

The Blessed tree

KHALIFA INTERNATIONAL DATE PALM AWARD



Volume No. Seven Issue No. 02
OCTOBER 2015



**U.N. CERTIFICATION OF AL AIN AND LIWA DATE PALM OASES AS
A GLOBALLY IMPORTANT AGRICULTURAL HERITAGE SYSTEM**



Photography by : Ismail Al Fraise, Date Palm Through the Eyes of the World - 2015

تحت رعاية معالي الشيخ نهيان مبارك آل نهيان
وزير الثقافة والشباب وتنمية المجتمع، رئيس مجلس أمناء جائزة خليفة الدولية لنخيل التمر



DATE PALM النخلة THROUGH THE EYES OF فَمِ عَيُونِ THE WORLD العالم

مسابقة دولية للتصوير الفوتوغرافي

باب المشاركة مفتوح للهواة والمحترفين
اعتباراً من 01 / 09 / 2015 ولغاية 31 / 12 / 2015
تعلن النتائج في شهر فبراير 2016

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بالتعاون مع رابطة الوطني الدولية للتصوير الفوتوغرافي

ترسل الاعمال حصرياً عبر البريد الإلكتروني
kidpaphoto@gmail.com
All materials to be addressed to kidpaphoto@gmail.com

www.kidpa.ae

Our Tree

KHALIFA INTERNATIONAL DATE PALM.... LEADERSHIP AND EXCELLENCE.....



Date palm tree is part of our ancient heritage system and has earned attention and care since long due to its heritage, nutritional, economic and aesthetic importance.

The Founder, the Late Sheikh Zayed Bin Sultan Al Nahyan (God rest his soul in peace) gave the palm tree special attention. He (God's mercy) was keen to expand green areas and achieve ecological balance. The date palm tree was one of the most important vegetative elements which covered large land areas and which, and thanks to such efforts, have changed from barren land into a green paradise. The white hands of Zayed (God's mercy) have reached everything and the palm tree has earned much of such good.

On the trail of Zayed (God's mercy), his successor, our father, H.H. Sheikh Khalifa Bin Zayed Al Nahayan (God protects him), has proceeded with the march of development and construction in all fields. The date palm tree received great attention and special care and Khalifa International Date Palm Award was one of the honors of His Highness in this field.

Since first founded, the Award has achieved a lot of progress and success and has effectively contributed to development of date palm sector at the Arab and International levels to occupy a prominent place at the global level and to become a destination for the researchers, experts, and farmers aspiring to record a distinctive imprint in date palm sector. The number of researches, studies and contributions submitted for the Award over seven sessions further emphasizes the standing of the Award which attracted the global experts and become a bridge for cultural and cognitive communication and exchange of experiences.

Such successes and achievements, which are the pride of Khalifa International Date Palm Award, have been realized thanks to the kind patronage of the Award's owner and sponsor, H.H. Sheikh Khalifa Bin Zayed Al Nahayan (God Protects Him) as well as the special attention of H.H. Sheikh Mohamad Bin Zayed Al Nahayan, Crown Prince of Abu Dhabi and Deputy Higher Commander of the Armed Forces who has rendered the Award special attention and has always directed to develop it towards exercising its role in promoting date palm sector.

Furthermore; the honor H.H. Sheikh Mansour Bin Zayed Al Nahayan, Deputy Prime Minister and Minister of Presidential Affairs through his graceful patronage of the honoring ceremony of the winners of the winners of the 7th Session has emphasized his great interest in date palm sector and his keenness to provide all means of support to scientific research on the blessed tree.

H.H. Sheikh Mansour coronation of the winners of the last session has given us all the incentive to exert maximum efforts for development of the Award and rallying all capabilities for maintaining its leading position and has also formed a new start of the Award towards wider and wider horizons. So, all thanks and appreciation to His Highness for his patronage and interest in Khalifa International Date Palm Award and for his wise guidance which enlightens us to achieve new accomplishments to be added to the Award's record.

With publication of this featured issue of the "Blessed Tree" magazine, as one of the fruits of Khalifa International Date Palm Award, a new chapter would begin in the success story documented by the successive issues of this publication which witnessed development keeping pace with the Award and parallel to it.

Having determined to maintain leadership and excellence of Khalifa International Date Palm Award, we are also keen to develop the "Blessed Tree" magazine so as to remain a reliable reference for researchers, farmers and scholars through the researches and studies published in its pages in a scientific and professional manner keeping pace with the times and fulfilling the aspirations. .

Nahayan Mabarak Al Nahayan

Minister of Culture, Youth & Community Development
Chairman of Khalifa International Date Palm Award Board of Trustees

Invitation to Researches, writers and interested Scientists

Out of the keen interest of Khalifa International Date Palm Award Secretariat General to spread the awareness and specialized knowledge in date palm industry across the world.

Therefore, we invite all academics, specialist researchers, producers and date palm (the blessed tree) lovers to participate in either languages Arabic or English in related matters and issues to date palm such as (cultivation, disease prevention, maintenance, food processing, marketing,...) materials should satisfy publication criteria set out in the magazine.

We value and appreciate your good efforts made to serve the blessed tree.

Materials are to be sent to Head of Media Committee via email address: kidpamagazine@gmail.com

Our Message

KHALIFA INTERNATIONAL DATE PALM...

SPREADING WIDER FOR SUBLIME PURPOSES ...



We are pleased to put this new issue in the hands of readers of researchers, farmers and those interested in date palm trees as we proceed towards a new phase of Khalifa International Date Palm Award, characterized by wider spread towards achieving sublime and noble goals in date palm sector due to its heritage, nutritional and economic importance.

The new phase of Khalifa International Date Palm Award, as represented in spreading wider with the Award, launching and sponsoring numerous events and participating in local and international activities. This phase comes to emphasize the attention the rational leadership of the UAE is rendering to the agricultural sector, in general, and date palm tree, in particular, and its leading role in this field. It is also a translation of the guidance and ideas of the Award's owner and patron, H.H. Sheikh Khalifa Bin Zayed Al Nahayan, President of the State (God Protects Him) as well as the special care of H.H. Sheikh Mohamad Bin Zayed Al Nahayan, Crown Prince of Abu Dhabi and Deputy Higher Commander of the Armed Forces who rendered date palm sector special attention.

Follow-up and attention of H.H. Sheikh Mansour Bin Zayed Al Nahayan, Deputy Prime Minister, Minister of Presidential Affairs with respect to date palm sector and Khalifa International Date Palm Award have also been one of the most important incentives of such a success and excellence. His Highness has rendered the Award special care and constant follow-up and his graceful patronage of the honoring ceremony of the winners of the 7th Session has emphasized his interest in the Award and celebration of the winners, giving thereby the workers and those interested in this sector the incentive to exert efforts and achieve further progress and success.

The initiative and guidance of His Highness for organizing the 1st Egyptian Dates Festival in Siwa Oases in the sisterly Arab Republic of Egypt, is also a true translation of his keenness to develop this sector at local, Arab and International levels and an emphasis of the Award's role and noble goals of being a bridge for cultural, cognitive and scientific communication and an occasion for strengthening the bonds of brotherhood, friendship and love among peoples.

Within such a context, guidance of H.E. Sheikh Nahayan Mabarak Al Nahayan, Minister Culture, Youth and Community Development and Chairman of the Board of Trustees of Khalifa International Date Palm Award, has come to participate in EXPO MILANO 2015 towards promoting the position of the Award at the international level and wider spreading of its culture. His Excellency has been always directing to rally all capabilities and support for maintaining leadership and excellence of the Award and realizing more achievements and for continuing its quest to attract the most important researchers and experts for contributing to development of scientific research on date palm tree.

Khalifa International Date Palm Award has been able to achieve its goals of dissemination of date palm culture and to occupy a leading position through attracting hundreds of farmers, researchers, experts and those interested in this blessed tree from countries all over the world. Parallel to the success the Award has attained, the "Blessed Tree" magazine has also earned the interest of a large segment of the researchers and farmers and hundreds of researches and practical studies have been published through its pages which effectively contributed to educating the farmer on using the latest methods of production, marketing, processing and treatment. The magazine has also supplemented the Arab Library with materials and photos which are considered an important reference for scholars, academics and those interested in date palm tree.

We are confident that the next is better for the future of this tree, thanks to your attention and contributing to the magazine with the latest experiments, studies, photos and researches. We fully hope to be up to your expectations and to the responsibility we are holding on our shoulders to upgrade the date palm tree towards achieving the goals and aspiration and equivalently to its importance and position, both past and present.

I am also glad to thank greatly the researchers and contributors to this magazine, who are indeed its most important pillar and a reason of its success and excellence. We always hope that the next will be lovelier, God willing.

Dr. Abdelouahhab Zaid Prof.

Secretary General of Khalifa International Date Palm Award



All issues of the Blessed Tree magazine are available
on KIDPA website: www.kidpa.ae

Scientific Supervision Board

Prof. Ghabeb Alhadrami

Dean's Office, College of Food
and Agriculture, UAE University

Dr. Helal Humaid Saad Al Kaabi

Director of Gardens & Recreation
Facilities Div. Southern Region

Dr. Hassan Shabana

Date Palm Global Network

Magazine Correspondences

All technical and scientific
materials are to be addressed to
the Head of the Media Committee,
Editorial Manager, on the
following address:

P.O. Box 82872, Al Ain, UAE
Tel: +971 3 7832434
Fax: +971 3 7832550
kidpamagazine@gmail.com
www.kidpa.ae

Design, Layout and Printing



P.O. Box 33644, Abu Dhabi, U A E
Tel: 00971 2 6395559
Fax: 00971 2 6395558
info@arevagroup.ae
www.arevagroup.ae

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Honorary Chairman

H.E. Sheikh Nahayan Mabarak Al Nahayan

Minister of Culture, Youth &
Community Development,
Chairman of the Award Board of
Trustees

General Coordinator

Dr. Abdelouahhab Zaid
Award Secretary General

Editorial Manager

Mohamad Kassab Al Mahamid
mkdassabm@gmail.com

Legal Director

Dr. Helal Humaid Saad Al Kaabi

Public Relations Officer

Ahed Karkouti

Publication criteria in the magazine

- The Articles should be new, dedicated particularly to the Award's magazine, and have not published before.
- Articles are to be in a soft copy, whether in Arabic or English, and should be supported by specialized sources and references at the end.
- Researches and studies should be accompanied by the required scientific photographs of high quality (digital / high resolution).
- Articles and photographs are to be submitted to the magazine by e-mail, or to be sent to the Award's P.O. Box on a CD with a typed and printed hard copy.
- The magazine is not obliged to return the articles back, whether published or not, to the participants.
- A writer of an article should enclose a personal photo with his CV including the full name, phone number, email and P.O. Box, in addition to the bank account number in English (Name, Name of the Bank, Account Number and Swift Code) in order to allow sending him the due amount in case the article is published, in compliance with the Magazine's financial system.
- All Articles in the magazine necessarily reflect the views of their respective authors and do not oblige Khalifa International Date Palm Award.
- Scientific subjects in the magazine are arranged according to technical considerations.
- The Magazine welcomes readers from all the date palm lovers around the world, who contribute in deepening the knowledge and building a sustainable society.

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IN THE PRESENCE OF MANSOUR BIN ZAYED AND NAHAYAN MABARAK...

Khalifa International Date Palm Award Honors Distinguished Personalities in Date Palm sector And Celebrates Winners of the Seventh Session

MANSOUR BIN ZAYED: PATRONAGE OF THE PRESIDENT OF THE STATE GRANTED THE AWARD EXCELLENCE AND LEADERSHIP



H.H Sheikh Mansour Bin Zayed Al Nahayan, Vice Premier and Minister of Presidential Affairs, emphasized that H.H.Sheikh Khalifa Bin Zayed Al Nahayan (God Protects Him), President of the State's patronage of Khalifa International Date Palm Award has granted it excellence and leadership to have a global prestige as the first specialized scientific award for date palm sector worldwide.

This statement came during his attendance of the honoring ceremony of the winners of Khalifa International Date Palm Award's Seventh Session and honoring His

Highness as a "Distinguished Personality" supporting date palm sector and in recognition of his great efforts for serving and developing date palm sector, in general, and his support of the Award, in particular.

H.H Sheikh Mansour Bin Zayed said: "This honor is a medal which we cherish and invites us to pride Khalifa International Date Palm Award that has constructively and effectively contributed to development of date palm sector worldwide to become a bright page in the Emirates track record of accomplishments in all forums."

His Highness added that today's celebration of the winners of the Award's Seventh Session confirms the great success the Award has achieved since its launch and adds a new achievement to its track record of giving and excellence. He also confirmed that he would spare no effort to support the Award and proceed with it to wider horizons for serving date palm sector and farmers so as to fulfill the Awards goals of highlighting the civilized face of UAE and its constructive role in progress of this sector and attention to palm tree as a component, among others, of our ancient heritage and bright present.

H.H Sheikh Mansour Bin Zayed then extended thanks and appreciations to those in charge of the Award, in the forefront of whom is H.E. Sheikh Nahayan Mabarak Al Nahayan, Minister of Culture, Youth and Social Development and President of the Board of Trustees, and praised their efforts and giving over the seven years age of the Award. He said that the quality and distinctive and quality leap the Award has achieved within such a short time is an evidence of diligent and sincere work, expressing meantime his confidence that those in charge of the various committees of the Award are capable of achieving further successes and of contributing to ensuring a promising and better future of the palm tree.

His Highness congratulated, as well, all winners of the Award's Seventh Session and praised their efforts in support and progress of the Award, stressing that the winner researches consist a distinctive addition to palm date sector and would contribute to development of production and manufacture and to practice the best ways for this purpose.

The General Secretariat of Khalifa International Date Palm Award organized a large ceremony today



Nahayan Mabarak: Following the example of our father Sheikh Zayed (God rest his soul in peace) in all what we have achieved..

at Emirates Palace Hotel. During this ceremony, a number of distinguished and influential personalities in date palm sector were honored and the winners of the five categories of the Award's Seventh Session were celebrated.

The ceremony started by the national anthem of UAE and the audience then watched a documentary about Khalifa International Date Palm Award and monitoring evolution of the Award since its inception.

H.E. Sheikh Nahayan Mabarak Al Nahayan, Minister of Culture, Youth and Social Development and President of the Board of Trustees, then delivered the Award's speech, where His Excellency welcomed the attending honorees, winners and the guests of diplomats, VIP's and media.

His Excellency also congratulated winners of Seventh Session of Khalifa International Date Palm Award, emphasizing that the top ranking researches and studies of the Award consist a new quality addition to date palm sector

and would work on development and upgrading of this sector and take-off this leading Award to yet wider horizons.

H.E President of the Board of Trustees said :“Honored by bearing the name of our father H.H. Khalifa Bin Zayed Al Nahayan (God Protects Him), President of the State and leader of its march and builder of its renaissance, Khalifa International Date Palm Award has achieved great development and a quality leap to maintain the leading position as the first scientific award specialized in date palm worldwide after having attracted the most important researchers, experts, scholars, academics, date palm farmers and those interested in this blessed tree at both Arab Countries and world levels. The Award has effectively contributed to development of date palm sector and worked through dozens of researches and studies to find appropriate solutions and efficient techniques for improvement of production and adoption of the best methods of cultivation, processing and marketing.”

His Excellency added: "With confident and constructive steps since its founding, we have set out with Khalifa International Date Palm Award towards fulfillment of all its goals, inspired by and following the example of the approach of the founding father Sheikh Zayed Bin Sultan Al Nahayan (God rest his soul in peace), who rendered utmost attention and patronage to the date palm and during whose reign agricultural sector witnessed great developments and a wide renaissance.

He (Gbh) considered agriculture the title of civilization and a main reason of progress and prosperity and a pillar of the economy of modern state and stressed same when he (Gbh) said: "Give me agriculture and I will guarantee civilization for you". With determination, wisdom and will, he managed to overpower circumstances and overcome obstacles to change desert into a green paradise through millions of trees and other plants. The palm tree was one of the most important pillars of the vast agricultural renaissance and the experts considered this tree a miracle in an era where miracles were over.

The palm tree has also enjoyed distinctive interest from the UAE people as a rich cultural legacy for the people of the region, an important nutritional and economic element and a title of hospitality and warm welcome. Keeping pace with the epoch tools, techniques and technology, UAE has managed to preserve its rich heritage and long-standing and established habits and traditions. They used the latest techniques and sciences and dedicating them to reconstruction of land, building of man and expansion of the green area achieving thereby many accomplishments at the world level, including Guinness record as the first country in growing of palm trees at world level."



His Excellency then extended deepest thanks, appreciation and gratitude to the founder and sponsor of the Award, H.H. Khalifa Bin Zayed Al Nahayan (God Protects Him), President of the State, who rendered this Award all due patronage and care to translate His Highness' vision, approach and interest in Agricultural sector, in general, and palm tree in particular. He stressed that the agricultural boom realized during the reign of His Highness (God Protects Him), is the best witness of such a care and attention after His Highness has directed to dedicate all capabilities to service of farmers and this good land which turned into a pinpointed green paradise.

His Excellency also extended all due thanks and appreciation to H.H. Sheikh Mohamad Bin Zayed Al Nahayane, Crown Prince of Abu Dhabi and Deputy Higher Commander of the Armed Forces, who rendered this Award special care. It is thanks to the guidance of His Highness that the agricultural sector is witnessing such a great prosperity and growth and has

achieved a significant increase in production. The area planted with palm trees has witnessed, as well, large expansion, thus bringing the UAE to the forefront of the dates producing and manufacturing countries worldwide.

His Excellency extended, as well, sincere thanks and appreciation to H.H. Sheikh Mansour Bin Zayed Al Nahayan, Vice Premier and Minister of Presidential Affairs, stressing that His Highness honoring him today comes in appreciation of his patronage and attention of Khalifa International Date Palm Award and their great impact on development and leadership of the Award as well as recognition of his great efforts in palm and date sector to which he has also rendered special attention, great care and limitless giving and that it is at the hands of His Highness that lot of accomplishments have been achieved, saying: "Honoring His Highness today is a response to only part of his great favors and gratitude."

His Excellency thanked also all members of the Board of Trustees of the Award for their dedi-

cation and efforts. He thanked, as well, the members of the Scientific Committee of the Award and all the other committees and all the authorities, departments and organizations which contributed to the success of the Award and worked on making it a scientific and practical edifice, contributing to development and upgrading of date palm sector.

H.E. Sheikh Nahayan Mubarak Al Nahayan then said: " Khalifa International Date Palm Award is no more just an annual award for honoring the winners and distribution of prizes, but has distinctively turned into an annual festival, forum and scientific communication bridge for exchange of knowledge and experiences.

The Award has become a cultural edifice where researchers, experts, farmers and those interested in date palm sector from all over the world meet to introduce conclusions of their ideas, researches and studies with limitless giving, up to the strategic, nutritional and heritage importance of this blessed tree and also to contribute to realization of sustainable development and advancement of this sector through the latest and best reached so far in terms of scientific research, practical experiments and purposeful studies of palm and date sector."

His Excellency stressed that the quality leap, successes and excellence achieved by Khalifa International Date Palm Award during a seven years march filled with giving holds us responsible for proceeding forward with advancement and development of the Award to the better so as to maintain its global leadership and prestige and to be a distinctive ring within the chain of successes and accomplishments achieved by UAE at world level and in all fields, thanks to the great patronage the Award is receiving, the sincere efforts of those in charge of the Award and

the contributions of the experts, researchers and farmers in order to maintain Khalifa International Date Palm Award as the globally top and most influential and effective award in line with the comprehensive cultural renaissance UAE is witnessing in all fields.

