

DATE PALM RESEARCH AND DEVELOPMENT PROGRAMME IN THE UAE (UAE / 2000 / 002)

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ABSTRACT

The Date Palm Research and Development Programme in the UAE, Co-implemented by the UAE University and the United Nations Office for Project Services (UNOPS) since 16 June 2000, will be presented. The Project's background and justification, its development objectives along with the immediate objectives, outputs and activities will also be discussed.

Key words: Date Palm, *Phoenix dactylifera*, UAE – University, UNOPS.

Date Palm Culture in UAE

The United Arab Emirates (UAE), proclaimed on the 02nd December 1971, is set up of seven Emirates with Abu Dhabi the capital of the State. UAE, with a total land area of 83,600 km² (including approximately 200 islands) is inhabited by 2.443 million.

Climatically, the country is divided into two ecological zones which greatly influence the agricultural production: These are the coastal region with hot and humid summers and warm winters, and the inland region which is more dryer.

Under the leadership of His Highness, The President Sheikh Zayed Bin Sultan Al-Nahayan, there are continual efforts to increase agricultural productivity, to make better use of available resources, and to produce an agricultural leap that is changing the face of the UAE's desert.

Indeed, His Highness, The President, attaches a great importance to agricultural development in general, and to date palm in particular. This special attention is clearly evident in the continued expansion in agricultural resources and investments, in the fast growth in the number of palm trees, in the continued increase in the size and variety of date

projects, in the extensive use of modern technologies, and in the important initiatives undertaken in the areas of manufacturing and marketing of date fruits.

The potentialities of a commercial date production industry in UAE were realised many years ago. This fact is evidenced by the recent planting of several million date palms to proudly reach the level of above 40 million date palms. (UAE News Agency; Al Khaleej No. 7763 of 20/08/2000).

The annual date production in UAE has jumped from less than 8,000 metric tonnes (MT) in 1971 to more than 240,000 MT in 1995, an increase of about 30 fold. The date fruit import had consequently dropped from 100,000 MT (1989) to 12,000 MT (1994). The decline corresponds with an increase in the country's production of 100,000 MT over the same period. The export of dates had also jumped from zero (0) in 1971 to above 50,000 MT in 1998 with a value of US\$ 15 million. The country exports its dates to India, Indonesia, Malaysia and Pakistan.

According to FAO Agristat-Database (1997), the UAE date harvested area has increased from less than 60 hectares (ha) in 1971 to 31,005 ha in 1996. This increase in superficies is about 48 times and allowed the country to be internationally classified as the Seventh major producing country with six percent of the world date production. This date superficies constitutes 15 % of the total cultivated land (about 200,000 ha).

The actual date tree population as mentioned above is about 40 millions of which 8.5 in AL-AIN region. The gene pool is large and composes about 120 date varieties. New introductions from Saudi Arabia, Iraq, Iran and Oman included Khallas, AbouMaan, Hallawi, Khissab, Khenezi, Nabut Saif, Jabiri, Hillali, Lulu, Chichi, Khadraoui, Sakii, Sultana and Barhi varieties.

The Red Palm Weevil (RPW), *Rhynchophorus ferrugineus* Olive., is considered a major pest of the date palm in the Middle East where it causes severe damage. During a period of 5 years, the RPW infected trees in the UAE jumped from 1,3000 (1990) to 44,000 date palms (1995). This pest infestation is annually doubling with a rate of 2.02 and constitutes a threat to the date industry in the country, as well as to the whole region.

As previously stated, the UAE Government is making all efforts to increase the date tree population in order to promote the date industry and to counteract the destruction effect of the RPW. Several million of date trees, covering a large spectrum of renown date varieties, are hence to be rapidly and cost-effectively produced through tissue culture.

The Date Palm Tissue Culture Laboratory of the Date Palm Research and Development Unit of the UAE University – Al Ain, was established during 1989 and took several years to reach a functional level.

However, major hurdles and specific problems and issues for consideration in developing a Date Palm Research & Development Programme are the following:

- **Lack of high-quality date cultivars:**

Most date plantations consist of seedling characterised by low fruit quality and yield. The import and planting of good quality varieties, propagated locally through tissue culture techniques, will strengthen the foundation of UAE date industry.

