, a considerable increase in the the adsorption maximum was determined. The applications of humic acid decreased the adsorption parameters of iodine in both whole and organic matter–free soils. The desorption percentages were between 0-15.3% in the original soil and 0-0,65% organic matter-free soil. While the humic acid applications decreased the value of desorption in the original soil, it increased the desorption ratio upon organic matter removal. It can be concluded that either soil organic matter or humic acid can have significant role in adsorption and desorption of iodine in calcareous soils.

Keywords: Iodine, Iodine Deficiency, Adsorption, Desorption, Langmuir Equation, Freundlich Equation, Calcareous Parent Material, Organic Matter, Humic Acid

SCG – Soil Genesis

Convener : Selim Kapur
Co-Convener : Erhan Akça
S. Theocharoupulos

Tuesday 18 October 2016

SCG – 240
The evaluation of the Retisols morphology and chemical properties changes in the context of the agrogenic transformation in Lithuania
Rimantas Vaisvalavicius-Akademija, Kaunas dstr., Lithuania

The evaluation of the *Retisols* morphology and chemical properties changes in the context of the agrogenic transformation in Lithuania

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Objective of the Study: to determine the changes of morphological and chemical properties in Lithuanian agroecosystems Retisols caused by agrogenic transformation.
Study Material: the agrogenically transformed *(Dystric Glossic Retisol (Drainic))* and relatively natural *(Dystric Bathygleyic Retisol (Loamic))* Retisols.
Results: The pH values of agrogenically transformed Retisols are significantly higher as compared to the relatively natural Retisols and therefore the ratio of total aluminium to mobile aluminium is lower in their topsoil. The same patterns are characteristic for the range of total and mobile potassium in such soils. The topsoil of agrogenically transformed Retisols contain lower amounts of total nitrogen as determined by the intensity of nitrogen application and the biomass losses together with the agricultural production. The dynamics of the manganese and phosphorus concentrations is related to organic material distribution throughout the soil profile and soil moisture regime peculiarities. However, the accumulation of phosphorus is fixed only in BCr horizon of the relatively natural soils. The predominantly undrained relatively natural Retisols accumulate much higher amounts of mobile and total iron as compared to agrogenically transformed soil.
Conclusions: Significant increase of mobile potassium content in El horizon of agrogenically transformed Retisol has obviously an anthropogenic origin.
The ratio of total Al and Fe to mobile Al and Fe in the topsoil of agrogenically transformed Retisol was found close to 1:1 whereas in the relatively natural Retisol this proportion was 3:1 respectively.
The higher accumulation of organic matter mineralization products was observed in the topsoil of relatively natural Retisol which increases soil solution chemical activity and also makes soil morphological features much more visible.
Acknowledgements. Research findings have been obtained through the national project „The

influence of long-term contrasting intensity resources management on genesis of different soils and to other agro-ecosystems components" (SIT-9/2015) financed by the Research Council of Lithuania.

Keywords: Retisols, soil profile, agrogenic transformation, soil clasification, morphological features, chemical properties, mobile aluminium and iron

SF – Soil Fertility and Plant Nutrition

Convener : John Ryan
Co-Convener : Hayriye İbrikçi

Friday 21 October 2016

SF – 626
Nitrate distribution in the soils of irrigated agricultural land
Hayriye Ibrikci-Adana, Türkiye

SF – 961
Soil-plant-atmosphere transfer of organic and metal(oid) pollutants in an industrial and urban
area
Austruy Annabelle-Fos Sur Mer, France

SF – 451
Evaluation of maximum allowable concentration of Cd and Pb in phosphate fertilizers of Iran
and correcting the Risk Based Concentration formula
Mojgan Yeganeh-Karaj, Iran

SF – 973
Determination of Nitrogen Use Efficiency to Durum Wheat Parents and Their F2 progenies Under Different Nitrogen Conditions
Nihan Tazebay, Ferhat Kızılgeçi-Şırnak, Türkiye

SF – 827
The Effect of Silicon and Phosphorus in Acid Soil on Dry Matter and Phosphorus Nutrition of Oat
Ayhan Horuz-Samsun, Türkiye

Nitrate distribution in the soils of irrigated agricultural land

Hayriye Ibrikci[1], Mahmut Cetin[2], Hande Sagir[1], Mert Ucan[2], Manfret Fink[3], Matjaz Glavan[4], Suha Berberoglu[5], Takanori Nagano[6], Jumpei Kubota[7], Ebru Karnez[8], Marina Pintar[4], Said Golpinar[2], John Ryan[9]
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Nitrogen (N) is one of the major plant nutrients, excessively used in crop production, mainly as inorganic fertilizers. Fertilizer N is either taken up by the plant or lost by leaching, volatilization and immobilization; considerable amount is also subject to remain in soil in the forms of nitrate (NO3) and ammonium (NH4). The research was carried out in a 9495 ha irrigated Akarsu Irrigation District, representative soil samples were collected from 107 points of the research area, and analyzed for nitrate concentrations in different depths. Nitrate concentrations were the highest in the surface horizons and decreased by the depth. Over 50% of the whole area had at least 70 mg NO3 kg-1 in the surface horizon. The data from 2011 to 2014 showed that nitrate leaching to the bottom horizons is also possible even though soil texture is clay. Nitrate concentration in the surface varied regardless of the soil type, but influenced by the fertilizer practices. Monitoring of soil nitrate within any irrigation system is important for the economical and environmental concerns.

Keywords: soil depth, mineral nitrogen, nitrate concentration, irrigated land

Soil-plant-atmosphere transfer of organic and metal(oid) pollutants in an industrial and urban area

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This research project aims to characterize the quality of soil and vegetable in order to evaluate the potential environmental and health risks associated with vegetable gardening in urbanized and industrialized areas. The study area is located in region of Bouches-du-Rhône (France), on a territory grouping 6 cities and presenting a strong industrial character with Fos-sur-Mer industrial zone (ZIP). Several objectives are aimed, (i) to measure the exposition of different cities of study area regarding organic (dioxins/furans, PCBs, PAHs) and metal(oid) pollutants (As, Cd, Co, Cr, Cu, Ni, Pb, Sb, V, Zn), (ii) to determine the influence of vegetable type in bioaccumulation and (iii) to evaluate the pollutant transfer pathway.
PAHs, undetected in the salad leaves, are present in soils with relatively high concentrations following a decreasing gradient according to the distance to the ZIP. Soil metal(oid) concentrations show no significant correlation with distance from the ZIP. However, some metals (Cd, Cu, Pb, Zn) have enrichment factors higher than 2 in soils indicating surface anthropogenic inputs. These anthropogenic inputs can have several causes, firstly, the traffic and industrial emissions of ZIP (this is the case of Pb, Zn and Cd) and secondly, the use of phytosanitary treatments (notably for Cu). These results measured in soil have repercussions in plant tissue with, according to their exposure, preferential accumulation in roots (As, Cd, Co, Cr, Sb, V, Zn) or in leafs (Pb, Cu, Ni). Otherwise, PCCD/F, PCBs and metal(loid)s were measured in all salads cultivated on the territory with a concentration gradient observed between the different cities depending on the distance to ZIP. This study showed that the bioaccumulation and storage capacity of metal(oid)s vary according to the plant vegetable. Finally, metal(oid)s vegetable concentrations do not exceed the regulatory limits for the consumption and the daily intakes present no risk for human health.

Keywords: metals and metalloids, organic pollutants, plant uptake, bioaccumulation, health risks

Evaluation of maximum allowable concentration of Cd and Pb in phosphate fertilizers of Iran and correcting the Risk Based Concentration formula

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Soil and Water Research Institute (SWRI)

Objective of the study: Evaluation of standards for some toxic metals in common phosphate fertilizers used in cultivating wheat and rice, as two keys crops, in Iran using risk based concentrations.
Materials-Methods: 30 soil samples (0-30 cm) were collected from 9 provinces of Iran. Cd and Pb Isotherm experiments were done using different concentrations of Cd nitrate and Pb nitrate solutionns, respectively. For assessing the risk raised from using chemical fertilizers in wheat and rice fields, we considered this pathway only:
chemical fertilizer ___soil____plant____human
soil_____human
For calculating the risk arising from chemical fertilizers, we used USEPA formula for calculating RBCs:
RBC= THI/(SACF*
{AR*1/FON*[((ED*EF*IRs*CF)/(BW*AT)*TOX)+((ED*EF*SA*AF*ABS)/(BW*AT)*TOX)+((ED*EF*IRc*RAFc)/AT*PUF*TOX)] })
Local data was used.
Results: Unit RBCs were calculated for all provinces and two receptor groups: children and adults and for wheat and rice. The least values were 1.54 and 23.47 mg/kg for Cd and Pb respectively. These unit values were adjusted to common fertilizers by multiplying unit RBCs in nutrient fraction of fertilizers.
Previous research showed that the share of chemical fertilizers in Cd and Pb accumulation in soil is 37% and 1.7% respectively. Then in this research it is suggested that THR in the formula should be changed to 0.37 and 0.017 for Cd and Pb respectively.

Cd RBCs (mg/kg) calculated by EPA formulas for simple superphosphate, triple superphosphate, monoammonium phosphate, diammoniumphosphate were24.64, 70.84, 80.08, 70.84 respectively and for Pb were: 375.52, 1079.52, 1220.44, 1079.62 respectively. these standards for the same fertilizers by our suggesting formulas were: 9.12, 26.21, 29.63, 26.21 for cadmium, respectively and for Pb were: 6.38, 18.35, 20.75, 18.35 respectively.
Conclusion: this research suggested values as standards in fertilizers seem more reasonable. Because in Iran chemical fertilizers have a small share in these metals accumulation in soils.

Keywords: chemical fertilizers, human health, risk based concentrations, standards, Cd, Pb

Determination of Nitrogen Use Efficiency to Durum Wheat Parents and Their F2 progenies Under Different Nitrogen Conditions

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To obtain high yield from N fertilization in wheat has an important place. However, a high amount of nitrogen because it is easily washed from the soil element in terms of the implementation of the environment causing negative impacts. The objective of the study was to evaluate nitrogen use efficiency of 6x6 half diallel durum wheat (Triticum Turgidum L.) F2 progenies and their parental lines at N0 (zero N fertilizer), N1 (120 kg N ha-1) and N2 (240 kg N ha-1) N levels. Significant differences were found among genotypes and nitrogen applications for grain nitrogen yield (GNY), N use efficiency for grain yield (NUEgy) and N use efficiency for grain N yield (NUEgn).The increase of nitrogen doses decreased N use efficiency (NUE) significantly. At the level N1, among parents Mersiniye genotype showed high values for GNY,NUEgy and NUEgn. Among hybrid combinations was found important. MersinixSpagetti' 'MısırıxLevante' for NUEgy (at the level N0 and N1, respectively) To ensure increase nitrogen use efficiency, in low nitrogen conditions would be more appropriate to select promising lines by crossing of high nitrogen use efficiency parents

Keywords: Diallel, Durum wheat, Nitrogen use efficiency, Grain nitrogen yield

The Effect of Silicon and Phosphorus in Acid Soil on Dry Matter and Phosphorus Nutrition of Oat

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In this study, the effects of silicon (Si) and phosphorus (P) to oat plant (Avena sativa L.) grown in acid soil on dry matter (DM), P content and uptake were investigated. For this purpose, the doses of 0, 10, 25, 50, 100 and 250 ppm P and 0, 50, 100, 200 and 400 ppm Si were applied to the pots including 2 kg oven-dry soil. The experiment was carried out in a randomized factorial design with 6 (phosphor) x 5 (silicon) dosses and 3 replicates under greenhouse conditions.
Increasing doses of the phosphor increased DM of oat plant significantly (P<0,05) compared to the control. The highest DM was obtained at P-100 and Si-400 dosage (13,58 g), while the minimum dry material was obtained at P-0 and Si-0 dosage (3,20 g). Phosphor application increased the DM of oat up to P-100 dosage and it decreased in P-250 dosage due to toxicity. Silicon increased DM significantly (P<0,05) in all the Si dosages, except for the control (P-0). These increments were found statistically significant with 50 ppm Si application to soil at 10, 25 and 50 ppm P levels, 100 ppm Si application at 100 ppm P level and 200 ppm Si application at 250 ppm P level (P<0.05).

The percentage changes in dry matter according to the control in the 0, 10, 25, 50, 100, 250 mg kg-1 doses of phosphorus increased with increasing silicon rates of 35,63%, 48,41%, 22,95%, 5,63%, 27,99 and 52,34%, respectively. It was found that higher increments were generally obtained in 400 mg kg-1 silicon doses. Silicon fertilization increased P contents except P-250 dose. Dry matter of the oat plant had positive relationships with P content and uptake. Therefore, applying silicon fertilizer to the oat plant grown in acid soil may be decrease lack of P deficiency and its toxicity.

Keywords: Oat, Acid soil, Dry matter, Phosphorus content, Silicon fertilizer

SG – Soil Governance: Best Practices Of Land Consolidation And Field Development Services Soil Legacy Data

Convener : Emrah Hakkı Erdoğan

Thursday 20 October 2016

SG – 662
Soil Cultivation Methods in Arid and Semi-Arid Areas in Turkey
Evren Çetin-Ankara, Türkiye

SG – 456
Study and monitoring of soil quality changes in land consolidation project of paddy fields of
Mazandaran, IRAN
Ali Cherati Araei-Karaj, Iran

SG – 110
An Evaluation Of Strawbery Production In Terms Of Plant Nutrition And Farmer Applications:
Evidences From Gediz River Basin, Turkey
Seda Erdoğan Bayram-Izmir, Türkiye

Soil Cultivation Methods in Arid and Semi-Arid Areas in Turkey

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Turkey is very sensitive for erosion based on its geographic position, climate, topography, geological structure, and soil conditions. As known, the average annual rain in arid regions under 300 mm, in semi-arid regions between 300 – 600 mm, and in humid regions over 600 mm. According to this definition; Approximately 65% of the country's area is defined as arid and semi-arid regions. The main purpose of the soil cultivation is to increase available water content for plants during the dry periods by increasing infiltration rate of rain and snow water deep into the soil, and prevent evaporation in arid seasons. It is neccessary to deep soil cultivation in order to help water infiltration. In the dry summer periods, soil should take care of with hoe for avoiding the soil cracks and water loss from those cracks. Those cultivation methods in arid and semi-arid areas are depend on bedrock material, soil properties, and land slope. In order to decide proper soil cultivation method in arid areas of Turkey's, climatic properties, habitat, soil depth, water-holding capacity, and bedrock and materials should be known very well. In recent years, tillage method used in afforestation and erosion control activities in Turkey processed by machine method since it began to be made mandatory deep soil cultivation. Crawler tractor, mini excavator, and spider excavator are the most common machines that are using for upper and lower soil cultivation and building gradoni terraces. Some other methods like cage-Geonet fence terrace, stone cord, diversion channels, and laying down geosynthetic materials need labor cost. In addition to these methods, building gabions, dry wall threshold, wooden threshold, and laying down mesh wire are commonly used for gully rehabilitation.

Keywords: soil cultivation, water conservation, arid areas, semi-arid areas

Study and monitoring of soil quality changes in land consolidation project of paddy fields of Mazandaran, IRAN

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This study was carried out in a paddy field consolidation project to investigate and monitoring of soil quality changes. Soil quality characteristics were evaluated pre and after the operation of consolidation project in two large plots: plot 1 (soil displacement rate of low to moderate degree) and plot 2 (soil displacement rate in a high degree). A network of 10 m ×10 m was created. Before and after land leveling and the alignment of the plots, within each network, 5 soil sub-samples in depth of 0-20 cm was prepared. After mixing of sub-samples, a composite soil sample prepared and then physico-chemical characteristics of soil samples was measured.
Results showed that the qualitative characteristics of the soil was slightly affected by land leveling operations. As a result of land leveling operations, phosphorus and potassium in plot 1 significantly increased, while the impact on the amount of phosphorus and potassium in plot 2 was not significant. The amount of soil organic matter in both plots significantly increased, as a result of land leveling operations. Soil test levels of micronutrients such as iron, manganese, zinc and copper in both plots of land leveling operations were not affected. By performing land leveling in both plots, the amount of EC reduced but pH increased. The low impact of land leveling on soil quality characteristics can be attributed to relatively large thickness of the surface layer of soil, slight topography and partially soil displacement rate in land leveling operations. The long history of tillage increases soil layer thickness and, consequently, a uniform distribution of soil qualitative characteristics in this study. As well as the long history of tillage increased paddy fields plow layer thickness where this research was conducted. This issue also reduced the impact of land leveling operations on the soil physico-chemical parameters.

Keywords: Land consolidation, Soil quality, Land leveling, Monitoring

An Evaluation Of Strawbery Production In Terms Of Plant Nutrition And Farmer Applications: Evidences From Gediz River Basin, Turkey

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Emiralem located in Gediz river basin which is having a significant agricultural potential is a county familiar with strawberry production. The fact that production style in the basis of yield associated with careless fertilizer use gave rise to soil, water and air pollution has become a threat to the environment. This study aims at describing the current circumstances on probable jeopardies toward human health and environmental pollution and examines the producer behaviors in order to increase the production potential of the region. For this purpose a survey of 67 producers covering 150 structured questions was carried out in the area. The data was analyzed via some descriptive statistical analysis techniques and particularly Analytical Hierarchy Process. The analysis depicted that the producers were seeking both quality and quantity during the strawberry production. It is also deduced that the farmers should be trained for sensitive production applications to environment via extension services.

Keywords: strawberry, fertilization practices, producer behaviors, producer pool

ST1 – Soil and Terroir

Convener : Edoardo A.C. Costantini
Co Convener : Peter Strauss

Thursday 20 October 2016

ST1 – 259
Mapping the "terroir effect" over the years by means of the combined use of three proximal
sensors
Edoardo A. C. Costantini-Firenze, Italy

ST1 – 898
Determination Of Microbilogy Activity An Other Soil Properties According To Different Soil
Depths In Ordu
Funda Irmak Yilmaz-ORDU, Türkiye

ST1 – 324
Terroir zoning in Tokaj- a Wine Region of Hungary
Zsofia Bakacsi-Budapest, Hungary

ST1 – 991
Soil Organic Carbon Status of Some Southern Mediterranean Vineyards of Turkey
Semih Tangolar - Adana, Türkiye

Mapping the "terroir effect" over the years by means of the combined use of three proximal sensors

Simone Priori[1], Giuseppe Valboa[1], Sergio Pellegrini[1], Marco Leprini[2], Rita Perria[2], Paolo Storchi[2], Edoardo A. C. Costantini[1]
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The "terroir effect" varies over the years as a consequence of the interaction between soil characteristics and climate of the millesime. Proximal soil sensing methods represent fast and non-invasive methods to obtain high-detail maps of soil variability. The work was aimed at testing the use of tree proximal sensors to obtain homogeneous zones (HZs) for separate grape harvest and wine-making.
The study vineyards had same cultivar (Sangiovese), vine rootstock (420A), and management. Data from a gamma-ray spectrometer, a georesistivimeter, and an EMI sensor were interpolated by ordinary kriging. The delineation of two HZs was carried out by k-means clustering of: i) Total counts of gamma-ray emitted from the soil (TC), ii) Electrical conductivity at about 0-30 cm depth (EC0), iii) Electrical conductivity at about 0-75 and 0-150 cm (EC1 and EC2). The quality of the wine produced in each HZ was tested for three consecutive years. The grapes from the two HZs were separately harvested and vinified to test the differences in the wine features and quality.
The data from proximal sensors resulted statistically correlated. TC and EC0 maps provided information about topsoil; data were highly correlated, but not completely identical. On the other hand, EC1 and EC2 maps were almost identical. Leaf water potential and grape yield (plant yield, bunch weight, and berry weight) did not show statistical differences between HZs in neither vintage. The sugar content produced in HZ1 was lower than in HZ2 in 2012-13, whereas it was similar in 2014. At the end of the alcoholic fermentation, total acidity in HZ1 compared to HZ2 was lower in 2012, but higher in 2013 and 2014. Wine polyphenol contents were much lower in HZ1 during 2012-13 and similar in 2014. The study demonstrates that dry and warm summers magnify the "terroir effect", whereas humid summers reduce wine differences.

Keywords: Wine, terroir, gamma-ray, georesistivimeter, EMI, sensor, Chianti, Italy

Determination Of Microbilogy Activity An Other Soil Properties According To Different Soil Depths In Ordu

Funda Irmak Yilmaz
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In this study, biological characteristics and their relationships with soil physico-chemical properties and nutrient contents were investigated in kiwifruit orchards which were in Ordu, Turkey. The 25 soil samples were collected from kiwifruit orchards. Samples were taken from 0-30 cm and 30-60 cm in depth.As a result, soil physico-chemical properties and nutrient contents showed significant correlation with soil biological characteristics such as dehydrogenase activity,alkali phosphatase activity, aryl sulfatase, CO2-production, and microbial biomass.

Keywords: Kiwifruit orchard soils, soil enzyme activity, microbial biomass, soil respiration, soil depth

Terroir zoning in Tokaj- a Wine Region of Hungary

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[3]Károly Robert College, Research Institute of Remote Sensing and Rural Development

Tokaj Wine Region is situated in northwestern Hungary and has been known as a significant production area of the „Aszú" sweet botritized dessert wine since the Middle Ages. Its reputation was established by the geological and corresponding pedological construction, the particular microclimate and the unique mold-infection which coupled with the long-term cultivation experiences.
Tokaj region consists of 27 villages, the total producing vineyard surface area is 5,500 hectares, and the total vineyard land exceeds 11,000 hectares. In 2013 the Hungarian Government has decided to elaborate a sustainable quality wine production in the Tokaj region coordinated by the Tokaj Kereskedoház Ltd, the biggest wine producer. To achieve the target it is indispensable to assess the vineyard land potential. The viticultural characterization of the land was carried out based on two main surveying phases (2013-2015), for a pilot in the first phase and for the whole wine region in the second one.
The primary objective of our work was the execution of an appropriate terroir zoning, considering the main environmental factors (geology, geomorphology and soil) by digital terroir mapping. As a start-up we adapted an evaluation methodology applied in French wine regions. The implementation was however carried out totally in spatial, digital environment. Four main sources of information have been used (i) airborne laser scanning, (ii) hyperspectral imaginary, (iii) digital soil maps compiled based on detailed soil survey and (iv) interpolated climatic data. Based on them pedoclimate, mesoclimate and soil water reservoir were spatially predicted.
Finally the plant available water content, the vigorpotential and „earliness" potential was calculated. Based on these three maps the optimal target of production (dessert wine, dry wine, sparkling wine) could be determined and the information could provide a basis for decisions made both prior to planting and during production.

Keywords: Tokaj wine region, digital terroir mapping, soil survey, viticultural potential

Soil Organic Carbon Status of Some Southern Mediterranean Vineyards of Turkey

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Turkey is among the first five of grape producing country. Vineyards are spread to several parts of the country with varying climate and soil types. The common landscape for vineyards can be defined as moderate to shallow soils with pH over 7.5 along with limiting nutrients particularly zinc that are overlain to moderate sloping topography. Except humid Black Sea and sub-humid Marmara region, soil organic carbon content through the country is below 2%. Southern Mediterranean is not the exception. And this figure is lower in vineyards because farmers in general focused on high production via applying excess chemical fertilizers and neglect soil physical and chemical quality components. Thus urgent precautions should be taken for maintaining soils productivity. The ReSolVe project, funded by Coordination of European Transnational Research in Organic Food and Farming System, seeks sustainable vineyard management methods by applying various carbon sources to soils for reaching the above said aim ie enhancing soil organic carbon. The experiment sites in Turkey are located on moderately sloping lands in Tarsus and Ceyhan towns. Both sites soils are effected from land degradation due to improper tillage and unbalanced nutrient management. The initial soil analysis revealed low organic carbon (<2%) with high lime content. Vetch, dry mulching and compost with control were applied in 2015 for evaluating the best management in the experiment sites. As we are in the second year of study, the results are not statistically significant. However, compost (animal manure and pruning mixture) revealed revealed slightly better results in terms of increasing soil organic matter.

Keywords: Soil organic carbon, vineyard, animal manure, compost, Tarsus, Ceyhan

TPAO – Turkey's oil joint stock companies
Convener : M. Kerem Kemerli

Friday 21 October 2016

TPAO
Technologies and used in the treatment of contaminated soils with hydrocarbons and application examples
Esra Tınmaz Köse, Türkiye

TPAO
Rehabilitation of hydrocarbon contaminated soil at TP applications
Naci Köse, Türkiye

Technologies Used In The Treatment of Hydrocarbon Contaminated Soils and Application Examples

Esra Tınmaz Köse, Ezgi Engin
Namık Kemal University, Çorlu Engineering Faculty, Department of Environmental Engineering, Çorlu/Tekirdağ/Türkiye

In parallel with rapid world population growth, increasing fuel demand causes an increase in oil and natural gas drilling activities and environmental pollution problems emaneting from wastes occured by these drilling activities. Hydrocarbon exploration researches involve the period starting use of geophysical methods until drilling an exploratory shaft in an attempt to determine existence of hydrocarbon resources. In this period contamination of land, air and water are in question. In contaminated lands it is possible that many contaminants like heavy metals, chlorinated compounds, total petroleum hydrocarbons (TPH), polycyclic aromatic hydrocarbons (PAH) are present.

There are methods named in-situ and ex-situ well accepted by international literature for the remedition of the hydrocarbon contaminated soils. Ex situ methods are the treatment applications of the contaminated soil on mobile or fixed facilities that are found off-site. The applications of this method can be summed up as follows: Soil washing, thermal treatment, bioremediation (pump and treat technology), chemical treatment, electrokinetic treatment, use of organic solvents or water based irrigating solution, metal extraction, solidification/stabilization, solid phase composting. As for in-situ methods applicable they are as follow: Soil vapor extraction, bioventing, bioremediation methods, vitrification, soil washing, solidification/stabilization, phytoremediation, thermal desorption, pump and treat method.

Within this study, treatment technologies in the context of hydrocarbon contaminated soils were investigated and application examples in the literature of our Country and World were presented.

Keywords: Contaminated soil, Hydrocarbon, Remediation, Treatment

Using risk based principles to prioritize intervention for legacy crude oil contaminated sites and determining data collection and remediation options appraisal requirements.

Richard Croft (Partner), Claire Illingworth Yurdakök (Senior Consultant) and Phil Crowcroft (Partner) - Environmental Resources Management Limited, UK

It is only relatively recently that the environmental liabilities associated with on-shore oil production have been considered at a high management level beyond the periodic need to respond to individual incidents. There are significant legacies of oil production wastes at a number of on-shore oil production fields around the world. Whether at the entry stage, with acquisition decisions to make, or at the operational or exit stages of a project lifecycle, an operator must have the basic information to assess and manage the financial liabilities and prioritize remedial intervention work related to impacts on soil, surface water and groundwater from contamination resulting from past operations.

One powerful way to approach an environmental liability assessment is to define an environmental baseline condition of the land within concession areas. Such a baseline condition survey will allow an operator to:

- define any incremental pollution caused by the operation of the field over its lifetime;
- articulate and manage the environmental liability exposure as it currently stands; and
- understand what is needed to be done, together with an outline cost, to restore the land to an acceptable condition in compliance with their permitting and operational licenses, likely regulatory requirements and in accordance with sustainable principles ultimately to facilitate an orderly exit from the license block.

All three of these objectives require data that represents the condition of soil, groundwater and surface water within the block and on its boundaries, but also very specific data related to risk assessment and remediation planning.

There is an understandable view often that there is little point cleaning up legacy issues part way through the operaitonal life of an asset, because there is a chance of recontamination. However understanding the risks posed by contamination at such assets allows the safe levels of contamination to be established and thus ongoing environmental management of assets can be focussed where it is needed, not spending effort cleaning up contamination which does not pose a risk whilst the oilfield is operational and access to it is restricted. Once an oilfield concesion is to be decommissioned, then assessment related to future land uses becomes relevent and different standards can be derived. This further evaluation of contamination related a change of use in the land can potentially be left till nearer the end of the assets life, although having the information earlier is always desireable if possible.

Without robust environmental data, decisions on liability exposure are compromised and it is not possible to undertake a comprehensive appraisal of whether remediation is necessary or if so, the most appropriate remediation options or the scale of the remedial works themselves.

This paper considers a systemized approach to understanding and managing environmental liabilities at on-shore oil and gas fields. Central to this approach is a methodical data collection process designed to build up the fact base on the Operators concession area, prioritize those sites for further more detailed data collection and optimize the effort of environmental sample collection and testing to provide the best understanding of the impacts, the level of risks posed and the basic information needed to allow an appraisal of truly viable and cost effective risk management and options for any remediation considered necessary.

TR – FitzPatrick's vision on soil: Terra Rossa (Red Mediterranean Soils)

Convener : Selim Kapur

Tuesday 18 Ekim 2016

TR – 891

Anthroscape: EA FitzPatrick and H. Eswaran's Holistic Landscape Approach for Mitigating Environmental Threats of the 21st Century

Selim Kapur & Erhan Akça – Adana, Turkey

Anthroscape: A Holistic Landscape Based Approach for Mitigating Environmental Threats of 21st Century

Selim Kapur[1], Franco Previtali[2], Claudio Zucca[3], Suha Berberoğlu[4], Erhan Akça[5]
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Centuries are remembered with human achievements alike the bronze age, the iron age of archaic and the 20th century as the age of innovation. However, the 21st century will be remembered as the age of extinction due to globally destructive land degradation and desertification, climate change and biodiversity loss. Humans shaped the environment in a sustainable way until the 18th century with few exceptions of salinity in Mesopotamia and the Indus Valley and the soil nutrient depletion of the Mayas. Other than arable lands even extreme landscapes in mountains and arid areas are converted to productive domains by water saving, cropping, animal husbandry via constructing terraces, water ways and other infrastructures. This arrangement leading to the development of human shaped landscapes is named as the 'anthroscapes' of today.
The 'Anthroscape' context includes the knowledge of present and ancient land use, topography, natural resources, biodiversity and climate of a region. Moreover, it concerns the balance between natural resource consumption and human needs. Turkey, is rich in anthroscapes due to its varying topographic and climatic conditions. While the Mediterranean anthroscapes, the semi-arid part of Turkey, focused on water saving and terrace farming since the Hittites, Romans and the Ottomans, the East Anatolian anthroscapes were meant for use as extensive rangelands due to the highly privileged environment in local plant species that secured fodder in the long winters since the Urartians, Romans and Ottomans. The opulence of various anthroscapes in Anatolia may be led to mitigate current global threats of climate change, land degradation and desertification and loss of biodiversity because of their high carbon sequestration potential, water saving capabilities and the conserved biodiversity zones. Anthroscapes reflect the human ability of challenging harsh conditions via their environmental friendly experiences accumulated since millennia.

Keywords: Anthroscape, Traditional Knowledge, Landscape, 21st Century

U – Carbon Management In Agriculture

Convener : Hakkı Emrah Erdoğan
Co-Convener : Erhan Akça

Thursday 20 October 2016

U – 562
Effect of anionic polyacrylamide on the retention of organic carbon in the soils treated with plant residues
Ali Akbar Safari Sinegani-Hamadan, Iran

U – 89
Dynamics of soil organic matter as affected by the period of organic farming
Reda Ragab Shahin-Cairo, Egypt

U – 924
Organic Carbon Contents of Turkish Soils and Changes in its Distribution as of Land Use
Mehmet Keçeci-Ankara, Türkiye

Effect of anionic polyacrylamide on the retention of organic carbon in the soils treated with plant residues

Ali Akbar Safari Sinegani, Sima Nourmohamadi Shafagh
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Increase in organic carbon input by adding organic fertilizers to the soil is used as a way to improve biological, physical and chemical properties of soil and carbon sequestration. Anionic polyacrylamide application as an organic soil conditioner alone or in combination with organic material can change soil quality. The objective of this study was to investigate the influence of some organic soil conditioners on carbon sequestration and retention of different forms of organic carbon in soil. Two heavy and light textured soils were sampled from the top 30-cm layer of two agricultural lands in Hamadan (northwestern Iran) which has a semi-arid climate. The samples were treated with alfalfa and wheat residues (d<2mm at a rate of 50g Kg-1 dry weight basis), and anionic polyacrylamide at the rates of 0, 0.1, 0.2 and 0.4 g kg-1 of soil. Samples were brought to field capacity, and were kept in the dark. Soils sampling was done at different interval times and the data were tested separately for each period. Total organic carbon, organic carbon (OC) in sand and clay + silt size fractions, OC in light and heavy fractions increased with the addition of plant residues (particularly wheat residue) to the soils. Polyacrylamide, in the heavy soil did not improve carbon sequestration. But in the light soil, caused improvements in carbon sequestration. Mean weighted diameter (MWD) of aggregates in the both soils increased significantly with the addition of plant residues, particularly wheat residue. In both the soils without plant residue, the application of polyacrylamide caused an increase in aggregates MWD. But, in the heavy soil treated with wheat and alfalfa straws, the application of polyacrylamide had significantly negative effects on aggregates MWD. However this bad effect on aggregates MWD was not found in the light soil treated with wheat and alfalfa straw.

Keywords: Carbon sequestration, Plant residue, Polyacrylamide, Soil aggregates

Dynamics of soil organic matter as affected by the period of organic farming

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Two commercial organic farms were chosen for the present work namely; Sicum located at Belbeis 20 Km northeast of Cairo city which represented sandy soils, and Faium one to represent alluvial soils located 100 km southwest of Cairo. Surface (0-20 cm) and subsurface (20-40 cm) soil samples were collected in both winter and summer season from the two farms; i.e. Sicum farm planted for 0, 12, 15, 18 and 23 yrs and Faium farm planted for 2, 4, 8 and 10 yrs.
The collected soil samples were subjected to the dry sieve analysis to determine and separate the dry aggregate size of < 0.25, 0.25-0.50, 0.50-1.00 and 1.00-2.00 mm diameter. The distributions of total organic carbon were studied in the whole soil and its aggregate fractions. The data showed that TOM significantly increased in both farms by increasing the period of organic farming especially in the surface samples of Sicum which had the longest period of organic farming. Total OM was concentrated in the finest aggregate fraction (<0.25 mm) in Sicum farm while it was in medium size fraction (0.25-0.50 mm) in Faium for both summer and winter seasons and it was also increased by increasing the period of organic farming.
The investigation of the humic and fulvic separates using infrared (IR) spectrophotometery, showed the dominance of carboxylic bands in fulvic especially in the subsurface soil samples which indicated its acidic function. Humic separates showed a relative increased in the intensity of aromatic bands as compared to fulvic separates with increasing the period of organic farming.

Keywords: Organic Farming, Farmin Period, SOM Distribution, Soil Organic Matter Management

Organic Carbon Contents of Turkish Soils and Changes in its Distribution as of Land Use

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Organic Carbon Map and Distribution of Turkish Soils were acquired within the scope of National Geospatial Soil Fertility and Soil Organic Information System Project which was jointly carried out by FAO and Soil Fertilizer and Water Resources Research Institute. Within the study, approximately 12.000 soil samples throughout the country were analyzed in the institute's laboratory in order to determine their organic carbon and fertility parameters. According to the acquired results, about 35,49% of Turkish Soils can be classified as very low, 43,48 % as low, 14,60 % as medium, 6,15 % as good and 0,28 % as high in terms of organic carbon content.

