



الجمهورية الجزائرية الديمقراطية الشعبية

University of Mohamed Khider Biskra

Faculty of Exact Sciences and Natural and Life Sciences

Department of Agronomic Sciences

## MASTER MEMORY

Natural and life Science

agronomic Sciences

Réf. : .....

**Presented by : latrache hayatte**

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### Theme :

**Survey on date palm (*P, dactylifera L.*) genetic resources  
in mountain groves (Ain Zaatout, Biskra)**

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Academic year : 2019 - 2020

## *Acknowledgement Page*

*First of all, I thank God for giving me life and strength. To do this work. Praise be to God,  
Lord of the Worlds, Most Merciful.*

*The work of this graduation note is the fruit of group work. Here I would like to thank all the  
people who helped me in any way.*

*First of all, I would like to express my sincere gratitude for the thesis of my teacher, Madame.  
Bedjaoui Hanan she is a passionate and dedicated scholar with the training and success of her  
students. Many thanks for your support, your unwavering confidence.*

*I express my gratitude to Dr. Hadjeb Ayoub, it's honored to me that he accept the presidency  
of this committee.*

*I would like to express my deepest gratitude and thanks to Miss. Farahi Camellia who had the  
honor to agree to be a reviewer for this work.*

*For my mom whose support has always been essential in my life, she always knows to be there  
at the right time. My friend, she's an amazing mom.*

*For my father without him I cannot do any of this and his friend Khairuddin Menzar made  
this journey even more fun.*

*To lina goucem, a simple thank you will not be enough to translate what I say to you. I owe  
you the sincere friendship you have always shown me. Finally, for your support, courage and  
especially your patience during these past months.*

*To dridy Ryan, thank you for your kindness.*

*And I can't forget my aunt who openly opened her house to all my visitors.*

*And also my friend meriem and her family they were a great help in my journey*

*To all the farmers and agriculture in my own town Ain Zaatout especially Ms Mniai Nassim  
who was so nice and open up to me and were proud of me for the bypass to my town.*

*To all my colleagues in agricultural sciences, I thank you for your support and kindness.*

*Thank you all for being there for me.*

## *Dedication*

*I dedicate this work,*

*To my parents who made me what I am today; to my friends for their biggest support all the time. And also I dedicate this work to my own town people to express my eternal gratitude to this great, open-minded scientist, modest, full of humanity and always ready to share their experiences and knowledge.*

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## **Abbreviations List**

CBD: The Convention International on Biological Diversity

G : gramme

Mm : millimètre

Cm : centimètre

Ppm: parte of million

%: percentage

Mg/100g: milligramme of cent gramme

ONM: the National Meteorological Office

I.P.G.R.I: Descriptor of the International Plant Genetics Resources Institute

D. S. A: development-supported agriculture

USGS: the U.S. Geological Survey

HQ: makkar al-Haras al-baladi



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## Introduction

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Date palm (*Phoenix dactylifera L.*) is the main crop of both traditional and modern Algerian Saharan agriculture. The economy of the southern provinces (wilayates) is based primarily on date palm cultivation and utilization of its fruit by-products such as paste, flour, syrup, vinegar, yeast, and confectionery. This provides a major source of income for oasis inhabitants. All parts of the date palm are used, including the leaves and trunks which are used for basketry and house construction. The fruit is consumed in fresh and dry forms, processed to produce syrup (Mimouni and Siboukeur 2011).

*Phoenix dactylifera L.* is composed of genetically discrete clones representing thousands of cultivars without the benefits of a dynamic mutation- recombination system; its genetic resources are the most important component of biodiversity in its natural habitats; these include modern cultivars, landraces, obsolete cultivars, breeding lines, and related wild species. Cultivated Phoenix is closely related to a variable aggregate of wild and feral palms distributed over a wide desert belt across the Middle East and North Africa. Genetic diversity and genetic structure of the species gene pool complex have been shaped and greatly altered by human and natural selection, clonal propagation, and spatiotemporal exchange of germplasm. (Jaradat et al. 2015).

It has a socio-economic importance and occupies an important place in the agricultural economy of Algeria. It constitutes 48.25% of the total value of agricultural and agri-food exports. The production begins to mark a certain dynamism of investment, with more than 18 million date palms, including 11 million productive palms, encompassing nearly a thousand varieties. Algeria occupies an important place in the world date production, with 6.75% of production, and 3.27% of exports. Also, the Algerian variety Deglet-Nour ranks first in terms of quality (Benzouche, 2012).

Ain Zaatout region (Beni Farah) is rugged and mountainous but brings together great agricultural potential in terms of production and genetic diversity of the date palm with a number of trees approximately there are 4000 palm trees in Ain Zaatout (Beni Farah) . According to (anonyms 1998),and 8703.3 hectares of forests served with 20 km of unpaved roads. We distinguish, at the ain zaatout level, two categories of cultivars those with high locale consumption such as "Bouzarrou " and those said to be common or of low commercial value which are hardly subject to preservation or conservation. Recovery and which are therefore exposed to the risk of disappearance.

## Introduction

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Our objective is to establish a typology of palm groves in the commune of Ain Zaatout in reference to the areas cultivated, production, existing varieties and those which have disappeared on the basis of a diagnosis following a survey we performed.

To carry out this work; we followed a research methodology that include several steps in order to achieve the objectives outlined above.

We will review in the first part a bibliographical reading on the basic concepts. Indeed, this part is structured in tow chapters, which deal with general information on the date palm, its genetic resources and the current situation of phoeniciculture in Algeria. For the practical part, we will present two chapters. The first concerns the materials and methods used with an overview of the study area. The second chapter contains the most important results where we approached elements relating to the genetic diversity of cultivars and dokkars. We therefore tried to identify the different aspects of genetic erosion: causes and impacts while referring to previous studies. In the end, we brought out the main conclusions meeting our objectives, as well as the necessary precautions and measures that must be taken to avoid this irreversible loss of our genetic heritage.

# **Chapter 01:**

**General information on the date**

**palm**

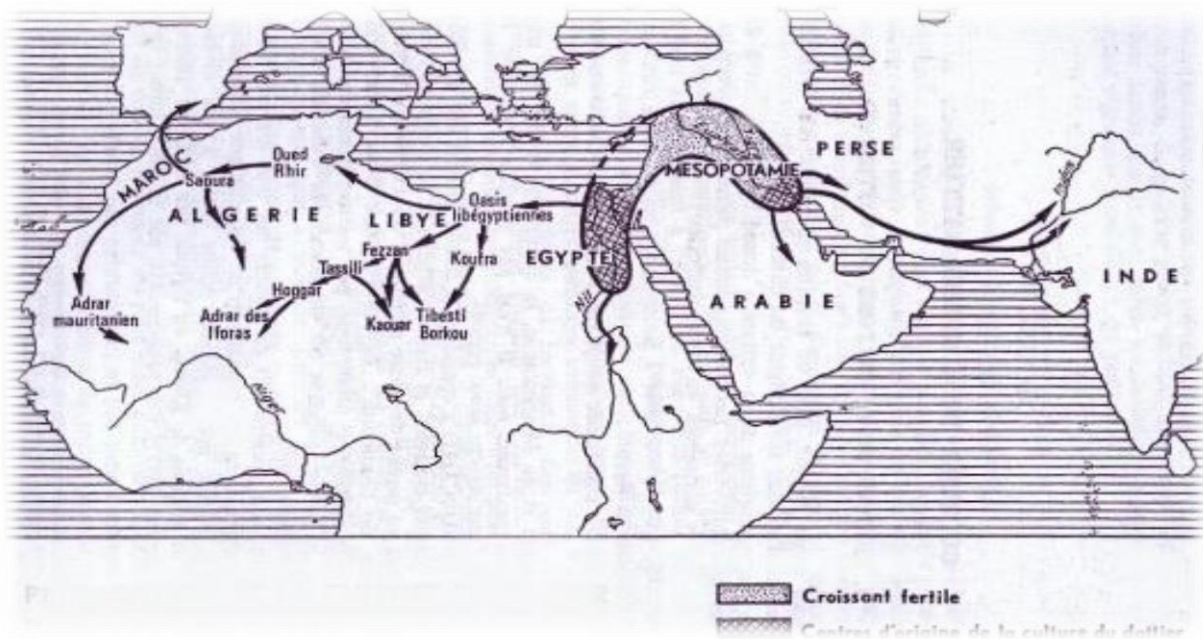
### 1.1. History and origin:

It was Linnaeus, in 1734 that gave the name of *Phoenix dactylifera* and made the description complete morphology of this species. In addition, several authors (Munier, 1973; Lunde, 1978; Djerbi, 1994; Ferry, 1994; Peyron, 2000; Zaid et al., 2002) described the meaning of *Phoenix dactylifera*; in the etymology, the word "Phoenix" derives from the name of date palm among the Greeks, who considered the tree of the Phoenicians and "dactylifera" comes from Latin "dactylus" derived from the Greek dactylis, meaning finger, due to the shape of the fruit.

Studies by Aoudah-Ibrahim (2011), have shown that "dactylis" or "Datte" derivative of the word "Daguel" or "Dachel" Hebrew origin, meaning fingers. It has been cultivated since antiquity but so far no remnants of phoenix have been found in the areas of the date palm.