H.E. Sheikh Nahayan Mubarak Al Nahayan terminated his speech by extending thanks to all researchers, experts and farmers nominated for all categories of the Award, stressing, meanwhile, that all these researches and studies consist a distinctive addition to the palm and date sector, wishing that the Award would get more featured participations, studies and researches in its next sessions towards development of date palm sector in terms of production, maintenance and manufacturing.

Director General
of Food and
Agriculture
Organization
of the United
Nations "FAO"



H.E José Graziano da Silva, Director General of Food and Agriculture Organization of the United Nations "FAO", delivered a speech during the ceremony, in which

he emphasized It is an honor to return to the United Arab Emirates for this year's edition of the Khalifa International Date Palm Award Ceremony.

This initiative grows in prestige year after year thanks to the leadership and commitment of the Emirates' Government.

FAO has been involved in date palm production for half a century. When I spoke to you last year, I mentioned some areas in which we could continue supporting you.

Today, I am happy to say that we are close to declaring operational two projects that respond to needs we have identified together.

The first project will help the Emirates map the extent of date palm production in the country and estimate water use in cropped land.

The second project will support integrated pest management in date palm production.

For many Arab countries, Date palms are much more than simply food. They are an integral part of your history and cultural identity.

Advancing towards the future while preserving your roots is not always an easy task, but the Emirates have been able to do that with their sustainable date palm production.

Today, I would like to celebrate these efforts.

FAO is proud to recognize the Emirates' Al Ain and the Liwa oases and their date palm production systems as Globally Important Agricultural Heritage Systems (GIAHS) sites.

There are thirteen countries with recognized GIAHS sites around the world, and today we recognize the date palm systems of the United Arab Emirates.

Allow me to explain the importance of GIAHS sites. They are

land use systems and landscapes, which are rich in biodiversity evolving from the co-adaptation of a community with its environment, its needs and its aspirations for sustainable development.

GIAHS sites are living, evolving systems resulting from the connection of human communities and their territories.

The Al Ain and Liwa date palm systems are excellent examples of this relationship.

They constitute globally significant in situ repositories of date palm genetic resources.

They are also home to ancient falaj irrigation systems that teach us valuable lessons on how to cope with water scarcity, a knowledge that will be of great use as we work for sustainable development in the face of climate change.

The Emirates has implemented an active and dynamic conservation program, seeking to revitalize the oases through a variety of measures.

They include protection against urban encroachment, restoration of falaj irrigation systems, and re-introduction of traditional agricultural management.

These efforts preserve knowledge transmitted through generations and ensure that tomorrow, as yesterday, date palms will continue to mean food security for the United Arab Emirates.

I would also like to take this opportunity to reaffirm FAO's commitment to food security and nutrition and sustainable development of the United Arab Emirates, the Gulf countries and the entire Arab world.

We are continuously looking for ways to better support you in reaching the development goals you have set. At the same time, our enhanced partnership also allows us to work together to assist other countries.



Under the wise leadership of His Highness Sheikh Khalifa Bin Zayed Al-Nahyan, President of the United Arab Emirates, and His Highness Sheikh Mohammed bin Rashid Al Maktoum, the Vice President and Prime Minister, your country is rapidly becoming a unique hub to address themes of crucial relevance to FAO, such as managing energy, water and food resources for sustainable growth; and building resilience, especially in countries facing protracted crisis.

An example of this was the Blue Economy Summit you hosted in January 2014, during the Abu Dhabi Sustainability Week.

We appreciate and value our partnership, and hope that we can continue strengthening it in the months and years to come.

A mosaic picture of the founder and sponsor of the Award

During the ceremony, H.H Sheikh Mansour Bin Zayed Al Nahayan received a gift from the General Secretariat of Khalifa International Date Palm Award to H.H President of the State, (God Protects Him), namely a huge picture made by more than ten thousand pieces of mosaic forming the image of H.H. Sheikh Khalifa Bin Zayed Al Nahayan (God Protects Him), founder and sponsor of the Award in besides the Award's logo, in appreciation and recognition of His Highness' limitless patronage and attention to the Award and the blessed tree.



A new global achievement of UAE...

H.H Sheikh Mansour Bin Zayed and H.E. Sheikh Nahayan Mabarak received from H.E José Graziano da Silva a certificate including FAO's certification of Al Ain and Liwa Date Palm Oases in UAE as a "Globally Important Agricultural System for present and future generations". This newly added achievement to the Golden Record of UAE a track record of considerable accomplishments at the global level and in all areas is the culmination of the efforts of the General Secretariat of Khalifa International Date Palm Award and Ministry of Environment and Water to include Al Ain and Liwa Date Palm Oases of the UAE within the Globally Important Agricultural Heritage Systems.



Celebrating distinguished personalities and winners



During the ceremony, distinguished personalities who have significantly contributed to the development of palm sector on the Arab and international level and have had an impressive footprint in this area were honored. The honorees were: H.H Sheikh Mansour Bin Zayed Al Nahayan, Vice Premier and Minister of Presidential Affairs; H.H Prince Faisal Bin Bandar Bin Abdulaziz Al Saud, Governor of Riyadh, Saudi Arabia; H.E. Sheikh Mohamad Bin Zaher Al Hana'i, State Advisor, Oman and H.E. Salim Odeh Salim Al Niber, Jordan.

H.H Sheikh Mansour Bin Zayed and H.E. Sheikh Nahayan Mabararak honored winners of the five categories of the Award and are : Dr. Michael Purugganan, New York University-Abu Dhabi, 1st winner of the " Distinguished Researches and Studies" category and Sultan Gardens and Farms Affairs, Oman, 2nd winner of the same category; Studies and Research Unit of Palm and Dates Development - Plant Tissue Culture Laboratory, UAE University, 1st winner of the "Distinguished Producers" category; Dr. Muhei Eddin Suleiman, Saudi Arabia, 1st winner of the "Best Distinguished Technology" category and Dr. Mohammad Rizk Annan, UAE University, 2nd winner of the same category; Dr. Nasr Al Jaghoub and Eng. Ahamd Fares Zaki, Palestinian State, 1st winner of the "Best Developmental Project" category and Coachella Valley History Museum of Date Palm, U.S.A, 2nd winner of the same category and Prof. José Romero Faleiro, India, winner of the "Distinguished Personality" category.

H.H Sheikh Mansour Bin Zayed congratulated the winners for their achievements and wished them luck and success in their career and to provide further researches and studies for supplementing date palm sector with researches to develop and upgrade it.



The winners extend thanks to the founder and sponsor of the Award...

The winners extended thanks and gratitude to H.H. Sheikh Khalifa Bin Zayed Al Nahayan (God Protects Him), President of the State, founder and sponsor of the Award for his good and blessed efforts for patronage of the date palm and his great support of date palm research and industry. They also

extended thanks to H.H. Sheikh Mohamad Bin Zayed Al Nahayane, Crown Prince of Abu Dhabi and Deputy Higher Commander of the Armed Forces, H.H. Sheikh Mansour Bin Zayed Al Nahayan, Vice Premier and Minister of Presidential Affairs and H.E. Sheikh Nahayan Mabarak Al Nahayan, President of the Board of Trustees for their patronage of date palm sector and Khalifa International Date Palm Award.

They emphasized that such patronage and attention have significantly contributed to develop-

ment of date palm sector at the world level and that, thanks to such leading efforts, UAE has become at the forefront of the countries rendering date palm special and distinctive attention as reckoned with in all international forums.

At the end of the ceremony, the audience toured the wing of the winner and featured photos of the Sixth Session of "Date Palm in World Eye" photography competition, organized by Khalifa International Date Palm Award within the activities aiming at development of date palm sector.

A NEW ACHIEVEMENT ADDED TO UAE GOLDEN RECORD

Certification of Al Ain and Liwa Date Palm Oases as a Globally Important Agricultural Heritage System



During the honoring ceremony of the winners of the Seventh Session of Khalifa International Date Palm Award on the 15th of March instant, H.H Sheikh Mansour Bin Zayed Al Nahayan, Deputy Prime Minister and Minister of Presidential Affairs of the UAE, will receive from H.E José Graziano da Silva, the General Director of Food and Agricultural Organization of the United Nations "FAO", a certificate including FAO's certification of Al Ain and Liwa Date Palm Oases in UAE as a "Globally Important Agricultural System for present and future generations". This system provides an outstanding contribution to promoting food security, biodiversity, indigenous knowledge and an

cultural diversity for sustainable and equitable development.

This newly added achievement to the Golden Record of UAE- a track record of considerable accomplishments at the global level and in all areas- is the culmination of the efforts of the General Secretariat of Khalifa International Date Palm Award and Ministry of Environment and Water to include Al Ain and Liwa Date Palm Oases of the UAE within the Globally Important Agricultural Heritage Systems.

On this occasion, H.H. Sheikh Nahayan Mubarak Al Nahayan, Minister of Culture, Youth and community Development, and President



of the Board of Trustees of Khalifa International Date Palm Award, emphasized that the efforts of UAE, under the wise leadership of our father H.H. Sheikh Khalifa Bin Zayed Al Nahyan President of the UAE, (God Protects Him), will not stop in order to achieve more global achievements in the field of sustainable development and preservation of ancient heritage and the process of development and construction and will effectively contribute to the global human civilization towards maintaining its prestigious position among the economically, culturally, scientifically and socially developed countries.

His Highness added that Khalifa International Date Palm Award, which enjoys the attention of its founder and patron H.H. Sheikh Khalifa Bin Zayed Al Nahyan (God Protects Him), the patronage of H.H. Sheikh Mohamed Bin Zayed Al Nahyan, Crown Prince of Abu Dhabi and Deputy Higher Commander of the Armed Forces and follow-up of H.H. Sheikh Mansour Bin Zayed Al Nahyan, Deputy Prime Minister and Minister of Presidential Af-

fairs, and out of H.H. keenness to achieve its objectives in enhancing the globally leading role of the United Arab Emirates, will proceed with its successful career towards maintaining leadership and distinction as the first of its kind in the world.

Thanks to such support and patronage, the Award would seek further gains and achievements to be added to the Emirates track record in order to exercise its role to the fullest and to realize its noble mission and constructive objectives for which the Award has been launched.

Under the guidance of H.H. Sheikh Nahyan Mabararak Al Nahyan, Minister of Culture, Youth and community Development and President of the Board of Trustees of Khalifa International Date Palm Award and in cooperation with the Food and Agricultural Organization of the United Nations "FAO" and UAE Ministry of Environment and Water have prepared a special file for getting international recognition to include date palm oases in the UAE

within the Globally Important Agricultural Heritage Systems and published a scientific booklet in this concern.

Prof. Abdelouahhab Zaid, Agricultural Advisor at the Ministry of Presidential Affairs and Secretary General of Khalifa International Date Palm Award, also participated with a working paper on UAE efforts for preserving the sites of traditional agricultural systems which are considered a globally important heritage as represented by the date palm oases in UAE in a workshop organized by the Islamic Educational, Scientific and Cultural Organization (ISESCO) and the Food and Agriculture Organization of the United Nations (FAO) about the "Globally Important Agricultural Heritage Systems in the Islamic World", on 4 and 5 of last November at FAO headquarters in Rome.

UAE was represented in the above mentioned workshop by Prof. Abdelouahhab Zaid and Ms. Fatima Obied Said Al Kalbani, Director of Agricultural Health and Development Department of Ministry of Environment and Water.

Khalifa International Date Palm Award and the Food and Agriculture Organization of the United Nations Sign a Letter of Intent



populations and contribute to the growth of the world economy; and that Khalifa International Date Palm Award aims to inspire researchers, growers and exporters involved in the cultivation of date palm and to support research related to the development of the various aspects of the date palm industry; the common will of both parties has met to share and disseminate information on food security, nutrition and agricultural and rural development using their potential, as far as possible, for the benefit of farmers, researchers and consumers in the region and worldwide.

Accordingly; both parties have agreed to explore areas of collaboration, including joint publications, workshops and other activities related to date palm production and to identify potential synergies in collaborating locally and regionally in sharing and disseminating information related to the area of nutrition and date palm production.

Both parties intend to work together to implement the above mentioned activities. All activities foreseen under the Letter of Intent would be the object of specific agreements outlining each Party's role and responsibilities.

The parties have also agreed that this Letter of Intent is a statement of intent and creates no legally binding obligations on the parties and that nothing in this Letter of Intent shall be construed as a waiver of any of the privileges and immunities of FAO nor as conferring any privileges and immunities of a party to the other party or to its personnel.

The General Secretariat of Khalifa International Date Palm Award and the Food and Agriculture Organization of the United Nations "FAO" signed a letter of intent for enhancement of joint cooperation between both on development of date palm sector, in particular, and Agricultural Sector, in general and at local, Arab and international levels.

The letter of intent was signed by H.H.Sheikh Nahayan Mabarak Al Nahayan, Minister of Culture, Youth & Community Development, President of the Award's Board of Trustees, on behalf The General Secretariat of Khalifa International Date Palm Award, and H.E.Dr.Jose Graziano da Silva, Director General of FAO, on behalf of Food and Agriculture Organization of the United Nations.

Considering the mandate of the Food and Agriculture Organization of the United Nations to eradicate hunger, improve nutrition, improve agricultural productivity, raise the standard of living of rural





PRaising THE EFFORTS OF THE GENERAL SECRETARIAT OF KHALIFA INTERNATIONAL DATE PALM AWARD

Nahayan Mabarak Chairs the Annual Meeting of the Award's Board of Trustees

H.H. Sheikh Nahayan Mabarak Al Nahayan, Minister of Culture, Youth and Community Development and President of the Board of Trustee of Khalifa International Date Palm Award, chaired the day before yesterday at Emirates Palace in the capital Abu Dhabi, and at the sidelines of the Award's ceremonies of honoring the winners of the Seventh Session, the 8th annual meeting of the Board of Trustees of the Award in the presence of all members. The Minister and the Board Members reviewed the agenda and he praised the efforts of the General Secretariat and the members of the Board of Trustees during the Seventh Session, which yielded new accomplishments and achieved further success of Khalifa International Date Palm Award and thus ensuring its excellence and maintaining its leadership and distinction at both Arab and international levels.

H.H. President of the Board of Trustees praised the great interest of H.H. Sheikh Khalifa Bin Zayed Al Nahayane (God Protects Him), President of the UAE, founder and patron of the Award, in date palm tree and agricultural sector in general. H.H. Sheikh Nahayan Mabarak Al Nahayan also praised the support of H.H. Sheikh Mohamad Bin Zayed Al Nahayane, Crown Prince of Abu Dhabi and Deputy Higher Commander of the Armed Forces, and the close follow-up of H.H. Sheikh Mansour Bin Zayed Al Nahayan, deputy prime minister, minister of presidential affairs, as having a considerable impact on



development of the Award and its achievement of a quality shift that has given it excellence and leadership.

His Highness and the Board Members reviewed the technical and financial report on the Award's Seventh Session. They all praised the efforts of the General Secretariat for the success achieved at media coverage level with the resulting widespread of the Award at the local, Arab and international levels. The Board of Trustees praised, as well, the development of "Date Palm in World Eye" photography competition, through attracting greater numbers of amateur and professional photographers worldwide in each session, confirming thereby credibility of the competition which enriched palm sector with a lot of featured photos, highlighted the date palm aesthetics and industries and supplemented the researches and studies of this sector with photos of special quality. H.H. Sheikh Nahayan Mabarak Al Nahayan and the Board Mem-

bers also praised the efforts of the scientific committee members of the Award, emphasizing that their application of the standards established by the Award with full transparency and clarity have highlighted the most important researches, studies and scientific experiments of date palm and was fair to the researchers and experts and granted further development and success to date palm sector at production, processing, marketing, irrigation and treatment level.

H.H. Sheikh Nahayan Mabarak Al Nahayan and the Board Members then approved the administrative and media plan of the Award's Eight Session and expressed their absolute confidence in the General Secretariat of the Award, stressing that the Secretariat is up to the responsibility placed on its shoulders for pursuing the successful career achieved by the Award and in keeping pace with the modern developments and technology and in line with the comprehensive cultural renaissance UAE is witnessing at all levels.

EXTENDED THANKS AND APPRECIATION TO THE AWARD'S FOUNDER AND PATRON AND
PRAISED THE SIGNIFICANT ROLE OF THE PRESIDENT OF THE BOARD OF TRUSTEES...

The Scientific Committee of Khalifa International Date Palm Award Holds its Annual Meeting ...

The Scientific Committee of Khalifa International Date Palm Award held its annual meeting yesterday under the chairmanship of Dr. Franz Hoffman, Chairman of the Committee, and in the presence of H.E Prof. Abdelouahhab Zaid, Secretary General of Khalifa International Date Palm Award. The meeting was also attended by all members of the Scientific Committee: Dr. Harrison Hues, Dr. Francis Marti, Dr. Abdullah Wahabi, Dr. Hasan Shabaneh and Dr. Samir Al Shaker.

At the beginning of the meeting, Chairman and members of the Scientific Committee extended thanks and appreciation to H.H. Sheikh Khalifa Bin Zayed Al Nahayane (God Protects Him), President of the UAE, founder and patron of the Award, for his great support of the Award. They also praised the significant role and wise guidance of H.H. Sheikh Nahayan Mabararak Al Nahayan, President of the Board of Trustees of The Award, and his keen follow up of all details of the Award, all of which have had a considerable impact on development of the Award and its achievement of further successes and accomplishments.

The Committee also expressed happiness at the diversity and distinctive standard of the studies and researches nominated for the last session have reached and the keenness of the most important experts and researchers around the world to participate and compete for the top ranks of all categories of the Award, emphasizing thereby the global standing



of the Award, its leadership and its effective role in date palm and agricultural sectors at both Arab and international levels.

Chairman and members of the Scientific Committee expressed, as well, confidence that the next session of the Award would earn more participation of high standard researches and studies that would work on upgrading date palm sector, in particular, and the agricultural sector, in general.

During the meeting, the Committee discussed several topics within the framework of development of the Award and setting off with it towards wider horizons to realize further achievements and to ensure that the Award would maintain excellence and leadership as the first specialized award in date palm at the world's level.

The Committee also discussed more thorough conditions for the competition, control of same and application of uniform terms and conditions in all categories of the Award so as to reach the stand-

ard of the prestigious international awards and to leave a distinctive mark in the field of scientific research and contribution to human civilization, up to the international status of UAE and its great achievements in all forums.

The Committee discussed, as well, a proposal to have the winners present a briefing of their winning studies and researches of all categories during the annual honoring ceremony prior to conveying this proposal to the General Secretariat of the Award for approval and implementation starting from the next session.

Khalifa International Date Palm Award, however, organized a large ceremony at Emirates Palace Hotel in Abu Dhabi last Sunday. During this ceremony, a number of influential personalities in date palm sector were honored together with the winners of the five categories of the Award that has witnessed great development and a quality shift which enhanced its leading position at international level.



Photography by : First Winner Roger Alfonso, Date Palm Through the Eyes of the World - 2015

IN A SPECIAL CEREMONY AND IN RECOGNITION OF THEIR CONSTRUCTIVE
ROLE IN PROMOTING AND SPREADING THE AWARD' CULTURE

The General Secretariat of Khalifa International
Date Palm Award honors a number of media
representatives and winners of “Date Palm
in World Eye” photography competition



The General Secretariat of Khalifa International Date Palm Award held a special ceremony at Abu Dhabi Intercontinental Hotel, during which a number of the various media representatives as well as the top ranking winners of for the 6th Session of "Date Palm in World Eye" photography competition.

