


Regional Workshop on Date Palm Development in the Arabian Peninsula

Abu Dhabi 29-31 May 2004

Abstract

Organized By
International Center for Agricultural Research in the Dry Areas (ICARDA) and
Ministry of Agriculture and Fisheries (MAF), UAE
In Collaboration with
United Arab Emirates University (UAEU) and
Gulf Cooperation Council (GCC)

Under the Patronage of

H.H. Sheikh Nahayan bin Mabarak Al Nahayan
Minister of Higher Education and Scientific Research,
Chancellor of UAE University

a Regional Workshop on

Date Palm Development in the Arabian Peninsula (AP)

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Status of Date Palm in GCC Countries

a. Kingdom of Bahrain

Date Palm cultivation in Bahrain is concentrated in the northern governorate, where approximately 65.7% of the total date palm trees are found. In this part of the country both soil and water are available in good quality. A collection of 100 varieties are grown in the different areas of the state with great diversity exist among them with regard to fruit size, color, quality, ripening and marketing time.

Out of these numbers only 7 varieties have been recognized for their commercial potential (Al-Moagy, Al-Begeira, Al-Ghora, Ekhlas, Al-khoneizy, Al-Marzaban & Al-Solamy).Transplants produced from seeds and off shoot are the major sources for new plantation. It was 1983 when the first transplant produced from tissue culture of Barhie variety was planted in Bahrain. A tissue culture laboratory was established in 1999, in Ministry of Public Affairs and Agriculture, resulting in the first tissue culture transplants, which are still in the vegetative growth period.

Agro management of date palm tree, fruiting and post harvest management of date palm fruits depend mainly on inherited experiences. Basin irrigation is the major technique used and only 27.6% of the total cultivated area use drip and/or bubbler irrigation. Water requirement was calculated as 50 m^3/ tree per year. Only Manures were added to the soil at land preparation. Recent recommendation suggests the usage of a complete fertilizer (NPK) in the rate of 3-6 kg/ tree per year. Fruits are marketed and consumed fresh after harvest due to shortage in storage facilities.

Date palm improvement and expansion in State of Bahrain faces several constrains. Of these is the availability of good varieties, which when and if available are very costly. The lack of date palm tree services including the use of mechanization. The varieties planted are of poor quality and not suitable for packaging and industrialization. Limited good quality land is available for date palm growing. The prevailing non-favorable environmental conditions for date fruit ripening, and most importantly the lack of available technical manpower for better date palm tree treatment and services.

Future prospective includes the development of research tools for:

- Improved techniques of date palm propagation through tissue culture with emphasis on genetic stability and quantity and timing of production.
- Increased awareness of date palm tree services, including agro-management practices, mechanization and management of flowering & fruiting.
- Recognition and classification of the different pests & diseases that infest date palm trees and fruits and methods of control through IPM techniques.

- Improve post harvest management with the objective of improving marketing. Develop better utilization of by-products based on market surveys for such a products.
- Identification, classification and finger printing of the local varieties, in line with the establishment of a gene bank. Use of new techniques for varieties improvement i.e. gene transfer especially in the area of adaptability to salinity, draught and pests.
- Develop a data base management and expert system that cover all areas of date palm production.

b. United Arab Emirates

United Arab Emirates (UAE) made great progress in date palm plantation and production. Date palm trees are now planted in all over Emirates, The official estimate is over 40 million trees planted in rural and urban areas.

Emphasizing the importance of technology transfer, a tissue culture laboratory has been established at UAE University in 1989, where in 2003 produced around 100'000 transplants from different varieties. The Ministry of Agriculture and Fisheries (MAF) in collaboration with El-Raghy Group started a tissue culture laboratory for producing date palm transplants and carried several research concerning the true to type of the date palm trees grown from tissue culture compared with one produced from off shoot. Where no differences were found in the physical & chemical properties of the fruit and the vegetative parts of the two types, similar pattern continued for the second generation of the date palm grown from tissue culture.

Based on a long term experiment (since 1995), the agro management of the date palm tree services was set. Irrigation & fertilization program was prepared taking into consideration the age of the tree & the month of the year, the program could be adjusted to fit different type of soils. MAF approached the biological control method for pests & diseases control to reduce the usage of chemical pesticides.

Fruiting, post harvest management & the utilization of different date palm by-products has received great attention. The introduction of mechanical pollination, the usage of *P. sylvestris* as a male pollinator to improve fruit setting, fruit size and to enhance ripening was adopted. Effort is also made to improve fruit quality by thinning & bagging of bunches. Cold storage & Drying chambers are in wide use by different farmers to improve their income by marketing rutab off season. The increases in number of manufacturers of date palm fruits have led to improved methods of packaging and marketing of the different products.

Most of the date palm varieties are now planted in the research stations of MAF. The total number has reached 130 varieties, though only 15 of these have commercial potential.

Future prospective includes the development of research tools for:

- Date palm tree agro-management in terms of fertilization, irrigation practices and mechanization of tree services in such away to improve productivity (quantity and quality) of existing farms.
- Develop techniques for improving productivity of second class varieties and identification of genetic variants for different commercial varieties with emphasis on improving adaptability to environmental stress.