Keywords: Organic Carbon, land use, Turkey, Agriculture

UA – Use of Animal Residues as Organic Fertilizers and Amendments

Convener : Angel Faz
Co – Convener : M. Angeles Munoz
J.A. Acosta

Tuesday 18 October 2016

UA – 363
Effect of composted horse manure addition on nutrient retention and leaching from an organic and two mineral soils in Sweden
Mohammed Masud Parvage-Uppsala, Sweden

UA – 415
Changes in microbial activities during vermicomposting of anaerobically digested sewage sludge with hazelnut husk and cow manure by earthworm Eisenia foetida
Fevziye Şüheyda Türkay-Kırşehir, Türkiye

UA – 667
Improvements in Aggregate Stability of Recently Deposited Sediments Supplemented With Tea Waste and Farmyard Manure
Bülent Turgut-Artvin, Türkiye

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Determining the effect of tea waste and farmyard manure addition on plant productivity potential for sediment accumulated in Borcka dam reservoir area
Bülent Turgut-Artvin, Türkiye

UA – 725
Nutrient availability and organic matter content under different inorganic and organic fertilization strategies in 30-year field experiment
Gabriela Mühlbachová-Prague, Czech Republic

Effect of composted horse manure addition on nutrient retention and leaching from an organic and two mineral soils in Sweden

Mohammed Masud Parvage, Barbro Ulèn, Holger Kirchmann
Department of Soil and Environment, Swedish University of Agricultural Sciences (SLU), 75651 Uppsala, Sweden

1.Objective of the Study
This study dealt with the proper use of horse manure and bedding materials in agricultural fields. The specific objective was to test the effect of application rate of composted horse manure in different types of soil and estimate the retention capacity and leaching losses of phosphorus (P), nitrogen (N) and carbon (C).

2.Material and Methods
The investigation was carried-out using topsoil columns (20 cm long, 18.8 cm diameter) of two mineral and one organic agricultural soil amended with two levels of composted horse manure, 18 and 36 Mg ha-1. Following manure addition, soil columns were exposed to three consecutive simulated rainfall events, each lasting over 12 h in a two days cycle and with an intensity of 8 mm h- 1 (~100 mm per event). Leachate concentrations of nutrients of the amended and control soils were used to estimate potential retention capacity and leaching losses.

3.Results
Results showed that the background losses from the organic soil was several-fold higher than from the mineral soils. On applying composted manure, the leachate concentrations of P, N and C significantly increased for the mineral soils, but only at the high application rate. Unexpectedly, P, N and C concentrations in leachate from organic soil decreased after manure addition, indicating greater potential for retention than leaching. Also, the increased amounts of P, N and C lost from the mineral soils corresponded to less than 10% of the amount added via composted manure, indicating high potential for retention.

4.Conclusion
We concluded that composted horse manure can improve soil nutrient status, as potential nutrient retention was higher than leaching from manure-amended soils, and that information on background nutrient content in soil may be more important than data on nutrient load applied through amendments when assessing retention and/or leaching potential in manure-amended soil.

Keywords: , Cambisols, Carbon, Compost, Histosol, Nitrogen, Phosphorus, Soil fertility, Water quality

Changes in microbial activities during vermicomposting of anaerobically digested sewage sludge with hazelnut husk and cow manure by earthworm *Eisenia foetida*

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The aim of the present study was to investigate the ability of an epigeic earthworm Eisenia foetida to transform anaerobically digested sewage sludge (SS) amended with hazelnut husk (HH) and cow manure (CM) in different proportions under laboratory condition (in darkness, 25°C) at 90 day. Two approaches investigated in the study were: (1) to find the best medium for growth and reproduction of E.foetida in different feed mixtures, (2) to evaluate the effects of anaerobically digested sewage sludge on microbial activities such as basal respiration (BSR) and microbial biomass C (Cmic) during vermicomposting period. Number and biomass of earthworms, BSR and Cmic in feed mixtures and earthworms were periodically monitored. The results indicated that maximum earthworm biomass was attained in feed mixture of 20%SS + 40%CM + 40%HH while the earthworm number was highest in feed mixture of 30%SS + 35%CM + 35%HH during the vermicomposting period. During the vermicomposting period, it was determined significant ($P<0.001$) differences in microbiological properties in feed mixtures. Significant increase was determined in levels of BSR and Cmic at the 30th day of incubation whereas significant decrease was determined at the rest of the incubation period. Significant ($P<0.001$) differences were determined among all of the incubation periods of feed mixtures in terms of BSR and Cmic and the highest levels were determined in feed mixture of 30%SS+ 35%HM+35%CM. It's suggested that the numbers and biomass production rates of earthworms were significantly affected by the proportion of SS of their feed mixtures. Results indicated that SS mixed with HH and CM could be utilized as an efficient soil conditioner for sustainable land restoration practices, at low-input basis, after processed by E.foetida. The study also inferred that the application of SS-based vermicompost in the agricultural fields as a soil conditioner, wouldn't have any adverse effect.

Keywords: basal respiration, *Eisenia foetida*, microbial biomass C, organic wastes, sewage sludge, vermicomposting

Improvements in Aggregate Stability of Recently Deposited Sediments Supplemented With Tea Waste and Farmyard Manure

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Influence of organic matter amendments on soil aggregate stability is well known, but the corresponding changes in recently deposited fine sediment are not documented well. In this study, improvements in aggregate stability of recently deposited sediment (RDS) supplemented with farmyard manure (FYM) and tea waste (TW) was evaluated during 18-week incubation period under controlled conditions. FYM and TW were applied to RDS at different rates (%0, %2.5, %5, %7.5, %10, %12.5 and %15 w/w), and aggregate stability was determined at different times of incubation (2nd, 4th, 6th, 8th, 10th, 14th, and 18th weeks) using wet sieving analysis. The results showed that aggregate stability of RDS treated with TW was statistically significantly higher than these of samples treated with FYM. Aggregate stability increased with increasing rates of both FYM and TW. Aggregate stability reached the highest value at the end of second week in FYM treated samples, and declined within the following incubation period. However, in the samples treated with TW, aggregate stability reached the highest value at the end of eighth week. Since the results of this study were clearly indicated that tea waste and farmyard manure input significantly increased aggregate stability of RDS, it is suggested that TW and FYM could be used for structural stabilization of degraded soils.

Keywords: Organic matter, degradation, aggregation, controlled condition

Determining the effect of tea waste and farmyard manure addition on plant productivity potential for sediment accumulated in Borcka dam reservoir area

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Sediments as a result of the erosion process is one of the best examples that can be shown to degraded soils. In order to increase production potential and restoration of degraded soils, organic matter addition have been used in the recent years. This study was conducted to investigate changes on some chemical properties including organic matter content, total carbon, nitrogen and sulphur contents and pH after the tea waste and farmyard manure addition to the sediments in greenhouse condition. For this purpose, different amounts of tea waste and farmyard manure (0%, 2.5%, 5%, 7.5%, 10%, 12.5% and 15%) were added to sediment samples and left for incubation of 18 weeks. Statistical analyses showed that the organic matter application caused improvement in the examined properties of the sediments and this improvement tended to increase depending on application rates. The pH of the sediments were lower in tea waste application and it was found to have a tendency to decrease depending on application rates, while it was revealed that pH increased depending on application rate of farmyard manure.

Keywords: Farmyard manure, incubation, organic matter application, sediment, tea waste

Nutrient availability and organic matter content under different inorganic and organic fertilization strategies in 30-year field experiment

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Crop Research Institute

The long-term field experiments enable to determine the changes in availability of nutrients under different soil fertilization management strategies. The availability of nutrients (P, K, Mg, Ca, Mn, Cu, Zn) studied in 30-years field experiment changed in correspondence of the kind of organic (farmyard manure - FYM), inorganic fertilization and combination of inorganic and organic fertilization. In addition, the site and soil type played an important role in nutrient availability for crops and in organic carbon content. Two methods were used for determination of soil nutrients. The Mehlich 3 is most used method in the Czech Republic and serves also for agricultural soil testing in the Czech Republic. Using KVK-UF method, the exchangeable elements in soils are determined. The soil fertilization with nitrogen affected the nutrient uptake by crops and in consequence decreased concentrations of nutrients in soils, particularly if soils received only mineral fertilizers. In addition, readily available exchangeable nutrients decreased more under mineral nitrogen fertilization in comparison to potentially available nutrients determined by Mehlich 3. The organic fertilization (FYM) improved the nutrient contents in soils, organic carbon content and soil pH even in case of synergic mineral nitrogen fertilization. It suggests that crops due to higher yields under soil management using only mineral fertilizers were able to use easily available nutrients which were not sufficiently substituted form the potential soil reserve. In consequence, negative nutrient balance was due to high yields observed at more fertile site on treatments with mineral fertilization by nitrogen. Is showed the necessity of correct nutrient supply by other sources (organic fertilizers) in presence of nitrogen fertilization particularly on fertile soils with expected high crop yields. These problems did not appear when organic fertilizers were supplied.

Keywords: long-term field experiment, inorganic and organic fertilization, nutrients, exchangeable elements, Mehlich 3, organic carbon, balance

US1 – Urban Soils – What is the soil information we can provide for new trends of demands on environment and ecosystem services from European cities?

Convener : Wolfgang Burghardt

Friday 21 October 2016

US1 – 521
Impact of soil use on some basic soil quality parameters: example of effect of public bath, park, city forest and meadow on soil compaction and organic carbon storage
Wolfgang Burghardt-Essen, Germany

US1 – 226
Soil microbial component of megapolis, large and small cities (Russia)
Kristina Viktorovna Ivashchenko-Pushchino, Russia

Impact of soil use on some basic soil quality parameters: example of effect of public bath, park, city forest and meadow on soil compaction and organic carbon storage

Wolfgang Burghardt, Baumbach Julia
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The quote and quality of natural resources in urban areas depends on the great number of diverse types of land uses. Differences of soil performances will occur between and within local land use types by modification from soil preparation and the use itself. Part of soil performance will be the basic soil properties such as texture, bulk density, pH, carbonate, organic carbon and nitrogen content. They will be presented for soils of urban forest and meadow at the fringe, and lawn of public bath and park site in the city of Essen, Germany.
Samples were taken with cups to a depth of about 30 cm. Texture was investigated by hand proof, and skeleton content, pH, soil mass, water content, carbonate, organic carbon and nitrogen content in the laboratory.
The texture was for all soils loess loam. Public bath and park soils had some skeleton. Bulk density showed increased soil compaction in the row urban forest, meadow, public bath and park lawn from about 0.7 to 1.5 g cm-3 in the upper 0-10 cm, in the deeper layers from 1.0 to 1.6 g cm-3. Differences in intensity of use within the public bath and park did yield differences of compaction. There was a decrease of pH from neutral to strong acid in the row urban lawn, meadow and forest. The organic carbon (OC) and nitrogen (N) content and density had specific patterns for each type of land use. The stock of OC in 0-30 cm depth increased from about 5 to more than 10 kg m-2 in the row urban lawns, meadow, forests.
We can conclude that different types of urban land use provide a large number of deviations of soil properties from natural sites. Impacts on soil quality experiences natural soils as well as man modified soils.

Keywords: Urban soils, land use, urban forest, meadow, park, public bath, bulk density, carbon storage, nitrogen storage, basic soil properties

Soil microbial component of megapolis, large and small cities (Russia)

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Urban soils experience high anthropogenic pressure, depending on settlement size (megapolis, large and small cities). Soil microbial component is a sensitive to various disturbances, and provide a relevant indicator of soil quality. Our research was focused on soil microbial community functioning in Moscow region cities ranged by population. Research areas included recreational, residential and industrial functional zones of Moscow, three large and three small cites (up to 12111, 250 and 50 thousands population, respectively). Soil samples were selected randomly (upper 10 cm layer, totally 128). Soil microbial biomass carbon (C_{mic}, substrate-induced respiration method) and soil basal (microbial) respiration (BR, CO_2 rate) were measured. Soil organic carbon (C_{org}), nutrient elements (N, P, K) and heavy metals (Pb, Cd, Zn, Ni, Cu) contents, soil acidity (pH), and soil texture were analyzed. The ratios of BR / C_{mic} (qCO_2) and C_{mic} / C_{org} were calculated. The C_{mic} varied from 57 to 1055 µg C g^{-1} soil, BR was from 0.13 to 2.37 µg CO_2-C g^{-1} soil h^{-1}, qCO_2 and C_{mic} / C_{org} were from 0.64 to 6.26 µg CO_2-C mg^{-1} C_{mic} h^{-1} and from 0.27 to 1.95%, respectively. In megapolis and large cities the C_{mic} values were in average by 20-30% less than those in small cities. In megapolis the soil heavy metals content was higher (by 2 times) than those in small cities. In industrial zones the mean soil C_{mic} and BR were significantly low compared to recreational and residential (by 1.2-2.7 times). The C_{mic} / C_{org} and qCO_2 were not significantly differed for functional zones of all studied cities. We concluded a "deterioration" of soil microbial community functioning under increasing urbanization. We also calculated the soil microbial CO_2efflux of megapolis area was 16-25 times higher than anthropogenic (transportation) CO_2 emission.

Keywords: urban soil, functional zones, microbial biomass, microbial respiratio

V – Implications of Rizhosphere Effect on Soil Quality

Convener : Araceli Perez Sanz
Co-convener : Rocio Millan

Monday 17 October 2016

V – 703
Plant growth promoting bacteria enhance Helianthus tuberosus L. grown on metalcontaminated soils
Araceli Perez Sanz-London, United Kingdom

V – 963
Spatial Distribution and Community Structure of Heterotrophic Soil Protists in the Rice Rhizosphere
Rasit Asiloglu-Aichi, Japan

V – 903
Plant effect on Si concentration in soil solution and phytoavailable Si from various Si sources in soil
Catherine Keller-Aix En Provence, France

Plant growth promoting bacteria enhance *Helianthus tuberosus* L. grown on metal-contaminated soils

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Plant associated bacteria are known to possess biofertilizer characteristics that can be exploited in agricultural applications such as the production of biofuel crops on marginal land. The objective of this work is to evaluate if the inoculation of some beneficial cultivable bacterial strains that were isolated from *Brassica napus* (1) can enhance the biomass of *Helianthus tuberosus* L. (*Asteracea*) when this crop is grown in a metal contaminated soil, and (2) can affect soil characteristics. *H. tuberosus* is an herbaceous plant, highly competitive to extract nutrients from the soil. Its low production cost and increasing interest in bioethanol production at industrial scale, makes it of great interest to produce bioenergy in marginal areas. A sandy metal contaminated soil was collected from a experimental field site nearby a zinc smelter (Lommel, Belgium) to perform a pot experiment under controlled conditions. *H. tuberosus* plants were inoculated with 5 bacterial strains (*Arthrobacter* sp strain 222, *Pseudomonas* sp strain 228, *Pseudomonas* sp strain 256, *Pseudomonas* sp strain 262 and *Serratia* sp strain 246), individually and as consortium. The joint action of the consortium increased *H. tuberosus* biomass and enhanced Pb and Zn uptake in the roots. A different behaviour was observed when the strains were added individually or in combination. The increment of the antioxidant enzyme activity in the roots of plants inoculated with the consortium suggested a phytostimulatory bacterial effect on the root hair development of *H. tuberosus*. Moreover, a qualitative effect in some soil characteristics was observed, especially at the pH level, which increased in some cases and by consequence reduced metal and nutrient uptake. In conclusion, the inoculation of *H. tuberosus* with the consortium could be a promising tool to be used in soils contaminated soils with Cd, Pb and Zn, by increasing biomass production and metal extraction by the plant.

Keywords: High biomass crop, Jerusalem artichoke, root hair, consortium, nutrient status

Spatial Distribution and Community Structure of Heterotrophic Soil Protists in the Rice Rhizosphere

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Rice rhizosphere is a hot spot for microorganisms, in which heterotrophic protists are one of the main microeukaryotic groups. However, less is still known about spatial distribution and community structure of protists in the rice rhizosphere. Here, we made a “mini-rhizobox” experiment in order to explore the micro-scale distribution of protists in the rice rhizosphere at the early plant growth stage. A rice seedling was grown in an agar media that contains nutrient solution and a soil suspension taken from a paddy field. Heterotrophic protists grown in the microcosms were regularly observed under microscope and enumerated with a direct counting method. Different types of protists densely populated the roots and surrounding area with an expanded area at the root tip part. Flagellates were the main protistan group that showed the highest frequency of colonization. Ciliates, flagellates, and amoeba showed different spatial distribution patterns. Flagellates populated the rice roots and the adjacent area, while amoeba populated a little apart from the population area of flagellates. Ciliates were observed mainly in the root tip area. The microeukaryotic community structure in the rice rhizosphere analyzed by PCR-DGGE was distinct from those in the non-rhizosphere of the planted microcosm and in the unplanted microcosm. Protistan species inhabiting the rice rhizosphere were affiliated to flagellates (*Nucleocercomonas* sp. and *Gymnophrys* sp.), amoeba (*Echinamoeba* sp.), and ciliates (*Colpoda* sp. and *Oxytricha* sp.), which was in agreement with the results of microscopic observation. Our results showed that the rice roots provide a favorable habitat for protistan species with prominent effect at the tip parts and the active sites of amoeba, ciliates, and flagellates may differ.

Keywords: Protozoa, Rice rhizosphere, DGGE, microscopic observation, micro-scale distribution, PCR

Plant effect on Si concentration in soil solution and phytoavailable Si from various Si sources in soil

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Plant Si plays a significant role in the global Si cycle as proven by the estimation of the total annual biogenic Si retention in terrestrial plants. Most of the cereals are Si accumulators, including wheat and rice. The beneficial effects of Si have been demonstrated by many studies using pots, hydroponic and field experiments and are particularly remarkable in plants exposed to biotic or abiotic stresses. Repeated cropping may lead to depletion of the phytoavailable Si pool in soil. As a consequence silicon fertilization is applied in many countries, especially on rice. However the processes modulating Si uptake from soil are not clearly understood. We performed pot experiments with increasing amounts of different Si sources including clay minerals (kaolinite, montmorillonite and vermiculite) and diatomite to 1) evaluate whether clay minerals could be a source of silicon for wheat and rice, 2) compare such common soil minerals with a potential Si soil amendment, containing amorphous Si (diatomite), 3) estimate how much plants were able to take up from these various Si sources and 4) find evidence of rhizospheric processes allowing for enhanced Si uptake. We show that differences in dissolved Si (DSi) in soil solution or plant available Si (PAS) extracted by Na2CO3 measured between pots with plants and pots without plants Si uptake is not explained by Si uptake but depends partially on plant species.. More importantly, both rice and wheat are able to modulate (decrease or increase) substrates pH and soil solution pH depending on initial soil/substrate pH thereby modifying Si concentrations in the solution and therefore PAS.

Keywords: Silicon, wheat, rice, kaolinite, montmorillonite, vermiculite, diatomite, uptake, pH

WM – Watershed Management: A Tool For Soil Conservation

Convener : Alaattin Yüksel
Co-Convener : Bayram Hopur

Tuesday 18 October 2016

WM – 498
Murat River Watershed Rehabilitation Project (MRWRP): Sustainable Soil Using (SSU)
Ali Rıza Demirkıran-Bingol, Türkiye

WM – 770
Assessing the impact of watershed management projects: Case study, Oued Mellah and Allal El Fassi watersheds, Morocco
Mohamed Yassin-Rabat, Morocco

WM – 886
Simulation of Tile Drain Flows in Response to Rainfall Characteristics in an Alluvial Small Watershed Using HYDRUS 1D
Rifat Akış-Hatay, Türkiye

WM – 890
Sustainable Land Use Planning Model
Ertuğrul Karaş-Eskişehir, Türkiye

Murat River Watershed Rehabilitation Project (MRWRP): Sustainable Soil Using (SSU)

Ali Rıza Demirkıran[1], Abdulkadir Sürücü[1], Alaaddin Yüksel[1], Yasin Demir[1], Ziya Polat[2], Şahin Incedemiroğlu[2]
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The Project's aim is poor upland villages within the Murat River Watershed, Eastern Anatolia, Turkey. The area is located within the provinces of Elazig, Bingol and Mus, which are ranked 53rd, 77th and 79th respectively out of 81 provinces in United Nations Development Programme's (UNDP) Human Development Index (HDI). The Project goal is reduced poverty among the upland communities of the Murat River Watershed. The development objective is improved livelihood and natural resources management in these catchment areas. The rehabilitation of the natural resource base is expected to "create the foundation for a sustainable utilization of the micro-catchment and increase the catchments' resilience to impact of extreme weather events (rainfall and droughts). The geographic coverage of the Project is defined as the hilly parts of Murat river watershed (technically the upper watershed of the Murat/Euphrates river system), which definition generates two areas within the upland districts and villages of Elazig, Bingol and Mus provinces in Eastern Anatolia separated by a relatively flat area of high plateau. The selected territory comprises some 100 micro catchments (MCs) of differing sizes with varying degrees of natural resource endowment and degradation and proximity to larger settlements. Common agro-ecological characteristics of the Project area are high altitude, steep slopes prone to erosion, limited availability of surface water and a short growing season following a long winter with snow. Relentless pressure on the fragile natural resource base has resulted in loss of vegetative cover and soils, and contributed to the risks of landslides and floods.

Keywords: Murat River, Watershed Rehabilitation, Sustainable Soil Using, Natural Resources

Assessing the impact of watershed management projects: Case study, Oued Mellah and Allal El Fassi watersheds, Morocco

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Within the framework of National Watershed Management Plan, the High commission of forests and waters and combating desertification (HCEFLCD) implemented a soil and water conservation program in 1.5 million hectares, over 18 priority watersheds, through 86 projects. Reforestation, rehabilitation of degraded forest ecosystems, fruit trees plantations with conservation structures, improving grazing land and construction of check dams are the main management practices. They were conducted as part of integrated participatory approach based on projects.
Nevertheless, the impact of these projects has not been assessed on a quantitative basis. The present paper shows a holistic approach integrating quantitative and qualitative methods to assess the impact of Oued Mellah and Allal El Fassi watersheds' management project.
Quantitative methods consist of hydrometric stations, radiometric measurements and monitoring gully erosion, whereas, qualitative methods were applied using multi date mapping and WOCAT spread sheets.
During the measurement period ranging from March 2009 to November 2015, 506 rainfall events with a total of 1274 mm were recorded at Sidi Sbaa microwatershed, a first tributary of Oued Mellah River. These showers have generated 106 runoffs that brought 18,695 m3 of water, 119,264 kg of suspended sediments and 53,151 kg of rolling coarse material. 2010 data were used to calibrate MUSLE model, the estimated data were close to the observed.
The initial results from radionuclide's measurements using 137Cs at Oued Mellah watershed have significant difference in soil erosion rate from managed and non managed landscapes. At Allal El Fassi watershed measurements using 7Be helped in determining P factor values for MUSLE application. Results show the undoubted contribution of watershed management to alleviate dam siltation.
Monitoring gullies has shown a deepening and widening of most of the gullies from up to down slope and WOCAT method helped in identifying and describing four best sustainable land management practices.

Keywords: Assessment, watershed, management, hydrometric, radionuclides, WOCAT

Simulation of Tile Drain Flows in Response to Rainfall Characteristics in an Alluvial Small Watershed Using HYDRUS 1D

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Storm water flooding and inundation events require managing surface runoff and drainage water in the Amik Plain, Turkey. The objectives of this study were to i) determine tiling flow effects on soil moisture distribution profile ii) simulate drain-tile flows in a clayey soil, and iii) compare drain hydrographs with simulated model drainage fluxes in the soil profile. The sandy loam (SL) site showed 88 m3/ha tile drainage, while silty clay loam (SiCL) site showed 71 m3/ha tile flow during the 32-day measurement period. The main's outlet showed 264 m3/ha of drain discharge to the streams, corresponding to 0.87% of total runoff. Drainage hydrograph measurements showed different peak flow rates and durations for the SiCL (2.9 cm/d, 33-days) and SL (3.2 cm/d, 28-days). The groundwater accretion was more effective than surface runoff events to limit cropping system in the plain. HYDRUS-1D simulations calculated water table elevations ranging from 41 to 44 cm during calibration and validation periods of 82 days. The occurrence of variably saturated conditions and tile discharges varied based on the site-specific field conditions such as soil texture and saturated hydraulic conductivity. Therefore, a flood control and protection measures can be planned based on drain discharges in the field.

Keywords: Drainage rate, Runoff, tile flow, subsurface drainage, Hydrus, soil moisture, piezometer, Amik Plain

Sustainable Land Use Planning Model

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A new approach, called the SLUP (Sustainable Land Use Planning) model, was developed based on soil loss. The proposed model was used for the first time in a small scale rural basin near Ankara, Turkey. This approach, based on the soil loss tolerance (T), was used to determine the soil conservation measures and land use planning in catchments. In this study, this new model's potential soil erosion (A) was determined using the USLE (Universal Soil Loss Equation) model in a GIS environment. In the study area, soil loss tolerance values were determined for each soil series based on the soil depth. Then, the potential soil erosion values were rated to the values of soil loss tolerance. According to the A/T results, erosion degree, description and proposed soil conservation, precautions were determined considering the limit values that were specified in the table and that reflect the combined effects of the support practice factor (P) and soil loss tolerance (T). The results showed that the mean soil erosion potential of the watershed was 16.30 t ha-1 year-1 and the most influenced land use cover exposed to erosion was bare land, which its potential soil loss was approximately 97.52 t ha-1year-1. The estimated amount of soil loss over 10 t ha-1 at the basin was contained in 25.84% of the total area. The areal distribution of soil erosion classes and soil conservation precautions was also obtained. According to the results, 64.68% of the basin had a non-existent or too-low erosion degree, 9.18% had a low-moderate erosion degree, 7.53% had a moderate-high erosion degree, 4.33% had a high erosion degree, and 14.33% had a very high level erosion degree. Consequently, this research suggests a new approach that can be used in terms of simplicity, flexibility and ease of application in rural catchments.

Keywords: SLUP model, soil loss, soil conservation, land use planning

Y – Pesticides in the Soil Environment

Convener : Oğuz Can Turgay
Co-Convener : Annabelle Austruy

Tuesday 18 October 2016

Y – 245
From bioavailability science to regulation of organic chemicals: the role of biological tests
Jörg Römbke-Flörsheim, Germany

Y – 638
Ion mobility spectrometry (IMS): toward a novel technique for measuring diazinon concentration in soil samples
Marzieh Sara Mohamady Ariya-Isfehan, Iran

Y – 435
Influence of soil amendments on biodegradation of PAH in soil – Modeling of microbial degradation and sorption kinetics
Arno Rein-Munich, Germany

From bioavailability science to regulation of organic chemicals: the role of biological tests

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The bioavailability of organic chemicals in soils is an important area of scientific investigation for environmental scientists, although this area of study remains only partially recognized by regulators and industries working in the environmental sector. Regulators have started to consider bioavailability within retrospective risk assessment (RA) frameworks for organic chemicals; by doing so, realistic decision-making with regard to polluted environments can be achieved, rather than relying on the traditional approach of using total-extractable concentrations. However, implementation remains difficult because scientific developments on bioavailability are not always translated into ready-to-use approaches for regulators. Similarly, bioavailability remains largely unexplored within prospective regulatory frameworks that address the approval and regulation of organic chemicals. In this contribution we - representing a bigger group of authors from academia, industry and regulation - will offer a simple, pragmatic and justifiable approach for use within retrospective and prospective risk assessment.
To include the results of tests on bioavailability in decision making a weight-of-evidence approach should be used. To date, the TRIAD approach, which consists of three lines of evidence, namely, environmental chemistry, (eco)toxicology and ecology, represents the most enlightened approach. It has been used successfully in sediment ecotoxicology for approximately 30 years and is currently being standardized by ISO. Since it is neither practical nor economically feasible to use all available methods we propose a stepwise, tiered, approach, similar to that used for metals. A decision is made after each tier on whether further investigation is necessary. According to this scheme, bioavailability can be included at a higher tier to provide additional site-specific data. Thus, bioavailability will be part of a second-tier of assessment. This new proposal provides an opportunity for the inclusion of a more detailed interrogative assessment procedure in which bioavailability plays a role and that will potentially lead to more realistic RA.

Keywords: Risk assessment, pesticides, standard tests, soil organisms

Ion mobility spectrometry (IMS): toward a novel technique for measuring diazinon concentration in soil samples

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There is a need to develop precise, reliable and rapid techniques for measuring hazardous material in the environment. We optimized and calibrated a soil extraction procedure followed by an ion mobility spectrometry (IMS)-based determination of diazinon in the soil extracts. Two soils with contrasting texture (loam and sand) were spiked by diazinon at the rate of 20 mg kg-1 reagent-grade diazinon. Non-spiked soil samples were also run as control treatments. The spiked and non-spiked soils were separately extracted by hexane, methanol and dichloromethane. Various parameters including time of sonication (5, 10, 20, 30, 60 minutes), centrifuging time (5, 10, 20 minutes), centrifuging speed (1000, 2000, 3000, 4000 rpm) and shaking time (30, 60, 120 minutes) were examined and an optimum extraction condition was adopted. Corona discharge ionization-IMS was used for detection and quantification of diazinon in the soil samples. Among the three solvents, methanol was most efficient for the extraction of diazinon. The greatest amounts of diazinon was extracted from the soils when they were shaked 2 h with methanol followed by centrifugation at 4000 rpm for 5 minutes. Extraction of diazinon was not affected by filtration through filter paper. The optimized IMS-based technique provided a high recovery of 100% to 115%. Detection limits, (calculated as 3× the signal-to-noise ratio) was 50 ng l-1. The standard deviations ranged from1.0% to 7.6% and a wide linear response between 50 to 10000 ng l-1 was observed. Overall, high recovery of diazinon extraction along with its low detection limit makes this analysis a promising technique for the measurement of diazinon in soil samples.

Keywords: Diazinon, Ion mobility spectrometry, corona discharge ionization, optimization

Influence of soil amendments on biodegradation of PAH in soil – Modeling of microbial degradation and sorption kinetics

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The truly dissolved concentration (i.e. the chemical activity) of contaminants in soils and sediments is the driver for their uptake into biota and subsequent effects. Tar, coking and incomplete burning processes have contaminated many industrial areas and most urban soils with carcinogenic polycyclic aromatic hydrocarbons (PAH). It is often not feasible to remove these and other toxic compounds from soils and sediments, and new strategies for minimizing their adverse effects are needed. For strongly adsorbing compounds like PAH, addition of adsorbing amendments to soils leads to reduced mobility, reduced bioavailability and thus less toxic effects. On the other hand, this also may lead to prolonged persistence, as only dissolved compounds are available to microbes.

This study investigates the simultaneous kinetics of desorption and microbial degradation. Experiments were conducted with the degrader strain *Sphingomonas sp.* 10-1 in soil suspensions spiked with ^{14}C-labeled phenanthrene. Three different soils were tested, and the influence of activated carbon, biochar (charcoal) and compost amendments on biodegradation of PAH was assessed. Experimental observations were simulated with a numerically solved five-compartment model simultaneously considering desorption kinetics, metabolism (*Michaelis-Menten* kinetics) and microbial growth (*Monod* kinetics with decay). The model fit the observations from biodegradation experiments when assuming co-metabolism, i.e. microbial growth supported by soil organic carbon.

Complete desorption was observed both in un-amended and compost-amended soils. Contrary, desorption was strongly inhibited by biochar and in particular by activated carbon. The modeled kinetics strongly suggest that activated carbon and biochar treatments largely reduce desorption into the dissolved phase and thus limit mineralization. The calibrated model can be applied to calculate ad/desorption and metabolism of PAH and other non-soluble contaminants in soils and sediments with/out amendments, to simulate the effect of bioavailability on biodegradation kinetics. It may also serve to predict effects of soil amendments and the success of remediation projects.

Keywords: biodegradation, sorption kinetics, soil amendments, PAH, bioavailability, modeling

Z – Modelling of Soil Erosion

Convener : Gunay Erpul
Co-Convener : Selen Deviren Saygın

Thursday 20 October 2016

Z – 948
The measured and predicted USLE/RUSLE-K values for the eroded sediments by RIFT from different land uses under laboratory simulated rainfalls
Selen Deviren Saygin-Ankara, Türkiye

Z – 949
Detailed investigation of soil erodibility parameters under different moisture conditions within the process-based WEPP model approach
Selen Deviren Saygin-Ankara, Türkiye

The measured and predicted USLE/RUSLE-K values for the eroded sediments by RIFT from different land uses under laboratory simulated rainfalls

Selen Deviren Saygin, Gunay Erpul
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Evaluation of land degradation in terms of soil erodibility is vital to protect and sustain of the susceptible areas, especially affected by land use types. Soil erodibility, described as the ability of soils to resist erosion, can be measured either directly under natural or simulated rainfall conditions, or indirectly estimated by empirical regression models. In this study we aimed to compare three empirical equations used to determine the soil erodibility factor of USLE/RUSLE prediction technology with the measured soil erodibility values in the eroded sediments by the raindrop impacted flow transport (RIFT) under simulated rainfall conditions. For that, interrill erosion process of RIFT was simulated in laboratory conditions by using the soils of three different land uses, sampled from a semi-arid catchment in Ankara, Turkey. The rainfall simulations were conducted with these soils (named as agricultural land, grassland and forest, respectively) under three slope gradients (9, 15 and 20%) and two rainfall intensities (80 and 120 mm h-1) with three replicates at the saturated conditions. Obtained results indicated that measured K values under rainfall simulations significantly varied under three different land uses and slope gradients and two different intensity conditions (*$P < 0.05$). The highest and lowest erodibility values were measured for agricultural and forest soils, respectively. Land use types had significant effects on the soil erodibility in the selected semi-arid catchment (*$P < 0.05$), and this was mainly related to the variations in their organic matter contents. Additionally, the predicted USLE/RUSLE-K values were generally greater than the measured K values. In the light of the obtained results, equations which used only textural combination of soils could not be capable to reflect differences between land uses. However, equations that used soil organic matter in combination with the soil particle size better agreed with the variations in land use.

Keywords: USLE/RUSLE prediction technology, Soil erodibility, Rainfall simulation, Land use types, Organic matter

Detailed investigation of soil erodibility parameters under different moisture conditions within the process-based WEPP model approach

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Predicting soil erosion is one of the most important steps in ecosystem assessment as well as in identifying best land management strategies and effective erosion control practices. The Water Erosion Prediction Project (WEPP) model is a process-based erosion assessment tool developed by the USDA-Agricultural Research Service. In the WEPP model, sediment production is spatially separated into interrill and rill areas and different equations and erodibility parameters are used to model sediment detachment and transport in these areas. This presentation is to summarize a study performed at the USDA-National Soil Erosion Research Laboratory to investigate soil erodibility parameters of two soils under three different soil moisture conditions, i.e., initially dry, saturated, and drainage conditions. Two soils, namely Palouse silt loam and Nansene silt loam from the U.S. Pacific Northwest, were used in laboratory experiments. Rainfall simulation runs were made to derive interrill erodibility (Ki). A mini-flume with gradually increasing flow rates was used to determine rill erodibility (Kr) and critical shear stress (τc). Results clearly indicate that saturated conditions had the highest runoff discharge for both soils. The greatest and lowest interrill erodibility rates were obtained for dry and saturated conditions, respectively. The Nansene soil, with about half of the soil organic carbon content as the Palouse soil, had higher sediment discharge rates and interrill erodibility values for all moisture conditions. For rill erodibility, the initially dry soil condition resulted in the greatest values while the drainage condition had the lowest. The highest critical shear stress value was obtained for the Palouse soil under the initially dry soil condition, and the lowest value was obtained for the Nansene soil under the drainage condition. Our findings also show that the effects of surface hydrologic condition on soil erodibility need to be taken into consideration in developing the next generation process-based erosion models.