However, the precise geographical origin of the Date Palm seems very controversial, according to (Munier, 1973; Pintaud et al., 2010), is the result of hybridization of several types of *Phoenix*. Although, several hypotheses have been discussed on its origin, but still have revealed that its origin frequently in the Bible (is found in Babylon and date to 4,000 years before Jesus. Christ). Whereas according to Newton et al. (2008) in the Gulf region Persian. From this place of origin, the culture of the Date Palm has spread towards the East and towards East Africa (15th century) and North Africa (11th century). From the 20th century, it was introduced in America by the Spanish conquests and Australia (Nixon, 1978).

On the other hand, the spread of the Date Palm in the Maghreb country took place in several ways: by Arab navigators, which replaced the caravan trade in across the Sahara, and the introduction of date stones by slaves; by selection peasant woman in ancient commercial transactions dates were used as money change; and by colonization which favored the planting of the Deglet nour variety (Ouenoughi et al., 2005).



**Figure 01:** Map present the commercial ways of date palm in the past (Ouennoughi et al., 2005).

## I.2 Systematic position

The genus *Phoenix* belongs to the Arecaceae family (formerly, Palmaceae) includes around 2,500 species (Dransfield et al., 2008). The Date Palm is a species belonging to the genus *Phoenix* which includes twelve (12) botanical species according to (Munier, 1973) and (Moore, 1973). Its systematic position was given as follows:

- Phylum: Angiosperms
- Class: Monocotyledons
- Family: Arecaceae (Palmaceae)
- Tribe: Pheniceae
- Genre: *Phoenix*
- Species: *Phoenix dactylifera* Linné, 1734.



### **I.3. Morphology and life cycles:**

#### **I.3.1. Morphological characteristics**

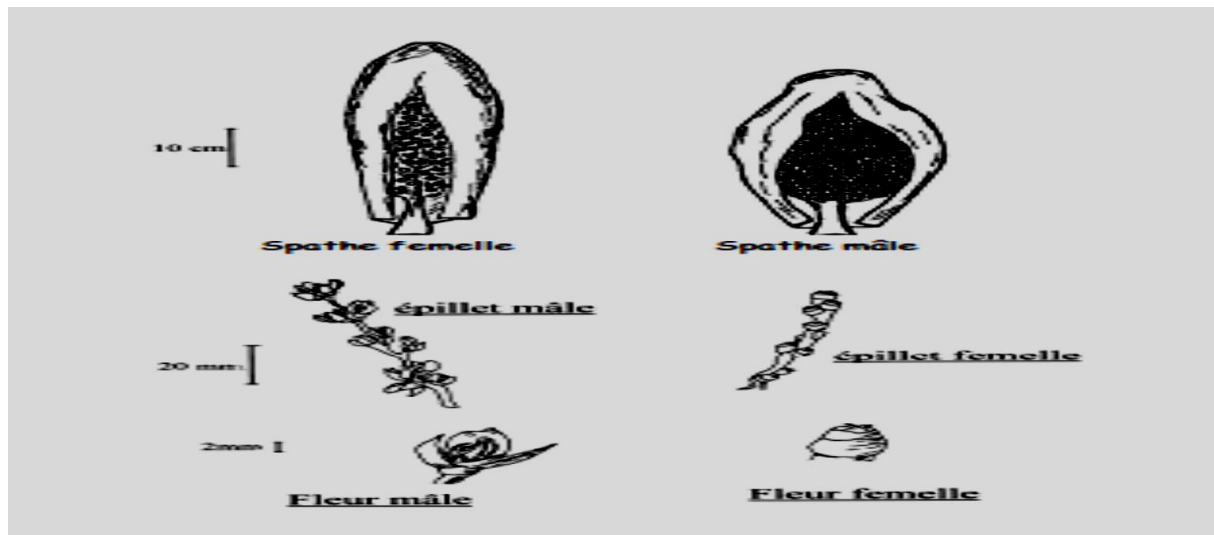
The Date Palm is a monocotyledonous plant; the first description of the date Palm was pointed out by the botanist Linné who, in 1753, allots the botanical name of *Phoenix dactylifera*. In addition, several scientists (Al-Bakr, 1972; Munier, 1973; Bouguedourra, 1991; Peyron, 2000; Ouinten, 2001; Espirad, 2002; Sedra, 2003) have described the morphology of this species as follows:

#### **1.3.2 Vegetative organs**

The date palm's root system is of the fasciculate type, three types of roots have been distinguished, according to their depth and their function (respiratory, nutritional and absorption). The stipe (stem or trunk); cylindrical, unbranched, lignified and brown in color brown from a height can reach more than 30 meters, diameter from 45 to 55 cm and has faculty to emit 4 to 5 releases, it is generally monopodic and covered on its surface by the base small ornamental open in turn for a lift fibrillum In the armpit of each palm finds an axillary bud which can develop to give birth to a rejection, at the base of the stipe or aerial attached to the trunk, commonly called "Rekeb". The palms (leaves; Jrid); over 6 m long, form the crown of the Palm tree Date palm at the top of the stipe. Their number varies from 100 to 200 palm, for an adult Palm in good vegetation, it produces three kinds of leaves during its life: juveniles, semi-juveniles and adults.

#### **1.3.3 Fruiting part**

The Date Palm are a dioecious plant; the reproductive organs are composed of male or female inflorescences carried by different palms called spathe. They have a form of clusters of ears protected by a closed and fusiform woody bract. They are greenish-yellow in color and are formed from buds developed in the axils of the palms.



**Figure 02:** Inflorescence male and female (Zango 2012)

### 1.3.4 Flowers

The flowers are unisexual with a very short peduncle, ivory in color, greenish yellow according to sex, cultivar or variety, a distinction is made: female flowers; are globular, of a diameter from 3 to 4 mm; consisting of a short calyx, three fused sepals and a corolla, formed of three oval petals and six aborted stamens or staminoids. The gynaecium comprises three independent carpel with a single ovum. At the time of pollination, an only one egg is fertilized, which results in the development of a single carpel which, in turn, evolves to give maturity, the fruit called date. The other eggs abort and fall after pollination. So for the male flowers; slightly elongated in shape and consists of a short calyx, three fused sepals and a Carole formed by three petals and six stamens. The male flowers are generally creamy in color, with a characteristic odor of bread dough.

### 1.3.4 The fruit

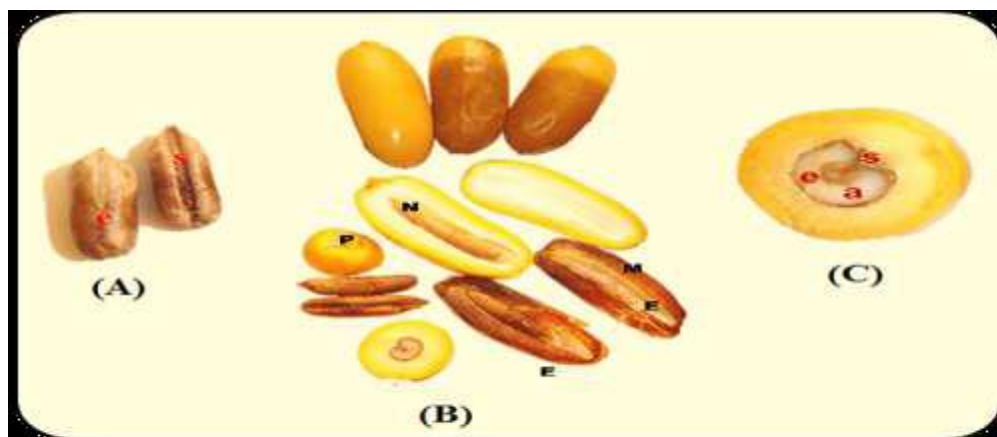
The date palm fruit (see Figs. 3, and 4. Page 9) is a berry called "Date, Tmar in Arabic", containing a single seed "nucleus" after fertilization, the ovum evolves to give a colored fruit green (size of a pea and then of a grape fruit to the normal size of the date) (Sedra, 2003). It is generally elongated, oblong or rounded, ovoid, sometimes spherical in shape. Case of the TANTEBOUCHET variety, it is composed of a core, having a hard consistency, surrounded by flesh (Djouab, 2007). The edible part of the date, called flesh or pulp, consists of three envelopes (pericarp, mesocarp and endocarp) (Espirad, 2002). The dimensions of the date are very

variable, from 2 to 8 cm in length and weight of 2 to 8 g depending on the varieties. Their color ranges from yellowish white to black, passing through more or less dark amber, red and brown colors (Djerbi, 1994)



**Figure 03.** Date variety (TANTBOUCHET) (Djouab, 2007)

The edible part of the date, called flesh or pulp, consists of three envelopes (pericarp, mesocarp and endocarp) (Espirad, 2002) (Fig. 4). The dimensions of the date are very variable, from 2 to 8 cm in length and a weight of 2 to 8 grams depending on the variety. Their color ranges from yellowish white to black, including amber, red, brown and more less dark (Djerbi, 1994).