- Identification of the major pests & diseases other than red palm weevil that infect date palm trees & fruits either in the field, storage and at the market.
- Improve methods of post harvest managements of date palm fruits to improve marketing at the off season period, provide techniques for industrialization of by-products with a market survey for such a product.
- Finger printing of the major varieties in UAE.
- Develop of a database system for varieties, research and expertise in the area of date palm production, management and marketing.
- Build up an expert system for date palm tree production in the different areas of emirates.

c. Sultanate of Oman

Date is the most important crop in the Sultanate of Oman. At present there are more than 8 million date palms, occupying 35630 ha. (48.1 of the total cultivated area).

Agro management practices of date palm in Oman follow the hereditary experience. Meanwhile, an increase in research activities have started in 1995, towards the identification and better management of the different date palm tree services i.e. water requirement, irrigation levels, water use efficiency, fertilization requirements (organically & chemically) and head of the tree service i.e. pollination, thinning, pending and pruning. The maximization of date palm productivity in Oman is constrained by several factors: Environmental constrains, especially the limited water resources, low soil fertility and improper addition of fertilizers,, small size farms, low quality of date palm varieties coupled with in experienced laborers, who are working at the farms

Through the realization of the unique germplasm collection of date palm in Oman, the Ministry of Agriculture and fisheries is willing to maintain the national heritage through the conservation of genetic resources and carrying out research for the improving and multiplication of this important crop. Two main institutes were established; The Tissue Culture laboratory in 1992 followed by the Biotechnology Laboratory in 2000 for the purpose of mass propagation, establishment of genetic map characterization of Omani genetic resources and the molecular detection of infestation in date palm. A Date Palm Research Station was established in1998 for the purpose of producing offshoots for the replacement program, supplying explants material for mass propagation and conservation of Omani cultivars. Accordingly, 30'000 date palm plantlets were produced yearly and the morphological classification of 45 cultivars was accomplished. The shortage in major equipment (DNA analyzer), trained staff and unavailability of a framework between the different laboratories impose constrains on the development of the biotechnology research development in Oman.

Date palm plantations have been suffering from number of pests and diseases infestation, mainly due to close spacing and high density plantation & excessive irrigation. Those of major economic importance affecting growth and yield of date palm qualitatively and quantitavely are Dubas Bug, Red Palm Weevil, Lesser Date moth, Old World Date Mite, wilts associated with Ceratocystis and Leaf spot diseases.

With the importance of date palm to the agricultural sector in Oman, the improvement in techniques for harvesting, post harvesting and handling, marketing and storage deserve more attention. The absence of a comprehensive quality control program resulted in, farmers ignoring extension recommendations. The lack of new products and the higher production cost reduced the competitive advantage of the local date palm production and discouraged investment in this area.

Future prospective includes

- Develop an agro management program for date palm tree services. application of the quality control and increase capacity building to reduce the cost of production.
- Supporting the national program for replacement of the old. lower quality date palm plantation with new cultivar through the support of the tissue culture laboratory
- Recognition and classification of the different pests & diseases that infest date palm trees and fruits and methods of control through IPM techniques.
- The need for the expansion in the gene bank field and maintenance of its facility, genome mapping of the most important Omani date palm cultivars and the introduction of new date palm varieties tolerant to biotic and abiotic stresses.

Develop an effective extension service for Omani date palm growers.

d. Kingdom of Saudi Arabia

Date palm production in Kingdom of Saudi Arabia (KSA) is considered the most important economic support for the agricultural sector and one of the major incomes for farmers and others. Date palm plantations cover an area around 141'000 ha (15% of the total world area, 2002) and supporting 18 million date palm trees. The total production is estimated at approximately 829'000 tons (13% of the total world production, 2002) and the export is around 33'000 tons giving a revenue about 20'000'000 US$.

A limited research has been done on the agro management practices of date palm trees i.e. NPK fertilization, tree services (pollination, pruning and thinning), in addition to, the identification of water requirements for date palm in the different region of the kingdom. With the importance of date palm, the area of agro management practices hasn't received the appropriate attention. This is due to shortage in trained and qualified personnel and laborers on modern date palm tree services. There is limited number of good commercial varieties, despite the increased number of local varieties. Date palm mechanization is lacking and date palm research is localization to certain areas of the country. Most seriously is the belief among farmers that date palm does not require fertilization and/or irrigation.

Production of transplants, from different commercial varieties i.e. Agwa, Anbara, Sheishi and al-Khalas & Al-Sokary, has received great attention from government and private companies (Al-Raghy BioTech & Sabad Al-Gomez) are producing a considerable number of this transplant.

The most important pests & diseases that infest date palm in KSA have been identified as red palm weevil (rpw), the longhorn date palm borer, the lesser & greater date moth, fruit stalk borer, Almond moth, dust mite, fusarium wilt & Al Wijam disease. Lack of adequate knowledge regarding the behavior and life cycle of most of these pests and diseases, and the lack of efficient IPM control Programs have resulted in the spread of such pests and diseases in different regions of the kingdom.

The absence of a germplasm conservation bank for the most KSA varieties and the lack of research in the area of developing improved varieties (tolerant to environmental stresses), testing the existing varieties for potential improvement, identifying means for controlling male trees production and finger printing of date palm varieties are the major constrains for biotechnology improvement in date palm production in K.S.A.

Future prospective includes the development of research tools for:

- Capacity building of national institute and personnel in the area of date palm agro management especially in the area of date palm orchard & trees services and provide new ways for market development and understanding.