H.E Prof. Abdelouahhab Zaid, Secretary General of Khalifa International Date Palm Award, started the ceremony by welcoming the honorees and conveyed to them the greetings of H.H Sheikh Nahayan Mubarak Al Nahayan, Minister of Culture, Youth and

Community Development and President of the Board of Trustees of Khalifa International Date Palm Award. His Highness praised the role of the various media in keeping up with the march of the award and transfer of the bright image of the achievements and gains of the award to all the peoples of the world. He also stressed that all types of media are a true partner in distinction and success and that their effective role has had a significant impact on development and promotion of the Award, its expansion at Arab and International levels and spreading the culture of date palm, which is a

milestone in our rich heritage and tightly linked to our identity and particularity of our culture and truly reflects the genuine Emirati generosity and nobility of traditions.

H.E the Secretary General added that all types of media have done their role and fulfilled their mission to the fullest, deserving thereby all due respect and appreciation. He also valued the constructive and civilized role of the media in documenting and reporting all activities and events in the Emirati arena and thus contributing to consolidation of the UAE position at the world's level.





His Excellency also praised the winners of the photography competition and their efforts and keenness to shoot the most beautiful images of date palm sector and industry to culturally enrich the Award and supplement the arena with distinctive quality photos that serve the research and studies on this important sector.

His Excellency pointed out that the Competition, with the special attention rendered by H.E Sheikh Nahayan Mubarak Al Nahayan, has achieved a tangible development both in the number of participants and in the quality and resolution of the photos, confirming thereby its importance as the first specialized competition of date palm worldwide. He also expressed hopes that the competition would achieve further development and expansion in the next sessions, stressing, meanwhile, that the General Secretariat of Khalifa International Date Palm Award would spare no effort to develop and upgrade the competition so as to allow the opportunity for participation, fair competition and gains for the

greatest number of armature and professional photographers worldwide as one of Award's objectives.

During the ceremony, H.E Prof. Abdelouahab Zaid granted appreciation certificates to the journalists and appreciation certificates with commemorative trophies to the winners of the Photography Competition.

For their part, the honored journalists praised this generous gesture which emphasizes broadmindedness of those in charge of the Award and their recognition of the noble mission of the media, enhancing thereby the good relationships between the Award and media. They also emphasized that such honoring would give them the incentive to exert yet more efforts to convey the shining image of all the events and activities organized and sponsored by UAE, on forefront of which comes Khalifa International Date Palm Award as a landmark in UAE record, towards highlighting leadership of the Award and the significant role UAE has in serving

and developing palm date sector and reflecting the shining image of UAE in line with the globally prestigious standing of UAE.

The top ranking winners of the Photography Competition praised Khalifa International Date Palm Award and "Date Palm in World Eye" competition for allowing them the opportunity to promote their talents and for having motivating their creativity through the standards selected by the competition's management and by creating a fair competition atmosphere to confer more importance on the cultural and aesthetic aspects of date palm. They also confirmed that they would continue to participate in the next sessions of the competition and contribute to expansion of date palm culture and aesthetics.

on choosing the top three winning photos. Winner of the first rank was Roger Alfonso, from the Philippines, the second Ismail Bin Mohammad Al Farisi, from Oman and the third rank went to Anas Mohammad Al Zib, from Oman as well.

Award Statistics 2009 - 2015

Total Number of Participants

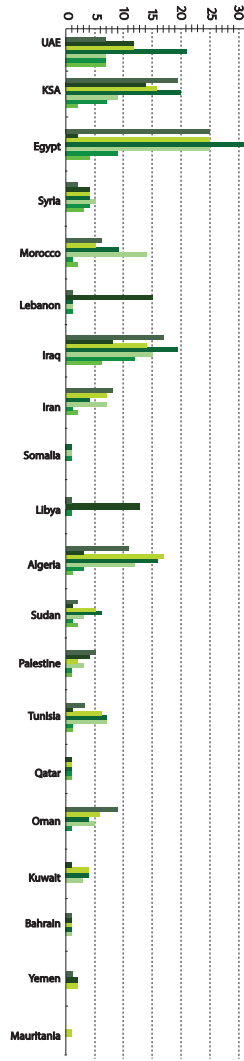
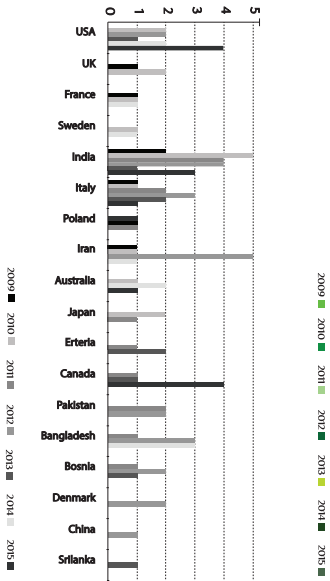
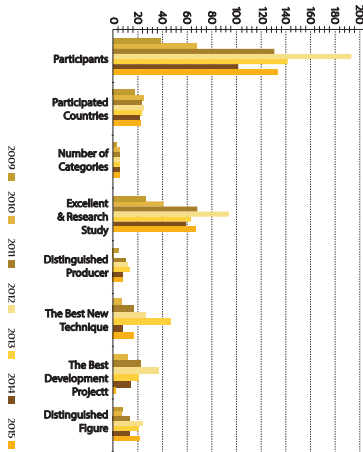
الدورة	إجمالي عدد المرشحين	إجمالي عدد الدول	عدد الفئات	فئة البحوث والدراسات	فئة أفضل إنتاج	فئة أفضل تقنية	فئة أفضل مشروع	فئة أفضل شخصية
2009	39	18	3	26	5	-	-	8
2010	67	25	5	40	1	7	12	7
2011	131	24	5	67	10	17	23	14
2012	194	25	5	93	12	27	37	25
2013	142	24	5	62	14	47	21	21
2014	102	22	5	58	8	8	14	14
2015	134	23	5	66	8	17	2	22

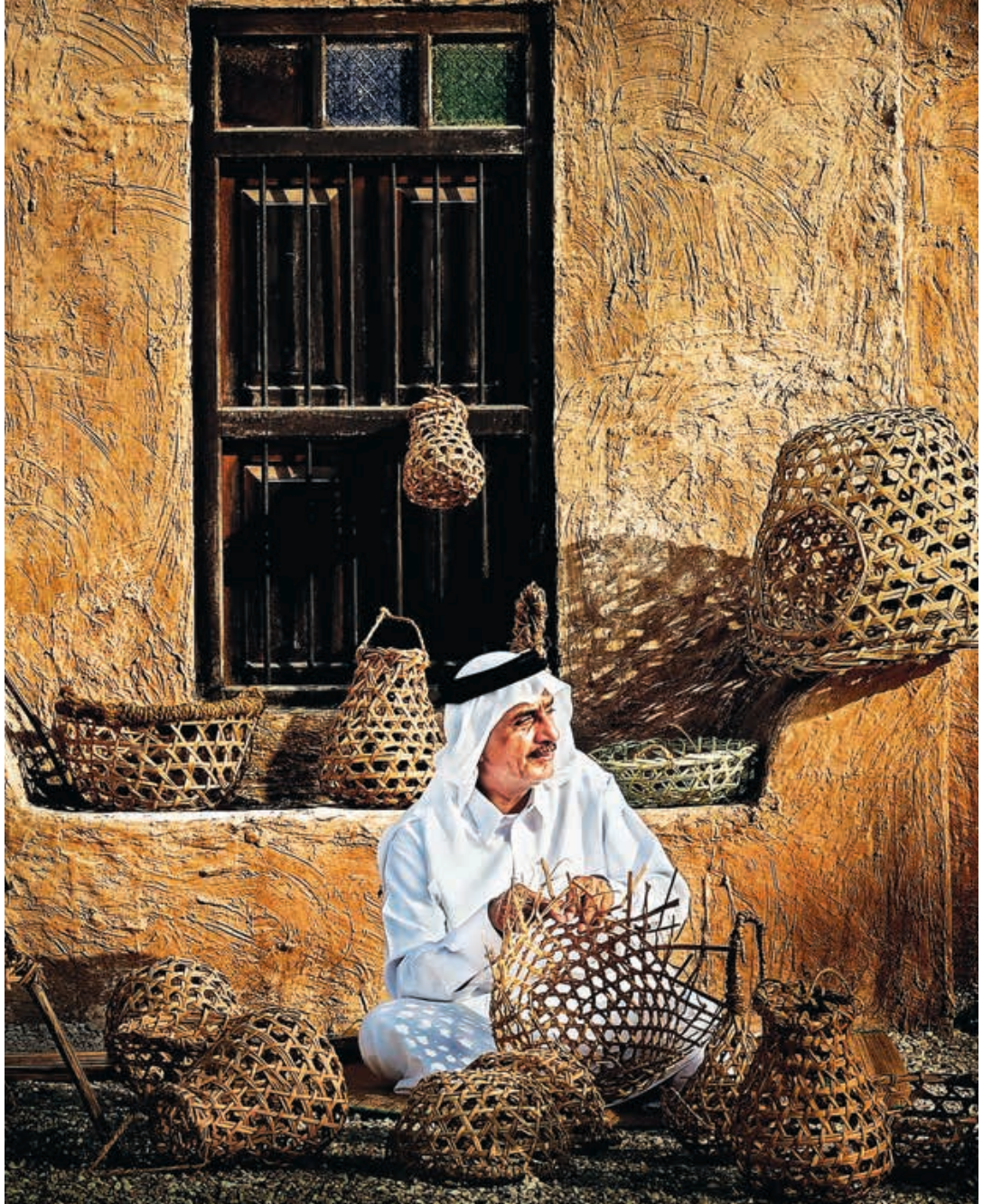
Arabic Countries

الدولة	الإمارات	السعودية	مصر	سوريا	المغرب	لبنان	العراق	الأردن	الصومال	ليبيا	الجزائر	البحرين	فلسطين	تونس	قطر	عمان	الكويت	البحرين	اليمن	موريتانيا
2009	7	2	4	3	2	-	6	2	-	-	1	2	1	1	1	-	-	-	-	-
2010	7	7	9	4	1	1	12	1	1	1	3	1	1	1	1	1	1	-	-	-
2011	9	9	25	5	14	1	15	7	1	-	12	3	3	7	5	3	5	1	-	-
2012	22	25	36	4	9	1	19	4	1	21	11	-	7	1	4	4	4	1	-	-
2013	12	16	25	4	5	-	14	7	-	22	5	2	6	6	1	6	4	1	2	1
2014	12	14	2	4	-	15	8	-	-	13	3	1	4	1	1	1	1	1	2	-
2015	7	19	25	2	6	1	17	8	-	1	11	2	5	3	-	-	-	1	1	-

Foreign Countries

الدولة	أمريكا	بريطانيا	فرنسا	السويد	الهند	إيطاليا	بولندا	إيران	أستراليا	اليابان	النمسا	كندا	باكستان	بنغلاديش	اليونان	الهند	الصين	سريلانكا
2009	-	2	1	1	-	2	1	1	-	-	-	-	-	-	-	-	-	-
2010	2	-	1	1	5	1	-	1	1	2	-	-	-	-	-	-	-	-
2011	-	-	-	-	4	2	1	-	-	-	-	1	2	1	1	-	-	-
2012	2	-	-	-	-	3	5	-	-	-	-	-	2	3	2	2	2	1
2013	1	-	-	-	1	2	-	-	-	-	2	1	2	1	1	-	-	-
2014	3	-	1	1	-	-	-	1	2	-	-	-	-	3	-	-	-	-
2015	3	-	-	-	3	1	-	1	1	-	-	-	-	-	-	-	-	-





Photography by : Firo S.Syedy, Date Palm Through the Eyes of the World - 2015

The Secretariat General of Khalifa International Date Palm Award

Publishes the Yearly Book 2015



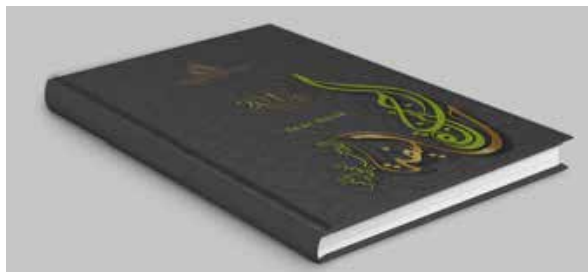
The Secretariat General of Khalifa International Date Palm Award published the Award's Yearly Book 2015, documenting all the events and activities of the Award's Seventh Session.

The book included an illustrated documentation of the honoring ceremony of the winners of the Seventh Session, under the auspices and in the presence of H.E. Sheikh Mansour Bin Zayed Al Nahayan, Deputy Premier and Minister of Presidential Affairs. The book also included documentation of the CV's of the influential personalities in date palm sector and who were honored during the annual ceremony of the Award.

The book included, as well, the CV's of the winners of the five categories of the Award's Seventh Session with abstracts of the winning researches and statistics of the Award since the 1st and till the 7th sessions as far as the number of participants in the Award's categories of Arab

and foreign countries and the number of works participating in each category are concerned. The number of works of the last session came to 134 studies and researches in all categories from 23 countries, of which 16 are Arab and 7 are foreign.

Introducing the book, H.E Prof. Abdelouahhab Zaid, Secretary General of Khalifa International Date Palm Award, said: " While celebrating the winners of the Seventh Session of Khalifa International Date Palm Award and with the gains and achievements the Award has realized over seven years, the Award is setting out today to broader and more spacious horizons in continuation of its march towards fulfillment of its objectives and mission of developing date palm sector at production, industry and marketing levels. In all what we are doing we take the example of the immortal approach of the Late Sheikh Zayed Bin Sultan Al Nahayan (God rest his soul in





peace) and translate the visions and ideas of the Award's founder and patron H.H.Sheikh Khalifa Bin Zayed Al Nahayan (God Protects Him), President of the State, for contributing to the development and construction process and realizing further achievements for the United Arab Emirates in international forums."

The Secretary General stressed that the great support Kahlifa International Date Palm Award is receiving from H.H. Sheikh Mohamad Bin Zayed Al Nahayane, Crown Prince of Abu Dhabi and Deputy Higher Commander of the Armed Forces and the constant

care of H.H Sheikh Mansour Bin Zayed Al Nahayan, Deputy Premier and Minister of Presidential Affairs are giving us the confidence and incentive to exert more efforts to develop the Award and work on achieving leadership and excellence. Constant follow-up and wise guidance of H.E. Sheikh Nahayan Mabarak Al Nahayan, Minister of Culture, Youth and Community Development and President of the Board of Trustees have also had great effect on the success and leadership the Award has reached. He added that the great development the Award has witnessed in the last session, both at the level

of participations, researches and studies and at the level of winners of the five categories of the Award, as well as the global reputation Khalifa International Date Palm Award has enjoyed emphasize that the Award is still perching at the apex of the pyramid as far as interest in date palm sector and working on development and advancement of this sector at the Arab and international levels are concerned and we are, thus, holding the extra responsibility to maintain such a position and reputability.

He further stressed that H.H Sheikh Mansour Bin Zayed Al Nahayan's auspices of the annual ceremony of the Award and His Excellency's crowning of the winners consisted the epilogue of the Seventh Session. His Highness' patronage of and interest in the Award since first founded, are the pride of all workers in and contributors to development of date palm sector. His Highness remains the ideal and example for all of us in this field and we pray to God to be always up to the responsibility and up to the expectations and confidence of His Highness.

H.E. the Secretary General expressed hope, that with the launching the Eighth Session, the Award would realize larger expansion and that he was sure that participation in the five categories of the Award would enjoy further popularity on part of the researchers, experts, academics and farmers from all over the world to supplement date palm sector with more constructive and useful researches for developing and upgrading this sector to yet better standards.

Then he said: "We shall spare no effort to facilitate participation procedures and to provide all support and assistance means for all researchers of the various countries, who are true partners in excellence, success and advancement of the Award."

Khalifa International Date Palm Award Opens Nomination For Its Eighth Session/2016



What achieved by the award over seven sessions was on the level of ambition, and hopes... Dr. Abdelouahhab Zaid

The General Secretariat of Khalifa International Date Palm Award announced the opening of the nominations for its eighth session in 2016 in five categories, starting from the first of June 2015 until the thirtieth of October 2015.

It is announced during a press conference held by the General Secretariat of the Award at the Emirates Palace Hotel, Abu Dhabi this morning in the presence of Dr. Abdelouahhab Zaid, Secretary-General of the Award, and Dr. Helal Humaid Al Kaabi, head of administrative and financial committee, and a crowd of representatives of local and international media,

and a large number of interested people and researchers in date palm sector.

At the beginning of the conference, The Secretary-General conveyed the greetings of H.H Sheikh Nahyan Mabarak Al Nahayan, Minister of Youth, Culture and Community Development, Chairman of the Board of Trustees of Khalifa International Date Palm Award to representatives of the media and those interested in date palm sector, and appreciation of His Highness for their blessed efforts and good contribution to the upgrading of the award and the dissemination of culture on Arab and international levels, also emphasized the constructive role of the various means of media and keep pace the award and all its activities to show the bright side and to highlight its leading position on the global level.

Dr. Zaid also said: "The observer of the Khalifa International Date Palm Award since its inception noticed and clearly a paradigm shift and the significant growth achieved by the award over seven sessions was on the level of ambition, hopes by virtue of the patronage of this award and its patron His Highness Sheikh Khalifa bin Zayed Al Nahyan, UAE President, may God protect him, as well as the great support for the award by His Highness Sheikh Mohammed bin Zayed Al Nahyan, Crown Prince of Abu Dhabi and Deputy Supreme



تحت رعاية

معاليه الشيخ نهيان مبارك آل نهيان
وزير الثقافة والشباب وتنمية المجتمع، رئيس مجلس أمناء جائزة خليفة الدولية لنخيل التمر

UNDER THE PATRONAGE OF HIS HIGHNESS SHEIKH
NAHAYAN MABARAK AL NAHAYAN
MINISTER OF CULTURE, YOUTH & COMMUNITY DEVELOPMENT
CHAIRMAN OF KHALIFA INTERNATIONAL DATE PALM AWARD BOARD OF TRUSTEES

General Secretariat of the Khalifa International Date Palm Award

الأمانة العامة لجائزة خليفة الدولية لنخيل التمر

**Launches the Award
Eighth Session 2016
Opens Candidature for
all Award's Categories**

**المؤتمر الصحفي لإطلاق
الدورة الثامنة 2016
وفتح باب الترشيح
لفئات الجائزة**

Commander of the Armed Forces, and follow-up and attention of His Highness Sheikh Mansour bin Zayed Al Nahyan, Deputy Prime Minister and Minister of Presidential Affairs, where he granted the date palm sector in general, and Khalifa International Date Palm Award in particular great attention and special care."

The Secretary-General stressed that the gracing of His Highness Sheikh Mansour bin Zayed Al Nahyan and honoring His Highness to the winners and honorees at the seventh session may form a new and bright start for the award and give them more brilliance and excellence, and giving us the motivation and ambition to maintain leadership and excellence and work to achieve successes and

new achievements commensurate with the prestige award, the name, which was honored by carrying.

His Excellency explained that the Secretariat of the Award and the Scientific Committee has completed all the preparations and the arrangements and special programs to start receiving applications under the directives of H.H Sheikh Nahayan Mabarak Al Nahayan, Minister of Culture, Youth and Community Development, Chairman of the Board of Trustees of Khalifa International Date Palm Award, and under the conditions and standards in each category...

He stressed the keenness of His Highness Sheikh Nahayan Mabarak Al Nahayan and wise direction to open the door for everyone

to participate, compete, given the opportunity to all nationalities and from all countries of the world to be, Khalifa International Date Palm Award, a monument and a forum for honest competition and a bridge of communication and exchange of information and experiences and to achieve the ultimate goal of the award and upgrading the date palm sector toward new horizons in each session to achieve the desired interest to farmers and all workers in this sector with the preservation of historical heritage, economic and special status of the blessed tree.