A: nucleus in profile and back (s: furrow; e: embryo). B: section of a Noyet Rotbet variety date Abdellah (N: nucleus or seed; P: perianth; M: mesocarp; E: endocarp; epicarp (skin)). C: Section of the nucleus variety Zogmougar (s: furrow, a: albumen; e: embryo)

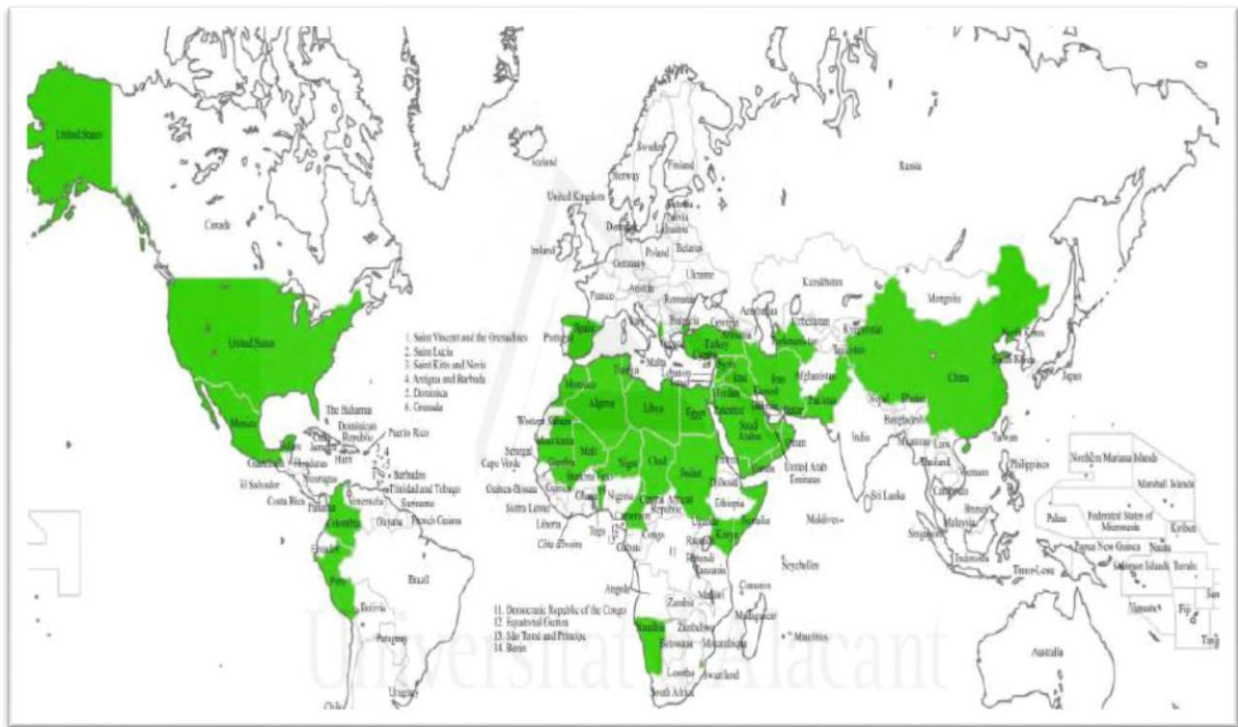
**Figure 04:** Core and fruit of a Date. (Espirad, 2002)

## I.4. Geographical area and importance:

### I.4.1. In the world:

From close up Merneh (2010) the areas of distribution of date Palm opens up the questions continents. It was cultivated in arid and semi-arid areas of the African continent. He was subsequently spread outside of these areas, as a fruit or ornamental tree, was introduced before the 15th century on the coasts of East Africa, in the 16th century on the American continent, (absi rima 2010), In the 17th and 18th century in the Comoros, Mascaraignes and Madagascar islands, in the 19th century in Australia, and finally in South Africa. According to Toutain (1967) and Munier (1973), palm culture is spread around the world in the northern hemisphere between the 9 ° and 33 ° parallels (Cameroon and Elche in Spain). He is not only a providential tree for the Saharan population, but also a symbol of human presence in hot desert areas.

Its extension testified to Islam in several regions especially in Saharan Africa and in Andalusia (Spain). It should also be noted, that the culture is much intensified in the Mediterranean basin and especially in North Africa and in the Arab countries of the Gulf. The date palm cultivation has been reported in other regain.

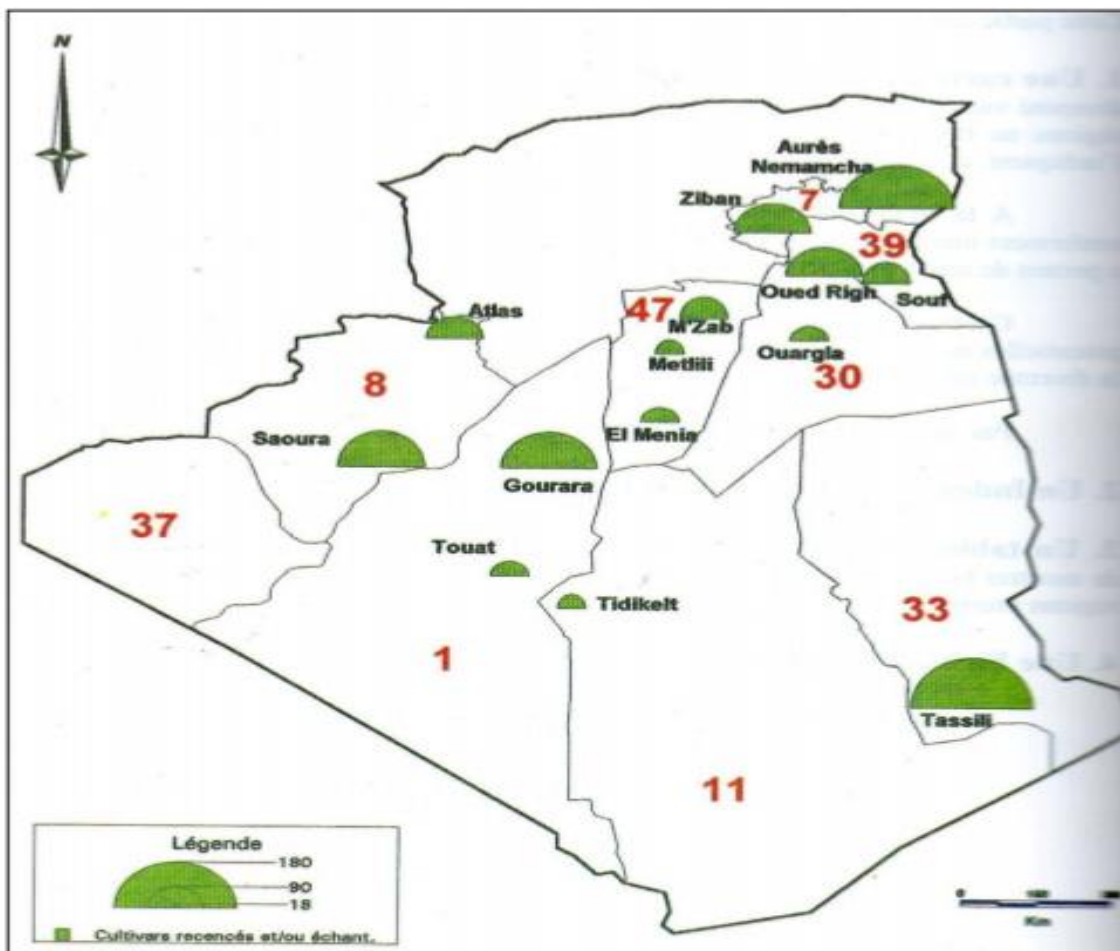


**Figure 05.** Geographical distribution of the date palm in the world (Sakin Abdrabo, 2013)

### I.4.2. in Algeria:

The origin of the Date Palm in Algeria comes from the "Arabian Peninsula"; across the trades who spread palm trees around the Mediterranean it was introduced especially in places with water in the Sahara (Toutain, 1967). Therefore the first palm groves of Oued Righ and Ziban appeared through the Bedouins Arab nomads, from the East, for trade (Jaradat, 2011).

The national phoenicultural heritage is concentrated in all the regions located under the Saharan Atlas (Houari, 1992) in the northern and eastern part of the Algerian Sahara (Fig.6. Page11). Mostly concentrated in the south-east of the country (Messar, 1996). Among these potential areas, namely: Souf, Ziban, Oued Righ, Ouargla Basin, M'Zab, El-Goléa, Tamanrasset, Illizi and Tindouf.(tab.1)



**Figure 06.** . Geographical distribution of the date palm in Algérie (Bouguedoura, 1991)

**Table I.** Varietal inventory (cultivars) in three phoenicultural regions of Algeria (Bouguedoura et al. 2010).

	Region	Number of cultivars	The Most Common cultivars
<b>West</b>	Atlas	70	Ghars, Asyan, Feggus
	Saoura	80	Feggus, Hartan, Cherka, Hmira, Deglet Talmine
	Tidikelt	60	Tgazza, Taqerbuch, Cheddakh, Aggaz, Ghars
	Gourara	230	Hmira, Tinnaser, Taqerbuch
	Touat	190	Tagazza, Aghamu, Taqerbuch
<b>Centre</b>	El-Menia	70	Timjihart, Ghars, Timedwel
	M'zab	140	Azerza, Ghars, Deglet Nour, Taddela
<b>Est</b>	Ouargla	70	Ghars, Deglet Nour, Degla Beida
	Souf	70	Deglet Nour, Ghars, Degla Beida, Mich Degla
	Zibans	140	Deglet Nour, Ghars, Degla Beida, Mich Degla
	Aures	220	Buzrur, Alig, Buhles, Mich Degla
	Tassili	180	Tanghimen, Tabanist, Khadaji
	Oued Righ	130	Deglet Nour, Ghars, Deglet Beida