- Develop techniques for improving transplants produced from tissue culture, identifying true to type varieties and production of male pollinator with higher Metaxenia ability and improve the technical supply of the national institute.
- Increase the awareness about the harmful effect of date palm tree infestation with the different pests & diseases and develop an IPM program for the control of major pests & diseases. Improve the technical competence of personnel working in the sector.
- Identification, classification and finger printing of the local varieties in line with the establishment of a gene bank. Use of new techniques for varieties improvement i.e. gene transfer especially in the area of adaptability to salinity, draught and pests.
- Develop a data base management and expert system that cover all areas of date palm production.

e. State of Qatar

Date Palm plantations represent 71% from the total area planted with fruit trees. Total area cultivated approx. 1366 ha (Containing 335765 trees bearing fruits & 146955 non productive trees). Most cultivation are in the North & Middle area of the state where environmental conditions are favorable, soil has deep profile with low salinity compared with other parts of the country.

A tissue culture laboratory has been established under the Agriculture & Water Research Directorate (AWRD), Ministry of Public Work & Agriculture, with main objective of providing Date Palm transplants & preservation of natural resources.

A survey of the morphological & physiological diversity in the different Date Palm species had been carried out. Moreover, propagation methods, explants physiological behavior and acclimatization of transplants are under evaluation. Lower response of Date Palm explants for ontogeny in the media, the differentiation in between the different species at the early stages in culture & pre-fruiting and lower percentage of success in rooting & acclimatization of the new transplants are the major constrains facing the laboratory. With the great importance of Date Palm and the increase in area cultivated most agro management practices depend on inherited experience and recommendations from different places that might be different in conditions than Qatar. Water requirement is calculated according to equations that take into consideration environmental areas, soil type and water salinity by Water Research Dept., AWRD.

No studies or research has been done due to the lack of special department for pests & diseases in the AWRD.

Post harvest management & handling, marketing, packaging and utilization of by-products faces constrains due to seasonal consumption, lower productivity and marketing.

Future prospective includes the development of research tools for:

- Date palm agro management especially in the area of fertilization, irrigation, water requirements & adaptation to salinity, mechanization of tree services, pollination, fertilization & fruiting.
- Improving the efficiency of date palm explants in culture, identifying the genetic variance in between the different species.
- Setting the IPM techniques for the various pests & diseases and methods for identifying & controlling weeds in date palm cultivation.
- Favorable storage conditions, increasing the seasonable consumption duration and develop techniques for the best use of the different products of date palm tree.

Modern Techniques for Date Palm Propagation through Tissue Culture Advantages and Disadvantages for Expansion

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Date palm tree has gained economical, social and environmental importance in the dry areas as a good source for food and as a protection for interplant crops.

Due to the fast expansion of date palms cultivation in many geographical regions i.e. Africa & Asia, it became difficult to obtain sufficient numbers of healthy and good quality offshoots. To address this problem, many tissue culture laboratories were established for producing date palm transplants. Recently, these laboratories have started to use Embryogenesis technique for producing transplants, regardless of the associated problems i.e. genetic variance & mutation.

The main Tissue culture techniques used for the production of date palm transplants are as follow:

1. Embryogenesis technique. The fastest method in producing transplants which might be different from the mother plants in some characteristics (occurrence of genetic variations & mutation).
2. Organogenesis technique. The modest technique for producing commercial number of date palm transplants pest free and are true to type.

The paper discusses the advantages & disadvantages of the traditional and modern techniques for producing date palm transplants

Management Of Soil And Water In Date Palm Orchards Of Coachella Valley, California

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The Date palm (*Pheonix dactyliphera)* in the U.S. occupies an area of approximately 6000 acres of land in Coachella Valley, southeast California, and 900 acres in Bard, near Yuma, Arizona. The date palm tree was introduced into the Western Hemisphere in the early part of the 20th Century. During the early years, over 100 varieties were evaluated in Texas, Arizona, and California for adaptability and performance. Present varieties include Deglet Noor, Mejhool, Khadrawi and Zahidi. Annual rainfall in the date production averages about three inches (75 mm). Consequently, all orchards depend on irrigation from the Colorado River. The two commonly used methods for water delivery are flood-basin irrigation and drip irrigation. The former is used for bearing-age orchards; the latter for date nurseries and newly planted orchards up to five years. Water management is governed by many important factors including orchard age, availability of water and soil properties which include texture, compaction, stratification, low fertility and high salinity. Soil management operations are designed to overcome major problems that limit tree growth and yield. These include slip plowing prior to planting the orchard, reducing the use of heavy machinery in field operations, maintaining adequate levels of soil fertility, controlling weeds, and leaching excessive salinity. All these operations impact tree vigor, yield and fruit quality.

Date Palm Head Management Practices

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Management of date palm head is of great importance since it affect quantity and quality of the produced fruits. These practices include the following:

1. Pruning: This practice is carried out to prune old leaves with reduced photosynthesis capacity, dry or diseased leaves, thrones on leaf bases, and removal of old, dry leaf bases that were left after pruning.
2. Pollination: This practice is carried out either, manually or mechanically. The preparation of pollen, storage, pollination practice, importance of pollen source and factors affecting pollination efficiency are discussed.
3. Fruit Thinning: This is usually practiced in the high valued cultivars. Different methods of fruit thinning, either, manually or by using growth regulators, effect of fruit thinning on yield quantity & quality as well as timing of carrying out this practice are discussed.
4. Spath Positioning: The importance timing and different methods of carrying out this practice is discussed.
5. Spath Covering: This is done, either to protect the fruits from unsuitable environmental conditions, or facilitate harvest, or protection from insects or bird damage. The different materials used for each purpose are discussed with the implementation of the benefits that are achieved.
6. Harvesting Methods: Different stages of fruit growth are discussed, along with how to determine the right stage to harvest for different kinds of dates (soft, semi dry or dry types).