- **Tissue Culture Laboratory:**

The planting of seedling still exists and should be discouraged. The removal and planting of offshoots is effected improperly and great losses result. Rooting of small offshoots, their adequate removal and planting will certainly enhance the survival rate. In order to satisfy the urgent and large demand for high-quality selected varieties, micro propagation *in vitro* constitutes the only issue. True to type plantlets of high quality date varieties and disease free will be mass produced by the Al Ain Laboratory and within a short period of time.

Only a well functioning tissue culture laboratory will be able to meet the future demand of the country. It will also be possible to enhance foreign exchange earnings, by satisfying the large demand for date planting material in the Middle East region.

- **National Capacity:**

A major technical hurdle which could block the rapid expansion of the date industry in the near future is the almost complete lack of “know-how” of practical tissue culture techniques of date palm. In

fact, rare people that have been fully trained in date palm *in vitro* mass propagation and there is a lack of information related to such technique. The background of technical and scientific staff, and manpower should be upgraded.

The build up of national capacity in the field of date palm tissue culture is to be targeted by the project.

- **Research & Development Programme:**

A well structured and coordinated research and development programme on date palm propagation and production is of an urgent need. The sustainability of the Tissue Culture Laboratory will strongly depend on the adopted research programme and on the national staff training.

PROJECT PRESENTATION

To increase and to diversify crop production is the main Government policy thrust for Agriculture. Improving the country's food self-sufficiency ratio is the target although, at present, there is a shift towards food security. Under the leadership of His Highness, The President Sheikh Zayed Bin Sultan Al-Nahayan, there are continual efforts to increase agricultural productivity, to make better use of available resources, and to produce an agricultural leap that is changing the face of the UAE's desert.

Presently, the Government and private sector date growers are convinced of the date production potential and are striving to establish and strengthen date plantations and to promote a modern date production industry. However, they are partially lacking some good quality date varieties, and are planning to mass-propagate these selected varieties through tissue culture techniques to satisfy the demand.

It is therefore necessary to overcome all shortcomings which could hamper the development and strengthening of the date palm production industry in the UAE.

The Government of the United Arab Emirates (UAE), in the framework of its development plans, has placed the establishment of a date production industry among its priorities. The Date Palm Research and

Development Programme (DPRDP) is one of several projects implemented by the UAE -University. Indeed the UAE-University plays a distinct role through multi disciplinary research programs at the Agricultural Sciences Faculty. The Date Research and Development Unit which includes the Plant Tissue Culture Laboratory is one of these important programmes. Over the past ten - (10) years, substantial investments have been made in the date production and propagation areas mainly using tissue culture techniques.

At the initiative of the United Nations Development Programme (UNDP) Country's office in UAE and the UAE University, an introduction mission to UAE University was undertaken by the Chief Technical Adviser (CTA) during the period 19 - 27 February 1999. The implementation of this introduction mission was made possible by funds from the UNDP Country's office (Abu Dhabi - UAE).

The objectives of this mission were to assess the situation of the date palm tissue culture laboratory, identify technical constraints to be overcome and to formulate an overall strategy and action Programme to support the date palm research and development programme in UAE. A project document proposal was drafted and submitted to UNDP Headquarters. In the context of the Country Cooperation Framework for the period 1997 - 2001, the UAE - University requested the UN technical assistance for a Date Palm Research and Development Programme.

Consequently, an agreement was signed on 5 December 1999, between the UAE - University as agent of the UAE - Government and the United Nations Development Programme (UNDP) representing UN Office for Project Services (UNOPS) as the executing agency.

The project reference is UAE / 2000 / 002 and the title is "Date Palm Research and Development Programme" with a government contribution of US \$ 639,996.00 (Duration: 4 years).

The project is to provide technical and scientific skills to the date research and development unit at the UAE University, to strengthen the tissue culture laboratory, to improve mass propagation and production techniques and to ensure the training of personnel. The continuous availability of the best date palm varieties, the implementation of the research and development programme, and the build up of national capacity are the aims of the project.

The project will strengthen the Date Palm Research and Development Unit of the UAE - University, then it is mainly focussed to national capacity building. As consequence of the first results, i.e. supply of vitro-plants to and their cultivation by the beneficiary farmers, the

project will play a very important role in the improvement of living conditions of rural communities, protection of the environment and sustainable management of natural resources.

The immediate beneficiaries will be the UAE University presented by the Date Palm Tissue Culture laboratory and the target beneficiaries will be the Government and private sector date growers producing, retailing and exporting date products. Local date fruit consumers and the world Muslim community would also share the benefit due to the expected increase in dates available in the country. Finally, the ecosystem of arid regions in UAE will be improved.