## 1.5. Importance of the Date Palm

### 1.5.1. At national scale

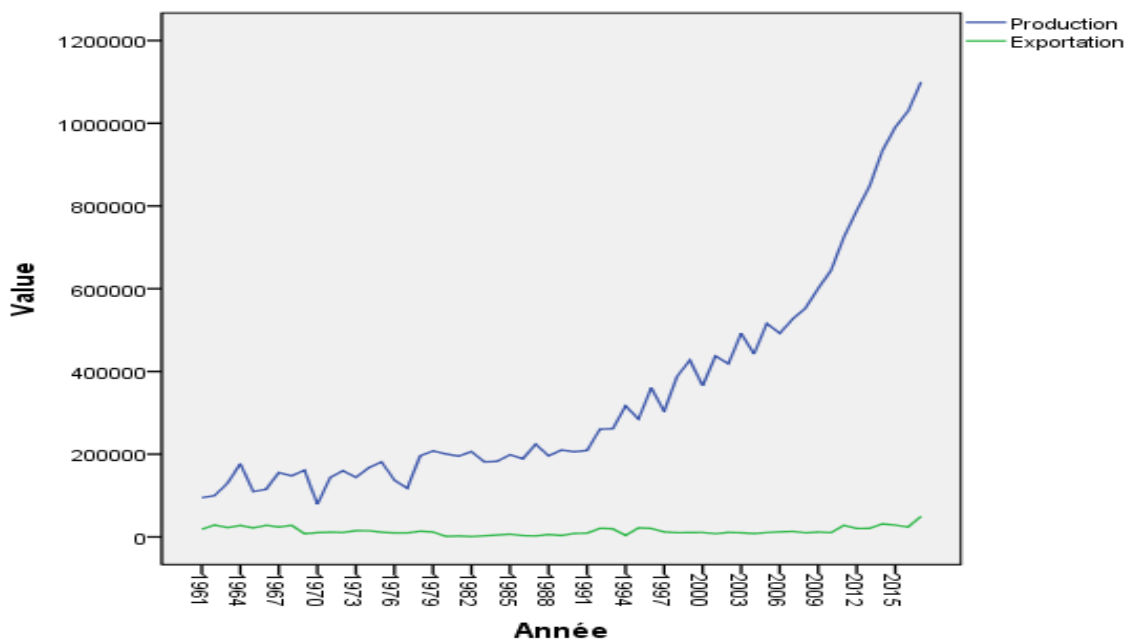
#### 1.5.1.1 Area and number of cultivars

We have recorded in recent decades an increase in the area intended for phoeniculture, of more than 150 thousand hectares then of 170 thousand hectares (MADAR, 2008), as well a remarkable evolution in number of the Palm tree. Indeed, 9 million feet were reported in 1996 by Messar, then passes to 15 million palm trees recorded in 2005 (Nahili, 2006). And around 16.5 million palm trees in 2008.

Lately this potential is in the order of more than 17 million palmers (DSA / MADAR 2011). Of the world (Thailand, Namibia, South Africa ...).

### 1.5.1.2. Production and yield

This heritage ensures a production of 7 million quintals of dates during the 2010-2011 agricultural companion, of which 47% of the total production is provided by the variety noble Deglet Nour, nevertheless, the average yield all varieties combined estimated at 49.5 kg per tree (D.S.A / S.I, 2009).



**Figure07:** Production and export of dates in Algeria (1961-2017)

### 1.5.2 in Ziban

The Ziban region is known for the quality of its dates, especially the excellent variety Deglet Nour which represents 63.5% (2012) of the total production of dates in Ziban, low rate, is recorded in the variety Ghars and similar soft dates, with 29% (2012) for the variety Degla Beidha and analogues dry dates.

Today, this heritage is estimated at more than 4 million date palm trees (2015), of which more 2 million palm trees are productive. Areas reserved for phoeniculture is 42 thousand hectares

(D S A / S I 2012) From a varietal point of view the variety Deglet Nour occupies a larger number of 2,517,075 palm trees, of which 1 million are productive by compared to other varieties: Ghars and analogues (soft dates) and Degla beidha or Mech degla and analogues (dry dates) respectively (431716), (898385) palm trees (D.S.A / S.I, 2012).



# **Chapter II:**

**Date palm Genetic resources and  
cultivation**

## 2.3 The Genus Phoenix or Species Diversity:

It is a monocot angiosperm woody diploid ( $2n = 2x = 36$ ) dioecious species of Arecaceae (palm family) plant family. There is a confusion regarding the exact number of species in genus Phoenix. In this genus, 19 species have been known so far but most often mentioning 12 valid species (Miller et al. 1930; Chevalier 1952; Moore 1963; Munier 1973; Dowson 1982; Jaradat 2011; Zabar and Borowy 2012) with little variations in the names of species. Among them, widely accepted species are *P. acaulis*, *P. canariensis*, *P. dactylifera*, *P. paludosa*, *P. reclinata*, *P. rupicola*, and *P. sylvestris*, while there is a confusion over the other spp.

**Table 02:** accepted or recognized species of genus Phoenix with their distribution by several prominent resources or investigators (A.A. Abul-Soad et al.)

species	Species name	Mentioned/accepted	Common name	Distribution
1	<i>P. Abyssinica</i> Drude	Kruenger (2001)	-	Poorly known species Ethiopia (Kruenger 2001)
2	<i>P. Acaulis</i> Roxb	Munier(1973,1974),Beccari (1890) Miller et al.(1930),Chevalier(1952), Mowry(1952),Moore(1963),Munier (1973,1974),Bailey(1976),(Dowson 1982),Barrow(1998),Kruenger(2001), The Plant List(2012)	Dwarf date palm,stemless/trunkless date palm	India(assam and Uttar Pradesh) Nepal,Bangladesh Myanmar
3	<i>P. Atalantica</i> A Chev	Dowson(1982),Kruenger(2001),The PlantList(2012)	Cape Verde palm	Cape Verde Islands(Africa)
4	<i>P. Canariensis</i> Chabaud Or <i>P. Canariensis</i> Hortex Chab	Beccari(1890),Milleretal.(1930), Chevalier(1952),Mowry(1952), More(1963),Munier(1973,1974), Bailey(1976),Barrow(1998), Dowson(1982),Kruenger(2001),The Plant List(2012)	Canary date palm,Canary Islandpalm, palmera Canaria	Native to Spain (CanaryIslands-Africa) but also found in Italy,Australia, Bermuda

5	P. Dactylifera L.	Martius(1836,1853),Beccari(1890), Milleretal.(1930),Chevalier(1952), Mowry(1952),Moore(1963),Munier (1973,1974),Bailey(1976),Dowson (1982),Barrow(1998),Krueger(2001), The Plant List(2012)	Datepalm, Nakhil(Arabic), khajoor(Urdu)	Widely cultivated species found in Arabian Peninsula,Middle East, Northern and Central African countries,Pakistan.Small populations found in southern Europe(Spain),USA(California,Arizona),South America (Peru,Chile),Australia
6	P. Farinifera Roxb	Martius(1836–1853),Beccari(1890), Chevalier(1952),Moore(1963),Munier (1973,1974),Dowson(1982)	-	Poorly known species India(Krueger 2001)
7	P. Hanceana Naudin	Dowson(1982), Krueger(2001)	-	-
8	P. Humilis Royle	Milleretal. (1930), Chevalier(1952), Munier(1973,1974),Dowson(1982), Krueger(2001)	-	-
9	P. Loureiroi Kunth	Martius(1836–1853),Mowry(1952), Moore(1963),Bailey(1976),Krueger (2001),ThePlantList(2012)	Loureiro's palm	China(Guangdong,Guangxi, Yunnan,HongKong),Taiwan. Philippines,Bangladesh,India,Nepal,Pakistan,Cambodia,Myanmar,Thailand, Vietnam
10	P. Paludosa Roxb	.Martius(1836,1853),Beccari(1890), Milleretal.(1930),Chevalier(1952), Mowry(1952),Moore(1963),Munier (1973,1974),Bailey(1976),Dowson (1982),Barrow(1998),Krueger(2001), ThePlantList(2012)	Mangrove date palm	Bangladesh,India(Orissa,West Bengal,AndamanandNicobar Islands),Myanmar,Thailand, Vietnam, Indonesia(Sumatra),Malaysia

## 2.4 Genetic Resources and Conservation

The oasis system plays ecological, social, economic, and cultural roles with the date palm as the main element. According to Benkhalifa (2007), citing Jain (1997), date palm genetic resources are classified into several categories : (a) Traditional cultivars from an intuitive selection and used in traditional

palm plantations. Those having Arabic or Berber vernacular names may be specific to a given region.

( b) Natural populations of male and female palm trees from seed ( khalts) . In general, they are not subject to scientific selection, but in some countries, the spread of date palms is only by seed. In Algeria, the population of khalts represents nearly 10 % in some oases and can be a reservoir of new clones selected for some interesting characteristics such as fruit quality, productivity, resistance, and early bearing.

(c) The advanced cultivars or modern cultivars from controlled crosses. In Algeria, breeding programs in El Arfi ane launched in 1940 and in Adrar in 1970 were ultimately unsuccessful.