Keywords: soil erodibility, interill erodibility, rill erodibility, critical shear stress, WEPP, soil organic carbon content

POSTER PRESENTATION ABSTRACTS

October 17, 2016

Session Name	Land Management	
Convener	Cafer Türkmen	
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461	The Effects of Gyttja on Nutrient Contents of Lettuce (Lactuca Sativa) and Some Soil Properties of Growing Media in Nickel Contaminated Soils	Ferit Sönmez
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The Comparison Of Yield And Quality Parameters For Bread Wheat Varieties Grown In Vertisol Order Soils

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This study was conducted to determine some yield and quality parameters for three bread wheat varieties grown under Vertisol order soils in Tekirdag dry conditions during the 2013-2014 growing season. In this research, the yield and quality parameters as grain yield, protein content, text weight, 1000 seed weight, moisture content, gluten content, gluten index, normal sedimentation value, retired sedimentation value were investigated. The 600 - 674 kg da-1 grain yield, 40 – 43 g 1000 seed weight, 10.4 - 12.1 % protein content, 80.5 -80. 8 kg/10 L text weight, 11.0 - 11.4 % moisture content, 25.6 - 29.9 % gluten content, 81.0 – 93.0 % gluten index, 34 – 40 ml normal sedimentation value and 41– 55 ml retired sedimentation value were averagely obtained from three durum wheat varieties. The differences in grain yield, moisture content, gluten content, protein content, normal and retired sedimentation values for the bread wheat varieties grown under Vertisol order soils were statistically significant. But, there were no statistically significant text weight and 1000 seed weight for bread wheat varieties.

Keywords: Vertisol order, bread wheat, quality parameters, grain yield

The Effects of Gyttja on Nutrient Contents of Lettuce (*Lactuca Sativa*) and Some Soil Properties of Growing Media in Nickel Contaminated Soils

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In this study, the effects of gyttja on nutrient contents of lettuce (*Lactuca sativa*) and some soil properties of growing media in Ni contaminated two different soils (Inceptisol and Entisol) were investigated. This study was conducted with the application of three levels of gyttja (0, 5 and 10%) in two different soils (Inceptisol and Entisol) contaminated with three levels of Ni (0, 40 and 80 mg/kg) in a factorial experimental design with three replications. As a basic fertilization, 300 mg/kg N and 90 mg/kg P2O5 were applied into each pot. At the end of the study; pH, EC, lime and organic matter content values obtained in different applications changed range in 7.23-7.91, 426.54-1879.5 µS/cm, 10.52-27.48 % and 1.04-5.81 % respectively. Nutrient contents of lettuce showed differences in different nickel and gyttja applications.

Keywords: Lettuce, nickel, soil properties, nutrient, Inceptisol, Entisol

Removal of some heavy metals from acid mine lake water using manure biochar

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The aim of this study was to investigate the possible use of goat manure biochar to remove heavy metals from acid mine lakes. Goat manures were carbonized under the limited oxygen conditions at 425 oC for 15 minutes. Water samples were collected from acidic mine lake in Can Province, Çanakkale-Turkey. Biochar samples were mixed with acidic mine lake water with different ratios. Changes of acidity (pH) and heavy metal (iron, cupper and nickel) contents were monitored over time. Consequently, using the biochar in acidic mine lake water increased pH from 3.12 to 7.82 Iron (Fe) concentration decreased from 10 mg L -1 to, 0.86 mg L -1. Similarly, nickel (Ni) concentration decreased from 0.23 mg L -1 to 0.03 mg L -1.

Keywords: biochar, acid mine drainage, heavy metals, goat manure

Adapting agricultural management to reduce nitrogen leaching in the water protected areas

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The aim of research was to determine how to adapt management of the agricultural land (cultivation technics, fertilisation, type of crop, crop rotation) to reduce influence on the leaching of nitrogen from the soil profile in the Drava river plain in Slovenia. The impact of 31 different scenarios of potential agricultural land management was evaluated using Soil and Water Assessment Tool (SWAT) model. Research was located on the shallow alluvial bedrock with carbonate and silicate layers, which is the main source of drinking water in the area. Results of the Soil and Water Assessment Tool model version 2009 showed that with the constant climate and land management technology magnitude of nitrogen leaching from the soil profile is mainly influenced by soil properties. The most drastic effect on the increase of nitrogen leaching showed vegetable production technology, followed by cereals (corn, wheat, barley). Agricultural ecological production by Slovenian standards can result in similar leaching potential as conventional farming, due to unfavourable conditions origination from soil properties (shallow soil profile). Effects of grassland production may lead to 76 to 98% reduction in nitrogen loss from soil profile in comparison to current practices.

Keywords: water protection zones, nitrate, soil type, groundwater, agriculture

Environmental Ethics for Land Management

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Environmental ethics is theory and practice about appropriate concern for, values in, and duties regarding the natural world. Humans dramatically rebuild their environments; still, their lives, filled with artefacts, are lived in a natural ecology where resources; soil, air, water, photosynthesis, climate are matters of life and death. Culture and nature have entwined destinies, similar to the way minds are inseparable from bodies. So ethics needs to be applied to the environment. There is no invisible hand that guarantees an optimal harmony between a people and their landscape, or that the right things are done in encounter with fauna, flora, species, ecosystems, or regarding future generations. Environmental quality is necessary for quality of human life.

As a result; the main aim of this study is to analyze the environmental ethics that has to be directed to human dominated, managed, disturbed landscapes, such a land ethic must be informed about ecosystem health, but more focused on human ecology, on political ecology.

Keywords: Environment, Ethics, Land, Soil, Ecosystems, Management

The impact of bypass flow in calibration of hydrological part of SWAT model - Example from Lower Seyhan River Plain Irrigation District, Turkey

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Bypass flow is known as unused part of total irrigation water delivered to the area by open irrigation channels. Depending the quantities can have important impact on area hydrological system especially on surface waters flows. There are many reasons why this flow occurs, for example it that can be caused by extreme use of irrigation water, in cases of open water channels malfunction or in cases of extreme rainfall events. Currently are effects of bypass flow on the area, whether are minor or major, unknown. But accurate water monitoring is needed if catchment models are used, as hydrological component of these models is crucial for proper functioning. Accurate estimations of the bypass flow could also lead in to the decrease of irrigation water demand. However, measuring or even estimation of the bypass flow is not a simple process. The aim of this research is to calculate and divide bypass flow from total irrigation water. Seven years of measured water flow data (2008-2014) from the Lower Seyhan River Plain Irrigation District (Akarsu irrigation district, 9,495 ha) located in Cukurova Region of Turkey was used in SWAT model. The model was improved by adding hydrological, environmental and agricultural parameters to derive accurate results. In the process we test our model calibration results with changing the proportions of bypass flow from 5 to 50 percentage of total flow. The model results showed that bypass flow impact on hydrological system should not to be underestimated. The calibration of the catchment model for Akarsu Irrigation District was not possible without bypass flow estimations.

Keywords: Bypass Flow, SWAT, Irrigation water, Modelling

Conversion of Agricultural Land to Non-Agricultural Uses in Turkey

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Providing a sufficiently balanced nutritional intake is recognized as one of the primary aims of sustainable agricultural sector. But, many countries are confronted with the need to feed a growing population because of decreasing availability of arable lands. Taking into account the intensive demand of various non-agricultural sectors exists on the agricultural lands, conservation and development of these resources are still important.

The main purpose of this study is to find an answer to this research question: which sector uses more agricultural lands in Turkey. In order to find an answer to this question, public policies and legal regulations are screened and views and approaches of the stakeholders regarding conversion of agricultural land to non-agricultural uses are assessed by using survey data. The results indicate that the most non-agricultural usage is commonly seen in the "urbanization" sector.

Keywords: agricultural land, non-agricultural land usage, conversion, sector

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October 17, 2016

Session Name	Remote Sensing	
Convener	İlhami Bayramin	
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324	The use of geographic information systems and remote sensing to measure ratio the vegetation north-east of the city of Mosul province	Khalid Anwar Khalid
471	Utilasation of remote sensing in the study of some pysagiques units in low chellif	Kasoul Karim

The use of geographic information systems and remote sensing to measure ratio the vegetation north-east of the city of Mosul province

Khalid Anwar Khalid
khalid Anwar KHALID

This research aims to determine the vegetation in the north- eastern region, the proportion of Mosul /Iraq using remote sensing and GIS techniques. Applied techniques using satellite data for artificial satellite Landsat-7, has been deducted from the study area to determine the visualizations vegetative cover ratio using natural vegetation guide (NDVI).

The current study relied on two scenes aliens satellite Landsat 7 TM on 2005, 2007 and on 2010 Use vegetation guide practical tool for monitoring agricultural land in the province of Nineveh. The values of the NDVI was the nearest number (1) in the image was taken in 2005, then followed by the image was taken in 2007, the results showed that the highest value of NDVI was in 2005 for the site Klkja 1 (0.400) This is true with the induction field as exploiting the area planted crop with okra in mostly soil with recipes and help them keep the dense vegetation.

The results showed the presence of strong relation between the density of vegetation cover and the evaluation of deterioration state with the reflection values with the red spectral band. It has also been found that there is a strong correlation between the values of (NDVI) and the density of vegetation cover and the degradation of range lands, in addition to the influence of sloping degree and direction in kalakji 1 on the (NDVI) calculated values.

Keywords: remote sensing, NDVI, vegetation Idex, Mosul

Utilasation of remote sensing in the study of some pysagiques units in low chellif

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The objective of this work is to use remote sensing to study the seasonal and interannual change of some paysagique unit at the low Cheliff region using satellite images Spot and Landsat TM.

Seasonal and interannual analysis of satellite images corresponding to 2000.2001 years for Spot 4 and 2006, 2007, 2008, 2009 and 2010 showed a close relationship between rainfall and the spatiotemporal dynamics of vegetation cover.

Keywords: Lower Cheliff, Remote sensing, SPOT 4-l Landsat TM, vegetation, rainfall

October 17, 2016

Session Name	Soil Conservation, Land Degradation, Desertification	
Convener	Taşkın Öztaş - Günay Erpul	
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555	Varibility Among Mapping Units Of The Same Soil Series In External Solonchacks	Mesut Budak
101	Effect of Polyacrylamide and Polyvinyl Alcohol on Runoff and Sediment from an Entisol under Simulated Rainfall	Tuğrul Yakupoğlu
372	Evaluation of soil degradation in the perimeter of Hmadna	Youssouf Zairi
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Salicornia as an Alternate Forage Crop for Phytoremediation of Salt-affected Soils

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Salicornia is a leafless C3 annual halophyte known as an alternate forage crop. A field study was conducted in the Mediterranean Karatas-Adana region of the Southern Turkey to evaluate the biomass production and feed quality of naturally grown Salicornia europaea and its effects on soil quality under protection. Salicornia biomass, groundwater and composite soils were randomly sampled from both the unprotected and protected sites and analyzed. Results showed that total, root and shoot fresh biomass were 22, 45, and 12% higher, respectively in the protected site than the unprotected site. Likewise, total, root and shoot dry biomass were higher in the protected site. Biomass collected from the protected site had a significantly lower content of acid detergent fiber, but higher content of digestible dry-matter and relative feed values than that of the biomass collected from the unprotected site. The biomass Fe and Zn contents were 1.9 and 1.8 times higher under the protected site than under the unprotected site. Groundwater and soil electrical conductivities were significantly lower under the protected site than under the unprotected site. Soil microbial biomass, active carbon and intermediate C pools were 36, 21 and 56% higher, respectively with an associated decrease (23%) in specific maintenance respiration in the protected site than in the unprotected site. Results also suggest that higher biomass yield and feed quality of naturally grown Salicornia under protection could be a suitable commercial halophyte in the coastal and in-land saline areas with high water-table of poor quality to provide alternate sources of animal feed.

Keywords: Salicornia europaea, soil, forage, quality, Groundwater, Biomass

Varibility Among Mapping Units Of The Same Soil Series In External Solonchacks

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Solonchaks are the soils with a saline horizon within 50cm of soil profiles. In alkaline carbonate soils, pH (>8.5) and the electrical conductivity (EC>8 dSm-1) are the two major criteria for a soil to be classified as a solonchak. If a typical soil profile has a salic horizon, similar soils are mapped as solonchaks without considering the spatial variability of salts in the area. The purpose of this study was to present the importance of spatial variability in classification of soils with high variability. Three soil series (Karadeli, Acir and Kizilkuyu) were identified with high salt contents but with no salic horizons in a soil survey conducted at the Central Turkey. Soil samples in a 400m by 400m grid design were collected from 0-30cm and 30-60cm depths. The coefficient of variability (CV) values of EC in Karadeli soil were 91.5% and 41.5% for 0-30 and 30-60cm, 69.8% and 26.5% in Acir soil and 95.8% and 51.5% in Kizilkuyu soil, respectively. The EC values in Karadeli soil ranged from 0.69 to 27.40 dSm-1 and from 0.79 to 12.78 dSm-1 for 0-30 and 30-60 cm. The EC in Acir soil ranged from 1.96 to 20.10 dS m-1 and from 5.74 to 14.52 dSm-1. The EC in Kızılkuyu soil ranged from 0.67 to 18.5 dSm-1 and 1.48 to 16.57 dSm-1. Five of 20 mapping units in Karadeli soil has salic horizons based on criteria given by IUSS Working Group WRB, 2015. Two of 6 mapping units in Acir soil and 2 of 7 mapping units in Kizilkuyu soil can be classified as Solonchaks. The results clearly indicated that spatial variability of soil characteristics used as a classification criteria should be taken into consideration for the classification of soils.

Keywords: Solonchak, soil series, soil mapping units, salinity, spatial variability

Effect of Polyacrylamide and Polyvinyl Alcohol on Runoff and Sediment from an Entisol under Simulated Rainfall

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The effect of a precaution practice against to erosion may be different depending on many parameters. Thus, strategies developed combat to erosion should be tested under different conditions. From this point of view, the objective of this study was to research the effects of polyacrylamide (PAM) and polyvinyl alcohol (PVA) applied to different initial sizes of aggregates of a Mollic Xerofluvent on the runoff and sediment quantities under the sequential simulated rainfalls in the laboratory. In this study, diverse aggregate sizes of the experiment soil were put in small erosion pans. Polymers were applied on these aggregates with 6.25 kg ha-1 dose as solutions. After 24 hours waiting time, the pans were placed on 15 % slope, and simulated rainstorms with 36 cm h-1 intensity were applied by using a drop former rainfall simulator for a duration of 12 minutes. When it rained, runoff and sediments were collected in 2-min. intervals. Runoff starting time (RST), runoff quantity (RQ), sediment quantity transported by runoff (SQTR), and transported soils to two sides of pan by splash (SLS) were measured as variables. Two days after first rainfall application, sequential simulates rainfalls were applied on same pans. Implementation has delayed the RST. Under first rainfall, minimum and maximum RQs were measured as 11.7 mm and 28.7 mm respectively. These values were recorded as 28.8 and 48.3 mm, respectively for second rainfall. SQTR and SLS values were changed between 40.9-1032.5 and 0.6-18.8 g m-2, respectively. These values were measured as 77.6-2830.2 and 0.5-14.8 g m-2 under sequential rainfall. As a conclusion, polymer applications to the Mollic Xerofluvent reduced soil and water losses. Their effectiveness varied depending on initial aggregate size.
This study was supported financially by The Scientific and Technological Research Council of Turkey (TUBITAK). Project Code: TOVAG/113-O-555. We thank the said institution.

Keywords: Aggregate, Erosion, Polymers, Simulated rainfall, Soil

Evaluation of soil degradation in the perimeter of Hmadna

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The perimeter of Hmadna, one of the irrigated perimeters of the Lower-Cheliff plain, knows an
advanced soil structural degradation accentuated by the increased evolution of the problem of the salinisation. Our purpose was to evaluate the level of this degradation by taking soil samples seven experimental pieces treated by amendments with various gypsum amounts, manure and DS 1997, analyzing them in the laboratory, then a statistical analysis was performed to show the effect of these treatments on the structural improvement using the MWD and Measured EC.
The results showed an important destructuration of the studied soils expressed with high mean values of measured EC > 4 dS/m and MWD of 1.13 mm. The analysis raised a significant effect of the gypsum and manure on structural stability and salinity, where as it is not clear for the DS 1997. We use the geostatistical approach based on Ordinary Kriging to map the spatial variability of the two studied characteristics EC and MWD according to the used amendments.

Keywords: degradation, structural stability, salinity, amendments, Hmadna

Modeling of vertical changes in soil salinity in an oasis of Algeria

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The oasis of Ouargla (south-eastern Algeria), which belongs to an arid environmental context, is more subject to the negative effects of salinization of soils and saline waters rise of the water table, mainly due to irrigation and a poorly managed sanitation across the palm. Understanding the evolution of salinity across the palm, taking into account the initial observed state and changes during the study period, climatic conditions, groundwater levels, contributions of water per irrigation, water quality and evapotranspiration is a crucial issue in the Saharan oasis in order to anticipate salinization and protect this ancient heritage.
The objective of this study is to develop a modeling approach represents the vertical evolution of salinity threatening the root zone of date.
This study compares two positions scenarios of groundwater. A situation where the water table is always kept at a fixed depth of 2 m from the ground surface and a second position where the water table fluctuates. For each of these scenarios, we test three doses of irrigation water: the current dose (3.4 cm), reduced irrigation (1 cm) and increased irrigation (5 cm) with two waters of different quality (5 mS.cm-¹ and 3 mS.cm-¹).
Modeling HYDRUS 1-D indicates that the fluctuation of the water table has more effect on the salinization of the root zone of the date palm that reduced irrigation dose 1 cm. In contrast, the increased dose of 5 cm is optimal for maintaining the salinity at the lowest level (<3 dS.m-¹) provided that it is fitted to both the local hydrologic context and state current salinity. No irrigation dose allows use without risk of salinization water at 5 mS.cm-¹.
Leaching éxigences, the yield palms and changes in soil moisture Laterales Will Be modeled by SALTMED approach, more generic.

Keywords: hydrological modeling, HYDRUS 1-D, Ouargla trough, oasis, arid climate, sandy soils, groundwater, salinity

Classification of solonchaks in Vojvodina province, Serbia

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Saline soil types - solonchak and solonetz cover an area of 114,250 ha in the Vojvodina Province. Process of salinization, being typical for solonchaks, is one of soil degradation, i.e. desertification processes.
At representative Vojvodinian sites labelled as solonchaks on soil map of Vojvodina 1: 50000 (Nejgebauer et al., 1971) 25 soil profiles have been opened and soil samples have been taken from genetic horizons. These soils were classified according to the contemporary domestic classification and according to FAO-WRB (World Reference Base for Soil Resources).
Based on the research results, we have established a small number of sites classified as solonchaks according to the before mentioned classifications as compared to soil map of Vojvodina from 1971. This is a consequence of desalinization processes in soils which had been solonchaks due to wide-range melioration measures (construction of basic canal network, construction of more dams and barrages on canals and rivers, draining of waterlogged fields) all of which have substantially altered the influence of surface and ground waters on soil salinity. Another reason for this decrease is an unbalanced soil classification. We have found that for our conditions, domestic soil classification from 1963 (which was the basis for soil map of Vojvodina) and FAO-WRB are more acceptable than contemporary domestic soil classification. The reason for this lies in the fact that both classification from 1963 and WRB include as the key criterion for determination of solonchaks not only content of total water-soluble salts in soil, but also the values of electrical conductivity in saturated water extract, and sum of field and laboratory data. Contemporary domestic soil classification significantly decreases solonchak areas since it has established only one criterion for this soil type - salt content. This criterion does not correspond to contemporary approach to saline soils classification.

Keywords: solonchak, solonetz, soil classification, FAO-WRB

Fodder Plants Which Can Be Used To Prevent Erosion In Gaziantep City

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Destruction of flora is one of the most important causes of erosion, which is the most serious environmental problem. This study aimed to determine species richness of the plants which are distributed natural vegetatiton of Gaziantep Region and have financial significance and can be suggested as solution to prevent erosion. Working materials are plant samples, which collected between 2011 and 2012 years in Gaziantep City. 17 species belonging to 4 families were identified from the collected specimens according to Davis (1965 – 2010). Fabaceae was identified as the first family in term of species richnes. The most common species are Lotus gebelia Vent. var. hirsutissimus (Ledeb.) Dinsm, Melilotus elegans Salzm. and Vicia sativa L. subsp. sativa L.

Keywords: Erosion, plant, soil degradation, soil consevation

Medicinal Aromatic Plants Which Can Be Used To Prevent Erosion In Gaziantep City

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There are several ways to prevent erosion, most effective of them to provide to be covered soil with plants. In this contex, giving priority to plants that have medical importance make a big contribution to the country's economy. Therefore, in the study, they were researched that medicinal aromatic plants can be used to prevent erosion. Working materials are plant samples which collected between 2011 and 2012 years in Gaziantep City. 28 species belonging to 17 families were identified from the collected specimens according to Davis (1965 – 2010). Asteraceae and Lamiaceae are the families including most species. In the region, known as 'sumak' Rhus coriaria L., known as 'donkey thyme' Thymbra spicata L. var. spicata L., known as 'mullein' Verbascum geminiflorum Hochst. are quite common.

Keywords: medical plant, land degradation, soil, erosion

Effects Of Conditioner Application On Dispersion Ratio In Soils With Different Reaction

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This study was carried out to determine the effects of rice husk compost, town waste compost and tobacco waste applications on the rate of dispersion in soils having different reactions under laboratory and greenhouse conditions. Soil samples used in this study were taken from soil surface (0-20cm) at different fields having acid, neutral and alkaline pH in Samsun region. Soil conditioners were supplied from different associations. The soil samples subjected to this research are medium in texture, acid, neutral and alkaline in pH, none and very slightly saline in EC, low and medium in organic matter content, and high and low in lime content. This study was conducted according to split bloc design. Tobacco waste, rice husk compost and municipal solid waste were incorporated into the acid, neutral and alkaline soils in four different rates (0.0, 2.5, 5.0 and 7.5%) and two replications. After a month of the incubation period, lettuce plant were grown in the pots. The results of analyses showed that applications of organic conditioners into soils decreased the rate of dispersion, values according to the type and application rates of organic conditioners. Effectiveness of the applications varied according to pH level of the soils.

Keywords: Organic conditioners, Dispersion ratio, Lettuce, Soil properties

Absorption and distribution of metals in Arundo plants grown in soil amended with treated sewage sludges

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Arundo (Arundo donax L), commonly known as giant reed, has been used as a source of biomass for more than twenty years. In order to avoid competition for soil with food crops, energy crops are usually implanted in marginal lands, poor in organic matter and nutrients. A good alternative to retrieve the soil fertility and improve crop yield is the use of sewage sludge as organic matter source. The use of wastes for improving energy crops production is an efficient option to manage these materials avoiding the transference of the pollutants containing to the food chain. According to soil characteristics and plant tolerance, soil available metals could be transferred to the crop. The aim of this study is to evaluate the absorption and distribution of metal from soils amended with treated sewage sludge, in the different plant organs with the aim to test Arundo capacity for phytoremediation purpose. The study was held in experimental plots (5mx10m) located in a calcareous soil in Alcalá de Henares (Spain) in a randomized block design with four plots by treatments and 36 plants (three rows) by plot. Four treatments were assayed: Control Soil (C), Soil + mineral fertilizer (F), Soil +sewage sludge composted with pruning waste (CP) and soil + sewage sludge treated by thermal dry (ST). After two growing seasons plants were harvested and biomass weight was determined. Metal content in leaves, stem, rhizome and roots was evaluated. Total and DTPA-extractable metal content in soil were also determined. The results showed a good tolerance of the crop to the sewage sludge application, obtaining higher biomass production in comparison to control and mineral treatment. In general, a significant translocation of metals to the plant was observed, but their accumulation in the different organs of the plant depended on the type of metal studied.

Keywords: Metals, Arundo, sewage sludge, energy crops

Response of barley and wheat plants to Cadmium contamination in soil

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The objective of the study was to evaluate the effect of Cd polluted soils on the growth of barley (Hordeum vulgare L.) and wheat (Triticum aestivum L.) plants, to assess their potential use in phytoremediation of soils contaminated with this metal. A greenhouse experiment was conducted using one cultivar of barley, Pedrezuela, and one of wheat, Albares. Soil was contaminated with 800 and 1600 mg Cd/kg, using an unpolluted soil as control. Ten pots per conditions were included. Relative water content, photosynthetic activity and total biomass of the plants were evaluated. Scanning electron microscopy (SEM) was applied to study the potential tissue damage. After six months, the plants were harvested and the concentration of Cd in root, shoot and grain was analysed. The DTPA-extractable Cd content was also evaluated in soil samples. The results showed that the higher dose resulted toxic for plants, while at the lower dose, the two cultivars completed their growing cycle and accumulated the highest amount of Cd in roots, followed by leaves, shoots and grain. Pedrezuela accumulated higher concentrations of Cd than Albares. The effect of Cd on the relative water content was unnoticeable. Photosynthetic activity decreased with respect to the control, 38% in Pedrezuela and 31% in Albares. The decrease in total biomass was 9% in Pedrezuela and 20% in Albares. The total biomass of barley was greater than the wheat. Morphological alterations at cellular level in plants treated with Cd were observed by SEM. The DTPA-extractable cadmium in soil samples from Albares was higher (23%) than that from Pedrezuela. It can be concluded that both cultivars could be used in the remediation of Cd contaminated soils in the study conditions. Pedrezuela barley was more effective in extracting Cd than wheat. Barley would be more efficient for the phytoremediation of Cd contaminated soils.

Keywords: Cadmium, barley, wheat, phytorremediation, Photosynthetic activity

Soil sensitivity mapping using remote sensing data. Application to the southern Steppe plains of Saida (Algeria)

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The southern Steppe plains of Saida (Algeria) are undergoing severe degradation following the desertification process that is a direct consequence of man and climate actions. The soil, which is the main factor in yield and biomass production in the considered region, is very sensitive to this phenomenon.
In this work, soil sensitivity, to the desertification process, is mapped by using the Mediterranean Desertification and Land Use (MEDALUS) model. This model combines soil quality indices, which determine the soil resistance to the erosion. These indices are related to the soil textures, morphopedological classes, depths, bedrock, slopes and stoniness's.
The soil textures are derived from hyperspectral remote sensing image and by using the United States Department of Agriculture (USDA) textural triangle. The soil morphopedological classes, depths and stoniness's are obtained from multispectral remote sensing image combined with morphopedological map. Geological map, of the concerned region, is used to derive the soil bedrock, and the slopes are obtained from digital terrain model.
The resulting soil sensitivity map includes three MEDALUS nomenclature classes. These classes are: fragile soils, slightly-sensitive soils and little/non-sensitive soils.

Keywords: Soil sensitivity map, hyper/multispectral images, Steppe plains, desertification, MEDALUS

October 17, 2016

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Determination of Potantial Toxicity and Plant Avaible Elements in Agricultural Land Of Eskişehir Sarıcakaya District

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Transitional Zona Agricultural Research Institute

This research was carried out to determine pollution levels in intensive agricultural areas of Eskişehir Sarıcakaya district between 2008-2010 years. For this purpose 112 soil samples were taken by GPS coordinates in between September –October months and analyzed. As a result of analysis ıt was found to be accumulation of phosphorus and potassium in soils. The amount of organic matter was found to be less than 1%.According to analysis toxicity of heavy metal was not detected however zinc, iron deficiency has been determinated in soil.

Keywords: Soil, Plant avaible elements, Toxicity, Plant Nutrions

Cumulative effect of long-term contrasting tillage system and residues management on soil organic matter and aggregation in a loam

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More recently, the sudden change in the global carbon cycle raised the question of carbon (C) storage in soils, because approximately 8.7 Gt of carbon (C) are emitted to the atmosphere each year on a global scale by anthropogenic sources. Tillage intensity affects soil C content and changes the distribution and stability of soil aggregates. The aim of this study was to assess the effect of tillage on soil organic carbon (SOC) content and soil aggregate stability.
A long-term (>10 years) field experiment was set up at the Institute of Agriculture, Lithuanian Research Centre for Agriculture and Forestry, on Endocalcari-Epihypogleyic Cambisol (CMg-p-w-can). Field experiment had a split-plot design in four replications. Residue management (with and without straw) was as main plot, while tillage (conventional – CT, and no-tillage – NT) was as sub-plot.
A composite soil samples for SOC content analyses were prepared from six samples collected per each treatment from the 0-10 and 10-20 cm soil layers according to Tyurin titrimetric (classical) method. Dry and wet soil sieving was performed to determine the amount and the size distribution of soil aggregates within 0-10 and 10-20 cm soil layers according to N. Savinov method.
NT, averaged across tillage and residues handling, significantly increased SOC content in both 0-10 and 10-20 cm layers, compared to CT. Residues returning reduced SOC in both tillage systems by 5-8 %. SOC was in favour for water stable aggregates (WSA) increase. Significant increase of agronomically valuable aggregates (0.25-5 mm) in 0-10 and in 10-20 cm soil depth was under NT. Straw returning under NT application increased the amount of agronomically valuable aggregates to 53-57 %. During 10 years of contrasting soil management the highest increase (by 10 unit percent) of WSA was under NT as compared to all depths and CT applied.

Keywords: conventional tillage, no-tillage, straw, soil organic carbon, aggregation

The Effects of Internal Temperature and Humidity of PVC Containers on Soil Respiration at Carbon Emissions Studies

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Objective of the study; Carbondioxide emissions in the soil is a result of a respiration event in the soil and its an important factor in the global carbon cycle. The study of CO2 emissions in the soil over a large part focused emission affecting soil temperature and moisture. In this study, between the years 2013-2015, over the lands that approximately 30-40 years untreated, using PVC containers, soda-lime method to measure carbon emissions, the impact of PVC container inside temperature and humidity were investigated.
Materials and Methods; The study was conducted at the plots of GAP Agricultural Research Institute Directorate. In the experiment, the carbon dioxide emissions from the soil samples under the PVC containers were measured weekly using soda-lime method. PVC containers internal temperature and internal humidity measurements is recorded automatically in 30 minutes with a measuring device(Data Logger, Decagon Device EM50) located on the land.
Results; Approximately two years of study weeks resulting carbon emissions, the minimum, maximum internal temperature and internal humidity and average data of PVC container, values are 12.63, 96.26, 58.07 (±1.4372 SE) g.CO2 m-2, 5.21 °C, 39.54 °C, 22.30 °C (±1.0937 SE) ve % 1.3625, % 29.7337, % 11.5968 (±0.7003 SE) respectively. Very important in terms of statistical inverse relationship between internal humidity of PVC container and a CO2 output (** p<=0.01; R2 -0495), very important level in a linear relationship with a PVC container internal temperature (** p<=0.01 R2: 0.526) respectively.
Conclusions; Measurements carried out with soda-lime, container inner temperature and humidity is observed to have a significant effect on the carbon emission.

Keywords: internal PVC container, humidity, temperature, CO2 emissions

Mean weight diameter and water holding capacity of aggregates under contrasting soil tillage systems

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Aggregate stability and organic matter are key attributes in minimizing detrimental impacts of agricultural practices and sustaining soil and environmental quality. Long-term (2006-2014) effects of six different tillage systems on aggregate size distribution and water holding capacity were investigated in a soil contained approximately 50% clay. The tillage treatments were; Conventional tillage with stubble (moldboard plowing) (CTS), Conventional tillage with stubbles burned (CTB), Heavy disc harrow reduced tillage (RTD), Rototiller reduced tillage (RTR), Heavy disc harrow zero soil tillage (RNT) and no till or zero tillage (NT). Soil samples were collected from 0-15 and 15-30 cm soil depths, and characterized for aggregate size distribution, field capacity (FC), wilting point water content (WP) and available water content (AW). The most frequently encountered aggregates in all tillage systems were at 4.0-2.0 mm size and the least frequently found aggregates were 1.0-0.5 mm. Conservation tillage systems increased the rate of >4.0 mm and 4.0-2.0 mm macro-aggregates compared to conventional tillage systems. The average mean weight diameter (MWD) value increased in the NT compared to the conventional tillage practices (CTS and CTB) at the rates of 137% and 204%, respectively at 0-15 cm soil depth. The MWD value in CTS (0.37 mm) was greater than the CTB (0.29 mm) treatment at 0-30 cm in which the stubbles burnt. Tillage systems had significant effects (P<= 0.01) on FC, WP and AW of soils. The highest AW in 0-15 cm was obtained with RNT (17.3%) and fallowed by RTD (14.2%) and RTR (13.2%). Similar responses were obtained for subsurface soil in terms of FC, WP and AW. The results revealed that conventional tillage practices lead the degradation of physical characteristics of soils which significantly reduce the water holding capacity. Whereas, minimum tillage practices have been shown to enhance soil aggregation and water holding capacity of soils.

Keywords: tillage systems, conventional, conservation, aggregate stability, field capacity, available water

Organic carbon distributions in aggregates under different tillage practices in mediterranean conditions

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The stability of aggregates plays a vital role in preserving and long term storaging of soil organic carbon (SOC). Thus, impacts of contrasting tillage systems on SOC have been of particular interest. In this study, long-term (2006-2014) effects of six tillage systems on SOC of different sized aggregates were investigated in a field experiment conducted under Mediterranean conditions in Adana, Turkey. Field experiment was established on Arik soil that contains over 50% smectitic clay. The tillage treatments were; Conventional tillage with stubble (moldboard plowing) (CTS), Conventional tillage with stubbles burned (CTB), Heavy disc harrow reduced tillage (RTD), Rototiller reduced tillage (RTR), Heavy disc harrow zero soil tillage (RNT) and no till or zero tillage (NT). Tillage systems had significant effects (P<=0.01) on SOC stored in different size aggregates. The highest SOC at >4.0 mm size aggregates were in NT (1.37%) and RTR (1.35%), respectively. The aggregates with the highest SOC content in 0-15 cm were at 1.0-0.5 mm size and the aggregates with lowest organic C content were at 2.0-1.0 mm size. Aggregate-associated SOC contents in 0-15 cm depth were higher under conservation tillage systems compared to the conventional tillage systems. Turnover effect of conventional tillage induces microbial activity and increases decomposing of organic matter in soil which resulted in lower SOC in surface soil. The effect of tillage systems in 15-30 cm was only significant for >4.0 mm size aggregates. The highest SOC at 15-30 cm depth were greater mainly in conventional tillage systems as 0.94% for both CTS and CTB. The results indicated that no-till and reduced till systems had greater aggregation and carbon storage at the soil surface but only CTB and CTS increased aggregation below the surface.

Keywords: Soil tillage systems, soil organic carbon, carbon sequestration, aggregate size, conservation, conventional

Geochemical fractionation of Cd and Pb in agricultural soils of Özbek Plain in Çanakkale, Turkey

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Soils are usually exposed to heavy metal pollutions since they are the largest receiving body among the other components of the ecosystem. Heavy metals can easily get into the food chain and can be dangerous for living organisms. This research was conducted to determine cadmium (Cd) and lead (Pb) in agricultural soils from Çanakkale, Turkey, using a sequential extraction procedure (acid soluble, reducible, oxidizable, and residual) as proposed by the Community Bureau of Reference of the European Commission. Soil samples have been taken from 12 different cultivated sites and analyzed for Cd and Pb concentrations. The flame atomic absorption spectrometer was used for metal determination. The validation of the results was checked by the analysis of the BCR-701 standard reference material. Amounts of heavy metals in each fraction were different from each other and orders of fractions for Cd; Residual> acid soluble > reducible > oxidizable and for Pb; Residual > reducible > acid soluble > oxidizable. Sequential extraction procedure revealed that mobile fractions (sum of acid soluble, reducible and oxidizable) of Cd and Pb were higher than their immobile fractions (residual). Such higher mobile fractions indicate pollution from anthropogenic sources such as agricultural inputs and traffic.

