المَجْهُولْ

Mejhoul Variety

The Jewel of Dates

—Origin, Distribution and International markets—

دُرَّةُ

جائزة خليفة الدولية لنخيل التمر والابتكار الزراعي
KHALIFA INTERNATIONAL AWARD FOR DATE PALM AND AGRICULTURAL INNOVATION

CO-EDITED BY
Professor Abdelouahhab Zaid
and Professor Abdallah Oihabi

التُّمُورْ

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Celebrating the UN Decade on Ecosystem Restoration (2021- 2030)

MEJHOUL VARIETY:
The Jewel of Dates —Origin, distribution and international market.

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The precise forms of address for individuals can vary in different regions of the world, and from country to country. For the purposes of this report, much consideration was given to ensuring the titles conferred on each contributor honours them with all due respect. We have elected that the title of His or Her Excellency should be conferred on ministers of state, heads of government and the heads of international organisations. Please accept our sincerest apologies for any unintentional offence caused in compiling this report.

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We dedicate this book: “Mejhoul Variety: The Jewel of Dates”, to H.H. Sheikh Khalifa bin Zayed Al Nahyan, President of the United Arab Emirates, “May God protect him”, the founder and patron of the Award, H.H. Sheikh Mohammed bin Zayed Al Nahyan, Crown Prince of Abu Dhabi, Deputy Supreme Commander of the UAE Armed Forces, and H.H. Sheikh Mansour bin Zayed Al Nahyan, Deputy Prime Minister, Minister of Presidential Affairs, the first supporter of date palm cultivation. The editors also extend their thanks and appreciation to H.E. Sheikh Nahayan Mabarak Al Nahayan, Minister of Tolerance and Coexistence, Chairman of the Award’s Board of Trustees.

Preface

The date palm tree received great attention and care from the founder of the United Arab Emirates (UAE), and the builder of its agricultural sector, the late Sheikh Zayed bin Sultan Al Nahyan, "May God bless his soul". This success continued, thanks to the vision of H.H. Sheikh Khalifa bin Zayed Al Nahyan, President of UAE, "May God protect him", and the guidance of H.H. Sheikh Mohammed bin Zayed Al Nahyan, Crown Prince of Abu Dhabi, Deputy Supreme Commander of the UAE Armed Forces, and the continuous support of H.H. Sheikh Mansour bin Zayed Al Nahyan, Deputy Prime Minister, Minister of Presidential Affairs. Each has contributed to the UAE's leading position among the top five date palm producers, manufacturers and exporters worldwide.

The Mejhoul date variety has earned special attention, due to its worldwide importance, that no other date variety has gained. This is due to the fruit's unique characteristics that distinguish it from other varieties. This uniqueness will be clearly presented through the material of this book, prepared with contributions from national and international organisations, as well as date specialists from across the world. The unique and important insights within this book have been gathered from the wide contributions of their Excellency's Ministers of Agriculture in date producing countries, as well as international specialists, organisations, and scientists.

If we take a glance at date palm cultivation history, we will clearly see the significant change in date palm cultivation and production in general from the 'old world' geographically represented in the Middle East and North Africa (MENA) region, where date palm cultivation has recently widely increased, using traditional techniques. The agricultural tools used for date palm cultivation and production are now considered agricultural heritage, as they represent different cultural and social natures, linked to the history of each date-producing country over hundreds, and sometimes thousands, of years. The date industry, and date consumption from within the traditional frameworks, no longer meets the needs of present-day consumers.

Today, the 'new world' of date palm cultivation and production is geographically represented widely throughout the world, and has been introduced to inhabitants of the United States of America (USA), Australia, Republic of South Africa (RSA), Namibia and Indonesia, among others. We can clearly see a significant shift in this sector in terms of used agricultural methods, and its in vitro multiplication, as new date palm cultivation follows the latest agricultural methods. Today, innovation is the main tool used to develop agriculture, whether before or after the harvest, manufacture, production and worldwide marketing of dates. We are at the forefront of an integrated agricultural industry for the blessed date palm tree, which has more value than its produced fruit. The date palm tree is itself an integrated system, its product and by-products are crucial, and the production, trade and marketing of the date represents the largest supply of the world's food industry.

His Excellency Sheikh Nahayan Mabarak Al Nahayan
UAE Cabinet Member, Minister of Tolerance and Coexistence, Chairman of the Board of Trustees, Khalifa International Award for Date Palm and Agricultural Innovation.

The Mejhoul date variety has earned special attention, due to its worldwide importance, that no other date variety has gained.

Editorial statement

—Professors Abdelouahhab Zaid and Abdallah Oihabi—

The Mejhoul variety is one of the most important date varieties in the world. This book's ambition is to present and highlight the importance of the Mejhoul variety, both in countries across the Middle East and North Africa (MENA) region, as well as in the rest of the new cultivation world.

In recognition of this world important date variety, the General Secretariat of the Abu Dhabi-based KIADPAI in the United Arab Emirates, chaired by His Excellency Sheikh Nahayan Mabarak Al Nahayan, Minister of Tolerance and Coexistence, President of the Award's Board of Trustees, took the privilege to produce a scientific specialised book entitled "Mejhoul Variety: The Jewel of Dates – Origin, distribution and International market".

ORIGIN

The Mejhoul date palm originated from the Tafilalet Valley in the Kingdom of Morocco, which is administratively known as the Errachidia Province. Origination was confirmed by the DNA analysis of several samples of Mejhoul palms collected from diverse areas including Morocco, Egypt and the USA. Several landmark studies have shown that the Mejhoul variety is a landrace variety of Moroccan origin.

Mejhoul dates were the principal export from the Tafilalet area of Kingdom of Morocco, dating as far back as the 17th Century, when it was sold in a fancy gift box for Christmas in Paris, Madrid, and London. The modern Mejhoul was largely introduced into the new world of date cultivation by the USA in 1927.

Mejhoul dates have slightly different names depending on the country or region of cultivation.

Mejhool, Mejhoul, Medjoul, Majhoul, Majul, Medjhool, Medjehuel, Majhol and Me-jool are all synonyms used to describe the same date variety. However, throughout this book we use the most popular name, which is MEJHOUL.

This book sheds light on a number of important factors, including the origin and geographical distribution of the Mejhoul variety, its edapho-climatic requirements, propagation techniques, and the fruit's chemical and physical characteristics.

The Arabian Peninsula, North African countries and the Sahel region, all of which are characterised by similar geographical and climatic conditions existing throughout the millennia.

These areas have a long history of cultivation of the date palm, as well as similar cultural characteristics that have created an enabling environment for large-scale Mejhoul plantations. This book describes and presents the vast Mejhoul plantations in several countries, such as:

Kingdom of Morocco (as the country of Mejhoul origin), United Arab Emirates, Arab Republic of Egypt, Hashemite Kingdom of Jordan, State of Palestine, State of Israel, USA, Mexico, Islamic Republic of Mauritania, Kingdom of Saudi Arabia, Republic of South Africa, Republic of Sudan and Republic of Namibia.

Moreover, it also address several crucial factors, highlighting the Mejhoul variety's marketing standards, and its regional and international marketing, as well as the importance of Mejhoul in the date palm strategies of the MENA countries, and the expected impact of this strategy on the date regional and international marketing.

Another important aspect of this book lies in the invaluable contribution of a number of regional and international organizations, such as

The International Center for Agriculture Research in the Dry Areas (ICARDA),

The Arab Organization for Agricultural Development (AOAD),

Association of Agricultural Research Institutions in the Near East & North Africa (AARINENA),

and Arab Centre for the Studies of Arid Zones and Dry Land (ACSAD).

The authors of this book hope that its outcomes will Influence decision-makers at the local, regional and international levels, provide recommendations on research, development, demonstrations and innovation on the Mejhoul variety, and also offer background information for the regional investment opportunities by private investors, as well as international development projects.

(*Arabic*);
referring to its origin:
Unknown

MEJHOUL DATES
have slightly different names depending on the country or region of cultivation we use the most popular name:

Mejhoul

مَجْهُولْ

دُرَّةُ

- ⊗ Mejhol
- ⊗ Madqul
- ⊗ Majdoul
- ⊗ Majhool
- ⊗ Majhul
- ⊗ Mashghul
- ⊗ Mechghoul
- ⊗ Medjeheul
- ⊗ Medjool
- ⊗ Medjoul
- ⊗ Mejhool
- ⊗ Mejool

Chapter one

Origin and Characteristics

المَجْهُولْ

دُرَّةُ

MEJHOUL VARIETY—*"The Jewel of dates"*—

التُّمُورْ

Origin and geographical distribution of the Mejhoul date variety

— Prof. Abdelouahhab Zaid and Prof. Abdallah Oihabi —

INTRODUCTION

Mejhoul, the "Jewel of Dates", is known for its attractive appearance, large size, brownish colour, succulent and juicy flesh, and excellent taste due to its maple syrup-like flavour. It is currently the most important and desired date on the international market, as well as the most expensive compared to other date varieties. Mejhoul dates have natural sugar crystals that give its skin a slight shimmer, and when you bite into one, you'll immediately notice the rush of flavours hinting at wild honey, cinnamon and caramel. They are truly one of nature's most delectable treats, tasting as if they have come right out of the oven.

دُرَّةُ

The Mejhoul date palm originated from the Tafilalet Valley in Morocco, which is administratively known as the Errachidia Province *(Figure 1)*. Origination was confirmed by the DNA analysis of several samples of Mejhoul palms collected from diverse areas including Morocco, Egypt and the USA (Elhoumaizi et al., 2006). This study had shown that the Mejhoul variety is a Landrace variety of Morocco.

During the 17th century, the Mejhoul was known as a high-quality date and its fruit was sold at a higher price than other varieties in the markets of England and Spain (Wright, 2016) At that time, most of the dates brought to Europe came from Tafilalet (Hodel & Johnson, 2007). Unfortunately, the occurrence of the Bayoud disease, caused by a soil-born fungi (*Fusarium oxysporum f.sp. albedinis)* which was described scientifically for the first time in 1919 by Foex & Vayssière (Malençon 1950) intensively destroyed the Moroccan date plantations. Mejhoul cultivars was among the most sensitive varieties to the disease and therefore, its fresh Mejhoul variety dates disappeared from the European market after its production decreased significantly.

—The international journey of the Mejhoul date variety—

THE FIRST JOURNEY TO THE US

In 1927, the French colonial authorities appointed a scientific commission to investigate Bayoud disease further. The commission included Walter Swingle from the US, as well as Vayssière, Maire, Régnier, Killian, De Lepiney, and Emberger from France (Charolin, 1930). The commission conducted its investigations in Colombachar, Erfoud, Errachidia (Ksar Souk) and Boudnib. During their stay in this late date oasis, which accounted for some 9,000 date palms made mainly of the Mejhoul variety, Swingle was impressed by the variety which he considered as one of the best dates grown anywhere. He purchased six standard size offshoots and was offered five small ones (Swingle, 1945) which he imported to the US. Arriving in Washington D.C. five weeks later, the 11 offshoots were fumigated and quarantined in Nevada, where no date palms were growing, but which had a suitable climate for date palm cultivation. This important quarantine period lasted from 1927 until 1936. Nine of the 11 offshoots survived to the end of the quarantine period, and they were then transferred (along with the 64 new additional offshoots they produced) to a US Department of Agriculture (USDA) research station at Indio in California. In 1944, the USDA station at Indio started distributing offshoots to growers in California and Arizona. The Bard Company of California took 24 offshoots from USDA and even now, 99% of date palm growing in Yuma and the Bard Valley are of the Mejhoul variety (Wright, 2016).

It is worth noting that the US Mejhoul industry, as well as the Mejhoul industry of several other countries (including Namibia, Republic of South Africa, Israel, Australia and Jordan) originated from the 1927 Mejhoul importation from Morocco.

Figure 1: Map of Morocco showing the location of the Tafilalet Oasis (around Errachidia).

Figure 2: The Mejhoul date palm in Rahat Almaa from which offshoots were collected by Walter Swingle in 1927, in the Boudenib/Tafilalet region, South of Morocco, (31°56'15.1N, 3°36'10.1"W). *Courtesy of Dr. M. A. Elhoumaizi.*

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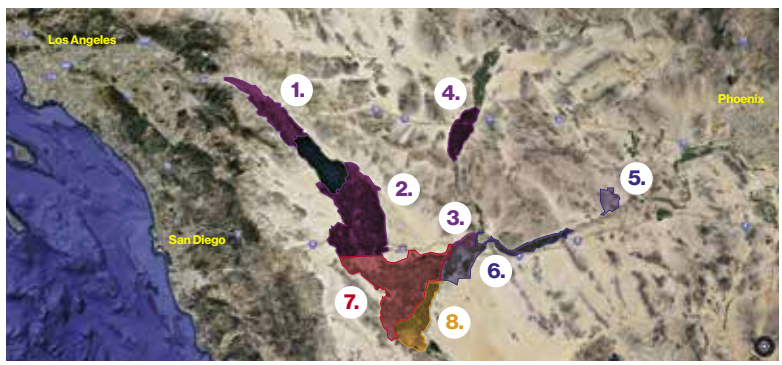
Figure 3: Major Mejhoul date growing areas in US and Mexico.
Source: (Wright, 2006).

1. Coachella Valley
2. Imperial Valley
3. Bard Valley
4. Palo Verde Valley
5. Hyder Valley
6. Yuma
7. Mexicali Valley
8. San Luis Rio Colorado



LOCATING THE MOTHER DATE PALM COLLECTED BY WALTER SWINGLE

Dr. Mohammed Aziz Elhoumaizi conduct a sound survey and site visit to the Tafilalet region, aiming to locate the original mother Mejhoul tree, from which the US Mejhoul industry originated. The region where the offshoots were collected is called Rahat Almaa. The geographical position of the mother plant is 31°56'15.1N, 3°36'10.1W *(Figure 2).*

THE MEJHOUL VARIETY'S SECOND JOURNEY TO VARIOUS COUNTRIES

The introduction of the Mejhoul date palm to Mexico was achieved through offshoots imported from the US to the San Luis Rio Colorado–Mexicali valley in 1968. Currently, Mejhoul represents 94% of the total date production in Mexico (Salomon, 2021). *Figure 3* represents the major Mejhoul growing areas in Mexico and the US.

Between 1978 and 1981, Israel imported 9,000 Mejhoul offshoots from California (Glasner, 2021).

In the early 1990s, the Republic of South Africa (RSA) imported hundreds of Mejhoul offshoots from California. Then, due to the development of the production of date palm plantlets derived from tissue culture, RSA and Namibia imported thousands of Mejhoul plantlets. Namibia also imported Mejhoul from different tissue culture laboratories from France and England.

In 1995, Jordan imported the country's first Mejhoul offshoot from California. Currently, Jordan has about 500,000 Mejhoul productive trees.

In 2006, Palestine imported Mejhoul plantlets derived from tissue culture from different sources (Al Banna, personal communication). Mejhoul cultivars were also introduced in other countries such as Australia, Peru, Chile and the Sudan.

Egypt has recently planted thousands of Mejhoul plantlets derived from tissue culture and aims to planting five million date palms of different varieties, including Mejhoul. In 2008, Morocco initiated the 'Green Morocco plan' programme, and has already planted three million date palms, of which the Mejhoul variety enjoys a 70% share. Morocco is also planning for a second extension of its date palm plantations (of about five million date palms) with a special focus on the Mejhoul variety (Generation Green Plan 2020 -2030).

The Mejhoul journey from Boudnib Valley in Morocco to the different date-producing countries around the world is represented in *Figure 4.*

GLOBAL MEJHOUL PRODUCTION

Mejhoul dates represent 94% of the total dates produced in Mexico, and 85% and 70% of Israeli and Jordanian date production respectively. *Table 1* summarises global Mejhoul date production in 2020 which is estimated at 108,498 tonnes (B. Glasner, R. Salomon, A. Haddad, M. Al Banna, personal communication2021).

Mejhoul date production is expected to increase enormously during the forthcoming years, mainly, through the introduction of several million date palm trees in new large areas of Moroccan and Egyptian date plantations. The impact of these extensions on the Mejhoul international market is be discussed in Chapter 6.

Mejhoul Journey

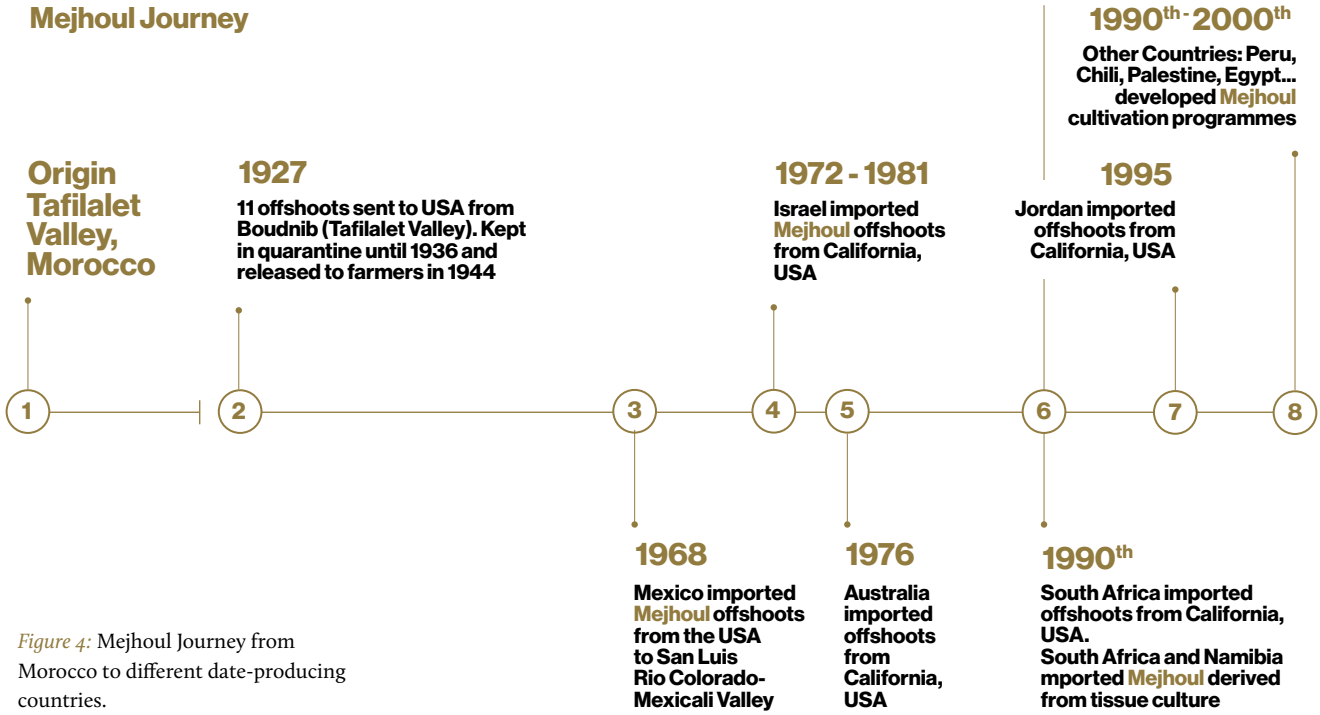
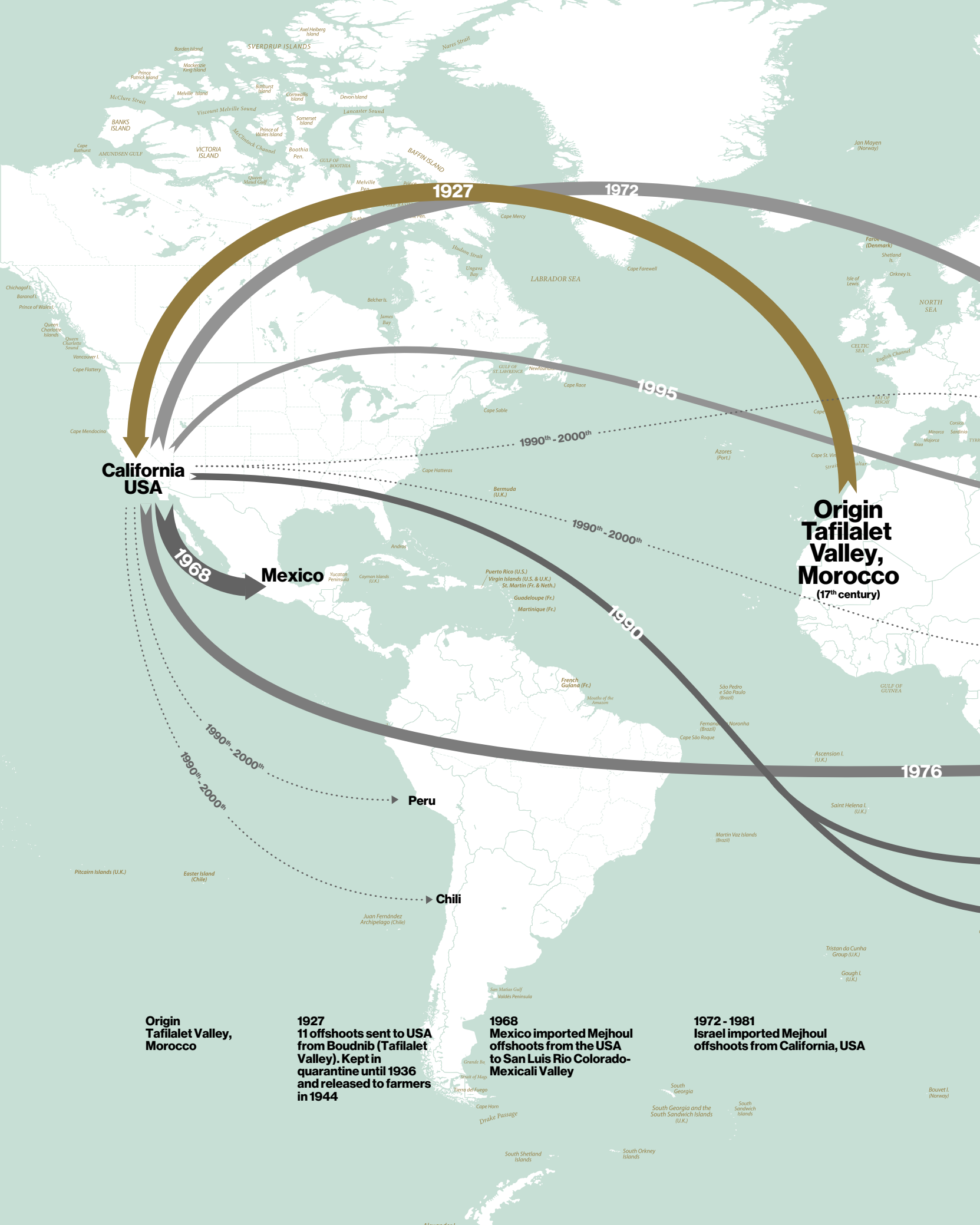


Figure 4: Mejhoul Journey from Morocco to different date-producing countries.

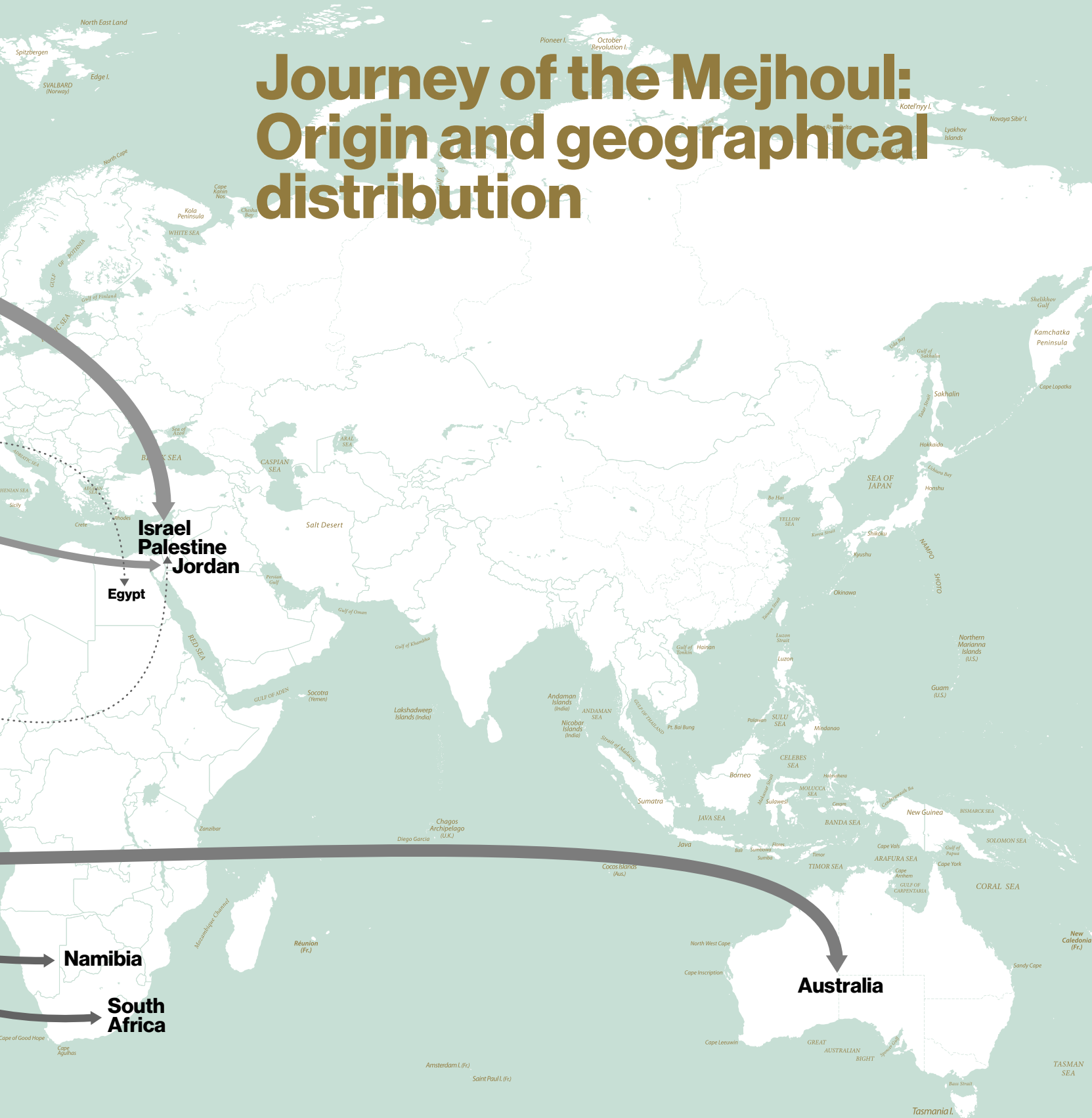
Table 1:

Mejhoul date production by country (in tonnes)

Country	Quantity	Share (%)
Israel	**45,000**	**41.48**
USA	**16,000**	**14.75**
Mexico	**14,898**	**13.73**
Palestine	**12,000**	**11.06**
Jordan	**10,000**	**9.22**
Morocco	**3,500**	**3.23**
SA & Namibia	**3,000**	**2.77**
Egypt	**3,000**	**2.77**
Peru	**500**	**0.46**
Australia	**100**	**0.09**
Others	**500**	**0.46**
Total	108,498	100.00


1927
1972
1995
1990th - 2000th
1990th - 2000th
1968
1990
1976
1990th - 2000th
1990th - 2000th
California
USA
Mexico
Peru
Chili
Origin
Tafilalet
Valley,
Morocco
(17th century)
Origin
Tafilalet Valley, Morocco
1927
11 offshoots sent to USA from Boudnib (Tafilalet Valley). Kept in quarantine until 1936 and released to farmers in 1944
1968
Mexico imported Mejhoul offshoots from the USA to San Luis Rio Colorado-Mexicali Valley
1972 - 1981
Israel imported Mejhoul offshoots from California, USA

Journey of the Mejhoul: Origin and geographical distribution



1976
Australia imported offshoots from California, USA

1990th
South Africa imported offshoots from California, USA. South Africa and Namibia imported Mejhoul derived from tissue culture

1995
Jordan imported offshoots from California, USA

1990th - 2000th
Other Countries: Peru, Chili, Palestine, Egypt... developed Mejhoul cultivation programmes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MEJHOUL VARIETY — "The Jewel of dates" —
التُّمُورْ

The Moroccan origin of the Mejhoul date variety

دُرَّةُ

— Dr. Dennis V. Johnson —

Determining the origin of a date palm variety such as Mejhoul (also spelled Mejhol, Madqul, Majdoul, Majhool, Majhul, Mashghul, Mechghoul, Medjeheul, Medjool, Medjoul, Mejhool and Mejool) is difficult because of inconsistent spelling and the use of a geographic location of production in place of a varietal name. Most date variety names have meaning, for example, Deglet Noor in Arabic signifies date of the light. But the origin of the name Mejhoul is unknown in either the Arabic or Berber languages.

There is consensus that the Mejhoul variety originates from the Tafilalet (alternatively spelled Tafilalt, Tafilat, Tafilelt, Talilet) Oasis, in the Atlas Mountains of southwestern Morocco. The Draa and Ziz rivers provide water for the oasis, which sits at an elevation of 764m, with coordinates 31.32°N, 5.33°W. At present, it is within the Draa-Talilalet Province bordering Algeria. Tafilalet is the largest oasis in Saharan Morocco and a place of ancient date growing. According to the recent date palm atlas of Morocco, Tafilalet is home to one-third of the date palm varieties recorded, 151 of 453 (INRA 2011).

Date fruits were reportedly exported from Morocco to Spain in 1575 (García-Arental 1980; Ogilby 1670), and possibly earlier during the Moorish occupation of Iberia (711–1492). In early accounts, date exports are referred to by their origin, such as Tafilalet, rather than by a variety name. Given the diversity of dates grown in Talilalet, other large-fruited varieties may have been included in commerce with what is assumed to be Mejhoul fruit. Traditionally, the Tafilalet Oasis is known to produce the best dates in Morocco, and they were in commerce throughout the country, in Algeria, as well as in Spain and England, known as Dátiles de Berbería and Talilet dates, respectively. In the seventeenth century, most dates imported into Europe originated from Tafilalet. The fruit is described as large, dark, and firm with excellent keeping and shipping qualities. Some of the dates traditionally grown in Spain may derive from Mejhoul seed (Meakin 1901; Ogilby 1670; Popenoe 1913, 1973). Mejhoul seed appears to have contributed to a number of American date varieties, for example, Andrate, Black Medjool and Lindy, present in California since 1911 (Hodel and Johnson 2007).

In his landmark study of palms, Martius (1823–1853) states that the most famous date fruit in Morocco was of the Mejhoul variety, this representing the first clear reference to it by name. The English traveller Walter Harris (1895) visited Tafilalet and observed that dates were the dominant agricultural product, quantities transported north by caravan and destined for shipment to Europe. Harris visited during the date harvest and described dates being dried in the sun prior to shipment. Bu Skri and Bu Kfus varieties were said to be delicious but were not known for travelling well; Mejhoul is not mentioned in the account.

The modern phase of Mejhoul fruit production began when Walter Swingle joined a French Commission in Morocco to deal with the alarming threat posed to date palms by Bayoud disease. A soil fungus, it affects date palms in general with Mejhoul being highly susceptible. On a field trip in 1927 to the Tafilalet Oasis, Swingle (1945) identified a healthy Mejhoul garden in the small Berber village of Boudenib. A palm exhibiting vigorous offshoot growth was selected; six standard size and five small offshoots were removed, prepared for shipment, packed in a box and shipped to Washington D.C., arriving about five weeks later. It is important to note that all 11 offshoots came from the same tree and therefore are genetically identical.

Plant quarantine officials decided that to prevent the possible introduction of Bayoud disease into the US, the Mejhoul offshoots had to be fumigated and then grown under supervision in a remote location for several years, in a state where no date palms were present. The southernmost tip of Nevada, along the Colorado River, was chosen as the quarantine site. The offshoots survived travel to the

MEJHOUL VARIETY—*"Rich Culture Sweet Future"*—

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site and were successfully planted on July 4, 1927. A local Native American farmer agreed to care for and irrigate the offshoots, with periodic supervisory visits by an agronomist from the USDA Date Station in Indio, California. Early on, two offshoots were lost but nine palms survived. Three years later the nine were all producing their own offshoots. After eight years of quarantine, all the plants were declared healthy with no evidence of Bayoud or any other maladies. By then, the original nine offshoots had produced an additional 64 offshoots. In the summer of 1936, the 73 plants were all transplanted to the Date Station in Indio with no losses (Swingle 1945; Thackery 1952).

The Date Station made offshoots available to growers in California and Arizona beginning in the 1940s, and the Mejhoul plantings have been expanding using offshoots ever since. Successful Mejhoul growing triggered interest in several other countries, and the USA gained a reputation as a source of healthy offshoots.

Dispersal of Mejhoul offshoots from the USA to other countries began in the 1950s. A few documented accounts are available. The modern date industry in north-western Mexico was established in the 1960s using Mejhoul offshoots from California (Ortiz-Uribe et al., 2018). In the late 1960s, Chile imported offshoots of standard varieties from California for trials near Arica, which included Mejhoul (Pavez Wellmann et al., 2007). However, commercial production has not yet been realised in that country. Israel made imports from California in the 1950s and again in the 1970s, which formed the basis of the current large-scale plantations along the Jordan Rift Valley (Carpenter 1975; Glasner 2004). Those introductions likely spread Mejhoul into Jordan and Palestine. The Republic of South Africa obtained offshoots of Mejhoul from Yuma, Arizona in 1990 to initiate commercial date production (McCubbin 2007).

The year 1990 was a turning point for Mejhoul dissemination, when commercial sources of tissue-cultured vitroplants became available. These were free of pests or diseases, and could be shipped anywhere in the world under more lenient phytosanitary regulations, and at lower cost. A date development project began in Namibia around 2000, which involved vitroplant propagation of Mejhoul (Proc Nambia, 2000). In South Australia, a farmer imported vitroplants for plantation growth of several standard varieties, including Mejhoul (Reilly and Reilly 2014). In addition to the countries mentioned, Mejhoul is reported to be grown to some extent in Algeria, Djibouti, Egypt, India, Iran, Kuwait, Niger, Oman, Pakistan, Saudi Arabia, Spain, Sudan and Syria (Al-Khayri et al., 2015). Mejhoul is a high value fruit, therefore it can be expected that other countries will attempt production in the future.

The Mejhoul variety in The Kingdom of Morocco: origin, geographical distribution, and international market

—— Eng. Mohammed Bachri, National Agency for the Development of Oases and Argan trees ——

Date palms are one of the oldest fruit trees in the world, having emerged since the end of the second era, spreading across the Persian Gulf to North Africa. Trade between the Maghreb countries and the Middle East played an important role in the value gained by date palm trees, which led to the spread of date palm cultivation in these areas using date seed.

Dates became the main source of food supply that travellers carried during their journeys across these countries. Date palm cultivation then reached the Islamic Republic of Mauritania, during the first century, and to Sudan in the fifth century. Date palm cultivation also spread into semi-desert areas, with dates the main source of food to travellers crossing the desertic areas.

Date palm cultivation was introduced to the USA during the 18th century, by biology travellers, however date palm cultivation did not spread there until the 1900s, in California (Toutain, 1965).

Dr. Abdul-Jabbar Al-Bakr, in his book 'The Date Palm: A review of its past, present status and the recent advances in its culture industry and trade', noted that the original source of the Mejhoul date variety was Tafilalet, Wadi Ziz. The Mejhoul variety was first introduced to the USA by Mr. Swingle in 1927, from the Moroccan town of Boudnaib, 90km from Errachidia city. It was then planted separately in the State of Nevada, until found free from pests and diseases, before being transferred to Indio, California in 1932. In 1957, The Date Palm Experiment Station in Indio started efforts to increase Mejhoul cultivation, after the significant results, and its excellent commercial qualities.

The 'Tafilalet book', is a contribution to the Moroccan history where during the 17th and 18th centuries, Al-Arabi Mizin spoke about the presence of the Mejhoul variety in the Aoufous region. Of the harvest traditions at the time, Al-Arabi Mizin wrote: "As for the harvest in autumn, they started it on the first day of October, except for the Mejhoul, which was harvested till the 17th of September".

All these sources prove the Mejhoul date variety originated from the Tafilalet area. Mejhoul fruits originating from this region are the result of the selections made by date growers throughout the years. The Tafilalet region is also known as the home of the International Forum of Moroccan dates, and replaced the annual 'Date Season', which was organised by the late King Mohammed V "May God bless his soul". Today, some of the people who lived during the time, still remember the first session held in the 1940s, after World War II, in the Erfoud/Errachidia region.

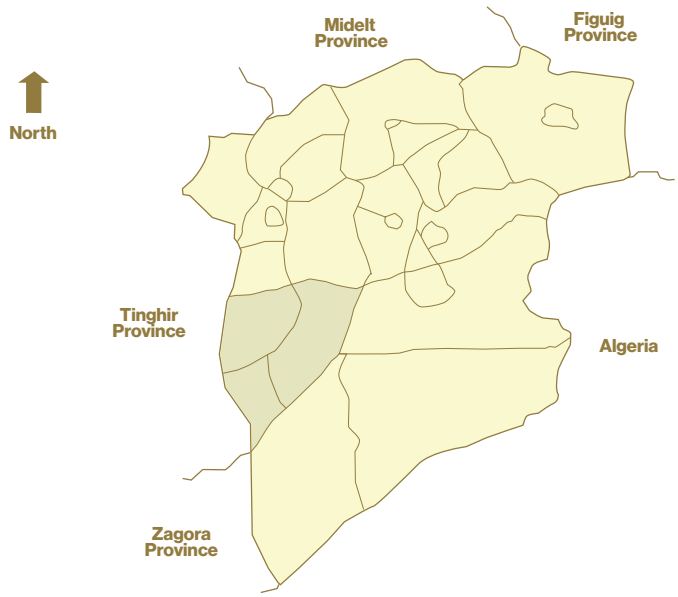
All this information proves the origin of the Mejhoul variety belongs to the Tafilalet area, and it is this date variety that attracted the attention of many regional and international investors. This in turn led to the introduction and spread of the Mejhoul variety in various regions in the Kingdom of Morocco, as well as other countries across the world, such as the USA, Republic of Namibia, South America, and Australia.

GEOGRAPHICAL DISTRIBUTION

The geographical distribution of Mejhoul production in Morocco includes two main plantation areas located on the banks of Wadi Ziz, Griss, Todgha and Draa, as well as expansions of Mejhoul plantations in the Errachidia area. These plantations have developed significantly under the Green Morocco scheme, which allocated important support to date growers in both traditional and commercial sectors. These efforts will also continue as part of the Moroccan new Green Generation Strategy.

The geographical boundaries of the date production areas of the 'Tafilalet Mejhoul' are:

- Northern parts of Midelt and Figuig areas
- Eastern parts of Figuig and the Algerian border
- Western parts of both Tinghir and Zagora regions
- The southern Algerian border



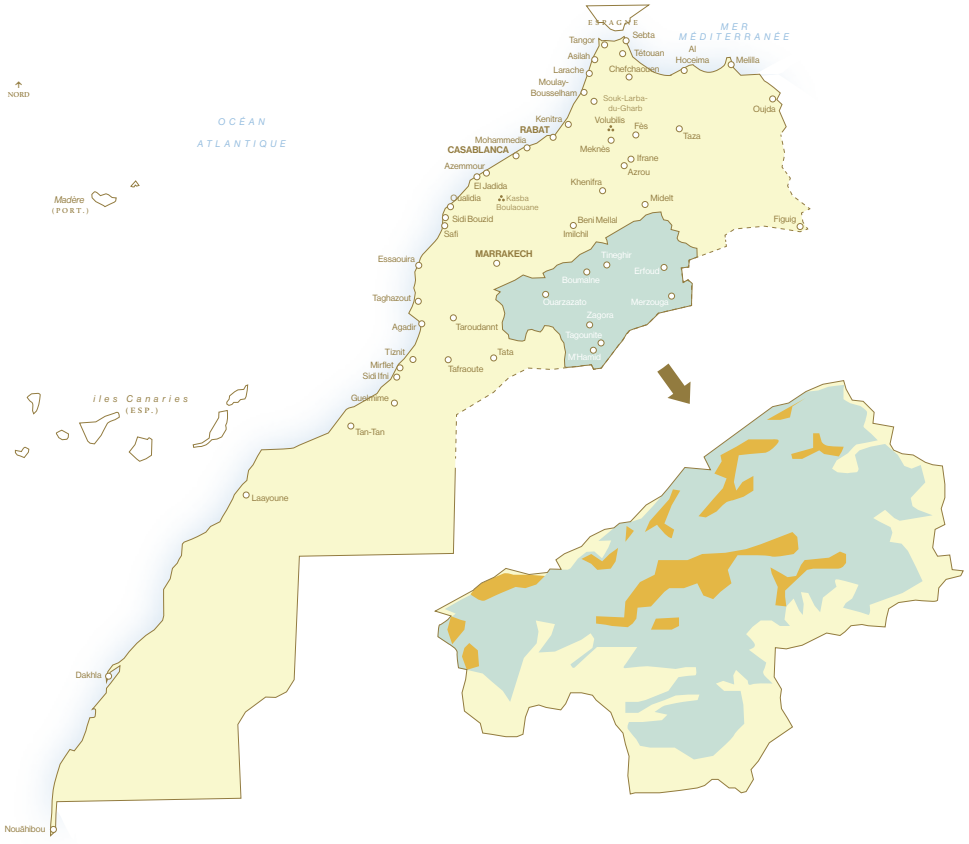


Figure 5 and 6: Maps of geographical distribution of Mejhoul variety in Tafilalet area.

EXPECTED DATE PRODUCTION ACCORDING TO TYPE, DIVERSE EXPECTATIONS, AND FUTURE MARKETING PROSPECTS

Taking into account the new modern Mejhoul plantations, the number of available date varieties in Morocco is set to change significantly in the coming years. At present, 'other' date varieties account for 90% of the total production, but this is expected to significantly reduce, being replaced by higher quality date varieties, such as the Mejhoul, Najda, and BouFeggous varieties, which are estimated to eventually take over more than 50% of the total Moroccan dates production.

INTERNATIONAL MARKETS

The Kingdom of Morocco exported 3,288 tonnes of dates, worth 55.9 million Moroccan Dirhams, in 2020, compared to 17.6 tonnes exported in 2011, worth 0.4 million Moroccan Dirhams. However, of this quantity, the production of the Mejhoul date variety was very low. Morocco is expecting the production of 70,000 tonnes of Mejhoul dates, to be presented in the national and international markets, by 2028.

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ICARDA Date Palm Regional Program in the Arabian Peninsula

دُرَّةُ

— Dr. Aly Abousabaa, Director General —

MEJHOUL VARIETY—*"Rich Culture Sweet Future"*—

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Date palm (*Phoenix dactylifera L.*) is one of the oldest trees crops globally, and the most important fruit crop in the Middle East and North Africa arid regions.
A 2019 study, which used whole-genome sequence data from a large sample of date palms and their wild relatives, revealed that the hybridisation between date palms and *Phoenix theophrasti Grueter* – a species endemic to the Eastern Mediterranean – is associated with the diversification of date palm (Flowers, et al. 2019).

Mejhoul dates most likely originated in the West Mediterranean and North Africa, and exist as a landrace variety at its origin, the Tafilalt region of Morocco (Devanand and Chao, 2003). It seems all Mejhoul date palms globally originated from one palm in Morocco (Zaid, 2002). A US-based study on the date cultivars in California evaluated the genetic variation in California and found that the accessions of Mejhoul in California are representatives of the genetic constituents of Mejhoul date from its original region of Morocco (Devanand and Chao, 2003).

DISTRIBUTION

The date palm tree is believed to be one of the most ancient crops in Southwest Asia and North Africa. However, dates can be grown in Australia, Mexico, South America, southern Africa, and the USA (Al-Alawi et al., 2017).

Mejhoul cultivars require relatively moderate temperature and humidity (El-Sharabasy and Rizk, 2019). As a result, it can only grow economically in a few areas in the world, including California, Mexico, the Jordan valley, and some parts of Egypt and Africa (*The Origins of Medjool Dates, 2019).* Mejhoul is the primary cultivar in Mexico, comprising 94% of the date-growing area (Ortiz-Uribe, Salomón-Torres and Krueger, 2019). There is no reference for the significant production of Mejhoul varieties in the Arabian Peninsula, and in the 'Atlas of most important date palm varieties in the Arabian Peninsula', Mejhoul is not listed (Ben Salah and Ibrahim, 2018).

INTERNATIONAL MARKETS

Although more than 2,000 known date fruit cultivars are being planted worldwide, only a few are economically imperative based on market demand, such as Deglet Nour, Mejhoul, and Khalas (AlFaris et al., 2021). Mejhoul dates are among the top five most valuable date varieties in the market worldwide (Ahmad, 2017) and command the highest market prices, which helps recover the additional production costs (Johnson and Hodel, 2007). Mejhoul (invert sugar variety) and Deglet Nour (cane sugar variety) are the two cultivars distinguished by their popularity in the world market, with Mejhoul representing around 25% of world exports (Autentika Global, 2020).

Mejhoul is the most expensive date variety in the regional market (Ahmad, 2017). For instance, in the UAE, the retail price of high-quality Mejhoul dates is as high as AED 175 (USD 48) per kilo. Similarly, in Saudi Arabia, the Mejhoul has the highest price in the retail market. In 2018, its price per kilo was more than USD 21, compared to Ajwa (USD 13), Sukkari (USD 7), Sogaai (USD 5), and Berni (USD 3) USD/kg respectively *(Figure 7)* (Abdul-Hamid et al., 2018).

Mejhoul production proved to be a profitable business for small to medium-sized date growers. In Jordan in 2015, an econometric analysis of Mejhoul date production among around 30 farmers was conducted. The results showed that the average annual costs of Mejhoul date production (including fixed costs), average total income, and the net benefit was USD 3,544, USD 8,870, and USD 5,326 USD/donum(1000m^2) respectively (Altahat, 2015).

Figure 7: Mejhoul palm tree (*Courtesy Muhi El-Din Hilali).*

MEJHOUL DATES AS A SOURCE OF HEALTHY NUTRIENTS

Mejhouls are rich in natural sugars, fiber, and several vitamins and minerals. Like other dried fruits, a small serving comprises many calories, and its natural sweetness is highly popular. Mejhoul fruits are larger, darker, and more caramel-like in taste than other common types of dates, such as Deglet Noor, and have a single pit surrounded by edible flesh. Mejhoul fruits are dried, not dehydrated, and sold soft and sticky. As they dry, their sugars become more concentrated, which increases their sweetness (Panoff, 2019).

Mejhoul dates also provide a concentrated source of healthy nutrients. Compared to other common varieties, like Deglet Noor, they contain significantly more calcium. Just two dates (48 grams) provide 133g calories, 36g carbs, 32g sugar and 3.2g fiber with 2% for each of Calcium and Iron, 7% Potassium, 19% Copper, 7% Vitamin-B6 and 6% Magnesium (Agricultural Research Service 2019).

While some studies have found that date fruits have a low glycemic index (GI) and shouldn't cause significant increases in blood sugar (Rock et al., 2009) (Alkaabi et al., 2011), Mejhoul dates include many calories in a small serving, meaning intake should be controlled. Mejhouls also contain antioxidants and nutrients that may lower the risk of heart disease, promote digestion, and support heart health, among other benefits.

TEMPERATURE AND SALT TOLERANCE

Mejhoul date palms prefer full-sun environments and thrive where winter temperatures don't reach and stay below -10°C. One study found that relatively low temperatures (20°C day and 8oC night) during plant fertilisation significantly decreased pollen germination rate, enhanced the formation of parthenocarpy fruit, and reduced normal fruit development (Slavković et al., 2016).