The Date Palm Project will concentrate its activities at the Date Palm Research and Development Unit including the Tissue Culture Laboratory in Al-Ain.

The project is attached to the UAE University which is appointed by the Ministry of Higher Education and Scientific Research as the executing agency. The project is working in close cooperation with existing institutions, organisations and projects related to the agricultural development in UAE.

Expected Outputs of the Project:

- A well structured Research and Development unit in the field of date palm micro-propagation and production will be established;
- Upgraded and well functioning Tissue Culture Laboratory;
- A larger genetic base of high quality date varieties amongst the local date population and the internationally renown varieties;
- Mass propagate selected varieties by tissue culture and their hardening-off;
- An established extension system which supervise and ensure a follow up to the distribution of date palm plants on a large scale to date growing areas;
- Four to six trained national staff in the field of date palm microporpagation and production.

Project's Development Objectives

1. Mass propagation through tissue culture of the best date palm varieties in order to satisfy the country's needs in plant material. Al-Ain tissue culture laboratory is to become a functional and sustainable national unit. The large scale multiplication and planting of date palm will halt desertification and increase food supply and income for farmers.
2. To improve the research/development level in the field of date palm propagation and production.
3. To build up the national capacity in the above mentioned areas.

Project's Immediate Objectives, Outputs and Activities

1. Immediate Objective 1:

Large scale propagation of the high yielding and good quality date varieties through the use of tissue culture techniques.

Outputs and Activities:

1. Output 1: A functional and sustainable Tissue Culture Laboratory.

1

- * Assess and improve the actual function conditions of the laboratory with regard to the production line, rate of multiplication, varieties introduced, equipment and personnel.
- * Study phase by phase the multiplication and aseptic processes in the laboratory.
- * Develop a long term coordinated research and production program in the field of date palm propagation and development.
- * Plan and conduct on site training for the laboratory personnel.
- * Advise national staff and date growers on the correct and modern nursery practices for date palm hardening.

1. Output 2: Mass-propagation of selected best date varieties.

2

- * Improve and/or establish the protocol for micro propagation techniques of superior selected varieties.
- * Introduction of various date varieties and selected cultivars to in vitro conditions.
- * Optimise per variety the multiplication process.
- * The Tissue Culture Laboratory - Al-Ain will be in charge of large scale multiplication of selected varieties to meet the national demand and avoid the use of undesirable imported material.

1. Output 3: Hardening-off of all produced tissue culture date palm plants.

3

- * Assess the actual nursery with regard to equipment and itinerary of acclimatization.
- * Develop a hardening-off program of locally produced tissue culture plants of the best date varieties.
- * The Tissue Culture Laboratory will supply the date growers with the technical itinerary and how to care for the tissue culture-derived date plants.

2. **Immediate Objective 2:**

To strengthen the national staff and technical manpower of the UAE University, the Ministry of Agriculture research personnel and private sector date growers. The national capability for date palm research and development in the field of in vitro propagation and production is to be urgently developed.

Outputs and Activities:

2. Output 1: Four to six trained staff and manpower capable of operating the date palm tissue culture laboratory and carrying out research activities on date production and propagation.

* A study tour of two weeks duration for the date palm project NPD and an officer from the Date Palm Research and Development Unit to advanced date tissue culture laboratories (Morocco & Namibia).

* An official responsible for research at the Date Palm Research and Development Unit should undertake a two weeks study tour to date research and development centres in Morocco and Tunisia.

* Annual demonstration and a national training course of one week duration on date palm micro propagation and production at UAE University.

* Organize in-service training in the lab, the nursery and the field.

* Organize meetings and seminars on *in vitro* propagation and production of date palm.

* Present an annual graduate course of 20 hours duration on plant tissue culture: Agricultural applications (UAE University); lab sessions are also to be conducted.

* Present an annual graduate course of 10 hours duration on Date Palm Tissue Culture (UAE University). Specialized lab sessions are also to be conducted.

* Supervise, Advise and co-advise post graduate research subjects (Master and Ph-D levels) in the field of date palm micro propagation and production. Annex 2 presents a list of potential subjects.