Keywords: Agricultural soil, Sequential extraction, Geochemical fractionation, Cd, Pb

Dynamics of organic carbon stock of Estonian arable and grasslands soils

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The aim of this study was to estimate the soil organic carbon (SOC) stock of Estonian agricultural mineral soil and SOC stock change depending on land use type (arable land and long-term grasslands (over 5 years). Generally the arable land was used for growing cereals, oilseed rape, legumes and animal feed used as ley in crop rotation. The main technique of soil cultivation was ploughing. The soil samples were collected during 2003-2014. The SOC stock change in arable land was estimate during 5 years (N=1973) and for grassland the mean duration was 6-12 year (N=427). On average soil sample per 1-5 ha was collected from 0-20 cm soil depth. The SOC content was measured by NIRS method. The soils of arable land were mostly automorphic (85 % of total analysed arable soils) and 15 % were hydromorphic (gleyic and gley) soils. Of grassland soils 61% were automorphic and 39 % hydromorphic. The SOC stocks of automorphic and hydromorphic arable land at the first sampling point were on average 65.1 and 103.1 t ha-1, respectively. During 5 years the SOC stock of arable land decreased (-0.98 and -1.94 t ha-1 y-1 in automorphic and hydromorphic soils, respectively). The initial SOC stock of automorphic and hydromorphic grassland soils was 53.2 t ha-1 and 88.4 t ha-1, respectively. The SOC stock of grassland was lower compared to arable land because originally the land with lower quality was use for establishment of grassland. The changes in grassland SOC stock were not statistically significant.

Keywords: SOC stock, SOC stock change, arable land, grassland

Effects of gypsum and mulch application on some physical properties of an alkali soil

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High exchangeable Na contents of the alkali (sodic) soils lead to dispersion and deterioration of physical properties. The aim of this study was to determine combined effects of straw and pumice mulch materials and different levels of gypsum on reclamation of alkali soil. Research was conducted in a randomized plot design with 3 replications as total of 27 columns. Gypsum and mulch materials were added into PVC columns as below mentioned treatment plan. Research includes; 1. 100% gypsum requirement and no mulch, 2. 75% gypsum requirement and no mulch, 3. 50% gypsum requirement and no mulch, 4. 100% gypsum requirement and straw mulch, 5. 75% gypsum requirement and straw mulch, 6. 50% gypsum requirement and straw mulch, 7. 100% gypsum requirement and pumice mulch, 8. 75% gypsum requirement and pumice mulch, 9. 50% gypsum requirement and pumice mulch. 140cm leaching water was applied to all treatments, and the changes of some physical parameters were determined in soil samples taken from 0-15cm and 15-30cm soil depths in columns. According to the results, gypsum and mulch applications to the alkali soil caused to differences in some physical properties such as water stable aggregates (WSA), hydraulic conductivity (HC) and saturation per cent (SP) in both 0-15 cm and 15-30 cm depths and leaching time. On the other hand it was seen that there was a positive relationship between treatments being higher infiltration rates and the treatments having higher WSA and HC properties.

Keywords: Reclamation, alkali soil, mulching, gypsum, soil physics

Determining The Effect Of Soils In Different Lime Content On Plant Development In Anatolian Sage (*Salvia Triloba*)

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Anatolian sage which is exported by being collected overly from nature of our country and one of the most important medicinal plants is one of the plant types which has been not taken to the cultivation commonly. It is important to know soil features of the plant in the order of taking to the cultivation. This study has been conducted in order to determine the effects of soils which have different lime content features on plant development in Anatolian sage. With this aim, the plants have been grown in pots which contain % 0, 15, 30, 45 and 60 lime. In the study, it has been tried to determine the effect of different lime contents on fresh and dry herb yield, fresh and dry leaf yield, plant height, number of plant branch, leaf width and leaf lenght per plant. According to the results obtained from the study, dependent on increasing in the lime content, it can be seen that plant growth has been regressed. Generally, plants have been not affected from 15 % lime and regression in the development of the plant above this proportion has been seen. The highest dry herb yield has occurred in control application not containing any lime and when it has contained 15 % lime and the lowest yield has obtained when it has contained 60 % lime.

Keywords: Anatolian sage, soil, lime, plant development

Composting of three-phase olive pomace by laboratory scaled automatic controlled reactors

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The aim of this study was to obtain much faster compost under controlled temperature and aeration conditions. Experiment was conducted at Canakkale Onsekiz Mart University. The composting system included four 100 L volume reactors. Three thermocouple wires were placed at the top, center and bottom of each reactor to measure the temperature of the composts at the interval of 5 minutes and temperatures were recorded by Programmable Logic Controller. Compost mixtures included olive pomace (50% w/w), goat manure and alfalfa. Compost water content was adjusted to 60% and water was added when reactor's temperature started to decrease. Sub-samples were taken at each mixing time to determine compost water content, total nitrogen and carbon, ash contents, pH and EC. The maximum temperatures of compost reactors were between 60-70 oC and they were obtained at 3th days of composting. Composts were removed from reactors after 30 days and remained in the laboratory for maturity. Average pH was increased from 8.7 to 9.3, EC values decreased from 11.91 to 9.3 dS/ m for composts in the reactors after 30 days. This research was supported by TUBİTAK project number 214O422.

Keywords: compost, reactor, olive pomace, manure

October 17, 2016

Session Name	Soil Survey and Mapping	
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Organic carbon stocks in the chernozems of Serbia

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The aim of this study was to quantify current SOC stocks in Chernozem in the Republic of Serbia. Chernozems are amongst the most productive soil types in Serbia where crop production is concentrated. Organic carbon stocks were estimated for soil layers 0-30 cm and 0-100 cm based on the results from a database and using soil maps.
Organic carbon stocks were calculated for the area covered by Chernozem which occupies 17,68 % of the territory of Serbia. The methodology for SOC stocks estimation was based on bulk density, organic carbon content and thickness of the analyzed soil layers. Based on the area of the Chernozem reference group and the SOC mean value, we calculated the total SOC stocks for Serbian Chernozems.
In the north of the country, in Vojvodina Province, the region with the most intensive agricultural production, the organic carbon content at 30 cm was mostly low, amounting to 1.93%. The most common soil type in this part of the country is Chernozem, which covers 57.9% of the area. The values of organic carbon content for this reference group, at 30 cm, ranged from 7.89 to 133.51 t ha-1, with the mean value of 73.82 t ha-1. The organic carbon content at 100 cm ranged from 24.21 to 341.37 t ha-1, with the mean value of 168.20 t ha-1. Chernozem and Gleysol, the two most common soil reference groups in Vojvodina Province, which occupy 76.03% of the area, were found to have larger organic carbon stocks than Cambisol, the most common soil reference group in Central Serbia.
The results obtained for Chernozems in the territory of the Republic of Serbia indicated that the organic carbon stocks for the soil layers 0-30 cm and 0-100 cm amounted to 101,13 x 1012 g (Tg) and 230,43 x 1012 g (Tg), respectively.

Keywords: Soil organic carbon stocks, Chernozem, soil layers, SOC content, Republic of Serbia

Development of the Digital Land and Soil Database of Latvia for the Support of Sustainable Land Use

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Currently, Latvia lacks a unified (nationwide) soil information system; therefore, the proposed activities are necessary for systematization of the existing information (paper soil maps, survey materials, analytical data, etc.), for creation of a national soil database, and for adaptation of the information to the European Union Standards. The current large-scale (1:10 000) agricultural soil survey (soil mapping and agricultural land evaluation) of Latvia was performed during 1959–1992. Soil spatial information includes soil types, subtypes and textural classes as well as descriptions of soil profiles. In soil classification, the genetic approach was used. Forest soils and soils in other non-agricultural use have not yet been mapped on a scale of 1:10 000 in Latvia. The primary purpose is to integrate the existing information into the Digital Land and Soil Database of Latvia, thus giving an opportunity to provide all interested persons with free-access information available in the format compatible with modern data processing and visualization techniques. This system will ensure possibilities for new data entry and for its continuous modernization and enlargement. The methods used for the Database creation include development of methodology, paper map scanning (A0 and A1 format), image processing, georeferencing and adjustment to the LKS-92 coordinate system, inclusion of newest available soil data, map digitization (soil type and land evaluation mapping units), integration of mapping units with orthophotomaps on a scale of 1:10 000, digitization of analytical data sets and survey records, translation of older soil units in the current Latvia Soil Classification System. The urgency for such a database appears due to the necessity for the information on natural resources inventory, environmental management, and National Assessment of Greenhouse Gas Emissions; besides, it will be applicable also for several practical purposes where spatial and analytical soil information is necessary.

Keywords: geographical information systems, digitization, mapping units, soil profiles

A decision matrix approach for terroir-driven viticultural micro-zoning in Bozcaada-Turkey

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Terroir is a term that defines a particular region's climate, soils and terrain which characterise the wine and a very important term for vineyard site selection. In this study we developed a terroir-driven site assessment tool for the land resources in Bozcaada. Bozcaada is renowned for its remarkable terroir and well-known for its vineyards and wines. The island is located in the north-east of the Aegean Sea, and in the south-west of the Marmara region in Turkey. For the purpose, a decision matrix was constructed using the climate, soil and terrain properties and responses of rootstocks and grape varieties were quantified to these terroir components. The data used in the model were derived from the detailed soil map of Bozcaada, long term climate data and the digital elevation model of the study area. The study consists of a non-spatial decision matrix and a spatial platform to produce raster based land suitability maps for selected rootstocks and varieties with the resolution of 50 metres. The expert and computer based decision matrix provides data to the spatial platform and GIS tools spatialize the provided data for the land evaluation at micro-scale, 50 metres resolution. Every pixel from raster surfaces provides a numerical value ranging between 0-1 which reflects the suitability to the selected rootstocks and varieties (1 = Most suitable, 0 = Not Suitable). Our study also provides a generic framework for further studies and it can be repeated at other regions, at different scales and for other crops.

Keywords: terroir, vineyard, land evaluation, soil, climate, terrain

A geoportal to offer access to soil data in Greece

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The HAO-DEMETER (ex NAGREF's), Dept. of Soil Science of Athens, of the Soil and Water Resources Institute, has developed a portal ie the www.gssoil-nagref.gr, based on the Geonetwork and Geoserver web G.I.S Free and Open Source Software tools, within the scope of the GS Soil FP7 e-contentplus programme. The aim of this is to harmonize, comply to INSPIRE directive, and provide web access to the available Greek soil data for soil awareness, agronomic, environmental and other soil conservation purposes.
In cooperation with AUTh, and using GeoNetwork opensource software, the Java Runtime Environment, the Apache Tomcat Server, and the MySQL database, available soil data such as electronic documents, vector maps, pdf data files, shape files and attribute tables with physical and chemical properties, and soil survey databases and its metadata became INSPIRE compatible and are uploaded and web available.
The www.gssoil-nagref.gr database contain INSPIRE compatible metadata, soil survey reports, soil maps, soil mapping units, soil taxonomic units, soil sampling points, soil profile descriptions, physical and chemical soil properties and data like soil texture, organic matter content, CaCO3 content, CEC, pH, salt, N, P, K, field water capacity, wilting point, available water content which can be viewed. All the above soil data can be seen by all European and not only citizens, increasing the potential uses and soil awareness. Using this system metadata are easily accessed and primary data can be seen, and after permission can be extracted and secondary data can be predicted through pedotransfer functions.

Keywords: soil data, metadata, GeoNetwork, Soil Portal, soil quality

October 17, 2016

Session Name	Soil Mineralogy, Soil Genesis	
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177	Changes in structural composition of fulvic acid and humic acid with depth in soils of a climo-biosequence in the Main Range of Peninsular Malaysia	Amir Hossein Jafarzadeh Haghighi
188	Mobility of 137Cs, 10Be and 210Pb in soil as a function of the soil texture, organic matter content and pH	Cornu Sophie
354	Some soil properties originated from volcanic materials (Andesite/ Thrachyandesite) in Isparta (Turkey)	Hüseyin Şenol
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351	Comperative clay mineralogy sudies of land mined and unmined soils in Nusaybin district of Mardin province\ Turkey	Şevket Karabulut
88	Post-agrogenic development of vegetation, soil carbon sequestration, and soil carbon pools under self-restoration in different climatic zones of European Russia	Olga Kalinina

Chronosequential Initial Soil Development on a Barrier Island (Spiekeroog, Northwest Germany)

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Spiekeroog is a barrier island in the North Sea about 6 km away from the German mainland. On its seaward side tidal currents induce a west-east drift of sediments leading to a sequence of sediments with decreasing age from west to east. As a result of this process the eastern appendix of the island, the so-termed “Ostplate”, developed. Starting as a bare sand flat it changed during the last 80 years to an area covered with vegetation with an elongated west-east running line of high dunes. These changes initiated the beginning of soil formation and are well documented by aerial images and vegetation maps. This bears optimal conditions to study the initial development and chronosequential alteration of soils within a very short time period of only 80 years.
The aim is to investigate the soils of the “Ostplate” which develop mainly on young dunes and episodically flooded central flats. For the soils of the dunes podzolization is expected to be the most dominant soil-forming process in the long term. The extent of this process is unknown and will be examined. In this context deeper insight in basic chemical and physical processes of podzolization will be gained, which are discussed controversially up to now.
The soils of the central flats are subjected to episodic flooding which causes alternating changes in redox potential. These changes strongly influence soil chemistry and weathering by controlling dissolving and precipitation of sulfur-iron compounds. In order to gain a better understanding of the influence of episodic flooding on the variation of soil properties, redox potential, pH and salinity will be monitored using permanently installed measuring probes. First results of the investigation will be presented.

Keywords: Barrier Island, Initial Soil Development, Chronosequential Alteration of Soils, Podzolization

Changes in structural composition of fulvic acid and humic acid with depth in soils of a climo-biosequence in the Main Range of Peninsular Malaysia

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The objective of this study was to investigate structural composition of fulvic acid (FA) and humic acid (HA) in soils of different pedogenesis in order to better understand the vertical translocation of organic matter (OM) in lights of pedogenic processes. To this end, FA and HA fractions were extracted from the A, E, and B-horizon of the four representative soil profiles (P1-P4) along a climo-biosequence in the Main Range of Peninsular Malaysia. The structure of these fractions was analyzed by Fourier-transform infrared (FTIR) spectroscopy. Seven band areas (3500-3200, 3150-3000, 3000-2800, 1700-1570, 1480-1400, 1400-1330, and 1170-950 cm^{-1}) between 3500 and 950 cm^{-1} were evaluated. The relationship between the relative intensity of these band areas as variables, indicative of possible changes in structural composition of FA and HA with soil depth, and 10 soil horizons was examined using principal component analysis (PCA). As a function of interacting climate and vegetation, different pedogenic processes were formed in soils of the studied climo-biosequence. The two important ones were argilluviation and podzolization, which were operating in soils at low (P1 and P2) and high elevations (P3 and P4), respectively. The band areas between 1400 and 1330 cm^{-1} and 1700 and 1570 cm^{-1} assignable to carboxylates increased with increasing soil depth for FA extracted from soils where podzolization was the active pedogenic process. Results of PCA showed that the structural composition of FA in B-horizons of the four studied soils was differed. Spodic B-horizons were concentrated near the band areas in the 1400-1330 cm^{-1} indicating the high proportion of carboxylate in the FA fraction of these horizons. This study demonstrates that changes in the proportion of carboxylates in fractions of soil OM, in particular FA, with soil depth could serve as a criteria showing translocation of OM within the soil profile under different pedogenic condition.

Keywords: FTIR spectroscopy, fulvic acid, humic acid, pedogenic processes

Mobility of 137Cs, 10Be and 210Pb in soil as a function of the soil texture, organic matter content and pH

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Vertical matter transfer processes in soils and their dynamics are up to now poorly constrained although they are responsible for the temporal evolution of the ecosystem services of the soils through the redistribution of most of their components with depth, especially the finest ones responsible for the main properties of soil surface layers. In order to better constrain and quantify these processes, we developed a kinetic quantification of the involved transfers based on vertical profiles of 210Pb, 10Be, 137Cs and C isotopes in Luvisols. All these elements penetrate the soil system through its surface and are known to be poorly soluble under certain physicochemical conditions (low organic content and neutral to basic pH, both conditions encountered in Luvisols) for which the elements are retained on the clay particles. Along the studied Luvisols, vertical profiles of these isotopes were fitted by a single advection - diffusion equation, demonstrating (i) that their soluble transfer could be neglected under the encountered pedological conditions, and (ii) the potentiality of the approach to trace vertical particle transfers in soils. The range of applicability of this type of approach was nevertheless not tested. In this work, we analyzed 210Pb, 10Be, 137Cs in soils exhibiting organic matter, pH and less than 2 µm fraction proportion gradients (Podzol, and Andosol Ferralsol). Acidic soils and large organic matter contents were considered. The depth distribution of the studied isotopes was then interpreted as a function of the organic matter content of the soil and/or of its pH value. This demonstrates that, when the 0-2 µm fraction proportion is low and under acidic condition, organic matter might be a strong sorbing phase for these isotopes and, therefore, that soluble transfer might not be neglected anymore.

Keywords: cosmogenic nuclides, radiogenic isotopes, clay translocation, bioturbation, pedogenesis

Some soil properties originated from volcanic materials (Andesite/ Thrachyandesite) in Isparta (Turkey)

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In this study investigated the physical and chemical properties, weathering processes, and pedogenetic products of soils developed from Andesite/Thrachyandesite on hill Çünür in Isparta. Four soil profiles were determined as K1 and K2 (northward side), G1 and G2 (southern side). Organic matter content was very high in surface horizons (1.96–5.53%), pH(H2O) values ranges from 6.92 to 7.82, EC is low (118 - 291 dS m-1) as for the texture of the soil was sandy loam (K1, K2), clay loam (G1, G2) and the bulk density is higher than 0.9 g cm-3 in the all profiles. According to the results of selective dissolution analysis, dithionite-citrate bicarbonate- extractable Fed was higher than oxalate (Feo), pyrophosphate (Fep). Oxalate - extractable Alo was higher than dithionite-citrate bicarbonate (Ald) and pyrophosphate(Alp) both northward and southern profiles. As K1, K2 profiles have Al + ½ Fe percentages (by ammonium oxalate) about 3%, G1, G2 profiles have Al + ½ Fe percentages (by ammonium oxalate) about 1.5%. Sio content was ranging from 0.66% to 0.79%. Non-crystalline minerals were not found like allophone and imogolite; only Al-humus and ferrihydrite were found. The soils of Çünür Hill did not show andic properties and were not classified as Andisol, because of a low rate of weathering, inadequate Si leaching, very little amount volcanic glass content. Classification of the profiles according to Soil Taxonomy indicates an Entisol (Lithic Xerorthent).

Keywords: Andesite/Thrachyandesite, selective dissolution analysis, weathering, Çünür hill, Entisol

The problems of the *Retisols* classification in the context of human activity and natural processes caused changes in Lithuania

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Objective of the Study: to determine the problems of Retisols identification and classification in agro-ecosystems.

Material-Methods: the soils featuring different erosion and moister regime in Wurm glaciation moraine highlands were identified by using the Lithuanian (LTDK-99) and WRB2014 (2015) soil classification systems.

Results: The usage of both soil classification systems causes the uncertainties. They are particularly relevant in highlands concerning their complex morphology; intensive human activities correspond to the ongoing erosion, and seasonal differentiation of ground water level in depressions. In the local areas soils which according to profile morphology may be subsumed to: Retisols, Gleysols, Regosols and Luvisols, according the chemical characteristics all of them would be Retisols featuring the different soil moisture regime and erosion level.

The ploughing and mixing of Retisols destroys their upper horizons (A-El-ElBt-...) at the same time, disappears the major diagnostic properties. Therefore strongly eroded Retisols are identified as Regosols while others are identified as Luvisols. In the first case, where the soils have AB-BC-C or AC-C horizons, it`s not an error, while in the second case where only A-Bt-C horizons are left – essential processes of pedogenesis could be interpreted incorrectly. The seasonal variation of soil moisture regime "covers" morphological characteristics of Retisols with gleyic properties specific for Gleysols. The level of groundwater decreases – the retic properties and/or albeluvic glossae are visible again.

Conclusions: the main identification problems of the Retisols on moraine deposits are determined by morphologically featureless El and Bt horizons. In the Retisols prevailing areas, field identification of automorphic and hydromorphic soils must be carried out in different soil wetness seasons.

Acknowledgements. Research findings have been obtained through the national project "The influence of long-term contrasting intensity resources management on genesis of different soils and to other agro-ecosystems components" (SIT-9/2015) funded by the Research Council of Lithuania.

Keywords: Retisols, soil classification, agro-ecosystem degradation, problems of identification, soils in moraine highlands

Comperative clay mineralogy sudies of land mined and unmined soils in Nusaybin district of Mardin province\ Turkey

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Comperative Clay Mineralogy Studies of Land Mined and Unmined Soils in Nusaybin District of Mardin Province, Turkey

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Cleaning of mines after 56 years from the formerly nationalized farmland on Turkey's borders with Syria gave an opportunity to determine the changes in the soils in the last 56 years. Four soils profiles were opened from the formerly land-mined area near Nusaybin district of Mardin Province and compared with two selected similar cultivated soils nearby. The area is dry with an annual average precipitation of 400 mm and soils have high clay and low organic matter contents and they are typically calcareous. The study gives a unique opportunity to determine the changes that have taken place in rather short terms. The aim was to investigate the selected physical, chemical and mineralogical changes in comparison of unmined soils. The cation exchange capacities were between 20 and 47 cmol/kg and the land mined soils had more CEC and this was due to increase in organic matter content, as organic matter causes an increase in the CEC, especially at high pH. Similar amounts of carbonates which were between 25 and 35% kept the soil pH at the same level. Higher organic matter in the mined area was quite an indication that soils under native conditions cause sequestration of organic matter that they were lost during cultivation in the past. Loses of organic matter under cultivation was significant. Dominant silicate clay mineral was smectite and this was followed by illite, paligorskite, kaolinite and likely interstratified minerals. No distinct differences were found between the land-mined and unmined areas, as we examined the soil clay minerals fraction with x-ray diffraction technique only.

Keywords: Mined soils silicate clay minerals, carbon sequestration, loss of organıc matter, Mardin soils

Post-agrogenic development of vegetation, soil carbon sequestration, and soil carbon pools under self-restoration in different climatic zones of European Russia

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Worldwide crop abandonment comprised about 2,197,000 km-2 in recent decades, 25% of all abandoned areas are in Russia. We studied plant succession, soil organic carbon (SOC) sequestration, and SOC pools of Podzols and Albeluvisols / Retisols of the taiga, Chernozems of the semi-humid steppe, and Calcisols and Solonetzes of the semi-arid steppe of Russia during post-agrogenic development without any direct human impact (self-restoration) on base of a chronosequential approach.
During self-restoration, vegetation developed towards their natural conditions. As well a trend towards natural soils was observed in every chronosequence in terms of increasing soil organic carbon (SOC) dynamics, indicating a net carbon sink function during self-restoration. Accelerated SOC gains occurred when forests established in the taiga and steppe species appeared in the Chernozem and Calcisol sequences. SOC gains occurred in the taiga mostly within the organic surface layer whereas in the steppe areas within the mineral topsoil of 0 – 0.2 m. The investigation of different carbon pools showed a significant organic carbon (OC) enrichment of the density fractions <1.8 g cm-3 (free particulate organic material (POM) and POM in aggregates) and the density fractions >1.8 g cm-3 (sand coarse/medium silt, fine silt, clay) following the increase of total SOC during self-restoration. POM in aggregates and mainly free POM were the most sensitive fractions for changes from arable land to native vegetation. In the taiga, SOC restoration time was almost identical with the duration of natural plant succession of about 150 years; in the steppe areas, SOC restoration took about 100 years and was longer than plant succession. Although self-restoration developed towards natural conditions, a full SOC recovery was hardly ever reached, revealing that self-restoration is a long or infinitely long-term process.

Keywords: post-agrogenic self-restoration, chronosequence, plant succession, soil carbon sequestration, soil carbon pools, Russia

October 18, 2016

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Greenhouse gas emission and balance of marshes at the Southern North Sea coast

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Environmental parameters controlling fluxes of the greenhouse gases (GHG) methane (CH_4), nitrous oxide (N_2O) and carbon dioxide (CO_2) differ spatially within landscapes due to natural or man-influenced site conditions. This study aimed to improve the understanding of landscape processes controlling GHG-fluxes of different landscape units of marshes (in terms of vegetation, land use and seawater inflow) at the Southern North Sea coast and thereby deliver a contribution to estimations of greenhouse gas balances at regional and national scales. For this methane (CH_4) and nitrous oxide (N_2O) emissions were quantified and related to reported carbon sequestration rates. Ancillary environmental parameters were determined to identify controlling factors and thresholds of these factors enabling GHG emissions.
For inland marshes (protected from the sea by embankment) the water level was the predominant factor controlling CH_4emissions ranging from 1.58 ± 0.87 kg CH_4 ha^{-1} a^{-1} and 1544.70 ± 291.90 kg CH_4 ha^{-1} a^{-1}. The duration of threshold exceedance (10 cm below surface) was found as a sufficient predictor for annual CH_4 emissions (Fig 1). Emissions of outland marshes (influenced by tides) varying from -1.34 ± 1.60 kg CH_4 ha^{-1} a^{-1} to 55.14 ± 18.80 kg CH_4 ha^{-1} a^{-1} were assumed to be predominantly controlled by sulphate (SO_4^{2-}) concentration, because soil CH_4-contents were negligible when soil SO_4^{2-}-contents exceeded 0.5 mg g^{-1} (Fig 2). The variability of the N_2O-fluxes (-0.81 ± 0.61 kg N_2O ha^{-1} a^{-1} to 17.78 ± 9.57 kg N_2O ha^{-1} a^{-1}) could not be explained by the collected environmental parameters.
GHG balances indicated that inland extensive grasslands (0.07 and 4.03 t CO_2-equivalents ha^{-1} a^{-1}) and particularly reed stands (49.50 to 15.59 t CO_2-equivalents ha^{-1} a^{-1}) are net sources of CO_2-equivalents over a hundred-year time horizon, while outlands are natural sinks (Fig 3).

Keywords: methane, nitrous oxide, greenhouse gas balance, marshes, sulphate, coastal wetlands

Assessment of Different Incubation Periods after Chicken Manure and Leonardite Application on Some Soil Biochemical Properties

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A laboratory incubation experiment was carried out to assessing the change of some soil properties due to chicken manure (CM), Leonardite (L) and a combination of CM and L had been applied at a rate of 10 ton/ha. The application was monitored for 60 days and the effects of manures varied with manure type and incubation period. The soil samples were incubated at field capacity for 15, 30, 45 and 60 days at room temperature (~30˚C) condition. The treatments were laid out in a completely randomized design with three replicates. The soil was analyzed for: soil pH, electrical conductivity (EC), carbon dioxide (CO2), potassium, nitrogen, phosphorus, organic carbon (SOC) and soil moisture. Generally, the results showed significant differences between all treatments and the control. Soil pH slightly increased with the incubation period up to 30 days and the highest EC (dS m-1) was observed in 45 days. Soil OC values have reached its peak at 45 days of incubation. While the highest N (%) and P (%) was found in 30 days. There was a significant increase in K as days of incubation period.

Keywords: Chicken Manure, Leonardite, Soil, Biochemical Properties, Incubation Treatment

Biochar's Agricultural Usage Opportunities and Its Environmental Impacts

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Agricultural crop residues, carbon rich by-products that come out when the biomasses such as wood are heated via pyrolysis in an oxygen free environment are usually called as "Biochar". Various organic material types including herbal product and forestry waste products, urban – open area wastes, industrial biomass by-products, animal manure and sewage sludge can be used in the production of biochar. Among its benefits are: decreasing the global warming through applying stable carbon in the soil, waste management, bioenergy production, soil health and soil's productivity characteristics. In conventional tillage systems the biochar are generally mixed more or less homogeneously throughout the topsoil (in most arable soils from 0-15/30 cm depth). One of the unique features of biochars is that they have high specific surface areas. Due to this reason, they play an important role in changing the bioavailability and ecotoxicologic impacts of the chemicals on the soil microorganisms and thus in their propagation. It was reported that biochar is very effective in fixation of many of the natural and anthropogenic organic compounds. It prevents the washing down of the nutrients. It decreases the nitrogen oxide emissions. It increases the cation exchange capacity. Depending on the characteristics of the biochar used in the soil, it changes the pH. It increases the soil's water holding capacity. It increases the biological activity of the soil. While the studies on biochar interactions in regard to soil and environment increase significantly, some of the potential unwanted results have not been analyzed completely or have not been reported yet. In order to understand the long-term agricultural and environmental impact of biochar application in the soil, the bases of potential and sustainable biochar technology must be recognized, and the impacts must be thoroughly determined after long-term applications are conducted appropriately.

Keywords: Biochar, Soil, Nutrient, Agriculture, Environment

Research of the methods for sımultaneous extractıon of macro and mıcro nutrıents ın acıdıc soıls

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Acid soils constitute more than quarter part of agricultural lands in Thrace Region and major part of the agricultural lands in Black Sea Region. This research was carried out to extract available soil macro (K, P, Ca, Mg) and micro (Fe,Cu, Zn, Mn, B) nutrients in 107 acidic soils sampled from Thrace Region by using single extraction solution (multinutrient extract solution) and analysis by ICP –OES equipment and determination of correlation coefficient between this method and classical other laboratory analysis methods.

For this purpose, Mehlich III, ammonium bicarbonate-DTPA (AB-DTPA), acid ammonium acetate-EDTA (AAAC-EDTA), modified Morgan and water extraction methods were used to extract available macro and micro nutrients.
According to correlation test results of classical macro and micro nutrients extraction methods, high correlation is determined for many of the nutrients in acidic soils between routine methods and Mehlich-3 extraction method and acid ammonium acetate (AAAC-EDTA) method.

Keywords: Acid soils, multinutrient extraction methods, Mehlich III, AB-DTPA, AAAc-EDTA, İCP-OES

Plant-available soil nitrogen – estimates and interpretations

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The Best Agricultural Practice urges to consider all possible sources of the nitrogen available for crops before decision is made for the use of fertilisers. Soil nitrogen supply is one of the most important parameters as well as the most complicated one to be considered for making fertiliser recommendations. Because of the high mobility of nitrogen compounds in soil, direct measurements do not always give an appropriate answer; besides, such tests are expensive and complicated therefore not popular among farmers. A simpler indirect soil nitrogen supply assessment method could be used taking into consideration the strong relationship among soil organic matter content, soil pH, and total nitrogen content in soil. Usually, data about the organic matter and pH status in soil is available for each field on each farm as these parameters are included in the routine soil test packages. The total soil nitrogen apparent recovery factors developed from field experiment data were used to quantify the amount of nitrogen available for winter rye and wheat, spring wheat and barley, winter and spring rape as well as for potatoes grown on mineral soils in Latvia. On average, the following soil nitrogen recovery factors, calculated from the total soil organic nitrogen pool within 0–20 cm depth, were obtained: winter cereals – 3.3–3.4%, winter rape – 2.3%, spring cereals and rape – 1.8–2.6%, and potatoes – 3.8%. There was a strong correlation ($r = 0.980$, $P <= 0.01$) between apparent recovery values if they were calculated only based on a 0–20-cm or 0–40-cm soil layer. Therefore, it is possible to make calculations only for topsoil data that are commonly available from routine soil tests. Studies on correlation between total soil nitrogen and soil mineral ($N–NO_3$, $N–NH_4$) nitrogen were performed for assessment of nitrogen supply to crops.

Keywords: total nitrogen, mineral nitrogen, crop requirements, assessment methods

The Relationships between Response of Phaseolus (Phaseolus Vulgaris L. Var. Nanus) Plant to Iron and Chlorosis Indices Values and Some Properties of Soils

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The aim of this study was to determine the relationships between the response of phaseolus (Phaseolus Vulgaris L. Var. Nanus) plant to iron fertilization and chlorosis indices values and some properties of soils.
Soil samples were taken 0-20 cm depth of agricultural lands of Bafra, Çarşamba and Suluova districts. Indices-1 and indices-2 showing capacity of available iron chlorosis formation were determined beside some soil physical and chemical properties. The response of phaseolus plant to iron fertilization with 0, 2, 4 and 8 ppm Fe-EDDHA applications was determined in these soils under greenhouse condition. According to the evaluations, iron application increased dry matter content more than 20% over the control in 20% of soils including less than 1% lime, 40% of soils including 1-5% lime, 41.7% of soils including 5-15% lime and 100% of soils including 15-25% lime.
Available iron contents of soils decreased, chlorosis formation indices-1 and indices-2 values of soils increased and bean plant showed positive response to iron fertilization of Fe-EDDHA form when total and active lime contents of soils increased. Similarly, when chlorosis formation indices-1 and indices-2 values of soils increased, increment values in plant dry matter due to iron fertilization increased.
While available iron content decreased with increasing sand content of soils, available iron content increased with increasing organic matter content of soils.

Keywords: Fe-EDDHA, phaseolus, response to iron fertilization, chlorosis formation capacity of soils, indices-1 (EDTA), indices-2 (ammonium oxalate), active lime, available iron

The concept of ionic activities in the evaluation of the soil sodisation

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S.A.R (sodium adsorption ration) is an evaluation parameter of the irrigation water quality which is calculated from concentrations of ions Na+, Ca++ and Mg++ in water. Its use implies that the irrigation water is transformed into soil solution without change of its composition. This parameter is used to predict the exchangeable sodium percentage (E.S.P) level when the soil adsorption complex will be in equilibrium with this water. Therefore, the S.A.R is currently used to characterize the equilibrium soil solution - soil adsorption complex, to predict structure degradation by the dispersion of the clay with soluble sodium.
S.A.R usually used is calculated based on ionic concentrations which do not take into consideration the activity of ions in solution.
In reality there are different expressions that calculate the S.A.R:
S.A.R (c): Calculated from ions concentrations, S.A.R (a): calculated from activities of simple ions, S.A.R adjusted (c): Calculated from ions concentrations and adjusted, S.A.R adjusted (a): calculated from activities of simple ions and adjusted. The adjustment takes into account saturation state of the solution with calcite.
This work treated the relationship between E.S.P and different S.A.R aforementioned of soil samples from the plain of Bas-Cheliff (Algeria), the activities of ions in solution was calculated by ionic association model “active” from the results of the ionic balance analysis.
The results show that the best estimate of adsorption complex sodisation is obtained from the S.A.R adjusted (a) values; concentrations give an underestimation of sodisation of soil solution and consequently adsorption complex sodisation. Changes in the E.S.P for the different S.A.R show that the increase of sodium in the soil solution is accompanied with sodisation of soil adsorption complex and consequently degradation of soil structure.

Keywords: S.A.R, E.S.P, Concentrations, activities, calcite, sodisation, soil

Content and distribution of nickel in agricultural soils of Vojvodina (Republic of Serbia)

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Ni is essential in the nutrition of higher plants. However, high contents of Ni in soil, as well as of other heavy metals, may pose threats to the quality of the agroecosystem. 1,370 bulked soil samples (0-30 cm depth) were collected in order to test soil quality for farming purposes. A grid superimposed over a soil map of Vojvodina by means of a GIS tool has divided the agricultural land of the Province into 4 x 4 km units, each representing an area of 1,600 ha. The samples were analyzed for pseudototal contents (HNO3 + H2O2) and available (e.g. EDTA) nickel content by ICP-OES. Pseudototal content of Ni in 119 tested samples was above threshold of 50 mg/kg (which is the maximum allowable concentration) for agricultural soils. The obtained results were within interval 4,3-218,5 and 0,2-33,1 mg/kg for pseudototal and available content, respectively. The majority of present results have low available Ni content which indicates geochemical origin of this element. The majority of present results for pseudototal Ni content were within intervals of 4.3-25 and 25-50 mg/kg, 411 and 840 of total 1,370 samples, respectively. The low pseudototal content of Ni below 25 mg/kg is found in sandy terrains and loess plateaus. Soil with pseudototal Ni content within the interval of 25-50 mg/kg generally occupies loess terraces. Soil with pseudototal Ni content within the interval of 50-75 mg/kg occupies alluvial plains. Soils with Ni content higher than 75 mg/kg occupy alluvial plains in the southern parts of the Province and parts of the Fruska gora mountain region. Southern part of the Province comprises alluvial plains of the Sava River, which indicates that the origin of Ni near the river might be from anthropogenic sources. This paper presents the results of the research within the National Project No. TR31072.