Dr. Abdelouahhab Zaid, Secretary-General of the Award, announced his happiness for opening nomination award categories door at



its eighth session, starting from the first of June 2015 until the thirtieth of the month of October 2015, and extended an invitation to all farmers and producers, researchers, experts, academics and specialists, scholars, and all lovers of the date palm in the world-tree, to participate and submit their applications for transparent competition and achieve the first positions in all award categories; namely: Personal Excellence Category, the Category of Best Development Project, the Category of Better Technology, Talented Producers Category, and the Category of Outstanding Research and Studies in the field of date palm cultivation and dates production. And Dr. Abdelouahab Zaid, Secretary-General expressed his

confidence that participation and competition will be broader and more in the eighth session of the Khalifa International Date Palm Award in all categories compared to the achievements and the polarization of the main researchers, experts and farmers on the Arab and international levels during the past sessions as a first prize specialized in the world... And wished all the candidates to achieve the benefit, winning and add a new brick to this edifice and achieve quality and distinctive shift in the date palm sector. At the end his speech, Secretary-General to Khalifa International Date Palm Award thanked and appreciated the presence of the media and those interested in date palm sector, and stressed the role of the media as real partners

in the success of Khalifa International Date Palm Award through shading the lights and giving the prize the media space it deserves and to highlight the big achievements of Emirates and its special role in the developing of civilization, and in proportion to the prestigious position at the global level. For his part, Dr. Helal Humaid Al Kaabi ,Head of the Administrative and Financial Committee, in his speech about the distinctive role of the media in the success of the award and to highlight the gains at the, local, Arab, and world level within the outstanding achievements of the United Arab Emirates. Dr.Helal also said: "Khalifa International Date Palm Award has managed since its inception in 2007 and over seven sessions

to attract the most important researchers and experts, academics and farmers around the world and became the edifice, frequented by all those interested in date palm tree through studies and research of distinctive scientific experiments achieved a qualitative and pioneering shift in the sector of date palm production and quality level, manufacturing, marketing, irrigation methods and treatment of lesions. All these new and innovative ways were credited achievements to Khalifa International Date Palm Award and after that providing an opportunity for everyone to participate and provide a summary of their research and spotted huge prizes for the distinct of them and free platform to compete and achieve the benefit”.

He stressed that all of this has been achieved due to the patronage and unlimited support from the owner of the award and its patron His Highness Sheikh Khalifa bin Zayed Al Nahyan, President of the UAE, may God protect Him, in addition to the great support provided by His Highness Sheikh Mohammed bin Zayed Al Nahyan, Crown Prince of Abu Dhabi and Deputy Supreme Commander of the Armed Forces, as well as follow-up and the interest of His Highness Sheikh Mansour bin Zayed Al Nahyan, Deputy Prime Minister and Minister of Presidential Affairs, and the guidance and support of His Highness Sheikh Nahayan Mubarak Al Nahayan, Minister of Culture, Youth and Community Development, Chairman of the Board of Trustees. In addition to the principle of transparency, clarity and equal opportunities, and the approach of the prize in its assessment of the posts, and granting them positions and awards.

And Dr. Helal Humaid Al Kaabi, pointed out, what emphasizes the pioneering of the award and

credibility is the number of posts over seven sessions, where the total number of posts reached at the end of the seventh session in various award categories to (809) posts, and the candidates representing 39 countries around the world (20 Arab and 19 foreign countries). Studies and researches have got the First position in the number of posts the category was ranked in each session, with a total posts of (412) study and research, (58) post for the best production of a distinct category, (123) post for the best outstanding category technique, (109) posts to the category of best development project, (111) candidate for the category of Best influential figure in the date palm sector. . These numbers continuously increase in each session emphasizes the significant growth achieved by the award and the widespread...

Dr. Helal Humaid Al Kaabi, pointed to the UAE's participation growth year after year, which confirms the position of the blessed tree in UAE, and the care and great attention given by the wise leadership of the agriculture sector in general and especially to palm sector farming, and the keenness of researchers, farmers and producers to actively participate and contribute to the development of this sector.

Dr. Helal Humaid Al Kaabi also expressed confidence that the award will have at its eighth session larger number of posts in each category, and to achieve the objectives of the award in the development of scientific research and specially in the palm field, and to encourage labors in the farming of the date palm sector to promote this sector in order to preserve the blessed tree on its strategic food and cultural significance to the all peoples.

At the end of his statement, the Head of Administration and Financial Committee said: “The General

Secretariat and the Scientific Committee will spare no effort in order to fulfill new achievements for the award, and I hope to be of level of responsibility and honesty... and what important role you are doing on the media level will be an important pillar in our success and our performance for this task and the integrity to be all at the expectations and trust of the owner of the award and its patron His Highness Sheikh Khalifa bin Zayed Al Nahyan, President of UAE, may God protect him”.

It is worth noting that the Scientific Committee of the Khalifa International Date Palm Award had held its annual meeting last March, headed by Dr. Franz Hoffmann, Chairman of the Committee, and the presence of His Excellency Dr. Abdelouahhab Z. Zaid Secretary-General of the Award. And it discussed during the meeting a number of issues that are in the development of the award and scurrying out to broader horizons, to achieve more accomplishments, and to ensure the superiority of the award and the preservation of their pioneering and discussed how to develop the competition conditions, Framing and applying terms and standardized provisions in all categories of the prize to bring it to the level of international prestigious awards , leaving a distinctive footprint in the field of scientific research and to contribute to the growth of human civilization the way that fits the status of the United Arab Emirates globally and the large achievements in all forums.

It is worth mentioning, however, that Khalifa International Date Palm Award grants great prizes to the top ranking winners of its five categories. The first winner gets an amount of AED 300,000 with a trophy and an appreciation certificate while the second winner gets an amount of AED 200,000 with a trophy and an appreciation certificate.

Under the auspices of Nahayan Mabarak Al Nahayan...
And within the events of the 8th Session of
Khalifa International Date Palm Award...

“DATE PALM THROUGH THE EYES OF THE WORLD”

PHOTOGRAPHY COMPETITION



Under the auspices of H.E. Nahayan Mabarak Al Nahayan, Minister of Culture, Youth and Community Development and President of the Board of Trustees of Khalifa International Date Palm Award, the General Secretariat of the Award announced that applications for the 7th Session of “DATE PALM THROUGH THE EYES OF THE WORLD” Competition/2016 is opened from today till December 31st 2015.

The Competition, organized in cooperation with Abu Dhabi Interna-

tional Photography Society, aims at promoting human relationship with the date palm tree and developing public awareness of the importance of this tree as well as exchange of experiences among world photographers, both amateurs and professionals, and highlighting of touristic, environmental and heritage potentials of date palm.

In a statement on this occasion, Prof. Abdelouahhab Zaid, Secretary General of Khalifa International Date Palm Award, said: Participation is opened to all photographers, both amateurs and professionals, within the mechanism set by the competition jury, including certain criteria and conditions for participation towards achieving the objectives of the Competition. The most important of such criteria and conditions are that the participating photos should be specifically intended for the competition and have never been published or included in any other competitions, that the pho-



النخلة في عيون العالم

Date Palm through the eyes of the world

tos should be taken by a professional camera as no photos taken by mobile phones or other devices are acceptable and that the photos should be taken by the participant him or herself.

Prof. Abdelouahhab Zaid stressed that the great success and wide expansion of Khalifa International Date Palm Award as well as the leadership the Award has achieved worldwide as the first specialized award of date palm have been positively reflected in the photography Competition which is witnessing great developments and new horizons in each session after having established a new and innovative thinking in the photography world. The Competition has worked on motivating and attracting amateurs and professionals to present an aesthetic image and thus highlighting the importance and beauty of the palm tree and the human relation with it, developing awareness of the significance of this tree and promoting human attachment to land and agriculture.

The Secretary General also expressed hopes that the 7th Session would witness wide turnout as compared to what the Competition has achieved in earlier sessions. The total photos participating in the Competition over six sessions was 5765 photos for professional and amateur photographers from 44 countries around the world, confirming thereby the great interest in the Competition and keenness of a lot of photographers to participate in it and contribute to its excellence.

The Secretary General of Khalifa International Date Palm Award also explained that "DATE PALM THROUGH THE EYES OF THE WORLD" Competition has achieved the objectives for which it has been founded. It has contributed to founding of a huge archive of a variety of artistic photos of the date palm tree and related industries, enhancing thereby its economic, heritage and nutritional importance and position in addition to providing researchers and

academics with quality and significant photos for their research and studies.

The General Secretariat of the Award allotted AED 45,000.00 for the top three winners. The first winner will get AED 20,000.00, the second AED 15,000.00 and the third AED 10,000.00 in addition to an appreciation certificate and a trophy for each. The Competition's administration will also issue a special fancy album featuring the 50 most beautiful participating photos to celebrate the date palm tree and the participants in the Competition.

A specialized technical committee, under the supervision of Abu Dhabi International Photography Society, will screen and evaluate the participating photos. The winning photographs will be announced in February/2016 and an exhibition will be held for the winning and featured photos at the sidelines of the annual ceremony of the Award. The winners will be also honored in a special ceremony under the kind auspices of H.E. Nahayan Mabarak Al Nahayan, Minister of Culture, Youth and Community Development and President of the Board of Trustees of Khalifa International Date Palm Award.

Interested participants all over the world may send their participations via the Competition website: www.datepalmphotocompetition.com

Participation criteria and conditions are also available on the official website of the Competition: www.kidpa.ae



Under Guidance of Mansour Bin Zayed...
**Announcement of Launching
of the First Egyptian Date
Palm Festival at Siwa...**

Under the guidance and honor of H.H. Sheikh Mansour Bin Zayed, Deputy Prime Minister, and Minister of Presidential Affairs, Khalifa International Date Palm Award announced today launching of an annual festival for the Egyptian dates at Siwa Oases in the Arab Republic of Egypt.

The announcement was made during a press conference held by the General Secretariat of the Award at Emirates Palace Hotel in Abu Dhabi this morning in the presence of H.E. Prof. Abdelouahhab Zaid, Secretary General of the Award and Dr. Helal Hamid Saaed Al-kaabi, Chairman of the Administrative and Financial Committee of the Award with representatives of local and international media and a number of those interested in date palm sector.

At the beginning of the conference, Prof. Abdelouahhab Zaid welcomed the attendants and said: "It is our pleasure and honor to renew our meeting with you in this holy month to announce a new event of Khalifa International Date Palm Award, which comes under the guidance and honor of H.H. Sheikh Mansour Bin Zayed Al Nahyan, Deputy Prime Minister, and Minister of Presidential Affairs, as represented in Khalifa International Date Palm Award's sponsorship, support and organization of the First Egyptian Date Palm Festival, scheduled to take place from 08 to 10 October, 2015, God Willing"



Dr.Zaid added: "Such an honor of the UAE, and under the guidance of H.H. Sheikh Mansour Bin Zayed, is a further confirmation of the close ties between the United Arab Emirates and Arab Republic of Egypt and enhancement of the bonds of joint cooperation on agricultural sector and would highlight, as well, the leading role of the UAE in supporting agricultural sector, particularly in the field of date palm. It would also emphasize the position of Khalifa International Date Palm Award and its constructive role in developing and upgrading of date palm sector at Arab and international levels in terms of cultivation, production and marketing and where the Award has earned global reputation, thanks to the great care of its owner and patron, H.H. Sheikh Khalifa Bin Zayed Al Nahayan (God Protects Him), President of UAE, the unlimited support of H.H. Sheikh Mohamad Bin Zayed Al Nahyan (God Protects Him), Crown Prince of Abu Dhabi and Deputy Higher Commander of the Armed Forces, attention of H.H. Sheikh Mansour Bin Zayed Al Nahyan and follow-up of H.E

Sheikh Nahayan Mabarak Al Nahayan, Minister of Culture & Community Development and President of the Board of Trustees of Khalifa International Date Palm Award."

The Secretary General indicated that this initiative aims at upgrading date palm sector, support and promotion of Egyptian date palm cultivation and seeking solutions for the problems encountered

by the Egyptian farmers such as unavailability of high quality varieties and contribution in control of palm pests in addition to improvement of the quality of production and packing and finding effective marketing solutions so as to raise the economic value of Egyptian dates. Due to the great experience of UAE in this field, there is also an idea of national project for developing date palm cultivation in the Arab Republic of Egypt.

He then explained that a decision has been undertaken to make the Festival an annual event under the auspices of H.E. Minister of Industry, Trade & Small and Medium Enterprises in Egypt as national awards festival for date palm sector. The festival will be held at the Handy Craft Center of Siwa Oases in October every year.

H.E the Secretary General also pointed out that a lot of Ministries and governmental and private organizations in the Arab Republic of Egypt have shown willingness to cooperate and to provide the required support for success of the festival to be added to the great efforts of UAE Embassy in Egypt



and the facilities to be provided by this Embassy for guaranteeing success of the festival and achievement of its goals. Among the most important participants and supporters of the festival are the United Nations Industrial Development Organization (UNIDO) and the Food and Agriculture Organization (FAO), being the strategic partner of Khalifa International Date Palm Award. The Regional Office of the Organization will appoint two experts for assessment of the actual situation of date palm cultivation and dates production in Egypt and will publish a scientific book about the festival. Khalifa International Date Palm Award is working on a study about all aspects of the date palm sector in Egypt for the purpose of understanding the real situation of this sector and seeking appropriate solutions for all its problems

for the benefit and welfare of the Egyptian farmer, in particular, and the date palm sector, in general.

The Secretary General then explained that responsibilities have been distributed for launching of the festival in time. A timetable has been elaborated and preparation of a promotional brochure and construction of a website for the festival are underway. At the sidelines of the festival, a number of lectures and accompanying events will be organized with the aim of granting the festival more vitality and for focusing on the importance of Siwa Oases as an area rich with date palm and a tourist destination having numerous heritage and historical privileges.

Prof. Abdelouahhab Zaid ended his speech by extending special thanks to H.H. Sheikh Mansour Bin Zayed Al Nahyan for his guidance

to hold this important festival, his patronage of date palm sector and his constant care to sponsor all the events of this sector and said: "We would to God to be up to the responsibility thrown upon our shoulders for success of this event and for highlighting the leading role of UAE in agricultural sector and its great support of development and progress of date palm sector." The Secretary General also extended thanks to the media, pointing out their big role in accompanying the activities and events of Khalifa International Date Palm Award, stressing that he is highly confident that the First Egyptian Dates Festival would have the special attention of the media towards highlighting the bright side of the UAE, its effective contribution to the making of human civilization and its reputation at the Arab and international levels.

For his part, Dr. Helal Hamid Saeed Al-kaabi, Chairman of the Administrative and Financial Committee of the Award, welcomed the media representatives and began by pointing out that the special care the Award is receiving from its owner and patron H.H. Sheikh Khalifa Bin Zayed Al Nahyan (God Protects Him), President of the UAE, the attention of H.H. Sheikh Mohamad Bin Zayed Al Nahyan (God Protects Him), Crown Prince of Abu Dhabi and Deputy Higher Commander of the Armed Forces and follow-up of H.H. Sheikh Mansour Bin Zayed Al Nahyan, Deputy Prime Minister and Minister of Presidential Affairs, thanks to such patronage and attention, the Award has achieved a great global reputation to emerge as the specialized award in the field of date palm worldwide.

He stressed that Khalifa International Date Palm Award, and within the framework of its strategy and sublime goals it has been launched to achieve, has not been restricted to being an award for competition or an annual honoring event but has become an international forum and set out towards new broader and larger horizons to exercise a significant role in consolidating relationships and constructive cooperation ties between the UAE and world countries.

He said: "The guidance of H.H. Sheikh Mansour Bin Zayed Al Nahyan for sponsoring the Egyptian Date Palm Festival at Siwa is a consolidation of the distinct relationships and fruitful cooperation between the United Arab Emirates and Arab Republic of Egypt and a confirmation of the important role the Award is playing towards development of date palm sector at the Arab and international levels and a further enhancement of the leading role of the Award in this sector, in particular, and agricultural sector, in general.

It is also a confirmation of the Award's role as a scientific forum and a bridge for communication of knowledge among experts, farmers, researchers and those interested in date palm sector." He also pointed out that such an honor comes, as well, within the scope of the targeted initiatives sponsored by the UAE in confirmation of its great role of caring of this sector, and ensuring development. It is also an enhancement of its constructive role in organizing exhibitions and festivals, embracing international awards and events and in attention to environmental issues and working on increase of green areas to serve sustainable development issues and food security, of which dates are an important part for many peoples in the world.

Dr. Helal Al-kaabi explained that sponsorship of Khalifa International Date Palm Award is not restricted to organization of this festival. It covers, as well, a contribution to launching of an award for the festival consisting of ten categories and the first winner of each category will get a financial award of EGP 20,000.00 in addition to an appreciation certificate and a trophy. The award categories and the criteria and conditions of same will be specified in a special publication to be issued prior to start of the festival.

He further explained that Siwa Oases, in Marsa Matrouh Governorate of the Arab Republic of Egypt, have been chosen due to the fact that the area is renowned for cultivation and production of dates and also for highlighting the historical, heritage and economic role of the rich Siwa Oases. Thereby; another goal of the festival would be achieved through promoting the area and its agricultural, tourist and economic importance and through highlighting its authentic heritage. For this purpose, the

festival's administration will provide a number of tourist guides to introduce history of the area and the vital places therein to the participants and visitors as well as publications for introducing the folk literature of the Oases and their deeply-rooted customs and traditions.

Dr. Helal Al-kaabi extended thanks and appreciation to all the ministries, organizations and public and private departments which showed willingness to support the festival and working on its success to be an annual landmark influencing the agricultural scene of the Arab Republic of Egypt and on education of the Egyptian farmer in addition to upgrading of date palm sector in Egypt in terms of cultivation, production, processing and marketing.

He ended his speech by extending thanks to H.H. Sheikh Mansour Bin Zayed Al Nahyan for his generous initiative and for his great support to the date palm sector worldwide. He also thanked the representatives of the local and international media for their constant and supportive communication with Khalifa International Date Palm Award, stressing once again the media's role as a strategic partner of the Award and effective contributors to the success of the Award's events through follow-up of its activities and dissemination of its culture.

Notably, Khalifa International Date Palm Award is organizing many activities and events related to date palm sector at the international level and has been announcing in each session launching of new events for serving and upgrading this sector. The First Egyptian Date Palm Festival at Siwa is within the scope of its purposeful strategy and fruitful activities and this festival is the first of its activities for this session.

TOWARDS PROMOTING ITS LEADING ROLE
AND DISSEMINATION OF ITS CULTURE...

Khalifa International Date Palm Award Participates In Liwa Rutab Festival...

AND CONFIRMS PARTICIPATION IN AJMAN RUTAB FESTIVAL...16



جائزة خليفة الدولية لنخيل التمر KHALIFA INTERNATIONAL DATE PALM AWARD

Khalifa International Date Palm Award has achieved great success during participation in the events of the 11th Session of Liwa Rutab Festival, held under the patronage of H.H Sheikh Mansour Bin Zayed Al Nahayan, deputy prime minister of the United Arab Emirates, minister of presidential affairs, and organized by the Administrative Committee of the Cultural & Heritage Festivals, Programs in Abu Dhabi and events of which were concluded last July. The Award has also achieved an outstanding presence at Liwa-Ajman Rutab Festival, held under the patronage of Hamdan Bin Mohammed Centre

for Heritage Revival in Dubai and organized by the Tourist Development Department in Ajman in cooperation with Liwa Rutab Festival. All these events concluded last August.

The pavilion of Khalifa International Date Palm Award at both Liwa and Liwa Ajman festivals for Rutab attracted large attention from the visitors and those interested in date palm sector, including farmers, researchers and academics who were keen to visit the pavilion and to review the Award's activities, publications and the participation conditions in the five categories of the Award.