The behavior of mature date palms against salinity was studied by Furr and Armstrong (1962). They examined the growth of 17-year-old Mejhoul cultivars using salinities ranging between 2,500–15,300 ppm. They found salinity has little or no effect on the growth rate of leaves, yield, size, or quality of fruit. They also reported on the chloride content of the leaf pinnae. Another study examined the effect of salts ranging between 520 to 24,000 ppm on the growth and salt uptake of Deglet Noor and Mejhoul varieties. They found the average growth rate of leaves declined as salinity increased, and related this to the salinity of the irrigation water rather than the salt content of the plants (Furr and Armstrong 1962).

A more recent study concluded that the long-term irrigation of Mejhoul with saline water of electrical conductivity (EC) of between 8-12 dS/m, was not commercially practical, as growth and date yield was severely reduced (Tripler et al., 2011).

Although the Mejhoul is among the date varieties with moderate cold resistance (Ben Salah and Ibrahim, 2018), it is more labour-intensive to grow and harvest compared to other varieties (Chaney, 2018).

المَجْهُولْ

A brief history of the Mejhoul's introduction and cultivation in the State of Israel

دُرَّةُ

— Mr. Gadi Shalitin —

The date palm (*Phoenix dactylifera L.*) has long been one of the most important fruit crops in the arid regions of the Arabian Peninsula, North Africa, and the Middle East. Jewish folklore considers the date as one of the 'Shiv'at Haminim' (Seven Species) – the seven holy fruits and grains listed in the Hebrew Bible as being special products of the Land of Israel.) The Mishna states that only first fruits of the Seven Species could be brought to the Temple in Jerusalem as offerings. In the Bible, King David names his daughter Tamar, which is the Hebrew word for 'date' and 'date palm'.

In the early days of the Jews returning to their homeland Israel, the condition of dates was poor with no significant good quality varieties to start modern cultivation. Several attempts were made at introducing date palm varieties into Israel. One of the most prominent persons to introduce several date palm varieties was Ben-Zion Israeli. Between 1934 and 1954, he brought thousands of date palm offshoots mainly from Iraq, Kurdistan and Egypt, which were planted in the Jordan Rift Valley from the Galilee Sea in the North, to Eilat near the Red Sea in the South. The varieties introduced included Barhi, Hallawy, Hadrawi, Zughloul, Samany and Deglet Nour (probably arriving from Algeria) *(Figure 8).*

In the late 1970s and 1980s, a project was created with the aim of introducing a better variety of date palm into Israel, the Mejhoul. The Mejhoul variety originated in the Tafilalt region of Morocco, and today produces large fruit widely accepted by markets around the world. This variety was exported from Morocco to the USA during the early 20th century by Walter Swingle. In 1927, when the Bayoud disease began spreading in Morocco, Swingle was given permission to send Mejhoul offshoots from Morocco to the US, where they were established mainly in California by private growers.

The author of this article, and his colleague Yeshayahu Kovatch, both worked for the Agricultural Section of the Jewish Agency. Kovatch was a close friend of Ned Stone Tanen, then President of Universal Studios, who introduced them with Mejhoul growers in Indio, California. They began buying as many offsprings of Mejhoul as they could find in the region, sending them covered in wet cloths to Israel. Several shipments were made, each contained tens to hundreds of Mejhoul offsprings. Once arrived in Israel, the trees were sent to nurseries, first in the Dead Sea region in the Jordan Valley, near Kalia, and in Yotvata in South Arava, where they were recovered and fully grown to provide more offshoots. Subsequently, the Mejhoul variety took its place as Israel's leading date variety for growth and export *(Figure 9)*, and today, 60% of the world market of the Mejhoul date is from Israel.

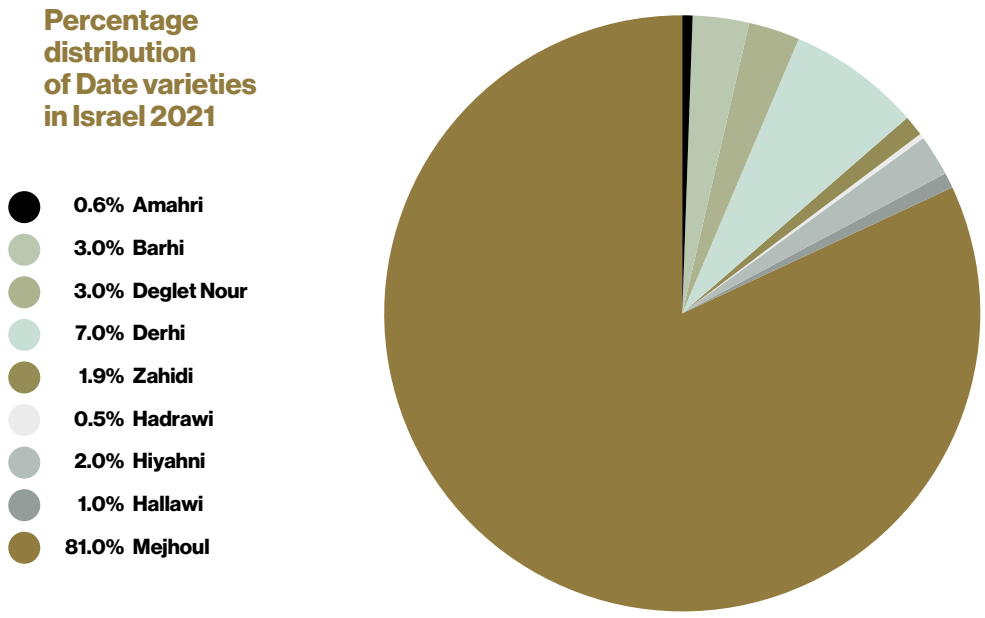

Figure 8: The distribution of date varieties in Israel, taken from data produced by the 'Diklaim' in collaboration with the Israeli ministry of Agriculture and the 'Fruit Council' in Israel, 2021.

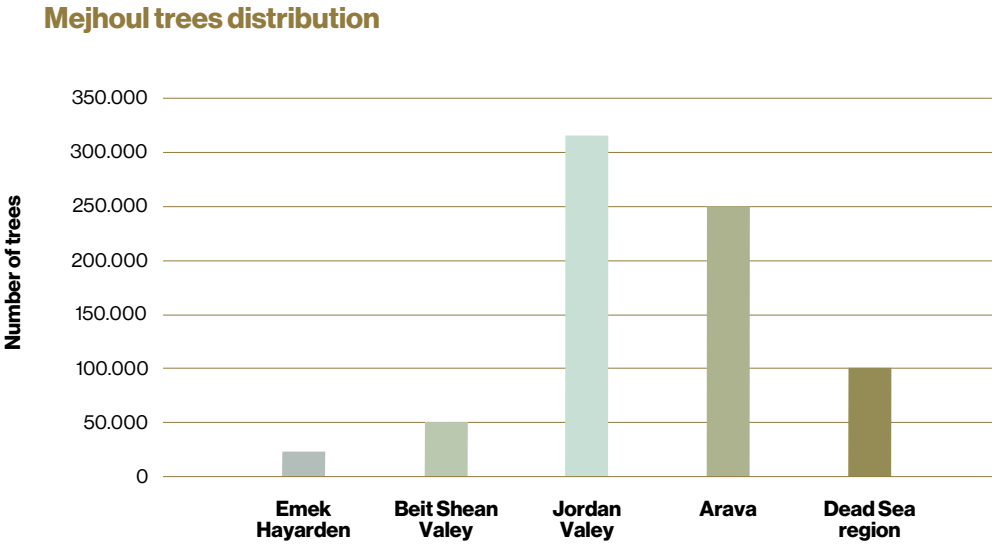

Figure 9: Distribution of Mejhoul dates in major growing areas in Israel, taken from data produced by the 'Diklaim' in collaboration with the Israeli ministry of Agriculture and the 'Fruit Council' in Israel, 2021.

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MEJHOUL VARIETY—*"The Jewel of dates"*—

التُّمُورْ

Edaphoclimatic requirements of the Mejhoul date variety

—— Prof. Meddich Abdelilah and Prof. Abdallah Oihabi ——

The edaphic (relating to the soil) and theclimatic requirements of the Mejhoul date variety can succinctly be described as follows. While all date palm varieties tolerate various soil types, the Mejhoul variety particularly grows better on free drainage sands or sandy loams with good moisture-holding capacity. It also accepts different pH levels but prefers neutral value. Several scientific studies have shown that the average pH in most date-growing areas varies between 7 and 8.5. Alkaline and saline soil negatively affect the productivity and the quality of Mejhoul fruits (Zhen et al., 2020).

WATER AND SALT STRESS TOLERANCE

The Mejhoul date palm tolerates drought and can continue to grow under severe water stress. For its optimal production, its water requirements are important and vary from 10,000 to 20,000m^3/hectare (ha) depending on different factors such as climatic conditions, irrigation management, age, soil texture and type of fertilisers used (Almadini & Al-Gosaibi, 2007; Meddich, 2021; Ou-Zine et al., 2021).

Mejhoul date palms are known as drought-resistant. However, for optimal productivity, appropriate and quality irrigation is needed, as irrigation management plays an important role in the fruit's development and quality. The implementation of adequate Good Agricultural Practices (GAP) plays an important role in the morphological and nutritional characteristics of Mejhoul dates.

Water salinity reduces yields and growth of Mejhoul trees, which remain tolerant to salt concentrations between 3-10g per litre, depending on the age of the date palm and the prevalent soil characteristics.

CLIMATIC FACTORS (TEMPERATURE AND RELATIVE HUMIDITY)

Figure 10 shows the main planting areas of Mejhoul in the northern and southern hemispheres, for which thermal coefficients and relative humidity are described.

The Mejhoul date palm prefers doses of cold in winter and heat is important from fruit set to harvesting, for around five to six months per year. This is confirmed by Figures 2a and 2b, and Figure 3, which represent respectively the average maximum and minimum temperatures of some of the main Mejhoul growing areas around the world.

Thus, in these areas the lowest minimum temperature varies from 3°C to 9°C, while the highest maximum temperature varies between 38°C and 42°C. The flowering process starts at around 18°C to 20°C (called 'zero vegetative value') which coincides with the period of January/February in the Northern hemisphere and June/July in the Southern hemisphere.

Figure 11a: **Average 30 years min Temperature (°C).** The main date-growing areas are characterised by low temperature during the period preceding the flowering season. This allows the induction of the flowering process. In the represented areas, the minimum observed average temperature varies from 4°C in the Northern hemisphere (Boudnib, Morocco), 3°C in the Southern hemisphere (Keetmanshoop, Namibia) and 10°C (Jericho, Palestine).

Figure 11b: **Average 30 years max temperature (°C).** The flowering of the Mejhoul date palms starts in general when the air temperature goes above 18°C. In most date-producing areas this occurs around end of January/February in the Northern hemisphere and June/July in the Southern hemisphere, respectively.

In instances where the temperature drops below 17°C after the fruit set period, a second date palm flowering can appear.

During the fruit maturation period, the climate in Mejhoul producing areas is hot, particularly July to August, in the Northern hemisphere, varying between 36°C at Al Waha Al Baharia in Egypt, and 42°C at Al Madinah Al Munawara in Saudi Arabia and Mexicalli in Mexico, while temperatures reach

Mejhoul planting areas

Figure 10: Mejhoul planting areas.

Average 30 years min Temperature (°C)

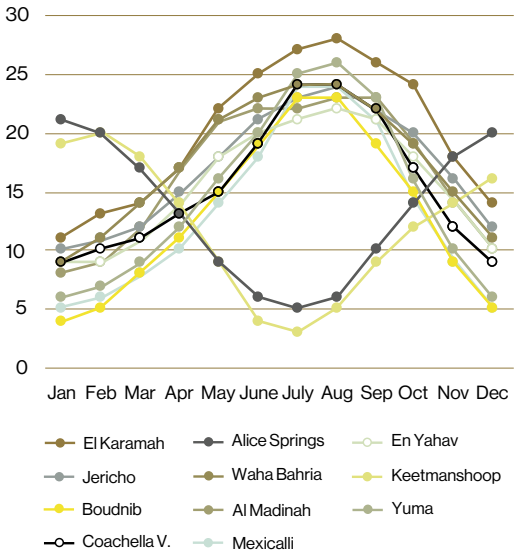

Figure 11a: Average 30 years min Temperature (°C).

Average 30 years max Temperature (°C)

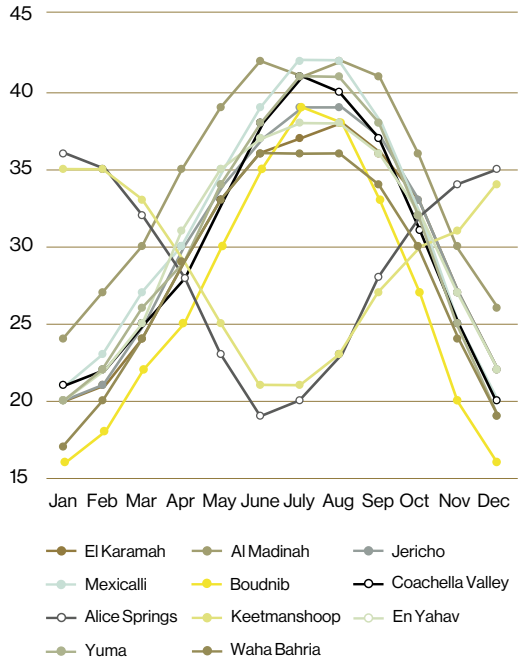

Figure 11b: Average 30 years max Temperature (°C).

around 36°C in the represented areas in the Southern hemisphere, during January/February.

Figure 12: **Average Relative Humidity % for the period 2016 - 2020.** Mejhoul dates require low air relative humidity (RH) during the fruit development and maturation periods. High RH levels may have a negative impact on fruit quality, mainly by causing serious problems of skin separation.

Therefore, the date-growing areas are mainly characterised by a dry climate during the June-August period, with RH of 14% at Al Madinah Al Mounawara in the Kingdom of Saudi Arabia to 50% RH at El Karamah in the Hashemite Kingdom of Jordan.

COMBINATION EFFECT OF DIFFERENT CLIMATIC CONDITIONS

As Table 2 shows, the combination of different climatic conditions of a given area significantly impacts date fruit maturation and quality, depending on the location of the date plant:

- The Al Madinah area in the Kingdom of Saudi Arabia (KSA) is characterised by hot temperatures (above 40°C) for four months (June-September), a heat unit of 4,370°C and a very dry atmosphere with an annual relative humidity average of 23%. Consequently, the Mejhoul fruits produced in this area are dry *(Figure 13),* mainly when the irrigation is not adapted to suit these climatic conditions.
- The Boudnib area in Morocco has an annual average temperature of 19.8°C, with a heat unit of 3,057°C. The combination of this temperature factor with a relative humidity of 31% makes the Mejhoul fruits of this area soft *(Figure 14).*
- In some areas of the Middle East where the air relative humidity is high, fruits are of dark colour *(Figure 15).*

The Mejhoul-producing areas around the globe present a diversity of the combinations of:

- Soil characteristics, including the physico-chemical factors;
- The cumulative heat units during the period from fruit set to fruit maturation; and
- The average air relative humidity mainly during the fruit development and maturation.

Therefore, the Mejhoul fruits produced in these areas present different fruit characteristics as a result of the above combinations. This includes fruit colour (high rate of relative humidity combined with high temperature provides dark fruits), fruit sugar content, total phenols, vitamins and antioxidants (Hasnaoui et al., 2010; Mahawar et al., 2017; Salomón-Torres et al., 2019).

The Mejhoul fruit characteristics are also impacted by prevalent agricultural practices, such as fertilisation, irrigation management, fruit thinning, and bunch management. Harvesting practices, as well as post-harvest handling, also play a crucial role in the quality of the final product. Therefore, it is essential to build the capacities of Mejhoul producers on Good Agricultural Practices (GAP) applied to Mejhoul cultivation to ensure the production of high-quality fruits that match with the targeted market standards. These agricultural practices should be adapted to the particular characteristics of each Mejhoul production area, mainly knowing that Mejhoul cultivar has good elasticity and adaptability to various edapho-climate conditions.

Average Relative Humidity % for the period 2016-2020

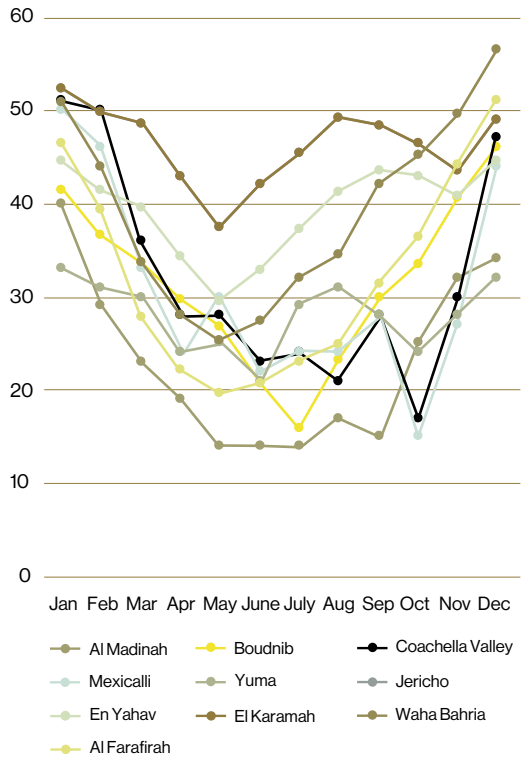

Figure 12: Average Relative Humidity % for the period 2016-2020.

Table 2:

Heat units, annual temperatures and relative humidity averages

	Cumulative heat units (°C*)	Average annual temp. (°C)	Average RH (%)
Boudinb	**3,057**	**19.79**	**31**
Waha Baharia	**3,117**	**22.83**	**39**
El karamah	**3,300**	**24.79**	**46**
Jericho	**3,300**	**23.65**	**46**
EN Yahav	**3,514**	**21.75**	**39**
Keetmanshoop	**3,614**	**20.29**	**25**
Coachella Valley	**3,637**	**22.83**	**32**
Yuma	**3,720**	**22.54**	**28**
Alice Springs	**3,767**	**22.08**	**32**
Mexicall	**3,974**	**22.17**	**31**
Al Madinah	**4,370**	**25.54**	**23**

* The cumulative heat units are calculated for seven-month period of March to September.

Figure 13: Dry Mejhoul dates produced at Al Madinah Al Mounawara, KSA.

Figure 14: Soft Mejhoul dates produced in Boudnib, Morocco.

Figure 15: Mejhoul dates of dark colour from Jordan Valley, Hashemite Kingdom of Jordan.

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MEJHOUL VARIETY—*"The Jewel of dates"*—

التُّمُورْ

المَجْهُولْ

In vitro mutiplication of the Mejhoul variety

— Dr. Reda Meziani —

دُرَّةُ

The propagation of the Mejhoul date variety is traditionally done by offshoots, but this technique is considered economically inefficient. It also does not meet the increased demand for plants required for the rehabilitation of existing date palm groves and the establishment of new ones. The use of micro-propagation techniques then remains the only way for massive, fast and compliant date plant multiplication.

Before the 1990s, the expansion of plantations of the Mejhoul variety throughout the world was limited. In fact, the reduced number of available offshoots, the risk of diseases transmission as well as the difficulties of exchanging offshoots of this variety between countries has significantly slowed down the development of these plantations. The development and extension of plantations in the last decade is mainly due to the establishment of several date palm tissue culture laboratories around the world.

In Morocco, for example, three million *in vitro* plants, mostly of the Mejhoul variety, were produced between 2010 and 2020. Likewise, thousands of hectares of Mejhoul were planted in Jordan, Egypt, UAE, and other phoenicultural countries, thanks to the development of this new technology.

PROPAGATION BY OFFSHOOTS

Multiplication by offshoots ensures obtaining plants that are 'true to type' to their mother plants. This mode of vegetative propagation allows not only the propagation, but also the preservation of the most interesting genomes (El Hadrami et al., 1998). Despite the advantages mentioned, this mode of propagation does present certain limits, namely the small number of offshoots produced by the tree, the low survival rate after planting and the risk of diseases and the transmission of pests. According to Abrou (1999), the difficulties of rooting offshoots also remain a real obstacle limiting the development of this technique. In order to improve rooting in the Mejhoul variety, several studies suggest the use of basal offshoots after submerging their bases in an auxin-based solution (IBA) at 3 to 4g/l. (Qaddoury & Amssa, 2004; Mansour & Khalil, 2019)

MICRO-PROPAGATION OF MEJHOUL

Micro-propagation by tissue culture is the only way of providing a solution for the massive production of date palm genotypes within a reasonable timeframe. For the Mejhoul variety, two micro-propagation techniques (somatic embryogenesis and organogenesis) are widely used in international laboratories for the production of tissue culture plants.

SOMATIC EMBRYOGENESIS TECHNIQUE

Somatic embryogenesis is the process by which somatic cells develop into embryos after a series of morphological and biochemical changes (Quiroz et al., 2006). This technique features a sequence of steps, including the induction of embryogenic callus, somatic embryo formation, somatic embryo maturation and their germination into plantlets. In the date palm, the success of each of these stages depends on several factors including the genotype, the type of explant and the used growth regulators. Several studies have shown that 2,4-dichlorophenoxyacetic (2,4-D) is the most effective auxin for the success of somatic embryogenesis in the date palm in general, and in the Mejhoul variety in particular (Eshraghi et al., 2005; Al-Khayri, 2016; Mazri et al., 2017). However, these same studies reported that the use of this auxin can induce somaclonal variation in tissue culture-derived plants (Fki et al., 2011a). However, compared to organogenesis, the technique of somatic embryogenesis allows a faster and more massive production of *in vitro* plants of the Mejhoul variety.

Organogenesis steps

1). **Offshoot preparation**

2). **Buds' multiplication**

3). **Elongation / rooting**

4). **Acclimatization**

5). **Mejhoul Vitroplant in the field**

Figure 16:
Organogenesis steps.

ORGANOGENESIS TECHNIQUE

The technique of organogenesis is based on the bursting of vegetative buds pre-existing on the cultured explant and their multiplication *in vitro*. The pre-existing origin of these buds gives produced tissue plants a maximum of genetic homogeneity (Engelmann, 2000). For the Mejhoul variety, the goal of this technique is the formation of buds directly on the explants without passage through the callus stage. Thus, this mode of propagation includes several stages: the initiation of buds, the multiplication of buds, the elongation of buds into leafy shoots, the rooting of the shoots and then acclimatisation of the obtained plantlets *(Figure 16).*

Unlike somatic embryogenesis, organogenesis does not cause somaclonal variations due to the use of low concentrations of growth regulators and the non-passage through callogenesis. However, plant production by organogenesis is much more difficult than that of somatic embryogenesis. The first research on the development of this technique for the date palm were carried out at INRA-Morocco (Rhiss et al., 1979; Zaid & Tisserat, 1983; Beauchesne et al., 1986; Ait chitt, 1989; Anjarne & Zaid, 1993; Bougerfaoui & Zaid, 1993; Anjarne et al, 1995; Mazri & Meziani, 2013, 2015; Meziani et al., 2015, 2016, 2019a, b)

INITIATION AND MULTIPLICATION OF BUDS

Initiation is the key step for successful organogenesis and requires well-trained laboratory personnel. Most of the problems encountered in the steps that follow the initiation have their origin during this phase (Abahmane, 2017). Bud formation on date palm explants depends on many factors, such as the composition of the culture medium, the genotype and the period of collection of plant material (Zaid et al., 2011). For the multiplication phase, the primary objective is to produce a maximum of quality organogenic cultures.

Mejhoul is one of the most recalcitrant genotypes for *in vitro* multiplication by organogenesis. With the aim of improving this micro-propagation process, several studies have been initiated. Bacterial and fungal contaminations are major problems during the stages of *in vitro* culture (Oda et al., 2003). Among all these contaminants, the so-called bacteria endophytic agents, which are located inside the tissues, constitute a real handicap to the micro-propagation of the Mejhoul variety on a commercial scale. A study conducted by Meziani et al., (2019) aimed at using extracts from seven aromatic and medicinal plants against endophytic bacteria in Mejhoul, allowed for the first time, the identification of the two bacteria most present at the time of the micro-propagation of this variety (*Microbacterium testaceum and Serratia marcescens)*. The study results suggest the possibility of using the essential oils of A.Herba-alba at the concentration of 0.1% against these two bacteria.

ELONGATION, ROOTING AND ACCLIMATIZATION OF PLANTLETS

The production of vigorous plantlets is an essential phase for the success of the micro-propagation by organogenesis of Mejhoul. Several studies reported that the texture of the medium, the mineral and hormonal composition, light, vitamins, carbon source, the nature of substrate and the greenhouse environmental conditions are the main factors influencing the quality and the survival rate of produced plantlets.

Meziani et al., (2019) report that the production of quality plantlets of the Mejhoul requires a passage through an MS/2 medium without growth regulators supplemented with 30g/l of sucrose and 6g/l of agar. According to this same study, it was confirmed that certain medium additives such as L-glutamine, myo-inositol, adenine, PVP and growth regulators are not necessary to achieve high survival rates during acclimatisation.

MEJHOUL VARIETY—*"Rich Culture Sweet Future"*—

المَجْهُولْ

دُرَّة

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3

MEJHOUL VARIETY — *"The Jewel of dates"* —

التُّمُورْ

Various Colors of the Mejhoul fruits

Illustrating the effect of different edapho-climatic conditions

4

5

Chapter two

Statements of their Excellencies Ministers of Agriculture

المَجْهُولْ

تَمْرَةٌ

MEJHOUL VARIETY — *"The Jewel of dates"* —

التُّمُورْ

المَجْهُولْ

Mejhoul variety cultivation in The Kingdom of Morocco

—— H.E. Dr. Mohamed Siddiqi, Minister of Agriculture, Fisheries, Rural Development, Water, and Forests ——

دُرَّةُ

The Mejhoul date variety, is of Moroccan origin. All of the internationally planted Mejhoul trees descended from 11 offshoots transported from the Bouthnib oasis to the USA by American scientist Walter Swingle in 1927.

With the Mejhoul variety widely considered as the most important commercial date variety in the international market, it was chosen as the cornerstone of the Moroccan national strategy for the reconstruction of existing traditional oases, where 67% of planted date palm trees, are of the Mejhoul variety.

Morocco's date palm sector is a strategic platform in terms of job creation, desertification control, and in terms of protection the environment. However, after a long period of prosperity and leadership, Morocco's date palm sector has deteriorated significantly. This is due to a range of factors, mainly desertification, droughts and the Bayoud disease, which have destroyed important parts of the Moroccan date palm oases, and eliminated a large range of high-quality date varieties.

THE RECONSTRUCTION PROCESS

In order to rebuild Moroccan oases, as well as to increase the international competitiveness of the Moroccan Mejhoul, in 2010, an integrated reconstruction strategy was initiated, coupled with a strong investment effort of approximately 7.7 billion Moroccan Dirham. Such national planning and large investment potential were represented by the following actions and activities:

¶ Re-intensification and rehabilitation of existing traditional date palm oases, based on a total area of approximately 48,000 hectares.

¶ Planting new date palm trees outside the traditional oases' orbit, on an area of 17,000 hectares.

¶ Establishment of new date palm orchards with a date production capacity of 160,000 tonnes by 2020, (compared to an existing average of 90,000 tonnes annually in 2009).

¶ Enhancing national savings from tissue culture-developed plants, by increasing the average annual production capacity to 300,000 vitro plants (between 2010 – 2020), compared to 60,000 plants during the 2005-2009 period.

¶ Boosting the capacity of date production units, and increasing their total reached volume to 110,000 tonnes (about 70% of the projected production by 2020), distributed as follows: 70,000 tonnes to be packaged as soft dates, 20,000 tonnes of date by-products, and 20,000 tonnes as livestock feed.

¶ Development of high-value annual date exports, with an annual export goal of 5,000 tonnes.

The Mejhoul variety is widely planted in various Moroccan oases, due to its great ability to adapt. However, the original source of the Mejhoul variety, the Tafilalt oasis, remains the leading oasis for production of the finest and most popular Mejhoul dates.

CHALLENGES TO DATE PRODUCTION IN MOROCCO

Like all other Mejhoul date producing countries, water scarcity, the effect of climate change, and marketing constraints, remain the main challenges facing this important sector. However, the future of the Mejhoul cultivation in the Kingdom of Morocco remains promising, thanks to the following factors:

¶ The adoption of an integrated strategy for the development of this sector.

¶ Motivating incentives and direct subsidies made available to investors by the Moroccan government

¶ Morocco has the largest number of date palm tissue culture laboratories internationally, which provides the necessary number of vitro plants.

¶ The availability of professional and certified personnel required to supervise and monitor all related oasis projects and programmes.

¶ The promotion of scientific research related to the development of the date palm sector in general, and the Mejhoul variety in particular.

¶ Morocco's proximity to Europe, the most important global market for exporting Moroccan Mejhoul dates.

¶ The strong competitiveness of Moroccan Mejhoul dates, mainly due to its fruit quality and low production cost, compared to the other international Mejhoul producing countries.

To maintain these achievements, and continue moving forward to developing this important sector, the Moroccan Ministry of Agriculture has placed the date palm sector at the heart of its National Green Generation Strategy (2020- 2030).

Figure 1: His Majesty King Mohammed VI, Kingdom of Morocco (*09th of October 2013). Dar Tomoor farm, by OUSSOU - Oasis of Ferkla - Tinejdad – Kingdom of Morocco.*

MEJHOUL VARIETY—*"The Jewel of dates"*—

التُّمُورْ

Mejhoul cultivation in the United Arab Emirates: Continuous development and promising marketing opportunities

—— H.E. Mariam Bint Mohammed Saeed Hareb Al Mheiri, Minister of Climate Change and Environment ——

INTRODUCTION

The United Arab Emirates extends a special care and importance to the date palm tree, which is considered a national wealth of great economic, environmental, nutritional and social value. From an economic point of view, the country has been able to be among the top ten date producing countries. Date palm trees also constitute a source of income for many workers in this sector, whether producers or marketers, as well as owners of related industries.

From an environmental perspective, the date tree is distinguished by its ability to live in the desert harsh environment, forming an ecological habitat for many organisms, such as soil organisms to birds, which contribute to creating a kind of an ecological balance. From a social aspect, the date palm tree constitutes a social heritage, in all segments of the UAE society, as it is involved in many traditional and commercial industries. The interest in the date palm tree in the UAE, is linked to the beginning of the UAE's establishment in the early seventies, where many national projects were implemented to increase the cultivated areas and adopt modern farming techniques such as irrigation, fertilization, and pest control.

MEJHOUL CULTIVATION IN THE UNITED ARAB EMIRATES

Mejhoul is one of the commercial varieties that witness high demand rates and generates high income, due to the large size of its fruits, and its unique degree of sweetness and distinctive shape. This variety is cultivated in several regions throughout the UAE, where it is characterized by its rapid growth, especially if cultivated using tissue culture Mejhoul trees. This variety is also tolerant of salinity and drought to a high extent. This is in addition to its high annual productivity, where it was estimated at 80-100 kg per tree. The production rate may increase according to the region, and the technical care provided to the tree, in terms of irrigation, fertilization and tree care. For example, the volume of what was supplied to Al Foah Company of local production between 2019 and 2020 reached about 290 tons, this figure does not include the rest of the factories, companies and other private outlets in the UAE.

Despite this, some challenges faced the Mejhoul cultivation, as the results showed that the flowering process is affected by high humidity, which affects the process of fruit set., especially during the flowering time, where date palm growers prefer to plant it in the less humid areas, such as Ras Al Khaimah, Liwa in the Emirate of Abu Dhabi, as well as Hatta region, in addition to several other regions across the country.

The second challenge facing Mejhoul cultivation in the UAE is the high temperatures, when the ripening time approaches, as it is a soft variety. Therefore, some date growers harvest the crops before it reaches the stage of maturity, and storing it in special drying rooms to avoid the hardening of fruits, which make it lose part of its value. One of the future projects is to study the possibility of developing the variety through genetic engineering to match the ripening stage of its fruits with the temperature without affecting the fruit quality.

DEVELOPMENT OF UAE MEJHOUL CULTIVATION

In general, policies, procedures and initiatives are developed to include all date palm varieties, and not just a specific one, but due to the distinctive outcomes of the Mejhoul variety, a number of practices have been implemented to develop the Mejhoul cultivation, the first of which is to encourage the adoption of tissue culture technology to produce this variety for two main goals, which are ensuring the production of diseases and pests free seedlings, with high production specifications, and the to reduce the costs compared to the importing procedure, which exceeds the capabilities of many date palm growers, as the number

Figure 2: The late Sheikh Zayed Bin Sultan Al Nahyan, United Arab Emirates.

Figure 3: H.H. Sheikh Khalifa Bin Zayed Al Nahyan, President of the United Arab Emirates.

of national laboratories specialized in its tissue culture, increased to three laboratories.

The development of Mejhoul cultivation is also implemented through working on increasing its productivity, raising its economic feasibility, and achieving an economic return for date growers, through set initiatives implemented by the Ministry, such as the "Nakhilna" initiative directed to farms in the Northern, Central and Eastern regions, and to combat palm pests such as "Red Palm Weevil", "Humaira", "Dubas", and "Halm ALGhubar", through the implementation of an integrated strategy of measures and procedures, and by using the latest systems and technologies in the detection and control of pests, the treatment of infected trees, technical guidance, capacity-building of date growers, and the implementation of thinning activities, by increasing their awareness of the importance of date palm cultivation operations (Trimming of old leaves bases, and offshoots), and providing them with needed technical support, by providing agricultural production requirements at half the price, in order to reduce costs and increase their financial returns from production. The Abu Dhabi Agriculture and Food Safety Authority is also implementing similar initiatives for farmers in the Emirate of Abu Dhabi, which contribute to the development and cultivation of this variety.

As for extension activities, an integrated guide for date palm cultivation was prepared, which includes all agricultural operations in terms of planning, selection of seedlings, cultivation, irrigation, fertilization, agricultural pest control, tree care and marketing, which was also launched through an agricultural application (Our Farms) to make the information accessible to all date growers.

As for the marketing sector, products' marketing is supported through the initiative to enhance the marketing of agricultural products, through which date growers are connected directly with consumers and outlets by signing a number of Memorandum of Understanding (MOU's) with major outlets, such as the Union Cooperative Society in Dubai, Carrefour, and Lulu supermarkets, which greatly contributed in promoting the marketing of dates in general and the Mejhoul variety in particular, in addition to marketing it as an organic product, which added a marketing advantage that increased its competition with imported products, this is also in addition to inviting date growers to participate in events and exhibitions specialized in date palm cultivation.

In regard to the future plans for the sustainable development of the Mejhoul cultivation, it will be carried forward by the implementation of more experiments, in cooperation with the private sector and research institutions to find solutions to any challenges facing date growers, and that will contribute to the development of the date palm sector in the UAE.

Figure 4: H.H. Sheikh Mohammad Bin Zayed Al Nahyan, Crown Prince of Abu Dhabi, Deputy Supreme Commander of the UAE Armed Forces.

Figure 5: H.H. Sheikh Mansour Bin Zayed Al Nahyan, Deputy Prime Minister, Minister of Presidential Affairs.

Figure 6: H.E. Sheikh Nahayan Mabarak Al Nahayan, Minister of Tolerance and Coexistence, President of the Award's Board of Trustees.

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MEJHOUL VARIETY—*"The Jewel of dates"*—

التُّمُورْ

المَجْهُولْ

Modern Mejhoul cultivation in the Arab Republic of Egypt

دُرَّةُ

—— H.E. Al Sayyed Mohamed Marzouq Al Kassir, Minister of Agriculture and Land Reclamation ——

The Arab Republic of Egypt is the number one date producing country in the world. It produces about 1.9 million tonnes per year, a 19% share of global date production, ranging from three date fruit varieties (soft, half dry, and dry).

There has been a significant and continuous increase in the number of date palm varieties grown in recent years, and the number of date palms of various Egyptian and Arab varieties is expected, to reach approximately 15.5 million by the end of 2021.

QUALITIES OF EGYPTIAN DATES

Although Eqypt boasts a wide range of different types of date fruits, based on taste, colour, appearance, and appropriate stage of harvesting, the Mejhoul variety is considered one of the most highly demanded varieties internationally, especially among European and Asian consumers, due to its unique characteristics, such as:

- High quality, taste, and large size (first grade).
- Rich in monosaccharides, and natural fibres.
- Useful for high blood pressure, as it contains a large amount of potassium.
- Useful in preventing heart and brain diseases, as the fruit is rich with iron, zinc, phosphorus, and calcium.

MEJHOUL CULTIVATION

The cultivation of the Mejhoul variety began in Egypt towards the end of the 1990s. Originally, commercial date farms specialised in growing the Al-Barhi and Mejhoul varieties. These farms were established near the Sarabium area, in the Al Ismailiya Governorate. These were the first and only producers of the Mejhoul date variety in Egypt for several years, until new specialised date palm farms started focusing more extensively on Mejhoul cultivation – especially in the Al-Wahat Al-Bahariya Governorate region – and began producing Mejhoul fruits that exceeded the quality of the original producer. As a result, a total of 1.4 million date palm trees have been planted in the past five years, representing 9% of the total number of date palm trees in Egypt.

Today, we expect a further increase of two million new date palm trees to be planted in the next few years, as date growers continue to import offshoots. This number is in addition to the previously planted trees, which are expected to produce a further seven million offshoots, in a five-year timeframe.

The great attention and care given to the development of the date palm sector is reflected in the Presidential project launched with the aim of planting 2.5 million date palm trees in the Toshka region of Eygpt. This initiative is in addition to the many farms and private companies that have cultivated the Mejhoul variety for more than a decade, and who are continuing to expand their activity in this field, thanks to the Mejhoul's high economic value. In 2020, their total Mejhoul production reached about 3,000 tonnes, part of which was allocated for external export because of its high quality.

EXPANSION OF MEJHOUL CULTIVATION

Egypt is now aiming to expand its cultivation of the Mejhoul variety, by working on the development of the date industry, and the establishment of new sorting and manufacturing stations. This expansion is taking place in new areas looking to start cultivating this date variety, in places such as Aswan, Al Wadi Al Jadeed, Al-Wahat, Al-Bahariya and Al Minya, in addition to the southern Red Sea and Sinai provinces, with the aim of increasing the added value of the Mejhoul date industry.

Figure 7: His Excellency Abdel Fattah El-Sisi, President of the Arab Republic of Egypt (*15th of March 2019). Toshka Project, Toshka, Arab Republic of Egypt.*

CHALLENGES ASSOCIATED WITH INCREASED DATE CULTIVATION

Arguably the main challenges facing Egypt today in expansion of Mejhoul cultivation is the limited available of climatically suitable areas beyond the now cultivated in Central and southern Egypt. This is in addition to the lack of availability of sufficient numbers of offshoots. Other challenges can be summarised as follows:

- Limited availability of experienced and well-trained worker resources, who lack the knowledge of appropriate Mejhoul agricultural operation, suitable for each region according to its climatic conditions.
- Scarcity of sufficient date drying equipment, production lines and sorting and packing stages, which can support the cultivation of the Mejhoul fruit in higher quantities
- Work required to develop and improve the techniques used in drying, sorting and grading of dates.
- The importance of establishing refrigerated date stores near production and trading areas, as well as refrigerated transportation.
- The need to add value to lower-grade Mejhoul fruits by recycling them into other useful products that will increase the date grower's income
- Attracting the private sector to invest in the Mejhoul date palm sector, recognising it as a long-term investment.

To overcome these challenges, Egypt has adopted the expansion of commercial date palm tissue culture laboratories. It is hoped these laboratories will to support the needs and requirements of the private sector, as well as the expansion of commercial nurseries to meet the needs of the Mejhoul and other date varieties.

In terms of new agricultural practices, Egypt is also adopting good agricultural practices and mechanisms, as well as following the latest international methods for the development of modern irrigation systems, digital processes and pest forecasting and diseases control. Egypt is committed to develop the date industry, as well as its agricultural methods, to ensure higher productivity of date crops, and to increase the quality and reputation of Egypt's dates within international markets.

Development efforts of Mejhoul cultivation in the Arab Republic of Egypt

—— H.E. Nevin Gamea, Minister of Trade and Industry——

The Arab Republic of Egypt pays close attention to the date sector in general, as part of the country's efforts to develop promising industrial and export sectors with a great competitive advantage. Egypt is the largest date producer in the world, with total production of more than 1.7 million tonnes, representing approximately 18% of the global production by volume, and 25% of the total production volume of Arab date-producing countries. The date palm sector is also considered one of the most promising sectors for achieving sustainable industrial and community development, creating job opportunities, improving producer's incomes, contributing to food security, and increasing exports.

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As part of its development strategy for the date palm sector, the Ministry of Trade and Industry has been cooperating with several international organisations, including the KIADPAI in the United Arab Emirates. The outcome is a programme designed to promote the date production sector. This will be achieved through the development of supply and value chains, while focusing on the transfer and application of modern technologies and good technical practices, in order to maintain date quality and maximise added value, as well as expanding the production of export items that will in return increase export rates.

Cultivation of the Mejhoul date variety comes at the top of this list, as it has several unique advantages, including the shape, large size, and sweet taste of its fruits, which makes the Mejhoul date one of the most desired varieties in international markets.

The Ministry of Trade and Industry is keen to provide technical support services and studies to help establish modern factories and rehabilitate existing factories – including factories to be qualified for international quality certificates, develop products and link industry to sources of scientific research. Other means of support will include increasing the efficiency of human resources, participating in international exhibitions, inviting importers from the most promising countries to local exhibitions and festivals, preparing studies on promising markets, and supporting exports.

The Arab Republic of Egypt is one of the best countries for Mejhoul cultivation, due to several factors. The most important of which is the suitable climatic conditions, good arable land areas, technical expertise, and well-trained human resources available at an affordable cost. Egypt also enjoys a unique geographical location, many trade agreements and free trade agreements, that link Egypt with the European Union, the Mediterranean basin, Arab countries, Africa, the Maghreb, Turkey, and South America, which increases international competitiveness. This is in addition to the availability of a large and growing local market, due to the annual increase in the population and, increased dates consumption as a source of high nutritional and health value, and the increasingly popular habit of regular dates consumption.

Egypt is a home to dozens of large scheme investment farms specialising in date cultivation and production, available in several governorates across the country, which also appliesinternational quality regulations in all its value chain components, and consists of thousands of planted Mejhoul date palm trees.

There are currently about 1.4 million Mejhoul date palm trees in Egypt, of which about 600,000 trees have already begun to fruit. These trees are expected to increase their productivity at an annual rate, which in return will increase the possibility of new Egyptian and Arab investments in the date sector, where all of the country's government is working hard to attract investors and ease any obstacles they might face.

MEJHOUL VARIETY—*"The Jewel of dates"*—

المَجْهُولْ

دُرَّةُ

Khalifa Award Photography Competition
© *Dhafer Alshehri*, KIADPAI

MEJHOUL VARIETY—*"Rich Culture Sweet Future"*—

التُّمُورْ

Egypt is also currently establishing the largest date production project in the region, on a total area of 40,000 acres, and with a capacity of 2.5 million date palm trees. This project includes the construction of refrigerated stores, sorting and packing stations, and various production lines to achieve the maximum benefit of the production, and maximise the added value.

The Ministry of Trade and Industry also calls for the integration of Arab efforts, the exchange of technical expertise and promotion of joint Arab investments in the field of date palm cultivation. As the Arab countries are responsible for more than 75% of global date production, and contribute to more than 60% of the world's date trade. It is believed that this collaboration would maximise the added value of date production, and make firm progress on eliminating obstacles.

The Ministry also encourages the establishment of joint logistic zones specialised in storing, manufacturing, and exporting dates. It also calls for increased interest in maximising the value of Arab dates, in light of the existing expansions, and in the presence of a surplus of these dates, while aiming to reduce the loss rate, prolonging the validity and availability of dates and their factories throughout the year.

Finally, I would like to sincerely thank the UAE and the KIADPAI, for their continued efforts in developing this promising sector. This has been achieved through the organisation of workshops, conferences, competitions, scientific publications, as well as organising date palm festivals in Egypt, and several Arab countries. Such efforts have helped to shine a spotlight on this important sector, extend the bonds of fruitful cooperation and to unite the efforts of all in serving this blessed tree across the world.

المَجْهُولْ

Mejhoul cultivation in the Hashemite Kingdom of Jordan

دُرَّةُ

— H.E. Khaled Hnaifat, Minister of Agriculture —

For the Hashemite Kingdom of Jordan, interest in the expansion of date palm cultivation as an economic investment began in the 1990s.

Since then, cultivated areas have increased rapidly, where date palm plantations growing to a size of 3,455 hectares by 2019, distributed across the Jordan Valley. Two date varieties (Mejhoul and Barhi) are grown although the Mejhoul is prevalent in hospitable climates from Al Aqaba in the far south, up to Al Zarqa in east Jordan.

Where the total area for date cultivation is expected to reach 5,000 hectares by 2030. By this time, total date production is likely to reach 50,000 tonnes, with an estimated value of US $140-210 million. The date palm fruits produced in Jordan vary between small, medium and large sizes. It is worth noting that many date palm farms and date packaging factories in Jordan have certificates of Good Agricultural Practice (GAP), as well as international quality certificates, which is one of the main advantages of the development and sustainability of this sector.

THE KEY CHARACTERISTICS OF MEJHOUL DATES IN JORDAN

The demand for Mejhoul dates grown in Jordan is increasing. This has resulted in the growth of exporting opportunities of this variety, due to the high-quality characteristics of the dates grown, which benefit from highly suitable environmental and climatic conditions. The most significant characteristics that drive the popularity of Mejhoul dates in Jordan are as follows:

1. Jordan's date palm trees benefit from a rich historical and environmental heritage, as they are considered as the grandchildren of the blessed date palm tree.

2. Jordan's dates are irrigated from the waters of the Holy Jordan River, near the place where Christ was baptised.

3. Dates produced from the Jordan Valley grow at an altitude of less than 350 metres above sea level, in completely natural conditions, and with a high oxygen content that has no counterpart in the world. This helps to give Jordanian dates a uniquely delicious taste.

4. Jordanian dates naturally reach the maturity stage on the tree, under the heat of moderate sun rays, of no more than 40°C during the day and no less than 25°C at night. Maturity occurs from 50 to 60 days, achieving the ideal thermal needs for the Mejhoul variety. The Mejhoul fruit flourishes under the highest levels of natural atmospheric pressure, in perfect growing conditions enabling it to retain most of its properties, flavour and nutritional value. These are the ingredients that give Jordanian dates their excellent taste, unique flavour and beautiful colour, along with other important nutritional components, such as vitamins.

5. Jordanian dates also mature in moderate atmospheric humidity conditions of about 50%-60%, ideal for the Mejhoul variety. This ensures Jordan produces bigger Mejhoul fruits than those produced in other parts of the world.

6. Mejhoul dates can be stored for one to two years, by freezing in a temperature of -18°C, without damaging its tissue.

7. Many of the date growers in Jordan have strong technical knowledge and are well trained to produce the best Mejhoul fruits, following required international specifications.

8. The existence of bilateral trade agreements between Jordan and other countries that have a strong consumer demand for dates, is a positive contributer towards facilitating the successful marketing and trade of the Mejhoul variety in Jordan, and makes the date fruit freshly accessible from trees to consumers directly in a short period of time.

PRODUCTION QUANTITIES AND EXPORTS

Jordan exports about 50% of its date production annually, and the dates exported are of high quality to various international markets, such as the Gulf Cooperation Council (GCC) countries and Europe. Jordan also imports about 12,000 tonnes of other date varieties from Saudi Arabia and other date-producing countries in the Arabian Gulf region.

دُرَّةُ

—The challenges facing Jordan's date palm sector—

SUSTAINABILITY OF NATURAL RESOURCES (IRRIGATION WATER)

One the date palm sectors agricultural sustainability and production needs, the most essential element is water. Water determines the appropriate quantity and quality of date cultivation, whereas the lack of water sources affects the expansion of date palm cultivation.