Keywords: soil, nickel, geochemical origin, geomorphological units

Indole – 3 – acetic - acids and carbon status in a peat soil under renaturalization

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The main task of this research was to study indole-3-acetic-acids (IAA) and carbon status in peat soil under renaturalization. In the experimental soil exposed to renaturalization for the past 12 years, differences in soil chemical properties were determined between the fields under different land management. Renaturalization was investigated in peat bog (Terric Histosol) at the former Radviliskis Experimental Station of the Lithuanian Institute of Agriculture. Soil samples for chemical analyses were taken from a peat bog soil from 0–10, 10–20 and 20–30 cm layers in 3 replicates in 2012 - 2014. Chemical analyses were carried out at the Chemical Research Laboratory of Institute of Agriculture.
Red clover and timothy mixture had a higher amount of IAA (163 µg kg-1) (0-30cm layer) compared to the other treatments. IAA decreased with the depth in all treatments. The previously differently used peat soil contained different status of organic carbon (SOC). Perennial grasses previously fertilized with commercial fertilizers (N120P60K120) had the highest content of SOC (439 g kg-1), the lowest content was in, unused peat soil (403 g kg-1) and there was set the highest lability of carbon. This work is an attempt to fill in the gap in research on soil renaturalization works.

Keywords: peat soil, SOC, IAA, renaturalization, land use

Determination of Plant Available Copper in Soil Samples Using Glassy Carbon Electrode

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Voltammetry is an alternative method for spectroscopy to determine trace metal contents in various soil extracts. This method is suitable for on-site environmental monitoring analysis due to its portability, low cost and short analysis time[1].

In this study, a simple and rapid analysis method was proposed to determine Cu(II) in soil samples using a glassy carbon electrode. Soil samples were collected from Black Sea region of Turkey. Anodic type stripping voltammetry technique were exemined for the detection of Cu(II) ion. Various experimental parameters, which influenced the response of Cu(II) were investigated in details. Magnitude of the oxidation peak currents were used to get optimal parameters. Preconcentration potential, stirring rate and preconcentration time were determinated as -0.9 V, 450 rpm and 60 s, respectively. Suitable supporting electrolyte type was also determined as 0.03 mol.L-1 HNO3. The analytical applications of the prepared electrodes were tested on soil samples. Analytical variables such as linear working range, detection limit, etc., have been determined for Cu(II). The proposed method has excellent analytical characteristics that include ease of handling, high sensitivity, wide linear dynamic range and low detection limit.

[1] Serrano N., Alberich A. Diaz-Cruz J.M., Arino C., Esteban M., 2013, Coating methods, modifiers and applications of bismuth screen-printed electrodes. Trend. Anal. Chem. Vol. 46

Keywords: Voltammetry, Copper, Available, Glassy Carbon Electrode, Soil

Application of kinetic models in describing copper release characteristics in amended and un-amended soils with municipal sewage sludge

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Release of copper (Cu) in amended and un-amended soils with municipal sewage sludge (MSS) plays profoundly role in controlling Cu availability in these soils. The objective of this research was to study the effect of MSS (1% w/w) on Cu release characteristics in 10 calcareous soils and estimate Cu release characteristics by soil properties. The amended and un-amended soils were incubated at field capacity at 25±1 oC for 30 days. After incubation period, the kinetics of Cu release in amended and un-amended soils were determined by successive extraction with DTPA-TEA solution in a period of 1 to 504 h at 25±1 oC. Results of kinetics study showed that desorbed Cu and release rate in the amended soils were higher than the un-amended soils. The results showed that released Cu increased 15 to 42% in amended soil compared to un-amended soils. The amounts of desorbed Cu in the un-amended soils ranged from 5.85 to 10.70 mg kg-1, while, the amounts of desorbed Cu in amended soils ranged from 7.62 to 12.45 mg kg-1. Release kinetics of Cu in soils conformed fairly well to power function, simplified Elovich, parabolic diffusion, and first order equations. The results of stepwise regression analysis indicated that calcium carbonate equivalent and clay can be used to estimate Cu release characteristics in DTPA-TEA solution in both amended and un-amended calcareous soils.

Keywords: calcareous soil, Sewage sludge, Cu, release

The effect of municipal sewage sludge on the available potassium in some calcareous soils

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Potassium is a macronutrient in plants and animals. Organic manures contribute to plant growth through their effect on the physical, chemical and biological properties of soil. Information about effect of organic manure on available K in calcareous soils is limited. The objective of this research was to study the effect of municipal sewage sludge (MSS) on available K in 5 calcareous soils. Municipal sewage sludge was applied the rate of 0, 0.5, 1, 2, 10 and 20 % (W/W). Samples were incubated at 25±1 0C and 20% moisture content for 150 days. At the end of incubation, available K in soil samples was extracted by 0.1 M Bacl2, 1 M NH4oAC, 0.5 M NH4oAC, 0.01 M CaCl2 and Mehlich 1 methods. The results shows that there was a liner increase in soil available K with MSS application. There was a significant positive relationship between K extracted by extractants and MSS application. The availability index in 0.1 M Bacl2, 1 M NH4oAC, 0.5 M NH4oAC, 0.01 M CaCl2 and Mehlich 1 extractants ranged from 4.85-5.67, 3.61-9.24, 2.66-11.30, 7.85-10.68 and 3.05-6.46 respectively. It be concluded that MSS applied to calcareous soils may enhance K nutrition of plants.

Keywords: municipal sewage sludge, availability, Potassium, calcareous soils

The content of low molecular mass organic acids in roots and the exudation of arctic willow (*Salix polaris*) as a strategy for nutrients release in arctic soils (Svalbard)

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The exudation of low molecular mass organic acids (LMMOA) represented a strategy of plants for releasing of nutrition and risk elements detoxification. Exudates are sources of carbon and energy for microorganisms. The aims of this contribution are 1) to describe a speciation and the content of LMMOA in root biomass and in root exudates of arctic willow (*Salix polaris*) and 2) to asses and compare the amount of available nutrients in different habitats of high-arctic tundra in Petuniabukta (Billefjorden, Svalbard).

Willow plants and soils were sampled on 4 localities under different vegetation covers (almost bare glacier forefield 25–69 years after deglaciation, partly vegetated (30%) tundra, fully vegetated dry tundra, and wet hummock-tundra). Five willow plants with roots and surrounding soil were collected on each locality. The root biomass was extracted by hot water. The exudation was carried out in deionised water for 2 h. Analysis of LMMOA and inorganic anions in both solutions were done by ion chromatography. Soil pH, the contents of water extractable nutrients and selected elements and soil sorption complex were also determined.

The most abundant LMMOA species in willow root infusions and exudates were lactate, acetate, formate, malate, and citrate. Lower amount of pyruvate, quinate and oxalate were also determined. The differences in LMMOA speciation were observed between sampling habitats. The content of certain LMMOA (mainly citrate) significantly correlated with water extractable $PO_4^{3-}$and K. The study of plants LMMOA in arctic region is important for assessment of the vegetation influence on initial soil development and nutrients releasing strategy of plants.

Keywords: Low molecular mass organic acids, exudation, artic willow, tundra habitats, nutrients

Development of an Automatic Titration System for the Determination of Calcium and Magnesium Macro Plant Nutrients in Soil

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Determination of Ca and Mg macro plant nutrients is extremely important both for the need of a balanced fertilization recommendation and for a high-quality product (1).
The two main methods for their analysis are:
1. Standard Method: Manual titration by EDTA in the laboratory
2. Spectroscopic devices: ICP-OES and AAS (2)
Automatic titrators are also commercially available on the market including common tests such as pH, salt, TAN (TotalAcidNumber), TBN (TotalBaseNumber) and others. These devices are used for an everyday analytical processes in industries from mining to food processing whereas there is no fully automatic system yet in order to determine available Ca and Mg elements in soil (3).
In this study, an automated titration system has been investigated for this purpose. The most important innovation in this context is using a detector system to see and save the end point (color change) during titration. We tested herein two different types of sensors (fiber optics and video camera) to find an appropriate option for our system. All experiments were done by standard EDTA method in the laboratory and repeated in the presence of these two different types of sensors each time. Results showed that video camera demonstrates the best performance for the titration of Ca ions. The data was extracted by using Corel PaintShop ProX7 program to construct calibration curve for quantitative determination.
This study showed a significant and fundamental aspect to make titration-based analysis for an automatic platform.

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Keywords: Ca-Mg analysis in soil, automatic titration, sensor technology, agricultural anaysis

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A physical model of the water retention curve of a hydrophobic forest soil

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The existence of an organic hydrophobic coating on the surface of soil particles may modify the soil's wettability, quantified in terms of the contact angle of the water-air-soil interface. It is therefore expected that, among others, the water retention curve would be consequently affected by the change in the surface of pore walls. We develop a physically based model of the characteristic curve of a hydrophobic soil, in which the model's shape parameters are defined in terms of the statistics of the soil's pore distribution and the contact angle. The model predictions were compared with water retention measurements of a hydrophobic organic forest soil and its corresponding hydrophilic counterpart. We found that the air entry value or soil bubbling pressure is a relevant parameter to define the soil's hydrophobicity. We propose a mechanism to explain how the various components involved in the retention of the studied soil, such as structure, hydrophobicity and organic matter, affect the soil-water characteristic curve during a drying process.

Keywords: hydrophobicity, organic matter, volcanic soil, modelling, Kosugi's water retention model

Tillage effect on soil physical properties

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Spatial variability of soil physical properties in a cultivated field such as; bulk density (BD), penetration resistance (PNT), saturated hydraulic conductivity (Ks), field capacity (FC) and permanent wilting point (PWP), were determined by geostatistical method. While BD values varied between 1.12 and 1.41 g cm-3, PNT resistance in 15 cm soil layer varied between 0.66 and 1.88 MPa. Also, clay content (31.48 to 43.97%), Ks (1.46 to 3.37 mm h-1), FC (30.40 to 39.66%) and PWP (19.22 to 24.42%) values showed variations among the sampling points. In kriging interpolation for the spatial variability of soil physical properties, the biggest r2 and cross validation r2 values were determined with spherical model for PNT, Ks, FC values, and exponential model for clay content, BD and PWP values. Spatial dependences of the properties, except BD, were found to be strong in the field. The semivariograms for clay, BD, PNT, Ks, FC and PWP showed spatial dependences with the ranges of 80.19, 19.67, 12.17, 18.40, 10.24 and 37.41 m, respectively. While PNT values significantly increased with increasing BD (0.366**) and decreasing moisture content (-0.408**), Ks values significantly increased with increasing BD (0.340*), and decreasing clay content (-0.905**) and PNT (-0.288*) values in the field.

Keywords: Cultivation, soil physical properties, spatial variability, kriging

The Effects Selenium on Plant Growth of Pumpkin (*Cucurbita Pepo* L.) in Drought Stress Conditions

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[1]Plant Nutrition
[2]Soil Physics

The objective of this study was to investigate the effects selenium on plant growth of pumpkin (*Cucurbita pepo* L.) in drought stress conditions. The study was carried out according to factorial experimental design with three replication in a chamber room under controlled conditions. The plastic pots having 2 kg soil were used as growing media with adding the basic fertilization of 250 mg kg-1 N, 75 mg-1 kg P2O5 and 100 mg kg-1 into each pot. Two different variety of pumpkin tolerated and non-tolerated to drought conditions were used in this study. The irrigation was made in three different levels of available water at 30%, 60% and 100% rates. The four doses of selenium (0 mg kg-1, 1 mg kg-1, 2 mg kg-1 and 4 mg kg-1) solutions as natrium selenat (Na2SeO4) form were applied when seeds were sown. The experiment was ended after seven weeks. Selenium applications increased plant growth criteria when compared to the control under drought stress conditions. The lowest and the highest values of plant length, root length, leaf number and leaf surface area were obtained as 7.0 and 19.1 cm, 6.6 and 16.4 cm, 4 and 8 number, 32.25 and 78.00 mm2 for non-tolerated plant variety, and 12.0 and 35.2cm, 5.8 and 20.4 cm, 5 and 10 number, 28.40 and 89.30 mm2 for tolerated plant variety, respectively. The measured plant growth criteria in tolerated plant variety were higher than that in non-tolerated plant variety in drought stress conditions. The positive effect of selenium application on plant growth criteria were generally more effective in tolerated variety than non-tolerated variety.

Keywords: Selenium, drought stress, pumpkin (*Cucurbita pepo* L.), plant growth

Prediction of Specific Surface Area of Soils Using Soil Properties

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In this study, specific surface areas (SSA) of soils taken different agricultural fields were predicted using pedotransfer functions. The values of SSA of 150 surface soils varied between 43.68 m^2 g^{-1} and 268.13 m^2 g^{-1}. Specific surface area had a significant positive correlation with clay content and significant negative correlations with sand and silt contents. Cation exchange capacity (CEC) among the soil properties had the highest correlation and direct effect (95.14%) on SSA of soils. It was determined that SSA values of soils, having significant correlations with clay, organic matter, EC, CEC and exchangeable Ca, K, and Mg contents, can be predicted by the equation derived using these properties of agricultural soils.

Keywords: Specific surface area, soil properties, pedotransfer functions, agricultural fields

Relationships between water stable aggregates and basic soil properties

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The objective of this study was to determine the relationships between water stable aggregates (AS) and basic soil properties, and to estimate the AS values of surface soils using linear regression models. 178 surface soil samples (0-20 cm) taken from cultivated agricultural fields were analyzed to determine AS, clay, silt, sand contents, soil reaction (pH), electrical conductivity (EC), organic matter (OM) content and exchangeable cations (Ca, Mg, K, Na). After determining the correlations between AS and soil properties, linear regression models were done using stepwise analyses in SPSS program. The AS values of soils varied between 2.01% and 79.14% with a mean of 23.50%. While AS values had significant positive correlations with OM (0.514**), clay (0.495**), Ca (0.171*) and K (0.157*) contents, they gave significant negative correlations with pH (-0.312**), silt (-0.312**) and sand (-0.242**) contents. To predict AS values, 6 linear regression models were produced by stepwise analyses. The R^2 values of the linear regression equations varied between 0.514** obtained using only OM as a variable and 0.805** obtained using the variables of OM, silt, clay, pH, K and EC. The values of AS can be predicted using the linear regression equation including less variables such as OM, silt, clay and pH with an R^2 of 0.779**. It was determined that OM, clay and silt contents are the most effective variables on water stable aggregates to predict in surface soils of cultivated fields.

Keywords: Aggregate stability, soil properties, linear models, prediction

Effects of Moisture Content and Freezing-Thawing Cycles on Agregate Stability of Soils

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In this research effects of freezing-thawing cycles on Aggregate Stability (AS) of loamy and clay soils with different moisture contents were investigated.
The soil samples were taken from the soil surface (0-15 cm) and sieved by a 2 mm screen. For both samles water-stable AS characteristics were analyzed. Then, they have replaced in soil sample rings. After equilibrium with two moisture level (0 bar and 0,5 bar). 0, 2, 4, 8 and 10 times freezing-thawing cycles were applied at -18 ˚C. AS analyses were done after each cycle. Finally the values of water-stable AS of samples with two different texture and moisture content were reduced. The most drashic reduction were observed on clay textured soil with 0 bar moisture content. The effects of freezing-thawing cycles were declined with coarse texture and low moisture content. These rigorous reduction on initial cycles have stopped after 4.th cycle.

Keywords: Aggregate stability, freezing-thawing cycles, Moisture Content, Texture

Soil physical properties changed with organic waste applications

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In this study, the effects of hazelnut husk and tobacco waste application on soil physical properties such as, bulk density, aggregate stability and saturated hydraulic conductivity were investigated under controlled greenhouse conditions. After incorporating 5% of organic wastes into soil, soil samples were incubated about 4.5 months under greenhouse conditions. Both organic waste treatments significantly increased organic matter content, aggregate stability and saturated hydraulic conductivity values of soil while they decreased soil bulk density values over the control. It was found that hazelnut husk and tobacco waste can be used as a soil conditioner material to improve soil physical properties and to prevent soil degradation especially in greenhouse conditions.

Keywords: Hazelnut husk, tobacco, bulk density, aggregate stability, permeability

Effects of Moisture Content and Freezing-Thawing Cycles on Agregate Stability of Soils

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In this research effects of freezing-thawing cycles on Aggregate Stability (AS) of loamy and clay soils with different moisture contents were investigated.
The soil samples were taken from the soil surface (0-15 cm) and sieved by a 2 mm screen. For both samles water-stable AS characteristics were analyzed. Then, they have replaced in soil sample rings. After equilibrium with two moisture level (0 bar and 0,5 bar). 0, 2, 4, 8 and 10 times freezing-thawing cycles were applied at -18 ˚C. AS analyses were done after each cycle. Finally the values of water-stable AS of samples with two different texture and moisture content were reduced. The most drashic reduction were observed on clay textured soil with 0 bar moisture content. The effects of freezing-thawing cycles were declined with coarse texture and low moisture content. These rigorous reduction on initial cycles have stopped after 4.th cycle.

Keywords: Aggregate stability, freezing-thawing cycles, Moisture Content, Texture

Determining the importance of soil properties for clay dispersibility using artificial neural network and adaptive neuro-fuzzy inference system

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The main purpose of the present research is to compare the results of Artificial Neural Network (ANN) with Adaptive Neuro-Fuzzy Inference System (ANFIS) in regard to determining the importance of soil properties affecting clay dispersibility. After sampling from two depths of 0--40 and 40--80 cm, the spontaneous and mechanical dispersion of clay were recorded using both weighing and turbidimetric methods. To determine the degree of importance of soil properties affecting clay dispersibility, first ANNs and ANFIS in MATLAB Software were learned using all research variables. After determining less effective properties and omitting them, the mentioned networks with remaining variables including percentage of clay, percentage of sand, soil reaction, electrical conductivity (EC) and sodium adsorption ratio (SAR) were learned and the degree of importance of each variable in clay dispersibility was determined. Finally, the results of ANNs and ANFIS were compared by calculation of validation parameters. Existence of high correlation between calculated values for weighing and turbidimetric methods showed a linear relationship between the two methods. In general, in both depths and for both weighing and turbidimetric methods, the sensitivity of clay dispersibility, to the percentage of clay and sand and SAR was higher than any other variable. Although the results obtained from the validation statistics indicate high accuracy of both ANN and ANFIS models, the last model showed relatively better results as compared to ANN model.

Keywords: Arid regions, Dispersible clay, Neuro-fuzzy models, Sodic soils

Performance of the several models in prediction of least limiting water range

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Pedotransfer functions (PTFs) may turn to be an alternative to the direct measurement. There are, however, contradictory information about the accuracy and reliability of developed PTFs for soil hydraulic properties using various methods including artificial neural networks (ANNs), multi-objective group method of data handling (mGMDH) and multivariate linear regression (MLR). Comparing these methods is main purpose of the current study. Laboratory measurements in 188 undisturbed soil samples with wide range of properties were used to compute four moisture coefficients (θwp,θ fc,θ sr,θ afp) from which experimental LLWR (LLWRe) was calculated. Eleven various soil attributes were also measured in disturbed samples and employed as independent variables to predict the same moisture coefficients and LLWR (designated as LLWRi) by ANNs, mGMDH and MLR methods. LLWR was also predicted directly (indicated as LLWRd) from the soil attributes. Accuracy and reliability of the developed PTFs to predict LLWRd and LLWRi, as compared to the LLWRe, was evaluated using root mean square error, Akaike information criterion and relative improvement. ANNs appeared as the most accurate and reliable tool for LLWRd and LLWRi prediction; mGMDH and MLR ranked in descending order. Significant differences in the prediction accuracy or reliability between the developed PTFs were evaluated using AIC. Results showed that both were significantly improved from MLR to mGMDH and ANNs, but between mGMDH and ANNs they were only significant at the training step. For LLWRi it was significant for validation step, too. More over LLWRd was better correlated to LLWRe (as a reference) than LLWRi implying that predicting least limiting water range directly from the soil attributes led to more accurate and reliable prediction than from the moisture coefficients as obtained from the developed PTFs

Keywords: accuracy, moisture coefficients, pedotransfer function (PTF), reliability

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The Effects of Different Organic Fertilizers Applied to Soils during Strawberry (Fragaria x ananassa) Cultivation

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For a long time, the use of chemical fertilizers has become a threat to both the human and environmental health due to the chemical ingredients. To overcome these negative effects of chemical fertilizers, different kind organic fertilizer using last decades. In addition farmyard manure and microbial fertilizer are used both organic and sustainable agriculture by farmers. This study has been conducted by adding organic fertilizer to soils where strawberry (Fragaria x ananassa) cultivation takes place, at different dosages by using four dosses of farmyard manure (FM) (0, 2, 4 and 6 tons da-1), two different biological fertilizers (BF1 and BF2) and combination of these applications. The experiment was conducted with 3 replications and 3 repetitions total of 72 pots with random trials block design. During the trials, the effects of these applications on soil and some plant properties have been examined. At the end of the study, it has been determined that the highest yield, the leaf area index, chlorophyll reading value, and dry plant material was obtained from is FM6+BF2 application, compared with control and other applications. When the soil is evaluated macro and micro nutritional content, it was decided most effective of FM6+BF2 combinations. As a result, it has been determined that the combination of FM6+BF2 application is effective against plant parameters and soil nutritional elements.

Keywords: Biological fertilizer, Farmyard manure, Soil, Strawberry

Effect of digestate and ammonium nitrate with limestone on specific soil properties

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The current human population has high energy consumption. The electric energy is obtained from various resources by their conversion. This process may adversely affect the environment in many ways. Alternative energy sources began to appear for mitigating the impact on the environment. One of them is the biogas, produced in biogas plants with digestate as a by-product. Digestate is commonly applied to the soil as a fertilizer but its effects on soil properties are not well known.
This paper shows the influence of the various kinds of fertilizes use on specific soil properties. It is an overview of the results obtained from the field trial from the year 2014. Field trail was realized on the soil during the corn crop production with the application of digestate and mineral fertilizer (ammonium nitrate with limestone) separately. The doses of the fertilizers were adapted to 150 kg. ha-1 of N.
The discussed soil properties are: bulk density, porosity, field capacity, maximum capillary, water capacity, minimum air capacity and soil structure, pH/H2O, pH/KCl, Corg content, ratio of humic acid (HA) and fulvic acid (FA), ammonium nitrogen, nitrate nitrogen and mineral nitrogen and macroelements content.
Obtained results indicate the differences in soil properties change according to specific fertilization. Certain soil properties reflected positively on digestate application (e.g. ratio HA:FA), other were more positive rather for mineral fertilizer application (e.g. phosphorus content). Bulk density shows independency between method of fertilization and resulting impact on the variable.
The positive or negative effect of digestate application has not been shown after first field trial. Changes in soil properties are long period issue, but these results are input material for the future evaluation of fertilization management with digestate.

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Keywords: soil properties, digestate, mineral fertilizer, corn

Modelling Agricultural Management Change for Lowering Nitrogen Leaching in Irrigated Mediterranean Area in Lower Seyhan Plain in Southern Turkey

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Nitrogen (N) cycle dynamics and its transport in the ecosystem was always an attracting process for the researchers. Calculations of N budget in agricultural systems with use of different empirical of statistical methods are common practice inOECD and EU countries. However these methodologies do not include climate and water cycle as part of the process. On the other hand studies on large-scale agricultural catchments are labour and work intensive. As a solution various computer modelling approaches have been used to predict N budget and related N parameters.One of them is internationally established Soil and Water Assessment (SWAT) model which was developed especially for modelling agricultural catchments. The aim of this study was to improve understanding of N leaching with simulationof agriculturalmanagementchanges (fertilisation, irrigation, plant species) in hydrological heavily modified catchment with irrigation depended agriculture under Mediterranean climate. The study was conducted in the Lower Seyhan Plain Irrigation District (Akarsu) of9,495 ha in Cukurova region of southernTurkey. Intensive and extensive water and nitrogen monitoring data (2008-2014), soil properties, cropping pattern and crop rotation was used for SWAT model build, calibration and validation of the model. One of the most limiting factors in calibration was lack of data on actual irrigation water amount used on the arable fields with flood irrigation techniques. The model results showed that water cycle with irrigation water inflow and outflow as well as bypass flow pattern has an important impact on nitrogen load and concentration in surface waters. Results of the agricultural management and crop growth showed that farmers in the area have applied nitrogen thoughtlessly and in excessive quantities causing high N leaching to groundwater and drainage (30 to 55 kg N ha-1) and pollution of surface waters.

Keywords: Nitrogen budget, Modelling, fertilisation, SWAT, cropping pattern, irrigation

Tracing organic and inorganic pollution sources of agricultural crops and water resources in Güzelhisar Basin of the Aegean Region–Turkey

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Güzelhisar Basin which is quite near the city of Aliaga in Ege Region of Turkey is a rather industrialized area where five iron and steel factories exist next to the cropping areas. The dominant crops are cotton, maize, vegetables, olive trees and vineyards.Water for the irrigation of these crops are supplied from Güzelhisar stream and the dam. However, industrial activities in the region threatens and will continue to threaten sustainable agriculture possibilities.

The objective of this project was to study the plant nutrients, hazardous substances, radionuclides and heavy metal contents by examining the soils, agricultural crops and natural plants from Güzelhisar Basin and water and sediments from Güzelhisar stream and dam.In order to accomplish the goal, grid system was established to study the 150 Km² of land systematically. The survey study was planned to continue 2 years successively. One year is already over and some of the laboratory work is finished

Preliminary results from the first year showed that there is no any threating condition in terms of heavy metals and in terms of natural radionuclides. Only the land near the coast had salinity and alkalinity problem which threatens and will threaten the plant growth

Keywords: Güzelhisar Basin, Pollution, Heavy Metals, Radionuclides

The effect of adding different organic metarials on some soil properties

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In this experiment, the effects of different organic materials addition on some physical and chemical properties of soil have been studied by the application of four different sources of organic material to soil. The study was carried out under the greenhouse conditions as pot experiment. Organic materials were applied to soil in three different doses, being pigeon manure, vermicompost, humic acid and barnyard manure.
According to the results of research into soil types and doses of organic material of some physical and chemical properties of soil has been a different effect on. A month 3 incubation period at the end, the different origin of organic materials of soil organic matter content (OM), cation exchange capacity (CEC), soil reaction (pH), electrical conductivity (E.C),trace elements, total nitrogen and phosphorus content of some physical and chemical properties on the effects of different levels occurred. As a result of the study, it showed that the soil regularly and efficiently with the use of organic materials with different origins could be able to improve the physical and chemical properties.

Keywords: Pigeon manure, vermicompost, humic acid, manure

The determination of soil properties and nutritional status of tomato plants grown under greenhouse conditions in West Mediterranean Region of Turkey

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In this study; the fertility of soils and nutrient status of plants were investigated in protected tomatoes cultivation for the provision of guidelines to farmers and researchers for better crop production.

The experiments were conducted at two growing seasons in Antalya Province in Mediterranean Region. Soil and leaf samples were collected from 32 greenhouses in first year and 45 greenhouses in second season grown tomato. Soil and leaf samples were collected at first fruit set and harvest period. pH, CaCO3, total soluble salt, texture, organic matter, total N, NO3-N, NH4-N available P, K, Ca, Mg, Fe, Mn, Zn and Cu of the soil samples were analyzed. Also N, P, K, Ca, Mg, Fe, Mn, Zn and Cu content of the leaves samples were determined.

Soil samples were mostly slightly alkaline, medium textured, rich in calcareous, low in organic matter and had moderate, high and very high in salinity.Total N, NO3-N and NH4-N content of soils were mostly sufficient and high. Available P, K and Mg were generally high level and available Ca level also was medium and high. Available Mn, Zn and Cu were sufficient level, the available Fe content ranged from low to high.

The results of leaf analysis showed that the N and Ca content of the samples were high in most of the greenhouses. While P, K, Mg, Fe, Mn, Cu contents of the leaves were sufficient and high level, Zn contents were changed between insufficient and high level.

According to results EC, P, and K level of greenhouse soils were increased, pH, lime, organic matter, total N, available Mn, Zn and Cu concentrations were not changed during the growing season. N, Zn and Cu concentration of tomato leaves were decreased, Ca, Mg and Fe content were raised from the first fruit set to the harvest.

Keywords: Tomato, soil fertility, plant nutrient status, greenhouse

Effects of Foliar Applied Boron and Indole Acetic Acid (IAA) on the Growth and Boron and Nitrogen Content of Common Bean (Phaseolus vulgaris L.) Plant

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In this study, effects of foliar applied boron (B) and indole acetic acid (IAA) on the growth and, B and N content of bean plants were investigated in B deficient soil under greenhouse conditions. A two factorial (boron and IAA) experiment was conducted as randomized block design with 4 replicates. Treatments consisted of 0, 100, 200 and 300 mg L-1 B and 0, 100, 200 and 300 mg L-1 IAA sprayed to leaves of plant at the beginning of flowering. Fresh and dry weight of plants, and total N and B contents were determined. Results of the experiment showed that compared to the control, foliar B application increased plant B concentration. Total N content of plants were significantly decreased by 300 mg L-1 B application although boron contents and dry weight of plants were increased by foliar IAA application. Total N concentrations decreased in IAA treated plants. In can be concluded that, foliar applied 100-200 mg L-1 B and 100-200 mg L-1 İAA ameliorate growth and some nutrient concentration of bean plants grown in B deficient soil.

Keywords: Boron, IAA, foliar fertilization, bean

Effects of Humic Acid Treatments on the Seedling Emergence and Growth of Soybeans (Glycine max L. Merr) Cultivars

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Greenhouse experiment to study the effect of different humic acid (HA) doses on the growth of soybean seedlings, was conducted during 2014 at the Department of Field Crops, Faculty of Agriculture, Ankara University.
The trial was designed using the randomized complete block design with split-split blocks arrangement with three replications. The seed of the cultivar Adasoy, Nova and Nazlıcan of Soybean were treated with Delta Plus 15 HA (150 g / l HA + 30 g/l potassium oxide - trade name) for evaluation of root length, seedling height, fresh & dry weight of roots and seedling. According to the research, 100% seedling emergence was noted after all applications. Root length ranged 5.100 - 7.600 cm. The results further showed that 120 g HA/100 kg dose induced maximum root length on cv. Nova. Significant differences among cultivars in terms of seedling were determined for seedling length and the maximum height was measured as 23.767 cm on cv. Nazlıcan. Applied doses of HA compared to control seedlings showed increased seedling height with maximum value (22.533 cm) obtained after using 60 and 120 g HA/100 kg. Maximum fresh root weight (2.643 g / plant) was noted on seedlings of cv. Nova after application of 60 g HA/100 kg. Maximum dry root weight (1.105 g/plant) was also noted on cv. Nova of soybean after using 60 g HA/100 kg. Considering seedling dry weight cv. Nazlıcan had edge over all other cultivars that were treated with HA and control. According to the research outcomes, significantly different results were noted among cultivars for seedling growth after treating seeds with 60 and 120 g HA/100 kg before sowing that positively affected seedling growth of soybean.

Keywords: Soybean, Glycine max L. Merr, Humic Acid, Seedling Growth

Interaction of Zinc and Some Heavy Metals in Dock (Rumex Patientia L.) Which is Grown Chromium, Cadmium and Lead Polluted Soils

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In this study, Dock (Rumex patientia L.) using some heavy metals (Cr, Pb, Cd) was applied to investigate the effects of zinc interacts with EDTA chelate. Therefore, as pots pollutants to 100 mg / kg Cr, Cd, Pb were applied as heavy metals Cr(NO3)3, Cd(NO3)3 and Pb(NO3)2 were given in the form. These heavy metals in the plant Dock (Rumex patientia L.) to increase the pot taken by the beginning of flowering for the 0, 5, 10 and 15 mmol kg-1 doses were practiced Ethylenediaminetetraacetic acid. Plants were harvested later two months development period It was determined with the increasing Ethylenediaminetetraacetic acid doses and Cr, Cd and Pb contents of Dock plant and the interaction of between heavy metal and Zn contents of Dock plant at the pot experiment. According to the results of experiments Zn contents of roots and leaves of plant gone up with increasing EDTA application to plants and increasing Cr, Cd and Pb contents of plants. These increases content were found to be statistically significant at the level of 1 %.

Keywords: Correlations, Zinc, heavy metal, Dock (Rumex patientia L.)

The Effect of Vermicompost on Macro Plant Nutritions of Pepper (Capsicum annuum L.)

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In this study, in the controlled conditions study was conducted, according to random experiment design in 3 liters pots. In this experiment, the effect of different doses (0, 3, 6, 9 and 12% vermicompost) applied vermicompost on contents of macro (N, P, K, Ca and Mg) plant nutritions on pepper (Capsicum annuum L.) was investigated. When the analysis of plant was evaluated, according to used doses average contents of N% respectively (0,95; 1,05; 1,13; 1,18; 1,19; 1,49), P % (0,60; 0,62; 0,64; 0,70; 0,74; 0,80), K% (1,04; 1,09; 1,10; 1,13; 1,35; 3,51), Ca% (0,36; 0,37; 0,42; 0,43; 0,48; 1,38), and Mg % (0,08; 0,10; 0,11; 0,12; 0,14; 0,30) was measured. The average N values increased to a different in comparison to the control but they measured under the standard value key to references. Generally P values were found sufficient. On the other hand K, Ca and Mg values were measured sufficient with only 15% application of vermicompost when they were comparison standard values.
There is an increase in the number of users and producers of vermicompost in our country. Vermiculture technology also supports to the sustainable agricultural production.

Keywords: Pepper, vermicompost, macro element, vermicultur technology

The Effect of Vermicompost Applications on Some Micro Nutrient Element (Fe, Cu, Zn, Mn) Contents of Cucumber (Cucumis sativus L.) Plant

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In the controlled conditions study was carried out, investigates the effects of different doses of vermicompost (3, 6, 9, 12, 15 %) and control (without treatment) applications on cucumber (Cucumis sativus L.) growth and some micro plant nutritions (Fe, Cu, Zn and Mn). This experiment was conducted in the 3 liter pot. Generally, plant growth, micro element contents were higher in 3 % and 6 % vermicompost doses according to the experiment results. According to the plant analysis results the average Fe contents (95,99; 97,39; 113,34; 94,24; 235,19 mg kg-1, respectively), Cu contents (5,78; 5,75; 6,31; 6,59; 5,88 mg kg-1, respectively), Zn contents (27,69; 39,59; 50,36; 50,30; 46,85 mg kg-1, respectively) and Mn contents (64,57; 65,94; 62,71; 59,81; 56,43 mg kg-1, respectively) were founded to considering doses. When taking into consideration the standard values, Fe, Zn and Mn contents were founded sufficient but Cu contents wholly insufficient in the all plant samples. Vermicompost is a material that maintains an environmentally sound for soils and highly economical means of sustainable agricultural production model.