(d)Controlled hybrids which include new genetic material obtained by biotechnological means. In this classification, traditional cultivars and khalts are found in traditional oasis and are estimated to number nearly 1,000 cultivars (N. Bouguedoura et al .2015).

### 2.3 Date Palm Biodiversity

Generally, date palm can be found in the warmer areas of all continents (excluding Antarctica) but varying in area and production. Sawaya (2000) suggested the importance of latitude and altitude to explain its geographical distribution. The date palm distribution for both Northern and Southern Hemispheres are between 10°N (Somalia) and 39°N (Elche/Spain or Turkmenistan) rendering to the latitude, whereas the promising regions are found between 24° and 34°N in Morocco, Algeria, Tunisia, Libya, Egypt, Iraq, Iran, and Pakistan (Zohary and Hopf 2000). The sea level from 392 m below to 1500 m above with an altitude range of 1892 m is suitable for date palm cultivation. The major date production areas are therefore from the Middle East, Northern Africa, and Pakistan, while some small production comes from dispersed parts of North America and South Europe.

Genetic diversity is defined as the genetic variations between species, subspecies, cultivars, populations, or individual clones that can be measured at the morphological, physiological, biochemical, and molecular levels (Jaradat 2015). The present-day date palm cultivars are the outcome of thousands of years of selection practice of seedlings holding desired features. As per statement of Wrigley (1995), each cultivar is derived from a unique single seed, cloned and vegetative multiplied. There are about 3000 (Zaid and de Wet 2002) or 5000 (Bashah 1996) date palm cultivars exist globally but sometimes might be synonyms of one cultivar found in different countries under a different name, but about 10% of them of a commercial importance (Johnson2011) .However ,each country got its own tope lite cultivars of commercial value.

### ➤ Definition of biodiversity

According to Birouk (2002), the concept of biological diversity (or biodiversity) refers to the set of variations that exist within the living world, that is to say, the number, the variability of organisms and the elements they constitute by association. The Convention International on Biological Diversity (CBD) has clearly defined its content as being: the variability of living organisms, from all sources, including, among others, terrestrial, marine and other aquatic ecosystems and ecological complexes which they are part of. This includes diversity within species and between species as well as that of ecosystems. Where it therefore covers three levels of variability in the living world: within living species (or genetic diversity), between species (interspecific diversity) and between ecosystems (ecological diversity).

## 2.5 State of genetic diversity

### ➤ In Algeria

Varietal inventory work, carried out in 70 zones in 14 regions, has shown that the Algerian palm groves still retain significant diversity (cf. Tab. 04. Page 15) (Douani and Khengaoui 2007). In fact, 940 cultivars have been identified in these palm groves, of which 2/3 are sampled. Certain cultivars with a geographic distribution more or wide have been the subject of a characterization (Benkhalifa et al., 1992; Hannachi et al., 1998). They are differentiated according to the morphological character of the tree and on the characters of the fruits and the seed (Brac de la perrière and Benkhalifa, 1990). The most important, economically, are: "In the East the variety Deglet Nour" whose date quality goes beyond borders.

Other varieties called common are of less importance Ghars , Degla Beida and Mèche-Degla "In the West the variety Takkerboucht", the most resistant to date blight or bayoud. Besides the recognized female cultivars,

Furthermore, either 90 to 93.4% are rare cultivars that are infrequent when a low rate is 6.6 to 10% represented by abundant to frequent cultivars (Belguedj.1996) while in 2002 the list of inventories shows that in these regions (Ziban Oued-Souf and Oued Righ), 91% of dates belong to the category of soft dates to semi-soft and the rest go to the group of semi-dry to dry dates.

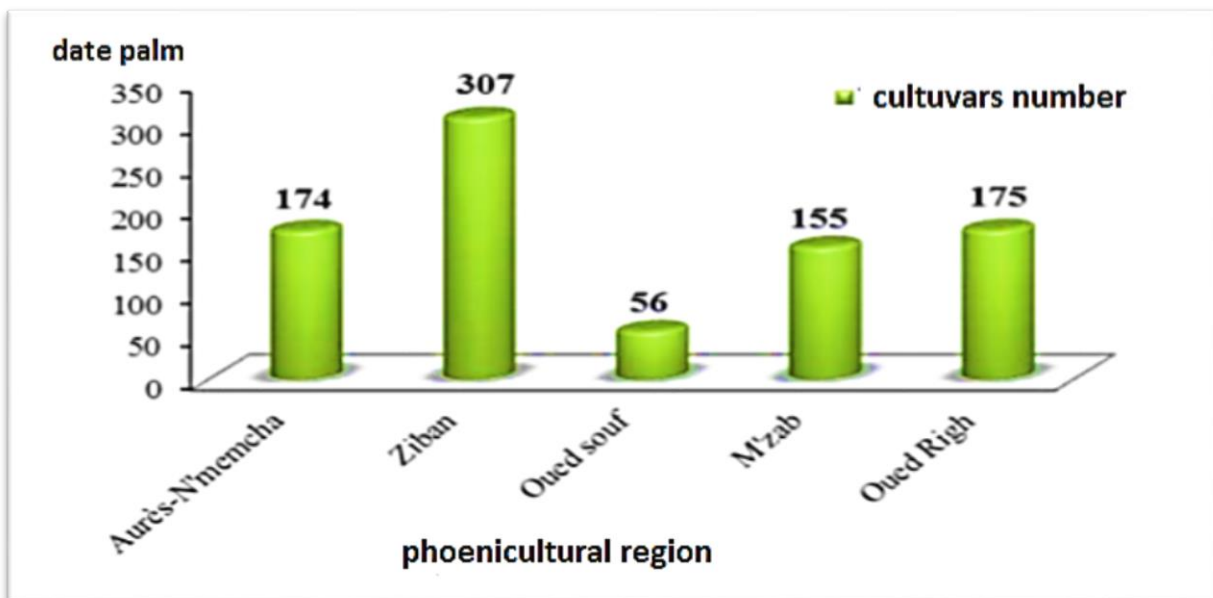
**Table03:** varietal inventories of the algerian palm carredid out duting the period 1984 up to 1992 (Douani et Khengaoui, 2007).

region	Surveyed areas	Years	Number of cultivars	
			Identified	surveyed samples
Touat-Gourara	Tinerkouk ,O,Aissa,Ded Toul, bouda	1984	223	144
Saoura	Saoura	1985	125	67
Atlas	Kasabi,Timoudi,Oukda,Fend,Mograr,Beni Ounif ,Zoubia,Tiouf,Rbiouat	1986	81	51
Tidikelt	Aoulef,Akabli,Tit,Inghar,In Salah, Foggaret Ezoua	1986	37	30
Touat-Gourara	Talmine, Ajdir,Charouine,Aougrouit,Tsabit	1987	197	23
El-Goléa	El-Méniaa,Hassi Gara	1990	60	35
Mzab	HassiFhel,Mansoura,Sebsb,Metilili,Zelfana,El-Attouf,Beni Isguen, Daia,Ghardaia,Berriane, Guerrara	1990	80	43
Laghouat	Laghouat,Lassafia,Lhouita,Lelmaya	1990	30	-
Cuvette Ouargla	Ngoussa,Frane,Ksar,Ain Beida,Mkhadema	1990	84	58
Oued Righ	Hjira,Touggourt,Djemaa ,Meghaier	1991	122	72
Souf	Robbah,Debila,Guemmar,El-Oued	1991	70	48
Ziban	Oued Djellal,Tolga,Oughlal,Sidi Okba	1991	117	85
Aurés N'memcha	El-Kantra,Djemourah,Sidi Masmoudi,Mchounech	-	210	86
Tassili	Djanet	1992	184	34

## 2.5. Geographic distribution of diversity

### ➤ in Algeria

From the figure (Fig 7) we note the existence of a large genetic diversity of the Date Palm, more than 80% is intended for the variety Deglet Nour in number of palm trees (Belguedj, 2005). Ziban is home to the largest number of Cultivars compared to Oued Souf Oued Righ with M'Zab and Aurès-N'memcha This richness in cultivars that characterizes the Ziban region results essentially from the diversity of its agro-ecosystems that it contains (Belhadi et al., 2008).



**Figure 08:** Importance of cultivars number in the main phoenicultural regions in Algeria. (CRSTRA, 2018).

### ➤ in Ziban

from the point of view of varietal diversity, according to belhadi et al. (2008), the inventories carried out at the ziban oases locality by locality, show that the sidi okba region is home to the greatest number of cultivars (84) (t b 4) followed by m'zirâ by el haouch de djemourah of urals of tolga (between 40 and 60) on the other hand the locality of el feidh region with pastoral vocation registers a reduced number of cultivars (11), the other localities shelter a small number of cultivars. Noting also in male date palms the existence of a diverse variety the (Dokkar Deglet Nour, Mech Degla, Ghars, Etc.).