In addition to the quality of water, and in particular salinity concentrations, the lack of rainfall also leads to the depletion of groundwater. This affects the growth of date palm trees, especially in the summer. Trees that suffer from insufficient water have lower productivity. Therefore, greater attention must be paid to the amount of water provided to a tree, through the use of modern irrigation methods, and avoiding traditional methods that risk causing the loss of large amounts of water due to evaporation and leaching.

THE HEALTH STATUS OF DATE PALM TREES AND FRUITS

Date palm trees are exposed to many pests, diseases, mites and nematodes, as well as snails, birds, bats, rodents, and weeds. These factors can lead to a total loss of approximately 35% of date palm tree production.

In the past four years, Jordan's date palm trees have faced a major challenge in the Red Palm Weevil. This pest began to spread in the Al-Zarka region, and then moved to the northern valleys. In 2019, it was also found in the central valleys of Karama, becoming a serious threat to Mejhoul and date growers in general. Today, the Red Palm Weevil is the number one priority, as this pest is considered a major threat to the sustainability of this important agricultural sector.

LACK OF A SKILLED WORKFORCE

Date palm farms need trained labour capable of carrying out various agricultural processes – such as trimming, pollination, and harvesting. This is alongside the implementation of fertilisation and pest control programmes, as well the need for trained technical labour capable of using special equipment and tools.

It has been noted that Jordanian people tend to choose working in sectors other than the date palm, and agriculture in general. This means Jordanian date production has a reliance on foreign workers, whereas the trained labour needed for the date palm sector is estimated at about 5,000 skilled workers. To have this number of well-trained workers for the date palm sector is anticipated to take five to seven years, depending on foreign workers arriving from different countries such as Egypt, Nepal, Sudan, Yemen, India, Bangladesh, and many others.

MARKETING

Competition in the Mejhoul date market is constantly increasing. This is a result of the attempts of many new countries looking to enter the market, the addition of new date varieties and the continued production from countries including the Arab Republic of Egypt, Kuwait, Republic of Iraq, and Libya. However, the quality of dates produced in climates similar to the climate in Jordan remains the main reason Jordanian dates are considered to have unique and commercially attractive characteristics. This helps Jordanian dates to maintain an internationally recognised positive image and brand value, while also taking advantage of the historical significance of date palm trees planted in the Jordan Valley. Maintaining this reputation is an important responsibility for promoters, marketers and producers of Jordanian Mejhoul dates.

REGULATING THE SECTOR

The unplanned expansion of date palm cultivation in Jordan, and the possible negative consequences as a result of this irregular expansion, has already led in some areas to the transmission of harmful diseases and pests between different production areas. It has also increased the difficulty of monitoring and follow-up from the relevant authorities to ensure the application of GAP, and appropriate agricultural services needed by date growers.

The development of the Mejhoul date sector in the State of Israel

—— H.E. Oded Forer, Minister of Agriculture and Rural Development ——

According to estimates by industry experts, the global harvest of Mejhoul dates in 2020 totalled 109,000 tonnes. Israel is the world's major producer, leading other production sources by a large gap. Close to half of all the Mejhoul date crops worldwide, about 45,000 tonnes, originate from Israel.

Figure 8 provides a summary of the growth in the number of Mejhoul date palm trees in Israel from 1995 to 2020. It is apparent that since the mid-1990s, the number of Mejhoul date palm trees has risen at an impressive rate, from 60,000 trees in 1995 to about 685,000 trees in 2020.[1] The accelerated development of the date sector is the result of the transition to the marketing of the semi dry and succulent Mejhoul dates, starting in the middle of the 1990s.

ECONOMIC IMPORTANCE

The Mejhoul date is an important and key component of the economy, with production taking place throughout both the Jordan Rift Valley and the Arava Valley, providing the livelihoods for thousands of families. Date growing palm trees are planted on 75% of the agricultural fields in these areas. There are 550 active date growers in Israel, and 70% are members of collaborative settlements (Kibbutzim and Moshavim), while the rest are independent growers. The overall value of date production in Israel, as of 2019, totalled US $280 million ($98 million in the local market, and $182 million in exports).[2] Most of the date plantations throughout the growing areas are irrigated using brackish water and recycled water.

Figure 9 sums up the development and exports of Mejhoul dates from Israel from 2009 to 2020. Over the past decade, Israel's Mejhoul harvests have increased threefold, from 15,000 tonnes to about 46,000 tonnes. According to projections, the 2023 yield will reach 53,000 tonnes, due to the entry of young trees and an increase in yields of trees that are five to ten years old.

The rate of increase in date exports currently lags behind the rate of increase in yields. From 2011 to 2020, exports of dates from Israel have more than doubled, from about 11,400 tonnes to 28,800 tonnes.

DEVELOPMENT OF EXPORTS

The development of date exports from Israel to leading destinations over the period from 2009 to 2020 is illustrated in *Figure 10.* The vast majority of date exports from Israel are of the Mejhoul variety, and only about 3,000 tonnes of other varieties were exported in 2020.[3] About half of the exports were shipped to destinations in the European Union (EU) and the UK. In 2020, exports to the EU and the UK totalled 16,000 tonnes, compared to 7,200 tonnes in 2011. Other leading destinations outside the EU in 2020 included Turkey and the US, with exports of 1,600 tonnes each, followed by Canada, Russia and Belarus, with exports totalling 1,000 tonnes each.

ADDRESSING DATE PRODUCTION CHALLENGES IN ISRAEL

Alongside its ongoing activities and accomplishments, the date production sector also faces many challenges. In response to these challenges, research is underway in regional research and development (R&D) centres located in date-growing areas in the Arava and Jordan Valleys, as well as in the Agricultural Research Organization (Ministry of Agriculture) and various universities. The studies conducted cover all aspects of date cultivation. From irrigation, thinning and trimming to plant protection and post-harvest fruit care.

Most of the research is conducted by the Ministry of Agriculture's Agricultural Research Organization, through its various institutes, and in collaboration with regional R&D stations. The Fund of

1 Date sector census
2 Date sector census
3 Date Board within the Plants Production and Marketing Board, Ministry of Agriculture & Rural Development, Plants Council

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Number of Mejhoul date palm trees in Israel

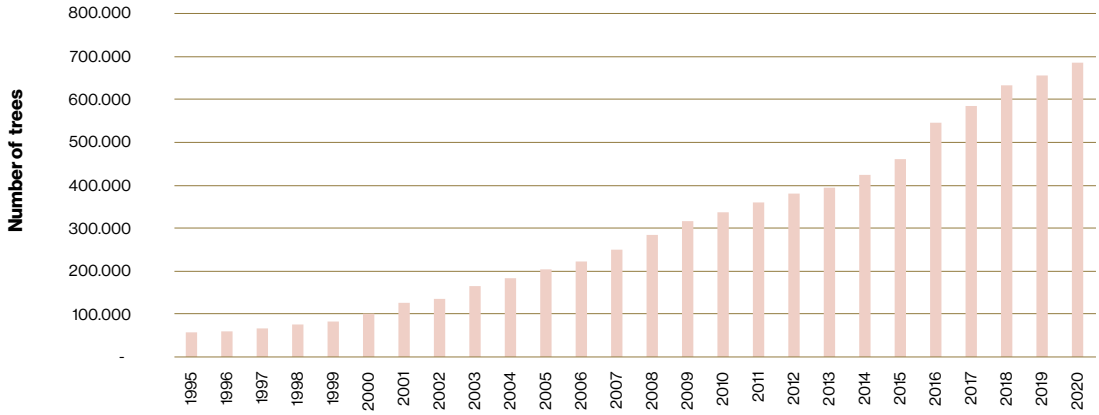

Figure 8: Number of Mejhoul date palm trees in Israel *(1995-2020).*

Yields and exports of the Mejhoul dates

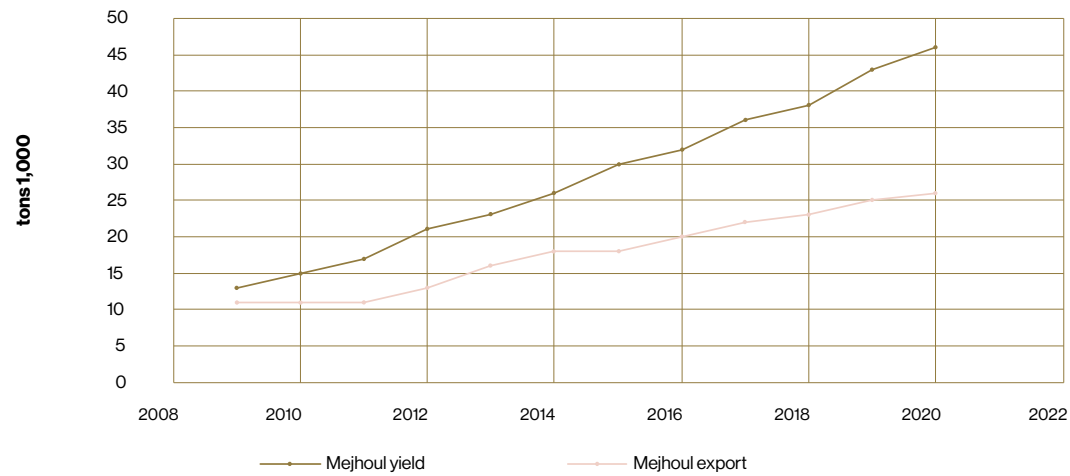

Figure 9: Development of the yields and exports of the Mejhoul dates from Israel *(2009–2020).*

Date export to leading destinations

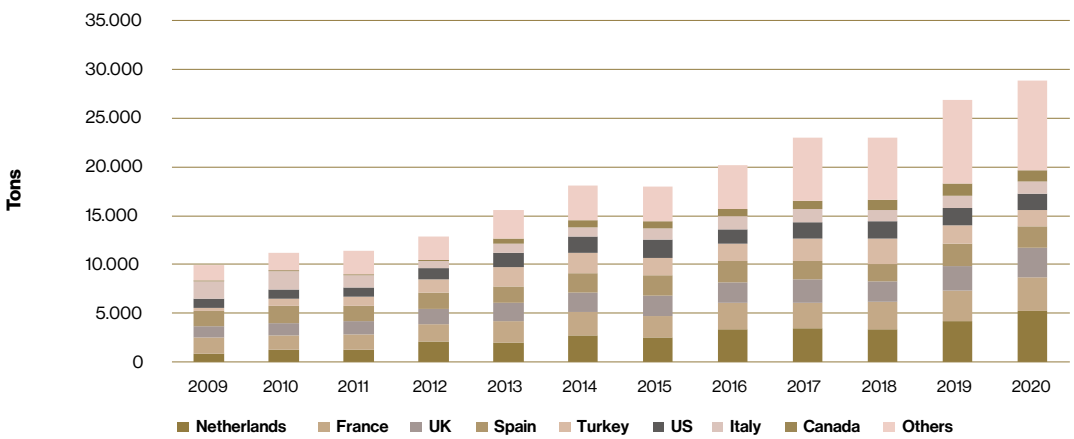

Figure 10: Development of date exports from Israel to leading destinations.

the Chief Scientist at the Ministry of Agriculture plays an important role in financing various research studies. Growers, through their payments to the Date Board within the Plants Production and Marketing Board, are also partners in financing research, projects and initiatives amounting to approximately NIS 1.5 million annually

Studies recently conducted include:

¶ Initiatives for the eradication of the Red Palm Weevil, which causes severe damage to date palm groves and is very difficult to eliminate. Among these is a project dealing with the environmentally friendly means of pest control focusing on the Weevil larvae. Another project deals with establishing Integrated Pest Management (IPM) systems in date palm groves.

¶ An initiative to minimise the number of symptomatic fruits with black mould (Aspergillus niger) infestations in date palm groves.

¶ A robotics project that aims to develop thinning/trimming technology solutions that will save manual work and make it possible to compete in the future global market by offering lower prices. At this stage of the venture, a prototype of a thinning robot is under development.

One of the major challenges encountered by exporters is the lack of a uniform definition for products. Another issue facing the date industry is the lack of a uniform quality standard. Work is currently underway, in collaboration with the Plant Protection Services, aimed at setting a uniform and binding standard for dates, including the percentage of moisture, fruit colour, degree of ripeness and size. The Date Board is also engaged in upgrading the coverage of the insurance policies by the Insurance Fund for Natural Risks in Agriculture.

CONCLUSION

The cultivation and export of Mejhoul dates in Israel has developed at an impressive rate over the past half-century. Currently, around half of the world's crop, about 45,000 tonnes, originates from Israel. This sector is an important and central component of the local economy throughout the Jordan Rift Valley, and supports thousands of families. Its development is made possible thanks to proactive and persistent marketing efforts and intensive research, led primarily by the Agricultural Research Organization and regional R&D centers. Advancement of the date sector and the financing of marketing and research activities are supported by the ongoing cooperation between the Ministry of Agriculture & Plants Council with the growers and distributors.

المَجْهُولْ

Mejhoul cultivation in the Republic of Sudan

دُرَّةُ

—— H.E. Al Taher Ismail Harbi, Minister of Agriculture and Forestry ——

The Mejhoul variety is ranked one of the best date varieties in the world, and has gained popularity in international markets to be known by the name "The King of Fruits", due to the large size of its fruits, softness, good taste and flavour, and its ease of storage.

THE INTRODUCTION OF THE MEJHOUL TO THE REPUBLIC OF SUDAN

The Mejhoul variety was first introduced in small quantities, in 2004, from the UAE. Several other introductions were from the KSA, Kingdom of Morocco, and Republic of Iran. It was then cultivated in most of Sudan's suitable states for date palm cultivation and production, especially in the Northern state, the Nile River and Khartoum.

Date production began in 2008, and the fruit was found to be more distinctive in the Northern and Nile River states, where thousands of trees were cultivated from the mother offshoots. The Al-Rajhi Company was one of the leading investors in this field, and it planted more than 11,000 Mejhoul date palm trees in the Northern and Nile River states.

Within Sudan, the Khartoum state produces the lowest crop of dates, as it lies in a rain belt, despite its unique advantage of early production (in July), which gives the Sudan a competitive advantage in the global market, taking into account that in most other Mejhoul-producing countries, their fruits are harvested only at the end of August.

ADVANTAGES OF MEJHOUL CULTIVATION IN SUDAN

- Climate and soil suitability, fresh water sources and high temperatures ensure the fruit's early maturation.
- The Mejhoul variety is resistant to salinity, drought and wind, and is capable of growing in all types of soil.
- The Mejhoul produces a large number of offshoots every year.

Through research, experiments and illustrative fields, the Mejhoul variety and its appropriate agricultural processes were identified to increase production and to benefit from all its characteristics.

MANUFACTURING

Gradually, the private sector recognised the value of the Mejhoul and started investing in expanding its production, by entering the field of date manufacturing. Today, the Mejhoul variety has become the number one choice of most date growers, and the price of its offshoots ranges from $200-$250, and with cultivated areas of an easily estimated to be 200,000 trees. This is in addition to the mother offshoots that have already been in the production loop since 2008. The large production of tissue culture-derived plants is now well implemented by several private companies.

MARKETING

Sudan harvests Mejhoul dates early, starting from July through to the end of August, giving Sudan a competitive advantage in the international markets.

CONSTRAINTS

However, there are some constraints that effect or limit the production of the Mejhoul variety in the Sudan. For example, the Mejhoul does not withstand ambient high humidity, which can lead to the bloating and rotting of the fruits. Some climatic factors can affect its fruit, leading to oxidation, with fruits consequently turning black in colour. Additionally, the difficulty of fruit thinning and harvesting requires multiple harvesting in order to obtain fruits of a sufficiently large size. There is also a lack of compatibility of the Mejhoul variety with some local males cultivars, such as the Ghanami, which can often lead to a low fruits yield and a failure of good production. Finally, because of the high temperatures in Sudan, date fruit should be kept in refrigerated stores, which in turn increases the production costs for the date growers.

المَجْهُولْ

Date Palm cultivation and production in the Islamic Republic of Mauritania

دُرَّةُ

—— H.E. Sidna Ouled Ahmed Ali, Minister of Agriculture ——

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التُّمُورْ

The Mauritanian Islamic Republic is located north of the equator, between West Africa and the Maghreb region, between latitudes 15° and 27°N, and lines 5° and 17°W, with a total area of about 1,030,700 square kilometres.

Rainfall is rare in Mauritania, where the temperature is significantly high, and the climate is generally dry most of the year. Temperatures in the summer range from 27°- 42°C, although temperatures in areas located near the Atlantic Ocean can fall to below 20°C.

The Mauritanian date palm oases are located in the centre of the country, specifically in the states of Adrar, Takant, Liassaba, and Al-Houdin, where agricultural activity depends on the cultivation of date palm, vegetables and cereals. The total number of date palm trees is estimated at about 2,641,343 trees, planted over 352 oases, with an average rate of 56 hectares per oasis. Average annual production is about 65,000 tonness, according to the Department of Agricultural Statistics, 2012.

DATE PALM CULTIVATION IN MAURITANIA

Date palms are considered one of the most important crops known in Mauritania. Many people work on date palm cultivation, and in many regions dates are considered a complete meal. Some studies indicate there are up to 250 date palm varieties in Mauritania, the most commercially in-demand varieties are AlAhmar, Sakani, and Salamdiniya, which are found in Adrar, and the AlMahboula and Tanterkel varieties found in Takanet.

Over the years, Mauritanian inhabitants have used date palms to weave mats, build houses, create sand shields, and feed animals. Despite the severe climatic conditions faced in Mauritania in recent decades, the date palm has contributed to the existence of oases and taught its people how to endure difficult conditions, and how to be productive under harsh climatic circumstances.

THE MEJHOUL VARIETY

The Mejhoul variety was first imported into Mauritania in 2015, and was planted in the Tajjaja area in the central state of Kant. They were then distributed to two groups, one of which was subject to a drip irrigation system, while the other group was placed under a pipes irrigation system. Both groups successfully grew normal offshoots, which started producing fruits in 2019. In early 2020/21, these date palm trees started producing very good to excellent fruits, particularly those trees that underwent a fruit thinning process, which resulted in producing large fruits compatible with international date market specifications.

Overall, Mauritania's strategy for oases development is focused on increasing date production in the country, and improving fruit quality in order to reduce date imports, improve growers' income and improve their daily standard of living through the implementation of the following objectives:

1. Increasing date palm cultivation by using modern irrigation techniques.

2. Creating an added value for national dates production by encouraging the industry's manufacturing and packaging of dates.

3. Rationalising the exploitation and use of water sources in oases, through the construction of dams and water barriers.

4. Encouraging agricultural research, especially in the diagnosis and control of date palm pests and diseases. It is worth mentioning that the Mauritanian Ministry of Agriculture was recently able to eliminate the Red Palm Weevil in less than a year after its emergence.

5. Reducing date production costs, and improving date quality, by expanding the production of excellent commercial varieties, led by the Mejhoul variety. We look forward to achieving the national goal of producing one million offshoots over the next five years, and a tissue culture laboratory has been built and equipped to mass propagate date palms through tissue culture multiplication techniques, and with an estimated annual production capacity of about 200,000 vitro plants.

In summary, Mauritania looks forward to further cooperation and exchange of experiences with Arab countries, organisations, and research and development centres that specialise in date palm cultivation and production, led by the KIADPAI.

MEJHOUL VARIETY—*"Rich Culture Sweet Future"*—

Chapter three

Statements of Regional and International Organizations

المَجْهُولْ

دُرَّةُ

Khalifa Award Photography Competition
© *Salem Sultan*, KIADPAI

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التُّمُورْ

Sustainable Development of date palm production systems in the Gulf Cooperation Council Countries: a model for regional cooperation on research and development

—— Dr. Aly Abousabaa, Director General, International Center for Agricultural Research in the Dry Areas (ICARDA) ——

Date palm is a crop that plays a central role in the agricultural systems of Gulf Cooperation Council (GCC) countries. The reason is its high nutritional value, resilience, and suitability to the arid and semi-arid areas that represent 90% of the Arab world. It is characterised by its tolerance to various environmental stresses (drought, low or high temperatures and salinity), but this may be reflected in flowering and fruiting.

A single date palm can produce 70-100kg of good dates and 45kg of by-products (pruning residues, slippers, harvesting and fallen fruits). Dates are considered a nutritional prize that is easy to store, transport and handle, and one that is available throughout the year. It is consumed fresh in three main stages of maturity (Al-Khalal/Al-Bisr for some Cultivars, the Rutab stage, and Tammar), and used in many value-added industries.

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The project for Sustainable Development of Date Palm Production Systems in the GCC member countries was introduced to promote regional cooperation to develop this critical sector. This was demonstrated by the minutes of the fifteenth meeting of the GCC Agricultural Cooperation Committee, held in 2003 in Doha, Qatar. In this meeting, ministers delegated the GCC General Secretariat to contact the International Consultative Group for Agricultural Research (CGIAR) and its research centres to include date palm in the agricultural crops researched by CGIAR and its research centres, and to form agricultural research work teams to prepare the research project proposal on date palm.

The International Center for Agricultural Research in the Dry Areas (ICARDA) was chosen to manage and implement the proposed project in 2004. To launch the project, ICARDA organised a workshop on date palm development in Abu Dhabi, which brought together researchers and scientists from the GCC member countries, international experts, and organisations. During this workshop, and in cooperation between the ICARDA and National Agriculture Research Systems (NARS) in the GCC member countries, the project was designed to develop a sustainable and profitable date palm production and marketing system. Implementation of the project activities started in 2006 following a five-year plan, and has since developed with three separate phases of five years each.

The first phase of the project entitled *Sustainable Development of Date Palm Production Systems in the GCC Countries* took place over five years, (2006-2012) focusing on applied research that is based on the strategic priorities of the project countries in its four technical work packages: field operations, post-harvest activities, integrated pest management, and biotechnology.

The first phase was successful in achieving the expected results for each technical work package, as well as providing a basis for the participating countries to synergise their experiences with complete exchange of knowledge and findings. This led to the project's evaluating committee suggestion of extending the project to a second phase for an additional five years (2012-2018). Throughout the first and second phases, the project completed 125 applied studies with 43 being studies on crop management, 25 studies on integrated pest management, 23 on biotechnology and biodiversity, 20 on post-harvest operations, and ten social and economic studies.

PROJECT ACTIVITIES AND OUTPUTS

The project started its third phase in 2018, and successfully built upon the successes and relevance of the technologies developed in the partner countries over the past 15 years. The project focused on dryland resources-based preservation and efficient utilisation to generate water-saving cropping techniques, integrated pest management and mechanisation to bring about cost-effectiveness into the date palm production and marketing system.

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The national project partners explored, tested and documented new subsurface irrigation system, soil fertility enhancement using mycorrhiza, liquid pollination, bunch ventilation techniques, polycarbonate drying chambers, biotech guided biodiversity conservation, Trichogramma production and use in biological control, mass inventory of date palm pests and natural enemies. These technologies are truly revolutionising for water productivity, date palm pollination and quality date production in the region and beyond. Each of these technologies has a standalone impact when applied individually, and cumulative impacts when applied as a package.

KEY DEVELOPMENTS AND DISCOVERIES

The development of relevant and revolutionising technologies under extreme water scarcity, poor soil and climate change triggered proliferation of abiotic and biotic stresses has been important, but does not alone make this project special. Development of amazing technologies is taking place in other projects. This project is special because of the innovative cross-institutional and national boundary integration on research and development (R&D) it established, and the inbuilt national partner ownership, fostering effective agriculture innovation, cross learning and instant up-scaling and out-scaling of technologies.

The public-private-producer-partnership (PPPP) model adopted proved to be a solid foundation for a win-win R&D model to develop a vibrant date palm industry and market in the region. The development and popularisation of date drying chambers in Oman and UAE is a good example of PPPP. The national and international R&D institutions, the manufacturing companies, the policy makers and the producers have actively participated in the designing, testing, demonstration, documentation and policy makers synthetisation and producers' adoption, both with and without government subsidy.

PROJECT KEY DELIVERABLES

This project has undertaken successful technology promotion of subsurface irrigation reducing water use by 40% in Oman, 37% in Saudi Arabia and 35% in Qatar. The Al-Foah organic farming company in UAE adopted subsurface irrigation on 7,000 date palms, making a 41% water saving. The use of fertigation by hydraulic injectors in UAE showed 42% and 75% of fruit weight increase in Mejhoul and Sukary cultivars, respectively. The benefits of integrated pest management (IPM) with Abamectin, Sulphur and Matrine biopesticides on dust mites and the lesser date moth, as well as use of *Trichogramma* with a capacity to feed on over 200 insects, have also been demonstrated. 60 date palm cultivars in the GCC countries have been fingerprinted, and 947 technical staff and farmers have benefited from the capacity building programme, with 119 date palm-related publications produced.

NOW AND THE FUTURE

Building on these successes, the current phase (2020-2022) focuses on: (I) consolidating and scaling the proven technologies within and beyond the region; (II) Advancing research on soil fertility through composting and recycling of date palm wastes; (III) Advancing digital augmentation of advisory services for a sustainable and resilient date palm industry in the region.

—Date palm project in GCC: investment performance—

KEY INFORMATION

- GCC funding: $8,500,000
- Investment period: 2004-2022
- Technologies considered: liquid pollination; polycarbonate drying chambers; and subsurface drip irrigation
- Date palm variety considered: 30% of the date palm area in the GCC countries is planted with Khalas variety
- Data source: Project technical reports, FAO Statistics

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ALL FOUR SCENARIOS

Scenarios	*1*	*2*	*3*	*4*
% adoption rate (harvested area) for the liquid pollination technology	1%	3%	5%	10%
% adoption rate (harvested area) for the subsurface drip irrigation	1%	3%	5%	10%

¶ An adoption of 400 polycarbonate drying chambers (250 small and 150 large) in KSA, Oman, UAE and 150 (100 small and 50 large) in Bahrain, Kuwait, and Qatar.

¶ 50% of the polycarbonate drying chambers are subsidised for both categories (small and large) and in both categories of countries)

¶ Date palm area and production is the average of 2000-2017 (FAO database)

¶ 30% of the produced date palm area is planted with the Khalas variety in each of the six GCC countries

RETURN ON INVESTMENT (ROI) FOR PROJECT COUNTRIES

¶ High ROI for UAE, KSA, and Oman under the four scenarios

¶ Returns and risks are proportionally to the adoption rate of the key technologies deployed by the project

¶ Investment options (i.e., project technologies) provides lower risk and profitable returns in the long-term

TOTAL ADDED VALUE (TAV) AND ROI

¶ Under the conservative scenario: 1% adoption rate of the key technologies deployed by the project:

- ROI indicator: 5.03
- TAV generated by this investment for GCC reaches over $50 million

¶ Under the optimistic scenario: 10% adoption rate of the key technologies deployed by the project:

- ROI indicator: 15.58
- TAV generated by this investment for GCC reaches over $141 million

AARINENA's efforts and achievements in date palm cultivation and production at the Arabian level

— Dr. Rida Shibli, Executive Secretary —

The Association of Agricultural Research Institutions in the Near East and North Africa (AARINENA) was established in 1985 to strengthen cooperation among national, regional and international research institutions and centres in the Near East and North Africa (NENA) region. AARINENA's mission has been to contribute to the enhancement of agricultural and rural development in the NENA region through fostering agricultural research and technology development and through strengthening collaboration within and outside the region. This is achieved through the dissemination and exchange of information, experiences and research findings.

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The aim of the research has always been to achieve a greater degree of self-reliance in food and agriculture, and to improve the nutritional well-being and overall welfare of the people of the NENA region, while sustaining and further improving the productive capacity of the natural resources base. The association is committed to promoting agricultural research and technology development and enhancing cooperation within and outside the region.

ASPIRATIONS AND OBJECTIVES

As outlined in *AARINENA Strategy 2019-2030*, our aspiration is to be the hub for NENA agricultural stakeholders who strive to jointly strengthen and transform agricultural research and innovation, to effectively address challenges and realise together a sustainable, inclusive and prosperous future for the region. As a unique network of representative multi-sector partners, AARINENA promotes and facilitates the development of state-of-the-art transformational solutions that enable NENA agricultural research and innovation systems to more effectively address critical and pressing agricultural and innovation challenges.

In this respect, AARINENA focuses on mobilising dialogue, knowledge exchange and partnerships over collective actions; empowering rural women, youth and small holder farmers; impacting policies, and strengthening capacities of NENA agricultural and innovation systems.

Despite the different activities of the association in all agricultural fields, it has a set of activities in the field of date palm cultivation. The regional date palm network of AARINENA includes many palm experts from Arab countries, including the UAE, Kuwait, KSA, the Sultanate of Oman, Algeria, Morocco, Tunisia, Libya, Jordan, Syria, Palestine, Iraq, Lebanon, Sudan, Egypt and Yemen. This regional date palm network promotes the exchange of information and experiences, linking and networking experts together, discussing challenges and finding common solutions among Arab countries.

DATE PALM CONSIDERATIONS

The meetings of the AARINENA Date Palm Network involves many topics related to date palm, the most important of which is the discussions of the pest of the red weevil of palm trees in NENA region countries. Meetings assess the current situation, reality, challenges and the most important solutions to reduce the spread of the insect, and discussions related to the reality of Bayoud disease, the prospects of palm cultivation, the stages of tissue culture propagation of date palms and the factors affecting its success. Other subjects include the exports and imports of global dates according to the latest global trade data in 2020, and the current status of pests that infect fruits, and ways to combat them to increase production for export, as well as the use of dogs and other methods in the early detection of palm weevil. There are many scientific publications and news exchanged between members, in addition to participating in other activities such as palm workshops and meetings.

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CREATING AN INNOVATIVE DATE PLANT PLATFORM FOR THE NENA REGION

One of the efforts undertaken by AARINENA is a project to establish a research, technology and innovation platform for the integrated production system of the date palm crop in the NENA region, a result of cooperation between AARINENA and the Food and Agriculture Organization (FAO).

The platform aims to enhance the integrated production system for date palm in the NENA region, and this platform will focus on coordinating the efforts of members at the regional and international levels, to promote the integrated production system for date palm in the NENA region, and to maintain high competitiveness in the global and regional market. This platform will be a centre for information and knowledge that effectively links relevant stakeholders and share research results, technologies and available innovations related to the date palm production value chain.

The platform is also expected to play an important role in technology transfer and enhancing the various capabilities of stakeholders and beneficiaries using information and communications technology (ICT) solutions. Among the expected activities of the platform are coordination among relevant stakeholders on various aspects related to the date palm production system, prioritizing research, innovations and technical practices related to the date palm value chain, and developing a regional model for an innovation platform including the monitoring and evaluation system for the integrated date palm production system.

PLATFORM ACHIEVEMENTS AND OBJECTIVES

Among the most important achievements that the platform will achieve, is defining research priorities and technical innovations related to the date palm value chain, activating the remote training protocol, and publishing the technical report on date palm. Among the long-term effects of this platform is the technical assistance that the innovation platform will provide, which will contribute to defining research priorities related to the date palm production system, access to knowledge and modern technologies from global, regional and national research centres, and update and enforce laws and legislation related to the transfer and exchange of date palm varieties. This will include recommending precautionary measures and quarantine and to raise awareness of the importance of innovation in the date palm field.

OPEN SOURCING SOLUTIONS

The platform will also become a regional hub for knowledge and information related to the implementation of various products. This is intended to show the final destination of an idea or solution, initially designed through the platform. The core of the platform model is the ability to come up with a problem or idea related to date palm, so stakeholders registered on the platform can contribute an idea to providing innovative open-source solutions to those problems to improve the quantity and quality of date palm products and create a new market. The platform also allows any party to register on the platform with the approval and coordination of AARINENA through the remote training portal.

Registered members of the platform will be classified according to different criteria, by type (farmer, researcher, government agency, academic institute, funding agency, etc.), or by research interests, or by country, and other. The platform allows all members from different partners and countries of common interest to collaborate on discussion, development, new idea solving or problem-solving through a communication portal. Additionally, the platform maintains a record of all contributions, contributors and suggestions. An application for this platform will also be developed using smart phones to facilitate beneficiaries, help to expand the number of beneficiaries and deliver information to everyone.

Achievements of the Arab Organization for Agricultural Development in date palm cultivation and production

—— Prof. Ibrahim Adam Ahmed Al-Dukheri, Director General ——

Date palm cultivation is of a great significance to the Arab region, as it is an export crop. Its social and environmental importance came from its traditional uses as a source of shade, food, and shelter in oases found in North Africa and the Middle East. Date palm cultivation faces many obstacles such as poor agricultural services and the spread of pests and diseases, which calls for concerted efforts to provide adequate protection to this regional wealth.

The world's date palm plantations make up about 1.3 million hectares in size, of which 74.28% are in Arab countries. Here, date palms are among the most important fruit trees found in oases and desert systems, and the Arab world produces about 5,927 million tons of dates annually comprising 72.58% of the world's date production.

On this note, the Arab Organization for Agricultural Development (AOAD) has paid great attention to the development of the date palm sector in the Arab world, through its programmes and projects implemented by all member countries. AOAD's aim is to keep pace with the development of vital, modern, environmentally safe agricultural technologies, and to coordinate between Arab policies and legislations in the date palm sector, in order to stop the decline of date palm cultivation in the region.

The date palm is one of the oldest and most important trees in the Arab region. It is characterised by its ability to grow sustainably and withstand extreme weather conditions, making it a unique source of food to humans and animals for thousands of years. Moreover, Arab nations have played a prominent role in the spread of date palm trees across the world.

The date palm tree is not just a tree that offers benefits from its fruits; it is also the centre of life for people. Date palm trees and date fruits were mentioned in the Holy books, and date palms are closely linked to Arab and Islamic civilisations, and their respective heritage. This tree is of great social significance, having historically proven a viable environment for most rural people.

Date palm cultivation in the Arab region occupies an important economic position, with dates considered a key export crop. Since its inception, AOAD has been concerned with developing the production, processing and marketing of dates across the Arab region. Intensive efforts continue to be made to preserve this tree. This interest has been reflected to varying degrees according to areas of its cultivation.

AOAD sincerely thanks KIADPAI, for sharing its efforts as part of the Year of the Fiftieth series initiative, and for producing a reference document for organisations and those interested in the date palm sector in the Arab region. We hope this has contributed to increasing knowledge and enlightenment on the most important achievements in the development of the date palm sector, thereby promoting Arab exported dates to international markets.

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المَجْهُولْ

Research conducted at the Arab Centre for the Studies of Arid Zones & Dry Land on the Mejhoul variety

دُرَّةُ

—— Dr. Nasr Eldin Al Obaid, Director General ——

التُّمُورْ

The Arab Centre for the Studies of Arid Zones and Dry Land (ACSAD) continues to give special attention to the date palm sector. In 1994, it established a date palm research and development network, which continued to operate until 2002. During this time, the network completed several analytical studies on agricultural systems and assessments on the economic impacts of technical constraints facing the date palm sector in Arab countries. The network also held several training courses and workshops on related topics.

To ensure work continuity on the date palm field, ACSAD introduced a programme specialising in the date palm sector. Under ACSAD's administration, this programme works to develop date palm cultivation in the Arab world through the enhancement of date palm tree processes, technical care, harvesting, trading, pests and disease control programmes, and the preservation of date varieties.

—Important activities of ACSAD—

THE GENETIC COMPLEX OF DATE PALM VARIETIES IN THE REPUBLIC OF SYRIA

In 2007, ACSAD established a genetic complex for about 20 date palm varieties, at the Deir Al Zawr research station in Syria. The aim was to preserve the main Arab date varieties of commercial importance, by determining their specifications and benefiting from their offshoots, in order to encourage the spreading of cultivation of these varieties. Studies were also conducted on the processes of date palm tree technical procedures, with the Mejhoul among the planted date palm varieties at the complex. *(Figure 1.)*

DEVELOPING VERTICAL AND GROUND DATE PALM CULTURAL TECHNIQUES

A development project entitled "Developing vertical and ground date palm cultural techniques, to increase production, and improve dates quality in the Arab region, 2015-2020" was implemented in 11 Arab countries. This project included significant research carried out on improving the productivity and quality of the fruits of the Mejhoul variety.

THE EFFECT OF BUNCH PROTECTION AFTER THE POLLINATION PROCESS

In the Republic of Sudan, researchers studied the effect of bunch protection after the pollination process. This research was conducted as part of the Soba project, south of Khartoum, during three consecutive seasons (2015-2016, 2016-2017 and 2017-2018).

The study was implemented on 15 date palm trees aged 12 years, with each planted at distance of 7m x 7m. The date palm trees were converging in growth strength, and pest-free, using technical agricultural operations that were carried out in accordance with the schedule used to grow date palms.

METEXENIA EFFECT ON MALE TREES

This study on the Metexenia effect on seven different male trees, including fruit characteristics and maturity period, was conducted in the Soba area, south of Khartoum, in the Republic of Sudan. The aim of the study was to determine the impact of the source of pollen on the productivity, maturity and quality of fruits, using seven selected male trees of different date palms. The study was carried out on 21 Mejhoul date palm trees, aged 12 years, divided into three stages.

The experiment was conducted during 2016 -2017, and the results indicated that the Mejhoul females pollinated with different male trees gave mixed results. The males 5 and 7 reduced the maturity rate of the Mejhoul fruits, while male trees 4, 3 and 6 delayed the maturity of fruits. These results may be of great importance in terms of controlling the maturity

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Figure 1. The Mejhoul variety planted in the genetic complex of date palm varieties, ACSAD.

of fruits and, depending on the market situation, especially when demand or prices are expected to rise in domestic or foreign markets.

With regards to the fruit pulp, males 1, 3 and 2 produced the highest pulp ratio, while males 5, 7 and 6 produced fruits with less pulp fruits. These characteristics are very important to consumers. The males 1 and 7 also gave the highest proportion of total dissolved solids, while male 3 provided the lowest amount.

FRUIT THINNING AND THE ADDITION OF POTASSIUM FERTILISERS

This experiment, carried out on the productivity and quantity of the Mejhoul fruits in the State of Palestine, was conducted in two model fields, both of which were planted with Mejhoul trees. This allowed researchers to conduct the operations of vertical and ground date palm tree cultural techniques, within the project parameters designed by ACSAD. The results obtained showed that potassium fertiliser rates had an impact on the fruit size, where the best fertiliser intake to produce the best fruit type was 8kg of potassium sulfate per tree. The fruit weights were close between 6-8 in the frond, and between 40 to 35.

EVALUATION OF THE MEJHOUL VARIETY PLANTED IN MODEL FARMS

This project was conducted in model farms located in the Kingdom of Saudi Arabia. Nine date varieties planted in the model fields were studied and evaluated: Shishi, Ashrsi, Barhi, Mejhoul, Nabout, Saif, Sakai, Rothana, Thawri, and Deqlet Noor. The results of the Mejhoul variety's assessments were as follows: *(Table 1)*

PROPAGATION OF THE MEJHOUL VARIETY BY TISSUE CULTURE

As a result of the expansion of date palm cultivation in Arab countries, and with date palm cultivation facing the serious threat of the Red Palm Weevil, which has wiped out large areas of date palm plantations, the demand for reliable and high quality date palm varieties has increased, particularly the demand for the Mejhoul variety, which is popular in both the Arab world and internationally. ACSAD continues to pay great attention to this date variety and its tissue culture multiplication process, where a special protocol was set to this purpose. *(Figure 2.)*

Table 1:

The results of the Mejhoul variety's assessments were as follows:

Number of planted trees	Number of studied trees	Number of days from the pollination process until fruit maturity	Maturity date
20	**3**	**145**	**Average early**

Production indicators

Average number of date palm inflorescences	Average number of spikelets per inflorescence	Average number of fruits in a spikelet	Average weight of fruits in an inflorescence	Average tree productivity/kg
8	**48**	**11**	**9.92**	**79.41**

Fruit quality indicators

Consumer phase	Texture	Length/cm	Width/cm	Shape	Size/cm³	Weight/g	Color *Soft*	*Dry*
Soft and dry date	**Half dry**	**4.79**	**2.5**	**Rectangular oval**	**16.8**	**18.8**	**Yellowish Brown**	**Brown**

Pulp weight/g	TSS %	Total sugar %	Humidity %	Seed specifications *Size/cm³*	*Width/cm*	*Length/cm*	*Weight/g*
17.5	**80.7**	**77.4**	**10.56**	**1.1**	**1.0**	**2.39**	**1.3**

Figure 2: Various stages of propagation of the Mejhoul variety by tissue culture technique.

Chapter four

Mejhoul Cultivation in the World

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Mejhoul cultivation in the MENA region

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MEJHOUL VARIETY—*"The Jewel of dates"*—

التُّمُورْ

The Mejhoul date palm in the MENA region

— Prof. Ibrahim Adam Ahmed Al-Dukheri —

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The aligned and updated strategy for the Arab Organization for Agricultural Development (AOAD) focuses on sustainable management of the natural resources underpinning various farming systems that secure food for population and promote development of the agricultural sector. The environmental challenges that impede development of the sector are many – with climate change and desertification, of the most challenging.

Certain crops, indigenous to the region, including the date palm, have shown significant adaptation capabilities and are likely to play a major role in combating desertification in the future – if properly managed and configured seriously in the oasis farming systems of the region.

The date palm has an economic importance apart from its adaptability to the harsh environment of the Middle East and the Arab Region in particular. Enhancement of the economic value of the crop is a prerequisite in convincing growers in the region to expand growth areas and intensify management of the crop, in order to attain the highest possible return – leading to expansion of green areas in the region.

The Mejhoul date variety has a considerable market value and offers the highest potential return worldwide. So far, the experience of producing Mejhoul dates in the Arab Region has proven a considerable success. Therefore, the region has huge potential to expand production of the Mejhoul, thus reinforcing the capacity of the region to mitigate and adapt to climate change through massive forestation programmes, which will be justified and supported on economic grounds.

Information below portray the activities, engagement and success of the Mejhoul date palm in the Arab region, which may set the scene for enormous future potential.

HISTORY ON THE ORIGIN OF MEJHOUL DATES

The nomenclature of date cultivars is confusing because of the long history of cultivation, wide exchanges of germplasm, dioecism, and seedling propagation. Thousands of named date cultivars exist in the Arabian Peninsula, Middle East and North Africa (MENA), but the exact numbers are unknown. For many cultivars, large numbers of synonyms and homonyms exist between and within countries. The transliteration of Arabic names into other languages further complicates the issue, and there are usually several transliterations of a single Arabic name. Although there are many cultivars of dates, some have become pre-eminent in the world market (Krueger, 2001; Nixon, 1950).

Mejhouls are often informally known as the "king of dates," the "diamond of dates," or the "crown jewel of dates" in reference to their elevated position. They are what is known as a "soft" date. The fruits are usually categorised as soft, dry, or semi-dry in reference to their texture and taste. Soft dates are usually considered to be the most exquisite, in part because of how much harder they are to grow, as well as how much more susceptible they are to loss by birds and insects.

Krueger (2001) stated that Mejhoul dates came to the USA from North Africa/Morocco. Since their introduction, they have played an incredibly important role in the cultures of this diverse area of the world. Elhoumaizi (2006) presented the hypothesis that the Mejhoul is a landrace variety in Morocco and it is not genetically uniform. Chao (2007) stated that the Mejhoul originated in the Tafilalt region of Morocco.

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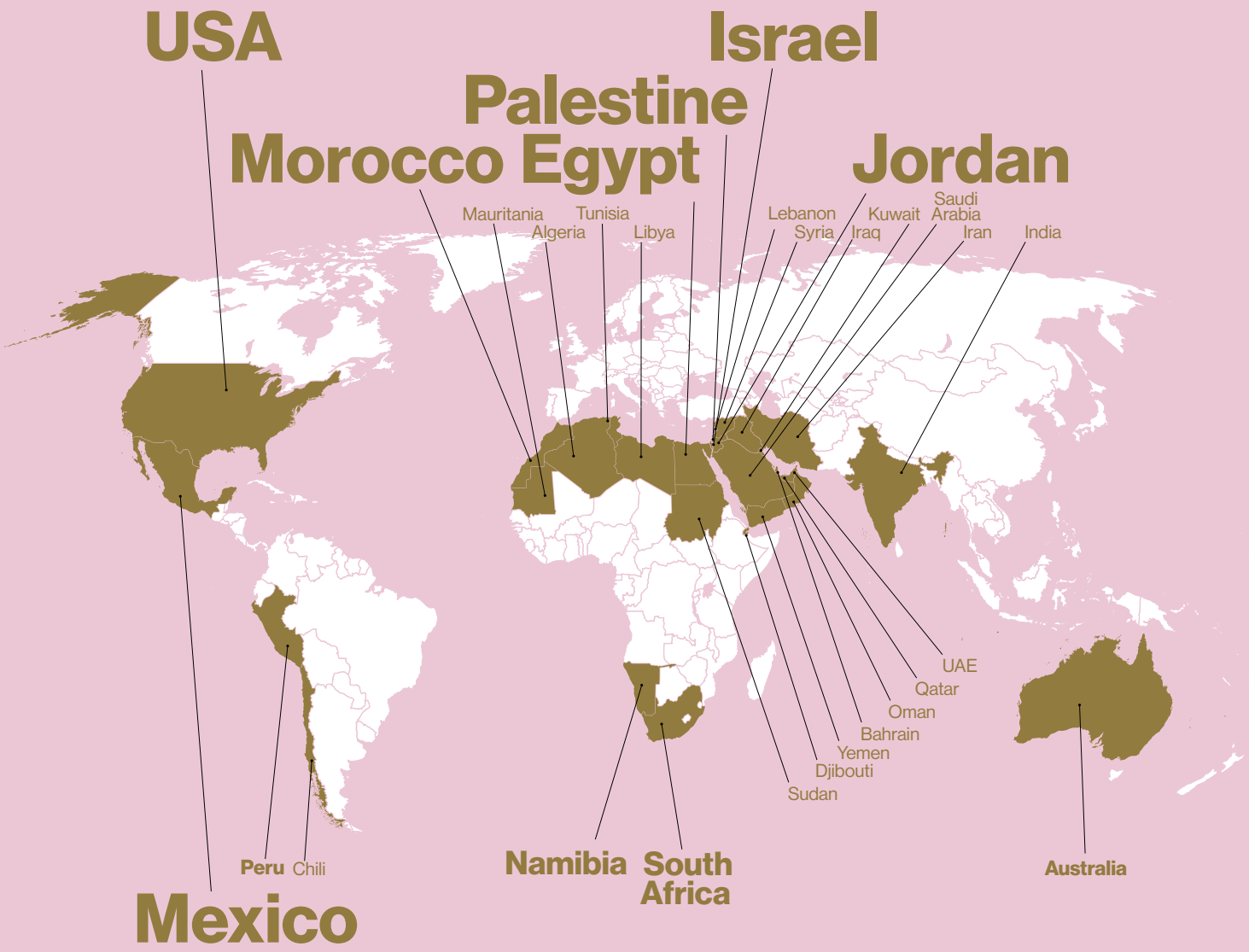
Mejhoul producing countries in the world



MEJHOUL VARIETY—*"Rich Culture Sweet Future"*—

—Mejhoul cultivation in the MENA region—

Hashemite Kingdom of Jordan

Date production is highly concentrated in the Jordan Rift Valley, which extends along the entire western boundary of the country. According to a 2005 survey, Mejhoul is one of the most important date palm cultivars in Jordan (Rumman and Al-Zubi, 2014; Johnson et al., 2015). The Mejhoul date palm is most commonly found in the Jordan Valley, WadiAraba, Gweera, and southern and central Aghwar. It is not suitable for cultivation in the northern regions of the Kingdom, because of inadequate weather conditions. The cultivated areas of the Mejhoul palm have reached approximately 2,000 hectares of land, out of which 1,000 hectares are cultivated with 240,000 productive palm trees. The remaining 1,000 hectares are cultivated with newly-planted Mejhoul palms trees yet to start the production cycle.