Knowledge Management and Transfer Using Information Technology and Expert Systems

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The transfer of knowledge from consultants & scientists to extension workers and farmers represents a bottleneck for the development of agriculture in any country. The current era is witnessing a vast development in all fields of Agriculture. Therefore there is a need for an unconventional method to transfer the knowledge of experts in certain domain to the general public of farmers, especially that the number of experts in new technologies is lesser than their demand in a certain domain.

The information technology played an important role in information and knowledge dissemination in the last decade. The usage of IT to transfer information and knowledge in the agriculture domain is one of the areas investigated by many institutions. Most of the Schools of Agriculture in well-known universities have built sites on the Web to disseminate agricultural information to the extension services and growers. The Central Laboratory for Agricultural Expert Systems (CLAES) has been established in 1991 within the Agriculture Research Center in the Egyptian Ministry of Agriculture and Land Reclamation, to conduct research in the area of transferring the knowledge and expertise accumulated in agricultural research to extension workers and growers, using information technology in general and expert systems, in particular.

Expert systems are simply computer software programs that mimic the behavior of human experts. They are one of the successful applications of the Artificial Intelligence field, a branch in Computer Science that investigates how to make the machine think like human or do tasks that humans do. Agricultural Expert Systems developed so far covers most of the knowledge areas for crop management including strategic decision such as variety selection, land preparation, planting, irrigation, fertilization, and harvesting, and tactic decision such as disorder diagnosis, control, and treatment. A typical agricultural expert system will ask the user about his/her plantation data for soil, water, weather, and any other abnormal observation and/or requirements, and produce a specific recommendation. It is like a plant doctor, which gives a specific advice for a certain plantation. It is not like a book or a web site where a user can find a lot of information and it is up to him/her to decide what to do. CLAES has developed in the last 10 years a dozen of expert systems for different crops and for animal health care. Experiments were conducted to measure the economic and environmental impact of using expert system in the field. The experiments showed that the net production has increased by approximately 25%. The impact

on environment conservation was assessed using two measures: water saving and chemicals usage reduction. It was found that fields managed by expert systems used less water by approximately 35 % and less fertilizers by approximately 16%. The impact on enhancing the performance of the extension workers when using the expert system was also measured. A tangible enhancement was observed which ranges from 80% to 157% in different expert systems.

The objectives of this presentation are two fold: first, to show how expert systems integrated with other information technologies can be used to strengthening the link between research and extension and second to report on two regional projects which are being implemented by CLAES in collaboration with ICARDA to build regional expert systems for tomatoes and cucumber under plastic tunnel for Arabian Peninsula region and wheat and faba bean for the WANA region. These projects can be used as models for regional collaboration in gathering knowledge related to a specific commodity at the regional level, building up an electronic repository of this knowledge, and availing this repository on the Web.

The Virtual Extension and Research Communication Network (VERCON) will be presented as a successful example that demonstrates how different information and knowledge systems are integrated to serve researchers, extension workers and growers. Other stakeholders could also find the web site very useful (http://www.vercon.sci.eg). The site contains two expert systems fro rice and wheat, extension bulletins produced by research institutes and central administration for extension, statistical data produced by the economic sector, and growers problems system that enables extension workers to interact with researchers at different levels, and keep a repository of all problems raised and its solution, and unsolved problems, if any, to be transferred to researchers to find solutions for them through their research programs. The site also provides other services as news and forums.

The experience in porting the cucumber expert system, developed under Egyptian condition, to the Arabian Peninsula will be demonstrated. The prototype expert system for cucumber can be accessed through the Arabian Peninsula Research Program web site http:// www. icarda.cgiar.org/APRP/ IT.htm. A workshop was held in CLAES for one week for researchers from Arabian Peninsula countries and developers from CLAES to fix the interfaces and knowledge extracted from the Egyptian version and included in the APRP expert system site. It was intended that regular reviews be done for updating information related to disorders and pesticides. More efforts are needed to fulfill this intension. The other project for wheat and faba bean are being implemented early results will be presented. In this project CLAES designed forms to acquire verities, agricultural practices, and disorders and their control in different sub regions in WANA. Most of the knowledge have been acquired and currently the system are being implemented.

Nutrients Requirements of Date Palm and Fertilizer Use

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Careful attention to cultural operations specially irrigation and fertilization in order to maintain good palm growth and gig yields of fruit of the best quality cannot be stressed too much .

Although numerous and valuable scientific investigations have been made in the last 40 years, it is apparent that most of the information has not been applied to improving the crop at the growers level.

The logical approach to rapidly increased production would probably improvement of existing plantings though different types of fertilizers as follows

Organic manures: Animal manures are widely used in the most date garden of the Arabian Peninsula and North Africa. The quantities of animal manure used, naturally very a great deal. Five to 15 tons per acre (4000m3) in the range of applications mostly reported from many date Districts. Steer manures is preferred because of its relatively higher nitrogen content (about 2.0%) compared with that of cow or gorse manures (0.5 to 1.0% 0) Chicken manure with a still higher nitrogen content (3 to 5%), is being used when available .