A great number of owners of date palm farms in the UAE were also keen to receive the registration form for participating in and competing for the Awards 8th Session/2016. They listened, as well, to a detailed explanation of the required criteria and conditions for participation and winning.

The educational publications issued by Khalifa International Date Palm Award and displayed during Liwa Rutab Festival received high attention from the researchers, scholars and academics due to the palm date studies, projects and scientific researches contained therein. The most important publications offered by the Award were: issues of the "Blessed Tree Magazine", the Yearly Book of the Award, the Winners Book and photos album of the "Date Palm in World Eye" Photography Competition in addition to introductory leaflets, educational brochures and CD's, copies of which interested people were keen to get.

H.E Prof. Abdelouahhab Zaid, Secretary General of Khalifa International Date Palm Award

expressed his satisfaction at the results achieved through participation in both festivals and stressed the importance of Liwa Rutab Festival as a significant window and annual forum for farmers, researchers and those interested in date palm trees and industries. His Excellency praised the high standard the Festival has reached in its 11th Session, thanks to the kind patronage of H.H Sheikh Mansour Bin Zayed Al Nahayan, deputy prime minister of the United Arab Emirates, minister of presidential affairs, who rendered date palm tree special attention and granted workers in and those in charge of date palm sector a great incentive to work sincerely for upgrading this sector at local, Arab and international levels and as far as cultivation, marketing and industry are concerned.

His Excellency also stressed that Liwa Ajman Rutab Festival is considered an important platform for communication with farmers and researchers for promoting the Award, disseminating its culture and attracting the largest number of participations. In this sense, the

Award has participated in the very first session of this event.

He pointed out that, and within its purposeful strategy, Khalifa International Date Palm Award has been working on strengthening its presence in all activities and events of date palm sector, in particular, and agricultural sector in general.

His Excellency further explained that the Award's yearly participation in Liwa Ripe Dates and Liwa Ajman Rutab Festivals comes within the Award's strategy of strengthening its presence in all forums and events related to date palm tree towards introducing its activities and categories and to allow the farmers the opportunities for and motivate them to participate in the Award through distributing participation forms and explaining the conditions and objectives as well as offering a lot of educational publications about the date palm tree. Such publications focus on production quality, the latest irrigation methods, pest control and modern packing and processing techniques for the benefit of the farmers, researchers and academics and to guarantee a better future for dates as a strategic commodity of high economic importance to a lot of peoples.

The Secretary General of Khalifa International Date Palm Award said that the desired objectives of participation in Liwa and Liwa Ajman Festivals for Rutab have been achieved. The Award has managed to attract a great number of farmers and researchers for participating in its five categories and competing for its valuable prizes. The Award has also succeeded in promoting the date palm culture and the importance of the blessed tree at nutritional, economic and heritage levels, as being one of the important objectives of the Award.

Towards strengthening its global position and highlighting the leading role of UAE in date palm sector...

Khalifa International Date Palm Award did participate in “Expo Milano 2015” in Italy...

Towards strengthening its globally leading position and emphasizing its active role in date palm sector, Khalifa International Date Palm Award did participate in the events of “Expo Milano 2015” festival in Italy through a special pavilion within the period September 13 to 21, 2015.

Such a participation did come after the great success and development achieved by the Award at the global level as being the first specialized award of date palm worldwide and after the Award has assumed a leading role in this sector and so attracting the most important researchers, farmers,





MILANO 2015

academics and experts, both Arabs and foreigners, to participate in all five categories of the Award over seven sessions so far. Concerning the aim of such participation, Prof. Abdelouahhab Zaid, Secretary General of Khalifa International Date Palm Award, stressed that the Award's participation in the events of "Expo Milano 2015" would be a translation of the vision of the wise leadership of UAE, namely strengthening the Award's global position and its leading role in all fields. The participation is also within translating the ideas of

the Award's owner and patron, H.H. Sheikh Khalifa Bin Zayed Al Nahayan, President of the State (God Protects Him) of highlighting the state efforts aiming at upgrading the date palm sector, within the great support the Award is getting from H.H Sheikh Mohamad Bin Zayed Al Nahayan, Crown Prince of Abu Dhabi and Deputy Higher Commander of the Armed Forces, the follow-up and care the Award is having from H.H Sheikh Mansour Bin Zayed Al Nahayan, Deputy Prime Minister and Minister of Presidential Affairs and upon the guid-



ance of H.E Nahayan Mabarak Al Nahayan, Chairman of the Board of Trustees of the Award within the Award's strategy of spreading its culture worldwide and development of scientific research on production, marketing and industry of date palm. His Excellency pointed out that Expo Milano 2015 would be an important opportunity and a convenient environment for promoting the culture and objectives of the Award and for attracting experts, researchers and farmers from various countries worldwide for partici-

EXPO
MILANO 2015

NUTRIRE IL PIANETA
ENERGIA PER LA VITA.
FEEDING THE PLANET
ENERGY FOR LIFE.
NOURIR LA PLANÈTE
ÉNERGIE POUR LA VIE

INGRESSO
ADMISSION
ENTREE

1 MAGGIO • 31 OTTOBRE
1 MAY • 31 OCTOBER
1 MAI • 31 OCTOBRE



participating in the Award's events and enriching it with researches and studies, contributing thereby to advancement of the date palm sector and development of all aspects of date palm tree towards achieving the desired goals and reaching the results for which the Award was founded. During participation in Expo Milano 2015, the Award's program would be full of many targeted activities. The program includes a lecture by the Secretary General, Prof. Abdelouahhab Zaid, about the Award, its categories, objectives, the successes it has realized and its constructive contribution to upgrading of

date palm sector. There is also a lecture by Prof. Helal AlKaabi, Chairman of the Administrative and Financial Committee of the Award, about the actual situation of date palm in the UAE and the progress this sector has achieved thanks to the wise policies of the state and its keenness to expand green areas and protect the environment. Another lecture will be given by Prof. Sandra Baisic about "use of palm residues, past and future" and the latest techniques modern science has reached and researches in this respect. Moreover; a special version of "Palm in World Eye" competition

would be launched during Expo Milano 2015 with valuable prizes for the first three winners. The first winner will get EUR 5,000, the second EUR 3,000 and the third EUR 2,000 in addition to a trophy to each of the three winners. Within the scope of its participation, the Award will organize a photography exhibition for the first three winner photographs of the 6 earlier sessions of the competition. The Award has also printed a special brochure in Italian about the Award, to be distributed to the visitors and directors of the pavilions of the 148 participant countries from all over the world.





Cryopreservation of date palm meristematic cells

L. Fki, O. Chkir, A. Nasri, N. Bouaziz, N. Sahnoun and N. Drira
Laboratory of Plant Biotechnology, Faculty of Sciences of Sfax- Tunisia.
A. Rival CIRAD, UMR DIADE, F-34398 Montpellier, France
Bart Panis Laboratory of Tropical Crop Improvement,
Katholieke Universiteit Leuven- Belgium.



E-mail: lotfifki@yahoo.fr

ABSTRACT

Date palm (*Phoenix dactylifera* L.) is the most important perennial plant in sub-Saharan and hot regions. Genetic erosion is among the serious problems which date palm is facing. This study aimed to produce and cryopreserve meristematic cell aggregates having the capacity to generate adventitious buds or somatic embryos. A biochemical investigation was carried out to explain the utility of the sucrose preculture and the cold hardening phases in a cryopreservation protocol. MS medium supplemented with 70 g/L sucrose was effective to get meristematic cells having the capacity to generate buds or somatic embryos from in vitro tissue culture. Compared to the standard vitrification protocol, the encapsulation vitrification and particularly the ultra-rapid droplet freezing techniques proved their high efficiency for the cryopreservation of the date palm meristematic cells. Thus, the highest survival rates using these techniques were

26.7, 53.3 and 66.7 % respectively. The multiplication rates, measured after a cultivation period of 3 months, of control and cryopreserved plant material were 3 and 2 successively. Sucrose preculture and cold hardening which both could induce activation of genes coding for resistance towards osmotic stress, as observed in total soluble proteins profiles and proline content measurements, increased considerably post thaw recovery rates after vitrification.. We showed that cryopreservation does not affect the morphogenetic capacities of this plant material. Indeed, multiple bud or embryogenic suspension cultures were established. Morphological studies showed the genetic stability of clonal material following cryopreservation.

Key words: date palm, genetic resources, cryobiology, tissue culture, caulogenesis, embryogenesis, SDS PAGE, proline

INTRODUCTION

Socio-economically, one of the most important perennial plant in sub-Saharan and hot regions is date palm (*Phoenix dactylifera* L.). This is why extensive efforts have been undertaken by the scientific community to overcome constraints hampering the extension of date palm plantations (El Hadrami and El Hadrami 2009). Biotechnological tools are effective to propagate, improve and preserve plant genetic resources (Pati et al. 2006; Parveez et al. 2000; Engelmann 2004; Panis 2008). In case of date palm, biotechnologies have already been fully employed for large scale propagation (Fki et al. 2003; Fki et al. 2010). Nevertheless, biotechnological approaches for date palm improvement and preservation still need more investigations. This study aims to produce and cryopreserve meristematic cells having the capacity to generate true-to-type in vitro date palms. A biochemical study was carried out to explain the benefits of the sucrose preculture and the cold hardening phases in a cryopreservation protocol.

MATERIALS AND

METHODS

Meristematic cell aggregates were initiated from date palm in vitro chlorophyll-free leaves using MS medium supplemented with 70 g/L sucrose (Murashige and Skoog 1962). Embryogenic suspensions were established from calli (0.5 g) and maintained on a rotary shaker at 100 rpm. For shoot multiplication, RITA bioreactors (Alvard et al. 1993) for the temporary immersion of cultures in liquid medium were used. The RITA vessel is made of two compartments: the explants are cultivated in the upper compartment and the lower one holds the liquid medium. Six bud clusters per bioreactor were

cultivated using 200 ml of MS medium supplemented with 70 g/L sucrose. The immersion cycle was 15 min every 24 h and the culture medium was renewed once every 4 months. Stock cultures were incubated in a growth chamber at 28 °C under a 16h photoperiod (photon flux: 30 μ Em⁻²s⁻¹).

Prior to cryopreservation, explants (< 3 mm) bearing meristematic cell aggregates were cultured on MS medium enriched with 180 g l⁻¹ sucrose or incubated at 4 °C for 2, 5 and 10 days. For cryopreservation, the standard vitrification, the encapsulation vitrification and the droplet vitrification protocols have been applied (Panis et al. 2005). Three different cryopreservation protocols were assessed in the present study, namely: standard (tube) vitrification, droplet-vitrification and encapsulation-vitrification. Three replicates of ten samples were used for each experiment.

In the first two protocols (standard vitrification and droplet-vitrification), explants were transferred into 15 cm³ loading solution (LS) containing 2 M glycerol and 0.4 M sucrose in MS medium for 20 min (Panis et al. 2005).

In the third protocol explants were placed into previously autoclaved 3 % (w/v) sodium alginate dissolved in MS medium, with 7 % (w/v) sucrose and no CaCl₂; then they were sucked up with a micropipette and gently dropped into 75 mM CaCl₂, 2 H₂O in MS medium supplemented with 7 % sucrose (Lakshmana and Singh 1990) and kept for 15 min. Encapsulated plant tissues were then transferred into the loading solution for 20 min.

The loading solution was then replaced by ice-cooled PVS2 solution (Sakai et al. 1990). This solution consisted of 30% (3.26 M) glycerol, 15% (2.42 M) ethylene glycol (EG) and 15% (1.9 M) DMSO

in MS medium containing 0.4 M sucrose. The pH was adjusted to 5.8 and the solution was filter sterilized. Both naked and encapsulated explants were treated with PVS2 solution for 15, 30, 60 or 120 min at 0 °C.

Explants were transferred into 2 ml cryotubes containing 0.5 ml PVS2 and then plunged into liquid nitrogen (Standard vitrification protocol). Alternatively, explants were transferred to a droplet of PVS2 on a strip of aluminium foil and then plunged into liquid nitrogen (droplet-vitrification protocol). For permanent cryostorage, frozen foil strips were quickly transferred to 2 ml cryotubes filled with liquid nitrogen then closed.

For encapsulated explants, alginate beads were transferred into 2 ml cryotubes filled with 0.5 ml PVS2 solution then plunged in liquid nitrogen (encapsulation-vitrification protocol).

After one hour of LN storage, strips of aluminium foil were transferred to recovery solution (RS) containing 1.2 M sucrose dissolved in MS medium for 15 min at room temperature (25 °C). Cryotubes containing the meristems or alginate beads were thawed in a water bath at 40 °C for 2 min then treated by RS at room temperature for 15 min. Explants were then placed onto two sterile filter papers on top of MS medium containing 180 g/L sucrose and then incubated in the dark. After 2 days, tissues were transferred onto MS medium containing 50 g/L sucrose and 0.1 mg/L 2,4-D. Survival rates were estimated using growth measurement at 4-6 weeks after thawing.

For histological examinations, explants were fixed in Svaloff Navashine solution (chromic acid 0.5 %, glacial acetic acid 5 %, formaldehyde 15% and ethanol 5 %), then gradually dehydrated using ethanol solutions (50 to 100%) and finally embedded in paraffin. Serial

sections (10 μm) were cut with a rotary microtome and stained with acetohematoxylin (Sass 1958).

For protein extraction, samples (0.5 g FW) were ground in liquid nitrogen then homogenized in 1 cm³ of maleate/Tris buffer 50 mM (pH 8.3) containing 2 % SDS, 0.5 mM EDTA, 2 mM PMSF, 1 mM DTT and 2 mM β -mercaptoethanol. Homogenates were centrifuged at 13,000 g for 15 min at 4 °C. Total soluble protein content of the supernatant was estimated according to Bradford (1976). For SDS-PAGE protein electrophoresis, samples (10 μg per lane) were loaded onto 12 % SDS gels and stained with Coomassie Brilliant Blue-R250 (Stone and Gifford 1997).

Proline content was estimated according to Bates et al. (1973) on 1 gFW of leaf tissue using 6 ml 3% sulfosalicylic acid. Two cm³ of the extract were placed for 1 h in boiling water with 2 cm³ ninhydrin and 2 cm³ glacial acetic acid and then cold toluene (4 ml) was added. Extracts were then filtered through a Whatman paper filter. Proline content was estimated spectrophotometrically at 520 nm and calculated as $\mu\text{mol/g}$ against standard L-proline (Sigma-Germany P-0380).

Statistical analyses of data were performed using one-way ANOVA and Duncan's test. *P* values < 0.05 were considered as statistically significant. Statistical analysis was computed using SPSS 13 software. Experiments were replicated three times. Data expressed in percentage were transformed by arcsin transformation and then analyzed. Arcsin transformation ($y' = \arcsin y \frac{1}{2}$, $y = \text{original percentage}/100$) was undertaken in order to stabilize the variance of data.

RESULTS

Murashige and Skoog medium supplemented with 70 g/L sucrose was effective to generate

date palm meristematic cells from *in vitro* tissue culture. Hyperthrioped chlorophyll-free leaves showed a high morphogenic capacity as they produced number of meristematic cell aggregates after only 3 months (Fig. 1).

Compared to the standard vitrification protocol, the encapsulation vitrification and particularly the ultra-rapid droplet freezing techniques proved their high efficiency for the cryopreservation of the date palm meristematic cells. Thus, the highest regeneration rates using these techniques were 26.7, 53.3 and 66.7 %, respectively (Table 1). Sucrose preculture and cold hardening both improved considerably post thaw recovery rates after vitrification. Both treatments were found to increase proline contents (Table 2) and to change the expression of 15 and 18 kDa proteins (Fig. 2). Besides, a newly expressed 21 kDa protein was detected only after cold hardening (Fig. 2). We also showed that cryopreservation does not affect the morphogenic capacities of this plant material. Indeed, cryopreserved meristematic cells could produce proembryos or adventitious buds. Furthermore, multiple bud cultures and embryogenic suspension cultures were established employing temporary immersion system (TIS) and agitated liquid media, respectively. With respect to the effect of the cryogenic treatments on the genetic integrity, no morphological differences were observed between plants regenerated from non-cryopreserved controls and cryopreserved meristematic cells. All the plants showed a similar growth rate in the greenhouse (0.5 \pm 0.2 cm in length per month), leaf colour and morphology. These observations are encouraging as regards genetic stability of cryopreserved material.

DISCUSSION

In this paper, we showed that cryopreservation of meristematic cells is a promising tool to establish date palm cryobanks. *In vitro* generated chlorophyll-free leaves were found to be a choice material to get meristematic cells. Enhancing sucrose concentration in the medium was sufficient for cell dedifferentiation. Our previous studies showed that PGRs such as 2,4-D were essential for cells dedifferentiation within primary explants tissue and that the culture period required to observe neoformations was much longer, especially when low concentrations of 2,4-D were used (Dirra, 1983; Fki et al. 2011a). Removing PGRs from culture media can minimise the risk of both somaclonal variation and loss of morphogenic capacity (Bairu et al. 2011). Indeed, LoSchiaivo et al. (1989) showed that auxins impact global DNA methylation rates which might disturb gene expression and phenotype. Fki et al. (2011b) confirmed that high level of PGRs was the cause of somaclonal variation in date palm.

We proved the benefits of the sucrose preculture and the cold hardening on post-thaw regeneration. Both treatments seem to be effective to activate genes coding for resistance towards severe osmotic stress and ultra-low temperature. Basic knowledge about cryoprotection is improving fast: indeed, the determination of physical and biochemical changes associated with tolerance to cryopreservation is a very interesting approach to optimize cryopreservation protocols (Kaviani 2011). We carried out such a biochemical study in order to assess the effect of sucrose preculture and cold hardening on the total soluble protein profiles and proline content of explants. Helliot et al. (2003) monitored ultra-structural changes occurring during the cryopreservation of banana api-

cal meristems. Moreover, differential scanning calorimetry (DSC) was used to discover the principal thermal events connected with plant cryopreservation procedures (Nadarajan et al. 2008, Sisunandar et al. 2010). The impact of sucrose preculture on protein metabolism in banana meristems was studied by Carpentier et al. (2010) through 2-D gel electrophoresis. These authors demonstrated that preculture was able to modulate the expression of genes which are essential for the acquisition of freezing tolerance. On the other hand, Zhu et al. (2006) demonstrated that sucrose pretreatment induced changes in sugar, sterol and fatty acid composition in banana meristems.

Many reports showed the efficiency of the vitrification technique and its two derived protocols, encapsulation-vitrification and droplet-vitrification (see Sakai and Engelmann 2007, for a review). In this study, we concluded that droplet vitrification remains the best way for date palm germplasm cryobanking.

ACKNOWLEDGMENT

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Tables

Table 1: Regeneration (%) of meristematic cell aggregates after 0 to 120 min exposure to PVS2 solution at 0 °C, followed (+LN) or not (-LN) by cryopreservation. Ten samples were used in each of the three replicates. +LN: cryo-preserved meristems; -LN: non cryopreserved; PC: sucrose preculture (2 days, sucrose: 180 g/L); CH: cold hardening (2 days, at 4 °C) v: standard vitrification; ev: encapsulation-vitrification; dv: droplet-vitrification. Data within a column with the same letters are not significantly different according to Duncan's test after arcsin transformation ($P < 0.05$).