**Table 04.** Importance of the number of cultivars in the various localities in Ziban (Belhadi et al., 2008).

location	Number of cultivars	Location	Number of cultivars
<b>Sidi okba</b>	<b>84</b>	bouchegroun	31
M'ziraa	60	Sidi Khaled	31
El-haouche	57	Ouled djlal	31
djammourah	51	Laghrouss	31
Lioua	50	M'lili	29
Ourlal	45	oumache	25
Tolga	44	M'chounche	24
El outaya	40	El-hadjeb	24
B. b azzouz	39	Ain-naga	19
K. sidi nadji	36	fougala	19
Lichana	35	Chetma	18
M'khadma	34	<b>El-feidh</b>	<b>11</b>

## 2.6. Types of oases:

According to Doll (1990) cited by (Baa, 2000), the oasis is a cultivated areas in desert environment or strongly marked by aridity. It is generally characterized by a significant water deficit linked between low precipitation and high evaporation, aggravated by high temperatures and frequent drying winds (Sirocco).

Inside the oases, the architecture of date palm is diversified according to water sources (Belguedj, 1996) three types have been distinguished:

### ➤ Oued palm groves

Are generally found in the northern most part of the Sahara: Khanguet sidi nadji, El-khantara... etc. This type of palm is most often poorly irrigated because it benefits only from very high irregular floods, because of this, their palm trees are grape in a bowl arranged to store the maximum amount of water at the time of the streets.



➤ **Palm groves arranged in basins**

To reach the shallow perennial groundwater (ghouts in Souf). This type of palm groves is tending to disappear but it still produces quality dates. In the Touat-Gourarra-Tidikelt region, there are palm groves irrigated by the foggaras systems, which are filter galleries, some of which predate the 6th place on without forgetting the new plantations with the advent of pumping over large areas and with commercial varieties such as Deglet Nour, Ghars and Mech Degla.

## **2.7. Oasis production systems**

According to Bouammar (2010) two types of oasis production systems: a mountain system which is similar to mountain agriculture and which is based on the use of surface water. This system is marginal due to its size (it represents 12% of the agricultural areas of the wilaya).

➤ **Ancient phoenicultural systems**

characterized by a high density of plantations, a non-aligned arrangement of palm trees, aging of palm trees, greater varietal diversity, associated crops of low importance, stagnation and the presence of associated crops (fruit trees, cereals, or vegetables) destiny essentially self-consumption among type of exploitation one finds the old palm groves colony whose type organized is much more like new palm groves in terms of density and alignment of the dominant variety plantation where the area is often large.

➤ **Modern system**

The palm trees are aligned allowing mechanical work; the spacing between the palm trees is regular. the density is less important and the dominant variety is deglet nour it is the s of the small and medium-sized exploitations of development their areas by areas equal or superior to 2 ha, a density of normal plantation with slightly high (140 to 180 palm trees / ha), in majority of deglet nour, the age is more than 25 years with little equipment.

➤ **Ziban oasis**

According To Dubost and Larbia-Yousef (1998), "ziban", from the Arabic word which means set of plural oasis of Ziban Biskra is a dynamic agricultural region. The region of Ziban especially lived for a century of its production of quality dates. However, the delimitation of the Biskra region is divided into two; the eastern region known as Zab Chergui and the western region known as Zab el Gherbi

(Bouammar, 2010). Whereas according to colonel Niox (1890) cited by (Lalouani and Alkama, 2009) the region was divided into Four Ziban:

- Zab El-Biskri (Oasis of Biskra): it is the entrance to Ziban
- Zab Chergui (Oriental Zab): Chetma, Sidi Khelil, Droh, Seriana, Garta, Sidi Okba, Ain Naga, Sidi Salah, Zeribet El-Oued, Liana, Khanga Sidi Nadji, Badès, Zeribet Hamed, El-Feidh, Sidi Mohamed Moussa, those all the whole of Zab Chergui .
- Le Zab Guebli (Southern Zab): Oumache, Mlili, Ain-Nagz, Ourlal Ben Thiou, S'hir, Lioua, Oulad Djelal, and Sidi Khaled. These oases are all located in the valley of the Wadi Djedi.
- Zab Dhahraoui (Northern Zab): is separated from The Zab Guebli by a strip of sand and swamps, and includes: Bou Chagroune, Lichana, Zaatcha, Farfar, Tolga, And Bordj, Foughala, and El Amri.

## 2.8 Genetic erosion in date palm

Genetic erosion has been variously defined as the loss of particular alleles , the reduction in richness of the total number of alleles ,and the reduction in evenness of frequencies or across species .

i. **Natural causes**, among the important we mention:

- **Silting**, which covers fertile soils of modest areas (Lambert, 2002).
- **Aging and water deficit** resulting in the gradual degradation of a large part of the traditional Algerian palm grove, of which 30% of the palms are beyond the production age (Messar, 1996 in Baaziz, no date).
- **Climatic instability**, which has adverse effects on plant genetic resources, which can manifest itself in soil erosion following heavy rain, wind and other natural agents (Adamou, et al., 2005).

ii. **Human causes**, these are:

- **The salinity of soils** in certain regions, caused by inefficient traditional irrigation practices. Palms, in such salinity situations, see their profitability decrease considerably, to the point of being sometimes neglected by farmers (Lambert, 2002).
- **National and international market forces**, market preferences go to dates of high commercial value. To meet this market demand, farmers are replacing the different

varieties existing in situ with a very small number of varieties offering greater commercial appeal. (Lambert, 2002).

- **The rural exodus** also causes the abandonment of this biological wealth. according to Belguedj (1996)

- iii. **Pathogenic causes**, following the impact of bayoud disease, which destroyed a large number of date palms (Lambert, 2002).

### **2.9The importance of genetic resource conservation**

Crop [genetic diversity](#) – critical for feeding humanity, for the environment and for sustainable development – is being lost at an alarming rate. Given the enormous interdependence of countries and generations on this genetic diversity, this loss raises critical socioeconomic, ethical, and political questions. The recent ratification of an international treaty (Food and Agriculture Organization, 2009) and the development of technologies to preserve crop diversity have raised expectations that must now be fulfilled. Countries are fundamentally interdependent with regard to plant genetic resources, and in particular for crop genetic resources which have been systematically developed, improved, and exchanged without interruption over millennia. Food and agriculture production are dependent on genetic resources domesticated elsewhere and subsequently developed in other countries and regions.

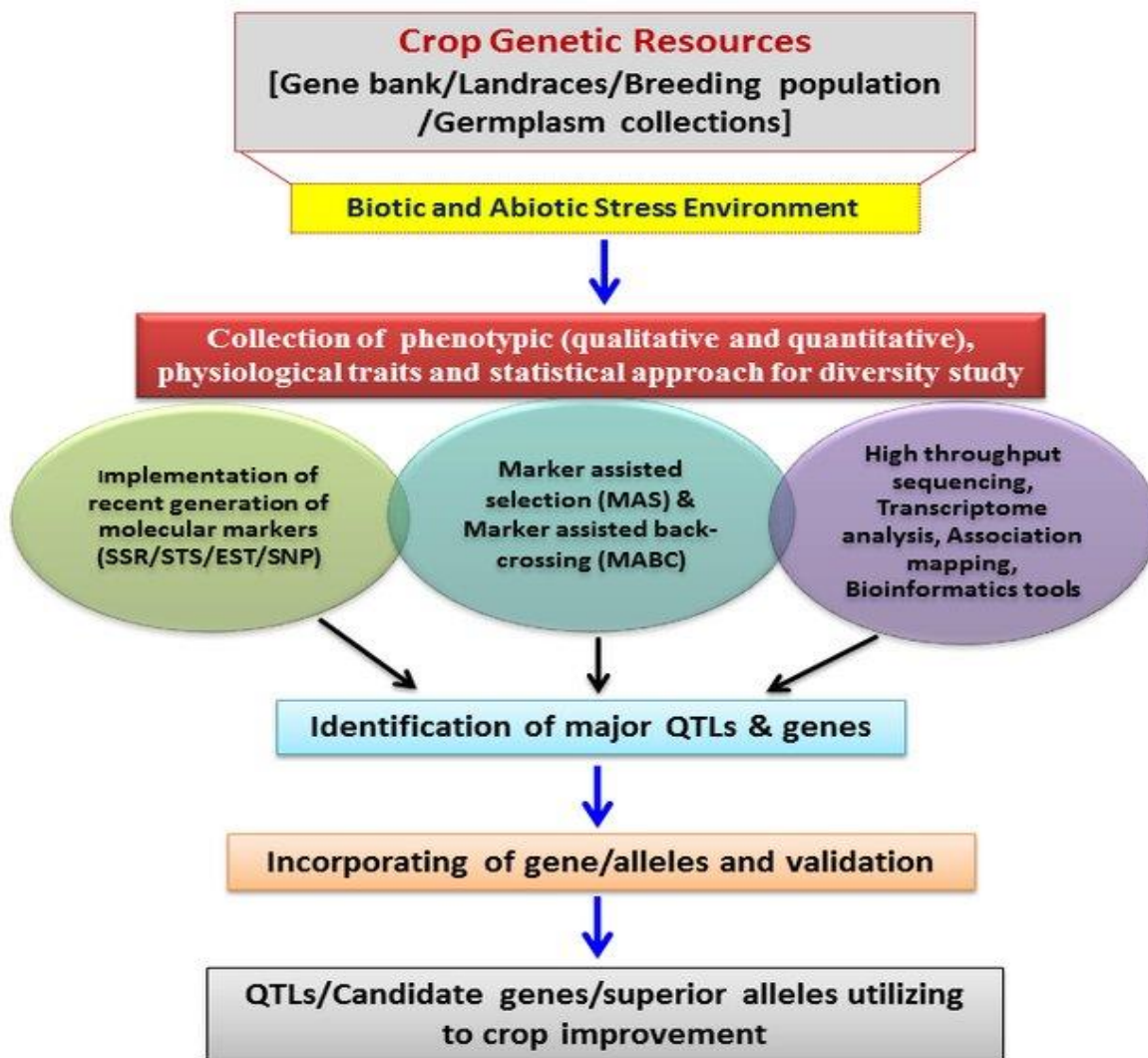


Figure 09: Crop [genetic diversity](#) (Food and Agriculture Organization, 2009).