State of Palestine

The Mejhoul is one of the finest dates produced in Palestine, regionally and globally. The Palestinian Ghor region (the Palestinian area of the Jordan Valley) possesses a comparative advantage for growing Mejhouls. After 1967, considerable areas of the Jordan Valley were cultivated with new high-quality date palm cultivars including the Mejhoul. The adaptability of the new cultivars, and the use of advanced techniques for date propagation and cultivation, produced a crop of excellent quality and yield to supply to local and international markets. In 2012, the total harvested area of dates in both the West Bank and Gaza was 725 hectares. In the West Bank, there were 85,000 date palms spread over 600 hectares, with a production capacity of 2,300 tonnes in 2012. However, the total date fruit production in Gaza was about 1,300 tonnes, with Hayany as a major cultivar in Gaza and Mejhoul in the West Bank. The average annual per capita consumption of dates in Palestine is 0.6kg (abu-Qaoud, 2015).

However, the entry of Palestinian Mejhoul dates into European markets depends not only on the growing capacity but the ability to compete with other countries, especially Israel. Israel remains a major supplier of dates to the Palestinian market. Several constraints face date cultivation and development, including limited water, pests and diseases, high investment costs, poor marketing, and inequitable competition with Israeli products. However, there is a trend by formal governmental agencies as well as by national non-government organisations (NGOs) to support the cultivation of date palms in Palestine. For example, the Palestinian Ministry of Agriculture has initiated several programmes to support date palm cultivation in the Jordan Valley since 2000, with local NGO participation.

State of Israel

In the 1970s, Israel imported thousands of Mejhoul trees from California (Bernstein, 2004). Expansion of dates into a major crop occurred throughout the Jordan and Arava Valleys (Glasner, 2004). The entire date palm industry subsequently shifted to Mejhoul production. Since 1990, the cultivated area of Mejhoul orchards has multiplied tenfold, and the total Mejhoul yield has increased by 17 times. This process resulted in turning the Israeli date industry more and more into a monoculture producing mainly Mejhoul fruit. Currently, more than 70 % of date palm trees in the orchards are of the Mejhoul variety. In the years ahead, future planting will make the Mejhoul's supremacy even more pronounced, as new plantations of Mejhoul are regularly being planted.

Kingdom of Saudi Arabia

It was noted by Aleid et al., (2015) that some Saudi framers were particularly interested in the cultivation of foreign elite cultivars such as the Mejhoul. An estimated 9% of Al Riyadh farms 50% of Al Qassim farms are planted with the Mejhoul variety. Recently, Rizk recorded the presence of Mejhoul cultivars in Al Medinaht (Rizk Report of Al Medinah date palm, AFTIAS, 2021).

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MEJHOUL VARIETY—"Rich Culture Sweet Future"—
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State of Kuwait

The Mejhoul is one of six major cultivars (PAAFR 2003) in Kuwait. However, a total of 40 cultivars have been reported as growing throughout the state (Al-Mudaires, 1992). While a few local nurseries imported tissue culture-derived date palms from the UK and France, most of the imports were the Barhi variety. Other cultivars, such as Khalas, Mejhoul, Nebut Seif, and Suckari were also imported, but in small quantities. Generally, there are several date palm cultivars with commercial potential in Kuwait. However, the Barhi, Khalas, Suckari, and Mejhoul varieties are considered of superior quality for commercial production (Sudhersan et al., 2015).

Arab Republic of Syria

The Mejhoul is one of the most important cultivars in Syria. Mejhoul is among several date palm plantlets propagated through tissue culture that were introduced from the Maghreb countries. The survival and success rate of these plantlets has been 100% (Haider, 2015).

Sultanate of Oman

To aid in the preservation of the extensive genetic diversity of date palm in Oman, the Ministry of Agriculture and Fisheries Wealth carried out various trait analyses to map their usage for large-scale propagation through tissue culture. The Mejhoul variety is in the scope of this work (Al-Yahyai and Khan, 2015). In these analyses, the Mejhoul performed distinctly from the rest of the date palm genotypes (Al-Ruqaishi et al., 2008).

Arab Republic of Egypt

The Mejhoul is among the most exotic date palm cultivars in Egypt. Mejhoul cultivars are planted at farms in the governorates of Giza, especially in the Bahariya Oasis, New Valley, Minya, and Luxor (El-Sharabasy and Rizk, 2019). Over the last two decades, more attention has been given to the evaluation of introduced date palm cultivars under local conditions, including foreign germplasm, and the Barhi and Mejhoul cultivars have been used commercially since their involvement in crop improvement programmes (Bekheet and El-Sharabasy, 2015).

المَجْهُولْ

Mejhoul cultivation in the Kingdom of Morocco

دُرَّةُ

— Dr. M. A. Elhoumaizi —

The date palm (*Phoenix dactylifera L.),* is one of the oldest and ancient crops in Southwest Asia and North Africa. Although the date palm is mostly cultivated for fruit, it is also grown in many countries as an ornamental plant or as a landscape tree (Chao and Krueger, 2007). The date palm tree offers a wide range of benefits. It contributes significantly to environmental balance and it thrives in severe climatic conditions.

In Morocco, the date palm is grown in several zones located on the southern side of the Atlas Mountains, along rivers and around water points. The date palm is grown mainly in regions situated in the southern and north-eastern parts of the country. The date palm is the pivot of the oasis ecosystem of the Moroccan Saharan and pre-Saharan regions, and the providential tree for more than four million inhabitants.

The surface area for date palm production in Morocco is estimated to be close to 60,000 hectares, with most date palms concentrated in the oases of Draâ -Tafilalet (77%), Sous Massa (15%), Oriental (5%) and Guelmim Oued Noun (4%) (MAPMDREF, 2021a).

The consumption of date fruit occurs mainly in the east and south-east oases of Morocco, where dates represent an essential diet component for the population. In the cities, date consumption becomes important during the Ramadan fasting month and Achoura, another religious feast (Toutain, 1973 and Chettou et al., 2005). *(Figure 1.)*

In 2017, total date production from Morocco was reported to be 129,562 tonnes (FAOSTAT, 2019). This comprised over 400 cultivars including a high proportion of Khalts (mainly originated from seed) and other high-value varieties such as Boufeggous, Mejhoul, Bouskri, and Aziza Bouzid (Hasnaoui et al., 2010).

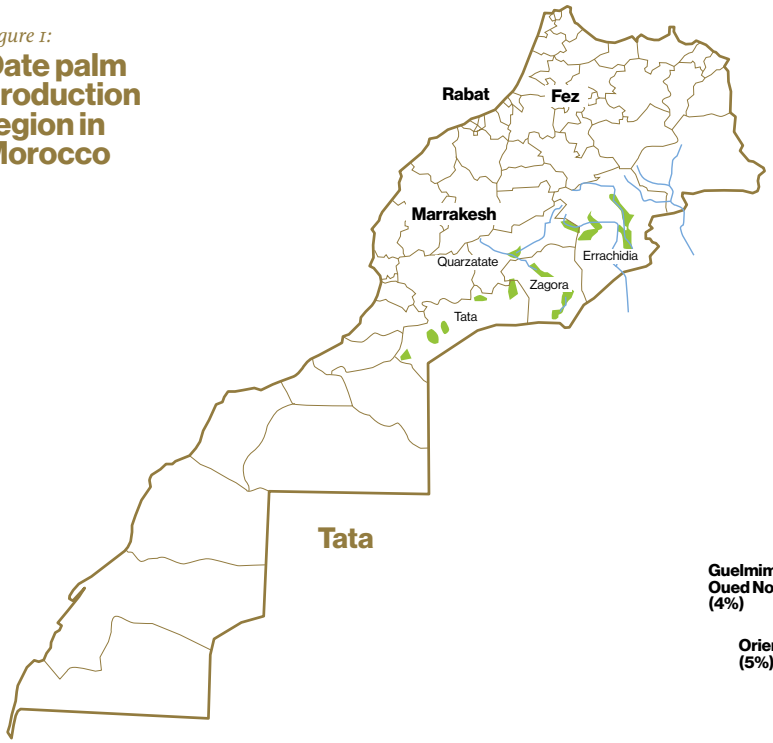
Morocco continues to import 60,000 tonnes of dates each year, mainly from Tunisia, especially Deglet Noor, the most widely marketed cultivar (about 90%) in Europe (APIA, 2008). Annual consumption of dates is estimated at 2.82kg per person. However, in more than 68% of cases, this consumption occurs on an occasional basis, particularly in the month of Ramadan.

Between 2008 and 2019, the area of land dedicated to the date palm increased by 25%, from 48,000 hectares to 60,000 hectares. Date production increase from 68,000 tonnes between 2003 and 2007 to 102,000 tonnes between 2010 and 2019. These figures are likely to increase in the next years due to new intensive specialised and mostly monovarietal date plantations, rapidly developing at the oasis outskirts. These plantations consist mainly of the 'Mejhoul' cultivar, with other valuable cultivars planted only in some cases. For example, the recently developed Nadja cultivar is resistance to Bayoud disease, and continues to be grown in some heavily infested areas (Sedra, 2003). *(Figure 2.)*

MEJHOUL VARIETY—*"The Jewel of dates"*—

Figure 1:

Date palm production region in Morocco



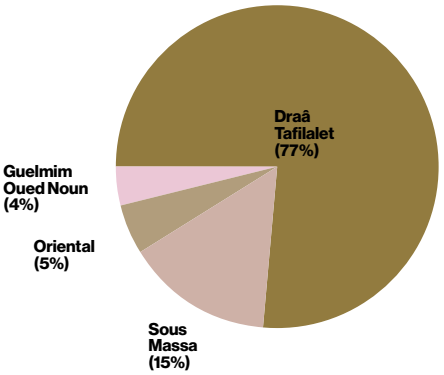
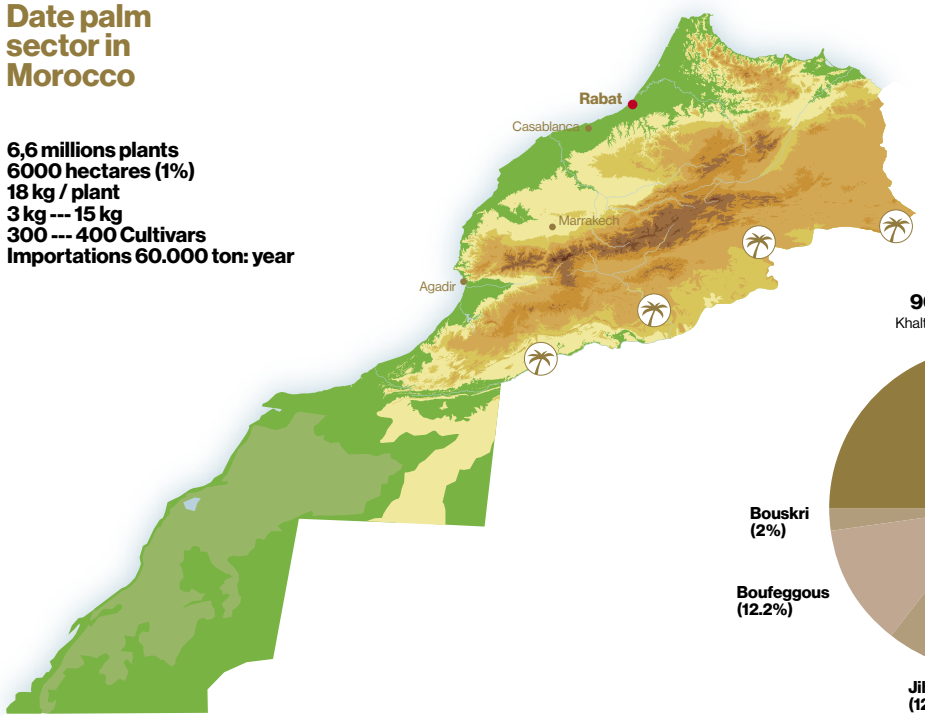


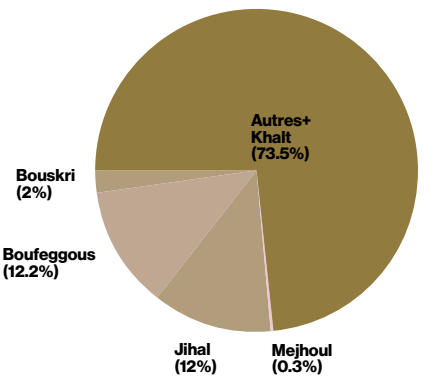
Figure 2:

Date palm sector in Morocco

6,6 millions plants
6000 hectares (1%)
18 kg / plant
3 kg --- 15 kg
300 --- 400 Cultivars
Importations 60.000 ton: year



90,000 ton / an
Khalts (not identified varieties)



HISTORY OF THE MEJHOUL CULTIVAR

There are an estimated 1,000 cultivars of date grown worldwide. Date palm cultivars were continuously subjected to natural selection imposed by their immediate environment, geographical locality, and agricultural practices. The 'Mejhoul', 'Medjoul' or 'Medhjoul' dates are one of the most popular date cultivars in Morocco, as well as in many parts of the world.

The Mejhoul date is originally from Boudenib in Morocco, but has spread around the world. It is of high commercial value and is considered to be one of the best exported dates with regard to its fruit quality and size in comparison with other cultivars. It was enjoyed exclusively by royalty and reserved for lavish celebrations, thus inspiring the titles "The King of Fruits" and "The Diamond of Fruits". The Mejhoul variety currently represents 0.3% of the total date production in Morocco and 70% of the new plantations developed within the Green Morocco Plan (GMP).

Until 1927, Morocco was the exclusive grower of Mejhoul date palms. The introduction of the Mejhoul date to the Western world came when disease nearly wiped out all date palm trees in the oases of southern Morocco. To save the Mejhoul fruit from extinction, 11 date palms were sent to the USA in 1927 by Dr Walter Swingle. These 11 offshoots were planted, and nine survived.

In 1934, the surviving date palms were moved to Coachella Valley in Southern California. Those offshoots are now responsible for the millions of Mejhoul dates found all over California, and in many parts of Arizona and indeed, the world. The propagation of the cultivation of the Mejhoul cultivar was carried out in two periods, first by offshoots (before 1995) and later by in vitro plants.

—Distribution of the Mejhoul in Morocco—

TRADITIONAL OASIS

In old plantations, almost 90% of the Mejhoul cultivar is cultivated in the region of Errachidia (ORMVAT, 2011). The Erfoud region remains the main supplier of Mejhoul in Morocco. Mejhoul date production is concentrated especially at traditional palm groves.

The productivity of the Mejhoul cultivar varies according to the irrigation conditions and the state of the plantations. However, average productivity is estimated at 42kg/plant. The Mejhoul cultivar is subjected to various phytosanitary problems that hinder its development and extension – the most significant being Bayoud disease.

In 2011, the total number of Mejhoul trees in Morocco was estimated at 15,1261, of which 72,584 were productive with an average annual production of 2,900 tonnes (ORMVAT, 2011). *(Figure 3. and table 1.)*

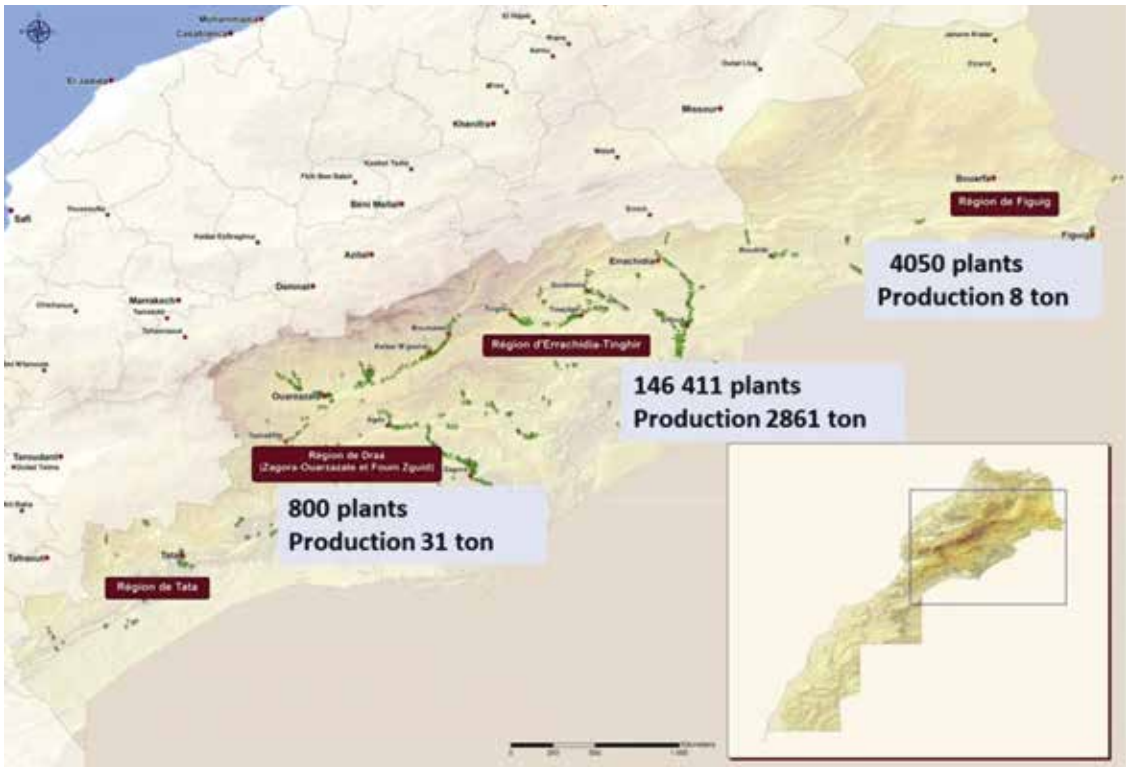


Figure 3: Mejhoul distribution in Moroccan traditional oasis (*2011*).

Table 1:

Mejhoul distribution in Moroccan traditional oasis (2011)

Regions	Tree number	Productive Trees	%	average yield / trees	Prod. tons
Erfoud	**67250**	**32850**	**49**	**40**	**1314**
Kheng	**13900**	**7425**	**53**	**40**	**297**
M'daghra	**11300**	**3740**	**51**	**40**	**150**
Ferkla-Tinejdad	**10250**	**5263**	**51**	**40**	**211**
Oued Naâm	**8906**	**4500**	**59**	**40**	**180**
Aoufous	**8800**	**5628**	**52**	**40**	**225**
Goulmima-Ghéris	**8000**	**1398**	**17**	**40**	**56**
Mellab-Touroug	**7000**	**4150**	**59**	**40**	**166**
Rteb	**6710**	**4300**	**64**	**40**	**172**
Figuig	**4050**	**300**	**7**	**27**	**8**
Alnif	**3545**	**1950**	**9**	**40**	**78**
Mezguita Agdez	**800**	**600**	**75**	**52**	**31**
Aïn Chouater	**750**	**480**	**40**	**64**	**12**
	151261	72584	42	45	2900

NEW PLANTATIONS

The Moroccan Government developed the Green-Morocco Plan (2008–2020) (GMP), a national agriculture strategy with the aim of improving food security and promoting inclusive economic growth through strengthening the resilience, sustainability and competitiveness of the agriculture sector and tackling structural inequalities (MAPMDREF 2021a).

The GMPs objectives for the date palm sector were as follows:

¶ To plant three million palms resistant to Bayoud disease in 10 years

¶ To make Morocco a date-exporting country, by producing 185,000 tonnes in 2030

Date production in Morocco has multiplied by 2.3 times, with a record date yield of 149,000 tonnes in 2020. The number of date palm trees in Morocco is estimated at 6.9 million, of these 2.7 million were planted within the framework of the GMP (118% of the objective set). This includes 1.5 million for the densification of traditional oases and 1.1 million in extensions, especially in the Meski-Boudnib region.

Region	*Tree number*
Oued Naâm	439552
M'Daghra	145231
Erfoud	119304
Kheng	28197
Ferkla Tinejdad	25189
Bouânane	25165
Goulmima Gheriss	21609
Mellab	12500
Aoufous	12400
Ain Chair	10086
RTeb	8200
Aghbalou	7893
Alnif	4250
Tadighoust	2443
Total	**862019**

Table 2: Mejhoul cultivar distribution in Moroccan traditional oasis and new plantations, Errachidia region oasis *(ORMVAT, 2020).*

The most significant new date plantation is based in the axis level of the Meski-Boudnib (Errachidia region). The cultivar profile of this plantation is mainly Mejhoul (79.3%) and Bouffegouss (16.1%), with Najda, Bouskri, AbouIjou, Boufeguous Gharass, Aziza Bouzid and Oum Nhal also represented. Foreign cultivars from other countries namely the Deglet noor, Berhi and Khalass also feature (ORMVAT, 2020). *(Figure 4., figure 5. and table 2.)*

MEETING THE GMP'S GOALS

Traditional propagation via offshoots is simply not enough to meet the present-day date palm tree demand, and the targets set by the GMP. Conversely, micropropagation has shown promising signs as a better large-scale propagation method for cultivating date palm trees. In Morocco, there are eight tissues culture laboratories producing in average 400,000 plants per year. Of these, 80% are of the Mejhoul variety. *(Figure 7.)*

In February 2020, the Government of Morocco launched its second strategic plan for agriculture. The new plan, named "Generation Green (2020-2030)" represents a continuity of the Green Morocco Plan (GMP), and sets out an agricultural development strategy through to 2030 (MAPMDREF 2021b).

The new plan has two major pillars:

¶ Develop a new agricultural middle class representing between 350,000 and 400,000 households by supporting young entrepreneurs through the mobilisation of one million hectares of collective lands.

¶ Promote human and social development.

As part of the Generation Green strategy, the national date palm planting programme provides for the planting of five million date palm trees, including four million in the Draa-Tafilalet region, with 2.4 million trees for the densification of traditional oases and 1.6 million trees for extensions.

(Figure 8.)

Area Mejhoul in traditionnel oasis in Morocco (2011)

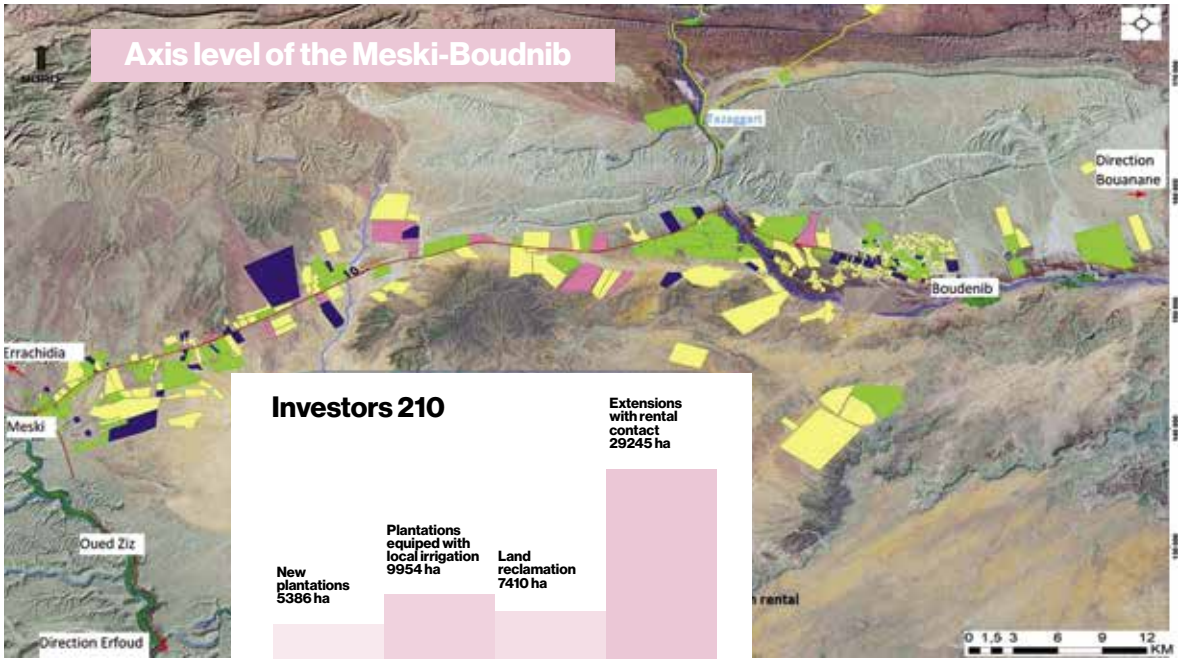
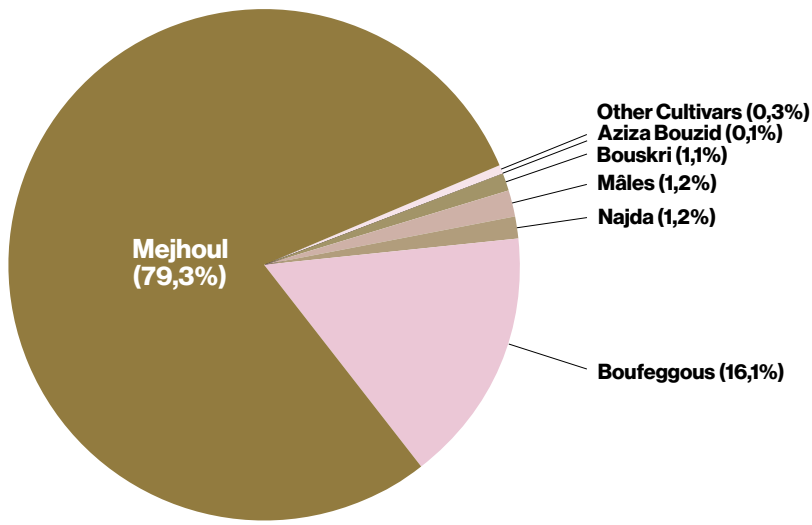


Figure 4: Mejhoul cultivation area in traditional oasis of Morocco (2011).

Figure 5:

Mejhoul distribution in Moroccan traditional oasis and new plantations, Errachidia region oasis (ORMVAT, 2020)



THE MEJHOUL DATES OF TAFILALET

Given its high commercial value, and traditional position in the domestic market, the Mejhoul dates of Tafilalet are uniquely positioned within the core of the development strategy of the GMP and its successor, Generation Green. This cultivar of date was the first to receive a labelling of a distinctive sign of origin and quality as Protected Geographical Indication (PGI) in 2010. The PGI name is used to identify a product as originating from a territory, region or locality, where a quality, reputation or other characteristic of that product can be attributed essentially to that product, and where production or processing takes place within the defined geographical area (MAPMDREF, 2019 c).

The geographical distribution area of the Mejhoul date palm is estimated at 32,500km², concentrated in the Errachidia province.

The geographical area granted the right to produce Mejhoul dates of Tafilalet is composed of 30 rural communities spread across the provinces of Errachidia and Tinghiri in the oasis of Tafilalet. This boundary delimitation is sufficiently wide to generate a variability of Mejhoul dates including the effect of the microenvironment associated with knowledge farmers (MAPMDREF, 2019c).

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THE 'MEJHOUL ROAD'

The 'Mejhoul Road' s the nucleus for the development of ecotourism in the oases. It has evolved from a tourism circuit to a territorial brand. The idea of the Sustainable Territorial Development Program of Tafilalet Oasis is to protect the oasis heritage and nature by introducing tourism products enhancing this goal. The main product is the "Mejhoul Road", initiated to create a specific area and image that enhances ecotourism efforts (Programme Oasis Tafilalet, 2016).

Figure 6: Tissues culture laboratories in Morocco.

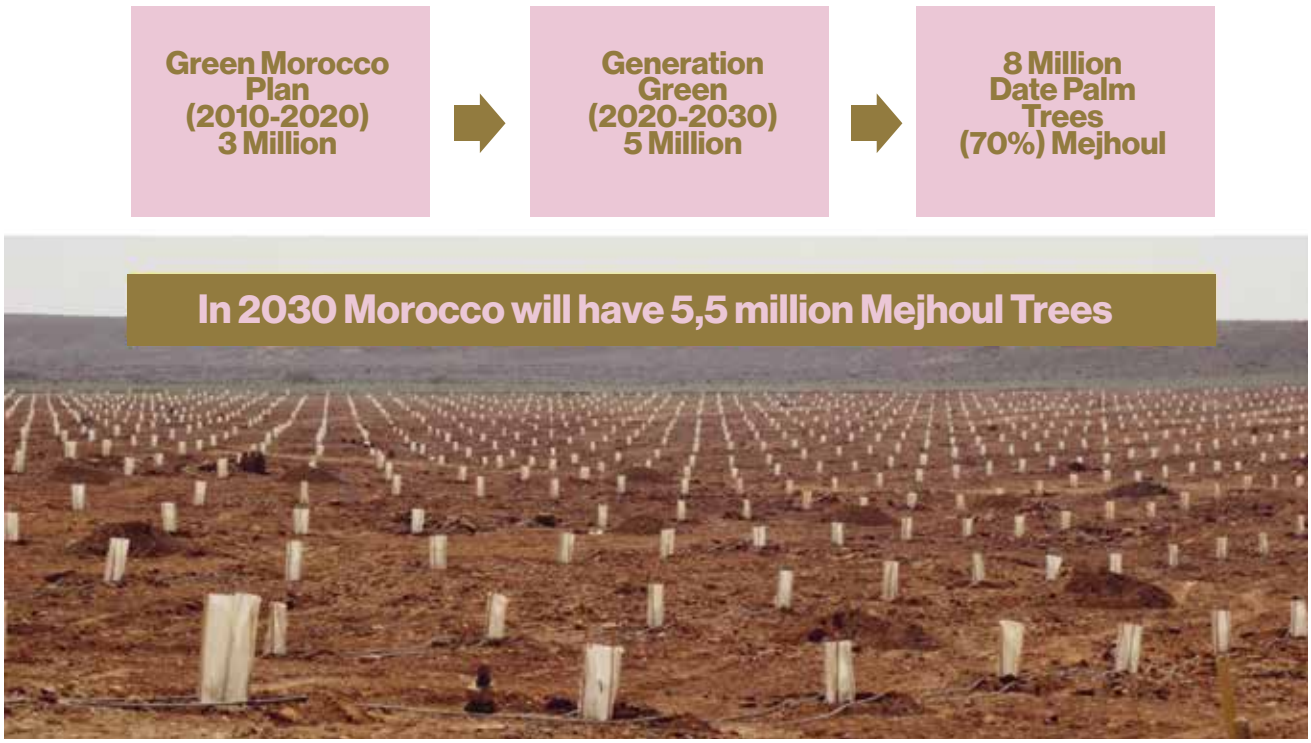

Figure 7: the Generation Green strategy, the national date palm planting programme provides for the planting of five million date palm trees.

Figure 8: Area Mejhoul in traditionnel oasis in Morocco *(2011).*

Khalifa Award Photography Competition
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MEJHOUL VARIETY—*"The Jewel of dates"*—

التُّمُورْ

The introduction of the Mejhoul variety to the United Arab Emirates

—— Prof. Samir Al Shakir and Prof. Abdelouahhab Zaid ——

In the United Arab Emirates (UAE), the date palm tree is part of the community and peoples' memory, as it represented a source of food, shelter, and living tools in the past. The date palm tree also symbolises the people's pride, which accompanied them when travelling, representing a cultural and social heritage.

A HISTORY OF THE MEJHOUL VARIETY IN THE UAE

The Mejhoul variety in particular, considered one of the most promising date varieties, was introduced to the UAE in several ways. It was first introduced in 1984, using Mejhoul offshoots that were gifted to the late Sheikh Zayed bin Sultan Al Nahyan, "May God Bless his soul" by Jaques Chirac, who served as President of France from 1995 to 2007. The offshoots were planted at His Highness' private farm in the area now known as the Kuwaitat Station for Horticultural Research. *(Figure 9.)*

In 1994, His Excellency (H.E.) the late Abdullah Al Masoud (former Chairman of the National Advisory Council in Abu Dhabi), introduced 200 Mejhoul offshoots to the UAE, which were planted at his farm (Ghomad), located in the AlHayer-Nahel area, between Abu Dhabi - Al Ain Road. In 1996, the process was repeated, and 550 new date palms were planted, on a density of 6×6 meters. The technical team at the farm were trained by Israeli experts and specialists in this field. This helped the experiment gain great success, and the date palm trees started producing fruits.

H.E. Al Masoud was motivated by this success to expand the plantation area, while continuing to plant more Mejhoul offshoots in different locations. A total of 1,500 Mejhoul date palm trees were planted in Liwa, 2,000 in Ghomad, 850 in Al Dhaid, and 650 in Al Twain in AlFujairah, which were imported from Israel. The Mejhoul variety then spread widely across all UAE date palm cultivation areas, such as Liwa, Al Ain, Fujairah, Al Dhaid and others.

Date growers in the UAE and especially in the capital of Abu Dhabi, began to plant the Mejhoul variety in their farms in Liwa, Al Ain, Al Dhahra, Al Wegan, and other small number of farms, where this variety was introduced in the western region of Abu Dhabi Emirate (Liwa), in 2012, by a group of farmers. The Mejhoul variety soon proved its suitability to the environment, climate, soil and water, found in the Western region, and produced high quality dates. Soon, most farms in the region had Mejhoul date palms planted, with a minimum of three to five trees each. Farmers experimented with the environmental suitability, as well as the agricultural problems and challenges accompanying the date cultivation processes before and after harvest. The average production of one Mejhoul tree is about 50kg per year, which is not considered high, especially as most of the seedlings planted do not reach their adult stage.

INCREASED SUPPLY AND DEMAND ACTIVITY FOR THE MEJHOUL

In 2015, the Al Foah farm started receiving Mejhoul fruits and re-evaluated its prices. Instead of 5 dirhams/kg, the price was raised to 12 dirhams/kg, then 15 dirhams/kg, according to available information the company annually received only 5-6 tonnes, then the quantities began to increase, and farmers started selling their Mejhoul production directly to the markets, at which point the price per kilo exceeded 20 dirhams. Proving that the demand for the Mejhoul was likely to continue, more offshoots were imported from Jordan, and 5,000 were planted in 2016.

Despite the cautious demand for the cultivation of this variety, the Mejhoul has a promising future in the UAE, where we find significant growth in the number of trees planted across different regions, as the environment is suitable for its growth. There are also several tissue transplant labs that produce the Mejhoul variety inside and outside the UAE.

Figure 9: The first Mejhoul date palm tree, planted in Kuwaitat Area, Al Ain, UAE, in 1984. (*Photo taken by Dr. Samir Al-Shakir, 2018).*

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© *Shutterstock*

MEJHOUL VARIETY—*"The Jewel of dates"*—

المَجْهُولْ

Mejhoul cultivation in the Arab Republic of Egypt

دُرَّةُ

—— Dr. Amgad Ahmed El-Kady and Dr. Sherif Fathy El-Sharabasy ——

Egypt occupies the first position as the largest producer of palm dates in the world, with an annual productivity of about 1.65 million tonnes from about 16 million palm trees, equivalent to nearly 18% of the global production estimated as 9 million tonnes, and about 25% of the Arab production of dates estimated as 6.5 million tons. Due to the large area of Egypt (1 million kilometres2) and the diversity of the climate, many varieties of dates are produced.

The semi-dry date varieties – which are mostly desired in the global markets – represent about 17% of Egypt's date palm production, and is considered the main pillar in the strategy of developing the dates sector and export. The popularity of semi-dry date varieties has contributed to the great expansion in the cultivation of the Mejhoul variety, and some other varieties of high market value in the last 15 years, especially in the regions of Giza, El-Wadi El-Gedid, Aswan and Minya Governorates.

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THE PREFERENCE FOR THE MEJHOUL

The Mejhoul variety has many advantages, including the late ripening time, that has earned it the top spot in competition with other early-ripening varieties. In terms of specifications, it has a beautiful shape, large size and an appropriate sweetness ratio, which makes it desirable for export, especially to Europe and America.

In terms of agriculture, Mejhoul trees are not exposed to a large amount of environmental stresses that affects the pollination process at the beginning of the season, which reduces production costs and leads to good fruiting ratio.

The Central Egypt region is considered one of the best areas for growing the Mejhoul palm, and it starts from Giza Governorate in the north to Assiut Governorate in the south, and from South Sinai Governorate in the east to the western oases of Giza and El-Wadi El-Gedid and Matrouh governorates in the west. Mejhoul can be grown in many other areas in Egypt, but it needs to apply some additional techniques to reach the high quality.

It is necessary to provide suitable environmental conditions for Mejhoul cultivation, especially the appropriate weather conditions, where it thrives in areas with moderate temperatures and humidity, as it grows best between 13°C to 37°C. It is not suitable for cultivation in areas with a lot of rain in the summer, especially during the stage of fruit ripening, and also in areas with long winters. Mejhoul trees are grown in many types of soil, but it is preferable to be planted in sandy or yellow lands with good drainage to obtain a good quality crop, while heavy black soil causes a decrease in the quality of the crop.

MEJHOUL CULTIVATION

Mejhoul cultivation goes through several stages of growth, which ends when the fruit reaches the semi-dry ripening stage (moisture content 23-24%), in which the fruit develops a wrinkled shape, distinctive colour, and becomes suitabile for consumption and marketing.

Thanks to the appropriate climatic conditions, Egypt is one of the best countries for cultivating Mejhoul. But Egypt also has strong advantages due to the availability of production inputs, human resources and trained labour at an appropriate cost, and the necessary land areas. Egypt's geographical location, shipping lines, and trade agreements with many countries of the world also allow for increased competitiveness in exporting the products, beside the availability of a large and growing local market due to the annual increase in the population and the growing awareness of the consumption of palm dates in general because of its high nutritional and health value.

دُرَّةُ

Figure 10: Bachdou cemetery, Deir Al Madina, Luxor, Arab Republic of Egypt.

MEJHOUL VARIETY—*"Rich Culture Sweet Future"*—

THE MEJHOUL INDUSTRY IN EGYPT

Egypt includes tens of investment farms specialised in the cultivation of date palms and the production of dates, containing hundreds of thousands of Mejhoul palms cultivated in the last 15 years. These farms rely mainly on the import of seedlings that are subjected to strict control by the Central Administration of Agricultural Quarantine at the Egyptian Ministry of Agriculture and Land Reclamation, which is responsible for ensuring the quality of imported seedlings, and to prevent the transmission of pests and diseases.

Most of these modern farms apply organic or clean farming systems to ensure the production of chemical free dates, and most of these farms are certified to international quality certificates such as Global Gap – GRASP.

INNOVATIONS IN DATE CULTIVATION

Cold stores, sorting and packing stations for these farms are also available according to the latest technologies, most of them are certified to international quality certificates such as BRC - ISO22000 - FSSC22000. One of these refrigerated warehouses – with a storage capacity of 4,000 tons – was established in El-Bahariya Oasis – Giza Governorate as a part of the continuous fruitful cooperation with KIADPAI with a grant from the UAE.

The number of Mejhoul date palm trees in Egypt is currently about 1.4 million, of which about 600,000 are fruitful, with an average productivity ranging between 60-70kg per palm. The total productivity at the present time reaches more than 3,000 tonnes annually, increasing at an annual rate due to the increase the number of fruitful palms cultivated in the last few years, and due to the new Egyptian and Arab investments in this sector.

The Egyptian Government encourages investment in Egypt in general, and the political leadership pays special attention to the date palm cultivation and date production sector in Egypt. This is in recognition of the varieties of dates with high market value, as the date palm sector is considered one of the most promising sectors for achieving the sustainable development and for increasing exports. Therefore, the Egyptian Government supports its exports by several mechanisms, including providing financial support for exports.

In this regard, since 2018, the establishment of the largest date palm farm in the region has started on an area of 40,000 acres that accommodates 2.5 million date palm trees in El-Wadi El-Gedid and Aswan Governorates for the cultivation of different types of date palms, where in the last two years, more than 700,000 Mejhoul date palm trees have been planted. This mega-project – which is gaining the attention of the political leadership in Egypt – is also establishing refrigerated and frozen warehouses, sorting and packaging stations, and various production lines to maximise the added value that can be derived from the date palm.

المَجْهُولْ

Mejhoul date cultivation in the Hashemite Kingdom of Jordan

دُرَّةُ

— Eng. Anwar Haddad —

"The Holy Palm Tree" was known to exist in Jordan more than 3,000 years ago, at Aqaba city, and the date palm tree's existence has been linked to many historical events that took place in the region throughout history.

Interest in planting the Mejhoul variety of date palm in Jordan started in the last century, with the late forgiven King Hussein Bin Tallal. His Highness was the first to plant the Mejhoul date tree in the royal farms in the Jordan Valley.

However, the expansion of the Mejhoul date variety to be grown as an economic investment and on a commercial scale started in the mid 1990s, according to a study by an agricultural credit cooperation expert team headed by Anwar Haddad, Chairman of the Jordan Dates Association. The study identified the best areas in which to plant the Mejhoul variety, and others. The study also drew the roadmap for the date palm farmers of Jordan, addressing their concerns at date palm planting, specifically the harder to cultivate Mejhoul date. Farmers like Khalab, Arar, Ayash and many others, adopted the expansion idea in growing the Mejhoul variety until the area planted reached 35,000 acres in 2019. Of this total, more than 80% is planted with the Mejhoul date.

THE CONTINUED EXPANSION OF THE MEJHOUL

Trends suggest that the annual rate of Mejhoul date production is increasing by 10-12% each year. Most of the areas planted with the Mejhoul date variety are situated in the Jordan valley, concentrated in Dair Ala, Al Kahrama North Dead Sea, and next to the place where Jesus Christ was baptised. Date production is also extending to the South of the Dead Sea, toward the Wadi Araba and Aqaba Region, according to the water flow availability that is needed to irrigate the date palm. *(Figures 11. and 12.)*

THE JORDAN CLIMATE

The climate in Jordan is a mix between Mediterranean and Desert climate. In the Jordan valley, which is part of the African Rift hole in less than half an hour, one can move from areas 1,000 metres above sea level to areas 400 metres below sea level. In temperature terms, the Jordan valley is considered a 'natural greenhouse'. This extends from Al Bakora in the North, where the number of accumulative thermal units reaches 1,800 thermal hours and the humidity rate does not exceed 60%, passing through mid Ghour (2,100 thermal hours, humidity 51%) to Ghour Al Safi (2,500 thermal rate) to Aqaba in the South, which enjoys 2,400 thermal hours and a humidity rate that does not exceed 50%. The early rainy or the late seasons rarely influence the ripening or pollination of the date palm in its planting areas.

Therefore, the Jordan Valley is considered to have the perfect climate for the growth and improvement of the Mejhoul date variety, in terms of both temperature and humidity, and also in terms of accumulated temperature that exceeds 18°C. The Jordan Valley's high oxygen content and highest natural air pressure also help, due to the fact that the Mejhoul date planted area in Jordan is situated next to the Dead Sea, the lowest point in the world at 400m below sea level.

THE SPECIAL CHARACTERISTICS OF JORDANIAN MEJHOUL DATES

Jordanian Mejhoul dates have a unique taste, texture and flavour that makes them worthy of being awarded the geographical indicator certificate. These characteristics are attributed to the long duration of the growing season (about 23-25 weeks) and the development of Mejhoul fruits in the Jordan Valley under ideal temperature and humidity conditions. This gives the date the chance to grow and develop in size as well as flavour, developing its full and fleshy substance.

All physical and chemical transformations occur inside the fruit during the growth period under perfect temperature and humidity conditions. These conditions positively impact colour and texture and gives the Jordanian Mejhoul a distinguished fingerprint compared to Mejhoul dates produced in other regions around the world.

Figure 11 and 12: Mejhoul modern date farm in Jordan Valley.

MEJHOUL VARIETY—*"Rich Culture Sweet Future"*—

THE PRODUCTION OF THE MEJHOUL IN JORDAN

The Mejhoul variety of date forms the backbone of the date palms located in the Hashemite Kingdom of Jordan, and it is categorised within the soft dates category, in which its sugars consist of monosaccharides (glucose and fructose).

The production of Mejhoul dates in Jordan forms more than 70% of the total date production in the Kingdom and its export reaches more than 80% of dates exports outside the Kingdom, in terms of quantity and more than 90% in terms of value.

The production of Mejhoul fruit is estimated to be about 70kgs/tree although it can reach approximately 105kg/tree. On average, there are 160 date palm trees in one hectare. The monoculture system for Mejhoul date farms prevails in the Kingdom, as the palm is planted alone where palms in the orchard are not carried on temporary cultivation, such as citrus fruits or others.

Most date palm cultivation is carried out by small and medium-sized palm farmers. 63% of palm farmers own 67% of palm planted areas, categorised as 11-120 donum (one donum = 1,000 square metres). Farmers owning 12-250 donums reach a percentage of 4.3% and own about 28% of palm properties. Bigger palm farmers who own more than 250 acres (1.1% of palm farmers) their ownership reaches around 13% of the total properties, while the lowest category 11 acres (one hectare) reaches about 33% of palm farmers, they only own about 4.5% of the properties space. This category consists mostly of traditional farms, normal non-commercial brands in home gardens and oases that are mixed with different varieties.

Jordan exports around 15% of its Mejhoul dates of various quality levels to more than 15 countries around the globe. The most important countries for export are the UAE, Qatar, Morocco, the Lebanese Republic, the UK and Turkey, respectively.

The Jordanian Mejhoul export market has rapidly developed, and enjoys significant price increases on an average basis. In 2020, the estimated exported quantity was around 6-7,000 tonnes, with a market value of USD 50 million.

In 2020, Jordan ranked 13th among countries exporting and producing dates, in terms of quantity and value. Jordan is ranked 7th in terms of pricing (according to the International Trade Centre) even though the average Mejhoul price is affected in exporting other lower priced brands, like Al Barhi, which is exported in semi-ripe or khalal stages. Jordan competes with a limited number of countries producing Mejhoul dates despite the entry of newer date-producing countries like Egypt, RSA, Namibia, Mexico, Austria, KSA and Iraq, which all present varying degrees in Mejhoul specifications like colour, fiber ratios, fruit humidity, shape and sweetness level.

A Jordanian study carried out in 2019 in collaboration with the FAO found that the most important factors impacting this positioning are the quality, appearance, taste freshness and packaging. Other less important factors related to health, food safety, and country of origin respectively, while the price was one of four factors impacting the decision of purchase of Mejhoul Jordanian dates in the international market.

Recently, Jordan has updated the Jordanian standard on dates and especially Mejhoul dates. Mejhoul variety dates have now been classified into five size categories: (small, medium, large, jumbo, super jumbo) while the specification categorises Mejhoul dates as per the date's quality into three major grades: excellent grade, first grade, and second grade.

The most important quality standards are: separated skin; colour; appearance; size homogeneity; and being free of foreign bodies. Official and civil efforts are dedicated to improving the standing of Mejhoul dates in the Kingdom to ensure that date production and marketing adapt to the very latest international market demands.

المَجْهُولْ

Mejhoul cultivation in the State of Palestine

دُرَّةُ

— Dr. Mufid Fayez Al-Banna —

MEJHOUL VARIETY—*"Rich Culture Sweet Future"*—

التُّمُورْ

The date palm tree is considered one of the endemic trees in the region for thousands of years, especially in the southern and central regions of Palestine and the surrounding area. It is found also in the Jordan Valley, where large quantities of seed palm trees were found randomly in the Jordan Valley and Jericho areas until the mid-nineties.

DATE PALM CULTIVATION

Date palm cultivation in the Palestine region has developed rapidly during the past few years. Interest in the palm tree began at the end of the 1990s, when many date varieties were introduced, especially in the areas of the Gaza Strip, Jericho, (Al-Aghwar, Al-Naema, Al-Jaftlik, Tubas, Qabatiya, Al-Bayada,) and the northern Jordan Valley.

In the Gaza Strip, a comprehensive study at the end of the 1990s was conducted on the climate and the extent of the success of some date varieties, including Mejhoul, Al-Barhi, Al-Halawi, Al-Zahidi, and Al-Amri. The Al-Barhi and Al-Halawi cultivars were successful in some areas of the southern and the central regions, especially in the low-lying areas, while the Al-Zahidi cultivar succeeded to a medium degree.

AN INTEMPERATE CLIMATE FOR THE MEJHOUL

The Mejhoul variety has so far not been commercially successful, because of its need for high temperatures and high thermal units. The average cumulative thermal (heat) units in the Gaza Strip range between 1,800-1,900 thermal units, while the Medjool variety needs more than 2,800 to 3,000 units.