PVS2 exposure at 0 °C (min)	Regeneration (%)											
	-LN -PC -CH	-LN +PC	-LN +CH	+LN v -PC -CH	+LN v +PC	+LN v +CH	+LN ev -PC -CH	+LN ev +PC	+LN ev +CH	+LN dv -PC -CH	+LN dv +PC	+LN dv +CH
0	96.7a	93.3a	96.7a	0a	0a	0 a	0a	0a	0a	0a	0a	0a
15	93.3a	96.7a	93.3a	6.7b	16.7c	6.7b	0a	0a	0a	13.3c	46.7d	36.7d
30	93.3a	96.7a	93.3a	13.3c	26.7d	23.3d	13.3b	23.3b	16.7b	36.7e	66.7e	53.3e
60	93.3a	93.3a	93.3a	6.7b	6.7b	6.7b	26.7cd	53.3d	46.7cd	16.7d	26.7c	23.3c
120	96.7a	93.3a	93.3a	0a	0a	0a	23.3c	33.3c	43.3c	6.7b	13.3b	6.7b

Table 2: Effect of sucrose (180 g/L) and cold (4 °C) treatments on proline content in date palm leaf tissue bearing meristematic cells. Experiments were replicated three times. Data followed by the same letter within the same column are not significantly different according to Duncan's test ($P < 0.05$)

Duration of the treatment (days)	Proline content (μg proline per g FW)	
	Sucrose (180 g/L) Treatment	Cold (4 °C) Treatment
0	99,3 a	99 a
2	370 b	376 b
5	373,3 b	365 b
10	368,3 b	378,3 b

Figures

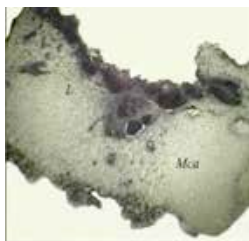


Fig. 1. Cross section showing meristematic cell aggregates within in vitro date palm chlorophyll-free leaf. Mca meristematic cell aggregate, L hypertrophied chlorophyll-free leaf. Scale bar 1 mm

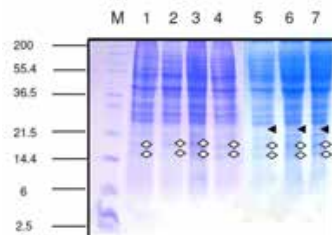


Fig. 2. Effects of sucrose preculture and cold hardening on the total soluble proteins profiles of the highly proliferating meristems. M: marker; Lane 1: control; Lane 2: 2days 180 g/L sucrose; Lane 3: 5 days 180 g/L sucrose; Lane 4: 10 days 180 g/L sucrose; Lane 5: 2 days 4°C; Lane 6: 5 days 4°C; Lane 7: 10 days 4 °C



Phyllotactic variability of some Algerian date palm varieties

R. Benmehaia¹, A. Simozrag^{2,3}, M.A. Benmehaia¹ and M.M. Bentschikou³

¹ Department of Natural Sciences and Life, M'sila University, Algeria.

² Department of Natural Sciences and Life, Biskra University, Algeria

³ Development and Valorization of Phytogetic Resources Laboratory, UMC .Algeria.

A. Rival CIRAD, UMR DIADE, F-34398 Montpellier, France

Bart Panis Laboratory of Tropical Crop Improvement, Katholieke Universiteit Leuven- Belgium.

Abstract

The phyllotaxis phenomenon for certain date-palm (*Phoenix dactylifera* L.) was not deeply and thoroughly studied. Indeed, our purpose aims to confirm some phyllotaxis hypothesis for seven Algerian date-palm varieties. Using an empirical method, we have studied the phyllotactic variability based on biometrical measures of date-palm trunk. The study shows that for the divergence angle, orthostical distance and parastichy's slope in each contact parastichy matters in their phyllotactic modeling. The results confirm an intravarietal difference in the phyllotaxis of the seven studied varieties. The particular concluded remark is that the thirteenth parastichy of Ilima variety become orthostical, which give the specific aspect (overlaid leaves) on the corona.

Keywords: Phyllotaxis, Contact Parastichy, *Phoenix dactylifera*, Algerian date-palm.

Introduction

The date palm's phyllotactic systems did not receive enough attention for in-depth study of

Phoenix Dactylifera L., There are few studies treating this subject, especially for the local varieties in Arab countries. Our study comes to check some hypotheses about the determinants of the phyllotactic systems for seven varieties of Algerian date palms.

With an empirical method, we aim to show the variability in phyllotactic systems, relying on a biometric measurements on the trunk of the palm, considering so that the divergence angle, the distance between orthostics, and the parastichy's slope in each contact parastichy which matters in modeling phyllotactic systems. The results confirm an intervariatal difference in the phyllotactic structure of the studied varieties. The particular concluded remark is that the 13th parastichy of Ilima variety become orthostical, which give the specific aspect on the corona.

Our research paper is structured as following. First, a brief look at the conception evolution in the theoretical research of phyllotaxis. We focus after that on the phyllotactic systems of the palm, particularly, of the date palm. At second, we



benmehaia_red@yahoo.fr



explain the methodology as well as experimental and modeling method used. Finally, we present and discuss the most important results obtained.

An Overview of Theoretical Framework of the Phyllotactic Systems

The phyllotaxis is currently considered as a multi-disciplinary with different methodologies. Guerreiro (1995) deduced its applications as a physical system and mathematical framework used in modern theoretical studies of phyllotaxis. The origins of the theoretical studies are relates to the work of Arthur Church (1904) who framed and theorized the phyllotaxis with mathematical approach. He has relied on the previous famous works of Bravais brothers with their descriptive approach. Every research had treated the simplest pattern of phyllotaxis.

The beginning of the in-depth studies coincide with the studies of the apical meristems structure where with studying the activity of this latter, we can understand the leaves' positions on the stem. The Plantefol theory (1947) has given a comprehensive approach of the apical meristem activity.

In modern approaches, Roger Jean's works are considered as the leading thesis in the modern theory. He presented several mathematical models in the last half century, and in-depth studies in apical activity (Jean, 1983), methodological studies used for plant biology and phyllotaxis (Jean, 1986) and some surveys in this area (Jean, 1995), and provided with Irvin Adler (Adler et al., 1997) a historical study in phyllotaxis.

Modeling Systems for the Phyllotaxis of Date Palm

The first studies had focused on oil palm phyllotaxis, relying on the above-mentioned works. Among these studies, was the study of Henry (1955), using the Plantefol's model for his descriptive study of oil palm phyllotaxis (Elais geinesis) considering the unique helix hypothesis. Rees (1964) present an in-depth study on the role of organizing apical meristem on phyllotaxis formations for Elais geinesis. Thomas et al. (1969) and on the same species, propose the equivalent phyllotaxis index (EPI) to explain fronds position on oil palm's trunk.

The study of Ferry (1998) comes to highlight the date palm phyllotaxis (*Phoenix dactylifera* L.) and is considered as the first study of the impact of the leaves shape characteristics on its phyllotaxis system where it has concluded that there are several models of the date palm using various methods. In contrast, Elhoumaizi et al. (2002) present a geometrical study of phyllotaxis, defining the divergence angle between fronds and its role in phyllotaxis systems and the phyllotactic variability. Moreover, Dror and Shimshoni (2009) suggest a study of the reconstruction of three-dimensional phyllotactic system for the date palm using modern techniques of simulation.

METHODOLOGY

In this study, we have adopted a biometric approach and we have acquired 5 895 measures on seven (07) date palm varieties located in the region of Biskra (Ziban oasis) which is considered as the most important region of the palm in Algeria. Three palm trees were chosen for each variety. In each palm tree, we have relied on four different measurements on the trunk that reflect the fronds positioning relative to each other.

Our study tries to find the possible relationships to consider a conceptual phyllotactic structure proving the following two hypotheses:

Hypothesis 1: The phyllotactic structures of date palm varieties differ according to their measurements.

All measurements (described later) differ in the selected seven varieties in our experience, which confirms the variability in the phyllotactic structure of the date palm trunk.

Hypothesis 2: The Itima represents a special case according to the parastichy slope.

We have note in the studied phenomenon that the contact parastichy differs in its parastichy slope from one to another (from 13, 8, 5 and 3). Furthermore, only the 13th parastichy in the case of Itima turns into an orthostich.

Variables

The studied phenomenon depends on the variable of diversity of phyllotactic forms as the dependent variable describing our phenomenon. The numeric values for this variable reflect the order of studied varieties as follows:

- 1- Deglet-Nour
- 2- Ghars
- 3- Mech-Degla
- 4- Itima
- 5- Safraye
- 6- Zogar-Mogar
- 7- Tati-Bent-Nouh

While four parameters (measurements) taken as variables explains the diversity of phyllotactic forms. These parameters (measurements) are regrouped in two kinds of measures. The direct one

including the distance between the orthostics and the helix height, and the indirect one which include the divergence angle and helix slope.

The distance between the orthostics (A): It is the vertical distance between the two fronds in a same parastichy (cm).

The helix height (B): Is the height of helical unit (cm).

The slope helix: Calculated by the distance between the orthostics (A) and the distance between the two fronds in same parastichy (F) expressing the relationship as following:

$$\alpha = \cos^{-1}(A/F)$$

The divergence angle: Calculated by the twice distance between the orthostics (A) and the radius (r) expressed as following:

$$\theta = A/r$$

The figure 1 shows the various measurements in our experience.

The Model

The nature of the dependent variable in this phenomenon (diversity of phyllotactic forms) is a qualitative and taken seven value reflect the seven varieties studied. We use for that the probabilistic modeling (the Logit Model) which as appropriate modeling kind for our variables case, presented by the following formula:

$$\Pr[E(Y = k|X_i)] = \alpha_i X_i + \epsilon$$

Where Xi indicates the above measurements, relying on two statistical tests, the adjusted correlation coefficient and of course using the null hypothesis test p-value.

RESULTS AND DISCUSSION

The experiment confirms null-hypothesis test where the model is represented in the following formula:

$$Y = \frac{-0.038}{(0.01)} \alpha - \frac{0.028}{(0.01)} \theta - \frac{0.043}{(0.01)} A - \frac{0.001}{(0.01)} B$$

; R2=0.97 P<0,0001

This model is significant, with a strong correlation between the different variables (Xi) and diversity variable, and each variable separately has a very significant effect with lower p-value, which confirms the null-hypothesis for each variable (see Table 1).

The two first graphs (see Figures) show an inverse relationship between the divergence angle and slope helix (Figure 2) and as well as the distance between the orthostics and the slope helix (Figure 3).

The latter shows clearly the inverse relationship of the various helixes. We can even notice the discrepancy between the various helixes. As Figure 2 shows an exceptional gathering where the divergence angle and slope helix is a large, specific to Deglet-Nour variety where 8th parastichy have a great divergence angle and slope helix. To prove our first hypothesis that relies on the variability of the phyllotactic structures of date palm and from their significance of results, we suggest the graphics (Figure 4 and 5).

Based on the three basic parameters, we have a clear contrast between the various phyllotactic systems of studied varieties, which clearly illustrate the seven gatherings. Figure 4 shows the relationship between the divergence angle and the helix height. Three mixed overlapping gatherings are illustrated and the same for Figure 5, which shows the relationship between the orthostic distance and the helix height.

We can denote also in Figure 6, that shows the divergence angles

by varieties, a relative variation for each variety. We can confirm the difference between phyllotactic structures in the studied varieties.

The Figure 7 comes to confirm our second hypothesis showing the slope helix for the studied varieties, and indicates that the fourth variety (Itima) is characterized by the presence of a vertical parastichy (90°), which represents the 13th parastichy in contrast of the rest.

This feature could be observed clearly in this variety where the 13th parastichy represent an orthostic on the trunk as well as on the corona, which make it distinct variety among others with regular spaces between parastichies on the corona that resulted from the vertical overlaying of fronds.

CONCLUSION

As result of this study, we can conclude that the phyllotactic systems of the date palm (*Phoenix dactylifera* L.) vary among varieties. The experience was conducted on seven Algerian date palm varieties. Through some biometric measurements of the phyllotaxis, the modeling has allowed us to show the variability in phyllotactic structures. While, this study calls for several perspectives including more varieties, relying on the palm corona, and focusing on the physiological aspects of apical meristem activity.

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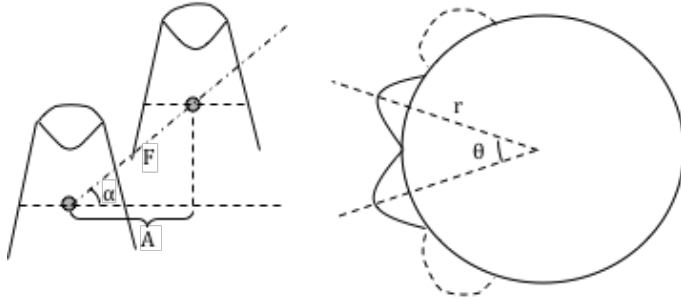


Figure 1. Representation of the used parameters

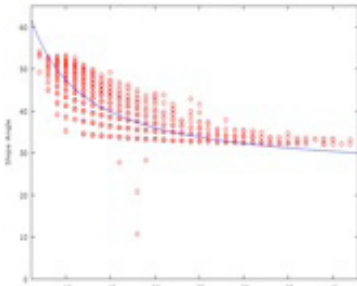


Figure 2.

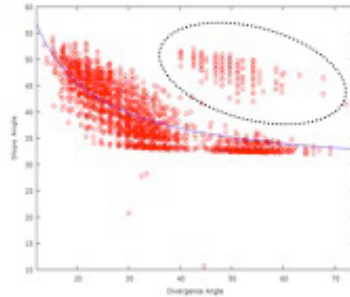


Figure 3.

Table 1. The Gretl output for the multinomial logit based on the experimental matrix

Logit Model, for n=5895 Observations, Dependant Variable = Var = [1,2,3,4,5,6,7]					
	Coefficient	Std. Error	t-Student	p-critique	
Height of Helical Unit (B)	-0,005127	0,0002242	-22,8661	<0,00001	***
Ortostical Distance (A)	-0,093862	0,0056447	-16,6284	<0,00001	***
Slope Angle (α)	-0,038982	0,0014744	-26,4376	<0,00001	***
Divergence Angle(θ)	-0,028524	0,0012188	-23,4023	<0,00001	***
Residuals Sum Square	1263,296			Sdt. Div. Reg.	0,563534
R2	0,9727502			Adjusted R2	0,972675
F(5, 3978)	28349,72			p-Value (F)	0,000000
Schwarz Criteria	6770,991			Hannan-Quinn	6750,692

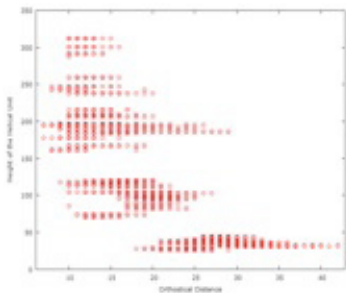


Figure 4.

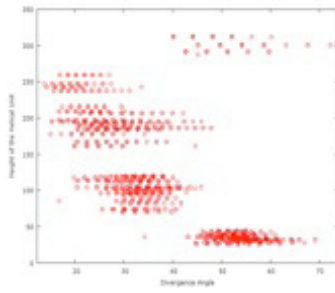


Figure 5.

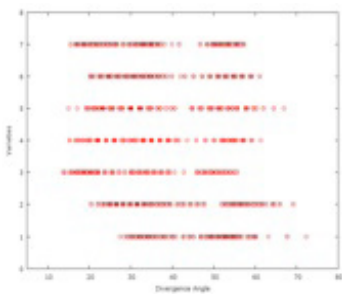


Figure 6.

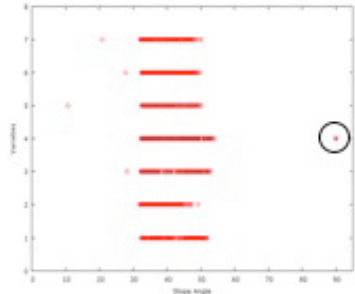



Figure 7.



Comparative study on date palm (*Phoenix dactylifera* L.) leaf spot fungal pathogens (*Nigrospora oryzae* and *N. sphaerica*)

Mohammed H Abass¹ and Najlaa H Mohammed²

¹Date Palm Research Centre, Basra University;


²Plant Protection Department, College of Agriculture, Basra University; Basra, Iraq.

Correspondence to M. H. ABASS,



dr.mha24@yahoo.co.uk

ABSTRACT



Date palm diseases is rising as an important concern during the last decades. The fungal pathogens of date palm are considered as the most serious problem causing significant reductions of growth, development, and production of date palm. Recently, in Iraq, several fungal pathogens have been isolated from heavily infected date palm leaves exhibiting symptoms of leaf spot; most abundantly, different species of *Nigrospora*. The present study was aimed at the characterization of these two *Nigrospora* species, isolated from different cultivars of date palm, based on morphological, molecular and pathological characteristics. In the current study, the

identity of both *Nigrospora* species have been revealed to be as *N. oryzae* and *N. sphaerica* on the basis of their morphological characteristics and molecular analysis of the Internal Transcribed Spacer (ITS) region. Results showed that both pathogens were found to be true pathogens on different date palm cultivars. Compared to *N. Sphaerica*, *N. oryzae* was more aggressive on the following cultivars: Al-Sayer, Hillawi, Zahdi, Leloy and Kantar. After 30 days post-inoculation, the overall average lesion diameter was 1.85 cm in response to the artificial infection with *N. oryzae*, whereas infection with *N. sphaerica* produced 1.42 cm lesions. Al-Sayer cv. was the most susceptible, among the tested cultivars to both *Nigrospora* species,

the lesion diameter was 2.50 cm, in contrast with cv. Leloy, 1.10 cm, which showed the lowest level of susceptibility. The extracellular enzymatic activity of both pathogens revealed that *N. oryzae* surpassed *N. sphaerica* in the production of cellulase and protease enzymes; whereas, lipase enzyme activity was absent in both fungi. The high enzymatic activity and virulence of *N. oryzae* on different date palm cultivars were approved in contrast with the species of *N. sphaerica*.

Keywords: Date palm, Enzyme activity, Leaf spot disease, *Nigrospora oryzae*, *Nigrospora sphaerica*

INTRODUCTION

Date palms (*Phoenix dactylifera* L.) are monocotyledon, dioecious plants, and one of the most cultivated palms around the world (Abass, 2013a). Date palm trees are cultivated in different regions worldwide, especially in Middle East, North Africa, Central and North America, Southern Europe, Pakistan and India (Zaid, 2002; Alshahib and Marshall, 2003). World production of date is estimated to exceed 7.5 million tons in 2009; the Arabian Peninsula contributes over one third of world total dates production (FAO, 2011).

Dates are well known as a good source of energy attributed to their rich content of nutrients, mostly carbohydrates and dietary fibre, certain essential vitamins and minerals such as iron, potassium, calcium and low level of sodium and fats (Thabet *et al.* 2010; Dayani *et al.*, 2012).

Many bacterial, fungal and other pathogens have been well studied on date palm; fungal pathogens are considered as one of the most serious pathogens and cause a significant reduction in date palm growth, development and production (El-Hassani *et al.*, 2007; Abass *et al.*, 2013).

Different species of the genus *Nigrospora* have been isolated and identified as a true endophytic pathogen on numerous plants. For examples, The species of *N. oryzae* (Berk and Broome) Petch is hosted by rice (Rice grain spot disease) and maize (Maize root rot) (Mew and Gonzales, 2002; Saunders and Kohn, 2008). Whereas, *N. sphaerica* (Sacc.) Mason has been isolated from decayed banana fruits (Esposito *et al.*, 1962) and spotted leaves of blueberry plants (Wright *et al.*, 2008).

Both of these two *Nigrospora* species were reported to infect and cause disease in date palm. Abass *et al.* (2006) were able to isolate and identify the species of *N. oryzae* from heavily infected date palm leaves with leaf spot disease in 2006, and in 2011-2012 they reported the species of *N. sphaerica* as a true pathogen of date palm trees which exhibited severe symptoms of leaf and stem spot diseases (Abass *et al.*, 2013).

The present study aimed at the separation of these two species of *Nigrospora* genus according to their morphological, molecular and pathological levels on different cultivars of date palm.