# Excremental part

Chapter III:

Material and method

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## **Approach method**

Our study based on a survey composed of questions, taken from the descriptor of the International Plant Genetics Resources Institute (I.P.G.R.I, 2005) with additions and modifications of some questions.

We conducted our investigation during the period from January 2020 to September 2020 in the region of Ain Zaatout.

The information was collected from farmers who own palm groves chosen through discussions and interviews to carry out our work because of its rapidity and simplicity, it also allows to obtain first-hand information.

### **1. Aims**

Our objective is to establish a typology of palm groves and assess genetic erosion of date palm genetic resources in the commune of Ain Zaatout (areas used, production, existing varieties and those which have disappeared), based on a diagnosis following our investigation and compare the results with the other region of the Wilaya.

### **I.4. Pre-survey:**

At the end of this work, 10 farms were retained and chosen for carrying out the work, at the rate of 2-3 farms in each of the 4 sectors in order to collect as much information as possible.

This step also allowed the questionnaire to be tested for possible corrections in order to make it more operational.

### **2. Survey**

We executed this survey based on a questionnaire and trips made at the level of some farms in the commune of Ain Zaatout. This survey should be took place for 3 months but due to the situation of the new Corona disease (Covid 19) it remains up to 8 months ( from the beginning of February to the end of August).

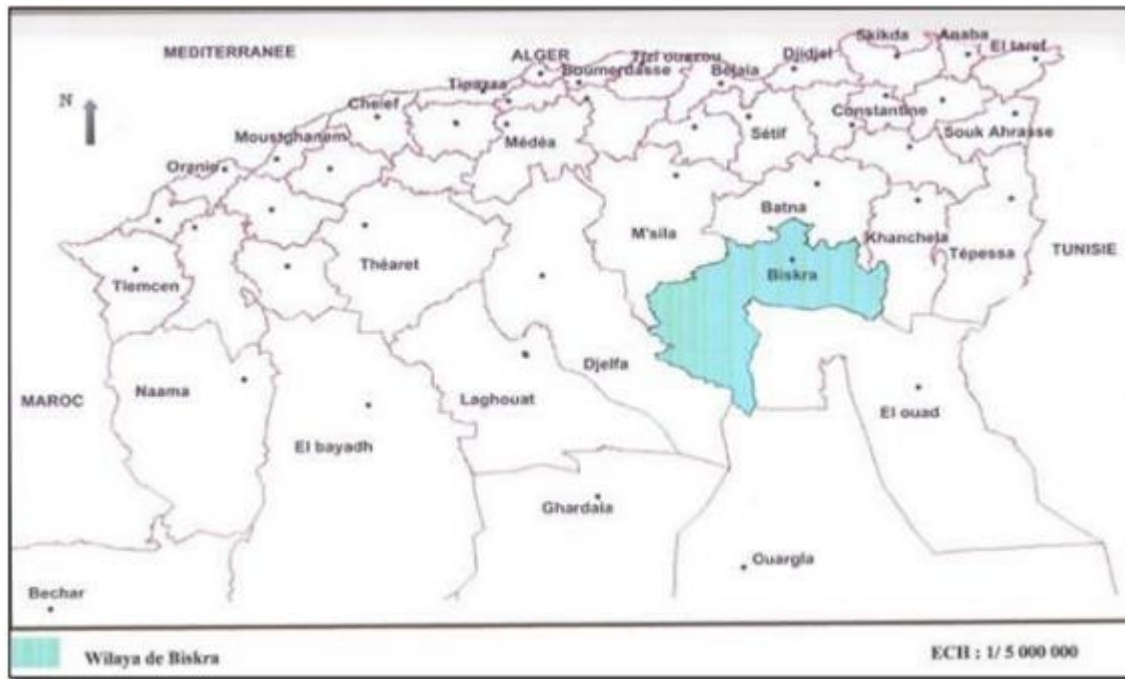
The interview survey is the method chosen to carry out our work, we were able to contact 10 farms distributed in 4 zones in the region of Ain Zaatout.

The questionnaire was carried out on the base of IPGRI (2005) descriptors, now bioersivity and containing 43 questions dealing with the following aspects:

- **Section n ° 1:** location of the study region.
- **Section n ° 2:** the genetic origin of the plant material.
- **Section n ° 3:** aspects of genetic diversity of the date palm (male and female).
- **Section n ° 4:** the different cultivars existing in the region and disappeared.
- **Section n ° 5:** Flora associated with the date palm cultivar in the region.
- **Section n ° 6:** genetic erosion factors.
- **Section n ° 7:** the different uses that farmers make of the palm tree and its parts.
- **Section n ° 8:** Cultural practices (harvesting, pollination) and resistance against biotic and abiotic stresses.

### **I.3.Presentation of the study region**

The city of Biskra, capital of the Ziban is located approximately 470 km south-east of Algiers. Its latitude is 34 ° 48 north and its longitude is 05 ° 44 east. It covers an area of 21,671.20 km<sup>2</sup>, is at an altitude of 124 meters. It is bounded to the north by the wilaya of Batna, to the east by the wilaya of Khenchela, the west by the wilaya of M'Sila and Djelfa, to the south by the wilaya of El-Oued and Ouargla the National Agency of Regional Planning (A, N, A, T 2009). It is part of the arid region of the country with a Saharan climate (hot summer and mild winter) (Djebaili, 1984).



**Figure 10:** Location and geographical limits of the Biskra region (DSA 2018).

### 1.3.1.1. Geomorphology

The relief of the region of Biskra is constituted according to Aïdaoui (1994) by three morphological units which are: the mountains, the foothills and the plains. Geographic groups:

- The Mountains, located in the north of the region, almost uncovered of all natural vegetation (El-Kantara (Ain Zaatout ), Djemourah and M'Chounech).
- The plateaus in the west they extend from north to south encompass approximately the dairas of Ouled Djellal where this study will take place, Sidi Khaled and part of Tolga.
- The plains, on the El Outaya -Doucen axis develop towards the east and cover almost all of the dairâs of El-Outaya, Zeribet El-Oued, the commune of Doucen and the area of Sidi Okba.
- The depressions, in the south-eastern part of the wilaya of Biskra (Chott Melghir).





**Figure 11:** the geomorphology of Biskra.

### I.3.1 .2. Climatic context:

According to the National Meteorological Office (ONM) 2018, the region of Biskra belongs to the arid bioclimatic stage with hot winter. The average rainfall is 114.78mm / year, with maxima of 49.53mm in winter and minima of 0 mm in summer, temperatures are very high in summer (40 °) and moderate in winter (8 °).

#### ➤ **Temperatures:**

The Biskra region is characterized by high temperatures that can reach an annual average of 22.8 ° c (ONM, 2018).

The monthly average temperatures are high, recorded during the months of June, July and August, with respectively, 36 ° c; 42.7c and 36.9 ° c (ONM, 2018).

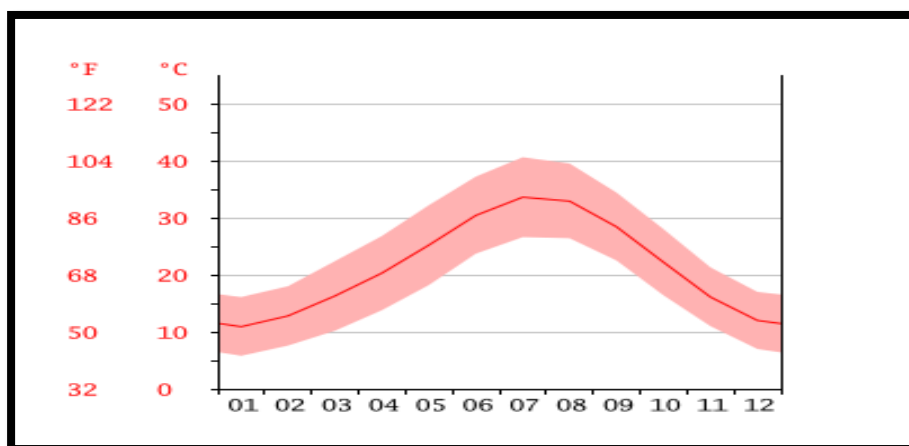
**Table 05:** Climate data for the Biskra area (Anonymous, 2019).

	Januar y	Fabrury	Mar ch	Ap ril	May	June	July	Aou get	Sept	Oct	Nov	dec
Average Temperature (°C)	10.9	12.8	16.3	20.3	25.2	30.4	33.6	32.9	28.4	22.2	16.1	12
Average Minimum Temperature (°C)	5.8	7.6	10.2	13.8	18.2	23.7	26.6	26.4	22.5	16.4	11	7
Maximum Temperature (°C)	16.1	18	22.4	26.8	32.2	37.2	40.6	39.5	34.4	28	21.3	17
Precipitation (Mm)	14	10	15	11	13	6	2	5	18	17	19	11

### ➤ Precipitation:

The climate of the region of Biskra is characterized by the irregularity of the rains in the year and in the weather. In addition, the drought is relatively important during this period (2010-2018) according to ONM, characterized by low rainfall.