- * Supervise and conduct the planned research according to the research and development Unit's workplan.
2. Output 2: A developed specialized library capable of disseminating information and results of the Date Palm Research and Development Unit.
- * Develop a specialized library, technical documents, production of technical leaflets and field reports.
 - * Initiate the editing of a national document on the "Date Palm Research & Development Activities conducted in UAE".
 - * Arrange cooperation and scientific exchange between the Unit and other institutions in the world that have common interest.
 - * Prepare the six months technical and progress reports.

Date Palm Tissue Culture Laboratory (DPTCL)

Presentation

The DPTCL, founded in February 1989, belongs to the UAE – University and took several years to reach its technical establishment. A new and adequate facility was build in 1993. The DPTCL receives the continuous attention of H.E. Sheikh Nahayan Bin Mubarak Al Nahayan, Minister of Higher Education and Scientific Research and Chancellor of the UAE – University. The DPTCL is internationally recognized as one of the major commercial Date Palm Mass Propagation Unit, thanks to the wise leadership of Mr. Hadeef. B.J. Al Dhahiri, the Vice Chancellor of the UAE – University.

The application of tissue culture techniques for date palm, also called *in vitro* propagation, has many advantages in comparison to the two traditional techniques (seed and offshoots propagation) and enables the following:

- Propagation of healthy selected female cultivars (disease and pest-free), Bayoud resistant cultivars, or males having superior pollen with useful metaxenia characteristics which can easily and rapidly be propagated;

- Large scale multiplication;
- No seasonal effect on plants because they can be multiplied under controlled conditions in the laboratory throughout the year;
- Production of genetically uniform plants;
- Clones to be propagated from elite cultivars already in existence, or from the F1 hybrids of previous selections, and seed-only originated palms;
- Ensure an easy and fast exchange of plant material between different regions of a country or between countries without any risk of the spread of diseases and pests; and
- Economically reliable when large production is required.

The following are a few highlights to describe the Project's DPTCL :

*** Budget and Infrastructure**

- Annual Operational Budget : 2.6 Million AED.
- Laboratory Superficy : 1,600 m²
- A date palm gene pool area : 20 hectares
- Hardening facilities : 14 Greenhouses and 3 Nurseries (5 hectares)
- Growth Chambers : Six (6) with 90,000 cultures capacity for each.
- Working Stations for Cultures : 32 (16 Air Laminar flow Hoods).
and Subcultures

*** Personnel (67 in Total)**

- Laboratory Technicians & Assistant Technicians : 48
- Greenhouses and Nurseries Staff : 14
- Laboratory & Hardening Supervisors : 2
- Managerial Staff (Director, Assistant Director & Financial / Administration Officer) : 3

*** Production Capacity**

So far the DPTCL had produced and distributed about 200,000 date palms of different varieties (e.g: Nabt Saif, Sultana, Barhee, Rziz,...).

The actual project aims to strengthen the existing unit and targets an annual production of one million date palms as from 2005. A second

working shift is to be installed along with new laboratory extensions and buildings.

* **Varieties Mass Propagated**

The following date palm varieties are *in vitro* propagated in the DPTCL: Khlass, Barhee, Rziz, Sakii, Jech Ramli, Maktoumi, Lulu, Nmishi, Chichi, Sukkari, Khissab, Abu Maan, Sultana, Nabt Saif, Khadraoui, Hilali, Khenezi and a male named MY2. A phenological description of these varieties is summarized in Table 1.

The project is implementing an annual programme to introduce new date selected varieties and to reintroduce the previous ones in order to continuously have young cultures available.

* **Project *In Vitro* Technology**

The DPTCL has used *Organogenesis* since its establishment in 1989, as the main *in vitro* technique to mass propagate UAE date palm varieties.

Organogenesis technique, based on meristematic tissues potentiality, avoids callus formation and does not use 2,4-D. Growth substances included in the media are used as low as possible. Organogenesis technique ensures the true to typeness of the produced date palm material.

Indeed, Organogenesis technique used in the project's DPTCL is totally different from the asexual embryogenesis used elsewhere. Asexual (called also somatic) embryogenesis, is based on the callus production and multiplication, followed by the germination and elongation of somatic embryos.

Organogenesis technique consists of 4 steps: Initiation of meristematic buds (called also the starting step), multiplication, elongation and rooting (swelling step).

* **Hardening off Programme**

Tissue Cultures derived date palms produced at the DPTCL go through a well planned hardening off (irrigation, fertilization, disease and pest control programmes). A survival rate above 90 percent is commonly obtained for all mass propagated varieties. This know-how is made

available to nationals within the project's framework as to build up national capacity.

