PP48: Phylogenetic relationships among *Phytophthora sojae*, isolated from damped-off soybean seedlings in Egypt

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The phylogenetic relationships among 15 *Phytophthora sojae* isolates came from damped-off soybean seedlings in Egypt using The internal transcribed spacer (ITS) region (ITS1, ITS2 and 5.8S rDNA) of the nuclear ribosomal DNA (nrDNA) were examined. The isolates were morphologically identical and grew at temperatures between 20°C and 35°C, and the optimum temperature was 30°C, with a radial growth rate of 25 mm/24 h. The results showed that there is a difference between the bp-sequences of ITS1 and ITS2 among the fifteen isolates. These 15 isolates were classified into two groups and the grouping depends on collection sites.

PP49: Importance of experimental design in pulse improvement

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There are three main stages in any breeding program of pulses: generation of genetic variability, selection, and test of experimental cultivars. The first stage includes making crosses, inducing mutation and introducing new germplasm. The second stage uses the variability created in the first stage and includes different breeding methods that will narrow the genetic variability. The last stage compares the existing cultivars with the germplasm generated in the second stage. During each of the stages in pulse breeding program, the control of the hypotheses is done through experimentation using trials. An experiment should be subject to a strict planning by developing an experimental protocol. Its basic elements are: definition of aims and conditions of experiment; definition of factors to study their influence (treatments); definition of experimental units to be observed; definition of observations that will be performed; and how different combinations of modalities of factors will be assigned to various experimental units. The experimental error is defined as the variation between plots treated alike and it is due to plant, climatic, and soil variability. Any experimental design should provide a valid measure of experimental error and reduce it as much as possible in order to increase the heritability and the response to selection. This is why design of experiments is based on three principles: randomization, replication, and local control of heterogeneity. In the early stage, plant breeding trials often include a large number of treatments (genotypes). Assessment is done using small plots with some of them replicated (checks) while most of them (hundreds of new genotypes) are unreplicated due to limited seeds, for example. In later stages, replicated yield trials with checks and tens of genotypes are used to measure progress. Consequently, each stage requires specific experimental designs due to the particular aim and conditions of the experiment. In this research work, the main components of an experimental protocol will be shortly described and the focus will be on the conditions of an experiment (on-station and on-farm; preliminary, main, and confirmation experiments). Then, the main experimental designs (augmented, row-column, alpha-lattice, incomplete block, randomized complete block, etc.) will be presented with their principles, at which stage of the breeding program they can be used, their advantages and their limitation.

PP50: Recent status of Moroccan faba bean landraces: collection, characterization and utilization

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Faba bean (*Vicia faba* L.) is an important food and feed legume crop in Morocco with a multitude of uses. Morocco is known to be an important center for diversity for faba bean. However, the erosion of faba bean genetic resources remains one of the principal threat for this crop. Therefore, *V. faba* genetic

resources need to be collected, characterized, evaluated and conserved in genebank before being proposed to be integrated in faba bean improvement program. A total of 117 local populations were collected from 2012 to 14 from the faba bean growing region of Morocco. These populations were morphologically characterized using ICARDA/IPGRI descriptors, and evaluated for major agronomical traits. Large genetic variability has been identified in terms of leaflet characteristics (size, shape and number), plant height, pod characteristics (angle at maturity, shape, surface reflectance, distribution on the stem, length and number of seeds per pod). Moderate variability was observed for leaflet size and shape, flower color. No variability was observed for growth habit, branching from higher nodes, wing petal color, pod color at maturity and hilum color. Based on morphological traits, principal component analysis led to grouping of these landraces into nine clusters. These Moroccan landraces were also screened for biotic stresses and identified landraces tolerant to chocolate spot. Concerning drought, the tested landraces showed large variability in tolerance to drought and performed well in both environments. Molecular analysis using microsatellite markers indicated substantial diversity among the local landraces. The identified useful variability is being deployed in conventional breeding for the genetic improvement of faba bean in national breeding program.

PP51: Screening of lentil germplasm to identify the sources of resistance against *Orobanche crenata*

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The root parasite, broomrape (*Orobanche crenata*) poses a serious threat to lentil production in Mediterranean and West Asian countries. Identification of resistant sources in the germplasm collections and the development of new tolerant varieties could be helpful to address the issue. However, resistance breeding is hampered by the scarcity of genetic resources and the lack of a reliable and practical screening procedure to identify existing sources of resistance in the germplasm. Resistance to Orobanche is a multi-component event. There are a battery of escape factors or resistance mechanisms acting at different levels of the infection process. Better understanding of these mechanisms would help to detect the genetic diversity in the germplasm collections. A total of 216 accessions including resistance sources identified from the previous study and a new set of ICARDA collections were screened under naturally Orobanche infested field condition. A wide variation of responses was observed against *Orobanche crenata* between the accessions. Among them, 46 accessions have showed no infestation by Orobanche in the field trial. Particularly, GCP9, GCP10 showed high levels of tolerance when compared to other tested accessions. In order to validate the field tolerance/resistance, a set of 21 lentil accessions of this collections were tested on both pot and petri dishes assays. During these screening essays, no accessions presented total resistance against *Orobanche crenata*. However, ILL10952 accession presented high tolerance rate in both pots and petri dishes assays, while ILL8068 seems to be very sensitive. In this study, we selected some promising genotypes that could be integrated in to the breeding program. Also, we found that this study has shown the importance of in vitro screening methods, which can give very interesting results that can complement to field screening and selection of genotypes for resistance and/or tolerance to Orobanche.

PP52: Screening of chickpea genotypes for salinity tolerance during early stage of seedling growth

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Salinity is one of the major stresses which severely limit crop production. It impairs seed germination, reduces nodule formation, retards plant development and reduces crop yield. Salinity affects germination