Keywords: Cucumber, vermicompost, soil, environment health

Effect of Different Applications of Zinc on Pomegranate Yield and Fruit Quality

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The aim of this study was to investigate the effectiveness of soil, foliar and soil + foliar application of Zinc (Zn) fertilezer on Hicaznar pomegrenate cultivar in Manisa, Turkey. It was conducted in a randomized complete block design with four treatments in five replicate. Soil application (100 gr ZnSO4.7H2O / tree) and foliar spray (% 0.25 ZnSO4.7H2O) of Zinc applied with the recommended amount of N,P,K. Soil Zn application was applied a time at the end of February with 15.15.15 fertilizer. Foliar spray Zn applications were applied two times on the trees, first,before flowering and the second, one month after the first applications. Zn had possitive significant effects on the fruit yield and fruit weight. The highest yield is determineted on soil Zn application. Fruit weight is chanced on Control (641,36 gr) < Soil Zn application (686,00 gr) < Foliar spray Zn application (688,40 gr) < Soil + Foliar spray Zn application (689,27 gr). Zinc effects were not significant for TSS, TA, pH. Based on the results, Hicaznar cultivar respond differently to Zn fertilization under irrigation system.

Keywords: Zinc, Punica granatum, yield, Hicaznar, fertilizer

Nitrogen and Nitrogen Fixing Rhizobacteria Applications Affect Soil Properties in the Cultivation of Cabbage

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The intensive use of chemical fertilizers causes significant environmental problems contaminating ground water and surface waters in addition to the negative effects on soil and plants. This study was conducted to determine the effects of nitrogen fixing rhizobacteria treatments as plant promoting rhizobacteria (PGPR) on soil properties in the cultivation of cabbage plants in Agriculture Faculty Experimental Area in Atatürk University in 2012 and 2013. To investigate effect of bacterial treatments, nitrogen fixing rhizobacteria (Paenibacillus polymyxa RC14) was applied via seed coating and seedling dipping, and investigated 6 doses of nitrogen fertilizer (0, 4, 8, 12, 16, 20 kg / ha) on soil physical and chemical properties studied.
Both seed and seedling PGPR treatments affected statistically soil properties, increasing organic matter content and available plant nutrient element content. PGPR treatments decreased EC. It was determined that the values of EC, NH4, NO3, Na, P, K, Fe and Mn have also increased with increase of nitrogen doses, the highest EC obtained from application of 20 kg ha-1 doses N in both years. In both years, PGPR applications (seed and seedling) increased content of NH4, NO3, K, Ca, Mg, P, Fe and Cu of soil. According to average values, the highest total N and CEC were obtained from seedling PGPR treatments. The amount of soil enzymes such as urease, acid phosphatase, alkaline phosphotase and dehidrogenase increased generally with seedling PGPR application. When nitrogen doses were evaluated, the content of soil enzymes was increased with doses of 16-20 kg ha-1 N. In conclusion, the PGPR strain used in this study could be an alternative way for improving soil properties and promising for environment friendly agriculture.

Keywords: Soil, PGPR, Paenibacillus polymyxa, nitrogen, enzyme, mineral content

EVALUATION OF DROUGHT SUSCEPTIBILITY INDEX, CANOPY TEMPERATURES AND STAY GREEN LEAF DURATIONS OF CHICKPEA CULTIVARS (*Cicer arietinum* L.) TO DETERMINE OF DROUGHT TOLERANCES

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The main objective of this study was to compare some physiological and biochemical parameters, usable as selection criteria in drought resistance. In this paper, the results of the canopy temperature (CT), relative chlorophyll (RC), stay green leaf duration (SGLD) of chickpea cultivars under the drought stress were evaluated only with their's drought susceptibility index (DSI), not given to other research findings (unpublished). For this purpose in Ankara-Haymana conditions, two consecutive field experiment in 2007 and 2008 growing season were performed under drought ve irrigated conditions. The experiments were designed as randomized complete block design with 4 replicates. The eleven chickpea cultivars (Menemen-92, Akcin, Aydin-92, Izmir-92, Kusmen, Canitez-87, Gokce, Sari, Uzunlu-99, Er-99 ve ILC-195) used in this study showed great variations in response to drought stress. When drought susceptibility index of the cultivars was considered, there was differences two field conditions and also between years. The CT of the cultivars grown in drought conditions was determined to be higher compared with the irrigated conditions. Also, the lower of difference between canopy and air temperature (CT_{diff}) of the cultivars showed the ability to better tolerate drought. It was determined that was differences the RC measurements of the cultivars and were decreased by drought stress. At the same time, it was observed that the varieties, especially the longest of the SGLD, were less affected by drought. According to results of evaluated parameters that were DSI, CT_{diff}, SGLD, cvs. Kusmen and Uzunlu-99 was recorded as drought tolerant for every two field conditions. At the end of this study, it was concluded that the CT, CT_{diff}, RC and SGLD parameters which were less time-consuming and economical could be used as criteria for drought resistance together with morphological, physiological and biochemical parameters usable in selection studies.

Keywords: Chickpea, drought stress, drought susceptibility index (DSI), canopy temperation difference (CT_{diff}), stay green leaf durations (SGLD)

The effects of Clinoptilolite on Some Physical and Chemical Properties of Soils on Organic Grape Growing

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311.595 hectares of organic grapes are grown, which constitutes 4.6 percent of the world's grape growing area.
Turkey is a major producer country of grapes growing in the world. Viticulture is one of the major branches of agriculture with respect to production area and its large share of income in Turkish national economy. Since 1985, Turkey producing and exporting organic raisins, is a world leader in the production of raisins.
8418 hectares grape are grown organically which constitutes 1.8 % of the total grape production area of Turkey
The research was established in 15 years old Sultani Çekirdeksiz vineyard under irrigable soil conditions in Alaşehir-Yeşilyurt Enterprise of Manisa Viticulture Research Institute during organic production phase from 2006 to 2007.
The objective of this study was to determine the influence of an applied clinoptilolite on the content of nutrient elements in the soil on organic grape. It was carried out according to randomized block design trials with three replicates consisting of 12 vines per parcel.
In general, clinoptilolite application effected positively grape yield and the content of physical and chemical properties of soils compared to control.

Keywords: Sultani Çekirdeksiz, clinoptilolite, physical and chemical properties of soils, organic grape

Effects to Chlorophyll Content of Fertigation and Foliar Nitrogen Application on Golden Sel B Apple Variety

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The experiment was carried out during 2009 - 2011 period under the Yalova location. The aim of the experiment is to determine using fertigation and postharvest foliar fertilization methods with different nitrogen doses (0, 30, 60, 90 g/tree) and application times (Application:1 starts at early spring before the buds burst and ends 40-45 days ago from harvest, Application:2 In addition to A1 postharvest foliar nitrogen application, Application:3 starts after blooming and ends 40-45 days ago from harvest, Application:4 In addition to A3 postharvest foliar nitrogen application) effects on leaf chlorophyll content on Golden Sel B apple variety grafted on M9 rootstock. The experiment was designed according to randomized block factorial experiment design with three replication. According to the results increasing doses of nitrogen had increased the chlorophyll content of the leaves, however no significant differences was observed due to the different nitrogen application times on the chlorophyll content.

Keywords: Apple, nitrogen, fertilization, chlorophyll

Effects of Humic Acid Uses on Soil Micro Nutrient Availability in Industrial Tomato Growing

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Humic acids (HA) provide formation of the organomineral in soil, thus they improve agricultural production. The objective of this study was to find effects of soil HA applications on soil micro nutrient availability. Humic acid was sprayed on soil at the rate of 0, 4, 8, 12, 16 and 20 L da-1 soil along with uniform dose of nitrogen (N) was applied through drip irrigation. The experiment was conducted according to randomized complete block design with 4 replicates in two year. Results showed that soil application of humic acid caused increase soil available Fe, Zn, Mn and Cu content compared to control treatment. Humic acid applications did not affect soil available B content. This study confirmed that humic acid increased solubility of soil elements. In this way, soil humic acid applications can reduce chemical fertilizer use.

Keywords: Nitrogen, tomato, humic acid, micro elements, soil fertility

Effect Of Fertilization With Green Manure On The Yield And Quality In Viticulture

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The vine cultivation is performed for thousands of years in the lands of Turkey, which has an ecology where the viticulture has been developed. The soil fertility and balanced fertilization will have a significant effect on the yield and quality in the vineyard cultivation performed in a variety of ecologies in Turkey. In order to obtain high quality products in the vineyard cultivation, which is of great significance in Turkey's economy, the soil fertility should be maintained as well as other cultural practices, and additional nutrition control should be performed of the grapevine leaves and leafstalks under that ecological conditions. Mixing some immature, green plants to wither on a field is called green manure fertilization, and the plants used for this purpose are called as green manure plants. With green manure fertilization, organic matter content in the soil increases. A green manure fertilization performed on purpose is especially beneficial for soil which has lower organic matter and nitrogen content, hence poor physical characteristics. Green manure is also beneficial for the fertile soil with better physical characteristics by maintaining the level of organic matter continuously. The provision of organic matter to the soil by green manure fertilization has a positive effect on microbial activity in soil by providing a food source to soil microorganisms, and has brought some positive changes in soil. In this review, the importance of green manure plants in viticulture was studied in detail.

Keywords: Soil, green manure, vineyard, grape, plant nutrient elements

SWAT Modelling Approach to Nitrate Losses in a Mediterranean Area

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Modelling practices make it possible for the the current situation to be better understood, and results to be generated in the most economical and quickest way via scenarios made up for different purposes where agricultural activities are intense. In the Mediterranean Belt products with high economic value like cotton, citrus, corn and wheat are produced. Irrigation and fertilization are especially important for high product yield and product quality. In this study conducted in an Akarsu irrigation district the modelling process was prepared via surveys and manuel measurements. ArcSWAT, the interface for the program ArcGIS, is used in the study. The crop pattern provided by satellite data, the rates and timing of nitrogen fertilizer applied to the crops in this pattern, cultivation and irrigation rates and timing are determined as a result of one-on-one surveys conducted in the field with farmers. The flow rates from the input-output irrigation and drainage canals is recorded daily by measurement and sampling devices installed in the study field for previous projects in the past years. Water samples were taken from the drainage canals and NO3 analyses were carried out. The daily nitrate and water flow rate results, both from the drainage canal on the exit of the study field and the model, are calibrated accordingly.

Keywords: SWAT, Nitrate loading, Nitrate leaching, Fertilization, Irrigation, Best Management Practices

Comparison of humic substances and microbiological preparations on the yield formation of lettuce

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Interest of plant growth promoting and soil biological activity affecting preparations increasing not only for biological agriculture but also in conventional one.
Experiments were carried out to investigate the effectiveness of six different preparations (two of them contain combinations of alive plant growth promoting bacteria, two- humic substances from vermicompost, two- other source of humic substances. Vegetation pot experiments were arranged in the green house of Latvia university of Agriculture. Commercial peat substratum was used in experiments. Preparations were used twice a month during lettuce growth in concentrations recommended by producers. All experiments were done in four replicates. Plant pigment content was determined spectrophotometrically in ethanol extract of leaves, water retention ability, plant yield and dry matter– gravimetrically. At the end of experiment soil respiration intensity was determined by titration, dehydrogenase activity and FDA hydrolysis intensity – spectrophotometrically.
Results showed that plant leaf pigment content varied from -14.8% till +17.7% in comparison with control. Carotenoids content was more reliant on preparations in comparison with chlorophyll content. Used humic preparations improved water retention ability of plants. Soil respiration intensity, dehydrogenases activity and FDA hydrolysis intensity depended on used preparation. The dehydrogenases activity mostly decreased as result of treatment in comparison with FDA hydrolysis intensity, which increased as result treatment with preparations. The increase of lettuce yield not exceeded 10% in comparison with control. The best results were obtained with vermicompost preparations.
This work was supported by research project of Latvia Council of Science No 519/2012

Keywords: Soil biological activity, soil respiration, dehydrogenase, FDA hydrolysis, plant pigments, water retention ability

The effect of soil type and rhizobia strains on the yield formation of broad beans (Vicia faba)

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Broad beans are wholesome source of nutrition for people. Moreover they are valuable crop in different crop rotation systems.. The effective symbiosis between the plant and the soil microorganisms has significant influence on legume productivity. The efficiency of symbiosis depends on the biological and environmental factors, including the type of soil. The experiment was established to evaluate the effectiveness of Rhizobium leguminosarum strains on legumes growth and productivity in the different soil types.. Rhizobium leguminosarum strains (R23, Zir3, R407 and R505) were from the collection of Latvia University of Agriculture) In the field experiments broad bean (Vicia faba L.) cultivar 'Bartek' and 'Karmazyn' were grown in sandy, loamy sand and peat soil. Seeds were treated with suspension of bacteria before sowing. Control variant was without treatment with microorganisms. Plant length, amount of dry matter, weight and formation of nodules was analyzed at the flowering stage. Number of pods, seeds yield and protein content in seeds at the end of experiment. Experiments were done in 4 replications. Data were examined by Analysis of Variance, using Student criteria and Correlation analysis between plant growth parameters and protein content in seeds. Results showed that the growth and yield responses of both beans species to inoculation with Rh. leguminosarum strains vary in the different soil types. There were no significant differences among variants at fresh weight and dry weight of plants. The inoculation with rhizobia contributed protein accumulation in the broad bean seeds but degree of influence ranges between rhizobia strains. Therefore, is crucial to find suitable rhizobia strain or strains combination for different soil types.

Keywords: Soil type, legume, Rhizobium leguminosarum, protein content

Effects of organic conditioner applications on available P content in soils with different pH

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This study was carried out to determine the effects of rice husk compost(RC), town waste compost(TW) and tobacco waste(TB) applications on available P content in soils having different pH levels under laboratory and greenhouse conditions. Soil samples used in this study were taken from (0-20 cm) depth of soil surface of the lands around Samsun. Conditioners were supplied from the different corporations. Soil samples are moderately fine, fine and moderate in texture, acidic, neutral and alkaline in pH, low in salt content, low and moderate in organic matter level and low and high in lime content.In the study carried out in split split plot experimental design, rice husk compost, town waste compost and tobacco waste were applied into soils at four doses (0 %, 2.5%, 5.0% and 7.5%) with two replicates. After a month of incubation period, plants were grown in prepared media. According to analyses and evaluation of the results, it was determined that applications of rice husk compost, town waste compost and tobacco waste into acidic (Tepecik, TP), neutral (Kampüs,KP) and alkaline (Çetinkaya, ÇT) soils increased available P content.It was observed that effectiveness of soil conditioner changed depend on acid, neutral or alkaline soil reaction status with application dose and material property of conditioner.

Keywords: Soil conditioner, Availability, P, pH

Evaluation of soil main quality indicators under different soil management

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In Lithuania either the worldwide, the soil capacity as well as the crop productivity directly depends of the soil quality. The complex of factors determines the soil potential capacity, but the principal soil quality indicators is soil organic matter and biological diversity. Our investigation aimed to evaluate the long-term impact of different intensity tillage and organic fertilisers on soil organic matter quantity and microbial abundance. The study performed on based of long-term field experiment carried out since 1999 at the Experimental Station of Aleksandras Stulginskis University (former Lithuanian University of Agriculture) at 54º52'50 N latitude and 23º49'41 E longitude, on Epieutric Endocalcaric Endogleyic Planosol (according WRB 2014). The obtained results (2011 and 2013) indicated that reduced tillage systems without primary tillage (shallow rotovating before sowing and catch cropping for green manure, no tillage) had a positive effect on soil organic carbon (SOC) both plots with straw and without straw, SOC content increases respectively 24.8–21.7, 32.1–33.7 and 33.9–32.6%. Mentioned significant differences of SOC were even higher in 0-10 cm top layer, in 10-20 cm depth these effects were lover. It shows SOC stratification processes in reduced tillage systems without primary tillage. Mobile humic substances increased catch cropping for green manure (53.2%) and no-tillage (58.8%) only in plots with straw compared with conventional ploughing. The mobile humic acids amounts 39.8% in the treatments without straw and 45.6% as with straw from total amount of mobile humus substances. If increased soil microbial abundance the soil organic matter decomposition have a tendency to intensify due to reduced tillage with primary tillage (shallow rotovating before sowing and catch cropping) compared with conventional ploughing. Even though microbial abundance (especially abundance of micromycetes) has been higher, reduced tillage increased the total microbial biomass stocks. Thus, it leads to higher SOC turnover rates in different long-term tillage practice.

Keywords: soil organic carbon, mobile humic substance, microorganizms, tillage

Effect of Timing Nitrogen Application on Macronutrient Uptake, and Grain Yield of Wheat Genotypes under Water Deficit Condition

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In order to examine the effects of water supply on nutrient uptake in winter wheat cultivars, field experiment was conducted in Agricultural Research Station of Miandoab in West Azerbaijan during 2014-2015 growing seasons. Treatments were arranged as split plot based on RCB design with three replications. Irrigation levels including full irrigation (I1) and no irrigation at spike appearance stage (I2), the time and how the use of 120 kg nitrogen fertilizer including 20 kg ha-1 nitrogen fertilizer in sowing and 100 kgha-1 at tillering stage (F1), 20 kgha-1 nitrogen fertilizer in sowing and 100 kgha-1 at in the appearance of the stem (F2) and 20 kgha-1 nitrogen fertilizer in sowing, 50 kgha-1 at tillering stage and 50 kgha-1 in the stem elongation stage (F3) and 5 bread wheat cultivars including zarrin (G1), Pishgam (G2), Orum(G3), Zareh (G4) and Mihan (G5). The use of nitrogen fertilizer at sowing, tillering and the stem elongation stage showed higher means of the grain yield. The highest concentration of nitrogen, phosphorus and potassium were determined in F3. The most concentration of K, N and P were determined in Pishgham, Orum and Zareh, respectively. In order to results, Pishgham and Mihan were introduced as a genotype with high tolerance to water deficit stress in this study. Thus, as much as possible it should not be used these two types of wheat cultivars in water deficit condition.

Keywords: ***grain yield, macronutrient, water deficit, wheat genotypes***

Effect of Nitrogen Application and Drought Stress on Grain Yield and Magnesium, Iron and Zinc Uptake of Wheat Cultivars

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The objective of this study was to evaluate the effects of nitrogen fertilizer and water deficit on grain yield and Mg, Fe and Zn uptake of bread wheat cultivars. field experiment was conducted in Agricultural Research Station of Miandoab in West Azerbaijan during 2014-2015. Treatments were arranged as split plot based on RCB design with three replications. Treatments including water supply (normal irrigation (I1) and spike appearance stage drought stress condition (I2)) and the timing of 120 kg nitrogen fertilizer (including 20kg. ha-1 nitrogen fertilizer in sowing and 100 kg. ha-1 at tillering stage (F1), 20kg. ha-1 nitrogen fertilizer in sowing and 100 kg. ha-1 at in the stem elongation (F2) and 20 kg. ha-1 nitrogen fertilizer in sowing, 50 kg. ha-1 at tillering stage and 50 kg. ha-1 in the stem elongation (F3) on Mg, Fe and Zn uptake and grain yield in five winter wheat cultivars (zarrin (G1), Pishgam (G2), Orum(G3), Zareh (G4) and Mihan (G5)). According to the results, Irrigation, nitrogen fertilizer and cultivars showed significant differences in grain yield, and Mg, Fe and Zn concentration uptakes. The highest grain yield per unit area and Mg, Fe and Zn concentration were determined under well irrigation condition. The highest concentration of Mg, Fe and Zn were measured at F2. The highest concentration of Zn, Mg and Fe were determined in Pishgham and Orum. Pishgham was introduced as a genotype with high tolerance to drought stress in this study.

Keywords: drought stress, grain yield, micronutrients, wheat cultivars

Soil Aggregate Protected Carbon and Nitrogen Distribution under Red Pine and Oak Natural Forests in the Mediteranean Region of Turkey

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The distribution of organic carbon and total nitrogen in different soil aggregate fractions was stated to be affected by the different plant communities. In order to determine the protected carbon and nitrogen in the soil aggregates, the Red pine (Pinus brutia Ten.) and Oak (Quercus coccifera) rhizosphere soils of natural forests of the Göksu catchment of Turkey were studied. The soils were sampled in two sampling sites and two different seasons. One in the summer (27th June, 2012) and the other in the winter (4th February, 2013). Rhizosphere soils under the cover of Red pine (RP) was compared with Oak (Ok) canopy via carbon and nitrogen content distribution in different aggregate fractions (>2, 2-0.25, 0.25-0. 05 and <2 mm). The highest Soil Organic Carbon (SOC) % and total Nitrogen (Nt) % were determined in the Ah horizon of the soils of profile RP1, RP2 and Ok1 and the A1 horizon of the soil of profile Ok2. The highest SOC% and Nt % were obtained from the aggregates less than 2 mm of the soils of all profiles. This shows that the macro-aggregates (less than 2 mm) contain higher SOC and Nt than the micro-aggregates (0.25-0.05 mm) as was determined in soils of all profiles. The highest SOC % was obtained from the aggregates between 0.25-0.05mm (5.07 %) in the Bw horizon of profile RP2 but generally the SOC contents of the aggregates less than 2 mm were high in the Bw horizons of all profiles. The highest Nt content (1.28%) was obtained from the aggregates of less than 2 mm in the Bw horizon of profile RP1. The soils of the RP1 and RP2 profiles were determined to have higher SOC and Nt, when compared to the soils of the Ok1 and Ok2 profiles.

Keywords: Natural forest, soil organic carbon, soil total nitrogen, soil aggregate fractions

The project of vermicompost producing female farmers

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Vermicomposting is an alternative system that have many advantages for recycling of large quantaties of organic materials that increasingly produced in modern life and agricultural activities. Vermicomposts are derived products from the accelareted aerobically biological degradation of organic materials by earthworm and microorganisms activities. Earthworms can break down organic matter very rapidly, resulting in stable, a better structure, higher microbial content, avaliable nutrient content and nontoxic than composts. The aim of this study was teaching and adoption of vermicompost production for using in agricultural activities. Morever, this project was aimed to decrease the agricultural input prices of this system, environmental pollution by recycling of organic materials, to attain a sustainable level of production and ecologic balance, to popularise vermicomposting and to attract the attention of investors. In this context, the training courses was made about vermiculture, waste management, earthworms species, benefits and utilisation of vermicompost and vermicompost application for the producer technical staff and 30 female farmers in Kayseri. The traning and applied training courses were carried out as 48 hours of theoretical and 8 hours of practical educational activity for female farmers and producer technical staff. Technical visits are organized to vermicompost facilities where have high vermicomposting technology in Austria and Vienna for the end of this project. Women who completed this training courses, visited the vermicomposting and organic farm facilities of the company Vermigrant in Vienna and Salzburg, for the aim of to raise their mindfulness about the importance of vermiculture. An introductory film and a documantary narrated and some printed materials prepared in CD media and as brochure. Finally, for the closing session of this project, a “Vermicompost Workshop” was organized by Kayseri Directorate of Provincial Food Agriculture and Livestock in Kayseri, with the participation of the academicians, officials from the provincial administration and the vercompost producers.

Keywords: vermicomposting, traning course, female farmers, earthworm, waste management

Fish Manure Improved Some Soil Physical and Chemical Properties

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To increase the content of organic matter in the soil and to diversify renewable resources, very different efforts have been made, and in this context it was discovered many organic-based fertilizers. Integrated use of organic waste with chemical fertilizer, in terms of reducing the damage caused by the use of chemical fertilizers to people and the environment is seen as a way out.
This study was conducted to determine the use of fish manure on some chemical and physical properties of soil in the cultivation of lettuce plants. The study was arranged in a completely randomized design with four replications in pots. There were 3 fertilizer treatments (mineral fertilizer-MF, fish manure-FM, mineral fertilizer + fish manure- MF+FM) and 4 dozes (0, 100, 150 and 200 kg ha-1 N).
The effects of applications on pH, lime, organic matter, total N, EC, CEC, P, K, Ca, Fe, Mg, Na, Cu, Zn and Mn content of soil were statistically significant. While the highest pH was obtained from MF+FM-20 kg da-1 N application and the highest organic matter, total N, EC, CEC, K, Ca, Fe and Mg were obtained from FM-20 kg da-1 N application.
In the study, the application of fish manure affected soil characteristic and has increased both organic matter of soil and available nutrient content for plant. The use of fish manure used as a promising method can be employed to reduce the amount of chemical fertilizer.

Keywords: Fish manure, Mineral fertilizer, Soil, Organic matter

Effects of Different Nitrogen Doses and Sowing Dates on Soil Nutritient Content in Garden Cress (Lepidium sativum L.) Growing

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A field experiments was conducted during the 2013 and 2014 cropping seasons at Atatürk University, Faculty of Agriculture, and Department of Horticulture, to study the effect on soil nutritient content of 4 levels of N (0, 50, 100 and 150 kg/ha) under 3 sowing dates (22 August, 1 September and 11 September) in garden cress growing. Sowing dates and fertilizer levels displayed significant effect on soil nutritient content in both cropping seasons. Generally, higer values were obteined from the second sowing date. In the study, different nitrogen application was found that increased to contents of plant nutrients in the soil when compared with control application. 150 kg / ha nitrogen dose showed an activity enhancer the content of other plant nutrients in the soil except for K, Mg, Ni, Cu and Zn.

Keywords: nitrogen, sowing dates, garden cress, soil nutritient content

Determination of Macro And Micro Nutritions at Different Leaf Sections of Sultani Çekirdeksiz Grape Variety in Gediz Basin

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The present study was conducted with the purpose of determining the nutritional status of vineyards in Gediz Basin, where Sultani Çekirdeksiz grape cultivation is carried out, through the analysis of varying leaf sections. During the flowering periods of four years from 2006 to 2009, samples were collected from the vineyards in Manisa Central District, Saruhanlı, Turgutlu, Ahmetli, Salihli, Alaşehir, Sarıgöl and İzmir Menemen localities from three different leaf sections as full leaves, leaf stalks and leaf blades.

Leaf samples collected during the flowering periods were subjected to nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), magnesium (Mg), iron (Fe), zinc (Zn) and manganese (Mn) analyses.

While total N percentage was determined through the use of Kjeldahl method, P content in the extracts obtained through wet decomposition was measured in a spectrophotometer with the use of Vanodomolibdo Phosphoric Yellow Color method, and finally K, Ca, Mg, Fe, Zn and Mn contents were measured with a atomic absorption spectrometer. Results were obtained in % values for macro nutritional elements and as mg kg-1 for micro nutritional elements.

Keywords: Sultani Çekirdeksiz grape, Gediz Basin, leaf analyses, macro and micro elements

Determination of Microalgae's Potential of Microbial Fertilizer

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In this study, microalgaes' biofertilization potential was assessed in the greenhouse and field treatments. Greenhouse experiment was conducted to determine which of the 3 different types of algea (Oscillatoria amoena, Oscillatoria nigro-viridis, and Desertifilum tharense) more effective. One year field experiment was conducted in order to determine the effect of algea on the yield of white. In the both of experiments, soil samples (0-20 cm) were collected (before planting and after harvesting) and some of properties of soil such as pH, EC, nitrate nitrogen, ammonium nitrogen, total nitrogen, organic carbon, available phosporus, exchangable potassium, urease, β-glucosidase and alkaline phospatase enzyme activities were determined.

Results of green house experiment showed that Oscillatoria amoena was the most efficient species. According to the results of the variance analysis, total nitrogen, urease enzyme activity and wheat yield showed a significant increase with the application of combined algea and chemical fertilizer. Detailed dose experiments (on their own and combined with chemical fertilizers) of this microalgae species shall be performed. In addition it is beneficial to set up form experiments within different plant varieties in irrigated and dried conditions.

Keywords: Microalgae, microbial fertilizer, nitrogen, enzyme activity, wheat

October 20, 2016

Session Name	Environmental Pollution	
Convener	Dilek Atasoy	
Abstract Number	**Abstract Title**	**Presenter**
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Copper, lead and zinc content in surface soil collected from urban area of Novi Sad, Serbia

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The aim of the study was to determine the concentration of Cu, Pb and Zn in urban soil of Novi Sad, Serbia, to produce geochemical maps of the metals, and to identify sources of pollution. Surface soil samples were taken across the central part of the city covering a surface area of 4 km x 5 km. Soil chemical properties were obtained following a standard procedure and soil mechanical properties were determined in the < 2 mm fraction. Pseudo total concentrations of Cu, Pb, and Zn were measured using the inductively coupled plasma - atomic emission spectrometry. Contour maps of spatial distribution of the investigated metals were obtained using ordinary kriging interpolation method.

Zn concentration at examined locations varied from 46.2 to 193.8 mg/kg. Wider range of values is observed for Pb and Cu: Pb concentrations ranged from 8.9 to 999.1 mg/kg and Cu concentrations from 4.4 to 459.2 mg/kg. Most of the soil samples for Cu and Zn show minimal enrichment, and 20 – 35 % moderate enrichment. The highest contamination is found for Pb: 20 % of the samples show significant, and 10 % display a very high enrichment. The mean concentration of Cu slightly exceeds the limit value, while the mean concentration of Pb is very close to the limit value according to the Serbian i.e. Dutch quality standard values. The results of statistical analysis and distribution patterns obtained using GIS mapping technique implied that traffic was the most important source of pollution.

Keywords: metals, urban soils, pollution, mapping, ordinary kriging

Boron Levels in Agricultural Soils Around Large Borate Deposits ff Seyitgazi (Eskisehir, Turkey)

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Boron, the only non-metal among the elements of Group III in the periodic table, is not uniformly distributed in the earth's crust. Boron is an important, naturally-occurring element found throughout the environment. Turkey has 70% of total boron reserve of the world and the USA is the second boron source next to Turkey with 13% of boron reserve. Seyitgazi-Kırka is one of the important boron deposits area in Turkey. Seyitgazi Plain is one of the most important plain of Turkey and ongoing an intensive agricultural activities, is particularly a rich basin of borax. In this study, soil samples were collected from forty-seven stations in seasonally. Boron levels in samples were determined by EPA's method and the study area was visualized using ArcGIS 10 software. The boron concentrations were compared with the average concentrations have been reported in soil and the results were observed very high.

Keywords: Boron, agricultural soil, Seyitgazi, Turkey

An Investigation of Cr Heavy Metal Removal from soil with Dock Plant (Rumex patientia L.)

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The aim of this research was to remediate the heavy metal (Cr) pollution in agriculture areas with dock (Rumex patientia L.) plant in a pot experiment, greenhouse conditions. For this purpose, a pot experiment was done Namık Kemal University. Heavy metals (100 mg/kg Cr) as Cr(NO3)3, forms were applied each pots. Then EDTA chelate was applied each pots four doses (0, 5, 10 and 15 mmol/kg) in blossom time to plants. The plants were harvested after two months planting. According to the pot experiment results, Cr contents of root and shoot of plants increased with increasing EDTA application to the plants. These increases were found significant statistically at the level of 1 %. According to the this experiment results, some heavy metal pollution (Cr) can be remediated with phytoremediation method in Tekirdağ province soils.

Keywords: Phytoremediation, Chrome, pollution, Dock (Rumex patientia L.)

Phytoextraction capacity and chemical forms of cadmium in hydroponically grown Impatiens walleriana under two solution intensities

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Impatiens (Impatiens walleriana), a potential hyperaccumulator of cadmium (Cd), could accumulate high concentration of Cd in the various organs. According to previous experimental results, the uptake Cd was transfer to the aerial organs driven by transpiration because the subcellular distribution of Cd in the roots was mainly in the soluble fraction. A hydroponic experiment using rooted cuttings of impatiens were conducted in this study including four Cd concentrations (5, 10, 20, 40 μM) and two solution intensities (50% and 100%) with three replicates. The objectives were to assess the phytoextraction capacity and also to understand the detoxification mechanism by analyzing the chemical forms of Cd in the different organs. Experimental results show that the Cd treatments had negative effect on the chlorophyll contents. The impatiens grown in 50% solution intensity accumulated significantly higher Cd concentrations compared with 100% treatment. The maximum Cd concentration in the root and shoot was 2426±234 and 1424±166 mg/kg, respectively. Cadmium was primarily association with pectate/protein (FNaCl) for most of these treatments regardless of organ, solution intensity, and Cd concentration. Approximate 58-81%, 44-66%, and 38-65% of the accumulated in the roots, stems, and leaves were compartmentalized in the FNaCl. This is a possible mechanism for impatiens to alleviate Cd toxicity.

Keywords: cadmium (Cd), chemical form, Impatiens, phytoextraction

The impact of the coal combustion residues from Thermal Power Plant Tuzla on the environment

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Thermal Power Plant (TPP) Tuzla with the installed capacity of 800 MW burns about 3.3 million tons of coal annually producing over 1 million m3/year of coal combustion residues (ash). TPP Tuzla emits approximately: 73590 t/year of SO2 and 13000 t/year of NOx or 99% of the total emission in Tuzla; 18390 t/year of small particles or 96% of the total emission. Ash dust is dispersed over an area of several kilometers even by the slightest movement of air during the dry season. Local health practitioners confirm that there is evidence of an elevated percentage of registered cancer and respiratory incidences that are likely to be linked to the state of the environment.

At the investigated area of disposal site Divkovici II (68 ha) in Tuzla, status and properties of the deposited ash were investigated, primarily mechanical composition, pH reaction and the content of heavy metals (Pb, Cd, Hg, Zn, Cu, Cr, As), as well as their potential effect on all parts of the eco-system in the area of Tuzla.

The research results indicate that Cu, Cd, Cr and As exceed the permissible limit under the BiH Regulation on permitted amounts of heavy metals in the soil. The contents of Pb, Hg and Zn are within permitted limits. The level of pollution and the impact on the ecosystem of the examined heavy metals are presented in this paper. The ash is characterized by high pH reaction (freshly deposited >11), sandy powder fraction susceptible to erosion by wind and high CaCO3 content.

Properties of the ash in the dissolved state have direct impact on the quality of ground and surface waters, plant and animal world of the immediate and wider area of the disposal site as well as on the air pollution due to suspended particulate matter during the dry season.

Keywords: coal combustion residues, ash, heavy metals, environmental pollution

Heavy Metal Content of the Soils in Ergene Basin, Turkey

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This research was conducted around Ergene Basin in 10 different locations depending on Alpullu Sugar Factory in 2012. Lead (Pb), cadmium (Cd), zinc (Zn), copper (Cu), nickel (Ni), iron (Fe) and manganese (Mn) were analysed in September in order to determine of environmental pollution in this region's soils.
The lowest Cd was 0.028 ppm in Kadikoy. The highest Cd was 0.072 ppm in Evrensekiz. The lowest Cu was found 0.82 ppm in Ahmetbey and the highest value was determined in Buyukkaristiran as 3.46 ppm. The lowest Fe was 4.48 ppm in Igneler and the highest Fe was 16.96 ppm in Pehlivankoy. The lowest Mn was 3.01ppm in Kadikoy while the highest was found in Hayrabolu as 14.37 ppm. The lowest Ni were 0.043 ppm in Igneler and the highest Ni was 1.18ppm in Pehlivankoy. The lowest Pb was found in Igneler as 0.762 ppm. The highest Pb was 2,856 ppm in Pehlivankoy. The lowest Zn was determined in Ahmetbey as 0.53 ppm and the highest value was 6.01 ppm in Pehlivankoy.
The highest accumulation of heavy metals in all locations was detected in Büyükkarıştıran, Evrensekiz, Pehlivankoy and Hayrabolu.