The area planted with date palm trees in Al-Aghwar, Palestine, was estimated at about 607 hectares in 2012, while the number of palm trees, according to the statistics of the Ministry of Agriculture until the end of June 2011, was estimated at about 85,000 trees. Most of these trees are of the Mejhoul type. As the intensive cultivation began in 2006 from different sources.

Currently, the area occupied by palm farms in the Jordan Valley is estimated to be 1,373 hectares, of which 107,772 are fruitful trees, and the rest are non-fruitful. The area is extending from Jericho and the borders of the Dead Sea to Bardala and Ain al-Bayda.

The main area in which the Mejhoul date palm is grown is Jericho, Al-Auja, Al-Jiftlik and Al-Zubaidat. Other than that, date palm cultivation is limited to the Barhi variety due to its tolerance of low temperatures compared to the Mejhoul. The numbers have doubled in the past ten years to about 250,000 to 300,000 palm trees, most of which are of the Mejhoul variety today.

MEJHOUL PALM CULTIVATION, SOURCES AND PLANTING DATES

Cultivation of the Mejhoul date palm spread intensively in 2006. There was a great interest in this species because of the good international specifications and high economic value. Further, the area planted with vegetables began to shrink as a result of water salinity, scarcity and markedly intolerance and economic feasibility in general.

The cultivation of the Mejhoul palm in the Jordan Valley and Jericho relied on various sources, including those imported by laboratories as tissue culture palms, and through specialised companies or related associations, including what is obtained from nearby farms or private nurseries in the region.

The planting of Mejhoul palms begins at the beginning of February until the end of May or at the beginning of October until the beginning of December. The planting is carried out regularly with a distance of 7-8 metres between one tree and the other. Each hectare contains 130 trees. The average yield per tree is 100-120 kg. *(Figure 13.)*

PRODUCTION AND INVESTMENT

In 2014, a study issued by the Palestinian Chamber of Commerce, Agriculture and Industry of Jericho and the Jordan Valley indicated that date

Figure 13: Mejhoul date palm plantation.

palm cultivation is a promising investment, as the production of dates doubled between 2012-2014 bringing the production quantity to about 4,000 tonnes, compared to 2,100 tonnes produced in 2012.

Currently, there are more than 1,300 hectares of date palm farms, the production of which reaches 30-40%. However, within four or five years, production is expected to reach a high degree of output, in terms of quantity and quality. Agricultural products exports accounted for the largest share in terms of number, with a rate of 43.8%, during August 2014, according to the statistics of the Ministry of National Economy.

EXPECTATIONS OF DOUBLING PRODUCTION

The total production of dates during the current year is estimated at 4,000 tonnes, representing a steady growth from last year, estimated at 1,000 tonnes. It is expected that production quantities will rise to 10,000 tonnes during the next four years, which requires doubling our export capabilities, and will require a marketing infrastructure compatible with this scale of production, especially that the current structure accommodates only approximately 1,500 tonnes.

STORAGE CAPACITY

The current capacity for storing and cooling dates reaches 1,500 tonnes. Given the expectation of producing up to 4,000 tonnes, we must work quickly to establish storage units and cooling units with a capacity of 2,000 to 3,000 tonnes during the current season. There are four to six factories for packaging and packing dates for export. The value of investment in the dates sector is estimated at USD200-250 million, and it provides approximately 4,000-5,000 job opportunities. Palestinian dates are exported to 25 foreign and Arab countries.

Palestinian dates depend mainly on the water of artesian wells, which distinguishes them with good taste, quality and high competitiveness, from the product of the settlements, which depend for their irrigation on untreated wastewater.

A PROMISING SECTOR THAT NEEDS A STRATEGY TO ORGANISE IT

The date production sector in Palestine, which is estimated at 4,000 tons this year, is a good percentage compared to the global production estimated at 50,000 tonnes, and it is expected to reach 20,000 tonnes over the next decade.

The date palm sector in Palestine is huge and in need of re-institutionalisation. It needs to introduce new development and strategic plans, in light of a production capacity that constitutes a third of the global production in the coming years. This strategy needs to include the provision of more by packing houses, refrigerators and storage points, without which some individual projects and personal investments may pose a tangible danger to the quality of date production, especially in the absence of strategic stores or a 'date bank', which helps in increasing marketing and storage capacity.

The most important problems faced by the date palm cultivation sector in Palestine are as follows. First, the lack of water security, as it uses surface wells, so it can stop at any moment, indicating that the water used for irrigation is salty and only suitable for palm cultivation. Second, cultivation requires developing and organising the relationship on a continuous basis, by linking the farmer with the merchant and the factory. Third, here is a weakness in the product marketing plans, and some take advantage of prices. And finally, there are currently restrictions hampering the introduction of pollen grains, pesticides and fertilisers, and the absence of sufficient and necessary support for farmers by official and non-official bodies at all stages of production.

MEJHOUL VARIETY—*"The Jewel of dates"*—

المَجْهُولْ

Mejhoul cultivation in the State of Israel

دُرَّةُ

—— Dr. Yuval Cohen and Mr. Baruch (Buki) Glasner ——

MEJHOUL VARIETY—*"Rich Culture Sweet Future"*—

التُّمُورْ

INTRODUCTION OF THE MEJHOUL TO ISRAEL

The Mejhoul is a large date cultivar that originated in Morocco. It was first introduced to Israel after a few offshoots were planted in the 1950s in the Southern Arava region in Yotvata. During the 1970s, more than 9,000 Mejhoul offshoots were imported from California. However, until the 1990s Mejhoul date orchards were limited and composed of fewer than 40,000 trees (cultivated on approximately 250 hectares). At that time, the small Israeli industry was based on other date cultivars originated in Egypt (Ameri, Hayany), Iraq (Barhee, Dayri, Helawi, Khadrawy and Zahidi) and Tunisia (Deglet Noor).

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Originally, Mejhoul was harvested, as most other date cultivars, as a fully dry fruit. It was a dark fruit with a very hard texture. In the 1990s, horticultural practices changed. Farmers started to harvest Mejhoul as a semi-dry fruit. The succulent texture of the semi-dry Mejhoul, and the large size of the fruit, made Mejhoul a commercial success, and export values developed, encouraging expansion of the industry.

INDUSTRY EXPANSION AND DEVELOPMENT

In the last 30 years, the Israeli Mejhoul orchards have multiplied more than 18-fold, reaching almost 700,000 trees on almost 6,000 hectares by 2020. The industry has increasingly turned into a monoculture based on Mejhoul as a single elite cultivar, which now comprises more than 80% of the planted date trees in Israel.

Annual production of Mejhoul has reached approximately 45,000 tonnes, and is expected to rise by an additional 30-40% with the maturation of the trees already planted in young orchards. The massive planting of Mejhoul has resulted in an expansion of the Israeli date industry, which has become an important crop for the Israeli agriculture.

The Israeli Mejhoul plantations are distributed along a narrow strip (only a few kilometres wide) in the Eastern part of the country, along the Jordan and the Arava rift valleys from the Sea of Galilee to the Gulf of Eilat (Gulf of Aqaba). This region is characterised by warm and dry weather.
A climatic gradient along this region determines dry desert conditions in the south and milder, sub-tropical conditions in the north. Mejhoul dates from northern orchards are usually darker, have a very soft, jam-like texture and suffer more from skin separation. By contrast, Mejhoul from the southern region, have lighter brown/amber colours, a drier and somewhat fibrous texture and are usually less prone to skin separation. *(Figures 14. and 15.)*

ENSURING HIGH QUALITY MEJHOUL DATES

As the Mejhoul date has evolved into an elite product, the quality of the fruit has grown to become a major concern for producers. Fruit had to be perfect in all aspects to achieve high prices. The two major factors determining the fruit quality perception are its size and the level of skin separation. Fruit loads affect fruit size. Protocols for early fruit thinning were developed to enable optimal fruit size without sacrificing on yield.

Skin separation is a phenomenon that is not yet fully understood. It has been suggested that skin separation occurs before fruit ripening, at the late stages of growth and colour change. Research has also suggested skin separation may result from increased air humidity conditions, but currently there is still no treatment to prevent the formation of affected fruits. In recent years a new and exclusive Mejhoul product has been developed, which is harvested at the Rutab stage, thereby having a higher water content (28-32%).

المَجْهُولْ

Figures 14.

Figures 15.

دُرَّةُ

Figures 16.

Figures 17.

التُّمُورْ

However, it is very hard to produce Rutab Mejhoul, the product has a short shelf life and is very vulnerable to microbial deterioration. Special protocols for cultivation, long term storage and shelf-life extension are being developed. *(Figures 16. and 17.)*

DEVELOPMENT OF NEW TOOLS FOR HIGHER QUALITY MEJHOUL

Israel has become the leader in Mejhoul date production. The importance of the crop demanded development of new tools and solutions for maximal efficiencies. Protocols for irrigation, fertilisation, pollination, fruit thinning and harvesting have been developed, and optimised, for different regions of the country. Mejhoul production is labour-consuming and efforts have also been made to develop solutions for labour reduction.

Cultivation of high quality Mejhoul require reaching the date crowns several times every year, for pollination, thinning, bunch management, harvesting and performing other tasks. The high stature of the date restricts efficient access to the crowns. It is impractical and dangerous to climb the trees by foot, or by using ladders. High platforms were therefore developed to enable fast and safe access of teams of workers to the crowns. Efficient tools for pollination and spraying the high bunches, either from the ground, from the air, using planes and recently drones, or from the high platforms, have also been developed. Mechanisation of date harvest was also promoted. Trunk shakers and units for gentle fruit collection were developed, independent or as part of the high platforms, allowing safe and fast harvest of numerous trees.

The high-quality demands of the Mejhoul have also led to developing efficient sorting and post-harvest technologies. Automatic sorting machines are used to sort dates according to their weight, appearance, and skin separation levels. Development of cold chains, starting at the packing house immediately after harvest – and continuing throughout sorting, long-term storage and export – are used to preserve the qualities of the fruit.

MARKETING OF THE ISRAELI MEJHOUL

The lack of availability of Mejhoul in Europe, and its perfect appearance and texture compared against other date varieties, has led to the targeting of Mejhoul as a different and premium product, gaining significantly higher prices over all other dates.

According to available data, Israel is producing close to half of the Mejhoul dates in the world. It is also the leader in export markets. Most of the fruit is exported to countries in Western Europe, and quantities increase annually. Other markets, in East Asia, the US, Canada and Australia are expanding. Approximately 25,000 tones of high quality Mejhoul dates were exported during 2020 from Israel. As a leader in Mejhoul production, Israeli companies, as well as the government, invest in promotion of Mejhoul. Attempts are made to introduce it as a 'young' and 'naturally healthy' product, and specifically offering it to the active and sporting young consumers.

المَجْهُولْ

Mejhoul cultivation and development in the Republic of Sudan

دُرَّةُ

— Dr. Daoud Hussein Daoud Suleiman —

MEJHOUL VARIETY—*"Rich Culture Sweet Future"*—

التُّمُورْ

The Mejhoul date variety was introduced to the Republic of Sudan in 1995, after other date varieties (Al-Barhi, Brem, Maktoum, Al-Zahdi, Al-Khastawi, Sayer, Al-Tabzal, Sukari, Khadraoui and Sultana) had already been introduced. All these date varieties were introduced using traditional means, and then cultivated using vitro plants from the tissue culture technique. Some 40,000 tissue culture plants of various date varieties were gifted by H.H. Sheikh Khalifa bin Zayed Al Nahyan, President of the UAE.

Recently, the Zadna International Investment Company imported several thousand date plants from the UAE, with about 15,000 of them proving fruitful. These tissue culture date plants were cultivated under different climatic environments, ranging from very dry to wet, from fertile to salty and alkaline soils. *(Figures 18. and 19.)*

EARLINESS IN MATURITY EXPERIMENT (METAXENIA)

To have an early maturity, and to escape the rainfall season, this study was designed with the aim of experimenting early maturation of Mejhoul fruits. Seven male Mejhoul trees were selected from several farms in Khartoum, and the results gathered over five consecutive years led to the selection of three threes chosen to mature three weeks' early compared to the remaining male trees. *(Figure 20.)*

POLLINATION COMPATIBILITY

A study into the possibility of Mejhoul flowers to accept male pollen revealed that the most appropriate pollination period in order to obtain a high quality of fruits, is within the first 48 hours of the flowers opening.

THE IMPACT OF THINNING ON THE CHARACTERISTICS OF THE MEJHOUL FRUITS

To improve the size of the Mejhoul fruits, various thinning process experiments were conducted during pollination, which improved the fruit's quality. *(Figure 21.)*

—Effect of thinning on future fruit size—

THE EFFECTS OF BUNCH COVERING

1. Raising the humidity around fruits

A study on the effect of bunch covering showed that when using closed plastic or paper bags, the water produced by fruits, is stored under the outer layer of the fruit. This creates a hospitable environment for the growth of fungal diseases, especially in rainy and Red Sea areas.

The Horticultural Research Center took readings in mid-July, where the proportion of sugar in fruits was relatively high. The amount of fruits lost during June are believed to be greater as a result of low sugar and easy water loss. The same bunch-covering experiment was conducted on Mejhoul dates, with the following results:

- Black and blue bags increased the weight the pulp and yielded higher quality fruits
- The lowest quality fruits were recorded when using a sack of jute
- Black and blue polyethylene bags clearly stimulated the maturity of the fruits, and encouraged their entry into the wet phase.

Figure 18: Mejhoul tree at three years - West of Omdurman.

Figure 19: Mejhoul date palm farm.

Figure 20: Mejhoul fruits early in maturity with three weeks, grown in Al khartoum area, pollinated by a male tree.

Figure 21: Effect of thinning on future fruit size.

Figure 22: Study on the effect on the fruits' quality of the colour of cover bags.

Figure 23: Mejhoul fruits produced at Virgin Mary Farm, West Omdurman.

2. A rise of temperature under the cover

It was found that the use of brown paper covers leads to a rise in the temperature of the fronds adjacent to brown paper. This in turn leads to the death or damage of its tissues. An experiment on the same Mejhoul variety in west Omdurman found that coverage using brown paper led to a high percentage of fruit set, and about quarter of the fruits showed a degree of damage, while the white paper-covering showed a limited colour change.
(Figure 22.)

DIFFERENT POLLINATION METHODS CONDUCTED ON MEJHOUL VARIETY

A study comparing several pollination methods on Mejhoul trees lasted for three consecutive years, and took place under the climatic conditions of Khartoum. The study showed the superiority of powder-based pollination, followed by the traditional pollination technique using male spikelets, in terms of quality.
(Figure 23.)

The rise of modern date palm cultivation as reflected by postage stamps and first day covers

— Dr. Dennis V. Johnson —

Postage stamp collecting may well be the most popular hobby in the world because it presents a fascinating amalgam of history and geography, and can be initiated by simply salvaging cancelled stamps at no cost. The first postage stamp was issued in England in 1840, and featured a profile of Queen Victoria, establishing the precedence that stamps could be attractive as well as functional.

Stamp collecting soon followed and some 20 years later, the term 'philately' was coined for the study of stamps and their history. Over time, the illustrations on stamps proliferated from royalty and prominent national personages to the widest of imaginable subject matters. The selective collection of thematic stamps, such as those featuring plants, emerged as a sub-specialty hobby.

DATE PALMS ON STAMPS

The initial representation of a date palm on a postage stamp is not easily identified because, in many instances, pinnate leaf forms, which may or may not represent a date palm, are employed in stamp design. A simpler criterion is the representation of an entire date palm. A routine online perusal of stamp catalogues of date-growing countries revealed what may be the first such date palm stamp: Kingdom of Egypt express stamp depicting a motorcyclist with date palms in the background, with a value of 20 mills, emitted in 1926.

Another early example is a set of three 1931 airmail stamps from the former Italian Libya colony of Tripolitania, located along the Mediterranean Sea. These stamps (shown in *Figure 24*, along with a pair of 1940 Libyan airmail stamps) depict a date palm in the background. It appears that most countries that produce dates have featured the palm on their postage stamps. The date palm is integral to the Saudi and Qatari national emblems, with the emblem in turn appearing on some stamps.

FIRST DAY COVERS

First day cover (FDC) collecting is a specialist stamp hobby, centering on letter envelopes with an affixed stamp or stamps, hand-cancelled at their time of issue, along with a cachet of printed information and designs. Research uncovered 10 such FDCs portraying date palms as the main subject, emitted between 1959 and 2018, by nine date-growing countries and territories. Descriptions of these FDCs are presented in *Table 3.*

The modern era of date palm research and development began in the late 1950s, spearheaded by the Food and Agriculture Organization of the United Nations (FAO). The FAO initiative is celebrated in the FDCs from Libya (1959) and Iraq (1965).

Photographs of five of the FDCs described in Table 1 are presented in Figures 24 to 29, from Libya, Bahrain, United Arab Emirates, Palestine and Israel, to show the diversity of designs they represent. The nine FDCs, issued in the past 60 years, mirror the increasing importance of world date fruit production over the same period.

Table 3:

First day postal covers featuring the date palm

Country or territory: Cachet	Stamp(s) details	Date and place of issuance
Bahrain: FDC, Date Palm Trees in State of Bahrain	**Set of four different stamps of 20, 80, 100 and 250 fils, displaying date palms and fruit stages**	**21 March 1995, Bahrain**
Dubai: FDC, Arab Palm Tree and Dates Day	**Set of two different UAE stamps (50 fils and 1 dirham) displaying date palms with fruit bunch inset and group of date palms**	**15 September 1987, Dubai**
Iraq: Iraq's Eternal Plant Date Palm F.D.C. Iraqi Philatelic Society, 2nd F.A.O. Dates Confe. Baghdad	**Set of three identical illustrated stamps of 3, 10 and 15 fils, with a row of date palms in fruit**	**27 December 1965, Baghdad**
Israel: As no part of the palm has any waste, the dates being eaten, the branches for Hallel, the twigs for covering, the bast for ropes, the leaves for besoms and the planed boards for ceiling rooms – so there are none worthless in Israel	**Set of three different stamps of 2.50, 7.40 and 8.30 shekels, depicting religious ritual us, fronds and fibres, and palm frond roof**	**28 August 2018, Jerusalem**
Libya: FAO first International Date Conference, Tripoli (5-11 December 1959), first day of issue	**Set of three identical design stamps of 10, 15 and 45 mills, showing fruiting date palms**	**12 December 1959, Tripoli**
Libya: Dates of Libya, FDC, first day of issue	**Set of five identically illustrated stamps of 500, 1,000, 2,000, 5,000 and 10,000 dirhams**	**31 December 2015, Libya**
Mauritania: Trees of Mauritania, first day of issue	**Single date palm stamp of 20 francs, showing several date palms; four additional stamps portray other native trees**	**15 May, Nouakchott**
Oman: Sultanate of Oman 2016, Fourth Festival of Omani Dates, FDC	**Single stamp of 100 baisa value, portraying two baskets of fancy date fruits**	**23-31 October 2016, Muscat**
Palestine: Palestine Post FDC: palm trees and dates. Cachet includes reduced reproductions of three envelope stamps and a fourth with a date palm scene	**Set of three stamps of 150, 200 and 500 mills individually featuring Hayani, Berhi and Mejhoul date Fruits**	**25 August 2017, Palestine**
United Arab Emirates: First Day Cover 2016. Date Palm Leaf. Khalifa International Award for Date Palm and Agricultural Innovation	**Single stamp of 3 dirhams, with a portrait of H.H. Sheikh Khalifa Bin Zayed Al Nahyan and date palm Fronds**	**15 March 2016, UAE**

Note: this list is not exhaustive.

Figure 24: Date palms in the design of Libyan airmail stamps from 1931 (above) and 1940 (below)

Figure 25: Libyan Date Palm First Date Cover, 1959

Figure 26: Bahraini Date Palm First Day Cover, 1995

Figure 27: Emirati Date Palm First Day Cover, 2016

Figure 28: Palestinian Date Palm First Day Cover, 2017

Figure 29: Israeli Date Palm First Day Cover, 2018

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Mejhoul cultivation in the Southern Hemisphere

دُرَّةُ

MEJHOUL VARIETY—*"The Jewel of dates"*—

التُّمُورْ

المَجْهُولْ

Mejhoul cultivation in the Republic of Namibia

— Mr. Pieter De Wet —

دُرَّةُ

MEJHOUL VARIETY—*"Rich Culture Sweet Future"*—

التُّمُورْ

The first initiative to begin the development of commercial date palms within the Republic of Namibia was in 1987. However this initiative was hampered due to a lack of technical knowledge, and classic cultivation mistakes were made during the first few years. It soon became clear that outside support would be needed, assistance was requested from the Food and Agriculture Organisation of the United Nations (FAO). In 1993, FAO responded with an investigative mission carried out by Dr Abdelouahhab Zaid from Morocco, to determine the prospects of date palm cultivation in Namibia. The recommendations of the report were positive, and a support programme was recommended.

The Namibian Government agreed to finance the Date Production Support Programme, which was officially activated in June 1995, after the relevant agreement was finalised with the FAO. The primary objectives of the programme were first to introduce technical knowledge on date palm propagation in Namibia, and then to establish high-quality date palm plantations in Namibia to serve as a nucleus for future development. This intervention was very successful and various date palm projects were initiated during this period.

MEJHOUL DATE PALMS IMPORTED TO NAMIBIA

During the initial procurement of tissue culture date palm plants, the Mejhoul variety was not available and several other varieties were obtained. It was, however, clear that Mejhoul date palms must be obtained for introduction in Namibia. The first Mejhoul palms to arrive in Namibia came as a consignment of offshoots imported from the US. A very strict quarantine process was followed but all plants were lost due to mistakes that we made.

Tissue culture Mejhoul plants were later imported from laboratories in South Africa, France and the UAE. Plants were hardened in nurseries on-site and an average 97% survival rate of the plants was achieved.

DATE PALM PRODUCTION

The Namibia Development Corporation initiated the first date palm projects in order to establish production protocols. It was proven that commercial date palm production could be achieved under Namibian conditions.

Private sector cultivation followed with the development of commercial date palm projects at Haakiesdoorn and Komsberg (Desert Fruit) and few smaller development initiatives that were undertaken by private farmers. The Mejhoul variety was predominantly used at these entities. Current date palm plantations in Namibia consist of 670 hectares of which 551 hectares is planted with Mejhoul date palms.

Some of the Mejhoul date palms are still not in full production, and the average production per palm is relatively low. Average production at the Naute project is 35kg per palm, each year. These production averages can still be increased substantially if good cultural practices are followed. Total Mejhoul fruit production is between 1,300 and 1,500 tonnes per year.

CONSTRAINTS

Some constraints are still experienced that hamper the expansion of date production in Namibia. For example, the availability of Mejhoul date palm plants in Southern Africa is very limited and available only at high prices. Mejhoul plant material must be imported from tissue culture laboratories at a cost of approximately $30 per plant and it is possible to import only a few plants at a time. To import cost-effectively 1,000 plants must be imported at a time. In addition, only limited technical support is currently available to date-growing activities in Namibia.

The local market for date fruit is limited, and the bulk of the produce must be exported. Marketing is not coordinated and producers must find their own markets. However, he environmental conditions in Namibia are such that high quality Mejhoul fruit can be produced and exported commercially.

Figure 30: Mature Mejhoul date palm plantation at the Naute Project

Figure 31: Young Mejhoul date palm plantation at the Naute Project

MEJHOUL VARIETY—*"The Jewel of dates"*—

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المَجْهُولْ

Mejhoul cultivation in the Republic of South Africa

دُرَّةُ

— Dr. Michelle McCubbin and Mr. Charles Edmonds —

MEJHOUL VARIETY—*"Rich Culture Sweet Future"*—

التُّمُورْ

The Mejhoul variety (or Medjool as referred to locally) of date palms is by far the most favourite and most cultivated variety in South Africa. The large size, sweet caramel taste, soft chewy texture and good appearance make it ideal for the South African market and export markets. The dates are a source of fibre, iron, calcium, magnesium and potassium and are a good energy source.

Date palm cultivation in South Africa first originated in Pella, as missionaries planted them around their station around 1882. Various cultivars, such as Khadrawy, Deglet Noor, Barhi and Mejhoul were planted at Klein Pella near Kakamas. Today, 87 hectares of date palms remain, with 90% of the plantation being of the Mejhoul variety at Karsten Farms.

Newer plantations have started up on the Orange River, with Southern Farms planting date palms of Mejhoul and Zamli varieties. Southern Farms has cultivated 200 hectares of Mejhoul, making up 24,600 trees planted to date. Smaller clusters of date palms have been grown elsewhere, such as Tankwa Karoo with around 50 plants and others on the Limpopo River near Mussina.

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CONDITIONS FOR PLANTING

The soils used for date palm planting can be placed into two main classifications, deep alluvial soils along the river banks of the Orange River, and coarse sandy soils in all the other areas away from the river. The microclimate along the river – with slightly higher humidity and better water retention in the soils – produces top quality areas for the date palms to grow. Although older plantations started with a 10m x 10m spacing, most of the new plantings have been established with 9m x 9m spacing, while even newer orchards have moved to a higher density spacing of 8m x 8m. The trend is to plant with the higher density the further one gets away from the river, to create better microclimates in the orchards.

New planting material is either tissue culture palms that are imported or from offshoots taken from existing orchards. Tissue culture trees are planted in 50/100 litre bags and kept in the nursery for one to two years, planted out when they are one metre tall. Offshoots are planted in 100 litre bags and planted out after one year, depending on their growth and root development.

The Orange River is the main source of water supply for date palm cultivation in South Africa, and the abundance of water assists in optimal production. The irrigation systems used in South Africa for date palms are mainly bubblers, micro and drip irrigation.

DATE PALM CULTIVATION

The date palm's flowering time in South Africa takes place from the end of July to September. All pollination is done by hand. The pollen is mainly imported from the UAE. Most of the pollen imported is of the male Ghunami variety. Fruit thinning is determined by the size specification of the target market the fruit is being grown for, although the best prices and higher consumer demand are for 'Large' and 'Jumbo' sizes. At pollination, the heart of the bunch is removed and the bottom 10cm of all the spikelets are cut off to reduce the crop load. The heart of the bunch is removed to help with ventilation and even the ripening of the fruit. The fruit is spaced on the spikelets to reduce compaction of the bunches. Once fruit set has been determined, the bunches are thinned to between 30-45 spikelets per bunch with 10-12 fruit per spikelet. At optimum production 90-100kg of fruit per tree can be expected.

The cultivation of dates is not without problems in South Africa. Pests such as white scale and fruit fly are present causing losses in production. The Greater Date moth (Arenipses sabella) is a new pest that is becoming a problem. The moth causes damage to the bunch bases or ends, which affects fruit yield and quality. The red palm mite (Raoiella indica) has also recently been reported to be seen on date palms.

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Khalifa Award Photography Competition
© Christopher Comeso, KIADPAI

التَّمُورْ

Fungal diseases, such as black scorch (Thielaviopsis punctulata), are also prevalent. Black scorch fungi penetrate the leaves, inflorescence, heart, trunk and bud, causing black and hard lesions. The leaves will have a charcoal-like appearance which will bend, die back and rot.

THE GROWING SEASON

The dates grow under hot and dry climatic conditions and the heat provides an ideal growing climate for the date palms. However the low humidity and dry climate in turn poses a major problem, with stage skipping of the fruits in the ripening process before harvest time. This affects the quality of the fruit. The dates are normally harvested between mid-February to March. The harvested fruit are then brought into a packhouse and cooled immediately after picking.

With a moisture content range of 19-24%, the Mejhoul date fruits are sorted into various categories such as Premium (loose skin 0-10%), Choice (loose skin 10-15%), Supreme, Large and Jumbo to give some examples. The fruit are packed for national fresh produce markets and supermarkets locally as well as for export. Dates are available in 200g punnets, 400g pouches and punnets, 1kg boxes and 5kg boxes. The Mejhoul fruits for export are frozen and shipped at -18°C. When frozen, the shelf life of dates can be up to one year.

MARKETING AND EXPORT

Some of the date-producing organisations use exporters to market their fruit while other organisations do their own marketing, for example through Southern Cross Marketing where the target markets are predominately the UK and EU countries such as the Netherlands, Spain, Germany and Portugal. A small percentage of fruit also reaches countries such as the UAE, Singapore and Cambodia. Around 20% of the fruit of lower quality is sold on the South African market before or during Ramadan.

In summary, the cultivation of date palms in South Africa is expanding and growing. Having fresh dates 'out of season' to the Northern Hemisphere date-growing areas has great advantages for South African date palm growers. Although other cultivars such as Zamli are also grown, Mejhoul still remains the variety of choice for the growers.

المَجْهُولْ

Mejhoul cultivation in Australia

—— Mr. Dave and Mrs. Anita Reilly ——

دُرَّةُ

MEJHOUL VARIETY—*"Rich Culture Sweet Future"*—

التُّمُورْ

The first documented importation of the Mejhoul date variety into Australia was in 1976, with offshoots introduced from the USA. A very small number of Mejhoul palms were planted at Pukatja (Ernabella), an aboriginal reserve in the far north of South Australia, along with Deglet Noor and many seedlings. In 1991, a Northern Territory government-led date palm initiative was undertaken in Central Australia at a research farm known as the Arid Zone Research Institute, located at Alice Springs. The date palm was selected as a crop that should be suited to this hot environment. Tissue culture plants were imported from England and France, along with Mejhoul offshoots from California.

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In 1991, Jim and Trudi Luedi established the Tamara Date Garden, located to the south east of Alice Springs on the edge of the Simpson Desert. They ran their Desert Fruit Company until retiring in 2006. Another nearby farm, Arid Gold, was also producing Mejhoul for many years.

CLIMATE AND CULTIVATION CHALLENGES

It was thought the Central Australian date industry would expand and be the main location for date production. However, there are challenges from high humidity and summer rainfall influenced by the monsoon season 1500km to the tropical north. High input costs of labour and freight also limit growth in this remote location. Today, the Desert Fruit Company is cooperatively owned and produces very good quality dates in drier years, with their Mejhoul considered as being as good as anywhere in the world.

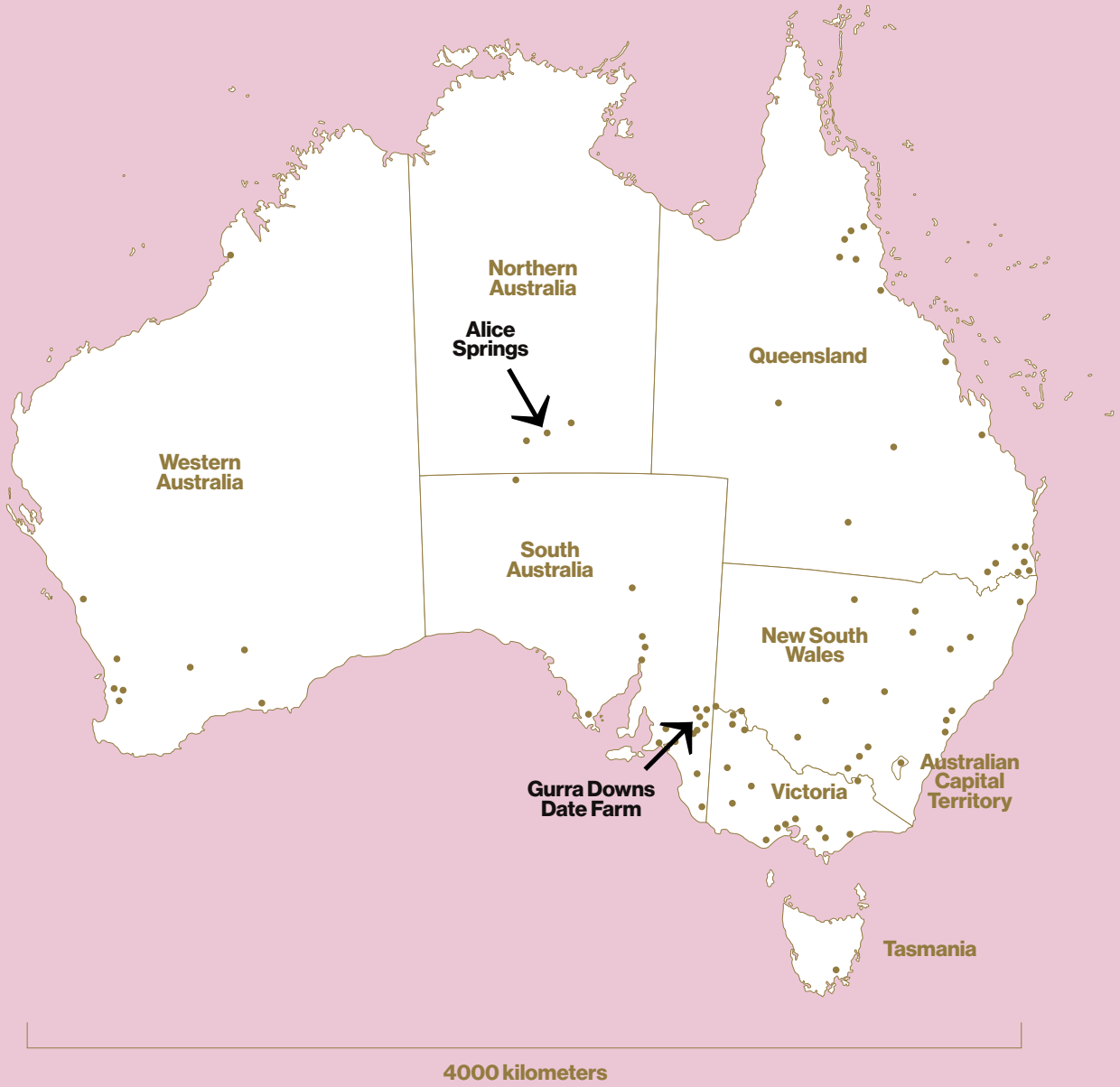
In 1996, Dave and Anita Reilly decided to plant date palms on their farm in the Riverland of South Australia. However, at that time, there was no available nursery stock in Australia. They established the Gurra Downs Date Company and in 2001, commenced importing tissue culture plants from Date Palm Developments in the UK. A date palm nursery was subsequently established, as well as an evaluation site to assess cultivar performance.

The Riverland is a semi-arid environment. Date palms had never been grown commercially in this region. There was no guarantee that any cultivar grown in this location was going to replicate yield and quality performance achieved in other date-growing countries. For Gurra Downs, the strategy was to introduce and evaluate as many world-leading cultivars as possible, with the aim of selecting the most suited cultivars for Riverland conditions. Twenty years on, it is most fortunate that the Mejhoul has proven to be one of two leading selections.

The Riverland climate is characterised by cool springs, hot dry summers, mild autumns and cold winters. One of the biggest challenges in selection is finding a cultivar that will successfully set fruit in low spring temperatures. The Mejhoul has consistently proven it has the capacity to set fruit at a lower temperature point than most other cultivars.

Summer/autumn rainfall is the enemy of the date grower. Some cultivars suffer fruit spoilage easily during high humidity events. Rain-induced fruit damage has disqualified many cultivars from commercialisation. However, the Mejhoul has proven to be reasonably tolerant of this occasional rainfall and high humidity. The percentage of fruit spoilage from rain events has been observed to be directly linked to temperature. The hot arid interior of Australia ripens the Mejhoul dates during the summer months of February to March when temperatures are highest. Fruit spoilage is more prevalent in these conditions than in southern Australia, where the fruit ripens later in the autumn season of April to June, when temperatures are lower.

Figure 32: Indicate the locations where the Mejhoul variety is currently grown in Australia.



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CULTIVATION PRACTICES

Gurra Downs has learned when growing Mejhoul, to thin bunches to no more than ten per tree. Although the tree can produce 250kg of fruit in a season, this has the tendency to convert the tree to a bi-annual bearing habit, and makes it unlikely to flower the following year. By limiting the yield to 80-90kg per palm, to ensure repeat flowering the following year, a large fruit size is still being achieved that is welcomed in the marketplace.

Since 2004, Gurra Downs has distributed date palms across the Australian continent to more than 400 farmers. Date palms are now being grown in districts where they have never been grown before. Many cultivars have been trialled, with some successful, and others not. One common thread among all farmers who are having success in growing dates is that it is consistently the Mejhoul cultivar proving to be widely suited.

THE FUTURE OF THE MEJHOUL INAUSTRALIA

Expansion of the Australian date industry is gaining momentum. Many areas selected to grow dates are in existing large horticultural districts like the Riverland. These districts are supported by good infrastructure with transportation, water security, availability of electricity for irrigation pumps, access to a workforce, and proximity to airports and shipping ports.

A characteristic of the Mejhoul is that it comes into production in a shorter number of years than most other cultivars. It also produces many offshoots, which is important for an expanding industry. The tree delivers heavy crops of large-size fruit, making it well known by the Australian public in the domestic marketplace. Mejhoul dates are displayed prominently in supermarket fresh fruit aisles, usually imported from the US, Mexico and more recently, Jordan and Israel.

In a global comparison, the Australian Mejhoul industry is very small but expanding. After 20 years of evaluating many cultivars, the Mejhoul genetics are providing Australian farmers with the confidence to increase production. The next stage of industry development is to invest capital in post-harvest facilities; to mechanise fruit handling and packing, as well as processing equipment to manufacture products like date paste and syrup.

Gurra Downs is very proud to be Australia's largest producer of the Mejhoul date variety. This magnificent tree has provided a great source of interest and excitement, not only for our family business but also for many other Australian farmers.

Figure 33: The Mejhoul variety farm in the Riverland of South Australia.

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Mejhoul cultivation in the American Continent

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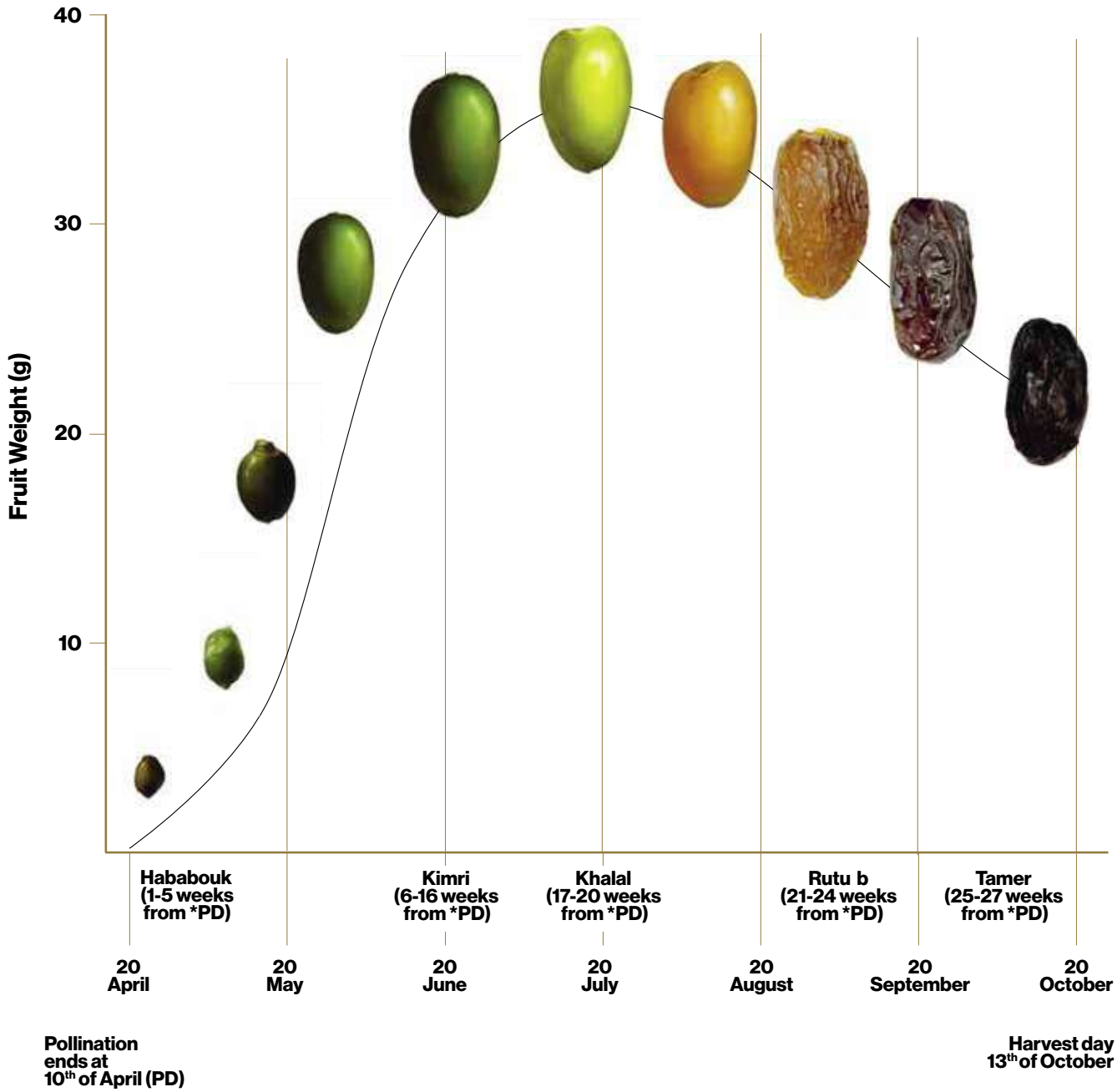
MEJHOUL VARIETY—*"The Jewel of dates"*—

التُّمُورْ

Mejhoul fruiting stages of date palm trees at the Northern hemisphere



MEJHOUL VARIETY—*"Rich Culture Sweet Future"*—

MEJHOUL VARIETY—*"The Jewel of dates"*—

التُّمُورْ

المَجْهُولْ

Mejhoul cultivation in the USA

— Dr. Glenn C. Wright —

دُرَّةُ

Spanish priests were the first to introduce the date palm to the United States (US) in the late 1700s (Toumey, 1898; Trent & Seymour, 2010). Palms were planted across both California and Arizona wherever the climate was favourable. These early plantings came from seed. However, US date consumption in the late 1800s and early 1900s exceeded the domestic supply, so most dates were imported (Hopper, 2013). As early as the 1820s, American ships carried US goods to ports on the Arabian Peninsula, and in exchange they picked up dates and other commodities. By 1925, US date imports exceeded 8,000 metric tonnes.

In response to the demand and the need to find suitable crops for the desert, the United States Department of Agriculture (USDA) organised importations of thousands of date palm offshoots, chiefly from Algeria, Tunisia, Egypt and Iraq, to California and Arizona (Toumey, 1898; Nixon, 1950; Hilgeman, 1972). Private individuals also imported thousand more. Many varieties were imported, including Barhi, Deglet Noor, Fard, Hayany, Khadrawy, Sayer and Zahidi (Wright, 2012).

The first arrival of the Mejhoul variety into the US was in 1912, but it is unknown what happened to them (Wright, 2016). Mejhoul dates were imported successfully into the US in 1927 by Dr. Walter Swingle (Swingle, 1945). Swingle was visiting Boudenib, Morocco, where the Sharif of the local oasis sold him 11 apparently disease-free offshoots which were packed in wooden crates and shipped to the US, arriving five weeks later. Because of the threat of Bayoud disease, the offshoots were fumigated upon arrival and placed in quarantine in Nevada for eight years, where nine of the 11 survived. After quarantine, the original nine and many additional offshoots were moved to a USDA facility in California. The entire US Mejhoul industry, and the Mejhoul industries of several other countries, originate from the importation of 1927.

MASS PRODUCTION IN THE US

The US date production industry began with a 23-hectare planting in 1945, near Bard, California, across the river from Yuma, Arizona. Stanley Dillman and Al Coleman were the first to plant the Mejhoul variety from 22 offshoots received from the USDA (Berryman, 1972). They developed several horticultural practices which are still practiced. Today, the US date industry encompasses 6,700 hectares, all in California and Arizona (USDA, 2021). The 2020 value of the industry was estimated at $189,000,000. Because the USDA does not distinguish between varieties, it is not possible to make a full comparison between the different varieties, but the author estimates the Mejhoul total is about 55%.

Dates are planted on both alluvial river-bottom soil and sandy upland soil. Since the Mejhoul variety makes many offshoots, tissue culture-derived palms are not common. Traditional planting of the Mejhoulpalm is about 9m x 9m square, but newer plantings are being established at a density of 8m x 8m, and 7.5m x 7.5m. One male palm is planted for every 49 females. There are no specific male palms identified as superior pollinators.

Growers employ either flood or pressurised drippers or microsprinklers to irrigate the palms. Irrigation rates vary by tree size and season, and can be as much as 500 to 600 litres of water per tree per day in the summer. Conventional fertilisers are applied through the irrigation water, and growers regularly apply nitrogen, potassium, and boron. Other macro- and micronutrients are not as commonly applied. Organic dates receive only composted chicken or steer manure.

Figure 34: *Silas C. Mason, Frank A. Thackery, and Walter T. Swingle, in Indio, California, 1920.*
Photograph courtesy of Robert R. Krueger, U.S. Department of Agriculture, Riverside, California.

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DATE CULTIVATION BY SEASON

Workers clean the palms in January, removing thorns and old leaves. Male palms bloom in early March, and once the spathe cracks, the male flowers and pollen are extracted and dried with fans and heat. Growers dilute pollen with flour, talc, or cornstarch. Female palms bloom in mid-to late March, and a mature palm will produce 20 to 25 bunches. Each emerging bunch is forced to curve downward by tying them to leaves below. Bunches are pollinated as many as four times a season using squeeze bottles, blow pipes, or modified air blowers.

Thinning the fruit begins in April. In areas with higher humidity, such as Arizona, workers remove about 70% of the fruit, leaving fruit spaced at about 2-3cm apart on the strands. Where humidity is less of a problem, the strands are cut so that six to ten fruit remain. After the centre strands are removed, 35 to 40 strands remain on the bunch. Workers support the increasingly heavy bunches by tying them to nearby leaf petioles for support.

Workers cover the bunches with cotton or nylon bags in late July. These bags retain fruit that might drop early, protect the fruit from birds, insects, and animals, protect the ripening fruit from rain and provide ventilation to the bunch. Some growers also insert metal rings into the bunches to spread out the strands, improve ventilation and reduce the chance of fermentation.

Harvest begins in late August; each tree is harvested three to four times, every 10-14 days as the fruit do not all mature uniformly. Harvest is finished by October. Each mature palm can produce as much as 100 to 125kg of fruit. At the packinghouse, unmarketable fruit are eliminated, then the rest are gently washed then sorted by maturation. This sort allows the fruit to be segregated according to the amount of time needed to dry them to 16-21% moisture content. Fruits are dried from one to seven days at about 65°C. Most dates are dried using forced hot air, but a few are dried traditionally in the sun. Following drying, the dates are washed again then sorted according to size and external appearance. Finally, they are packaged and kept refrigerated or frozen until sold. Because of the use of the bags, the heat applied during drying, and the frozen storage, no additional fumigation is necessary.

Mejhoul variety dates grown in Arizona and California have no significant pest problems. Carob moth (*Ectomyelois ceratoniae)* infestations are eliminated by the steps noted above. The palm weevil (*Rhynchophorus vulneratus)* has been eliminated from the US (Hoddle, et al., 2016) although the South American Palm Weevil (*Rhynchophorus palmarum)* has been advancing northward in the coastal areas of Mexico and Southern California since 2010 (Hoddle, et al., 2021). Date growers and Agriculture Department officials are monitoring for the arrival of this pest. Black Scorch *(Thielaviopsis punctulata)* is an occasional problem and the Bayoud disease has been kept out because of phytosanitary regulations. No date palm offshoot has been imported to the US since 1929.