Inorganic: nitrogen: Recently, inorganic chemical fertilizers have been widely accepted as a major source of improving and maintaining soil fertility. Palm tress need sufficient nutrients in proper balance for normal growth and development. Sixteen chemical elements are known to be essential for date palms. Except carbon, hydrogen and oxygen, the remaining 13 elements are taken up by plant development and crop production .The amount applied showed be determined on the basis of whether it is used alone or in combination with manure or cover crops.

Micro elements: Results of some studies clearly show the vital role of microelements e.g., Zn, cu, Fe, b and Mn as well as their combined effect, whether used in organic or inorganic from. on improving the total yields and fruit quality of date palm .

Recently trends in fertilization of Date palm:

Fertigation :with the developments of the irrigation and fertilization systems the technology of plant nutrition has been developed though the addition of fertilizers with the irrigation water , which has been called finally " Fertigation " obviously , Fertigation system affected by all factors affecting the irrigation and Fertigation system affected by all factors affecting the irrigation and fertilization of all irrigation systems. Kinds of fertilizers, time of application of fertilizers with the irrigation water though the Fertigation system has proved to play a

major role in increasing growth, yield and fruit quality. Many investigations must be done to study the nutrient concentration in soil solution, saving in labors and energy, and flexibility in tiring applications in relations to crop demand, regardless of growth stages of palm and fruits.

Bio fertilizer: recently, the trend is the usage of microorganisms for plant nutrition. Using Biofertilizer is very important in case of the new huge projects due to the sandy soils, which lacks the biological activity. Many investigators are now trying to increase such bacteria population in soil to make the nutrient elements more available for plants and consequently increasing the crop yield. Moreover, elemental fertilizer application would be reduced which in turn lead to save the costs of crop production and keep the environment out of pollution.

Slow – release N fertilizer: it is known; uptake of nitrogen by date palm trees did not exceed 60% of that added in fast – release N fertilizer. These drawbacks of the fast release N fertilizers have promoted a search for fertilizer that characterized by lower loss of their own nutrients via drainage water. Using slow – release fertilizer was proved to be very favorable in improving growth , nutritional status of the trees , fruit set , yield and fruit quality date palms . Little work has been done on such slow release N fertilizers much more information still need for assessing the appropriate source the actual and optimum rates and times to be applied for gaining the maximum productivity in date palm trees.

Research requirement for further investigation:

Special attention should be given to studies on the type of fertilizers used and the water requirements of date palm under the environmental prevailing in each region with emphasis on methods of irrigation and fertilization which lead to minimizing water consumption and loss of minerals.

Emphasizing the importance of agricultural programs and trying to promote them, and offering courses which give information to those associated with date palm and train them on the modern techniques of developing agricultural operations of date palms.

It is important to study the recent trends (Biofertilizer , Fertigation and slow – release N fertilizer) in fertilization of date palms and its effects on reducing mineral fertilizer rates and con sequent lowering pollution rates of water and soils .

Agricultural Water Use in the Arabian Peninsula with Extreme Scarcity

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In the dry areas, water scarcity is the severest of the world, and in the Arabian Peninsula it the maximum in the dry area. With very limited rainwater and ground water being depleted, most of the countries are increasingly depending of desalination of sea water. Agriculture and demand for fresh water in this region is growing. Increasing water supply from ground water and desalination implies high cost and serious environmental consequences. Agricultural strategies under extreme water scarcity should be based on sustainability maximizing economical and environmental returns for the unit volume of water. Crops that satisfy this criterion should be carefully selected together with water and agro management packages that insure minimizing water losses and optimizing water productivity. Drought and salinity tolerant high value crops and plants indigenous to the local environment are more suitable. Date palm is a viable option in this region; however, current irrigation practices are inefficient. Adaptive research at the local level is required to develop options to minimize irrigation water losses and improve plant productivity. Effective extension and capacity building for efficient water use are also essential.

Pests of the Date Palm (Phoenix dactylifera L)

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The paper includes surveys and studies made over the last two decades on the "Arthropod Pests of the Date Palm", in UAE. They are to be considered, more or less, as representative for the whole region, because of the similarity of the terrain, similarity of growing conditions and the passage of planting material throughout the years.

The studies revealed the indigenous occurrence of:

- the dubas bug *Ommatissus lybicus*
- the scale insects *Parlatoria blanchardi* and *Phoenicococcus marlatti*
- the 'the giant mealy' *Pseudaspidoproctus hypheniacus*
- the trunk-borer *Jebusaea hammerschmidtii*
- two rhinoceros beetles: *Oryctes agamemnon* and *O. elegans*
- the two date moths: *Batrachedra amydraula* and *Aphomia sabella*
- the date mite *Oligonychus afrasiaticus*
- the frond crimson mite *Raoiella indica*

Over the years the author witnessed the arrival of more (exotic) pests imported with planting material:

- the Red Palm Weevil Rhynchophorus ferrugineus
- the third rhinoceros beetle Oryctes rhinoceros
- the third scale insect Fiorinia phoenicis

The author also discovered and described a new pest: the inflorescence beetle Macrocoma sp.nov.