Keywords: Ergene Basin, Soil, Heavy Metal, Sugar Beet

Assessment and management of contaminated sites in Serbia

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Since 2005 Serbian Environmental Protection Agency started creation of National Inventory of contaminated sites. The new legislation enacted in 2010 established the definition of contaminated sites together with reference values and provided a legal background for future prioritization studies and detailed investigations.
In the territory of the Republic of Serbia 393 potential contaminated and contaminated sites have been identified. From the analysis of contaminated sites management data, it can be concluded that preliminary studies on all identified contaminated sites up to 2014 year have been carried out, while main site investigations have been completed on a lesser number of sites. On average 0.56 Potentially Contaminated Sites are estimated to exist per 10.000 inhabitants.
The greatest number of registered sources of localized soil pollutions is related to municipal waste disposal (45.48%), industrial waste disposal (12,31%) and industrial and commercial activities (33.92%).
The great flood, which hit Serbia in May 2014, has shown that there is a need for better planning and management of contaminated sites. Rains led to a rapid increase of water levels in the main rivers in Serbia. The main environmental problems included: contamination of water and land from legacy mining operations and activation of landslides. The incident in the old and closed antimony mining site is one of the major independent environmental issues occurring from this disaster. Over 100,000 m³ of contaminated sludge poured into a local creek, which flows into the Sava river. Poorly stored hazardous waste in industrial plants were affected by the heavy rainfall and contributed to soil pollution. There is no recognized acute human exposure from toxic chemicals and hazardous waste releases were recorded from the floods, several contaminated ‘hot spots’ pose serious risks of localized chronic exposure in the medium to long-term.

Keywords: Inventory, contaminated sites, industrial sites, soil pollution, flood

Assessing Contamination of Soils Located Adjacent to a Cement Factory in Kahramanmaras Narlı Plain Using Elemental and Spectral Characterisation Techniques

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This study investigated the impacts of a cement factory on soil contamination in the Narlı Plain of Kahramanmaraş. For this purpose around 30 soil samples were collected at two sampling depths; 0-30 and 60-90 cm, and sampling points were recorded with a GPS. The soil samples were analyzed for total Ca, Mg, K, P, S, Na, Fe, Cu, Mn, Zn, Mo, Cr, Ni, Cd, Ti, Pb, As, Sr, Si, Al, and Zr elements using XRF and ICP. β factors obtained from gain-loss ratios were separately calculated for each element. Spectral characterization of soils in terms of contamination by elements were also evaluated using hyperspectral visible and near infrared reflectance spectroscopy (VNIRS) technique at wavelengths ranging from 350 to 2500 nm. After raw spectra was obtained, spectral decomposition was performed using Principal Component Analysis (PCA). The results showed that β values were around 1 for all samples and it did not change depending on the distance from the cement factory. The differences observed at one sampling point (sample number 17) was considered to be due to parent material. Spectral characterization of the samples taken from upper sampling depth using VNIRS-PCA method revealed that Cr and Ni were significantly correlated with PC1 with highly weighted by wavelengths in NIRS region, and Cu and As was significantly correlated with PC6 with highly weighted by wavelengths in visible region. For samples taken from subsurface (60-90 cm depth), only Mn was significantly correlated with PC1. According to both instrumental and spectral characterization of the samples, distribution of the investigated elements was mainly dependent on parent material. In addition, the evaluation of analytical gain-loss ratio values indicated that there was no addition from other sources into the system at the sampling time.

Keywords: total elements, Narli Plain, soil contamination, PCA, elemental analysis, spectra

Heavy metals in urban soils of an industrial city on the example of Skarzysko-Kamienna

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The conducted studies concerned a determination of the content of heavy metals in urban soils of Skarzysko-Kamienna. Soil samples were collected from thirty study sites around the city. The soil samples were collected from surface layers of industrial and urban green areas as well as urban allotment gardens. The soil samples were used to determine the total content of selected heavy metals: Pb, Cd, Cu, Ni, Zn, and Cr with the atomic absorption spectroscopy (AAS) method after mineralisation in aqua regia, and physicochemical properties: size composition with Casagrande's aerometric method modified by Proszyński, pHKCl with the potentiometric method, hydrolytic acidity Hh with Kappen's method, Hx and Alx with Sokolov's method, sorption capacity by Kappen's method. The highest content of heavy metals were noted for soils from the industrial areas. These soils were characterised by the increased content of Pb, Cu and Zn, which was proved by the analysis of contamination degree determined with the geo-accumulation index (Igeo). With respect to legal standards of soil quality, the soils were characterised by the permissible content of heavy metals. In the case of Cr and Pb, the normative content was exceeded in individual study sites, which indicated a point source of emission. The analysis of physicochemical properties of soils indicated strongly acidic and acidic pH and high hydrolytic acidity, and unfavourable sorption properties, which pose a real threat of leaching of heavy metals and their accumulation in plants. Moreover, the increased values of hydrolytic acidity with regard to the decreased values of cation exchange capacity make the soils vulnerable to acidification. Because of a great interest in amateur cultivation of vegetables and fruit in urban allotment gardens, the decreased pH values in the soils may cause leaching of heavy metals of the industrial genesis and their accumulation in crops intended for consumption.

Keywords: urban soils, heavy metals, total content, geo-accumulation index

Implementation of soil bioavailability concepts in the determination of German precautionary values

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According to the German Federal Soil Protection Act (1998), soil precautionary values are defined as "soil values which, if exceeded, shall normally mean there is reason that concern for a harmful soil change exists, taking geogenic or wide-spread, settlement-related pollutant concentrations into account". In the German Soil Protection Ordinance (1999), such values are given for nine metals. All of them were defined based on total concentrations ("aqua regia").
Regarding the pathway "soil – soil organisms" there is a poor correlation between total metal concentrations and their effects on microbes, plants and invertebrates. A realistic risk assessment of metals should preferentially be based on concentrations of their biologically available fraction – but it is not clear which fraction should be used for regulatory purposes and how to measure it. The implementation of bioavailability should account for several aspects affecting metal toxicity to soil organisms, such as the differences between laboratory and field conditions (including ageing processes) or the variations in the properties of natural soils (i.e. pH, clay content, CEC) – not to mention the form of the metal (i.e. water-soluble salts vs. metal oxides etc.).
The German Federal Environmental Agency has launched a project in order to develop a transparent concept to derive soil precautionary values considering ecotoxicological effects of bioavailable fractions of metals. The work starts with a literature review on existing concepts on the derivation of soil values for metals. Afterwards, a specific concept is formulated as a basis for practical testing. The latter is focusing on a limited number of metals, soils, ecotoxicological tests and extraction methods. The concept will be tested for a cationic metal (copper) and an oxyanion (arsenic or molybdenum). In the final step all available information is used to propose a new concept for including bioavailability into the derivation of future precautionary values.

Keywords: Soil ecotoxicology, microorganisms, plants, invertebrates, metals

Magnetic and chemical characteristics of metallurgical dusts and soils from the surroundings of steel and non-ferrous plants

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The main objective of this study was identification of manganese and iron (hydro)oxides occurring in industrial dusts and soils being under their deposition for long time period. In principle, Mn and Fe (hydro)oxides present in these samples originate from high-temperature technological processes. An assessment of soil condition in respect of its ecological hazard caused by excessive (with reference to the geochemical background) accumulation of manganese and iron in the upper soil layers was the additional aim of this research.
Soils samples (collected from different soil horizons) taken from surroundings of iron/steel and non-ferrous plants as well as metallurgical dusts, flue dusts and ashes from power stations were subjected to investigation. During the studies a mix of magnetic, mineralogical and geochemical methods were applied. Magnetic methods comprised low-field volume magnetic susceptibility measured in situ and in the laboratory, temperature dependent magnetic susceptibility and partition by isodynamic magnetic separator. Physical methods (in order to determine mineralogical characterization of samples), such as scanning electron microscopies and Mössbauer spectroscopies, as well as chemical methods - mainly determination of total content of HM using ICP-MS and sequential extraction in order to determine and identify specific chemical binding forms of metals, were also applied.
Results indicated distinction between (hydro)oxides of iron and manganese as well as differences caused by varied sources of these (hydro)oxides (steel or non-ferrous metallurgy). Specific values of Curie temperature and Mössbauer spectra were attributed to the specific mineral phases which had never before been subjected to similar investigation. Additionally, it was found that kind of metallurgical process influenced on the forms of iron and manganese which dominated in polluted soils and specific industrial dusts.

Keywords: soil contamination, industrial dusts, magnetic susceptibility, heavy metals

Assessment of potential for seven selected pharmaceuticals to migrate in the subsurface water environment

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The presence of human and veterinary pharmaceuticals in the soil environment is recognized as a potential threat. Therefore the sorption isotherms and dissipation half-lives of 7 pharmaceuticals in 13 representative soils of the Czech Republic were evaluated. In two cases, (trimethoprim and carbamazepine) sorption affinity was mainly controlled by organic carbon content. In four cases, sorption depended on two factors: soil pH (affecting compound ionization) and the number of available sites for sorption. Depending on the pKa of the pharmaceutical, either hydrolytic acidity (sulfamethoxazole partially existed in the anionic form) or basic cation saturation (clindamycin, metoprolol, and atenolol molecules mostly existed in cationic form), controlled sorption of pharmaceuticals on selected soils. In the case of clarithromycin (which also mostly existed in cationic form), sorption complex saturation played the most important role. The greatest persistence in soils was measured for carbamazepine, followed by clarithromycin, trimethoprim, metoprolol, clindamycin, sulfamethoxazole and atenolol. Half-lives (at least partly) reflected the sorption of the studied pharmaceuticals onto soil particles and increased with increasing sorption (sulfamethoxazole and clindamycin), which is usually presumed. However, in 3 cases (atenolol, metoprolol and trimethoprim) the half-lives decreased with increasing sorption and carbamazepine and clarithromycin mostly did not considerably degrade during our experiments. We propose that pharmaceutical persistence in soils is mostly depended on soil type. In general, for compounds that were degradable in the studied soils, lower average half-lives and variability were calculated for soils of better quality (Chernozems) in comparison to those of lower quality (Cambisols). Regarding the dissipation rates of the studied compounds, and sorption affinities, the highest potential to migrate in the soil water environment is expected for carbamazepine, followed by sulfamethoxazole, trimethoprim and metoprolol. Based on our findings, extended transport of clindamycin, clarithromycin and atenolol through the vadose zone seems improbable.

Keywords: pharmaceuticals, ionizable compounds, sorption, dissipation

Experimental and mathematical assessment of transport of four pharmaceuticals in the undisturbed soil columns

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Transport of four pharmaceuticals (sulfamethoxazole, trimethoprim, atenolol and carbamazepine) was studied in soil columns (a diameter of 10.5 cm and a height of 13 cm) taken from all diagnostic horizons of three different soil types (Haplic Luvisol, Greyic Phaeozem and Haplic Cambisol). The irrigation by water contaminated by mixture of all four compounds followed by ponding infiltration of distilled water was simulated and water outflow and solute concentrations from the bottom of the soil sample was monitored in time. The sorption isotherms off all four pharmaceutical were also evaluated. Experiments were performed for the individually applied compounds and for all compounds mixture. Soil hydraulic properties were measured using the multistep outflow experiment. Resulting sorption isotherms and soil hydraulic properties were used to simulate observed compound behavior in soil columns using HYDRUS-1D model. The sorption affinities of atenolol, trimethoprim (both molecules mostly existed in cationic form) and carbamazepine (not ionized) slightly decreased when evaluated for mixture of all four compounds in comparison to those evaluated for single solute solutions. On the other hand sorption affinity of sulfamethoxazole (which partially existed in the anionic form) increased in comparison to that evaluated for single solute solution. The greatest sorption affinity to soils was observed for trimetroprim followed by atenolol, carbamazepine and sulfamethoxazole. The same sorption afinity was measured for carbamazepine and sulfamethoxazole in the Haplic Cambisol. Observed compound discharge reflected evaluated sorption isotherms and soil structure. The highest mobility was observed for sulfamethoxazole followed by carbamazepine, atenolol and trimethoprim. Mobility of sulfamethoxazole decreased with decreasing pH. While mobility of atenolol and trimethoprim decreased with increasing base cation saturation, and with increasing organic matter content for carbamazepine. Simulations using the HYDRUS-1D program reasonably approximated measured data when assuming non-equilibrium water and solute flow (i.e. dual-permeability model and two-site sorption model).

Keywords: pharmaceuticals, ionizable compounds, sorption, soil columns, water flow, contaminant transport, mathematical simulation

Effects on the soil quality in an ecological control of the Medfly (Ceratitis capitata) with the use of the attractant " BIODELEAR"

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In the framework of the LIFE-Biodelear project the effects of soil quality in the ecological control of Medfly (Ceratitis capitata) with the use of the attractant “BIODELEAR” in orange orchards in the island of Chios, Greece, is studied.

For this soil samples were analysed for physicochemical properties and for soil N, Organic Carbon, Basal Respiration, Microbial biomass and residues of the agrochemicals used previously in the experimental farms.

Soils in the experimental fields at the beginning of the project were periodically sampled both bellow the orange trees canopies and between the trees rows and in soil depth 0-10 and 0-30 cm. Samples were analyzed for soil N, P, B, available K and Na, exchangeable Ca, Mg, CEC, available Cu, Zn, Mn, Fe, pH, salinity, organic matter and soluble anions such as CL-, NO3-, PO43-, SO42-.

According to the results, the first two areas, consist of soil with slightly alkaline pH, no salinity problems, low organic matter, medium quantity in total N, low amount of P, high amounts of Ca, Mg and poor in Mn, Fe and B, adequate CEC, K and Zn and high levels of CL- ions. The third area, consists of soil with slightly alkaline pH, no salinity problems but EC levels close to 4 mS cm-1 (salinity threshold), rich in organic matter, medium in total N, rich in available K, high amounts of Ca, Mg, adequate CEC, poor in Mn, Fe and B and rich in Cu and K, adequate in Zn and high levels of CL- ions. All areas presented excessive concentrations of water soluble ions especially CL- due to the bad quality of irrigation water. The above data will be combined with residues in soils and with basal respiration and microbial biomass data.

Keywords: Chios island, LIFE-BIODELEAR, soil properties, soil quality

Chemical composition of snow cover in Novi Sad, Serbia

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The scope of this study was to investigate the metal content in urban snow in Novi Sad, Serbia. Snow samples were collected near busy and less busy crossroads. Filtered samples of melted snow were analyzed by ICP-OES analytical technique to assess concentrations of nine metals.

The average metal concentration decreased in the following order (with the highest decrease in the first element): Na > Ca > K > Zn

> Fe > Mn > Cu > Al > Pb and Na > Ca > K > Zn Fe > Cu > Mn > Al > Pb,

> for high volume traffic and low

volume traffic locations, respectively. The highest concentration at all sampling sites was found for Na as a result of road de-icing salt

(NaCl) applied. The second and the third most abundant elements in the snow were found to be Ca and K which could be explained with the fact that rock (or soil dust) is most probably the source of Ca excess as well as of K. Semiquantitative analysis of the particles using scanning electron microscopy/energy-dispersive X-ray spectroscopy (SEM/EDS) was conducted and morphology of the particles was examined for dry matter of two snow samples. Dust particles of the snow samples were mostly composed of quartz, alkali feldspars and plagioclases. The aerosol particles recorded in snow were also consisted of spherical Si and C particles mainly originated from combustion processes.

Keywords: metals, pollution, urban snowmelt, SEM-EDS, ICP-OES

Agricultural lands in Russia contaminated after Chernobyl accident: the safety of crop production after a half-life period for caesium-137

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A large-scale radioactive pollution of agricultural lands affecting more than 2.3 million hectares in Russia was a result of Chernobyl accident in 1986. The areal of the most fertile chernozem soils of Tula region was also included into contaminated territory and received the name Plavsk radioactive hotspot. Initial levels of Cs-137 in soils of the area exceeded radiation safety standard by 5-15 times. Nevertheless it was decided to continue agricultural land use with the strict control of Cs-137 in vegetable production.
Such study was performed in 2011-2015 with the goal to determine modern levels of Cs-137 accumulation in soils of Plavsk radioactive hotspot and to evaluate the radionuclide transfer into main agricultural crops (wheat, barley, maize, rape, soybean, amaranth, potatoes) and pasture grasses. It has been found that chernozems of the area were still polluted with 4-8-fold excess above safety standard (176-282 kBq/m2) and significantly higher Cs-137 accumulation in soils of geochemically subordinate positions due to Cs-137 redistribution within river valleys initiated by soil erosion. As a whole, Cs-137 activities in roots and shoots of meadow vegetation with predominance of perennial grasses (73-120 Bq/kg) were also higher than in annual cultural crops of watershed, where Cs-137 activities in total biomass of cereals (37-70 Bq/kg) were greater than in total biomass of other crops (5-31 Bq/kg). Under this conditions Cs-137 transfer into edible parts of plant production not exceeded 6-12 Bq/kg for cereals, maize and rape (permitted level 60 Bq/kg), 32 Bq/kg for potatoes (permitted level 80 Bq/kg), 17-26 Bq/kg for fodder leguminous, non-leafy vegetables, pasture species and cultural grasses (permitted level 100 Bq/kg). Thus, inspite of long-term radioactive pollution of chernozem soils there is a reasonable possibility to obtain radioecologically safe plant production.
The study was conducted with the support from the Russian Foundation for Basic Research (project no. 14-05-00903).

Keywords: Cs-137, radioactive contamination, "soil-to-plant" transfer, Chernobyl accident

Environmental Effects of Haulage Operation with Truck in The Surface Mining

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Mining applications is a process which is making mineral available in the earth's crust to economic value in terms of the industry. In this context, mining applications that include all activities are performed underground and above ground. Whereas underground mining is a method used in situations where a very thick layer on the mineral stratum, surface mining is the process of removing the acquisition of the cover layer near the earth mineral ores. Above ground made in mining operations, during haulage operations conducted with trucks occurring adverse environmental effects it is higher than underground mining. These effects; can considered as air quality, soil and land use, flora and fauna, human values and visual pollution. The biggest factor which often cause environmental impact is dust that formed during processing drilling, ignition, excavation, loading, haulage, unloading operations. The dust formed during haulage, not only harm the environment but also for occupational disease in coal miners, who lives near the carriageways people's health, and causes a malfunction of fast means of haulage because of the density of the dust and tear. The biggest effect of dust on the flora. Dust effects of plant species distribution in the area by covering the plant leaves and causes of environmental impact due to increased risk. In this study, mining and mineral ore processing in the region between the area around the institution, during the truck haulage operations are environmental effects that may occur. These effects are air quality, soil and land use, flora, fauna, human values and powders having a significant impact on visual pollution, smoke, exhaust fumes, factors such as solid and liquid waste have been made in investigating possible solutions.

Keywords: Mining applications, Truck Haulage, Environmental Effects, Dust

Environmental risk assessment of drilling mud on soil and seabed

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It is widely recognized that uncontrolled discharge of petroleum products or other materials from onshore or offshore oil and gas exploration and production wells, and from associated industrial operations including treatment and service facilities that are required to be on or near the coast, can have direct and sometimes deleterious impacts on the environment. During both exploration and production drilling for oil, mud is used to lubricate and sometimes provide hydraulic power to the bit, to bring cuttings to the surface and to control reservoir pressure.
Present study aimed to 1) Assessment of environmental impacts and controlling actions to reduce them by FMEA (Failure mode and effects analysis) method; 2) identification and evaluation of drilling mud as an environmental hazard.
The environmental effects of fifteen oil platform on soil and seabed based on FMEA method was evaluated. For each identified impact the severity and probability of impacts has been calculated and its values after the control action has been estimated according to FMEA matrix. Based on collected data from three offshore platform in Persian gulf and onshore platforms, environmental effect of drilling mud was rated as high risk (5). Main important identification of mud drilling as hazard is due to its adverse effect on the soil and seabed biological community. The extent of biological effect is greater from oil-based mud cuttings than from water-based mud cuttings. Beyond the area of physical smothering, the effects of oil-based mud cuttings due to organic enrichment of the sediment and/or the toxicity of certain fractions of the oils used, such as aromatic hydrocarbons. Based on available data, application of synthetic-mud for offshore platform and Land treatment (promotion of microbial respiration) for onshore platform are effective elimination and control measures to reduce the risk significantly i.e. from high risk (5) to medium risk (3).

Keywords: Environmental impact, Risk assessment, Drilling mud, Oil platform, FMEA method

Ecological Investigation of Red Calcareous Parent Material Used Natural and Mine Quarry

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This study was conducted to investigation of soil and plant cover properties of red calcareous parent material in natural and mine quarry in Eldivan district of Çankırı Province. In two different uses of red calcareous parent material plant and soil (0-30 cm depth) sapmles were collected in 16 sampling point in different aspect and slop. Soil texture, field capacity (FC), permanent wilting point (PWP), available water (AW), bulk density (BD), soil reaction (pH), electrical conductivity (EC), lime (CaCO3), soil organic matter (SOM) content analysis was performed. In both uses of parent material, soil properties such as texture, EC, EC, PWP, FC, BD and pH were similar in terms of the difference between CaCO3 and SOM. Accordingly, soils formed from naturally occurring red calcareous parent material CaCO3 content of 1.30 to 4.36% (low) and SOM was found between 1.38 to 2.73%, in the land mines in the area used as CaCO3 content of 17%, 15 to 38.37 (high) and SOM ranged from 1.26 to 3.43%. As the identification of plant samples collected from study areas, naturally red calcareous parent material vegetation consist of 18 families 45 genera and 62 species, mining red calcareous parent material vegetation formed from 22 families 56 genera and 73 species.
This study was supported 114O707 number TÜBİTAK project.

Keywords: Red Calcareous Mining Quarry, Çankırı, Eldivan, Soil Properties, Plant Cover

Risk Effects of Abandoned Chrome-Marble Mine Quarries on Soil and Plant Relationship

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This study was conducted to determine effects of artificial hazards in abandoned chrome and marble mine quarries in Eldivan district of Çankırı province and abandoned chrome and their effects on plant species and soil properties. As a result of observations made in the field artificial hazards are; water accumulation in the quarries, dispersion of the material in the waste area and uncontrolled use of abandoned quarry such waste dump area. Soil and plant samples were collected in 15 (11 from marble and 4 from chrome) quadrates (25 m2) with different aspect and slope to determine the effects of artificial hazards on soils and plants. Soil texture, field capacity, permanent wilting point, available water, bulk density, soil reaction (pH), electrical conductivity (EC), lime (CaCO3) and soil organic matter analyzes were performed. Identification of collected plant samples were done according to 'Flora of Turkey and The East Aegean Islands I-X' which have been published in P.H.Davis (1969). As a result of the study, dispersion of the material in the waste of chrome area and uncontrolled use of abandoned quarry such waste dump in marble area differences were identified in terms of floristic composition and soil properties. Especially in this field, depending on the soil compaction field capacity, soil organic matter, CaCO3 content and floristic composition is weaker.
This study was supported 114O707 number TÜBİTAK project.

Keywords: Chrome, Marble Mine Quarries, Çankırı, Eldivan, Artificial Hazards

Environmental Risks & Sustainability of Cappadocia Soils

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Environmental Risks & Sustainability of Cappadocia Soils.
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Volcanic and volcaniclastic rocks cover a significant part of Turkey. The majority of these rocks are located in the Volcanic Province of Cappadocia. The soils located in this province were formed on volcanic parent materials of Neogene-Quaternary ages. Volcanic activity causes the release of potentially toxic elements such as As, Hg, Al, Rb, Pb, Ni, Co, Cr, Mg, Cu, and Zn, which in turn cause water and soil pollution. Ni, Co, and Cr concentrations in andesitic parent material from the 106 ppm, 22-52 ppm, and 65-201 ppm, respectively. The limit values for Ni, Co, and Cr are between 10-50 ppm, 1-20 ppm, and 10-80 ppm in soils, respectively. The majority of the volcanic ash soils have excellent properties for plant production. However, the volcanic parent materials in the Volcanic Province of Cappadocia have high concentrations of potentially toxic elements, which occur in soils. Potentially toxic elements in these soils also occur in the plants such as; cereals, vegetables, and fruits and groundwater. The aim of the this study is to determine the environmental risks and sustainable properties of cappadocia soils.

Keywords: Soil, Environment, Sustainability, Cappadocia, Toxic elements, Agriculture

Attenuation of Landfill Leachate Constituents by Volcanic Slag

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Volcanic slag, also called volcanic cinders, is a kind of lightweight basalt lava in reddish to black color. Natural structure of volcanic slag is quite vesicular and glassy; therefore it has high porosity and low density. That is why it has been used all around the world in many different applications such as landscaping, bedding material and to some extent in water treatment. In this study potential use of volcanic slag at municipal dumping sites lacking proper leachate collection and treatment systems was evaluated with lab-scale experiments. The aim of choosing leachate was to see how effective volcanic slag will be in removing various types of contaminants from a complex mixture and for its potential use at such sites. Leachate is known for its variable and complex nature containing a wide variety of contaminants depending on the disposed wastes in landfills. Sanitary landfills usually have a proper liner, but overtime when the landfill sites get older this liner can lose its function. The volcanic slag used in the experiments was from the Kula Volcanic Geopark, Manisa Turkey. Investments for municipal sanitary landfill in the Manisa region have just started. Leachate penetration into the soil with possible effects on groundwater in Kula region is most likely. Both batch and column experiments were also carried out to evaluate this environmental risk. Batch tests demonstrated that chemical oxygen demand (COD), nitrate, magnesium, sodium and potassium removals were occurring at high degrees (>70%). Furthermore, volcanic slag had a trend to remove sulfate and zinc. Volcanic slag column performance over time increased for calcium, heavy metals (Cu+2, Cd+2, Ni+2, Zn+2) and sulfate (>70%), whereas COD, ammonium, chloride and fluoride removal was decreasing in time.

Keywords: volcanic slag, landfill leachate, contaminants, attenuation

Conversion of Agricultural Land to Non-Agricultural Uses in Turkey

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Providing a sufficiently balanced nutritional intake is recognized as one of the primary aims of sustainable agricultural sector. But, many countries are confronted with the need to feed a growing population because of decreasing availability of arable lands. Taking into account the intensive demand of various non-agricultural sectors exists on the agricultural lands, conservation and development of these resources are still important.

The main purpose of this study is to find an answer to this research question: which sector uses more agricultural lands in Turkey. In order to find an answer to this question, public policies and legal regulations are screened and views and approaches of the stakeholders regarding conversion of agricultural land to non-agricultural uses are assessed by using survey data. The results indicate that the most non-agricultural usage is commonly seen in the "urbanization" sector.

Keywords: agricultural land, non-agricultural land usage, conversion, sector

October 20, 2016

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Effects of stand age on forest soil properties and soil carbon storage capacity of Uludağ fir in Kastamonu region

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Forests are the largest terrestrial reservoir for atmospheric carbon. They remove CO2 from the atmosphere and store it in the organic matter of soil and trees. Approximately half of Earth's terrestrial C is in forests (1146 × 1015 g), and about two-thirds of such amount is retained in soil pools. Differences in carbon storage between forest sites could be mainly attributed to variations in vegetation type and physical properties of soils. On the other hand, there are indications in the literature that the amount of carbon stored in a forest stand depends on its age. However, not many detailed study is available on this topic from Turkey. Therefore, we have set up a study which investigates the effects of stand age on forest soil properties and soil carbon storage capacity using the most common tree species, Uludağ Fir, in Kastamonu Region. Under similar microclimate conditions, soil samples were collected from six different stand age classes (57, 66, 183, 250, 283 and 306 year-old) of Uludağ fir. The soil samples were taken from 5 different soil depths (0-5, 5-10, 10-15, 15-20 and 20-30 cm) using soil cores and analyzed for soil pH, texture, soil bulk density and total carbon and nitrogen content, and stock capacity. The results showed that there were significant differences in soil carbon and nitrogen stock rates between stand ages and also between the soil horizons. When 0-30 cm depth was considered, the 66 yr-old stands had the lowest soil carbon stock capacity (100 Mg C h-1), followed by the 57 yr-old (167 Mg C h-1), the 250 yr-old (176 Mg C h-1), the 306 yr-old (181 Mg C h-1), the 183 yr-old (185 Mg C h-1) and the 283 yr-old (186 Mg C h-1). Nitrogen stock capacity was highest for the 183 and 283 yr-old stands (9.58 Mg N h-1 and 9.48 Mg N h-1 respectively), while it was lowest for the 66 and 57 yr-old stands 5.96 Mg N h-1 and 7.54 Mg N h-1 respectively). Variation in soil carbon and nitrogen stock capacity in relation to the soil depths varied with the stand ages. For example, the soil C stock capacity in the 66 yr-old stands decreased with the soil depth, but increased with the soil depths in the 250 yr-old stands. In conclusion, the results from the present study illustrate the important point stand age could define the potential carbon and nitrogen stock capacity of a given soil. Therefore, it should be considered in future studies and more detailed studies are needed to reach a final conclusion.

Keywords: Stand age, Carbon storage, Uludağ fir, Soil, Kastamonu

Comparison of litter decomposition rates under different stand age of Uludağ fir and Scots pine tree species

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It has been widely hypothesized that litter quality and climatic and soil conditions regulate decomposition. Several studies also suggest that the rate of litter decomposition could vary with stand dynamics (especially stand age, gaps, tree species) partly as a result of species turnover and partly through modification of site environments. The present study examined the effects of different stand ages on litter decomposition rates for two common tree species, Uludağ fir and Scots pine in Kastamonu Region. A litter-bag experiment was performed using Uludağ fir litter from 38, 60, 90 and 100 year old stands, and Scots pine litters from 18 and 30 year olds stands. The litter bags were placed on the corresponding sites (the different age stands) and were sampled every 6 month for 1.5 years. At the end of the field experiment, for Uludağ fir, the 60 year-old litters showed the highest mass losses (75.5%), followed by the 100 year -old litters (70.9%), the 38 and 90 year-old litters which had similar mass losses (62%). Scots pine showed higher litter mass losses than Uludağ fir. The 18 year-old Scots pine litters decayed faster (78.2%) than the 30 year-old litters (75.5%). Those differences within and between tree species could be attributed to initial litter quality variables of different age litters and also adverse environmental conditions under the different age trees. But, this study didn't intend to study all those factors. However, the results from the present study illustrate the important point that initial litter quality variables of different age litters could define the potential rates of microbial decomposition rates within and between tree species, but adverse environmental conditions, in which decomposition takes place, could also significantly affect litter decomposition rates of different age litters. Therefore, more detailed studies are needed to reach a final conclusion.

Keywords: Litter decomposition, stand age, Uludağ fir, Scots pine, Kastamonu

Active organic carbon dynamics in soils under temperate beech forests with different herb vegetation and lithology

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Carbon accumulation in soil is closely related to the rate of soil organic matter decomposition within the C cycle, and therefore to the quantity and quality of C input. Low molecular mass organic acids (LMMOA) are a part of the carbon cycle, and represent an important component of the active organic carbon.

The aim of this study is to determine, the level of LMMOA speciation and content in soils on 4 localities with beech forest, but different herb vegetation (herb-rich beech forests, herb-poor beech forests, acidophilous beech forests), different parent rock (sandstone, fonolite, granite, shale) and different humus forms (mor, moder). Knowledge of the LMMOA composition allows to describe dynamics of dissolved organic carbon (DOC) and estimate the share of LMMOA on the soil C cycle. Different soil horizons were sampled separately: organic L, F, H, organo-mineral A, and mineral B horizons. Speciation of LMMOA, selected inorganic anions (NO3-, PO43-) and cations (Na+, Ca2+, Mg2+) by means of ion chromatography and element composition by means of ICP-OES were determined in aqueous extract. Other soil properties like active and exchangeable pH, dissolved organic carbon (DOC), content of C, N, S by NCS analyzer, sorption characteristics were also determined.

The following LMMOA were found in soils of studied localities (in the order of decreasing concentrations): acetate >formate >oxalate >lactate >valerate >propionate >malate. The highest contents of LMMOA were found in upper organic soil horizons, and the contents decreased with increasing depth. Localities with the highest contents of LMMOA were characterized by the highest nutrient availability (Ca, Mg, P). Influence of parent rock has not been sufficiently demonstrated.

It was confirmed that herb-rich ground vegetation can accelerate the decomposition rate of organic matter in soils under beech forests. These transformation processes can be monitored through the content of LMMOA in forest soils.

Keywords: forest soils, low molecular mass organic acids, carbon, herb vegetation

The effect of vegetation cover on the presence of low-molecular-mass organic acids in temperate forest soils

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The Low-Molecular-Mass Organic Acids (LMMOA) are an essential part of the processes affecting soils, and represent a reactive fraction of dissolved organic carbon (DOC). LMMOA participate in transport of mineral nutrients and reduce potential toxicity of selected elements such as Al. The aim of this research is to determine the speciation, and amount of LMMOA, and to assess their behaviour in temperate forest soil under different vegetation covers.

The studied localities represent some of the major temperate forest environments influenced, to a certain degree, by human activities. Oak-hornbeam coppice forest, Ravine forests, Beech forests, Floodplain forest, Spruce monoculture forests and Peat bog pine forest were selected for soil samples collections. Samples were collected from all sufficiently developed soil diagnostic horizons (L, F, H, A and B). The content of selected LMMOA, inorganic anions, elements and Al species were determined in aqueous extracts. Soil pH, moisture, soil sorption complex, and total content of C, N and S were also determined.

The highest contents of LMMOA were observed in upper organic horizons. The amounts decreased with decreasing soil depth. Soils in localities with coniferous forest (Spruce monoculture and Peat bog pine forest) contained a lower amount of LMMOA than other localities, probably due to the slow decomposition process of litter in the form of mor or moder humus. Faster decomposition of litter (in the form of mull) leads to an increased production of LMMOA, as was observed in soils under Oak-hornbeam coppice forest, Ravine and Floodplain forest. A strong relationship was determined between LMMOA and water extractable PO43-, and there was also significant negative correlation between LMMOA content and trivalent Al. Humus form and decomposition processes play a key role in the speciation of LMMOA in forest soil and in nutrient availability/release.

Keywords: forest soil, low molecular mass organic acid, vegetation cover, organic carbon

Humic Substances Potential of Forest Soils

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Humic substances are the macromolecules which are the major components of the natural organic matter in soil and water. They composed of three fractions: humic acid, fulvic acid and humin. Humic acids are the long chained substances in dark brown or black color and have high molecular weight. They can be dissolved solely in water when soil pH is higher than 2. Fulvic acids are short chained organic substances in low molecular weight, water soluble at all pH conditions and have the range of colors from yellow to orange. Humins are the fraction which are not soluble in alkali and are not soluble in acid.
Humic substances that are extracted from the same origin may feature similar but also dissimilar. Moreover similarities can be found between humic substances extracted from various geographic regions in different climate conditions. Elemental structures of humic substances are noticeably similar around the world and all have same general functional groups. It's thought that all soil types involve all humic substance fractions; however ratios of fractions differentiate to soil types. Although humus of forest soils contains high amounts of fulvic acid, the peatlands and grasslands are known to contain high amounts of humic acid. While humic acid color of forests is brown, grassland's is gray.
Particularly the forest areas under atmospheric conditions like high rainfall, low evaporation rate and temperature leads soil to get acidic character. Biological activity remains at minimum and a thick humus layer is composed by the accumulation of organic matter. These structures are rich sources of humic substances having organic matter content around 95%. The richest source of humic acid is the low calorie lignite coal. Humic substances can be utilized in many fields such as agriculture, industry, biomedical and environment. Still there are unidentified characteristics to be researched.