US DATE PRODUCTION AND EXPORT

US date production is low compared to other date-producing countries. This author estimates that the US is now producing about 25,000 metric tonnes of Mejhoul variety dates annually. DatePac is a large grower cooperative in Yuma Arizona that produces pesticide-free and organic Mejhoul dates. DatePac claims its dates are sold in 90% of all the supermarkets in the US. There are other smaller date packinghouses that distribute their fruit to local, regional, and international markets. USDA statistics show that US dates are exported to Canada, Australia, Mexico, and the UK. Dates are imported into the US from Tunisia, Algeria, Israel, and Mexico (Agricultural Marketing Resource Center, 2018). US table date fruit consumption (not processed) was about 75g per person per year in 2019 (Statista, 2021). However, increasingly aggressive marketing programs are leading to more buying. This level of consumption represents a 50% increase over 2012.

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Figure 35: Imperial Date Gardens, Yuma Arizona, USA, *9-2021.*

Figure 36: Imperial Date Gardens, Yuma Arizona, USA, *9-2021.*

INTRODUCTION OF THE MEDJHOOL DATE FROM AFRICA INTO THE UNITED STATES

By Walter T. Swingle, Collaborator, Bureau of Plant Industry, U. S. Dept. of Agriculture

Early in May, 1927, by invitation of the French government I joined a Commission appointed to investigate the much-feared Bulondh disease of the date palm in Morocco. This Commission included members from Algiers, Morocco and France, all experts in their respective lines of botany, entomology, plant pathology and quarantine procedure.

Our trip began at Erfoud, near the Algerian-Moroccan boundary, and we proceeded to Colomb Béchar where we saw the frightful ravages of the parlatoria scale, introduced without its natural enemies on a few offshoots from Algeria. This Oasis, about 12 miles long and from 1 to 2 miles wide had formerly been pest-free. Parlatoria scale spread with incredible speed throughout the oasis; the dates were only about half-size and were completely covered with scale, entirely unfit for human consumption. Hogs would perhaps have eaten them but the Arabs do not eat pork!

On our way into the heart of southern Morocco we were delayed for about a week at Bou Denib, about 100 miles east of Tafilalet, the greatest date oasis of Africa, noted for its choice Medjhool dates. We were waiting for the French army of occupation to arrange for our trip with adequate military protection, as the country was not yet fully pacified.

Here I had the good fortune to become well-acquainted with the civil and religious head of the oasis of Bou Denib where about 9000 palms were growing. He was a Cherif (lineal descendant of Mahomet) and a Hadj (having made a pilgrimage to Mecca) and his authority over the Arabs of the Oasis was practically unlimited. All dealings with the Arabs of Bou Denib by the French military authorities posted there were through him. He invited our party to a dinner served in true Arab style—delicious food but no utensils except one's fingers. One advantage of this system is that the meat must be tender to come off the bones! We had a young sheep roasted whole, many bowls filled with kous-kous, and very strong, very sweet tea. During the dinner I talked with the Cherif about the Medjhool date, the only variety exported in large quantities from Morocco to Europe. I learned to my amazement that the Arabs only received about 2 cents a pound for these dates. I told him I had bought these same dates from the original package in London for one shilling (then worth about 24 cents) a pound. I told him the Arabs should get more for their dates and he asked at once how much more. I told him if the Arabs would grade their dates for size and condition (dry or moist) and protect them from flies they should be able to get 5 or 6 cents a pound. This amount impressed him as extravagant but interested him very much. From then on, he was very eager to show me any and everything regarding the Medjhool date. I asked him if it would be possible to buy a few Medjhool offshoots to send back to the United States as we did not then have this famous variety in our country. He arranged to accompany me through the oasis with several of his men. We entered one date garden after another only to find the Baloudh disease in or near every one of them. Finally we came to one that did not show any of the pale leaves in the middle of the leafy top, characteristic of the Baloudh disease. The gardens adjoining on three sides also showed no signs of it. On the fourth side was the irrigation canal with date palms planted along it. I followed the canal back to the point where the water issued from an underground conduit excavated in the soil for miles back to the mountains. I found no trace of the disease along the canal. Thereupon I asked the Cherif to ask the owner if he would sell me a few offshoots and at what price. Without bothering to ask the owner he said in no uncertain terms, "He will sell you what you want at a reasonable price." The owner's men thereupon began feverishly to cut offshoots from the base of a Medjhool palm surrounded by offshoots. In a few minutes six standard-sized offshoots had been cut, but in their haste the workmen had knocked off five other small shoots. They told me I need not pay for these small offshoots but could use them to fill the spaces between the large offshoots when they were packed in a box. The offshoots were all packed that night at the Army post and shipped at once to the United States. They arrived in Washington about five weeks later.

The Plant Quarantine authorities of the U. S. Department of Agriculture decided that no treatment that could be devised in Washington would be sufficient to convince them that these offshoots were free from Baloudh disease, and that they must be grown for several years under strict quarantine supervision in a **state with no date palms in it!** This at first seemed an impossible condition, but an emergency survey showed that the southern point of Nevada was just the place—a good date climate, between two date states, California and Arizona, and no date palms were growing in Nevada.

Thanks to the skilful work of Mr. Frank A. Thackery, an Indian farmer was found in this region,

Figure 1

A. View of the location in southern Nevada where the imported Medjool offshoots were first planted and the appearance of the offshoots in 1931, four years after planting.

B. One of the imported Medjool palms with crop of fruit borne in 1931 and the Cheemhuevi Indians who helped care for the offshoots. Mike Tobin on the left. (Photos by Dewey Moore)

MEJHOUL VARIETY—*"The Jewel of dates"*—

المَجْهُولْ

Mejhoul cultivation in Mexico and other South American countries

دُرَّةُ

— Prof. Ricardo Salomón-Torres —

In Mexico, the crop of Mejhoul date palm found the best climatic conditions for its development in the San Luis Rio Colorado, Sonora and Mexicali, Baja California valleys. By 2020, both areas achieved 14,898 tonnes of Mejhoul dates. The Mejhoul cultivar represents 94% of the national date production, making Mexico the second-largest producer in the American continent, and the fourth largest producer in the world. In South America, its cultivation is very little developed. However, it has good development prospects in the medium term.

The modern date industry was established in Mexico in 1968, in the San Luis Rio Colorado Valley (32°18'19"N, 114°56'43"W), with the first Mejhoul date plantation using offshoots imported from Yuma, Arizona (Johnson, Al-Khayri, & Jain, 2015). Over time, this crop spread to the Mexicali valley (32°22'27" N, 115°07'13" W), with offshoots imported from southern California. Finally, it expanded to the arid regions of northwestern Mexico. Date palm cultivation in Mexico is 97% concentrated in these two valleys, with the production of the Mejhoul cultivar standing out with 94% of the national production (Ortiz-Uribe, Salomón-Torres, & Krueger, 2019). Likewise, the Mexican companies that produce dates are well organised. Each year, they improve their cultivation techniques, gain more experience to obtain better yields, and continue the expansion of the planted areas.

دُرَّةُ

MEJHOUL CULTIVATION

The Mexican date industry is very small compared to the larger producing countries of this fruit, largely due to the fact that it is not a high priority crop. Production has increased by almost 50% during the last two years. In 2020, 15,849 tonnes of dates were harvested in 2,504 hectares (ha), of which 14,898 tonnes are attributed to the Mejhoul variety (SIAP, 2021). With this, Mexico becomes the fourth-largest Mejhoul date producer in the world after Israel, the US and Palestine (Krueger, 2015). However, almost a thousand hectares have not yet entered into production, which would represent around 7,000 additional tonnes of Mejhoul dates in the short term, with which Mexico could become the second largest producer (see Table 4.) The average yields of Mejhuol date palsm are between 6.78 and 7.90 tonne/ha, however, some harvesters that carry out the best crop practices have achieved up to 12 tonne/ha. *(Table 4.)*

The establishment of one hectare of Mejhoul date palm is estimated at $28,000 for the first year. For its second year, $9,500 and from the third year, it remains at approximately $4,500. This means that between seven and eight years, the crop becomes highly profitable (SCSA, 2021).

The cost of labour in handling the palms and packing the Mejhoul date is very low in relation to the costs in the US, which gives Mexico a greater competitiveness and higher profits. This advantage has been seized by some US companies, which send several thousand tons of Mejhoul dates for packaging to Mexico, which are then returned to the US for commercialisation.

The Mejhoul date is exported mainly to the US and Australia, and to a lesser extent to countries such as the Netherlands, Spain, UK, Canada, Italy and Argentina, among others. In 2019, 5,550 tonnes were exported with a value of $19.5 million.

DATE PALM CULTIVATION AND PRACTICES

In Mexico, there are no significant problems with pests or diseases with date palm. The agricultural-sanitary authorities of Mexico offer free training for the good management of safety and management of pests and diseases.

The small and medium-sized date harvesters have been integrated into associations called the Date Product System to improve the competitiveness of the crop with better cultural and commercial practices, as well as negotiating with the government

Table 4: **Date production in Mexico in 2020**

State	Surface planted (ha)	Surface harvested (ha)	Production (tonnes)	Yield (tonnes)	Production value ($ millions)
Baja California	**1,740.00**	**755.00**	**5,972.93**	**7.90**	**38.20**
Baja California Sur	**373.13**	**369.13**	**602.01**	**1.63**	**1.17**
Coahuila	**16.81**	**16.81**	**25.75**	**1.53**	**0.06**
Sonora	**1,363.94**	**1,363.94**	**9,248.35**	**6.78**	**21.27**
Total	**3,493.88**	**2,504.88**	**15,849.04**	**7.34/ 1.58**	**60.70**

Figure 37: Mejhoul date palm development in the Baja California valley.

programmes aimed at supporting date production. Likewise, constant training is offered to harvesters with the intervention of researchers, field technicians and government analysts, to stimulate the improvement of the quality of the Mejhoul date. Finally, internal consumption has recently been stimulated through fairs, tourist routes and exclusive agricultural exhibitions for dates, where fresh fruit, gourmet dishes, beverages and a great diversity of by-products derived from Mejhoul dates are offered (Ortiz-Uribe et al., 2019).

Water scarcity has not yet been a climate change problem in this date-producing region of Mexico. However, some preventive measures have been taken to conserve water, such as cementing irrigation canals and some parts of the Colorado River (which comes from the US and feeds both valleys), in order to avoid water seepage. According to data from the Ministry of Agriculture, a higher yield has been reported in plantations where drip irrigation systems are used than those that use flood irrigation systems (SADER, 2021). With this, the government hopes to encourage the use of drip irrigation systems to save irrigation water.

Given the climatic conditions of this region of Mexico, the transplantation of offshoots commonly has a mortality rate between 20 and 30% (SCSA, 2021). To avoid this risk, very few harvesters have opted for the acquisition of in vitro seedlings. However, there is much distrust on the part of the harvesters, since the yields of the palms produced by this method are not known and those that are planted in Mexico are still very young.

Within bunch thinning activities, 50 to 70 strands per bunch, 10 to 14 dates per strand, and 16 to 20 bunches per adult palm are commonly left behind (Salomon-Torres et al., 2017). Most of the plantations are irrigated, the common method of pollination is by means of dry pollen mixed with flour (Salomón-Torres et al., 2018) and very few companies have production of organic Mejhoul date *(see Figure 38).*

Research efforts are focusing on improving fruit quality through the use of growth bio-stimulators, efficient pollen management, reduction of mortality in the transplantation of offshoots, and the method of pollination in liquid suspension, it is in its first stage of experimentation. Likewise, the quality of the Mejhoul date produced in Mexico has recently been evaluated, concluding that it has the same or better nutrients and antioxidant properties than that produced in other parts of the world (Salomón-Torres et al., 2019).

OTHER SOUTHAMERICAN COUNTRIES

Date palm cultivation can be found in limited specific areas in Colombia, Venezuela, Argentina, Brazil, Peru and Chile. These last two countries have regions with agroclimatic conditions that have allowed the successful cultivation of the Mejhoul date, which is currently produced in family gardens, not in commercial quantities (Escobar & Valdivia, 2015).

In Chile, date palms are mostly found in the extreme north of the country and do not constitute an important industry. The interest in this crop began in 1965-1970, when the Chilean government introduced offshoots from the US to the Tarapacá Region (Escobar & Valdivia, 2015). Likewise, in 2020, 1,100 in vitro Mejhoul palms from California were introduced to Chile, with which it is intended to develop a new agribusiness associated with the production of Mejhoul dates (Generación M, 2020).

In 2018, the visit of harvesters and technicians from Honduras and Panama was received in Mexico, in order for them to know the agronomic characteristics of the Mejhoul date crop, to implement it as a production alternative in their respective arid regions. Harvesters in Argentina are currently analysing alternatives to import Mejhoul offshoots from Mexico to that country.

CONCLUSIONS

Being a recently introduced crop, and one of less importance, there is still much to do to increase the production of Mejhoul dates in Mexico. It is necessary to develop further research to improve yields, quality and decrease mortality after transplantation. Farmers should focus more on quality production than quantity. A more active participation of the government of Mexico is required, in terms of economic support for its cultivation, as well as a wide advertising campaign to stimulate the internal consumption of Mejhoul date.

Figure 38: Some aspects of the agricultural management of organic date Mejhoul in Mexico.
A) Preparation of the inflorescence for pollination
B) Harvest of the date Mejhoul
C) Organic plantation of Mejhoul date in the Valley of Mexicali, Mexico, with the bunch in bags

المَجْهُولْ

Mejhoul cultivation in Asia

دُرَّةُ

MEJHOUL VARIETY—*"The Jewel of dates"*—

التُّمُورْ

المَجْهُولْ

Date palm cultivation in the Republic of India

—— Dr. Bharathy Narayanan Mohanan and Mr. Ajit Singh Batra ——

دُرَّةُ

MEJHOUL VARIETY—*"Rich Culture Sweet Future"*—

التُّمُورْ

With average imports of more than 310,000 metric tonnes each year, India is the world's largest dates importer and constitutes nearly 30% of total global imports (Figure 1). Iraq, UAE, Islamic Republic of Iran and Pakistan are the major date suppliers to India. With a population of 1.4 billion, India has tremendous market potential for dates, which is evident from the increasing imports trend.

Several varieties of dates make a significant contribution towards the volume of dates in the Indian market, including: Mazafatti, Safawi, Deglet noor, Fard, Khunezi and dried dates of other varieties. These dates are being imported at a price of $0.4 to $1.5 per kg (FAOSTAT). *(Figure 39.)*

However, due to increased awareness and structured marketing efforts by several importing companies, Mejhoul – known as the emperor of dates – has been established as one of the premium date varieties in India. Jordan and Israel are the top two Mejhoul exporting countries to India. Dates from Israel and Jordan are being imported to India at a markedly high cost than other varieties, of between $5 and $7 per kg (FAOSTAT).

Before partition in 1947, India was one of the top date-growing countries, with dates grown primarily from the great desert of Thar. However, partition left the entire date growing region in today's Pakistan (Figure 2, highlighted with arrow). After partition, India lost this bio-diversity and date planting materials. This meant India's date industry could not grow until 2007-08, due to unavailability of high quality planting material. *(Figure 39. next page)*

'GREENING THE DESERTS'

Atul Ltd, along with the Indian government, introduced the 'Greening the deserts' initiative, which introduced tissue culture-raised date palms to India. Atul demonstrated successful cultivation of various varieties of date palms in arid and semi-arid agroclimatic zones of India by establishing the nation's largest tissue culture-raised date palm demonstration farms in Jaisalmer and Bikaner districts, Rajasthan, spread over more than 250 acres and 125 acres respectively.

Mejhoul, was one of the ripened varieties (Rhutab and Tamar stage), which performed well in the demonstration trials in the Thar desert of western Rajasthan, while fresh fruit varieties like Barhee, Khunezi also showed excellent results as fresh fruit varieties (Khalal stage) in other regions, including the Rann of Kutch of North Gujarat.

To ensure a continuous supply of high quality true-to-type tissue culture-raised planting material of date palms, Atul also set up Atul Rajasthan Date Palms, a state-of-the-art tissue culture production unit, as a joint venture with the Government of Rajasthan under a public-private partnership model with overseas technology transfer from Date Palm Research and Development Center, UAE University, Al-Ain, UAE. To expand globally, Atul acquired a majority stake in Date Palm Developments UK (DPD), one of the world's oldest and largest date palm tissue culture commercial units. Further, it has set up a third production unit of tissue culture date palms at Panoli, Ankleshwar, Gujarat, India.

دُرَّةُ

MEJHOUL VARIETY—*"The Jewel of dates"*—

Top date importing countries

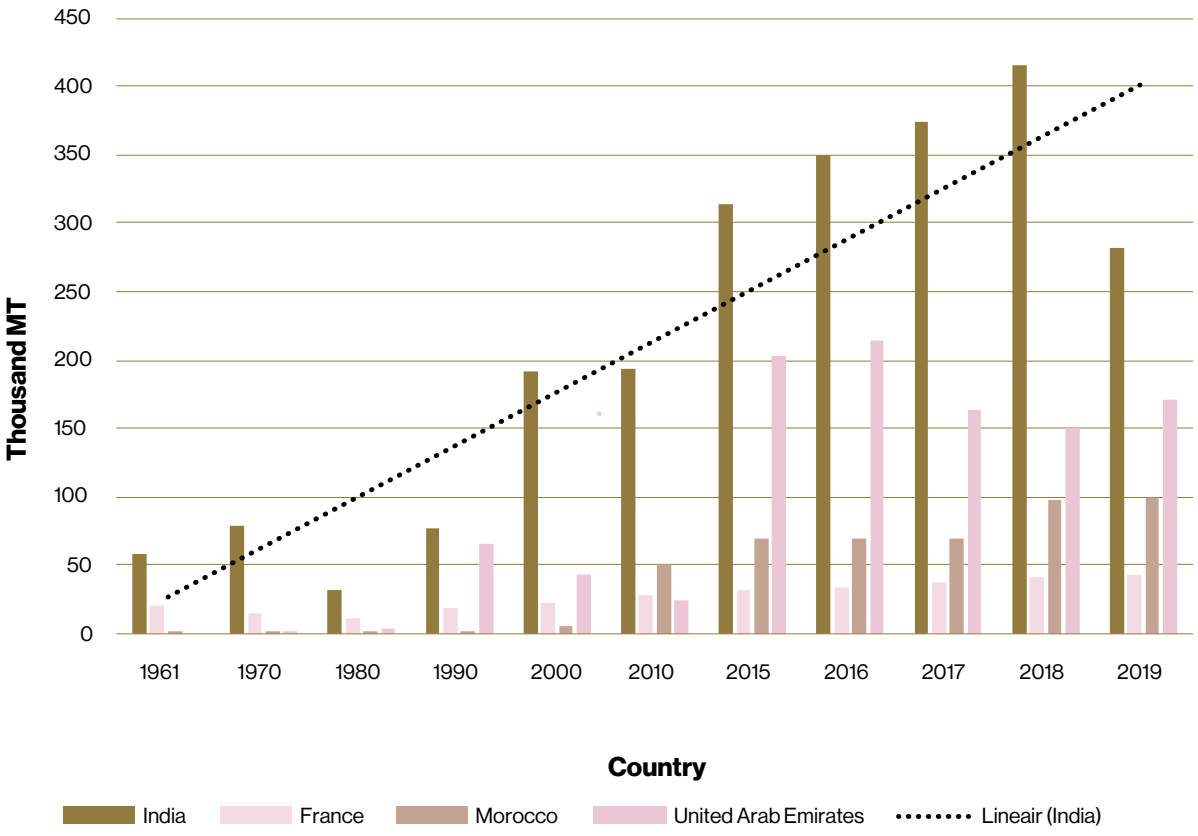


Figure 39: Top date importing countries. *Source: FAOSTAT.*

For its contribution towards establishing a modern and scientific date industry in India, Atul has been awarded the Khalifa International Date Palm Award 2009, Siemens Ecovatives Award 2010, Peacock Eco Innovative Award 2014, Make in India Award 2015 and Rashtra Vibhushan Award 2018. Atul has contributed in providing high quality tissue culture date palm planting material over more than 8,000 acres in India.

The Mejhoul variety has shown good commercial feasibility in arid regions of India, where rain is scant. Indian farmers have adopted improvised post-harvest technologies to deliver high quality standards of Mejhoul. According to the Indian climate, the Mejhoul tree starts flowering during February and March. Upon pollination, the fruit develops and enters into the Khalal stage between May and June. Further, it enters the Rhutab stage between July and August, and is finally harvested in Rhutab/partial Tamar stage *(Figure 41).* Conversion of Rhutab to Tamar is done after harvesting by simply drying under the sun or using solar dryers *(Figure 42).* The appearance of the Indian Mejhoul is light brown to dark brown, depending on which stage it is harvested *(Figure 43).*

The size and weight of Indian Mejhoul dates varies from 3cm to 5cm and 8g to 20g, respectively. There is scope of achieving a larger Mejhoul, if the thinning of bunches is implemented timely, during berry development in the Kimri stage. Indian farmers are adapting fruit bunch management and fruit sorting and grading techniques to improve on quality. After drying, dates are then sorted, washed, graded, packed according to size and quality and packed in retail packs *(Figure 44).* The Indian-grown Mejhoul fetches prices in home markets of INR 300 (approx $4) to INR 1500 (approx $20) per kg.

With the support of the Indian government, and continued good performance of high quality tissue culture date palms, Indian farmers of hot and arid climatic zones, especially in Jaisalmer, Barmer and other districts of western Rajasthan are being encouraged to cultivate the Mejhoul variety. Hence the area under cultivation of Mejhoul is gradually increasing in India.

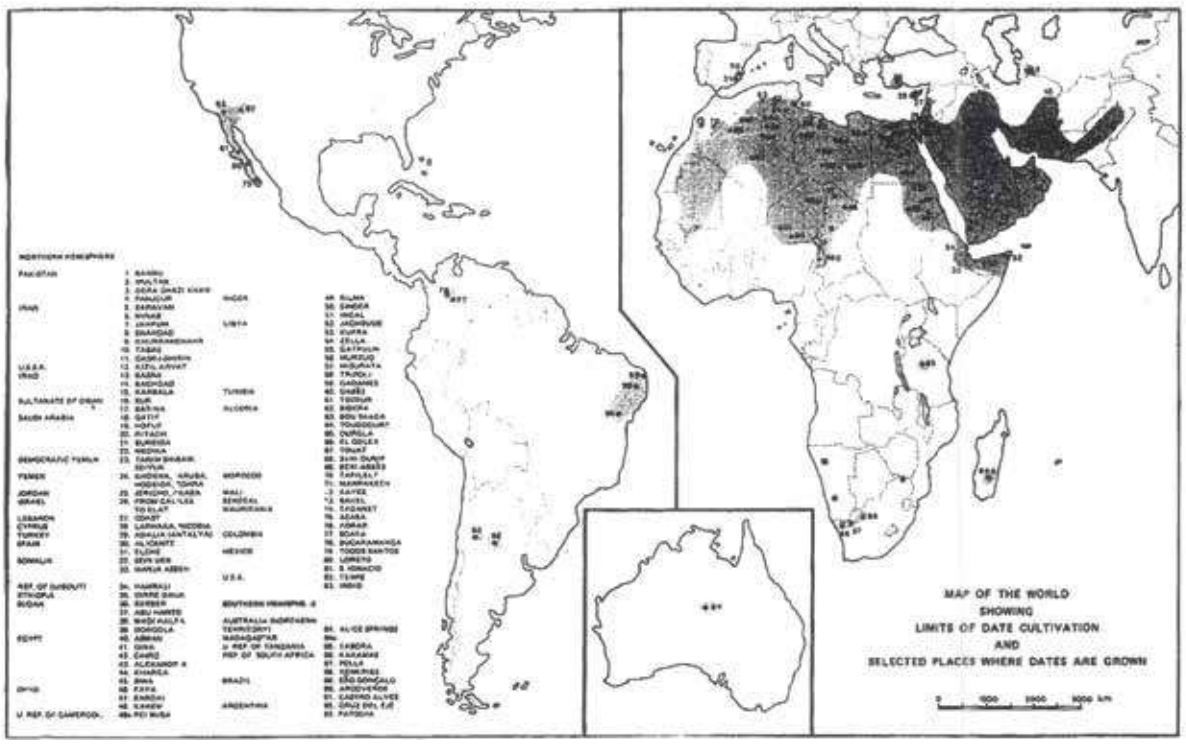


Figure 40: Date growing regions (FAO).

Figure 41: Fruit bunch management.

Figure 42 Drying harvested Mejhoul.

Figure43: Appearance Indian Mejhoul.

Figure 44: Grading and packing of Mejhoul.

Chapter five

Nutritional Values of Mejhoul Dates

المَجْهُولْ

Healthy aspects of the Mejhoul

The world's #1 food against Heart Attack Hypertension and Cholesterol

دُرَّةُ

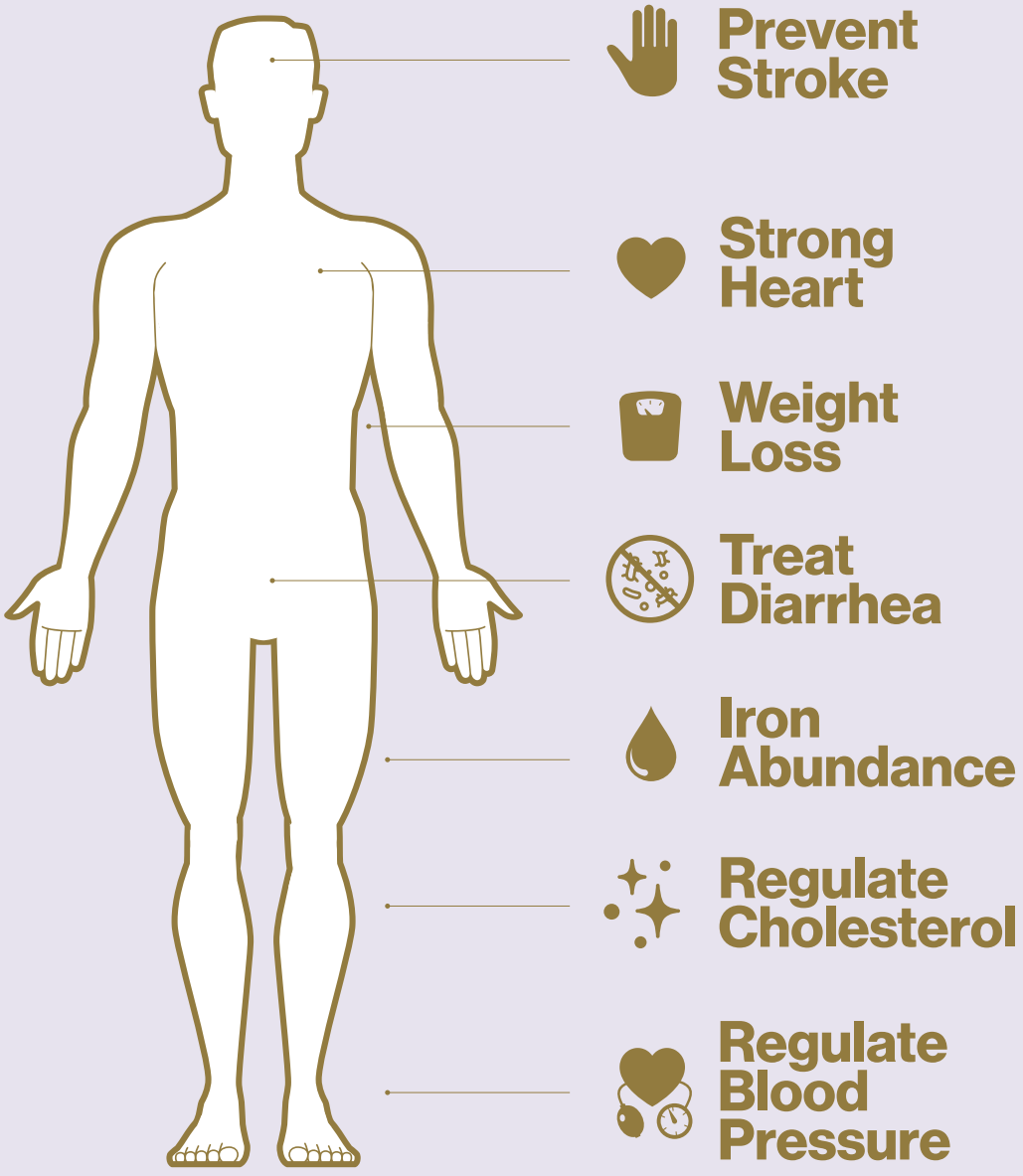
Dates are rich source of pottasium which prevents strokes and promotes the heatlh of nervous system

To strenghten your heart and prevent heart issues, soak a few dates in the evening, and drink the water in the morning

You should consume dates on an empty stomach in the morning to lose extra weight

MEJHOUL VARIETY—*"The Jewel of dates"*—

التُّمُورْ



Pottasium has a benifical effect of the microflora in the intestines and prevents diarrhea

The high iron content in dates is especially helpful in the case of anemia in children and pregnant women

Dates prevent blood clotting and cleanse the blood vessels, and control cholesterol level

Dates are high in magnesium and pottasium they are effective in the case of high blood pressure

المَجْهُولْ

دُرَّةُ

MEJHOUL VARIETY—*"The Jewel of dates"*—

التُّمُورْ

Mejhoul variety: Description and fruit characteristics

— Prof. Abdelouahhab Zaid —

دُرَّةُ

Synonyms: Mejhool, Mejhoul, Medjoul, Majhoul, Majul, Medjhool, Medjehuel, Majhol and Me-jool. However, the most popular name is MEJHOUL.

Meaning: (Arabic); referring to its origin: Unknown

History: Originally from the Tafilalet area of Morocco, where it was the principal export dating as far back as the 17th century, when it was sold in a fancy gift box for Christmas in Paris, Madrid and London. The modern Mejhoul was largely introduced into the new world of date culture by the US in 1927.

MEJHOUL DESCRIPTION

A description of Mejhoul has been provided by several authors (Zaid and de Wet, 2002 and El-Sharabasy and Rizk, 2019). The Mejhoul trunk is medium in size, leaves are short with average curvature and of medium width, and the number of spines on each leaf ranges between 30 and 38. Fruit size varies from small to large; shape is mostly oval, ranging between orange and yellow, topped with fine reddish-to-brown stripes that develop during the khalal stage. The fruit becomes reddish brown in color when fully mature and has a waxy coat and a light skin; the shrunken mesocarp is wrinkled and rough and has a flesh thickness of 0.5–0.7 cm, a soft texture, little fiber, and a delicious taste; and the palm is early bearing. The palm produces 70–90 kg per tree per year (Abu-Qaoud, 2015).

¶ The Mejhoul is a medium-to-late ripening variety, its harvesting season is around mid-September and the end of October, depending on the climatic conditions.

¶ Although classified as a soft date, Mejhoul is firmer than other varieties like Barhee and Khadrawy.

¶ Very little damage from rain. Fruit quality, however, is very sensitive to temperature and humidity. Both low and high extremes are not suitable for achieving high quality fruits.

¶ Mejhoul is among the date varieties the most responsive to fruit thinning, heavy thinning is required to obtain a high value commercial fruit.

¶ Easily produces 20 to 25 offshoots per tree.

Distinguishing characteristics: Medium-size trunk, short to medium leaves which are organised with little curvature. Has a high fruit quality (large size and attractive). It outshines all other date varieties for fruit quality and size.

It is of high commercial value and is considered the premium date for export markets, hence being known as “the Rolls-Royce of dates”.

DESCRIPTION

Palm: Leaves are short to medium (3.5-3.8m), about 1m shorter than Deglet Nour and Barhee varieties with a slight curvature. Dark green at early age, then changing to yellow with brown strips at the middle.

Trunk: Narrow to medium diameter.
Leaf bases: Average in size with light and inconspicuous scurf on edges.

Spines: 30 to 35 in number, thick and significantly developed at the base, one-quarter of the leaf’s length; usually in twos and sometimes in threes (Figure 10). Lower spines measure from 5-10cm and spines from 15-20 cm.

Pinnae: Straight, but often found curved to the middle; a taller pinnae (70-80 cm × 2.5-4cm); width (36-54cm × 4.5-5.0cm). On the outer centre side of the leaf they are open flat to 160°-180°, and on the inner side from 50°-90°. At the end of the leaf, the pinnae are at 45° on both inner and outer sides. At the base of the leaf, the pinnae start at 50°, opening to 90°. Along the length of the leaf, pinnae protrude at various angles (45° to 180°), in a unique formation specific to Mejhoul.

Inflorescence: Short orange base with a large number of spikelets each with 50 to 60 flowers.

Fruitstalk: Orange-yellow in colour; short to medium size but thick; a wax cover is usually found at its lower half. The fruitstalk with its short length, if not properly supported, could be broken when bearing heavily.

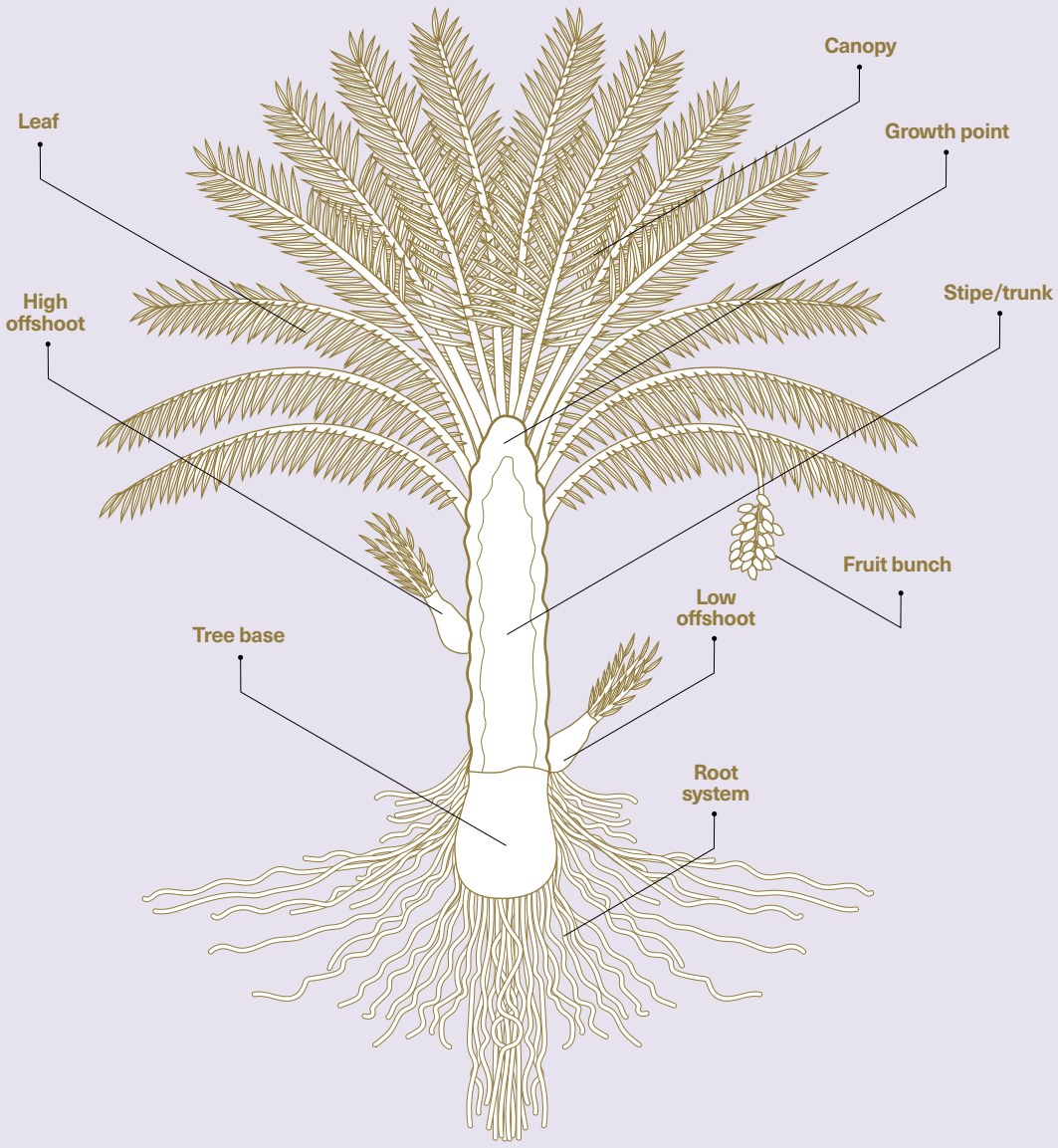


Figure 1.
Diagram showing the construction of a date palm with its root system.

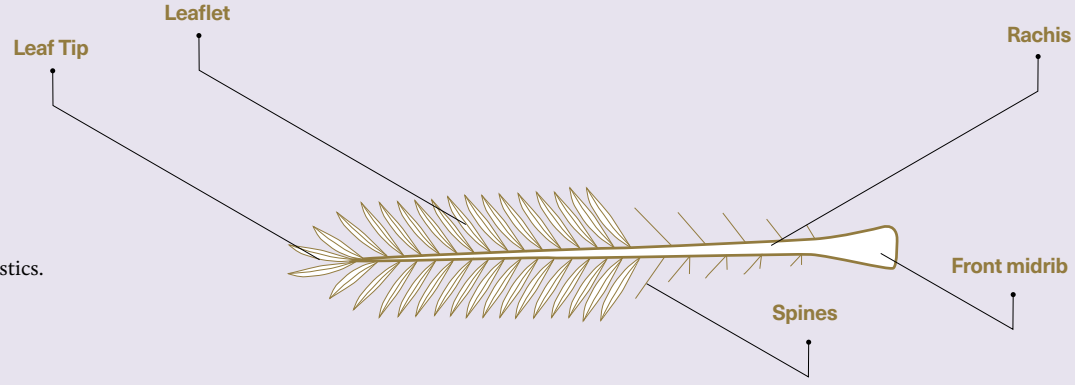


Figure 2.
Date palm leaf characteristics.

Fruit: Very large (20-40g) and elongated – broadly oblong, oval to somewhat ovate (5cm x 3.2cm in diameter). Irregularities in shape are common, and are associated with ridges on the seed, and the fruit is usually is covered with a waxy structure. Colours are as follows:

- Khalal stage: yellow-orange with clear dark red strips
- Rutab stage amber
- Tamar stage (ripe): transparent dark brown to black

The mature fruit colour is related to the climate and growing conditions.

The skin is irregularly wrinkled, shiny at the peak and dull at the lower part. Skin is medium-thick and tender, tied to the flesh, but at Tamar stage the fruit shrinks and the thickness of the flesh to 5-7mm with little fibre. Flesh is firm, meaty and thick, brownish amber, translucent with practically no fibre around the seed. Taste is excellent, sweet, but not concentrated.

FRUIT SIZE

To achieve large and jumbo fruit sizes, the grower must monitor the number of fruits per spikelet and bunch, and the yield per palm to keep the numbers at optimal levels. Depending on the overall growing conditions, the following is suggested:

Yield per palm: 80-120kg

Number of spikelets per bunch: 25-35

Number of fruits per spikelet: 5-10

Reducing the number of fruits per spikelet can be achieved by:

1. Non-effective pollination;
2. Decreasing the number of fruit setting from flowers by chemical spraying (not advised); and
3. Hand thinning. The best results are still by hand thinning when the fruit is at 1.0-1.5cm in size.

Seed: A walnut-brown, shiny colour that is darker at the end, 1.5 gram. Seedling canal is closed approximately 50 % of the seed diameter with small wrinkles. On each side of the seed there is a protrusion forming a "wing shape" that is typical of Mejhoul and different from all other varieties.

Fruit defects: Two main non- pathogenic defects are typical to Mejhoul:

a) *Loose skin:* During drying, on the palm and after picking, as the flesh loses water, the skin tends to separate from the flesh. Loose skin is mainly the result of growing and habitat conditions. It is not affected much by the naturally or artificially drying process. Loose skin is an aesthetic defect rather than a taste defect, and fruit with more than 20 to 25% loose skin are graded as Class II.

b) *Sugar crystallising:* A common problem with loose skin fruit, mainly where the skin is broken, is that aromatic sugar crystals are formed on the flesh and under loose skin. Sugar crystallising is more common in fruit with high moisture content at harvest. Again, this is an aesthetic defect that will categorise the fruit as Class II.

Pests and Fungi: During drying, many fruits fall from the bunch without the calyx, leaving a hole at the base of the fruit before drying is completed. Through this hole, fermenting beetles and fungi enter the fruit and that causes the fruit to sour. A slow drying process results in a higher level of fruit spoiling.

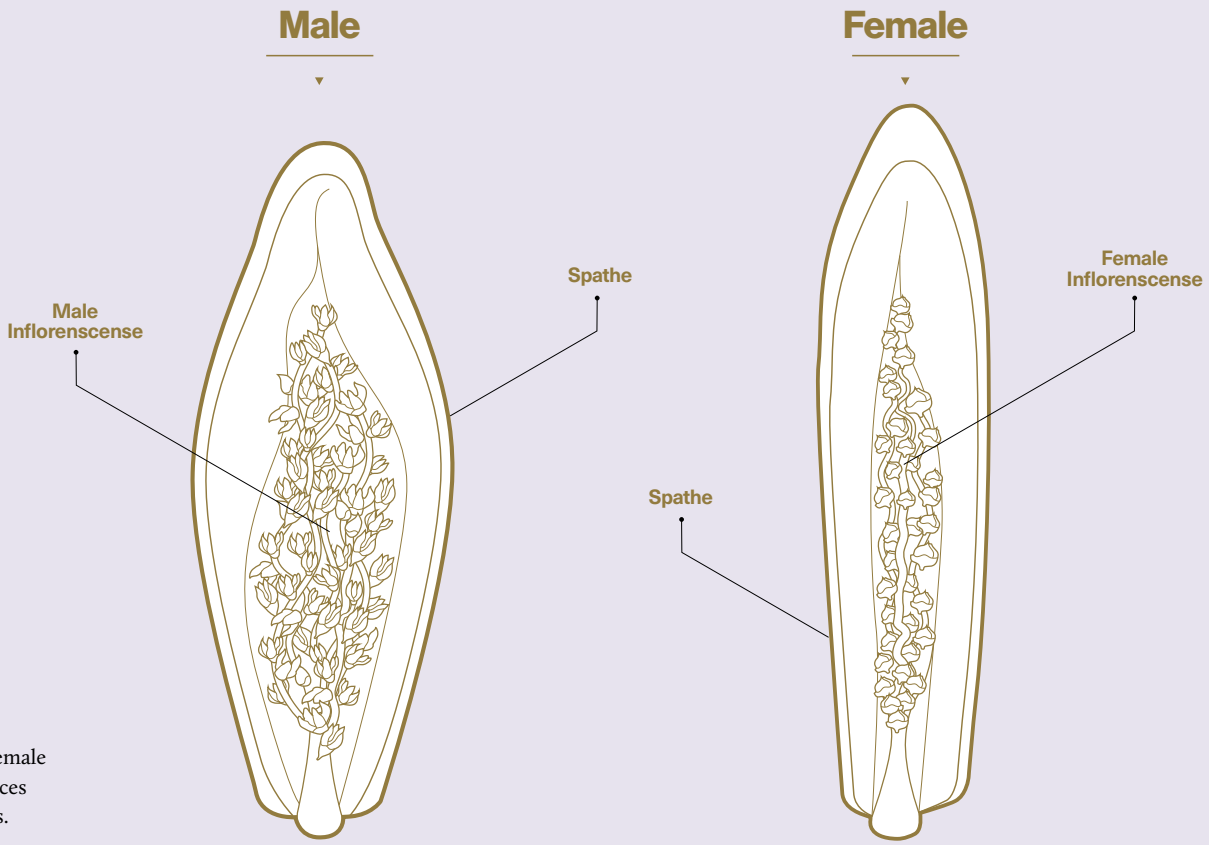


Figure 3.
Date palm male and female inflorescences and flowers.

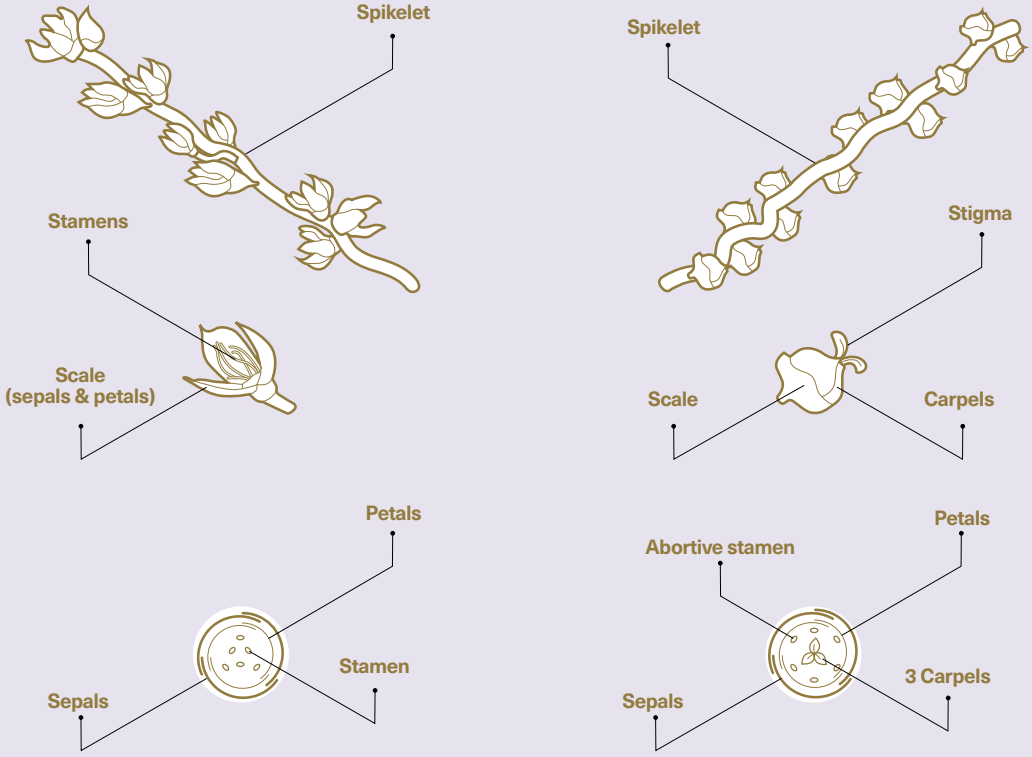


Figure 4.
Date palm male and female flowers (*Source: Dowson, 1982*).

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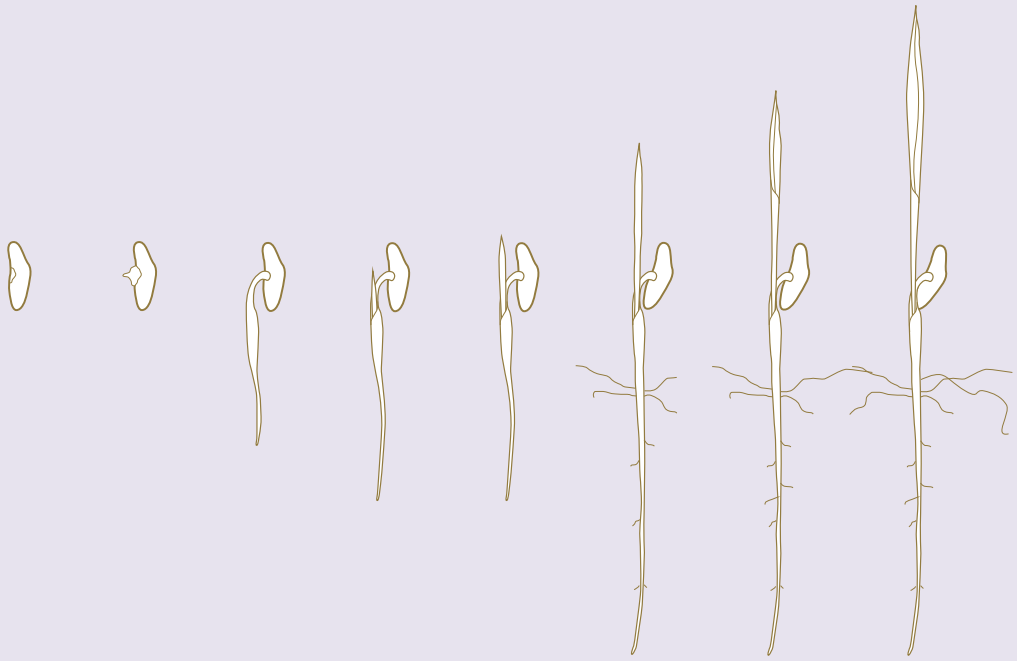

Figure 5.
Various development stages of a date palm seedling.