There is a recent growing importance of some of these pests; attention is also needed to be paid to the slowly spreading 'Al wijam' of the undetermined aetiology.

With a limited knowledge of phytopathology, the author also recorded the common and most important fungal diseases of the date palm, in UAE

The paper is composed of a pictorial and textual presentation of morphology, life cycles and management of the different pests.

Genetic Diversity and Germplasm Conservation Using Molecular and Genomic Techniques

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Three types of markers have been generally used in the assessment of genetic diversity in plant species, morphological markers, protein-based markers, and DNA-based markers. DNA-based markers provide useful information regarding genetic diversity and relationships between accessions, as these remain unaffected by environmental factors and the developmental stage of the plants. They also have the advantage of being abundant and highly polymorphic. Of the various kinds of DNA-based markers characterized so far, Restriction Fragment Length Polymorphism (RFLP) was the first and until recently the most commonly used for the estimation of genetic diversity in plant species, but the RFLP assay is time consuming and labor intensive. The recently developed Polymerase Chain Reaction (PCR) marker techniques, which include Random Amplified Polymorphic DNA (RAPDs), Simple Sequence Repeats (SSRs), and Amplified Fragment Length Polymorphism (AFLPs), are playing an increasingly important role in DNA fingerprinting and pedigree analysis.

Efficient genotyping technologies are going to play an increasing role in future breeding. However, widespread use of current genotyping technologies is limited by their low throughput and high cost. We see an opportunity to by-pass the sequencing paradigm and improve useful traits in agricultural species by a better knowledge of genomic diversity and better tools to recombine that diversity productively to generate improved individuals with superior characteristics. Efficient genotyping tools play a key role in this strategy.

In the early 1990s the development of automated sequencers and computer programs capable of analyzing lots of DNA made possible two new approaches to obtaining sequence information. Instead of going specifically after a gene of interest, people created rich cDNA libraries (containing many of the expressed genes of an organism), picked cDNA clones randomly, and rapidly determined some of the sequence of nucleotides from the end of each clone. These expressed sequence tags or ESTs could then be compared to all known sequences using a program called BLAST. An exact match to a sequenced gene meant that the gene encoding that EST was already known. If the match was close but not exact one could conclude that the EST was derived from a gene with a function similar to that of the known gene. Although the most recent methods of hybridization based analysis (DNA Microarrays) using immobilized cDNAs (Schena et al., 1995), or oligonucleotide Microarrays (Lockhart et al., 1996), can potentially examine the expression patterns of a relatively large number of genes, these methods can only examine expressed sequences that

have already been identified. In contrast SAGE allows for a quantitative and simultaneous analysis of a large number of transcripts in any cell or tissue without prior knowledge of the genes (Velculeseu et al., 1995). Also one of the most effective techniques which was developed by Kilian and coworkers, 2002 is the Diversity Arrays™ Technology, which is a novel genotyping method developed originally using plant genomes as models, which provides for low cost, high throughput, sequence-independent genotyping.

To that end, using the techniques applied for genomic studies, extensive characterization at the structural and functional level of the vast genetic resources is now being applied. Together with the comparative genomic gene discovery component, the functional and structural characterization of diversity will provide the raw materials (i.e., the genes) for novel solutions to virtually any breeding objective.

دراسة مج البخار الماني عند تمور "دقلة نور" التونسية

حبيب البوعبيدي و عبد القادر نبيلي
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بالبلاد التونسية تعتبر التمور من أهم المواد الفلاحية المصدرة إلى الأسواق الخارجية و يعتبر الصنف "دقلة النور" من أصناف التمور الأكثر شهرة و الأكثر تصديرا. حوالي 80 بالمائة من هذه التمور يصدر بعد معاملتها داخل وحدات التكييف التي لا يزال العديد منها يتبع أساليب شبه تقليدية مما يحتم بذل المزيد من الجهد للسيطرة على الطرق المتبعة, و خاصة عمليات التجفيف, وجعلها أكثر جدوى و أقل كلفة و كذلك التحكم في الظروف المناسبة للمحافظة على نوعية التمور أثناء الخزن.

لذلك تم تصميم منحنيات مج البخار الماني متساوية درجة الحرارة لتمور "دقلة نور" على GABدرجات حرارة : 5 , 30 و 40 درجة منوية و تم وصف هذه المنحنيات بمعادلة كما تم تقييم ثوابت هذه المعادلة و محتوى طبقة الامتصاص الأولى من الماء. حسبت الطاقة اللازمة للتجفيف والعمر الافتراضي لهذه التمور.

Genotyping Egyptian Date palm Cultivars Using RAPD, ISSR, AFLP Markers and Estimation of Genetic Stability among Tissue Culture Derived Plants