Keywords: Humic substances, fulvic acid, humic acid, humin, forest soils, organic material

Parent material effects on soil organic carbon sequestration in mountain forest soils

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The purpose of the study is to compare soil organic carbon (SOC) sequestration in forest mountain soils developed on calcareous and non-calcareous parent material. Calcareous Leptosols and Cambisols were compared in terms of the morphology of humus A and organic O horizons, SOC concentration, and SOC stock.
The research was conducted in Lejowa Valley in the Tatra Mountains (Poland). The valley is formed of sedimentary rocks: limestone, dolomite, shale.
The research was conducted as a block experiment. Four similar plots (100 m × 100 m) located close to each other were established. All plots were located in a mature spruce forest. 10 subplots were randomly selected in every plot, which yields 40 subplots representing both calcareous Rendzic Leptosols and non-calcareous Cambisols. Samples were collected from O and A horizons and from intervals beneath humus horizons (up to 30 cm beneath the A horizon) using core sampler.
The concentration of total carbon (TC) was measured using a CHNS analyzer. CO2 content in carbonates was determined using a volumetric calcimeter method. SOC was calculated by subtracting inorganic carbon from TC. Bulk density was determined and SOC stock was calculated.
Both O and A horizons are significantly thicker in Rendzic Leptosols than in Cambisols. The mean SOC concentration in the mineral horizons is slightly higher in Rendzic Leptosols, while in O horizons it is higher in Cambisols.
Mean SOC stock is significantly higher in Rendzic Leptosols than in Cambisols which is mostly the result of the large thickness of A and O horizons.
We conclude that the presence of carbonates in parent material affects the SOC stock by modifying the morphology of the horizons that contain a high SOC concentration. This is most likely affected by the presence of the calcium cation, which binds organic matter in mineral-organic compounds and suppresses its decomposition.

Keywords: SOC sequestration, soil organic matter, forest soils, mountain soils, Cambisols, calcarous Leptosols

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Biomorphological Analitical Aproaches on Forensic Pollens

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Nevşehir Hacı Bektaş Veli University

Biomorphological Analitical Aproaches on Forensic Pollens

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Palynology is a sub-discipline of botanical ecology and it has been shown to have great benefit to the criminal investigator. Pollen grains are produced in the anthers of flowers and can provide clues as to the source of items and the characteristics of the environments from which the material on them is sourced. The most significant assemblages of palynomorphs are picked up from bare soil, mud, leaf litter organic debris and vegetation. Pollen composition in a trace sample can be used to disassociate origin. Their often complex morphology allows identification to an individual parent plant taxon, which can be related to a specific ecological habitat or a specific scene. Palynomorphs can provide excellent trace evidence, fulfilling the requirements relating to the transfer, persistence and detection of such evidence. Palynological evidence can also provide very powerful investigative and associative evidence.

Keywords: Pollen, Biology, Morphology, Taxonomy, Forensic sciences

Keywords: Pollen, Biology, Morphology, Taxonomy, Forensic sciences

Mycorrhizae effects on single- and mixed cover crops and biomass carbon recycling in soil

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The aim of our research was to evaluate the growth and biomass production of single and mixed crop crops species with mixed mycorrhizae inoculations under the sterile and non-sterile clay loam soil media and their suitability to contribute biomass carbon recycling under the Mediterranean semi-arid soil conditions. A greenhouse experiment using randomized complete design in a sterile vs. non-sterile, control vs. mycorrhizae and 13 cover crops combinations factorial combination with 3 replications. The selected cover crops were Radish (R), Safflower (S), Pearl millet (PM), Mustard (M), Field pea (FP), Fava bean (FB), Common vetch, Berseem clover (BC), R-M-S-PM, BC-CV-FB-FP, BC-CV-FB-FP-M-R-SF-PM, BC-CV-FB-FP-M-R, and BC-CV-FB-FP-SF-PM, respectively. At maximum vegetative growth, cover crops were harvested, separated into shoot- and root biomass, washed under running water, and oven-dried at 550C until a constant weight was obtained. A portion of the fresh root biomass was analysed for mycorrhizal colonization. Among the cover crop species used, while Safflower produced the highest amount of total biomass, equivalent to 29.4 Mg/ha, Field pea produced the lowest amount of total biomass. The BC-CV-FB-FP-SF-PM cover crops mix produced the highest total plant biomass (29 Mg/ha) under both sterile and non-sterile soil conditions. In both sterile and non-sterile soil conditions, mycorrhiza inoculation produces highest total biomass. However, the mycorrhizal inoculum significantly impacted on cover crop growth and biomass production under sterilized soil. While under the non-sterile soil condition, cover crops had irregular root colonisation, the sterile soil conditions had higher root colonisation.

Bu makale TÜBİTAK-TOVAG -114O448 nolu proje tarafından desteklenmektedir.

Keywords: Cover crops, Root and shoot biomass, soil sterilization, nutrient recycling, and Mediterranean climate

Biochar doze and mycorrhiza application on sorghum plant growth and nutrient uptake

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The soil in costal of Mediterranean have low organic carbon and soil quality is less. Since fertilizer have negative effects on soil quality it is sound to use organic amendment material such as biochar and mycorrhizal fungi. Mycorrhiza is one of the extensive organism have symbiosis with nearly 90 percentage of plant community. Under greenhouse conditions pot experiment was conducted to search the effect of different levels of biochar application on sorghum (Sorghum bicolor) host plants growth and nutrient uptake. Under greenhouse conditions, two deferent soil series soil were treated with G. etunicatum mycorrhiza species and different doses of biochar (control 10 ton ha-1 and 20 ton ha-1, 40 ton ha-1) produced from Eucalyptus sp and Phragmites feedstock. At harvest, the plant responses to mycorrhizae and biochar were determined. It was found that mycorrhizae-inoculated plants produced more fresh shoot and root dry weight than non-inoculated ones. Also mycorrhizal inoculation increased plant nutrient uptake. Also biochar have effect on soil carbon content.
It seems that biochar and mycorrhizae can be used as a competitive agent for nutrient uptake

Bu makale TÜBİTAK-TOVAG -112O785 nolu proje tarafından desteklenmektedir.

Keywords: Biochar, mycorrhizae, sorghum, plant nutrition

Nitrogen mineralization in biochar and compost amended soils under an incubation study

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Nitrogen mineralization in biochar and compost amended soils under an incubation study
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The purpose of this study was to determine the nitrogen (N) mineralization capacity of Eucalyptus (Eucalyptus camaldulensis) and Phragmites (Phragmites australis) feedstock produced biochar and compost incorporated to soil. Both feedstock materials were used under 500oC pyrolytic temperature to produce biochar. The same feedstock materials were used to make compost under controlled conditions for 8 months. Biochar and compost material incorporated into Kiziltapir and Balcali soils at 0 ton/ha, 10 ton/ha, 20 ton/ha and 40 ton/ha rates and they were incubated for 35 days in presence of 85% of filed capacity. Samples were collected after 3, 7, 21 and 35 days of incubation, to analyze soil mineralizabel NH4+-N, NO3-N and total N.
The results showed that with increasing biochar and compost rates, mineralized NH4+-N, NO3-N contribution increased. Compost treated soils have higher nitrogen mineralization than biochar treated soils. In biochar amended soil, mineralize-able N concentration was increased with the passage of time, however in terms of compost, mineralization was increased up to 21 days and after that decrease in mineralization was observed. Mineralization rates differed significantly in both soils and observations showed that N mineralization capacity of Balcali soil is higher in comparison to Kiziltapir soil.

Bu makale TÜBİTAK-TOVAG -112O785 nolu proje tarafından desteklenmektedir.

Keywords: Biochar, soil mineral nitrogen, compost, incubation studies

Impact biochare on the efficiency of Trichoderma harzianum (T.26) fungi in stimulation seed germination and growth of Cilli peeper

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The study aimed to investigate the effect of adding to full and half recommendation biochare (vegetation) to the soil in Efficiency of Trichoderma harzianum (T.26) fungus to stimulate the germination of seeds and the concentration of the elements Fe and Mn and Zn in the leaves and the growth of hot pepper seedlings to the age of 40 days. Included six treatments represent the first treatment Add 4 g/ kg soil for T.26 isolation of fungi, The second and third treatments. Add charcoal powdered full recommendation 17.5 g.kg -1 (40 Tun.h-1) and a half recommendation charcoal (8.75 g.kg-1) respectively, on the relay while the two treatment represent the fourth and fifth interactive between add isolation of fungi and add biochare a half and full recommendation
and the sixth treatment is control.
The results of showed the interactive treatments(100%biochare+T.26) and (50% biochare+T.26) Significantly superior to the treatments remainder and achieved the best values for indicators which included The percentage of germination, their concentration of Fe, Mn and Zn elements and In addition indication stem length, number of leaves, shoot soft and dry weight and root soft and dry weight As it amounted to (68 and 65)%, (312 and 305) mg.kg-1, (139 and 138) mg.kg-1, (147 and 138) mg.kg-1, (15.5 and 15.2) mg kg-1 (15.6 and15.0) leaf,(28.8 and 28.1) mg.g-1,(8.30 and 8.10) g,(1.26 and1.22)g,(1.89 and 1.82)g and (0.014 and 0.014) respectively, while control treatment recorded the lowest values of which included 46%,(152.5,70.3 and 68.5) mg.kg-1,7.1cm, 8.3 leaf, 18.5mg.g-1, 1.05g and 0.022g respectively.

Bu makale TÜBİTAK-TOVAG -112O785 nolu proje tarafından desteklenmektedir.

Keywords: biochar, Trichoderma harzianum fungi, chilli peeper, plant growth

Ecological Characteristics of Forensic Soils

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Soils are complex materials. They consist of many ecological components in varying proportions. These components may be naturally occurring or introduced by the activities of man, and so soils contain a wealth of information of potential forensic use. In addition, the particulate nature of most soil components and the customary contact of people and objects with the ground surface create numerous opportunities for the transfer and subsequent recovery of soil as potential evidential material. Soil is generally developed on residual or transported geological material and so may always be traced back to the parent rocks from which it has formed. The value of an inorganic characterisation is that the inorganic fraction is generally inert and not affected by time or sample storage. Forensic soil samples often contain plant fragments, which until recently have received little attention. They potentially can adhere to footwear or clothing or be transferred to areas of contact. Pollen composition in a trace sample can also be used to disassociate origin. Also, soils contain a large number of diverse microorganisms.These microorganisms assemble in communities that may be specific to a location. An improved understanding of soil organic matter and the soil microbial community has recently provided an opportunity for developing a range of complementary biological signature analytical forensic tools. Thereafter, any of the biogeochemical characteristics of soil found on potential evidential items, may be used to indicate its provenance or to compare it with other samples of known provenance. As such, soil may be used for investigative purposes during enquiry or for evaluative purposes which culminate in the presentation of soil as evidence in courts of law.

Keywords: Soil, Ecology, Biology, Geology, Characteristcs, Forensic sciences

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Determination of Microbial Response in Natural Soil Aggregates for Soil Characterization in Different Land Shapes

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Soil organic carbon, the major component of soil organic matter, is extremely important in all soil processes also soil microbial biomass is a useful indicators of soil quality. Soil microorganisms are involved in several processes that influence soil quality and microbial biomass changes rapidly in response to changes in soil properties. They may indicate an increase in beneficial biological functions in soil and a future increase in organic carbon content in soil. In this study the changes in microbial response in natural soil aggregates were determined for soil characterization in different land shapes. This study was carried out in lands formed on accumulated sediment depositions in Engiz Watershed located within Samsun Province. It was determined that the Corg and Cmic content varies between % 0,68-1,75 and 0,65-5,25 mg CO2-C/1h/g FKT in soil samples, respectively. Cmic content was also generally found higher level in aggregates involved <250 µm and 250-425 µm diameters as compared to other aggregate size classes. Moreover, we detected that Cmic:Corg ratio was generally much higher in microaggregate than in macroaggregates fractions. This study thus showed that the aggregate size distribution and some microbial properties in aggregates varied significantly in different developed soil types formed on different landscape positions.

*This research was supported by TUBITAK project which has 213O073 number.

Keywords: Microbial response, soil aggregate, soil formation, organic carbon

Effect of Phosphorus Solubilizing Bacteria on Bulk and Rhizospheric Soil's Biological Properties

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Application of chemical fertilizers besides having economic concerns has also been reason of environmental and ecosystem degradation so sustainable and organic agriculture is becoming popular in research and among farming communities. Phosphorus holds second position after nitrogen among macronutrients required for better plant growth among essential nutrients and is needed in higher amounts. Meeting this high phosphorus input for better crop yields causes problems like eutrophication so phosphorus solubilizing bacteria (PSB) being important plant growth promoting rhizobacteria (PGPR) are being emphasized to utilize phosphorus fixed in soil layers. This study was carried out with the objective to evaluate the effect of PSB on plant growth but more importantly on soil biological properties including enzymes and soil respiration. Treatments included control, 50 mg kg-1 nitrogen application, 50 mg kg-1 nitrogen and 12 mg kg-1 phosphorus application, reduced dosage of nitrogen 25 mg kg-1 with PGPR and 25 mg kg-1 nitrogen along with 0.12 g raw phosphorus and PGPR.
Results indicate that plant parameters like above and below ground plant biomasses (fresh and dry weight), plant nitrogen and phosphorus content were significantly enhanced in all the treatments when compared with control. Soil chemical properties also significantly differed where bulk soil pH in rhizosphere was found lowest in treatments with PGPR when compared with all other treatments but was not affected in rhizospheric soil where EC was not affected with any application. Rhizospheric and bulk soil showed higher amount of nitrogen, phosphorus and organic matter in PGPR applied treatments. Alkaline phosphatase and β-glucosidase enzymes were found significantly higher in the last treatment when compared with other treatments. Soil respiration was interestingly found higher in control soil but did not differ statistically from other treatments.
Concluding, application of PGPR with lower amounts of chemical fertilizers can reduce the use of chemical fertilizers and has also potential of improving soil health in long term aspects.

Keywords: Phosphorus solubilizing bacteria, rhizospheric soil, alkaline phosphatase, β-glucosidase, enzyme activity

Effect of different type of green manure, Hairy vech and Crotalaria, on soil fungi

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A large amount of chemical fertilizer had been put into soil compared with their uptake by crop products in Japan. Therefore, it deteriorated soil environment including ground water. One of environmental friendly technique is green manure, which is plowed back plant into soil. There are many reports on the nutritional management of green manure in crop products. However, we could not find any reports for the influence of green manure on soil microorganisms. In this study, we investigated fungi in the soils sampled before/after plowing back the heiry vech and Crotalaria.
The lysimeter (5m×5m) was used in this study and set subplots as chemical fertilizer, no-green manure, Heiry vech and Crotalaria. Soil sampling was conducted before and after plowing back into soil. The quantities of Heiry vech and Crotalaria put into soil was 120 kg-dry/10a (carbon input; 45 kg/10a, nitrogen input; 2.50 kg/10a) and 565 kg-dry/10a (carbon input; 229 kg/10a, nitrogen input; 16.0 kg/10a), respectively.
The number of fungi in both plots of chemical fertilizer and no-green manure hardly changed for the sampling period. In contrast, fungi in each plots of hairy vech and crotalaria increased. Moreover fungal proliferation was different between hairy vech and crotalaria. It seemed that fungal proliferation in crotalaria suppressed more than that of heiry vech. Alternatively it seemed that actinomycetes increased in crotalaria more than that in heiry vech. We think actinomycetes may be antagonist against fungi. Moreover the specific colony was found only in the plot of hairy vech and confirmed genus Cladosporium as the result of sequencing. This species did not appear when Crotalaria was plowed back into soil. Soil microbes such as fungi and actinomycetes changed by plowing back into soil, and the differences of plant as green manure seemed to influent in the soil microbes.

Keywords: Green manure, Heiry Vech, Crotalaria, Soil fungi, Actinomycetes

Determination of Macro And Micro Nutritions at Different Leaf Sections of Sultani Çekirdeksiz Grape Variety in Gediz Basin

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The present study was conducted with the purpose of determining the nutritional status of vineyards in Gediz Basin, where Sultani Çekirdeksiz grape cultivation is carried out, through the analysis of varying leaf sections. During the flowering periods of four years from 2006 to 2009, samples were collected from the vineyards in Manisa Central District, Saruhanlı, Turgutlu, Ahmetli, Salihli, Alaşehir, Sarıgöl and İzmir Menemen localities from three different leaf sections as full leaves, leaf stalks and leaf blades.

Leaf samples collected during the flowering periods were subjected to nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), magnesium (Mg), iron (Fe), zinc (Zn) and manganese (Mn) analyses.

While total N percentage was determined through the use of Kjeldahl method, P content in the extracts obtained through wet decomposition was measured in a spectrophotometer with the use of Vanodomolibdo Phosphoric Yellow Color method, and finally K, Ca, Mg, Fe, Zn and Mn contents were measured with a atomic absorption spectrometer. Results were obtained in % values for macro nutritional elements and as mg kg-1 for micro nutritional elements.

Keywords: Sultani Çekirdeksiz grape, Gediz Basin, leaf analyses, macro and micro elements

Earthworm under direct seeding, Ca-amendments and herbicides in Ultisols

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The earthworm population density is a widespread soil quality indicator due to its key role in modifying soil structure, nutrient cycling and soil ecology. The earthworm population density and other relative variables were studied in different field and laboratory experiments with an Ultisol under a xeric moisture regime. We investigated the influence of several factors: Direct seeding (DS) vs Traditional tillage (TT); Ca-amended plots vs unamended plots, and the influence of three common herbicides: i) glyphosate (N-(phosphonomethyl) glycine) 36 % p/v (4l/ha); ii) Metazachlor (2-Chloro-N-(2,6-dimethylphenyl)-N-(1H-pyrazol-1-ylmethyl)acetamide) 50% p/v (4l/ha), and iii) MCPA (dimethylamine salt of 4-Chloro-2-methylphenoxy)acetic acid) (2.5l/ha), against controls without herbicides. Data about earthworms as affected by tillage and amendments came from field experiments, whereas data of the effect of herbicides came from laboratory assays.
The densities of earthworms (Eisenia foetida mainly) were generally low, because the initial acidic soil used had been degraded by excessive tillage. After several years of implementation of DS, an increase of earthworm population density was detected compared to the TT. Similarly, the damage caused by wild boars (detectors and consumer of earthworms) were more common in SD plots than in TT. However, the added amendments (sugar foam and gypsum), as well as the tested herbicides, did not induce significant differences in the number or weight of earthworms per unit area compared to respective controls. This suggests that the earthworms were much more sensitive to changes in the physical conditions as those provided by soil managements than to the chemical conditions as those provided by herbicides or amendments.
The earthworm population density was positively correlated with moisture content, field capacity and organic matter content. Also, other positive correlations were found with other biological parameters such as the activity of β-glucosidase and substrate-induced respiration, all of which were increased under SD compared with TT.

Keywords: Tillage, soil structure, soil ecosystem, acid soil

Soil microbiological properties in a soil with addition of Philoscia muscorum

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Soil organisms are an integral part of ecological environment and contribute greatly to the disintegration of the plant and animal based wastes, especially in agricultural areas. Moreover, they have importants effects on plant nutrition and soil fertility because they are actively involved in the biological processes and sometimes they direct these processes. Isopods mainly inhabit the litter layer; by fragmenting leaf litter, they facilitate litter decomposition and nutrient cycling. As a consequence, terrestrial isopods indirectly affect the activity and community composition of the soil microflora. The isopod Philoscia muscorum (Isopoda; Philosciidae) is a common and abundant member of the saprophagous soil macrofauna in Turkey. The objective of this study was to determine effect of Philoscia muscorum on microbiological properties in wheat straw as a carbon source for isopoda added clay loam soil. The microbiological properties and their activities due to addition of increasing number of Philoscia muscorum into the soil was measured over a short term (four-week) period under laboratory conditions. Incubated microcosms under standard conditions were inoculated with a natural assemblage of Philosciidae species. At the end of the experiment, the soil with a high number of Philoscia muscorum content showed higher microbiological properties such as microbial biomass C and microbial respiration than the soil with a low number of Philoscia muscorum content. Philoscia muscorum stimulated soil microbiological properties and altered the response of this biomass with addition of wheat straw into the soil microcosms.

Keywords: Soil, isopod, microbiological properties, wheat straw

Microbiological properties of Solonetz and Risky Solonetz Soils in Bafra Delta Plain, Turkey

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The objective of this research was to assess the variation of soil microbiological properties and the relationships among the soil microbiological, physical and chemical properties along soil profiles formed on Bafra Delta Plainformed by Kızılırmak River, Turkey. For this purpose, soil classification was performed for six profiles by taking soil samples along horizons and the soil physical, chemical and microbiological characteristics such as microbial biomass, microbial respiration were determined. According to the soil classification system, soils on research area were classified as SodicHaplustert, TypicCalciaquert, SodicCalciustert, VerticHaplustept, TypicUstipsamment. The study represents that Na and ESP (exchangeable sodium percentage) contents increase in the lower soil layers for all soil profiles. Furthermore, it was determined that the microbiological properties of soil decreased with increasing soil depth and these decreases were significant statistically. As a result, the microbiological properties had significant positive correlations with organic matter, total N, available P and K contents in soil and significant negative correlations with exchangeable Na and ESP contents in soil.

Keywords: Soil, Sodium, ESP, microbial biomass, microbial respiration

Profiling of soil bacterial communities in organic paddy fields using high throughput next-generation sequencing

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To understand soil microbial ecosystems in rice fields, soil microbial community compositions have been studied based on molecular biological approaches (e.g. t-RFLP, PCR-DGGE, clone library methods), which focus on dominant species due to technical or economical limitations. Recently, high throughput next-generation sequencers (NGS) are becoming popular and can be used as a cost-effective technique to investigate microbial communities more deeply. In this research, differences of soil bacterial communities between conventional and organic rice fields were investigated using NGS.
Rice fields examined in this research were located in Nagano, Japan. Four different treatment plots were established in the organic field by the combination of differences in the tillage season ("fall and spring tillage" or "spring tillage") and photosynthetic bacterial inoculation (*Rhodopseudomonas palustris*). In the inoculated plot, *R. palustris* cultures (1.6 x 109 MPN/mL) were inoculated into nursery boxes at 160 L/ha. Soil samples were collected just before the transplanting, before the mid-summer drainage and the grain-filling period and soil DNA was extracted. Bacterial 16S rDNA (V4 region) was amplified and the amplicons were sequenced using Miseq (Illumina, San Diego).
From each samples, 80,880 to 100,412 sequences were obtained and were clustered into operational taxonomic units (OTUs) at 97% similarity level. Of the total OTUs obtained, 99.99% of them have less than 1% abundance ratio. In all treatments, the proportions of phylum were mostly same as follows; approximately 25-30% Proteobacteria, 20% Chloroflexi, 15% Acidobacteria and 10% Actinobacteria. Comparing bacterial communities using the OTUs showing less than 1% abundance ratio, the organic plots after the transplanting were clearly differentiated from the others. This suggests that the effects of rice field managements on soil bacterial communities can be understood by focusing on non-dominant bacteria. The differences in the tillage season and photosynthetic bacterial inoculation had little effect on the bacterial communities.

Keywords: next-generation sequencing, Miseq, paddy field, photosynthetic bacteria, bacterial community

Relationship between root development and carbon fixation in biochar and mycorrhizal application

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Relationship between root development and carbon fixation in biochar and mycorrhizal application
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An ideal soil has air and water in equal ratio while soil particles are two times of it. Biochar – a step toward ideal soil, is used to improve soil quality by leading to proper soil aeration, regulating water movement and providing shelter to the soil microbes such as mycorrhizae and bacteria which are involved in plant growth promotion. Strong and well established roots lead to the healthy plant which enhances the CO2 capturing by maximizing photosynthesis ability. Similarly increasing the root infection by mycorrhizae leads to the root length enhancement which consequently after harvesting remains in the soil and contribute to build up the organic carbon. In biochar amended soils, increase in root biomass is also observed which is piling up the organic carbon in soil. Both biochar and mycorrhizae are the independent keen players for root development and C-fixation but their joint venture can be the solution for limiting CO2 emission which is recently highlighted as serious threat to this planet in Paris conference 2015. In present work we have searched the effect of biochar and mycorrhizal inoculation on citrus root growth and carbon fixation. Mycorrhiza and biochar applied plant have high dry weight, root length, surface and volume.

Bu makale TÜBİTAK-TOVAG -112O785 nolu proje tarafından desteklenmektedir.

Keywords: Biochar, mycorrhizae, citrus, root growth

Interrelation between the structures of a soil cover, physical and chemical properties and some biological indicators of soils of Absheron

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The object of this research is the soils of the Absheron region which is located on the shores of the Caspian Sea and covers a South-East tip of Greater Caucasus.
From geomorphological respect it splits into two parts: 1) a Western hilly, foothill part and 2) the Eastern lowland part. The total area makes up approximately 400 thousand hectares. Absheron is a very complex arid object from the soil and ameliorative standpoint. The main type of soil at the Absheron is the grey-brown type featuring a variety of physical and chemical properties and capacity of the fine-earth layer.
As a result of soil and geographical researches, scientific bases of studying of the structure of a soil cover (SSC) were developed for Absheron taking into account a relief and geomorphological structure based on modern methods of computer technologies. A map of SSC (scale 1: 100 000) was drawn using the method of plasticity of a relief and on the basis of that map separate types of soil were differentiated. For foothill part a treelike, treelike and volcanic and etc. types are characteristic. Internal properties of these structures were defined: their soil contents and specific physical, chemical and biological properties. Analyses of the data indicate a wide variation of the number of microorganisms depending on type of SSC. The lowest number of microorganisms characterizes structures of a soil cover with inclusions of sand and saline soils in flat part of the peninsula.

Keywords: Absheron, structure of soil cover, microorganisms, soil

Long-term effects of organic amendments on soil organic matter quality in a Swiss agrosystem

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This study assesses the effect of mustard green manure, cereal straw, farmyard manure and cattle slurry application on soil organic matter (SOM) quality in a 37-year field trial carried out by Agroscope in Changins (VD), Switzerland. Following the particle size fractionation, bulk soil and clay-associated soil organic carbon (SOC) were further investigated by diffuse reflectance Fourier transform infrared spectroscopy (DRIFR) for their humification index using 1630 cm-1: 2925 cm-1 absorbance band ratio. Extracellular enzyme activity was also evaluated using fluorogenically labeled substrates, concerning C (β-glucosidase; BG), N (β-1,4-N-acetylglucosaminidase and leucine aminopeptidase; NAG and LAP), P (phosphatase; AP) and redox (phenol oxidase, PO) cycles. Spectroscopic characterization of the four organic amendments was additionally performed for their biological reactivity (O-functionality/C, H, N-functionality).
Application of solely mineral fertilizers resulted in the lowest SOC content and the highest humification degree due to the lack of fresh organic matter input. Among the organically treated soils, those with straw, farmyard manure and cattle slurry application exhibited a higher SOC content and a lower humification index than that treated with mustard green manure.
In general, the clay fraction functions as a long-term sink of C. Solely the green-manure-treated soil tended to accumulate the SOC in sand fraction which is the active pool. Hydrolytic enzyme activities (BG, NAG and AP) were generally higher in soils treated with green manure and straw, while phenol oxidase (PO) activity seemed to be slightly higher in soils treated with animal manures.
In the conditions investigated in this trial, qualitative results on SOC differed significantly between cereal straw restitution and mustard green manure insertion. We conclude that the cereal straw restitution may be an interesting alternative to animal manures for maintaining SOC in long-term stockless farms.

Keywords: Soil organic carbon, Particle size fractionation, DRIFT, Soil enzyme activity, Green manure, Wheat straw, Farmyard manure, Cattle slurry, Humification

Availability and Speciation of Zn in the Rhizosphere Soil of PGPR-inoculated Pistachio Seedlings under Saline Condition

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Soil salinity and Zn deficiency are among the major limiting factors for growth of pistachio trees in many regions of Iran. The use of plant growth promoting rhizobacteria (PGPR) is new strategies to reduce the destructive effects of salinity and improvement of nutrient availability. A greenhouse experiment was conducted in order to evaluate the effect of fluorescent pseudomonas rhizobacteria [pf_0 (Control), pf_1, pf_2 and pf_3] and Zn (0 and 5 mg kg^{-1} soil) on the availability of Zn in the rhizosphere soil of pistachio seedlings (cv. Badami) under soil salinity (0, 1000 and 2000 mg NaCl kg^{-1} soil). The availability of Zn in the soil was evaluated by 0.005 M DTPA and 1 M NH_4NO_3. The speciation of soil Zn was evaluated using Visual MINTEQ software. The results showed that salinity stress significantly enhanced the DTPA and NH_4NO_3 extractable Zn in the rhizosphere. Application of 2000 mg NaCl kg^{-1} soil drastically increased the DTPA and NH_4NO_3 extractable Zn by 105 and 27% compared to the control, respectively. Also, inoculation by PGPR isolates (averagely) significantly increased the DTPA and NH_4NO_3 extractable Zn in the rhizosphere by 52 and 14% compared to the control, respectively. However, the highest amount of the DTPA and NH_4NO_3 extractable Zn was obtained from the combined application of PGPR and Zn at the high salinity level, which were 3.85 and 0.82 mg kg^{-1} soil, respectively. Also, the results indicated that application of PGPR, Zn and salinity increased the soluble Zn concentration (Zn^{2+}) in the soil solution. Moreover, Application of NaCl, particularly at the highest level (2000 mg kg^{-1} soil), lead to formation of $ZnCl^+$ and $ZnCl_2$ (aq) complexes in soil solution. Thus, the combined application of soil rhizobacteria and Zn could be a more effective strategy for enhancement of Zn availability in the soil under saline condition.

Keywords: Extractants, Fluorescent pseudomonads, NaCl stress, Zn bioavailability

Yield response of wheat and changes of microbial activities in indigenous *A.chroococcum*inoculated soils with different plant residues application

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The objective of this study were (i) to determine yield response of spring wheat (*Triticum aestivum*) in indigenous *Azotobacter chroococcum* inoculated soils with different plant residues application, (ii) to compare change of microbiological properties such as Basal Soil Respiration (BSR) and Microbial biomass (Cmic) in *A.chroococcum* inoculated soils with different plant residues such as tobacco waste, rice husk, soybean waste and wheat waste application, and (iii) to explore the best plant residue inoculated with *A.chroococcum* strain into the soil under greenhouse conditions. A pot experiment was carried out in the greenhouse with the wheat in order to investigate the effects of *A.chroococcum* inoculation with different four plant residues application. The experiment consisted of 10 treatments (plant residues with *A.chroococcum* inoculation, plant residues without *A. chroococcum* inoculation, only *A.chroococcum* inoculation and a control treatment without inoculation and plant residue application) and 3 replications, and the pots were distributed in completely randomized design. The experimental soil was filled in 5 L pots. Thirty seeds were sown in each pot and thinned to 15 plants per pot after the full emergence of the first leaf. Plants in pots were harvested 124 days after sowing. At the end of the experiments, samples were collected from the pots and determined of wheat yield and soil microbiological parameters. Based on the research results, the grain and straw yield was increased in all the treatments and maximum increase was obtained from *A.chroococcum* inoculation with tobacco waste. The inoculation of *A.chroococcum* and plant residues into the soil produced different responses of soil microbiological properties. Generally, stimulatory effects of *A.chroococcum* with plant residues on Cmic and BSR in the soil were observed. The inoculation of *A.chroococcum* with wheat residue and tobacco waste caused statistically significant increases in BSR and Cmic in soil.

Keywords: *Azotobacter chroococcum*, Soil, Soil microbial activity, Wheat yield

The Effect of Plant Growth Promoting Rhizobacteria on the Growth and Micronutrient Uptake in the Pistachio Seedlings under Salinity Stress

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Salt stress is one of the major limiting factors for the growth and establishment of pistachio trees in central Iran, especially Rafsanjan area. The use of salt-tolerant beneficial bacteria associated with plant roots can improve fertility of salt-affected soils and enhance plant resistance to environmental stresses. In order to investigation of the plant growth promoting rhizobacteria (PGPR) on the growth and micronutrient uptake of the pistachio seedlings in saline conditions, a greenhouse study was carried out with three isolates of fluorescent pseudomonads [pf_0 (Control), pf_1, pf_2 and pf_3] and three levels of salinity (0, 1000 and 2000 mg NaCl kg^{-1} soil) with three replications. The results showed that salinity significantly reduced the growth of pistachio seedlings. When the salinity increased to 2000 mg NaCl kg^{-1} soil, the amount of the leaf number, stem diameter, shoot dry weight and root dry weight of pistachio seedlings decreased by 26, 37, 36 and 83% as compared to the control, respectively. However, inoculation with the PGPR (averagely) significantly increased the leaf number, stem diameter, shoot dry weight and root dry weight of pistachio seedlings by 19, 23, 14 and 13% as compared to the control, respectively. Also, according to the results, increasing the salinity levels decreased the uptake of micronutrients in the pistachio seedling shoot. The application of 2000 mg NaCl kg^{-1} soil significantly reduced the uptake of Fe, Zn, Mn and Cu by 23, 60, 53 and 41% in the shoot, respectively. Furthermore, inoculation with the PGPR isolates (averagely) significantly increased the uptake of Fe, Zn, Mn and Cu by 31, 50, 65 and 63% in the pistachio seedling shoot, respectively. These results revealed that the use of soil beneficial bacteria can reduce the negative effects of soil salinity on the pistachio seedlings by improvement of nutrient uptake.

Keywords: Fluorescent pseudomonads, Growth parameters, NaCl stress, Nutrient uptake

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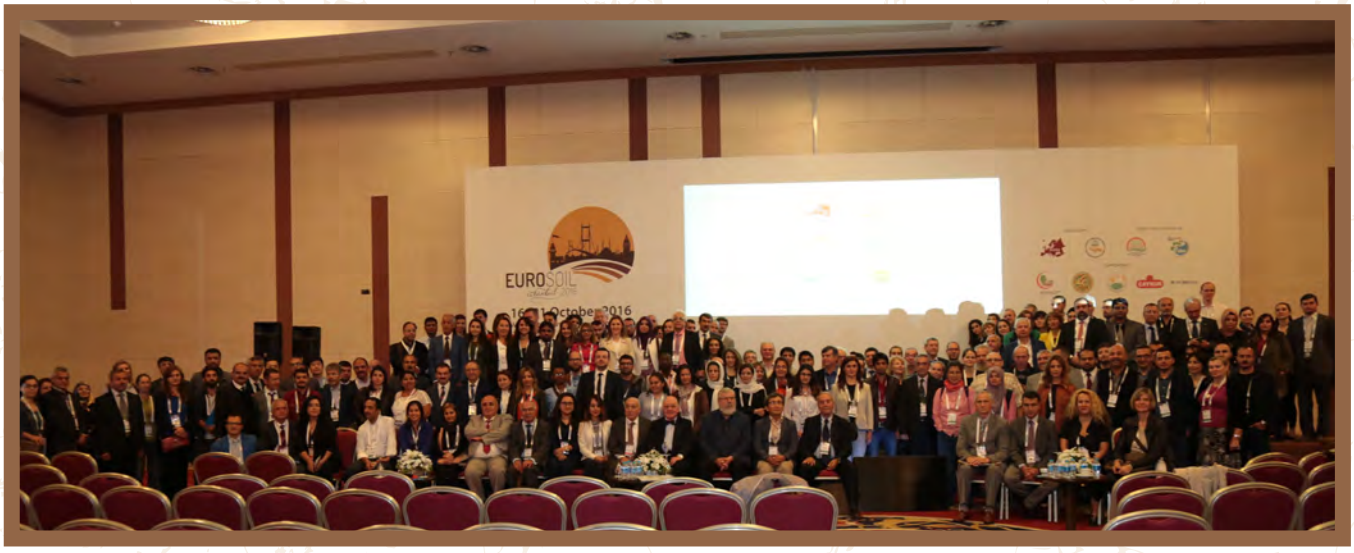

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