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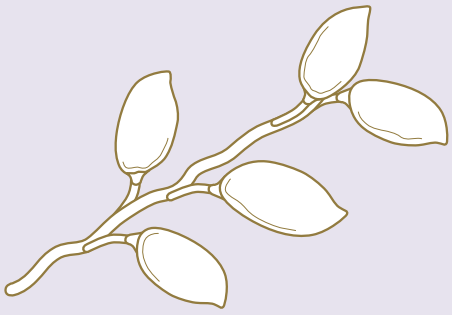
Figure 6.
Morphology and anatomy of date palm fruit and seed.



The dietary characteristics and health benefits of Mejhoul dates

—— Mr. Baruch (Buki) Glasner and Dr. Yuval Cohen ——

Dates are well known since ancient times as a source of nutritional energy. The high percentage of sugar acts as a preserving agent, making both fresh and dry fruit less perishable. Seeds of date fruit have been found in many archaeological sites along the Rift Valley that runs from the Lebanon to Mozambique, proving the importance of dates in ancient diets. *(Figure 7.)*

HEALTH BENEFITS

The trend of healthy and natural nutrition is at its peak. Dates in general, and specifically the Mejhoul variety, are proving to be the ultimate healthy and low-fat answer to the craving for sweets. Dates are consumed in a natural state, have negligible sodium (Na) content, while being very rich in dietary fibre, minerals and antioxidants. The Mejhoul variety has an impressive fibre content of about 6g per 100g of fruit, a fact that contributes to a feeling of satiety and helps to maintain a healthy digestive system. Dates are a source of minerals such as potassium, magnesium, iron, calcium and zinc, and contain B vitamins. Basic information on the values of the semi-dry Mejhoul fruit is described in Table 1.

Many of these minerals are essential for bone strength and the prevention of hypertension. The high ratio of potassium to sodium in Mejhoul fruit has major benefits. A large, published study showed that higher dietary potassium-sodium ratios can lower the mortality rate from cardiovascular and other diseases by up to 50%. Dates are rich in antioxidants (polyphenols). Studies led by Professor Michael Aviram of the Technion Rappaport Faculty of Medicine the showed that the consumption of Mejhoul dates reduce low-density lipoprotein (LDL) cholesterol oxidation and has the potential to remove excess cholesterol from artery walls (Rock et al., 2005).

It is also interesting to note that although dates are rich in carbohydrates, their glycemic index (their effect on blood sugar levels) are medium, shattering the perception of the date's high glycemic index.

It is important to emphasise that the data above represents average values, with fluctuations due to the large variation between different cultivation regions, sources of fruit, or even because of different harvest times. In addition, this data relates to semi-dry fruits with a water content of 22-26% (water content of this level provides a soft and smooth texture to the fruit).

As we can learn from Table 1, the Mejhoul fruit is mostly composed of carbohydrates, with various sugars being the main carbohydrates. The sugars in ripe Mejhoul dates, like most other date cultivars, are composed mainly of the monosaccharides glucose and fructose (fruit sugar), with both in similar concentrations. Sucrose is present in earlier stages, but during fruit ripening it is completely converted into the two monosaccharides. These reducing sugars are readily absorbed during digestion. To the human taste, fructose is twice as sweet as glucose. The high sugar level induces a feeling of satiety and may also reduce the total calorie intake compared to fat-rich foods (Al-Farsi & Lee, 2008). Additional carbohydrates form the fruits' fibres.

WATER CONTENT

Water content in ripe Mejhoul dates varies between 19-26%, although this percentage depends on the dryness of the harvested crop. If the fruit is left on the tree until fully dry, its water content will be 16-19%. However, most of the Mejhoul crop is currently selectively harvested while in a semi-dry state, before full drying of the fruit. It is marketed with a water content of 22-26%. Fruit with higher water content is dried in the field or under controlled conditions in packinghouses, while fruit with lower water content is incubated with water in warm conditions until the dry fruit reaches proper moisture levels. These processes ensure the fruit attains a soft and smooth texture.

Figure 7: A typical Mejhoul date plantation.

Figure 8: The Mejhoul is a natural fruit with no additives or preservatives.

Table 1.

Nutritional values of Mejhoul dates

Nutrient	Value per 100 grams
Water	**21.32 g**
Energy	**277 kcal (1160 kJ)**
Protein	**1.81 g**
Total lipid (fat)	**0.15 g**
Ash	**1.74 g**
Carbohydrate,	**74.97 g**
Fiber, total dietary	**6.7 g**
Sugars, total	**66.47 g**
Sucrose	**0.53 g**
Glucose	**33.68 g**
Fructose	**31.95 g**
Maltose	**0.30 g**

Mineral	Value per 100 grams
Calcium (Ca)	**64 mg**
Iron (Fe)	**0.9 mg**
Magnesium (Mg)	**54 mg**
Phosphorus (P)	**62mg**
Potassium (K)	**696 mg**
Sodium (Na)	**1.0 mg**
Zinc (Zn)	**0.44 mg**
Copper (Cu)	**0.362mg**
Manganese (Mn)	**0.296 mg**

Vitamin	Value per 100 grams
Vitamin C	**0 mg**
Thiamin	**0.05 mg**
Riboflavin	**0.06 mg**
Niacin	**1.61 mg**
Pantothenic acid	**0.805 mg**
Vitamin B-6	**0.249 mg**

WATER ACTIVITY

Water activity or Equilibrium Moisture Content (ERH) is another method for determining fruit status with regards to the risk of microorganism contamination. Water activity is the most reliable criterion to determine the shelf-life of date fruit. Water activity <0.65 at 26°C serves as a critical limit for commercial date storage and ensures resistance to deterioration by microflora. (Glasner et al., 1999; Navarro & Navarro, 2015).

PROTEIN CONTENT

The amounts of protein within date fruit are too small to be considered a significant nutritional source. However, dates contain essential amino acids which the body cannot make and must be provided in the diet. Glutamic, aspartic, lysine, leucine, and glycine are the predominant amino acids in fresh dates, whereas glutamic, aspartic, glycine, proline, and leucine are the predominant amino acids in dried dates. (Al-Farsi & Lee, 2008). Mejhoul dates can be categorised both as 'fresh' if harvested early, or 'dry' if water content is below 20%.

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MEJHOUL DATES: NATURAL HEALTHY DELIGHTS

The Mejhoul variety tastes sweet and delicious and is defined as a superfood. The Mejhoul has a fat content of less than half a percent, and compares highly favourably with other sweets (such as chocolate or ice cream) that contain significantly higher amounts of fat. The Mejhoul is a natural fruit with no additives or preservatives, and its high fibre content helps in the proper functioning of the digestive system. The Israeli date industry has promoted the Mejhoul as a healthy and natural delight.

Mejhoul variety's advantages, mechanism of its fruit ripening, and packaging requirements.

—— Dr. Hassan Khalid Hassan Al-Ogaidi ——


تمر مجهول فاخر
Premium Medjool Dates
التميز
EXCELLENCE
إنتاج غور الأردن
Production of the Jordan Valley
بيت لحم
Bethlehem
للتجارة
MEDJ
Alghat Dates
بالميرا
L NKHIL
SELECTED JORDANIAN DATES
MEDJOUL
5Kg
PREMIUM QUALITY
MEDJOOL
DATES
تمر مجهول عالي الجودة
SEDRA DATES
سدرة للتمور
JOUL DATE
MEDJOOL
تمر مجهول أردني
Jordanian Medjoul Dates
التمور الذهبية

Various date palm packages

The Mejhoul variety originates from the Kingdom of Morocco, where it was traditionally catered to royalty and important visitors to the Kingdom. However, after Bayoud disease infected the oasis, it damaged a large proportion of the Kingdom's date palm plantations. As an initiative to save the date palm trees, Mejhoul offshoots were gifted to the USA.

The Mejhoul is considered a delicious and soft date variety, characterised by its distinctive sweetness and shape. The weight of the fruit may reach 50g. The main Mejhoul-producing countries include the Kingdom of Morocco, USA, State of Palestine, Hashemite Kingdom of Jordan, and more recently the Republic of Namibia, Republic of South Africa, Australia, and South America.

THE MATURITY MECHANISM OF THE MEJHOUL FRUIT

The process of pollination begins when cells start to actively multiply, which lasts for a short time. Then begins the phase of chimri and green colour, and then the yellow phase follows as a result of the typical fertilisation and irrigation, which increases the size of the fruit until it reaches a fixed size. It is recommended to increase the irrigation process (continuous watering) from the permeable phase to the yellow phase (900 litres per week). At this stage, vital and physiological processes begin on size, taste, flavour, disappearance of chlorophyll and the appearance of maturation pigments.

The continuous irrigation process helps to increase the commercial maturity of the fruit. Whereas the Mejhoul trees need a large amount of water when first pollinated until it reaches the end of the yellow phase, the water supply should be reduced at the beginning of the hydration process.

After this stage, next comes the process of complementing gradual maturity and maintaining the physiological, chemical, physical and vital transformations of the fruit. Notable changes include increased softer and fresher fruit tissue, a decrease in the respiratory activity of the fruit, a reduction in acidity and the transformation of all pectinate substances from an undissolved form to a melted one.

The process of Mejhoul thinning is very important to produce fruits of good size and weight. This is a purely technical process through which the quantity and quality of production can be determined. This thinning process depends on the experience and skill of the farmer, so that they can reconcile the production and the process of packing (infrastructure) of the date farm.

(Figure 9: Growth phases of the Mejhoul fruit)

MEJHOUL HARVEST AND PACKAGING REQUIREMENTS

The fruits of the Mejhoul date palm are usually harvested in mid-September and, depending on the temperature, the harvesting season may continue until mid-October. Mejhoul harvesting is both time-consuming and labour-intensive. Because it is a high-cost fruit, extra care is given to prevent its exposure to any risks, such as pests or birds.

Bunch protection techniques at an early stage have proven their effectiveness with Mejhoul fruits, as the fruit falls into the net cover. Unlike other date varieties, Mejhoul fruits are harvested one by one, not by cutting the whole bunch. Mejhoul fruits are also considered 'soft dates', so therefore the 'shallow dish' packaging technique used for soft to semi-dry fruits is applied.

Figure 9: **Growth phases of the Mejhoul fruit**

Phase I
Begins immediately after the pollination process and lasts for 3-5 weeks, depending on the environment and climate. The main characteristics of this phase are:

1. **The start of growth**
2. **The shape of the grain spherical**
3. **Light colour, with green horizontal lines**
4. **High humidity**

Phase II
At this stage, the fruit shows a rapid growth lasting for for 4-6 weeks, depending on the environment and climate. The main characteristics of this phase are:

1. **Green colour**
2. **Rapid increase in weight and size**
3. **High humidity**
4. **Taste**

Phase III
The main characteristics of this phase are:

1. **Yellow colour**
2. **Larger fruit**
3. **Slow weight gain**
4. **Increased sugar**
5. **Sweeter taste**

Phase IV
The process of the fruit switching from beesser to wet begins and continues until its peak. This phase is characterised by:

1. **Sweetness of the fruit**
2. **Honey colour**
3. **Disappearance of the juicy substance**
4. **Sweetness is very clear**
5. **Sugary taste**
6. **Wet period between 2-4 weeks**
7. **40-45% moisture**

Phase V
Reveals the full maturity of the fruits in reddish and black colour by soil, and is the final stage of the maturation process of the fruit. This phase is characterised by:

1. **Strong weight and shape**
2. **Low humidity 25-28%**
3. **Colour varies between red to brown**
4. **The outer crust is attached to the pulp, forming a beautiful shape, but the crust is soon separated by environmental conditions**

THE FIRST COOLING PROCESS

In date plantations where the field temperature is high, reaching 45°C to 50°C, it is understood that the temperature of the fruit should be gradually reduced to 15°C, and then to 5°C. This cooling process during the first 24 hours makes the fruit become harder, and helps to maintain its distinctive shape. *(Figure 10.)*

WEIGHING

The weighing of the fruit is an important part of the process, and is done directly after the fruit is taken from the field and sent to the selection and grading station. The weighing process indicates the production quality, and the number of workers needed for further processing.

WASHING AND DRYING

The washing and cleaning of the fruits, to remove straw and dust, is considered an important and delicate process due to the sensitivity of the Mejhoul outer layer, which is an important part of its selling value. The amount of excess water in Mejhoul fruits also affects its quality, as it contains high levels of pH, which makes the drying process very sensitive. The fruits then undergo a sterilisation process to remove any pests (including their eggs), by using a closed-room fumigation process.

SELECTION AND GRADING

The selection and grading process is important for the identification and sorting of fruits according to sizes, which it is essential in determining the prices of the fruit and suitable packaging. This process needs to be monitored and controlled, as it is also important to have highly-skilled labour. Today, machinery has been introduced which can conduct the process automatically.

The selection and grading specifications of Mejhoul dates, can be organised as follows:

¶ The ideal humidity of Mejhoul fruits is 25-28%.

¶ First and second grade Mejhoul fruits are sorted separately, as well as the dry and damaged dates, each in a separate category.

¶ First grade Mejhoul dates are free from extra humidity, which gives them a beautiful brown colour.

¶ Second grade Mejhoul dates tend to have a yellow-brownish colour, as a result of the entry of air between the outer layer of the fruit and the pulp. While different from first grade Mejhoul dates, they are still of good quality, as natural growth in good quality soil means they are rich in calcium fructose and calcium glucose under the fruit's outer layer.

¶ Dates are free of mechanical, physical or chemical damage.

¶ Dates are free from issues such as bloating, excess sugar or removed outer layer.

PACKAGING

Packaging depends on customer demand and tastes, but the most commonly-used packaging is carton packs of 5kg. Dates are also made available in 3kg, 2kg and 1kg quantities. Packaging includes moisture-resistant packs to maintain the fruit quality, and are usually wrapped in shrink-storage nylon. *(Table 2.)*

TWO TYPES OF STORAGE

Short-term storage, and long-term storage. Dates stored for a short term are stored at temperatures of 5°C to 10°C, whereas dates stored for longer periods can be kept at temperatures of -18°C to -25°C.

Figure 10: Beautiful texture of semi-dry Mejhoul fruits.

Table 2:

Mejhoul date sizes, and number of fruits per 5kg pack

Fruit Size	Weight/g	Average Weight	Number of fruits per box of 5kg
Small	**14**	**12**	**76-80 pieces**
Medium	**15-18**	**16**	**55-71**
Large	**19-23**	**21**	**43-50**
Jumbo	**24-27**	**25**	**37-45**
Super Jumbo*	**+27**	**29**	**30-40**

* Mejhoul fruits may reach up to 30-40 g per fruit, if well taken care of.


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MEJHOUL VARIETY—*"The Jewel of dates"*—
التُّمُورْ

المَجْهُولْ

Food Value of Mejhoul fruits

—— Prof. Abdelouahhab Zaid and Prof. Ibrahim Adam Ahmed Al-Dukheri ——

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The Mejhoul date is ranked first among the types of dates produced. This is because it has many advantages that make it a desirable product to consumers due to its taste. Also this type of dates contains mainly monocrystaline (glucose and Fructose) not bilateral sugars (Sucrose) which has a negative impact on the levels of blood sugar. As well it contains high levels of potassium, phosphorus and anti-oxidants., which indicates the importance of this healthy food type and sufficient justification of the large increase in its consumption.

In the view of human nourishment, date fruits are rich sources of sugars, protein, minerals, fiber, and vitamins. A swift energy source due to the high sugar content, dates have been called nature's candy. It is an excellent snack food and being recommended.

Mejhoul dates have natural sugar crystals that give its skin a slight shimmer, and when you bite into one, you'll immediately notice the rush of flavors hinting at wild honey, cinnamon and caramel. They're truly one of nature's most delectable treats, tasting as if they've come right out of the oven.

When the fruits reach maturity (tamar), sucrose inverts into glucose and fructose. Dates contain reasonable amounts of vitamin A, thiamin, riboflavin, and niacin and are a good source of minerals such as potassium, calcium, and iron, as well as of dietary fiber. They possess antioxidant potentials. Table 1: gives the nutritional values for Medjool.

Table 1: Nutritional value of Medjool cv. dates (nutrient values and weights are for edible portion)

Table 3: **Nutritional value of Medjool cv. dates (nutrient values and weights are for edible portion)**

Name	Amount per 100 grams	Unit	Min	Max
Water	213	g	19.5	23.1
Energy	277	kcal		
Energy	1160	Kj		
Protein	1.81	g	1.67	1.96
Total lipid (fat)	0.15	g	0.1	0.21
Ash	1.74	g	1.69	1.79
Carbohydrate, by difference	75	g		
Fiber, total dietary	6.7	g	5.9	7.4
Sugars, total including NLEA	66.5	g	65.2	67.7
Sucrose	0.53	g	0.48	0.58
Glucose (dex- trose)	33.7	g	32.8	34.5
Fructose	32	g	31.5	32.4
Lactose	0	g	0	0
Maltose	0.3	g	0.27	0.34
Galactose	0	g	0	0
Calcium, Ca	64	mg	60	69
Iron, Fe	0.9	mg	0.79	1.01
Magnesium, Mg	54	mg	53	55
Phosphorus, P	62	mg	60	64
Potassium, K	696	mg	690	701
Sodium, Na	1	mg	0	1
Zinc, Zn	0.44	mg	0.43	0.45
Copper, Cu	0.362	mg	0.353	0.371
Manganese, Mn	0.296	mg	0.281	0.311
Vitamin C, total ascorbic acid	0	mg	0	0
Thiamin	0.05	mg	0.047	0.053
Riboflavin	0.06	mg	0.06	0.06
Niacin	1.61	mg	1.45	1.77
Pantothenic acid	0.805	mg	0.76	0.85
Vitamin B-6	0.249	mg	0.231	0.266
Folate, total	15	µg		
Folic acid	0	µg		
Folate, food	15	µg		
Folate, DFE	15	µg		
Choline, total	9.9	mg		
Betaine	0.4	mg		
Vitamin A, RAE	7	µg	6	9
Carotene, beta	89	µg	72	107
Carotene, alpha	0	µg	0	0
Cryptoxanthin, beta	0	µg	0	0
Vitamin A, IU	149	IU	120	178
Lycopene	0	µg	0	0
Lutein + zeax- anthin	23	µg	17	29
Vitamin D (D2 + D3), International Units	0	IU		
Vitamin D (D2 + D3)	0	µg		
Vitamin K (phyl- loquinone)	27	µg	2.7	2.8
Vitamin K (Dihy- drophylloqui- none)	0	µg	0	0
Fatty acids, to- tal trans	0	g		
Tryptophan	0.007	g		
Threonine	0.042	g		
Isoleucine	0.045	g		
Leucine	0.082	g		
Lysine	0.054	g		
Methionine	0.017	g		
Cystine	0.046	g		
Phenylalanine	0.048	g		
Tyrosine	0.016	g		
Valine	0.066	g		
Arginine	0.06	g		
Histidine	0.029	g		
Alanine	0.078	g		
Aspartic acid	0.22	g		
Glutamic acid	0.265	g		
Glycine	0.09	g		
Proline	0.111	g		
Serine	0.062	g		

Source: *US Department of Agriculture National Nutrient Database for Standard Reference, Basic Reports 9087 and 9421. Accessed 18 Sept 2014.*

Nutritional value of Mejhoul dates

(Per 100 grams)

Energy
277 kcal
1160 kJ

Water
21,3 g

Minerals

- Potassium 696 mg
- Calcium 64 mg
- Phosphorus 62 mg
- Magnesium 54 mg
- Sodium 1 mg
- Iron 0.9 mg
- Zinc 0.44 mg
- Copper 0.362 mg
- Manganese 0.296 mg

Vitamins

- Thiamin 0.05 mg
- Riboflavin 0.06 mg
- Niacin 1.61 mg
- Pantothenic acid 0.805 mg
- Vitamin B-6 0.249 mg
- Folate, total 15 µg
- Folate, food 15 µg
- Folate, DFE 15 µg
- Choline, total 9.9 mg
- Betaine 0.4 mg
- Vitamin A, RAE 7 µg
- Carotene, beta 89 µg
- Vitamin A, IU 149 IU
- Lutein + zeax-anthin 23 µg
- Vitamin K (phyl- loquinone) 2.7 µga

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Carbohydrate, by difference 75 g

Protein 1.81 g
Fiber 6.7 g
Lipid (fat) 0.15 g
Ash 1.74 g

Sugars

Glucose (dextrose) 33.7 g

Fructose 32 g

Sucrose 0.53 g
Maltose 0.3 g

Chapter six

Constraints and diseases facing Mejheul cultivation

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Figure 1: The Red Palm Weevil,
© *Shutterstock*

MEJHOUL VARIETY—*"The Jewel of dates"*—

Main constraints facing Mejhoul cultivation

— Prof. Abdallah Oihabi and Dr. Jose Romeno Faleiro —

The Mejhoul date variety is facing several biotic and abiotic constraints which are threating the sustainability of the date palm sector in the Middle East and North Africa (MENA) region, including climate change, the Red Palm Weevil, Bayoud disease, and lack of good agricultural practices

CLIMATE CHANGE

Climate change is arguably the greatest challenge facing date palm cultivation in the MENA region, and its negative impact is already noticeable on the productivity and fruit quality. Changes in the temperature cycle, such as the increase of temperature during fruit maturation observed in different date-producing areas, has led to a significant increase of the rate of dates skin separation. This problem is most severe when corrective measures of the irrigation management are not taken. Mejhoul dates are known to be very delicate, therefore, any change in the surrounding environment will impact the fruit quality, resulting in dates remaining very small and dry.

Climate change may impact other factors related to date production such as:

- Prolonging drought seasons
- Increased risk of fire after drought periods (this was the case in in the Tafilalet Valley in Morocco, where Mejhoul variety land was devastated by fire)
- Reducing water availability
- Degrading soil quality, mainly by increasing its salinity rate
- Reducing agricultural activities in date-producing regions, leading to increased immigration of the youth and reducing the qualified workforce.

As the effect of climate change affects the whole MENA region, as well as the other Mejhoul date-producing countries, regional and international coordination could help to mitigate its effects and improve the resilience of its impact to these regions.

THE RED PALM WEEVIL

During the late 1990s, the red palm weevil – *Rhynchophorus ferrugineus Olivier* – was first reported on Mejhoul date palms in the Jordan-Palestine-Israel region. The pest gained a foothold on date palms in the Middle East during the mid-1980s, and thereafter spread rapidly worldwide mainly through infested planting material transported for farming and ornamental gardening. Ensuring the transport of pest-free planting material therefore requires the implementation of strict phytosanitary measures. *(Figure 1.)*

The red palm weevil is currently managed through an Integrated Pest Management (IPM) strategy comprising several components, which has been deployed with varying degrees of success and failure. The lack of an efficient, easy to use and cost-effective infestation detection device, the absence of effective biological control agents, coupled with weak enforcement of phytosanitary measures to check the movement of infested planting material, have resulted in the build-up and spread of the red palm weevil pest.

Adopting the appropriate agricultural practices while planning new date palm plantations – of Mejhoul and other varieties – with respect to palm density (spacing) and irrigation can go a long way in mitigating red palm weevil infestation. Enhanced in-groove humidity due to high palm density and open flood irrigation are known to contribute to red palm weevil attack. Furthermore, protecting injuries on the palm immediately after offshoot and frond removal significantly eliminates the threat posed by invading gravid female weevils attracted to palm volatiles emitted by injured palm tissue. The routine application of preventive insecticidal treatments on a calendar basis for red palm weevil control also needs

Figure 2: Date palm trees infected with the Bayoud disease.

Figure 3: Will the climate change be another important constraint to date Palm cultivation? Boudnib area, Tafilalet region, Errachidia City, Morocco *(26 January,2022).*

to be discouraged. Large organic date plantations of Mejhoul and other date varieties are coming up in the MENA region where the challenge of chemical-free and environmentally-friendly control measures against red palm weevil and other pests needs to be addressed.

Managing the threat of the red palm weevil, and protecting the Mejhoul and other date palm varieties is not an easy task, but is not impossible either. It calls for the deployment of dedicated and qualified personnel, supported by adequate financial resources, with efficient planning, implementation, supervision and evaluation of the management strategy, and requires a high degree of coordination among all concerned stakeholders.

BAYOUD DISEASE

Bayoud disease has intensively devastated Moroccan date plantations, destroying more than ten million date palms in almost one century (Zaid et al., 2002). It is therefore considered the most destructive date palm disease in North Africa. Only few low-quality dates Moroccan varieties are resistant to this disease but unfortunately, the Mejhoul cultivar is among the most sensitive of date varieties. *(Figure 2.)*

Bayoud is a disease caused by a soil-born fungi called Fusarium oxysporum f.sp. albedinis. Bayoud disease appeared for the first time in The Draa Valley in Morocco, and was described scientifically for the first time in 1919 by Foex & Vayssière (Malençon, 1950).

The nature and distribution of the pathogen in the soil, and its spread through the root system of the date palm, makes control of the disease through chemical methods unsuccessful. Therefore, the creation of new date varieties – combining good-quality dates and resistance to Bayoud disease through mass breeding – was the method chosen by Morocco to control the disease. Consequently, a few varieties presenting the desired characteristics were created, particularly the Nejda cultivar, but none have been able to compete with the Mejhoul variety.

Given the importance and the reputation of Mejhoul dates at both local and international markets, Morocco planted three million date palms where the Mejhoul variety share is around 70% (Green Morocco Plan 2008-2020). These date palms were planted in virgin areas where date palm had never been planted, and consequently were Bayoud-free. Sever prophylactic measures were taken and appropriate agricultural practices implemented in order to avoid the development and spread of the disease in the newly-planted areas. *(Figure 3.)*

LACK OF KNOW-HOW OF MEJHOUL THE GOOD AGRICULTURAL PRACTICES

In most of the Mejhoul-producing countries in the MENA region, the agricultural practices applied to date palm cultivation are traditional and not adapted to the environmental conditions of the specific area (AOAD, 2018). The Mejhoul variety is among the varieties most affected by the application of non-appropriate agricultural techniques to its cultivation, as its fruits are very delicate and therefore need special care.

The Good Agricultural Practices specific for the Mejhoul include: pollination, thinning, bunch management, harvesting and post-harvest handling, which are all different from the needs of other date varieties (Oihabi, 2014). However, most of the date producers in the traditional areas of date cultivation don't take this fact into account, leading to low productivity and fruit quality.

The continuous use of inappropriate agricultural practices in dates production, combined with the effect of the climate change, has led to the rarefication of the water resources and the degradation of their quality, as well as the depletion of other natural resources including soil degradation.

To overcome this handicap, the concerned countries and other stakeholders should develop a cooperation programme aiming at increasing the understanding of Good Agricultural Practices, which can be applied by producers to Mejhoul date production.

The economic dimension to investing in date palm waste

— Eng. Fuaad Mansur —

Date palm trees will always be a source of a living to many people. The date palm tree is also an invaluable source of national income, and in many countries, taking care of this tree ensures a decent standard of living to a large segment of the population.

The waste from date palm trees comes from fronds, trunks, frond bases, date bunches, and sheath. These waste materials were previously used in traditional handicrafts, and in tools that are no longer needed today. This means that date palm waste has become a serious problem and a burden on date palm growers. In addition, governments in several countries are forced to bear a high cost to dispose of data palm waste, either by burning or burying it. In some cases countries are not as respectful to environmental regulations and laws as adopted by governments in Arab countries.

INVESTING IN DATE PALM WASTE

There are several good reasons to invest in date palm waste. First, such an investment would support the sustainability strategy that most Arab countries currently seek to implement. Second, investment would prevent the high financial cost and large annual expenses incurred by governments of date-producing countries forced to collect, transport, burn and bury date palm waste, alongside the cost of buying and maintaining the machinery required for these processes. Finally, investing in industrial projects to recycle date palm waste also means valuable additional income to date palm growers.

THE ECONOMIC DIMENSION

At the national level, investing in industrial projects to recycle date palm waste offers a significant positive impact on the national income of countries with large date palm plantations. Such projects are considered a safe investment, for their reliance on local raw materials (non-imported) that are inexhaustible, and where prices are not affected by the fluctuations of international markets. This is in addition to the fact that industrialised projects will reduce the dependence on imported products, which implies real support to national economies.

For the date palm growers, one of the main advantages that can be achieved from investing in date palm tree waste of their farms, is that the water materials can either be sold to achieve a direct financial return, or they can take a share of the industrial project's income, based on the amount of supplied date palm waste materials.

DATE PALM WASTE INVESTMENT PRODUCTS AND ECONOMIC FEASIBILITY

A number of products can be obtained from date palm waste recycling, and investment projects in some Arab countries have already been working on commercial scale, production of products such as:

- Medium-density fibreboard (MDF) panels
- Particle boards
- Palm pallets
- Palm charcoal
- Draft carton
- Animal feed
- Palm plastic doors
- Organic fertilisers

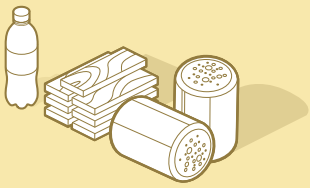
The economic viability of an industrial project will depend on several factors, including the access and availability of raw materials. In most Arab countries, establishing a project to invest in date palm waste can prove successful, provided raw material is available locally and does not need to be imported. Any industrial project must prepare a comprehensive economic feasibility study that takes into account all factors likely to have a positive or negative impact on the formation of such a project.

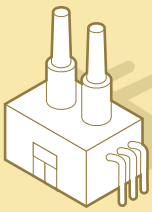
MEJHOUL VARIETY—*"The Jewel of dates"*—

Recyclable Elements of the Date Palm

Waste

Recyclable plastics wood scrap and agricultural waste



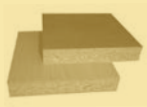


Making

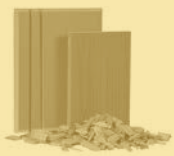
Food, health, industrial and construction products

DatePalm Pallets

DatePalm Plastic Doors



DatePalm Partical Board



DatePalm MDF

DatePalm Charcoal

DatePalm Animal Feed

DatePalm Organic Fertiliser

DatePalm Draft Carton

—Annual financial returns for farm owners by investing the date palm waste of their farms in industrial projects—

Farm size	*Annual sales of project products*	*Annual material returns to the farm owner*
MDF PLANK PRODUCTION PROJECT		
Construction of an integrated project based on the waste of 1 million date palm trees	$16.4 million	Annual financial return of the project: $4 million
PALM PARTICLE BOARD PROJECT		
Construction of an integrated project based on the waste of 1 million date palm trees	$13.6 million	Annual financial return of the project: $3.4 million
PALM CHARCOAL PRODUCTION PROJECT		
Construction of an integrated project based on the waste of 1 million date palm trees	$11 million	Annual financial return of the project: $3.8 million
Construction of an integrated project based on the waste of 1 million date palm trees	$13.6 million	Annual financial return of the project: $3.4 million
PLASTIC WOODEN DOOR PRODUCTION PROJECT		
Farm with 1 million date palm trees	$300 million	Annual financial return of the project: $60 million

Date palm oases and the climate variability dilemma

— Mr. Mohamed Tafrawti —

Forest and oases fires are a global phenomenon, the effects of which are comparable to natural disasters – affecting various natural resources and leaving behind long years of destruction.

Where the forest and oases fires became an ongoing bad memory to the oasis inhabitants, and according to an annual chronology, this phenomenon requires doubled efforts and continuous vigilance to stop the encroachment of flames and fires in oases and forests.

Oasis inhabitants of the south of Morocco can never forget the Amskroud oasis fire, which destroyed about 960 hectares in the outskirts of Agadir (southern Morocco). It was the first time such a fire reached the "fourth level" of intervention, due to the severity of the fire, which required international assistance. The fire spread to the Ziz Aoufous oasis in the Erachidia region, destroying more than 2,540 palm trees, on an area of 20 hectares. The Zagora oasis was also destroyed by massive fires, with nearly 15 hectares of date palm trees burnt down. Both the Tagisift and Toughza regions experienced the loss of about 2,000-2,500 date palm trees, across a total area of approximately 15 hectares. In August 2021, the Aoufous area suffered the burning of approximately 40 hectares, or 5,500 date palm trees.

A similar series of massive fires also took place in the south-eastern Moroccan oases in Draa and Ziz Valleys, located near Errachidia and Taghajijit, close to the city of Goulmima. Tens of thousands of date palm trees were destroyed during the past year, and nearly 5,000 date palm trees were also destroyed in Aflandra (Zagora region). In 2021, 6,000 date palm trees were destroyed by fire in Afra in the Zagora region. This is in addition to other fires that occurred weekly and affected hundreds of date palm trees in various southern regions.

THE CAUSES OF FIRE OUTBREAKS

These fire outbreaks in the date palm oases are mainly due to the persistence of drought, and an almost regular rise in temperatures in the summer. The continuous changing of social habits of people living in these oases have also contributed to the increase in oases fires, through the total absence of recycling efforts of plant waste from date palm trees and other plants used for cooking and heating wood, and replacing them with gas instead of date palm fronds, making dry palm leaves easy tools for the outbreak of fire. The fencing of some small date palm groves with cement walls is then considered one of the contributing factors to the inability to control the fire.

The relationship between oasis inhabitants, especially younger generations, and the oases wealth has resulted in changes in behaviour and local knowledge. Date growers no longer have behaviours that recognise the danger to the oasis' wealth and nature, as it was before. There is a change in the society that no longer has experience in dealing with environmental and natural factors.

The date orchard cleaning process also does not take into account the agricultural outlets that allow easy access to oases. There are no special sites for waste incineration. No value is also given to plant waste, as there is lack of knowledge for producing by-products, such as MDF wood and organic fertilisers. These oases also lack monitoring and warning systems. Thus, improvement requires strengthening links and coordination between various public and local institutions, and civil society within the framework of an action plan based on continuous follow-up and evaluation.

Responding to the increased prevalence of oases fires means acknowledging two basic elements: First, this dilemma must be addressed in a structural context, as the problem of fires has become linked to climate fluctuations. Second, this climate dimension must be integrated into a new strategy that concerns the management of natural resources in general. The awareness aspect must be urged, since the human factor, hence the local population, should be made aware they might be contributing to the spread of this problem.

The various extreme natural events that affect the world are due to the influence of climatic conditions. In the Mediterranean region in general, droughts and the interruption of rain for long periods (usually between May and October), makes oases vulnerable to fire risks. Climate change and its effects, including the increase in temperatures and the speed of the eastern winds, are among the natural factors that need to be invoked in resolving this deep concern facing the oasis system.

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MEJHOUL VARIETY—*"Rich Culture Sweet Future"*—

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Chapter seven

Mejhoul Economical and Strategical Impact

MEJHOUL VARIETY — *The jewel of dates* —

Regional and international marketing of Mejhoul dates

—— Prof. Abdallah Oihabi and Prof. Abdelouahhab Zaid ——

Dates are produced in 40 countries around world, with an annual production of 9,075,466 tonnes. Of this total, 1,836,827 tonnes (20.24%) are distributed to the international market, generating a total income of USD 2 billion (FAOSTAT, 2021). The remaining dates quantities are used for local consumption and waste, which represents up to 40% of the date production in some date-producing countries (AOAD, 2018).

The available data provided by international organisations about dates production and international marketing does not specify the share of specific date varieties. Therefore, it is impossible to distinguish the relative weighting of different date varieties, unless the information is communicated by the concerned agencies in the targeted date-producing country.

The information about Mejhoul production and marketing reported in this chapter has been gathered with the most appreciated cooperation of members of specialized agencies and research centers in the main Mejhoul date-producing countries such as Morocco, Israel, the US, Jordan, Mexico, Palestine, South Africa, Namibia, Egypt, Peru, and Australia.

PRODUCTION AND INTERNATIONAL MARKETING OF THE MEJHOUL

The estimated Mejhoul production of the top ten date-producing counties (at the global level) for the year 2020 is summarised in *Table 1*. It estimates total Mejhoul date production at 105,498 tonnes which represents 1,16% of the total world dates' production. Israel is the leader of this variety production at the international level with 41.48% of the world production followed by USA and Mexico with respectively 14.75% and 13.73%.

STANDARDS AND MARKETING

Mejhoul dates are the most appreciated of date varieties, and the most expensive at the international level. It is also one of the rare varieties with specific marketing standards, including three grades: Medium (15-18g/date), Large (19-22g/date) and Jumbo (23-27g/date). Some exporters also include a fourth Super Jumbo category (+27g/date).

The price of Mejhoul dates varies at the international level between $7 and $10 per kg for the Medium to Jumbo grades, while retail prices vary from one country to the other, with packaging quality having a significant impact. *Figures 1 to 6* represent a sample of Mejhoul selling prices in different markets around the world. In various European countries, the cost the consumer pays for 1kg of Mejhoul is around €20.

MEJHOUL INTERNATIONAL MARKETING

As indicated in the introduction, the data exposed in this article was gathered thanks to the collaboration of members of specialized agencies and research institutions in the main Mejhoul dates producing countries.

MAIN MEJHOUL EXPORTING COUNTRIES

Table 2 presents the volume of dates exported by the main Mejhoul date-producing countries. These countries represent 90% of the volume of Mejhoul produced in 2020 at global level and together export an average of 63.27% of their total Mejhoul date production.

The international Mejhoul date market is leaded by Israel and the US, which together represent a 67% share of the total volume exported by the main Mejhoul date-producing countries. Palestine is the country exporting the lowest share of its Mejhoul production (33.33%). This is mainly related to the problems facing the sector, including insufficient infrastructure and other challenges of the respective date sector value chain.

Table 1:

Estimated Mejhoul date production 2020

Country	Quantity (tonnes)	Share (%)
Israel	**45,000**	**41.48**
USA	**16,000**	**14.75**
Mexico	**14,898**	**13.73**
Palestine	**12,000**	**11.06**
Jordan	**10,000**	**9.22**
Morocco	**3,500**	**3.23**
SA & Namibia	**3,000**	**2.77**
Egypt	**3,000**	**2.77**
Peru	**500**	**0.46**
Australia	**100**	**0.09**
Others	**500**	**0.46**
Total	108,498	100.00

Table 1: Estimated Mejhoul date production 2020 *(Glasner, 2021, Salomon (Mexico) 2021), Anwar Haddad, and M. Al-Banna (Palestine) personal communication).*

Table 2:

Volume of Mejhoul dates exported reported to the produced volume in 2020

Country	Mejhoul production (tonnes)	Mejhoul export (tonnes)	Mejhoul as % of total date export/ production
Israel	**45,000**	**29,000**	**64.44**
US	**16,000**	**13,262**	**82.88**
Mexico	**14,898**	**8,165**	**54.81**
Palestine	**12,000**	**4,000**	**33.33**
Jordan	**10,000**	**7,511**	**75.11**
Total/average	97,898	61,938	63.27

Table 2: Volume of Mejhoul dates exported reported to the produced volume in 2020. Export sources: *B. Glasner (Israel), USDA (US), R. Salomon (Mexico), A. Haddad (Jordan) and M. Al-Banna (Palestine).*

Figure 1: Mejhoul dates in Malaga, Spain.

Figure 2: Mejhoul dates in Alicante, Spain.

Figure 3: Mejhoul dates in Morocco.

Figure 4: Price of Mejhoul compared to Barhi and Deglet Nour varieties in a market in Alicante, Spain.

Figure 5: Mejhoul dates in Marseille, France.

Figure 6: Mejhoul dates in Al-Madinah Al-Munawara, Saudi Arabia.

The main Mejhoul date-producing countries are low date producers overall. A total production of 142,581 tonnes in 2019 represents 1.57% of the world's date production (FAOSTAT, 2021). *Figure 7* shows Mejhoul dates represent the largest share of exported dates from these countries, particularly the US and Jordan, with a 90% and 80% share of Mejhoul dates respectively. In terms of volumes, Israel is exporting 46.82% of the total volume exported by the five main exporting countries followed by the US (21.41%), Mexico (13.18), Jordan (12.13%) and Palestine (6.46%).

Unfortunately, no official information is available with regards to the incomes generated by Mejhoul dates handled via the international market.

MEJHOUL DATE DESTINATIONS

Figure 8a-8e presents the destination of the dates exported by the main Mejhoul date-producing countries. The dates produced by these countries are directed to different destinations around the world, although the UK is a common partner to the five countries, there is a specific geographical distribution depending on the origin of the Mejhoul dates. This distribution can be summarised as follows:

- The US and Mexico mainly trade with Australia, USA and Mexico.
- Jordan mainly deals with Arab countries.
- Israel focuses on European countries such as the Netherlands, France, the UK and Germany.
- Palestine's main trading partners are the UAE, Turkey and the UK.

SUMMARY

Currently, Mejhoul date production is mainly limited to five countries, led by Israel and the US. The total production of Mejhoul dates represents only 1.16% of the world's total date production, but the Mejhoul is the most sought after and expensive date on the international market. Unfortunately, there is no data related to the economics of the marketing of this important variety provided by any international organization. Therefore, it is not possible to measure its financial share of the income of the US$2 billion generated by the international date market.

Information and statistics provided in this chapter is expected to change completely within the next five years, due to the important increase in the areas planted with Mejhoul variety in several countries in the MENA region. Indeed, as part of its 'Green Morocco 2008 -2020' programme, the Kingdom of Morocco has planted more than three million date palms, including at least 70% of the Mejhoul variety. The extension of the Mejhoul plantations in Morocco will continue with the new programme: 'Generation Green 2020-2030', which has a specific focus on increasing the number of date-packing facilities. Egypt has also started a very ambitious programme of planting several million date palms, with Mejhoul as the main variety. The entrance in production of all these newly planted date palms should make Morocco and Egypt the main Mejhoul world producers, and will put more pressure on Israel and the US as the current international market leaders.

Mejhoul dates among the total dates exported

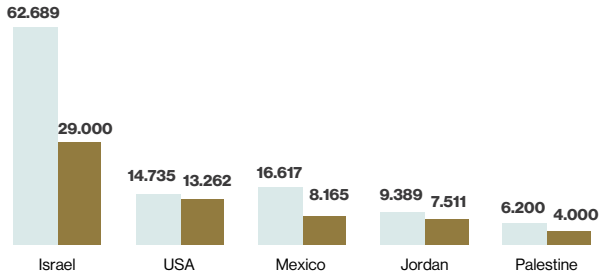

Figure 7: Share of Mejhoul dates among the total dates exported by the main Mejhoul-producing countries.

Main destinations of the USA dates during 2019 (%)

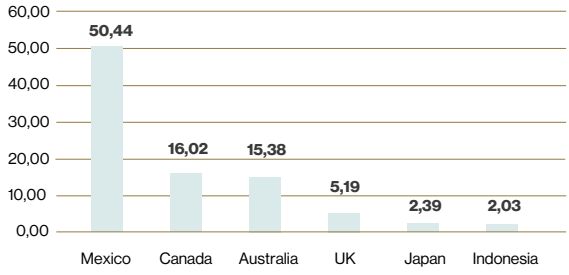

Figure 8a.

Main destinations of Jordan dates during 2019 (%)

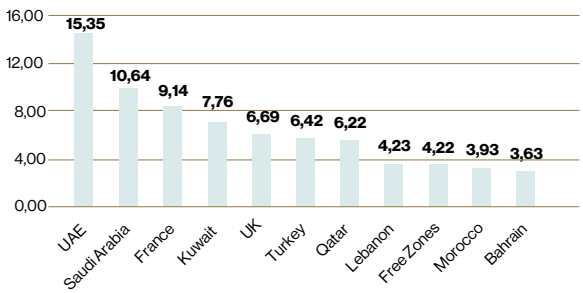

Figure 8b.

Main destinations of Palestine dates during 2019 (%)

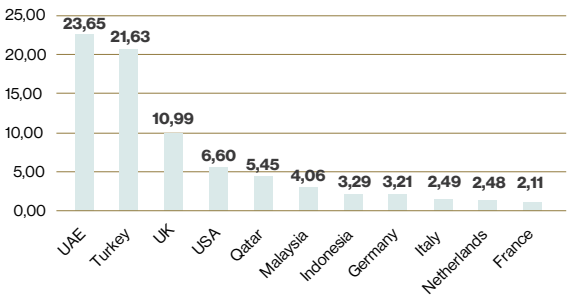

Figure 8c.

Main destinations of Jordan dates during 2019 (%)

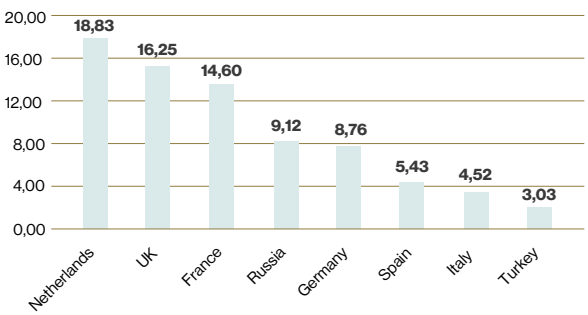

Figure 8d.

Main destinations of Palestine dates during 2019 (%)

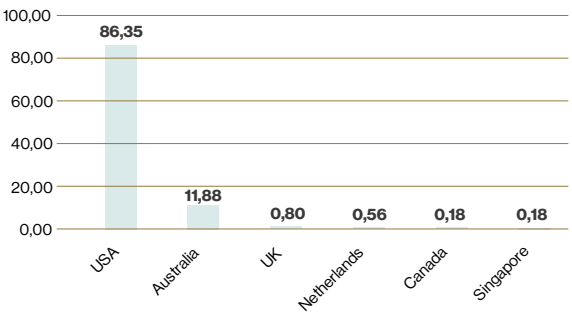

Figure 8e.

Figure 8a to 8e: The main destinations of dates produced by the main Mejhoul date-producing countries (ITC calculations based on UN COMTRADE statistics, January 2020).


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Activities implemented by Khalifa Award in date producing countries

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including Arab Republic of Egypt, Hashemite Kingdom of Jordan, Islamic Republic of Mauritania and the Republic of Sudan

MEJHOUL VARIETY—*"The Jewel of dates"*—

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Selection of the best Mejhoul farm

Selection of the best Mejhoul production

Selection of the best packing unit

Participation in the scientific seminar

MEJHOUL VARIETY—*"The Jewel of dates"*—

Hadiklaim date market of Mejhoul variety

— Dr. Yaniv Cohen —

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Hadiklaim is a growers cooperative that handles a significant quantity of the Mejhoul dates grown in the State of Israel. Mejhoul dates grown in Israel are considered to be a premium product that is marketed in 40 countries around the world.

Hadiklaim was founded in 1982, with the aim of representing date growers in Israel. Hadiklaim was established by three regional grower-owned enterprises. In the early 1980s, the dominant date variety was the Hayani, and the Mejhoul was only a minor crop, making its very first steps.

One of the biggest advantages of Hadiklaim came from the collaboration encompassing the entire value chain of date growers, packing houses and date marketing. Hadiklaim is a marketing company specialising in only one product, dates, mainly the Mejhoul variety. Therefore, our entire team is highly skilled and knowledgeable in producing the Mejhoul. After a short while, a unique and new product at the time would be presented to the world, known as 'Soft Mejhoul'.

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Hadiklaim has always been known to adopt new and innovative techniques, such as: fumigation, using an ecological approach, and shifting from methyl bromide to an environmental-friendly heat treatment. Collaboration with scientists led to the use of growth regulators to slow the growth pace of the date trees. Packing houses and machinery producers developed a computer programme to increase accurate results, as well to be able to identify internal fungi, such as the aspergillus niger fungus.