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Date palm (*phoenix dactylifera* L.) is one of the most important fruit crops in North Africa including Egypt and in Middle East. Egypt lies in the fruit largest producer among Arab countries. However, little is currently known about the molecular characterization of date palm cultivars. Determination of genetic variability and proper cultivar identification in date palm would be of major importance in improvement programs and in germplasm characterization and conservation to control genetic erosion. In an attempt to determine a molecular fingerprint characterizing each of the Egyptian date palm cultivars, three types of PCR based markers, i.e., RAPD, ISSR and AFLPs were applied on two sets of five cultivars cultivated in two different regions. Delta and Upper Egypt .Intravarietal variations were investigated using ten random decamer primers on ten individual trees representing each of the five cultivars of the two sets. All the tested primers exhibited intravarietal polymorphism among the Delta set, while the Upper Egypt set revealed negligible intravarietal polymorphism. To asses the genetic polymorphism and to develop fingerprint for each of these cultivars RAPD,ISSR and AFLP analysis were conducted on bulked DNA samples composed of the DNA of the different trees representing each cultivar .Fingerprinting of the Delta cultivars (Zaghloul, Samany, Hayani, Siwi and Amhat) was conducted using 8 ISSR and 6 AFLP primer /primers combinations. This revealed a total of 53 and 433 amplicons, respectively and a level of polymorphism of 64.1% and 53.81%, respectively. DNA profiling of the five Upper Egypt cultivars (Bertmoda, Gandila, Malikaby, Shameia and Sakkoty) was carried using 41 RAPD, 19 ISSR and 28 AFLP primer/primers combinations, Thus exhibiting 259, 159 and 1135 amplicons representing a level of polymorphism of 18.9%, 34.6% and 41.6%, respectively. The genetic similarity matrices were estimated for the two sets and used to develop dendrograms revealing the genetic relationships. Moreover, unique markers characterizing each cultivar were identified. Furthermore, the genetic stability of tissue culture derived plants from cultivars Zaghloul (Delta) Bertmoda, Gandila, and Sakkoty (Upper Egypt) studied using RAPD and AFLPs in tissue culture profiles exhibited non significant polymorphism revealing the true to type nature of these plants.

Objectives

1-To produce a catalogue revealing the DNA profiling of the Egyptian Date palm cultivars.
2- To investigate the genetic variation at the intra and inter varietals level in Egyptian date palm.
3- To assess the genetic relationships among the Egyptian date palm cultivars.
4-To identify unique markers characterizing each cultivar.
5-To evaluate the genetic stability of tissue culture derived plantlets.

This will have its impact in germplasm collection preservation date palm breeding and improvement programs.

Opportunities for Development and Use of Entomopathogenic Fungi.

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Modern agriculture, and its associated large, monoculture plantations have created conditions favoring the rapid establishment and spread of various noxious insects. This has promoted a heavy reliance on synthetic insecticides to control, limit, and contain the spread of these insects. Concerns over environmental pollution, human-health risks, and insect resistance have stimulated the search for alternative control strategies and their use within integrated pest management (IPM) programs. This approach emphasizes population monitoring to guide pest management decisions, use of cultural and biological controls, and limited insecticide usage. Biological control is considered a major component of IPM, but is frequently under-utilized. Microbial biocontrol agents, and fungi in particular, can play a significant role in the regulation of many insect pests; mycopathogens such as Beauveria bassiana and Metarhizium anisopliae infect many insects over a wide range of environmental conditions. Some notable successes have been achieved using fungi to control major pests such as desert locusts, tsetse flies, and Colorado potato beetle, under what may be considered less-than-favorable conditions. Novel delivery systems have also met with success in the control of pests that have been hard to contact with conventional sprays. To achieve similar progress against pests of date palm, a progressive series of steps need to be taken.

First, to obtain candidate strains for testing, an extensive survey of the pest population throughout its range is likely to yield indigenous pathogens from infected adult and larval stages, and from soils in date palm groves; isolates recovered from or known to be active against related pests found in similar climatic/agroenvironmental zones can also be acquired. Whatever the source of the fungi, the same considerations are then required for their further development as effective and reliable pest management tools. Many pests live in cryptic environments, so pathogenicity trials should initially be directed against developmental stages that can be realistically targeted with fungi. Assays should be run at temperatures replicating those experienced at the time of insect activity to identify strains capable of infecting and killing the pest under these conditions. But virulence should not be the sole criterion for selection; active strains need to be characterized according to their spore production capacity (for mass-production purposes), and environmental competence (i.e., their ability to persist, germinate, grow, and infect insects in the environment in which they will be used). These are essential to the selection of the most suitable strains, and must be followed by the development of

efficient mass production and delivery systems, and effective use strategies. The ability to produce and formulate large quantities of stable, virulent inoculum of consistent quality in a cost-effective manner is vital, but the complexity of the process is often underestimated; critical issues relevant to mass-production and formulation will be covered in this presentation. Compatibility of the fungi with other IPM components and non-target organisms must also be ensured. Field efficacy has to be demonstrated through scale-up trials, and the technology refined into a form that can be readily implemented and (with appropriate support and guidance) transferred to the farming community.Fungi have great potential for development as effective microbial control products, but their successful development depends upon these factors being addressed.