MATERIAL AND METHODS

1-FUNGAL ISOLATES

N. oryzae and *N. sphaerica* were isolated from heavily infected date palm leaves with spot symptoms,

most leaves were collected from cvs. Al-Sayer and Hillawi. The isolation was conducted on a Potato Dextrose Agar (PDA) medium supplemented with chloramphenicol at 25 °C according to Abass *et al.* (2013). Briefly, heavily infected leaves of date palm were brought to the laboratory and sectioned into small pieces of 1-2 cm², and sterilized with sodium hypochlorite (10% of commercial chlorox), subsequently rinsed in distilled water and placed on PDA plates.

2-MORPHOLOGICAL IDENTIFICATION OF *N. ORYZAE* AND *N. SPHAERICA*

The hyphae and conidia were examined in 7-d old colonies grown on PDA plates. The morphological identification was performed according to Matsushima (1975). Specimens were examined using a Zeiss AxioLab compound optic light microscope (AxioLab.A1, Fisher Scientific, Germany). Micrometric data was based on measurement of 100 individual spores, hyphae and conidiogenous cells.

3-EXTRACTION AND PURIFICATION OF FUNGAL DNA

The procedures used for fungal genomic DNA extraction, purification and ethanol precipitation were according to Zolan and Pukkila (1986). Briefly, a single-spore cultures were placed on Potato Carrot Agar (PCA) medium at 25 °C for 7 days. The mycelium and conidia were collected (approximately 10 g) and ground with liquid nitrogen at room temperature, then extracted with 600 µL extraction buffer [1% hexadecyltrimethylammonium bromide, 0.7 M NaCl, 50 mM Tris-

HCl (pH 8.0), 10 mM EDTA, 1% 2-mercaptoethanol], vortexed and incubated at 60 °C for 30 min. An equal volume of chloroform:isomyl alcohol (24:1, v/v) was added, tubes were then centrifuged 5 min at 13000 rpm. The aqueous phases were recovered into fresh tubes containing isopropanol and followed by a second centrifugation for 1 min. The DNA pellets were resuspended in 300 µL of TE buffer [10 mM Tris-HCl (pH 8.0), 1 mM EDTA].

4-PRIMERS DESCRIPTION AND PCR AMPLIFICATION

Universal primers (ITS1 and ITS4) were selected for molecular identification of *Nigrospora* species. The sequences of primers were: ITS1: 5'-TCCGTAGGTGAACCTGCGG-3', which hybridizes at the end of 18S rDNA and ITS4: 5'-TCTCCGCTTATTGATATGC-3', which hybridizes at the beginning of 28S rDNA (White *et al.*, 1990). The Polymerase Chain Reaction (PCR) was carried out in 0.2-mL polypropylene tubes with a total mixture of 50 µL consisting of a 4 ng of gDNA template, 5 µL of 10× polymerase buffer, 8 µL of dNTPs (1.25 mM), 1 µL of Taq DNA polymerase (Roche) and 1 µL of each primer, and distilled water up to 50 µL.

The thermal cycler used was equipped with a heated lid (M. J. Research Inc., Waltham, Massachusetts, USA). The PCR cycle was set up as follow: 5 min initial denaturation and enzyme activation at 95°C, followed by amplification for 35 cycles at 95°C for 1 min, 55° C for 1 min and 72° C for 1 min with a final extension at 72° C for 10 min (Rodrigues *et al.*, 2011).

The PCR products were resolved by horizontal electrophoresis in a 2% agarose gel after staining with

ethidium bromide (approximately 0.2-0.5 µg/mL). The PCR products were sequenced and analyzed by comparison with all available sequences in the National Centre for Biotechnology Information (NCBI) (<http://www.ncbi.nlm.nih.gov>) using the Basic Alignment Sequence Tool (BLAST): (<http://blast.ncbi.nlm.nih.gov/Blast.cgi>).

5-SUSCEPTIBILITY OF DIFFERENT DATE PALM CULTIVARS TO THE INFECTION WITH NIGROSPORA SPECIES

Five date palm cultivars (Al-Sayer, Hillawi, Zahdi, Leloy and Kantar) were chosen (because of their heavily infection symptoms of leaf spot) to determine the level of their susceptibility to the artificial infection with *N. oryzae* and *N. sphaerica* under the laboratory conditions, following the procedures of Abass *et al.* (2013) using mycelium plug inoculation on detached healthy date palm leaves. Briefly, five pieces of leaves (approximately 1.5 cm in length) per cultivar were surface-sterilized and rinsed in sterile distilled water five times. A wound of 0.5 cm diameter and 0.5 cm depth was made by a sterilized cork borer, and a 0.5 cm mycelial plug from *N. oryzae* and *N. sphaerica* colony grown on PDA was placed inside the wound and sealed with parafilm. A sterile PDA plug (0.5 cm) served as a negative control was used. The inoculated wounded leaves were placed in 200 mL flasks containing 20 mL sterilised distilled water and kept at 25°C for 30 days. The development of symptoms was monitored and the diameters of resulting necrotic lesions around the wound were measured according to Bachillor and Illage (1998). The reisolation of the pathogen from the inoculated

leaves, to fulfil Koch's postulates, was conducted on PDA plates as described above. The current test was repeated twice to confirm the results, the average of these experiments were considered for analysis

6-EXTRACELLULAR ENZYME ANALYSIS

The most important enzymes of both *Nigrospora* spp. were assayed as below:

6-1- Cellulase activity

N. oryzae and *N. sphaerica* were grown on YEPA (0.1 g yeast extract, 0.5 g peptone, 16 g agar in 1 litre of distilled water) supplemented with 0.5% (w/v) N-carboxymethyl cellulose. Each plate was incubated at 25 ° C. The plates (9 cm diameter) were flooded with 5 mL of Congo red (0.1%) and then destained with sodium chloride (1%) for 15 min. The clear zones around the colonies were measured by taking the average of three directions on each Petri dish.

6-2- Protease activity

The protease activity of *N. oryzae* and *N. sphaerica* was assayed following the procedures described by Amirrita *et al.* (2012) on GYP A medium (1 g glucose, 0.1 g yeast extract, 0.5 g peptone, 16 g agar in 1 litre of distilled water) amended with gelatine (0.4% w/v). Both GYP A and gelatine were sterilized separately by autoclaving for 20 min. Saturated aqueous of ammonium sulphate was used (5 mL/ plate) to flood the cultures. The saturation of ammonium sulphate was done by dissolving a 75 g of ammonium sulphate in 100 mL of distilled water. The clear halo around the colonies indicating the proteolytic activity and was measured by taking the average of three directions on each Petri dish.

6-3-Lipase activity

The procedure of Sierra (1957) was followed to determine the lipase activity of *N. oryzae* and *N. sphaerica*. Briefly, the medium of Peptone Agar Medium (PAM) (10 g peptone, 5 g NaCl, 16 g agar in 1 litre of distilled water) supplemented with sterilized Tween 20 at 1% (v/v) was inoculated with fungal colony plugs of 0.5 cm of tested species and incubated at 25 °C. The clear halo indicating the lipase activity.

RESULTS

1-MORPHOLOGICAL AND MOLECULAR CHARACTERISATION OF NIGROSPORA SPECIES

Both *N. oryzae* and *N. sphaerica* were isolated from heavily infected date palm leaves with spot symptoms, most leaves were collected from cvs. Al-Sayer and Hillawi (Fig. 1). After 7 days of culture on PDA plates, both species of *Nigrospora* grew rapidly and produced white colonies, initially, and then became brown to dark brown due to the abundance of sporulation (Fig. 2 A and B).

The species of *N. oryzae* produced a single-cell conidium of 14 -16 μM in diameter; each conidium was born on hyaline vesicle at the tip of the conidiophore of 4.5-6.0 μM . The conidium shape was ranging from spherical to black subspherical with the hyphae diameter at 7 -9 μM (Fig. 2 C).

The species of *N. sphaerica*, a single-cell conidium was produced at the attenuate apex of conidiophores which were 7-9 μM in diameter, spherical to oblate, solitary, black with smooth-walled and about 19 -20 μM as a diameter.

The diameters of hyphae were 8 -11 μM (Fig. 2 D).

The results of molecular characterization of *Nigrospora* species emphasizing on the Internal Transcribed Spacer (ITS) region of ribosomal DNA (rDNA) with ITS1 and ITS4 primers showed that the ITS sequence analysis had a 99% of identity with a total of -515 bp for *N. oryzae*, and -500 bp for *N. sphaerica* (Fig. 3).

On the basis of morphological characterization and molecular analysis of ITS region, the identity of *Nigrospora* species was revealed to be as *N. oryzae* and *N. sphaerica*.

2-SUSCEPTIBILITY TEST OF FIVE DATE PALM CULTIVARS TO THE INFECTION WITH NIGROSPORA SPECIES

The results of susceptibility test of five different date palm cultivars which were Al-Sayer, Hillawi, Zahdi, Leloy and Kantar, proved the ability of both tested species of *Nigrospora* to induce spot symptoms on all tested cultivars after artificial inoculation at laboratory. Generally, *N. oryzae* was more aggressive species on all detached healthy leaves of date palm cultivars compared to *N. sphaerica* (Table 1). The overall average of lesion diameter was 1.83 cm in leaf treated with *N. oryzae*. The symptoms of leaf spot developed as an oval to spherical shape with a green blackish centre. Al-Sayer cultivar was the most susceptible among tested cultivars to the artificial infection with both *Nigrospora* species where the lesion diameter was 2.50 cm. In contrast cv. Leloy showed the lowest level of susceptibility showing 1.1 cm-lesions after 30 days of inoculation; whereas, all tested cultivars in negative control remained symptomless

during the incubation period up to 30 days post-inoculation (Fig. 4). *N. oryzae* and *N. sphaerica* were consistently recovered from lesion tissues and reidentified fulfilling Koch's postulates.

3-EXTRACELLULAR ENZYMATIC ACTIVITY OF N. ORYZAE AND N. SPHAERICA

The two species of *Nigrospora* spp. were screened for the activity of their extracellular enzyme, including cellulase, protease and lipase. Both *N. oryzae* and *N. sphaerica* showed positive results for cellulase and protease enzyme assay, while no indication for any activity with lipase assay in *Nigrospora* species (Table 2, Fig. 5). It's noteworthy that *N. oryzae* was the most active in the cellulase and protease analysis compared to of *N. sphaerica*.

DISCUSSION

Date palm is considered as one of the most ancient cultivated palm trees in the world providing fruit (dates) as a food source for thousands of years (Suliman *et al.*, 2012). In Iraq, date palm cultivation encounters several constraints among which the wide spread of fungal diseases presenting a serious threat for growth and development of date palm (Abass *et al.*, 2006). Several important fungal pathogens have been isolated and identified as a causal agent of damaging diseases, including leaf spot disease (*Alternaria*, *Graphiola*, *Pestalotia*, *Microsphaerella* and *Phoma*), inflorescence rot (*Mauginiella scattae*), neck bending (*Ceratocystis paradoxa*), root rot and fruit rot (*Aspergillus*, *Alternaria*, *Fusarium* and *Penicillium*) (Al-Juboory, 2005; Abass *et al.*, 2006; Al-Sheikh, 2009). Most of these diseases have been concentrated in the date palm orchards nearest to

the river banks, such as Shaat-Al-Arab River in Basra province where the high level of humidity could contribute to the spread of these fungal infections (Abass *et al.*, 2013).

Regarding the disease of leaf spot, several fungal genera have been isolated and identified as a true pathogen on date palm in Iraq, including: *Alternaria*, *Pestalotia*, *Mycosphaerella*, *Phoma* and *Nigrospora* (Abass *et al.*, 2006, 2013). Two different species have been found to be a leaf spot pathogen which belongs to the genus of *Nigrospora*. *N. oryzae* and *N. sphaerica* (Abass *et al.*, 2006, 2013). In the present study, both species of *Nigrospora* were successfully grown *in vitro* and exhibiting rapid proliferation on PDA plates at 25° C. However, the morphological examination showed that the sizes of conidia and conidiophores as well as the hyphae diameter could be a reliable parameter for discriminating between these two species. Most importantly, the conidia diameter which were larger in response to *N. sphaerica* (up to 20 µM) compared to *N. oryzae* (up to 16 µM). The molecular identification with ITS primers (ITS1/4) revealed the identity of both pathogenic species of *Nigrospora*. The sequence data alongside with BLAST search proved the identity (99%) to be *N. oryzae* and *N. sphaerica* thus confirmed the morphological identification. The Internal transcribed Spacer (ITS) regions of ribosomal DNA (rDNA) has a great importance in confirmation of fungal identification; both ITS primers ITS1 and ITS4 were used to amplify these regions which compass the 5.8S coding sequence situated between large and small units (White *et al.*, 1990). The ITS sequencing method has been implied widely for discrimination between many

closely related species belong to the genera of *Alternaria*, *Aspergillus* and *Penicillium* (Henry *et al.*, 2000; Konstantinova *et al.*, 2002; Pashley *et al.*, 2012; Abass, 2013b).

The susceptible test showed that the species of *N. oryzae* was the most aggressive on all tested date palm cultivars, compared to *N. sphaerica*. The most susceptible reactions were observed with Al-Sayer and Zahdi cultivars, in contrast with Leloy cultivar which showed the lowest level of susceptibility for both species of *Nigrospora*. The high level of pathogenicity in the artificial inoculation with *N. oryzae* on date palm detached leaves could be attributed to the enzymatic and toxic activity of the pathogen, which might be higher in the in the species of *N. oryzae* compared to *N. sphaerica*. Several toxins have been isolated and identified from the culture filtrate of *Nigrospora*, such as lactones, most importantly; phomalactone which induced water-soaked lesion of tested leaves (Fukushima *et al.*, 1998).

The degradative enzymes produced by plant fungal pathogens are crucial factors in the pathogenesis involving several biological functions such as host specificity, deterioration of the present study shows positive results of cellulase and protease activity in the culture media. Both *N. oryzae* and *N. sphaerica* produced cellulase and protease enzymes but the highest activity was observed in the cultures of *N. oryzae*. This variation could be attributed to the level of virulence of *N. oryzae* which was more aggressive on all tested date palm cultivars in contrast with *N. sphaerica*. It was reported that the host specificity as well as fungal virulence could be one of the explanations of the variations in

the enzymatic activity of different plant fungal pathogens such as *Mauginiella scattae*, *Fusarium moniliforme*, *F. graminearum* and *F. semitectum* (Abass, 2005; Ahmad *et al.*, 2006).

No detection of any lipase activity in both species of *Nigrospora* when Tween 20 was used as a substrate for lipase enzyme assay. Numerous published paper showed the suitability of Tween 20 as an appropriate substrate for lipase assay in solid medium (Tan *et al.*, 2004; Amirita *et al.*, 2012). The negative result of lipase was reported in different plant fungal pathogens such as *Thialoviopsis paradoxa* (Abass, 2005).

CONCLUSIONS

Our results indicated that the morphological characteristics, based on the diameter of conidia of *Nigrospora* spp. are reliable features for fungal identification on the species level. The morphological characterisation was confirmed by ITS sequences and proved the identity of *N. oryzae* and *N. sphaerica*. The susceptibility test of different date palm cultivars revealed higher levels of virulence of *N. oryzae* compared to *N. sphaerica*.

The variation of enzymatic activity of cellulase and protease between the two species of *Nigrospora* may suggest an explanation for the significant differences in their pathogenicity on date palm detached leaves. The high level of virulence of *N. oryzae* could be correlated with the high enzymatic activity. Further investigations focusing on toxicological and histological aspects will help to better understand the nature of pathogenicity of *Nigrospora* species.

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Figures



Fig. 1. Leaf spot disease symptoms on A and B Al-Sayer cv. C and D Hillawi cv.

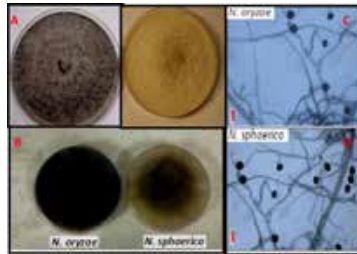


Fig.2 A. 7 days growing culture of *N. oryzae* and *N. sphaerica* on PDA plate. B. Reverse growth of *N. oryzae* and *N. sphaerica* on PDA plate. C. Microscopic features of *N. oryzae*. D. Microscopic features *N. sphaerica*. Bar 20 μ m.

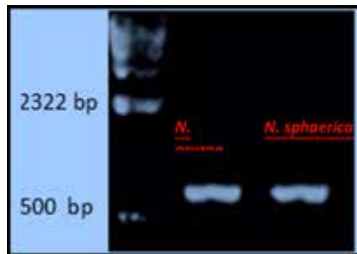


Fig. 3. PCR products of DNA from *N. oryzae* and *N. sphaerica* with ITS primers. Lane 1, Lambda HindIII DNA marker; lane 2, *N. oryzae* (515 bp); lane 3, *N. sphaerica* (500 bp). The sizes of both fragments were estimated by comparison with lambda HindIII DNA marker (Gene Ruler) and the computer program of Photocapt MW software 10.0. Vilber Lourmat.



Fig. 4. Infection procedure of *N. oryzae* and *N. sphaerica* on date palm detached leaves.

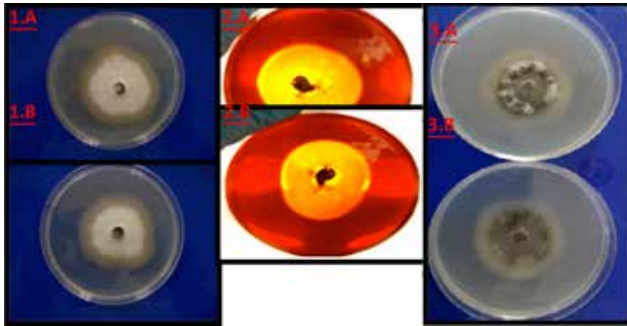


Fig. 5. Results of different enzymatic activity of *N. oryzae* and *N. sphaerica*.

1. Protease activity: A. *N. oryzae*, B. *N. sphaerica*.

2- Cellulase activity : A. *N. oryzae*, B. *N. sphaerica*. 3- Lipase activity: A. *N. oryzae*, B. *N. sphaerica*.

Tables:

Table 1. Lesion diameter of different date palm cultivars (cm) caused by two species of *Nigrospora*


Date Palm cultivar	Fungal species		Average of cultivar
	<i>N. oryzae</i>	<i>N. sphaerica</i>	
Al-Sayer	2.90	2.10	2.50a
Hillawi	1.60	1.25	1.40c
Kantar	1.30	1.50	1.40c
Leloy	1.20	1.00	1.10d
Zahdi	2.15	1.25	1.70b
Average of fungal species	1.80a*	1.42b	

Means within each column followed by the same letter are not significantly different at the $P < 0.01$ level as determined by Duncan's multiple range test.

Table 2. Extracellular enzyme assay of *N. oryzae* and *N. sphaerica*.

<i>Nigrospora</i> species	Cellulase activity (mm)			Protease activity (mm)			Lipase activity (mm)		
	R.G.	Z.D.	E.A.	R.G.	Z.D.	E.A.	R.G.	Z.D.	E.A.
<i>N. oryzae</i>	50.0	20.0	+	53.0	15.0	+	45.0	-	-
<i>N. sphaerica</i>	45.0	10.0	+	45.0	10.0	+	35.0	-	-

R.G.: Radial Growth, Z.D.: Zone Diameter, E.A.: Enzyme Activity. + Active; - Inactive.



Morphological characterization of Saudi Arabian date palm cultivars based on vegetative and reproductive traits

Nabeel Al-Wusaibai¹, Abdallah Ben Abdallah², Mohamad Al-Husseini¹, Hajji Al-Hajji¹, Husein Al-Salman¹, Khaled Kurshed¹, And Abdallah Oihabi³

(1) Date Palm Research Centre (DPRC), P. O. Box 43, Al-Hassa-31982, KSA.