* **After Distribution – follow up**

The project also initiated a programme to ensure a sound follow up of the distributed date palms. A precise technical itinerary highlighting all steps from palms delivery till after field planting is available for date growers.

Implementing Agency

The Date Palm Research and Development Programme (UAE/2000/002) is a UAE project under the responsibility of the UAE – University and Co-Implemented by the United Nations Office for Project Services – UNOPS.

Contact and More Information

Further information can be requested from Prof. Abdelouahhab Zaid, Chief Technical Adviser / Project Director, and Eng. Helal Humaid Al Kaabi, National Project Director, UAE – University, both at the following address:

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**Table 1: DESCRIPTION OF 17 DATE PALM VARIETIES UNDER MULTIPLICATION
In the DPTCL (*) (January, 2001)**

COMMON NAME	ORIGIN	FRUIT QUALITY	FRUIT RIPENING	FRUIT FLAVOUR	FRUIT COLOUR (***)	FRUIT SHAPE	FRUIT TEXTURE	FRUIT SIZE	DESIRABLE CHARACTERS
KHLASS	KSA / Al Hassa.	Excellent	Medium	Rich	Yellow in Khalal	Oblong – oval	Soft	Medium with a very small perianth	- Drought tolerant, even better than Khenezi. - Longterm storage
BARHEE	Iraq / Basrah	Excellent / High / superb	Medium / late	Rich / delicate with thick flesh	Light amber to yellow (Khalal)	Broadly oval, nearly cylindrical or rounded	Soft	Medium	High quality, heavy yield; with low tannin in Khalal stage
RZIZ	KSA/ Al Hassa	Excellent	Medium / late	Mild	Yellow	Oval	Soft	Small to medium	- Also called ARZIZ - Second after Khlass.
SAKII	KSA/ Najd	Good	Medium	Strong & delicate	Clear yellow	Cylindrical	Dry	Medium to large	-
JECH-RAMILI									
HILALI	Oman, (**) UAE, KSA	Medium to good	Late / very late	Mild / delicate	Yellow	Oval	Soft	Medium	- One of the very late ripening varieties - Small canopy
MAKTOUMI	Iraq / Basrah	Good	Medium to late	Rich	Yellow / Orange	Oval to Round	Soft	Medium to large	- No fibers at Bisser stage.
LULU	KSA	Good when consumed Rutab	Late / Medium	Good, but with fibres	Yellow to golden	Oval	Soft	Small to medium	- Large fruit bunches. - Easy to thin.
NMISHI									

COMMON NAME	ORIGIN	FRUIT QUALITY	FRUIT RIPENING	FRUIT FLAVOUR	FRUIT COLOUR (***)	FRUIT SHAPE	FRUIT TEXTURE	FRUIT SIZE	DESIRABLE CHARACTERS
CHICHI	KSA / Al Hassa	Average to Good.	Medium	Sweet	Yellow to Green	Long Oval	Semi dry soft to	Medium	- Also called Abu Taouik
SUKKARI	Iraq / Basrah	Very good to Excellent	Medium	Sweet	Yellow	Heart shaped	Soft	Small	- A small seed.
KHISSAB	KSA & Oman	Good	Late / Very late	Tangy	Dark red	Oval-round	Soft / dry	Medium	- Skin separation problem - Not of Export quality
ABU MAAN	UAE (**)	Good	Medium-early	Good	Yellow	Oval-long	Soft / dry	Large	- Black at Tamar stage.
SULTANA	KSA	Excellent	Medium / Late	Slightly sweet	Yellow	Oval-round	Soft	Medium	- A very rare variety
NABT SAIF	KSA / Al Hassa & Qaseem	Excellent	Medium	Excellent	Yellow	Oval-round	Soft	Medium	- Highly prized variety but lower than Khlass.
KHADRAOU I	Iraq/ Basrah	Good	Medium/ early	Rich	Yellow-Green	Oval	Soft / dry	Medium	-
KHENEZI	KSA / Al Katif	Average to good	Medium	Sweet / close to Barhee	Red	Oval-long	Soft	Medium	- Tolerates high humidity.

(*) DPTCL: Date Palm Tissue Culture Laboratory.

(**) UAE: United Arab Emirates / KSA: Kingdom of Saudi Arabia.

(***) Fruit colour at Rutab stage.