Date Post Harvest Valorization In Morocco: Present Status And Research Activities

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In Morocco, the sector of date palm represents the main skeletons of the agricultural activity in the oases due to its environmental, economical and social influences. Indeed, the date palm constitutes an important part of the Sahara environment since it plays an important role in the protection of interplanted cropping systems and the stabilization of the ecological system. In the economic side, the date palm sector occupies an important position to the national level since its dates production, valued to 93 000 tons, generates a value of 744 million of dirham annually (average of 1989/90 – 1997/98). The dates also contribute to the farmers income (between 40 to 60%) and constitute an important commercial activity between the north and the south of kingdom. In addition to human consumption and animal feeding, the date palm assures a wide range of utilization products. Despite its economic importance, the date sector is facing several problems encountered during pre and post harvest techniques. These are mainly, traditional production practices (few care is giving to regimes and to harvest operation), inadequate packaging, inappropriate preservation methods, absence of transformation industries for low quality date, non-hygienic conditions of storage and inadequate commercialization circuits. In order to minimise effects of the above mentioned constraints, research projects conducted by National Agronomic Research Institute (INRA) are aimed at elaborating post harvest technologies adapted to the national and international market. These are preliminary characterization of Moroccan dates and techniques of preservation, packaging, storage and processing. Research also focused on commercialization aspects. Results have show that there is a big difference between the varieties as regard to physical, chemical and biochemical criterias such as specific density, fibrous nature, pulp importance, acidity, water activity, sugars, aromatic components, and they gave some important informations concerning the commercial, nutritional, organoleptic and technological qualities. Results have also permitted the classification of varieties into different homogeneous groups according to their specific features. They have allowed to make some propositions for the best way to use these varieties. Concerning date preservation, three main techniques were investigated: date pasteurisation, heat treatment using "Gonet" oven and ionisation technique. The effect on disinfestation (destruction of date moth) and date quality preservation were studied. In its preliminary studies on date transformation, INRA has produced different derived products such as jam, paste, flour and juice. Ongoing

works concern the indexing of the traditional ability notably the traditional methods of date transformation. Three main studies on date marketing were achieved and they included all the levels of the commercialization circuit (agronomic, technological and commercial). Indeed, two major aspects were studied: Description and analysis of the present situation of the production, valorization and commercialisation, and investigation on date marketing system within the country (consumers and merchants level). Those studies have permitted to establish an integrated plan of actions in order to face the problems and constraints who hinders the development of dates sector in Morocco. One of these studies is published in French language under the title: "Valorisation et commercialisation des dattes au Maroc".

Development / Improvement Of Date Palm Postharvest Handling

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Dates (Phoenix dactylifera. L.) were and still are an important crop in the Arabian peninsula (AP). Many advances have been made in the date palm culture and the fruit are processed, shipped and enjoyed throughout the world. However in some date growing areas there is more room for improvements of the industry. Harvesting, Postharvest handling and processing, storage and food safety considerations need to be reviewed and await more development Postharvest ripening procedures currently applied and possible ways to improve it, organically produced dates and value added treatments will be presented. In the present paper such issues are addressed and related problem solving research approach is proposed

About CGIAR, ICARDA and APRP

The CGIAR is an international group of representatives of donor agencies, eminent agriculture scientists, and institutional administrators from developed and developing countries who guide and support its work. The CGIAR receives support from a wide variety of country and institutional members worldwide. Since its foundation in 1971, it has brought together many of the CGLAR world's leading scientists and agricultural researchers in a unique South-North partnership to reduce poverty and hunger. The mission of 'the CGIAR is to promote sustainable agriculture to alleviate poverty and hunger and achieve food security in developing countries. The CGIAR conducts strategic and applied research, with its products being international public goods, and focuses its research agenda on problem-solving through interdisciplinary programs implemented by one or more of its International centers, in collaboration with a full range of partners. Such programs concentrate on increasing, productively, protecting the environment saving biodiversity, improving policies, and contributing to strengthening agricultural research in developing countries. The world Bank, the Food and Agriculture Organization of the United Nations (FAO), the United Nations Development Programme (UNDP), and the United Nations Environment Programme (UNEF) are cosponsors of the CGIAR. The World Bank provides the CGIAR System with a Secretariat in Washington, DC. A Technical Advisory Committee, with its Secretariat at FAO in Rome, assists the System in the development of its research program.

Established in 1977, the **International Center for Agricultural Research in the Dry Areas** (ICARDA) is governed by an independent Board of Trustees. Based in Aleppo, Syria, it is one of 16 centers supported by the Consultative Group on International Agricultural Research (CGIAR). ICARDA serves the entire developing world for the improvement of lentil, barley and faba bean: all dry area developing countries for the improvement of on-farm water-use efficiency, rangeland and small-ruminant production; and the West and Central Asia and North Africa region for the improvement of bread and the durum wheats, chick-pea and farming systems. ICARDA's research provides global benefits of poverty alleviation through productivity improvements integrated with sustainable natural-resource management practices. ICARD meets this challenge through research, training, and dissemination of 'information in partnership with the national agricultural research and development systems. The results of research are transferred through ICARD's cooperation with national and regional research institutions, with universities, with universities and ministries of agriculture, and through the technical assistance and training that the Center provides. A range of training programs is offered extending from residential courses for groups to advanced research opportunities for individuals. These efforts are supported by seminars, publications, and specialized information services.

Arabian Peninsula Regional Program (APRP) serves the seven countries of the Arabian Peninsula, namely Bahrain, Kuwait, Qatar, Saudi Arabia, Sultanate of Oman, United Arab Emirates, and Republic of Yemen. The Program addresses three priority themes (i) rangelands, forage and livestock; (ii) protected agriculture; (iii) water resources management. The three major themes are supported by research in agroecological characterisation and stress physiology. Emphases are also given to institutional strengthening and capacity building, human resource development, information technology and its transfer. APRP is supported financially by the Arab Fund for Economic and Social Development (AFESD) and the International Fund for Agricultural Development (IFAD) and more recently the OPEC Fund for International Development.

ICARDA-APRP

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