(2) FAO Project (UTFN/SAU/043/SAU), DPRC, P. O. Box 43, Al-Hassa-31982, KSA.

(3) FAO Programme Coordination Unit, P O Box 558, Riyadh-11421, KSA.



n_alwusaibai@yahoo.com

ABSTRACT

The Kingdom of Saudi Arabia is among the top three date producing countries of the world, producing over a million tons of dates annually from an estimated 23 million date palms grown in over 172,000ha accounting for 17% of the global production. The Kingdom has a wide genetic pool of over 400 date palm cultivars.

We studied 11 representative cultivars from eastern, central and western region of the Kingdom. The major vegetative traits studied pertained to fronds, including the leaflets and thorns (spines) on the fronds. With regard to the reproductive traits the number of bunches, bunch stalk, strands, flowers and fruits (fructification) were studied.

Results revealed that the cultivars from the western region had an intensive vegetative growth, as reflected by the higher number of fronds in the cultivars, Ajwah,

Anbara and Safawi. This parameter could serve as an indicator to distinguish between cultivars from the date growing regions of the Kingdom. With regards to the length of the fronds, cultivars from the central region viz. Nabutsaif, and Sulaj registered the maximum frond length. Further, the highest number of thorns on the fronds was recorded in the cultivar Safawi from the western region, while the cultivar Khunaizi from the eastern region had longest thorns. It is pertinent to mention that the cultivars from the central region were characterized by few thorns on the frond spaced closely and consequently had more area on the frond for leaflets which could be a genetic character to adapt to the environment. Observations on the reproductive traits revealed that the cultivars from the eastern region recorded the best results with regard to bunch number (Sheshi), length of bunch stalk

(Khalas), width of bunch stalk (Reziz) and number of strands per bunch (Khalas). Further, Anbara from the western region recorded the maximum average fruit length and width while the cultivars Khalas and Reziz recorded the maximum length and width of the seed, respectively. Further, the cultivars Sheshi and Ajwa recorded the maximum weight of fruit and seed, respectively. With regard to the form of fruits Khalas, Sheshi and Sokai were oval, Reziz, Ajwah and Nabutsaif were aspheric while fruits of Anbara and Sulaj were semi-cylindrical in form. Seeds of the cultivars studied had three distinct forms viz. semi-cylindrical in Khalas and Ajwah, fusiform in Sheshi, Anbara and Sulaj while it was oval in Reziz and Nabutsaif. These studies form the basis to categorize date palm varieties of the Kingdom into clusters based on the above traits.

Key Words: Date palm, cultivars, Saudi Arabia, morphological characterization

INTRODUCTION

Date palm *Phoenix dactylifera* L. is an important fruit crop of the arid regions of the world especially in the Middle East and North Africa where it has been cultivated since ancient times and is closely associated with the life and culture of the people in these regions. It is estimated that there are 100 million date palms of which 60 % exist in the Arab world. It is believed to have been cultivated as early as 4000 B.C. and has its origin in Mesopotamia (Wrigley, 1995). During the past three centuries, dates have also been introduced to new production areas in Australia, the Indian sub continent, Mexico, southern Africa, South America, and the United States. Dates are a main income source and

staple food for local populations in many countries in which they are cultivated, and have played significant roles in the economy, society, and environment of those countries (Chao and Krueger, 2007). Date palm has wide genetic diversity due to a high degree of out breeding (Popenoe, 1992). Zaid and De Wet, 2002 reported the occurrence of 3,000 cultivars around the world.

The Kingdom of Saudi Arabia is among the top three date producing countries of the world, producing over a million tones of dates annually from an estimated 23 million date palms grown in over 172,000ha accounting for 17% of the global production. Over 400 date palm cultivars have been reported from Saudi Arabia (FAOstat 2010; Anonymous, 2006). As in all date palm growing countries of the world in Saudi Arabia too, date palm cultivars are region specific characterized by unique vegetative and reproductive traits. These traits play an important role in characterization of a particular cultivar in respect to its adaptation to a particular agro-ecosystem besides impacting the yield and commercial norms of dates. Studies on characterization of date palm cultivars are rare (Baker *et al.*, 1999).

This study pertains to the morphological characterization of major Saudi Arabian date palm cultivars from the eastern, western and central regions of the Kingdom based on vegetative and reproductive traits.

MATERIALS AND METHODS

Studies were carried out during 2013 to characterize major Saudi Arabian date palm cultivars from the eastern (4), western (3) and central (4) date palm growing

regions of the Kingdom based on the vegetative and reproductive traits. The cultivars studied are presented in table 1.

Studies on the vegetative traits were carried out with respect to the fronds where in observations on several characters viz. number of fronds / palm, length of fronds (m), number of leaflets / frond, length of frond mid-rib with leaflets (m), number of thorns (spines) / frond, length of thorn / frond (m), length of frond mid-rib with thorns (m) and length of frond mid-rib between last leaflet and first thorn (m) were recorded. As regards the reproductive traits fruit bunch characters viz. number of bunches / palm, bunch stalk length (m), bunch stalk width (m) and number of strands / bunch were studied. Further, observations on the physical traits (length, width and forms) of fruits and seeds were also recorded in Khalas, Sheshi, Reziz, Ajwah, Anbara, Sulaj, Nabutsaif and Sugai.

With regard to the frond and bunch characters three replications (palms) per cultivar was maintained. Individual observations were recorded on one frond or bunch in each of the three replicate palms. As regards the fruit characters observations were recorded in three palms per cultivar wherein 15 fruits per palm were maintained. Data on the above characters was compiled and subjected to statistical analysis (ANOVA, $p=0.05$). Results of the study are presented and discussed below.

RESULTS AND DISCUSSION

Results presented below indicate significant variation among cultivars for all the traits studied.

Among the several vegetative traits studied results presented

in table 2 reveal that the date palm cultivars from the western region of the Kingdom had the highest average number of fronds / palm (65.77) with the cultivars Ajwah (66.30) and Anbara (66.00) having the maximum and statistically similar number of mean number of fronds. The least number of fronds/ palm (39.33) were seen from the cultivars in the central region of the Kingdom with the cultivar Sukari recording the lowest mean number of fronds (32.00). Further table 2 reveals that length of the fronds and leaflets / frond were inversely related to the number of fronds/ palm with cultivars from the east recording a least values for mean frond length of 3.70 m and leaflets/ frond of 162.25 as compared to cultivars from the central region which registered the highest frond length of 4.70 m and leaflets/ frond of 205.43. A similar trend was observed with respect to length of frond mid-rib with leaflets, where cultivars from the central region recorded the highest mean value (3.72m), with cultivars from the east registering the lowest mean value for this character (2.57m). It can be inferred that the lower number of fronds per palm for cultivars from the central region of the Kingdom was compensated by higher frond length and leaflets / frond there by sustaining photosynthetic levels in relation to date palm cultivars from the west of the Kingdom where the cultivars recorded higher number of fronds / palm. Though, cultivar wise significantly different values were recorded for number of leaflets on the right and left of the frond, this character was cultivar specific with the same number of leaflets being recorded for each cultivar on the right and left of the frond mid-rib. Microsatellites analysis of 26 Tunisian date palm cultivars using stable vegetative features showed high polymorphism

among the cultivars studied (Hamzaet *al.*,2011a).In date palm yield levels are known to be correlated the number of fronds. Nixon, 1957 reported that an average of 7.5 leaves/bunch ratio in the Deglet Noor cultivar was needed to obtain high yields of fruit of good quality and also to assure the production of an adequate number of bunches the following year. Bacha and Shaheen, 1986 concluded that increasing leaf/bunch ratio up to 9: 1 resulted in increasing yield and improving fruit quality in both Nabutsaif and Reziz cultivars.

Results pertaining to characteristics of thorns (spines) on date palm fronds in major Saudi Arabian cultivars (Table 3) show significant differences among the cultivars studied with Safawi from the west of the Kingdom recording the highest number of thorns / frond (39.00). In general cultivars from the east recorded least mean number of thorns / frond (22.33) as compared to cultivars from the central region of the Kingdom which recorded the highest mean value (26.60). This character was inversely related to length of the thorns on the frond with cultivars from the east recording higher mean values (0.18m) as compared to date palm cultivars from the central region of the Kingdom (0.10m). Variation in this trait (spines) could be a physiological adaptation to different environmental conditions prevailing in the three regions of the Kingdom.

With regard to the fruit bunch characteristics (Table 4), significant differences were recorded for the traits studied with the highest mean number of bunches / palm being recorded in date palm cultivars from the east (12.59) followed by cultivars from the west (11.33) and the central region of the Kingdom (9.23),

respectively. The cultivar Sheshi from the east registered the highest number of fruit bunches/ palm (16.33). As regards the number of strands / bunch the cultivars from the east registered the highest mean values (76.75), while the cultivars from the west of the Kingdom registered the lowest mean value (49.33). For this trait, the cultivar Khalas recorded the highest value of 94.30 strands/ bunch. The cultivars, Khalas and Reziz from the east also recorded maximum length and width of bunch stalk, respectively. Yield levels in date palm are known to be influenced by vegetative traits especially the leaf/ bunch ratio (Nixon, 1957; Bacha and Shaheen, 1986). Our findings with respect to the cultivars Reziz and Khalas are in agreement with these reports.

Further from figure 1 it is evident that the cultivar Anbara from the western region recorded the maximum average fruit length and width while the cultivars Khalas and Reziz recorded the maximum length and width of the seed, respectively. Further, the cultivars Sheshi and Ajwa recorded the maximum weight of fruit and seed, respectively (Figure 2). Reports from Saudi Arabia indicate that analysis of the morphological data of fruits revealed a high level of diversity in length-width ratio, colour, shape of the fruit, fruit-base and in the percentage of area covered by the fruit cap. Correlation of morphologic characters with genomic similarity using RAPD markers showed that the fruit shape is one of the characteristics most influenced by genetic variation (Al-Khalifa *et al.*,2012). Studies carried out on the quality norms of premier date palm cultivars from the eastern region of Saudi Arabia (Al-Abdoulhadi, 2011), showed that Khalas recorded the maximum fruit

length in all the three categories of large, medium and small sized fruits. With regard to the breath of fruits, the cultivar Sheshi registered the highest values. Further, Sheshi recorded the highest fruit weight values, which in turn influenced the number of fruits per unit weight, with Sheshi recording the least number of fruits per 500g. Sakret et al., 2010 from Egypt reported fruit length to significantly differ among the fruits of eight date palm cultivars studied with the cultivar Kuboshy registering the maximum fruit length, while the cultivar Samany registered the maximum fruit width.

With regard to the form of fruits Khalas, Sheshi and Sokai were oval, Rezi, Ajwah and Nabutsaif were aspheric while fruits of Anbara and Sulaj were semi-cylindrical in form. Seeds of the cultivars studied had three distinct forms viz. semi-cylindrical in Khalas and Ajwah, fusiform in Sheshi, Anbara and Sulaj while it was oval in Rezi and Nabutsaif (Table 5). Our results are in agreement with reports by Al-Khalifa et al/2012 for fruit shape of the cultivars Khalas and Sukari. Studies carried out in Tunisia on date palm cultivars to study the morphological and genetic diversity showed significant differences among subpopulations for all traits measured with morphological variation being correlated to fruit maturity period (Hamza et al., 2011b).

It can be concluded that there exists wide variability among the date palm cultivars studied and further molecular analysis will help to determine the relationship among these cultivars forming the basis to categorize date palm varieties in Saudi Arabia into clusters based on the above traits.

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Tables

Table 1. Major date palm cultivars from the eastern, western and central date palm growing regions of Saudi Arabia selected for the study

Sr. No.	Date palm cultivars of Saudi Arabia studied		
	Eastern region	Western region	Central region
1	Khalas	Ajwah	Sulaj
2	Sheshi	Anbara	Sukari
3	Reziz	Safawi	Nabutsaif
4	Kheneizi		Sugai

Table 2. Characteristics of date palm fronds in major Saudi Arabian cultivars

Sr. No.	Cultivar	Mean values					
		Number of fronds / palm	Length of fronds (m)	Number of leaflets / frond	Number of leaflets on right of frond mid-rib	Number of leaflets on left of frond mid-rib	Length of frond mid-rib with leaflets (m)
I. Cultivars from the Eastern Region							
1	Khalas	55.00ab	3.87b	175.70c	88.70c	88.70c	2.77c
2	Sheshi	46.70bc	3.43c	145.00d	73.00d	73.00d	2.69c
3	Reziz	56.70ab	3.45c	152.30d	76.00d	76.00d	2.20d
4	Kheneizi	45.30bc	3.98b	176.00c	87.70c	87.70c	2.61cd
II. Cultivars from the Western Region							
5	Ajwah	66.30a	4.05b	199.00b	99.00b	99.00b	3.16b
6	Anbara	66.00a	3.51c	169.30c	87.00c	87.00c	2.64c
7	Safawi	65.00a	4.79a	170.30c	83.30cd	83.30cd	3.40b
III. Cultivars from the Central Region							
8	Sulaj	53.30ab	4.97a	224.00a	113.70a	113.70a	4.08a
9	Sukari	32.00d	4.28b	197.70b	98.30b	98.30b	3.25b
10	Nabutsaif	32.70d	5.13a	186.70bc	92.70c	92.70c	3.97a
11	Sugai	-	4.43b	193.30b	96.70b	96.70b	3.58ab
Regional mean values							
	East	50.93	3.70	162.25	81.35	81.35	2.57
	West	65.77	4.12	179.53	89.77	89.77	3.07
	Centre	39.33	4.70	205.43	100.35	100.35	3.72

Figures with same letters within the column are not significantly different ($p=0.05$)

Table 3. Characteristics of thorns (spines) on date palm fronds in major Saudi Arabian cultivars

Sr. No.	Cultivar	Mean values			
		Number of thorns /frond	Length of thorn / frond (m)	Length of frond mid-rib with thorns (m)	Length of frond mid-rib between last leaflet and first thorn (m)
I. Cultivars from the Eastern Region					
1	Khalas	27.33c	0.16b	0.87b	0.24c
2	Sheshi	20.33d	0.12bc	0.77b	0.29b
3	Reziz	21.00d	0.13b	0.87b	0.21c
4	Kheneizi	25.67c	0.24a	0.90b	0.23c
II. Cultivars from the Western Region					
5	Ajwah	19.00d	0.12bc	0.75b	0.38a
6	Anbara	18.67d	0.09c	0.72bc	0.40a
7	Safawi	39.00a	0.12bc	0.36b	0.34b
III. Cultivars from the Central Region					
8	Sulaj	25.00c	0.08c	0.84a	0.22c
9	Sukari	31.67b	0.08c	0.84b	0.31b
10	Nabutsaif	26.33c	0.14b	0.92b	0.39a
11	Sugai	23.33c	0.09c	0.73bc	0.35ab
Regional mean values					
	East	22.33	0.18	0.85	0.24
	West	25.56	0.11	0.61	0.37
	Centre	26.60	0.10	0.83	0.32

Figures with same letters within the column are not significantly different ($p=0.05$)

Table 4. Characteristics of date palm bunches in major Saudi Arabian cultivars

Sr. No.	Cultivar	Mean Values			
		Number of bunches / palm	Bunch stalk length (m)	Bunch stalk width (m)	Number of strands / bunch
Cultivars from the Eastern Region					
1	Khalas	12.33b	1.67b	0.04b	94.3a
2	Sheshi	16.33a	0.98bc	0.05b	79.3b
3	Reziz	11.00b	1.06b	0.14a	63.7b
4	Kheneizi	10.67bc	1.24ab	0.04b	69.7b
Cultivars from the Western Region					
5	Ajwah	9.00c	0.81c	0.04b	65.0b
6	Anbara	12.00b	0.79c	0.04b	37.3a
7	Safawi	13.00b	1.05b	0.05b	45.7c

Sr. No.	Cultivar	Mean Values			
		Number of bunches / palm	Bunch stalk length (m)	Bunch stalk width (m)	Number of strands / bunch
Cultivars from the Central Region					
8	Sulaj	12.33b	1.24ab	0.04b	74.7b
9	Sukari	6.67d	0.88c	0.04b	54.7c
10	Nabutsaif	8.67c	1.48a	0.04b	74.7b
	Sugai	-	-	-	-
Regional mean values					
	East	12.59	1.11	0.07	76.75
	West	11.33	0.88	0.06	49.33
	Centre	9.23	1.20	0.04	68.03

Figures with same letters within the column are not significantly different ($p=0.05$)

Table 5. Forms of date fruits and seeds in major Saudi Arabian cultivars

Sr. No.	Cultivar	Fruit form	Seed form
1	Khalas	Oval	Semi-cylindrical
2	Sheshi	Oval	Fusiform
3	Reziz	Aspheric	Oval
4	Ajwah	Aspheric	Semi-cylindrical
5	Anbara	Semi-cylindrical	Fusiform
6	Sulaj	Semi-cylindrical	Fusiform
7	Nabutsaif	Aspheric	Oval
8	Sugai	Oval	Fusiform

Figures

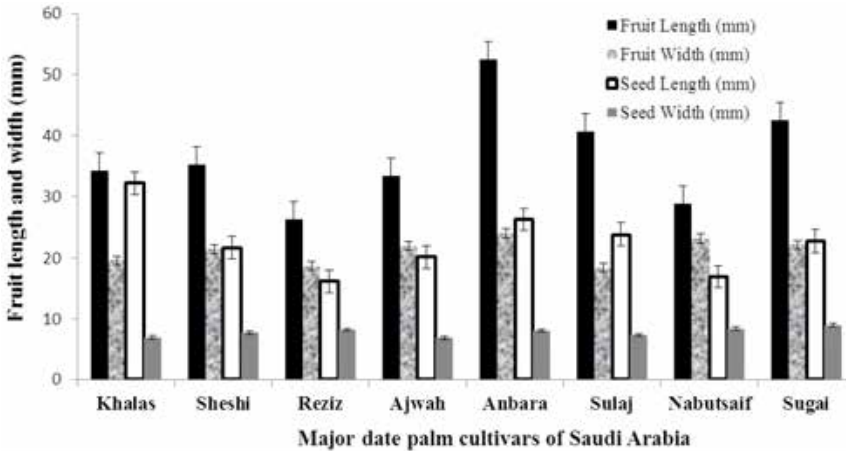


Figure 1. Physical traits (length and width) of date fruits and seeds in major Saudi Arabian date palm cultivars

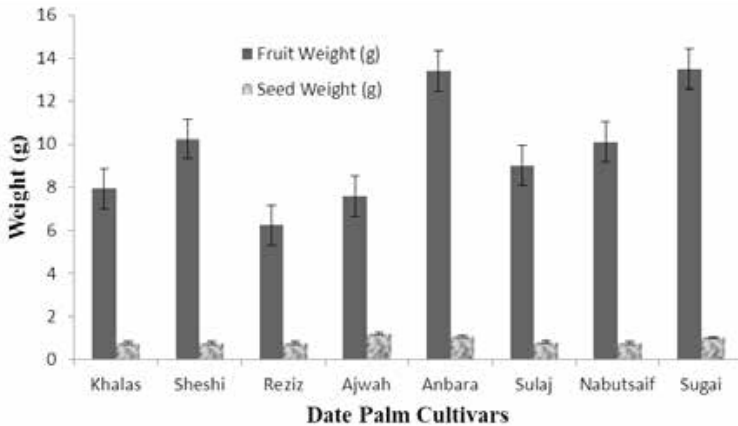


Figure 2. Weight of date fruits and seeds in major Saudi Arabian date palm cultivars