MEJHOUL CHARACTERISTICS

Compared to all other date varieties, the Mejhoul has long been considered to be a fruit with unique properties. As such, it requires different post-harvest treatments, such as disinfection alongside a strict quality matrix. This allows Hadiklaim to sort the Mejhoul dates into 15 quality categories, which provides us with the adaptability needed to market the product to different consumers with various needs and tastes.

Sophisticated sorting machines as well as customised and innovative storage facilities are required to preserve the special properties that define this unique fruit. It is crucial to keep the Mejhoul high-value perception when compared to other varieties, due to all the aforementioned reasons. Over the years, we have seen significant growth in demand alongside growth in production.

MEJHOUL MARKETING

Global distribution of Mejhoul dates, from various origins and with various properties, brands and marketing methods, is predicted to increase in the future. This future growth is expected to occur mainly in the Kingdom of Morocco, the Hashemite Kingdom of Jordan, and the Arab Republic of Egypt. The Mejhoul market is a sensitive one, consistently affected by fluctuations in all other dates and dried fruit market worldwide. Higher values have been achieved due to the limited volume, compared to the demand and supply of higher-quality product.

Over the years, Hadiklaim has never compromised on the quality of the dates it produces and distributes, although it could attain a higher commercial value by doing so. Looking forward, maintaining quality is our top priority. It is very uncommon for an agricultural product of a certain variety to outsell all other varieties by 400%. This is a unique market and keeping it as such requires observing these two main aspects: supply versus demand, and quality.

MEJHOUL SUPPLY VERSUS DEMAND

We believe it is necessary to join global efforts to increase the demand for dates, and the Mejhoul in particular, by introducing date consumption to new markets and consumers. For example, the Mejhoul is still unknown to about three billion people in Asia, South America and Africa.

The domestic consumption in the Israeli market is 2.5kg per capita annually. This means means we have a long way to go, however increased domestic demand is feasible. Increasing awareness for dates in general, and Mejhoul in particular, is an ambition that should be of interest to all date-producing countries and date growers. To achieve this ambition, considerable resources and processes are required, a single company or country cannot achieve it one their own. We therefore would welcome collaboration between countries to increase awareness to the Mejhoul.

We urge all counties to achieve high-level date growing procedures while maintaining all post-harvest treatments, maintaining hygiene on all procedures, and employing advanced packaging and unique marketing methods. Preventing the Mejhoul from becoming a mere commodity is essential to all producers around the world.

MEJHOUL VARIETY — *"Rich Culture Sweet Future"*—

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Chapter eight

Conclusions and Recommendations


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Conclusions and recommen-dations

—— Prof. Abdelouahhab Zaid and Prof. Abdallah Oihabi ——

CONCLUSIONS

The Mejhoul date variety, originally from the Tafilalet Oasis in Morocco, is a semi-dry fruit characterised by its large size, juicy flesh, fresh flavour and excellent taste. These fruit quality characteristics make Mejhoul dates the most preferred date, and consequently the most expensive date variety in the international market.

Walter Swingle observed the excellent qualities of this variety and thus, collected 11 offshoots from a Mejhoul palm in the Moroccan locality of Boudnib, before exporting them to the USA in 1927. From there, the variety was spread, through offshoots, to various countries including Israel, Mexico, Jordan, and Australia, to name a few. In the 1990s, the development of new tissue culture techniques accelerated the spread of the Mejhoul cultivation around the world. New Mejhoul commercial plantations were implemented in several countries including Namibia, Palestine, the Gulf countries, Egypt, Morocco, Sudan, and parts of South America.

Currently, global Mejhoul production is around 108,500 metric tonnes, but this volume will increase tremendously in future years, due to the significant extension of Mejhoul plantations in most of the above-mentioned countries.

The main date producing countries taking the lead in the expansion of Mejhoul plantations are:

¶ *Kingdom of Morocco:* Around three million date palm trees derived from tissue culture have already being planted due to the 'Green Morocco 2008-2020' programme, with the Mejhoul variety representing around 70% of the total. A second new programme: 'Green Generation 2020- 2030', which aims to plant a further five million date palms, with a specific focus on the Mejhoul variety, was initiated in early 2021.

¶ *Republic of Egypt:* A programme aiming to plant 2.5 million date palms in the New Valley and Aswan Governorates, is currently underway, with some 700,000 Mejhoul date palms already planted.

¶ *Hashemite Kingdom of Jordan:* Its date palm plantation is expanding from 500,000 date trees to one million, also with a special emphasis on Mejhoul variety.

¶ Other date-producing countries such as the Republic of Sudan, Israel, and most Gulf countries, are also extending their existing Mejhoul plantations.

It is worth noting that the expansion of Mejhoul date plantations worldwide will not necessarily meet the date fruits produced by these countries will match international marketing standards and specifications. This is due to the following reasons:

¶ Most date growers in the above-mentioned countries lack knowledge of the Good Agricultural Practices (GAP), applied to the date palm in general and to Mejhoul variety, in particular (AOAD report 2018).

¶ Cultivation of the Mejhoul variety requires a more skilled workforce than other date varieties.

¶ Mejhoul marketing standards are not well known (or less understood) to most of the date producers.

¶ There is a significant absence of infrastructure – such as appropriate storing and packing facilities – in most of the date producing countries.

Mejhoul date, origin in Tafilalet Oasis, Morocco

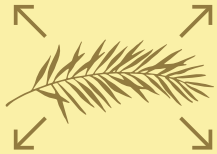
Most preferred date worldwide

Global production

108,500

metric tonnes

Export since 1927 from Morocco to rest of the world



Expansion of Mejhoul plantations

With about 8,5 million new planted date palms

Cultivation of Mejhoul variety requirements

Skill, knowledge and infrastructure

Enhancing Mejhoul Global Network

These challenges will continue to be constraints to countries seeking to enter the international date producing market and compete with already well established date producers, unless expansion programmes are accompanied with comprehensive strategies involving capacity building activities, infrastructure development and ample market analysis.

RECOMMENDATIONS

Despite the challenges facing the Mejhoul variety, its production volume is expected to increase massively within a few years. Therefore, it is highly recommended to urgently enhance the international cooperation among date-producing countries and related organisations through the creation of a Mejhoul Global Network (MGN). Such a structure would take responsibility for the following activities:

- Develop a strategy for the promotion of Mejhoul dates at a global level.
- Design a new market advertising campaign aiming at attracting new consumers, such as youth and athletes.
- Coordinate with its members to provide accurate information related to Mejhoul harvested areas, the number of Mejhoul date palms per country, respective production quantities, exported quantities and the income of Mejhoul regional and international marketing.
- Work towards creating common global standards for the Mejhoul date.
- Develop tools to enhance cooperation and exchange of technical expertise among all Mejhoul producing countries.

Acknowledgments

Khalifa International Award for Date Palm and Agricultural Innovation General Secretariat is pleased to dedicate this book: "Mejhoul Variety: The Jewel of Dates", to **H.H. Sheikh Khalifa bin Zayed Al Nahyan, President of the United Arab Emirates, "May God protect him", the founder and patron of the Award, H.H. Sheikh Mohammed bin Zayed Al Nahyan, Crown Prince of Abu Dhabi, Deputy Supreme Commander of the UAE Armed Forces,** and **H.H. Sheikh Mansour bin Zayed Al Nahyan, Deputy Prime Minister, Minister of Presidential Affairs, the first supporter of date palm cultivation.** The editors also extend their thanks and appreciation to **H.E. Sheikh Nahayan Mabarak Al Nahayan, Minister of Tolerance and Coexistence, Chairman of the Award's Board of Trustees.**

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Biographies

His Excellency Sheikh Nahayan Mabarak Al Nahayan, Cabinet Member and Minister of Tolerance and Coexistence.

His Excellency Sheikh Nahayan Mabarak Al Nahayan occupies the position of Minister of Tolerance and Coexistence since October 2017. His Excellency Sheikh Nahayan joined the Federal Government in 1990 and held a number of portfolios including Minister of Higher Education and Scientific Research, Minister of Education, and Minister of Culture and Knowledge Development. His Excellency Sheikh Nahayan was also the Chancellor of United Arab Emirates University from 1983 to 2013; Chancellor of Higher Colleges of Technology from 1988 to 2013; and President of Zayed University from 1998 to 2013. His Excellency is also the Chairman of the Board of Trustees of Khalifa International Award for Date Palm and Agricultural Innovation, since 2007.

Prof. Abdelouahhab Zaid

Professor Zaid is an Agricultural Advisor to the United Arab Emirates Ministry of Presidential Affairs. He also serves as Secretary General of the Khalifa International Award for Date Palm and Agricultural Innovation. Throughout a distinguished career devoted to crop science, horticulture and agronomy, he has held several high-level government, academic and institutional roles and participated in biotechnology development projects aimed at increasing plant production and employment in more than 20 countries.

Professor Zaid has been honoured with multiple awards, including a BR. Sen Award and Honorary Medal from FAO, and an Award of Excellence from AOAD.

Prof. Abdallah Oihabi

Prof. Oihabi has 40 years of extensive expertise in crop production, protection, GAP and Value chain analysis and as a good agricultural practices expert, with a special focus on date palm cultivation. Prof. Oihabi successfully managed the widest FAO cooperative programme in the MENA region, including several agricultural The Khalifa Award Report 8. Appendices and End Notes 255 development projects. He also implemented agricultural projects in Niger and Namibia. He is the co-founder and CEO of Agroprospective, an agriculture consulting company in Morocco. Previously he served as University Professor in Marrakech, where he supervised several international cooperation projects and PhDs.

Doctor Dennis V. Johnson

Dr. Dennis V. Johnson is a consultant, former university professor and independent scholar. He graduated from the University of California, Los Angeles, with a Ph.D. in Geography, specialising in the fields of agriculture and biogeography. Dr. Johnson has worked extensively in international development to provide technical assistance in agriculture and forestry projects for programmes worldwide. Palms are his special interest, and he has published books and articles on their conservation and broader utilisation.

For the past 20 years, his research has focused on the date palm, in particular the history of its introduction and cultivation in non-traditional areas such as Spain and the Americas.

Dr. Johnson has co-authored a book on date growing in the US, and has contributed to and co-edited seven books on various aspects of date palm development and biotechnology. He has made several presentations on dates and other palms at international conferences in the UAE, Saudi Arabia, Algeria, Spain, the UK, Sweden, Denmark, Brazil and Peru.

Eng. Mohammed Bachri

Eng. Mohammed Bachri is an Agricultural Engineer, and has specialised in rural engineering and sustainable development for more than 30 years. He is currently the Director of Strategy and Partnership at the National Agency for the Development of Oases and Argan trees (ANDZOA).

Eng. Bachri works on developing and monitoring the implementation of the sustainable development strategy for the oasis and argan regions, while developing areas of national and international partnership and cooperation to support the implementation of the strategy.

Previously, Eng. Bachri was appointed as a national coordinator to the First Millennium Challenge project, which was funded for the benefit of the Kingdom of Morocco by the USA (USAID). He was also formerly Head of the Hydropneumatic Preparation Department, and Head of the National Program Monitoring and Tracking Office, at the Moroccan Ministry of Agriculture.

Dr. Aly Abousabaa

Dr. Aly Abousabaa is CGIAR's Regional Director for Central and West Asia and North Africa, and is the Director-General of ICARDA. As strategic leader in sustainable development, climate change advocacy, and agriculture research in global dry regions, his remit covers MENA, sub-Saharan Africa and Central and West Asia.

Before joining CGIAR to head ICARDA, Aly was Vice President of the African Development Bank (AfDB) where he led the preparation and execution of key strategies in agriculture, water, natural resources management, climate change, infrastructure, women, youth, and governance. Through mobilising and managing a portfolio of $11 billion, his work has changed the lives of millions of people across Africa.

In addition to being an active reformer, both within ICARDA and OneCGIAR (the dynamic reformulation of CGIAR's partnerships), Aly promotes the global scaling of dryland agriculture innovations to improve smallholder family farmers livelihoods' resilience under climate crisis.

Dr. Abousabaa holds a master's in civil engineering from Montana State University in the USA and a bachelor's degree in civil engineering from Alexandria University, Egypt. He has built up a personal global network of international partners in development and continues to sit on several international boards.

Mr. Gadi Shalitin

Mr. Gadi Shalitin was born in Jerusalem in 1935. He attended the Mikveh Israel Agricultural School and was awarded a Degree in Agriculture from the Faculty of Agriculture at The Hebrew University of Jerusalem in 1960, Mr. Shalitin completed his Masters's Degree, with honours, majoring in grapes cultivation, in Rehovot.

Mr. Shalitin joined the agricultural section of the Jewish Agency, and was sent as an expert to Ethiopia in 1963 to start an Agricultural educational school. He advanced in the Agricultural section of the Jewish Agency, from a regular orchard and grapes instructor, eventually becoming the Manager of the Department of Fruit Trees. In 1971, Mr. Shalitin was sent to Nairobi, Kenya and started the growing of grapes, introducing know-how of grape cultivation to the region.

Mr. Gadi Shalitin is a master agronomist and former Chief Agronomist in the Agricultural Section of the Jewish Agency, and later became the CEO of the Israeli Ministry of Agriculture between 1989-1992. In 1993-96, he was sent by the State of Israel to the USA to serve as Israel's Chief Agricultural Attaché for the US, Canada and Mexico. Mr. Shalitin is now retired and lives with his wife Neomi at the Karmei-Yoseph village.

Prof. Meddich Abdelilah

In 2001, Prof. Meddich Abdelilah obtained his PhD in Biotechnology and Plant Physiology at Cadi Ayyad University Marrakech, Morocco. Its research aim was adopting innovative practices that improve the yield of date palms and underlying crops subject to biotic and abiotic constraints through the use of natural bio-stimulants.

Prof. Abdelilah was involved in field work responsible for technical monitoring at the local level on behalf of the Mohammed IV Foundation for Environmental Protection (2002–2014). He was also responsible of the installation and operation of municipal nursery, having 15 hectares since 2003-2014 for date palm production.

Prof. Abdelilah has published more than 80 scientific papers (including 60 articles indexed

Scopus & Web of Science (Clarivate)). He has contributed to more than 20 projects related to the socio-economic and environmental sector, with a particular focus on date palm, agriculture, soil, biofertilisers and the economic management of water and waste.

Dr. Reda Meziani

Dr. Reda Meziani is a Researcher at the National Institute of Agricultural Research (INRA-Morocco). He is also responsible of the National Laboratory for the date palm tissue culture and the coordinator of the date palm project at INRA. Since 2016, Dr Meziani has also been Head of the Regional Center for Agricultural Research, a research centre that specialises in date palm, located in Errachidia, Morocco.

A native of Morocco, Dr. Meziani wrote his Ph.D. on Mejhoul micropropagation by the organogenesis technique at the Moulay Ismail University in Morocco, and he has published numerous articles in this field.

H.E. Mohammed Sadiki

His Excellency Mohammed Sadiki is Secretary General of the Ministry of Agriculture and Maritime Fisheries. He is a State Engineer in Agronomy, with a Doctorate of State in Agricultural Sciences and a PhD from the University of Minnesota (USA).

Since 2009, H.E. Sadiki has held the post of Director General of the Hassan II Agronomic and Veterinary Institute. He began his career as a teacher-researcher at the Agronomique et Vétérinaire Hassan II institute, and later became Director of Scientific Research and Doctoral Training.

H.E. Sadiki has been an expert with the International Institute of Plant Genetic Resources (IPGRI) in Rome, Italy, since 2000, and with the French National Research Agency (ANR) in Paris since 2010. He also has significant experience in the field of cooperation and partnership development at national and international levels, and has contributed to several scientific and technical publications.

H. E. Mariam bint Mohammed Saeed Hareb Al Mheiri

Her Excellency was recently appointed Minister of Climate Change and Environment in the UAE, to spearhead the drive to mitigate and adapt to the impacts of climate change, protect the country's ecosystems, and enhance food and water security. Previously, Her Excellency was Minister of State for Food and Water Security, where responsibilities included monitoring national food stocks and water supply, channeling investments in food and water technology innovation, and building international partnerships.

Her Excellency is also the UAE's Federal Government Representative in the UN's Food and Agriculture Organization, as well as for the International Center for Biosaline Agriculture. She is a member of the Board of Directors in the Abu Dhabi Agriculture and Food Safety Authority, and also a member of the Board of Trustees of Khalifa International Award for Date Palm and Agricultural Innovation, the Dubai Future Foundation, and the World Economic Forum's Global Future Council on Food Systems Innovation. Her Excellency received her Bachelor's and Master's Degrees in Mechanical Engineering from the Rheinisch-Westfälische Technische Hochschule (RWTH) in Aachen, Germany.

H.E. AlSayyed Mohamed Marzouq Al Kassir

His Excellency AlSayyed Mohamed Marzouq Al Kassir is the Minister of Agriculture and Land Reclamation in the Arab Republic of Egypt. He graduated from the Faculty of Commerce at Tanta University, Egypt. He has more than 40 years of experience in the banking sector, which began at the National Bank of Egypt. H.E. has enjoyed a career of distinction within the banking sector, and was appointed to the role of President of the Industrial Development Bank of Egypt in 2011, after which he became the President of the Egyptian Agricultural Bank in 2016. He was also formerly a member of the board of directors at NCB London.

H.E. Al Kassir's experience is not limited to the banking sector, and has extended to the chairmanship of the boards of directors of several financial institutions, local and international companies. He has also worked in several economic sectors, serving as Chairman of the Financial Sector Fund Company, and as a member of the board of directors of the Egyptian Real Estate Refinancing Company.

H.E. Mrs Nevin Gamea

Her Excellency Mrs Nevin Gamea is Minister of Trade and Industry in the Egyptian Government. She has also held several significant roles during her career, including leadership of the Central Sector for Financing Small Enterprises in the Egyptian Social Fund for Development, where she took responsibility for formulating a strategy for financing small enterprises. H.E. participated in setting the first investment policy for the Social Fund for Development, and played a major role in ensuring 10.5 billion Egyptian pounds was made available to the sector between 2013-2016, representing 52% of total funding since the Fund's inception. H.E. Mrs Gamea was subsequently chosen as the first (formerly) Secretary General of the Social Fund for Development, and succeeded in attracting grants worth 509 million Egyptian pounds to be used in community and human development enterprises, which provided nearly 42,000 jobs.

H.E. Mrs Gamea also developed all non-financial services for owners of small enterprises in addition to expanding entrepreneurship programmes to spread the idea of self-employment among young people. She was selected by Forbes as the most influential government official in Egypt, and several times named as one of the most important female figures influencing the national and Arab region economy, as well as being considered one of the most important experts in the field of investment and project development. H.E. Mrs Gamea graduated from the Faculty of Commerce, Cairo University.

H.E. Khaled Hnaifat

His Excellency Khaled Mousa Hnaifat is Minister of Agriculture for the Hashemite Kingdom of Jordan. He has also held several leading positions such as Executive Director Production Branches Project at the Jordanian Ministry of Labor, and was also appointed as Minister of State in 2016.

H.E. Hnaifat has participated in multiple committees and councils during his career including as a Member of the Executive and Advisory Board of Tafila, Member of the University Council at Tafila Technical University, Representative of Jordan at the Euro-Mediterranean Regional and Local Assembly, Elected member of the Euro-Mediterranean Regional and Local Assembly, and Rapporteur of the Cultural Development committee in the Euro-Mediterranean Regional and Local Assembly. He has also been President and a member of several charitable and cooperative societies in Tafila, and Member of the Executive Council of the Arab Ministers at the Arab Center for the Studies of Arid Zones and Dry Lands.

H.E. Hnaifat holds a bachelor's degree in Mechanical Engineering from Al-Balqa' Applied University, and a fellowship in the Leadership of the Municipal Work from the University of Washington, USA. He also received the Medal of King Abdullah II Ibn Al Hussein, Order for Distinction of the Third Degree.

H.E. Oded Forer

H.E. Oded Forer is the Minister of Agriculture and Rural Development of Israel, and the Minister for the Development of the Periphery, the Negev, and the Galilee.

Previously, Minister Forer served as a member of Knesset on behalf of the Israel Beiteinu party and as the chairperson of the Finance Committee and the Committee for the Advancement of Women and Gender Equality in the Knesset, working to legislate and promote the fight against domestic violence. Minister Forer also chaired the Knesset's Small and Medium Business Lobby.
In 2013, Minister Forer was appointed as the Director-General of Israel's Ministry of Immigrant Absorption, where he successfully initiated a special plan to absorb immigrants from France and led the government initiative for a national programme to promote the integration of Ethiopian immigrants. Minister Forer was the founder and Director-General of CEO Strategy, an organisational development company that serves as a consultant to various public-private partnership projects (PPP).

He is an advocate by profession and holds a Bachelor's Degree in Government and an Batchelor of Law Degree from the Interdisciplinary Center Herzliya (IDC) and an MA in Political Communication from the Tel Aviv University.

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H.E. Dr. Al Taher Ismail Harbi

His Excellency Dr. Al Taher Ismail Harbi is the Minister of Agriculture and Forestry for the Republic of Sudan. He holds a PhD in Agricultural Engineering from Romania. In his career, H.E. Dr. Harbi has held several leading positions, including being appointed as Director and Chairman of 17 private sector companies in the Republic of Sudan.

H.E. Dr. Harbi has participated in several regional and international conferences, including the First Agricultural Conference, 2nd Agricultural Conference in Khartoum, Oil Crop Production and Productivity Conference in the Arab World, and the effects of climate change in East and Central Africa conference in Nairobi. He has also paid several scientific visits to Egypt, Libya, Kuwait, Canada, USA, Australia, Turkey, Syria, Netherlands, England, India, Saudi Arabia, and Tunisia.

H.E. Sidna Weld Ahmed Ali

His Excellency Sidna Weld Ahmed Ali is an agricultural engineer, specialising in plant protection. After graduation from Mousel University in the Republic of Iraq, he held several government positions in the Islamic Republic of Mauritania, where he was appointed Director General of the Mauritania Dates Company, as well as becoming an expert on development projects at the Mauritanian Ministry of Agriculture. These projects included the Sustainable Development of Oases project, the Anti-Poverty Project in Southern Aftout and Karakoro (PASK), the Anti-Poverty in rural areas project (PROLPRAF), and Irrigation Valuation Project for Food Safety. He has also worked as a Professor of Agricultural Technical Education at the Secondary Vocational School in Boki.

Prof. Rida A. Shibli

Professor Rida A. Shibli is a Professor of Plant Biotechnology and Biodiversity at the University of Jordan. He holds a B.Sc and M.Sc from the University of Jordan, and obtained his Ph.D. from the University of Illinois, US.

Prof. Shibli has occupied many administrative and scientific positions, and is currently Founder and Dean at the Faculty of Agriculture Technology, Al-Ahliyya Amman University, and the Executive Secretary of AARINENA, Jordan. He is also President of Mutah University, and Vice-President of Jordan University, and the President of The University of Jordan – Aqaba Branch.

Prof. Shibli has wide experience in research in plant biotechnology and biodiversity, has contributed towards more than 175 scientific publications and projects, and has received several honors and awards for his many achievements in community education.

Prof. Ibrahim El-Dukheri

Prof. El-Dukheri is the Director General of the Arab Organisation for Agricultural Development, which works to address major problems (such as water scarcity and salinity) facing the agricultural sectors of Arab countries. Previous roles include Federal Minister of Agriculture and Forestry, Director General of the Agricultural Research Corporation (ARC) and Minister of Agriculture and Forests, South Darfur, Sudan. Prof. El-Dukheri obtained his PhD in Agricultural Economics (system analysis; mathematical approach) from the Technical University of Munich in Germany, his M.Sc. in Agricultural Economics from Washington State University in the US, and his B.Sc. (Honours) in General Agriculture from the University of Khartoum in Sudan.

H.E. Dr. NasrEddin Al-Obaid

His Excellency Dr. NasrEddine Al-Obaid has had a significant career journey in several government positions in the Syrian Arab Republic betwee 1982 and 2021. His current role is Director General of the Arab Centre for the Studies of Arid Zones and Dry Land (ACSAD).

H.E. Dr. Al-Obaid has featured in a number of scientific publications and studies, including the following books: 'Economic and environmental assessment of the direct and indirect effects of combating desertification in the Arab world' and 'Monitoring and combating desertification in Jabal AlBashri', as well as a study on the 'Impact of genetic improvement of the mixing

of Shami goats and local goats on the economic and social situation of livestock breeders in the Hashemite Kingdom of Jordan'.

H.E. Dr. Al-Obaid has also participated in several international conferences in the agricultural sector, and he is Chairman of the Project and Cooperation Committee in the Republic of Sudan, Kingdom of Saudi Arabia, Qatar, Kuwait, and the Islamic Republic of Mauritania. He holds a PhD in Agricultural Economy and Environment.

Prof. Mohammed Aziz Elhoumaizi

Prof. Mohammed Aziz Elhoumaizi has more than 25 years of professional experience in the field of date palm production (harvest and post-harvest), and date palm protection. Prof. Elhoumaizi's date palm expertise was developed through collaboration with several international organisations, including FAO, BID, USAID and UNIDO, in many different countries (including Ethiopia, Egypt, Eritrea, Djibouti, Saudi Arabia, Cameroon, Kuwait, Algeria and Tunisia). Prof. Elhoumaizi works at the University Mohammed Premier Faculty of Sciences in Morocco, where he is responsible for the teaching and supervision of research activities for graduate and postgraduate students working on date palm genetic resources, agricultural biodiversity. Prof. Elhoumaizi also conducts training sessions and extension services for farmers, as well as organising and facilitating participatory workshops and high-level meetings.

Dr. Samir H. Al-Shakir

Dr. Al-Shakir has held several important positions through his distinguished career. Previous roles have included Head of Food Technology Department and Dean at the University of Baghdad's College of Agriculture, Permanent Representative of Iraq to the Food and Agriculture Organization (FAO), and Director-General of Agriculture and Water Resources Research Center (AWRRC). Dr Al-Shakir has also been a Dates Expert Consultant in the Arab Federation for Food Industries (AFFI), Technical Manager of the Emirates Dates Factory Al-Saad. He has also undertaken several freelance and consultancy roles, and participated in numerous feasibility studies at factories in Iraq, the Kingdom of Saudi Arabia, Oman, Kuwait, Qatar, Pakistan, Egypt and Jordan.

Dr. Al-Shakir has also visited several national agricultural experiment stations national research centres, food and agricultural factories, schools, institutes, colleges and 12 regional and international centres for food agriculture. He holds a master's degree in Post-Harvest Technology and a PhD in Food Technology, both from the University of Georgia, USA.

Dr Amgad El-Kady

Dr El-Kady is Director of the Food and AgroIndustries Technology Center (FAITC) and is also Head of the Technical Secretariat of the Supreme Council of Dates in Egypt. He is a founding member of the Arabic Union of Palm Dates Producers and Manufacturers and is an expert in the establishment of date palm factories and technical workshops in date palm processing. Dr El Kady was the Technical Consultant for the FAO's Date Palm Value Chain Development Project. He is a member of the Organizing Committee of the Egyptian Palm Dates Festival and the Scientific Committee of the Sudanese and Jordan Palm Dates Festivals. He holds a PhD from the Faculty of Agriculture in Cairo University, Egypt.

Prof. Sherif Fathy El Sharabasy

Prof. Sherif Fathy El Sharabasy is an international expert in date palm production. He has held several senior positions during his career, including as Director of the Central Laboratory of Date Palm Research and Development at the Agricultural Research Centre, Ministry of Agriculture, Egypt. Prof. El Sharabasy was also a key participant in several national and international projects, such as date palm cultivation and maintenance in Kenya and Somalia, date palm value chain development in Egypt, digital agriculture extension in Egypt, by the Food and Agriculture Organization (FAO). Other projects include controlling the Red Palm Weevil in the economic areas of Egypt, by the Agriculture Research Center (ARC), and optimizing in vitro (Tissue Culture) cryopreservation methods for long-term storage of Egyptian date palm cultivars project, conducted by the National Strategy for Genetic Engineering and Biotechnology (ASRT).

Prof. El Sharabasy has also been a key participant in several national missions, such as setting-up the sustainable development agricultural strategy for Egypt's Agricultural Research Center (2015), as a representative of the Ministry of Agriculture in the Committee for the Development of the Dates Sector (2016-2015), member of the Committee for the Establishment of the Twenty Million Palm Trees Project - Tahya Misr Fund and Jenan Emirates Company (2017), and member of the scientific committee and competitions for the Siwa Dates Festival (2017-2018).

Eng. Anwar Haddad

Eng. Anwar Haddad is Chairman of the Jordanian Dates Association (JODA), a post he has held since 2016. The idea for JODA came in 1995, when he was Head of the Studies Department at the Agricultural Credit Corporation. Here he conducted a survey exploring the opportunities of growing date palms in Jordan.

In 2015, Eng. Anwar was appointed President of JODA, and was responsible for promoting Jordanian Mejhoul dates in the global market, while improving the know-how and production of dates domestically. In 2018 he participated in a book on Jordanian dates and in 2021 published a booklet on his experience of Nejhoul date production in Jordan. Eng. Anwar holds an MSC in Agricultural Economics, and a BSC in Agricultural Sciences. He is looking forward to issuing Jordan's Good Agricultural Practices (GAP) policies for Mejhoul dates in the near future.

Dr. Mufid Fayez Al-Banna

Dr. Al-Banna began working with date palm trees in the UAE between 1978 and 1994. He moved into the field of research and studies with the Emirates University in Al Ain, where alongside studies and research, he published and participated in numerous scientific conferences and workshops. In 1982, his first supervised experiment to introduce varieties of tissue culture date palm was successful.

Dr. Al-Banna subsequently moved to the Gaza Strip in 1994, to work in and develop the date palm sector in Palestine. He established the first database to promote the scientific development of the palm sector Three institutions and associations were established in the West Bank and Gaza Strip, and supervised the work on developing the date palm sector to be one of the key contributors the Palestine's national economy. During this time, he helped to develop the first advanced factory for date processing, as well as development of the first factory for fodder derived from palm waste. Dr. Al-Banna has undertaken many studies and scientific research relating to the date palm, and has frequently represented Palestine within international forums. He is currently working on publishing his first book on Palestine's date palm trees.

Dr. Yuval Cohen

Dr. Yuval Cohen is a senior scientist in the Department of Fruit Tree Sciences at the Agricultural Research Organization, Volcani Center, in Israel. He graduated from the Department of Botany at the Hebrew University of Jerusalem, and performed a postdoctoral study at the University of California, Berkeley and sabbatical leave at the University of California, Davis, US.

Dr. Cohen's research is focused on date palms and mangos. He combines horticultural studies with physiological as well as molecular biology approaches. Dr. Cohen has studied different aspects of date palm biology and physiology, including research projects on date palm fertilisation and fruit settings, fruit quality, effects of plant regulators on vegetative growth and on reproduction and date propagation. He has collaborated with other research groups to promote solutions for plant protection against date palm pests and diseases, postharvest control of fruit quality, efficient irrigation, precision agriculture and introduction of robotics to date palm cultivation. Dr. Cohen also studies different aspects of mango physiology, including induction of flowering, fruit set and abscission, as well as quality fruit traits. He also coordinates the Israeli mango breeding project.

Mr. Baruch (Buki) Glasner

Mr. Baruch (Buki) Glasner has served as an Agricultural Extension Manager at Hadiklaim, the Date Growers Co-operative in Israel, for more than 30 years. He works with date growers on crop management and with packing houses on fruit quality and post-harvest. Previously, Mr. Buki worked as a researcher at Eden Agricultural Research Station, and as a date growing expert for the Israeli Ministry of Agriculture Extension Services. He also served as chairperson of the date growers' board in the Israeli Plant Council, in charge of R&D and date promotion.

Mr. Buki was born at the Kfar Ruppin kibbutz, located 500m from the Jordan River, in the same year as the establishment of Jordan's first date plantation. 25 years later, that very same plantation was managed by Mr. Buki.

Operating as a marketing date consultant, Mr. Buki participated in three FAO missions to Namibia and Mexico. He has also co-authored chapters in two books: Date Palm Genetic Resources and Utilization (Springer) and Date Palm Cultivation (FAO). Mr. Buki has a Bachelor's Degree in Agronomy from the Hebrew University, Jerusalem, Israel.

Prof. Dawood Hussein

Prof. Dawood Hussein is currently a National Coordinator of Fruit and Date Palm Research, at the Horticultural Crops Research Center, and a National Coordinator for two sessions of the Date Palm Research and Nationalization Network, by the Arab Centre for the Studies of Arid Zones and Dry Land (ACSAD). He is also a part-time professor of fruit specialisation at several universities, and is a consultant for many organisations and study offices, such as the Arab Organization for Agricultural Development (AOAD), and the Food and Agriculture Organization (FAO), in several countries including Somalia, Mauritania, and Kenya.

Prof. Hussein holds a master's degree in Horticulture from the University of Khartoum, Sudan. His thesis was on the "Effect of different Citrus rootstocks on yield, fruit quality and nutrient up-take, under Jabel Marra conditions". He also holds a PhD in Horticulture from the University of Khartoum, with a thesis on "Comparative studies of two cultivars of date-palm (Phoenix dactylifera) with respect to some phenotypic, cytologic and propagation aspects". Prof. Hussein has published more than 40 horticultural crops papers that were approved by the Agricultural Research Authority, and the Ministry of Agriculture in Republic of Sudan.

Mr. Pieter F. de Wet

Mr. Pieter Francois de Wet was born and completed his schooling in Namibia. Thereafter, he completed his tertiary studies at the University of Stellenbosch in South Africa, gaining an Honours Degree in Agriculture Economy. Mr. Pieter has extensive experience as a lecturer and with agriculture project development in Namibia. As an Agricultural Economist he has been involved with multiple project investigations, socio-economic surveys and project proposals, as well as with the initiation, implementation and overall management of project development activities.

Mr. Pieter's involvement with date palm development in Namibia stretches from the first initiatives to establish a commercial date palm project up to the point of fully operational commercial date palm projects. During the process, various study tours were undertaken, symposiums attended and consultancy missions undertaken. Of particular interest, is his position as National Project Director for the Date Production Support Programme implemented in Namibia under the guidance of the FAO from 1995 to 2018.

Dr. Michelle McCubbin

Dr. Michelle McCubbin grew up on a farm in the Kingdom of Eswatini (still commonly known as Swaziland) where she developed a love for plants. After completing her Ph.D. in Plant Physiology and Biotechnology –on the micropropagation of date palms and papayas – Dr. McCubbin worked for two tissue culture facilities, heading the production units to produce date palms and banana plants for export. In Eswatini, she started her own laboratory but also felt she was called to care for orphans and vulnerable children.

Dr. McCubbin is the director and founder of Caring for Shiselweni and Pasture Valley

Children's Home, where she cares for 58 children. She also runs a skills project and training college to train entrepreneurs on solar renewable energy and supports over 450 children monthly that need food, clothes and school fees. Dr. McCubbin also runs a plant nursery and grows blueberries and flowers. Her passion for plants, and compassion for children, continues.

Mr. Charles Edmonds

Mr. Charles Edmonds is an accomplished farmer with international experience, having worked on large-scale horticultural farms in South Africa, Namibia and Argentina. He has also managed all aspects of large-scale corporate farming businesses at executive level, as well as being a consultant to Royal Court, Farms and Gardens, Oman. Mr. Edmonds' passion is developing sustainable farming practices by incorporating regenerative agriculture systems to all types of horticultural crops. He is currently running 12 large-scale soil regeneration trials to determine which method is the most effective in addressing carbon sequestration in soil. His motto is "healthy soils, healthy plants, healthy people".

Mr. Edmonds was co-winner (Desert Fruit) of the 2019 International Khalifa Awards for Date Palm and Agricultural Innovation. In 2021, he won the award for the Best farm (Boschendal) in the Cape Winelands, South Africa. He is currently General Manager, Agriculture of the famous Boschendal Estate in Franschoek, South Africa. He is happiest when travelling the world, looking at new agricultural innovation practices.

The Reilly Family

Dave, Anita and Shaun Reilly own the Gurra Downs Date Company, and are considered to be leaders in developing the modern Australian date industry. Gurra Downs has been importing date palm genetics for over 20 years, and is now Australia's largest date farm with a nursery to supply farmers nationwide.

The Reillys have studied date production in many countries, this led them to establishing an R&D programme that evaluates cultivars for climate suitability, with the aim of adapting management methods to suit Australian conditions. The Reillys have strong environmental values and focus on sustainable farming practices. They work collaboratively with government agencies, assist in training farmers, have authored several publications and undertake consultancy and guest speaking roles.

In 2010, Dave and Anita were awarded the Khalifa International Date Palm Award for Best New Development. Dave is a 2012 Nuffield Australia Farming Scholar, and in 2019 was awarded the South Australian Food Industry McGillivray Entrepreneurial Award. Dave and Anita both also hold Advanced Diplomas in Agriculture and Horticulture.

Dr. Glenn C. Wright

Dr. Wright is Associate Professor and Extension Specialist for Fruit Crops at the Yuma Agriculture Center in the University of Arizona, US. He joined the University of Arizona in August 1992. Dr. Wright's work focuses the commercial date palm and citrus industries in Southwest Arizona and Southern California, and he also works with other fruit-bearing crops, such as pomegranates and olives. His research interests encompass all horticultural and post-harvest aspects of these crops.

Dr. Wright is currently working on studies on thinning and date palm water use. He has also worked on date palm pollination, fertilisation, and soil compaction studies. At the University of Arizona, Dr. Wright teaches a course he developed entitled 'Citrus and Date Production', and he teaches date palm, citrus, and fruit tree culture to master gardeners and the general public. Dr. Wright has a Ph.D. in Horticulture from Texas A&M University.

Prof. Ricardo Salomón-Torres

Prof. Salomón-Torres is a research professor affiliated with the Department of Horticulture, Sonora State University, Mexico. He is a computer engineer, has a Ph.D. in Bioinformatics, and completed did a post-doctorate in date palm biology, where he is currently developing his research.

Prof. Salomón-Torres is a member of the Mexican Computer Academy and belongs to the National System of Researchers in Mexico. He

has authored more than 20 research papers in referred international journals, three book chapters, and a book, and has been a reviewer for multiple scientific journals. Prof. Salomón-Torres has been the organiser of an International Date Palm Forum and an International Date Palm Colloquium developed in Mexico, with the inclusion of renowned international date palm researchers. He has also contributed numerous research presentations and has undertaken strong collaborative work with date harvesters in Mexico. He also teaches courses to undergraduate and graduate students, maintaining an active research programme on date palm, focusing in particular on improving date quality.

Dr. Bharathy Mohanan

Dr. Bharathy Mohanan has 51 years of experience in various capacities. He is currently the President and Whole-time Director of Utilities and Services for Atul, and is also the Managing Director of Atul Biospace and Atul Rajasthan Date Palms.

Dr. Mohanan worked on introducing tissue culture date palm production to India, in efforts to recover the lost biodiversity of date palms in the country, thereby generating rural employment, developing sustainable ecosystems in the arid and semi-arid regions of India to emerge as a global tissue culture raised date palm plant producer. He has served 'the blessed tree' for almost 15 years in the form of farming, micro-propagation, and food processing of harvested fresh and ripened dates.

Dr. Mohanan holds a graduate degree in Engineering (Honours) from the University of Calicut, and has been appointed to the directorship of several limited companies during his career, including Aasthan Dates, and Atul Clean Energy.

Mr. Ajit Singh Batra

Mr. Ajit Singh Batra is the Senior Vice President – Business Development at Atul Ltd, India. With more than 30 years of work experience, Mr. Batra has worked on the sales and marketing of textile colorants (dye and dye intermediates) in India and international markets. This has provided him with vast experience of travel to almost 50 countries, where he has worked on business development initiatives which led to the opportunity to set-up and lead teams in overseas subsidiaries of Atul in China and the UAE, business acquisition in the UK, technology transfers, and setting up joint ventures with the Indian government and private partners.

Mr. Batra also introduced the concept of bringing the lost biodiversity of date palms back to India, thereby generating rural employment, developing sustainable ecosystems in the arid and semi-arid regions of India to emerge as a global tissue culture raised date palm plant producer. He has served 'the blessed tree' for almost 15 years in the form of farming, micro-propagation, and food processing of harvested fresh and ripened dates.

Dr. Hassan Khalid Al Ogidi

Dr. Hassan Khalid Al Ogidi has held several senior positions during his career, including Director General of Date Palm Regional Center for Middle East and North Africa, under the supervision of the United Nations Development Programme led by the Food and Agriculture Organization (FAO). Other roles include Senior Researcher in the Iraq Council of Scientific Research, Consultant at Royal Jordanian Society for Environment Protection, and Chief of the FAO's Date Palm Journal Editing Board.

Dr. Al Ogidi's work has been published in several books during his career, including: Date Microbiology (1987), Date Confectionery (1987) Food Processing Dates (2001) and Dates Palm Master of Trees & The Jewel of Fruits (2009/2010). He has also contributed to more than 40 renowned international scientific books and bulletins.

Dr. Al Ogidi holds a Bachelor's Degree in Food Science, obtained from Baghdad University, and was awarded a PHD in Biotechnology from the Bulgarian Academy of Sciences.

Dr. Jose Romeno Faleiro

Dr. Jose Romeno Faleiro specializes on the management of the red palm weevil. He has wide experience and deep insight on both the area-wide control of the red palm weevil and on diverse aspects of this date palm pest. His work on goes back to 1993 when he was dispatched

by the Government of India to Saudi Arabia for five years as a member of the Indian Technical Team on the red palm weevil.

Dr. Faleiro has also widely published extensively cited research on the red palm weevil, as well as being invited to deliver talks on the subject at meetings in numerous countries. Since 2008, he has completed several consultancy assignments for FAO and other international organisations in Egypt, Iraq, Jordan, Libya, Mauritania, Morocco, Republic of Georgia, Saudi Arabia, Sudan, Tunisia, UAE and Yemen. In 2015, in recognition of his contribution in combatting the pest, Dr. Faleiro received the prestigious "Khalifa International Date Palm Award".

Mr. Mohamed Al Tafrawti

Mr. Mohamed Al Tafrawti is a Moroccan environmental and scientific writer who has contributed to various national and international media channels. He is currently the President of Environmental Horizons for Media and Sustainable Development Center, as well as the Editor-in-Chief of the "Environmental Horizons" blog at www.marocenv.com.

Mr. Al Tafrawti continues to make a significant contribution, both in Moroccan media and internationally, in representing the relationship between the environment and the problems facing sustainable development. His determination to publish his articles through traditional and modern media, led to him receiving the King Hassan II Environmental Award in 2018, in the media category.

He is also an active member in several associations such as the Moroccan Association of Regional Sciences, the Arab Association of Scientific Media, and the Arab Forum for Environment and Development.

Eng. Fuaad Mansur

Eng. Mansur is a Chemical Engineer with three patents in date palm and agricultural waste recycling. He has supervised several date palm and agricultural waste recycling projects in Iraq, Gabon, South Africa and UAE, and has worked as an expert with the Fraunhofer WKI Research Institute in Germany, the Polimex Forest Research Center in Poland, and also the United States Agency for International Development.

Dr. Yaniv Cohen

Dr. Yaniv Cohen is General Manager of the Hadiklaim Date Growers Cooperative, in Israel, which brings together some of the world's leading producers of top-quality dates. The cooperative consolidates the activities of Israel's largest and most advanced date producers, including quality control, administration, marketing, sales and export activities.

Dr. Cohen has vast experience in marketing agricultural products to global markets. He comes from a family of farmers in Israel who were highly active in the domestic market, and he started his international activity with the Agrexco export company. While managing the company's international trade division he sourced produce in order to complete the Israeli season with various products. After starting his own private sourcing company in the UK, Dr. Cohen was recruited to manage the Hadiklaim Date Growers Cooperative's marketing activity.

He was subsequently appointed General Manager, in which time Hadiklaim has helped Israel to become a leading exporter of the Mejhoul date variety, with activity in 42 countries. Dr. Cohen has an MBA from IDC Herzliya, Israel.

Abbreviations

1. AARINENA: Association of Agricultural Research Institutions in the Near East & North Africa
2. ACSAD: Arab Centre for the Studies of Arid Zones and Dry Land
3. AFTIAS: Aid for Trade Initiative for Arab States
4. AOAD: The Arab Organization for International Agricultural Development
5. APIA: Asian Pacific Islander American
6. ARC: Agricultural Research Corporation
7. ASRT: American Society of Radiologic Technologists
8. CGIAR: Consultative Group for Agricultural Research
9. DPD: Date Palm Developments
10. ERH: Equilibrium Moisture Content
11. EU: European Union
12. FAITC: Food and Agro-Industries Technology Center
13. FAO: Food and Agriculture Organization
14. FAOSTAT: Food and Agriculture Organization Corporate Statistical Database
15. FDC: First day cover
16. FSC: Forest Stewardship Council
17. GAP: Good Agricultural Practices
18. GCC: Gulf Cooperation Council
19. GMP: Green Morocco Plan
20. ICARDA: The International Center for Agriculture Research in the Dry Areas
21. ICT: Information and communications technology
22. IDC: Interdisciplinary Center
23. INR: Indian rupee
24. INRA: National Institute of Agricultural Research
25. IPM: Integrated Pest Management
26. JODA: Jordanian Dates Association
27. KIADPAI: Khalifa International Award for Date Palm and Agricultural Innovation
28. KSA: Kingdom of Saudi Arabia
29. LDL: Low-density lipoprotein
30. MAPMDREF: Ministry of Agriculture, Maritime Fisheries, Rural Development and Water and Forests.
31. MENA: Middle East and North Africa
32. MGN: Mejhoul Global Network
33. MOU: Memorandum of Understanding
34. NARS: National Agriculture Research Systems
35. NCB: Saudi National Bank
36. NENA: Near East and North Africa
37. NIS: New Israeli Shekel
38. ORMVAT: Regional Office for Agricultural Development of Tafilalet
39. PAAFR: Public Authority of Agriculture Affairs and Fish Resources
40. PASK: Anti-Poverty Project in Southern Aftout and Karakoro
41. PGI: Protected Geographical Indication
42. PPPP: Public – Private – Producer - Partnership
43. PROLPRAF: Anti-Poverty in rural areas project
44. R&D: Research and development
45. ROI: Return on investment
46. RSA: Republic of South Africa
47. SCSA: Social Care Standards Authority
48. TAV: Total added value
49. UAE: United Arab Emirates
50. UK: United Kingdom
51. UN: United Nations
52. UN-FAO: The Food and Agriculture Organization of the United Nations
53. USA: United States of America
54. USD: United States Dollar
55. USDA: United States Department of Agriculture

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MEJHOUL VARIETY—*"Rich Culture Sweet Future"*—

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MEJHOUL VARIETY—*"The Jewel of dates"*—

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Mejhoul Variety

The Jewel of Dates

—Origin, Distribution and International markets—

Mejhoul Variety is one of the most important date varieties in the world, where the present book's ambition is to highlight and present the importance of the Mejhoul Variety in the Middle East and North Africa (MENA region), as well as in the rest of the new cultivation world.

In recognition of this world important date variety, the General Secretariat of the Abu Dhabi based Khalifa International Award for Date Palm and Agricultural Innovation in the United Arab Emirates, chaired by His Excellency Sheikh Nahayan Mabarak Al Nahayan, Minister of Tolerance and Coexistence, President of the Award's Board of Trustees, took the privilege to produce a scientific specialized book entitled "Mejhoul Variety: The Jewel of Dates – Origin, distribution and International market."

This book sheds the light on a number of important factors, where it presents the origin and geographical distribution of the Mejhoul variety, its edapho-climatic requirements, propagation techniques, and the fruit's chemical and physical characteristics. Where it also addresses several crucial factors, as it highlights the Mejhoul variety's marketing standards, and its regional and international marketing, as well as the importance of Mejhoul in the date palm strategies of the MENA countries, and the expected impact of this strategy on the date regional and international marketing.

The book also aims to Influence decision makers at the local, regional and international levels, where it provides recommendations on research, development, demonstrations and innovation on the Mejhoul variety, and offers a background information for the regional investment opportunities by private investors as well as international development projects.

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