Indeed, the highest average rainfall is recorded during the month of May with 49.53mm and the lowest in June and July (0mm), with an annual average of 114.72mm



**Figure 12:** Annual distribution of average temperature (Anonymous, 2019).

### 3-1-3-3- Relative humidity

**Table 06:** Average monthly relative humidity (%) of Biskra region 2019.

monthe	january	february	march	april	may	june	july	august	sep	oct	nov	Dec
H%	52,3	55,6	44,5	40,7	45,4	34,3	25,4	41,6	42,8	54,4	56,3	59,8

The data in Table 06 shows that the relative humidity is low and varied greatly by the effects of high temperatures and large thermal amplitudes. It generally varies from 25.4% in July to 59% in December for the year (2019).

### ➤ The wind

According to Benbouza (1994), in the region of Biskra, the wind is frequent throughout the year the driest and coldest. On the other hand, in summer the southerly and south-easterly winds are hot and dry. The annual average wind speed is 15.7 km / h (2018).

**Table 07:** average monthly relative of wind of the Biskra region 2019

month	january	februar y	march	april	may	june	july	august	sept	oct	nov	dec
Wind km /h	18,1	16,8	22,3	19,4	17,8	16,7	13,6	11,6	10,4	14,6	16,6	10.7

## I.3.2 Ain Zaatout Station

### I.3.2.1 the geographies situation

The station of Ain Zaatout is located at 35.14 ° North and 5.83 ° East between the wilayas of Biskra and Batna south of the mountain range of Aurès, it has a total area of 171.19 km, is characterized by two types reliefs.

Mountainous within its limits with the wilaya of Batna where the altitude can reach up to 1350m, Para-steppe in the valleys and wadis, with an altitude of 615 m to more than 1000m.



**Figure 13:** Location of the region Of Ain Zatout in the Wilaya of Biskra. (Source: google image).



**Figure 14:** Sky view of Ain Zaatout Size of this preview: [800 × 450 pixels](#). ([Wikimédia Commons](#).)

The total area of the municipality of Ain Zaatout is 171.19 Km<sup>2</sup>. According to the July 1998 general census, there are 4015 permanent residents in the village leading to a population density of 23 inhabitant / Km<sup>2</sup>.



Ain Zaatout is rugged and mountainous in the north, with expanses of semi-desert in the south. It is bordered by El Kantara, Lotaya, Branis, Djemmoura, Thagousth and Maafa making it at the edge of the Berber speaking zone of Aures. It stretches along 35 km from north to south. The two major cities close to Beni Farah are Biskra (50 Km southwards) the capital of Ziban and Batna (75 Km northwards) capital of the Aures.

According to the 1998 general census, there are 4000 palm trees in Beni Farah and 8703.3 hectares of forests served with 20 km of unpaved roads. (Sit of Ah Frah (Ain Zaatout) of Auras (Last update: 05 February 2010 consulted 25/09/2020)



**Figure 15:** the palm tree rest a life located in fedan sdar area , Ain Zaatout region 2020.

### 1-The geomorphological of the study area

Our study area extends from the North of the Wilaya of Biskra where the glaxis of the southern slope of the Aurès manifests itself with an altitude of 1100m (Djebel Krouchel "Daira de Ain Zaatout") soil rich in limestone presence of mixed vegetation shrub trees and herbaceous vegetation, tufts in particular, sagebrush and Alfa.

**Table 08:** The most important exploitations in Ain Zaatout (sit of Ah Frah (Ain Zaatout) of Auras (Last update: 05 February 2010 consulted 25/09/2020)

Place	Latitude (°)	Longitude (°)	Altitude (metre)
<b>Borgho</b>	35.123	5.793	615
<b>Ain l'Gat (archelological site)</b>	35.130	5.790	640
<b>Ain l'Gat (spring)</b>	35.131	5.792	639
<b>Feddane Sder</b>	35.139	5.807	718
<b>Foonta (spring)</b>	35.139	5.810	739
<b>Malwadh</b>	35.142	5.817	807
<b>Thikhlileen (spring)</b>	35.142	5.823	820
<b>Ain Sh'ka (spring)</b>	35.144	5.826	836
<b>Ikhef al' Akabeth (tombes)</b>	35.143	5.828	915
<b>Ikhef al' Akabeth (highest peak)</b>	35.141	5.829	961
<b>Ikhef al' Massala (water tower)</b>	35.142	5.837	975
<b>Zaadhodh (munipal offices - <i>makkar al-baladia</i> )</b>	<b>35.145</b>	<b>5.837</b>	<b>944</b>
<b>Al Jamaa Lakbeer</b>	35.147	5.836	987
<b>Highest peak beside Al Jamaa Lakbeer</b>	35.148	5.836	995
<b>Th'sawent n'Ighzer</b>	35.149	5.839	919
<b>Al Markaz</b>	<b>35.151</b>	<b>5.837</b>	<b>990</b>
<b>Municipal Guards HQ (makkar al-Haras al-baladi)</b>	35.155	5.836	972
<b>Thassagrooth (Inside the Watch Tower)</b>	35.155	5.845	1061
<b>Tizi (old school's courtyard)</b>	<b>35.154</b>	<b>5.847</b>	<b>1036</b>
<b>Allagh al-Galaath (football stadium)</b>	35.145	5.842	1003
<b>Thishobar</b>	35.146	5.844	1118
<b>Djebel Louz</b>	35.134	5.855	1352
<b>Ikhef n'Souf</b>	35.152	5.856	1025

## 2-Climate

Ain Zaatout (Beni Farah) has hot summers, and bitterly cold winters. July and August are the hottest months with a temperature of 30-40° C on daytime but evenings and nights are cooler. December, January and February are short and cold. Temperature may go beyond the freezing level during the nights and mornings. The rain season starts from September to April. Cold winds are common. The

snow, once a frequent sight in the village, is seldom seen these days which lead to a continuous shortage of water supplies especially from the main fountains in the village. This has undermined the whole activity of terrace farming that once was a thriving activity.

### 3-1 The soils of the study region

The main types of soils in Ain Zaatout regions according to the observation we made and the interview with farmers and local people we conclude that the type of the soil is red salty-clay soil and poor (calcLime) soil due to the erosion and the decrease of the water .

Clay is one of the three primary soil types, alongside silt and sand. According to the U.S. Geological Survey (USGS), "most clay minerals form where rocks are in contact with water, air or steam." Although clay soil is viewed as a bane by many gardeners, clay is a necessary component of good soil. Loam, which is considered ideal for most applications, consists of roughly equal parts of clay, silt and sand, according to Purdue Consumer Horticulture. (Isaiah David 2017).



**Figure 16:** the soils salty - clay of the region of Ain Zaatout.

### 4-Vegetation

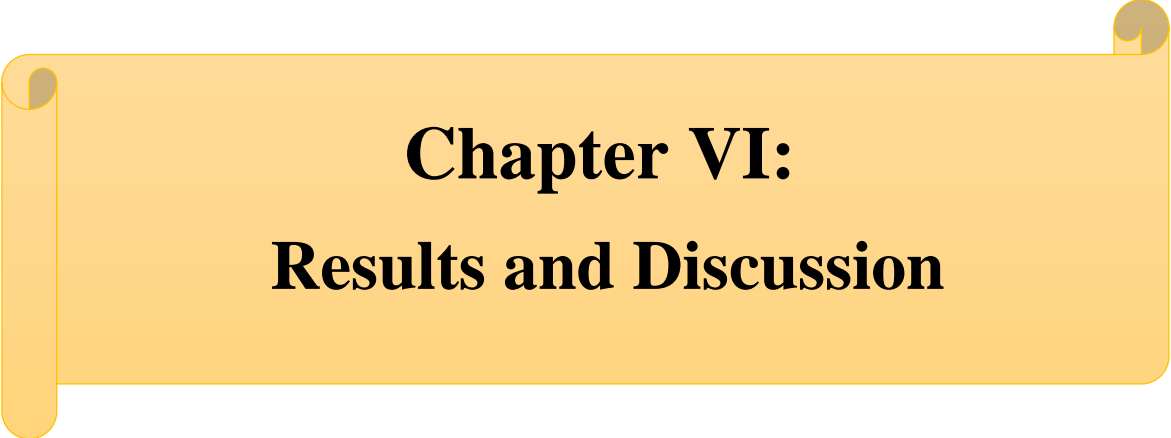
The mountainous part of Ain Zaatout (Beni Farah) is covered by evergreen oaks (locally called Ashakreedh), juniper trees (locally called Zimba) and esparto alfa grass. Such a vegetation has the ability to resist droughts and high altitudes. The area is also the place of many medicinal herbs like Artemesia (two variants: Izri and Thagoufth), Mzoushan, etc. The Oueds contain oleander (Alili) and can sometimes be very thick as is the case between Ain Sh'ka and Thikhileen. Only scrubby vegetation grows on the southern slopes.source





**Figure 17** : Some vegetation growves in the mountain of Ain Zaatout .





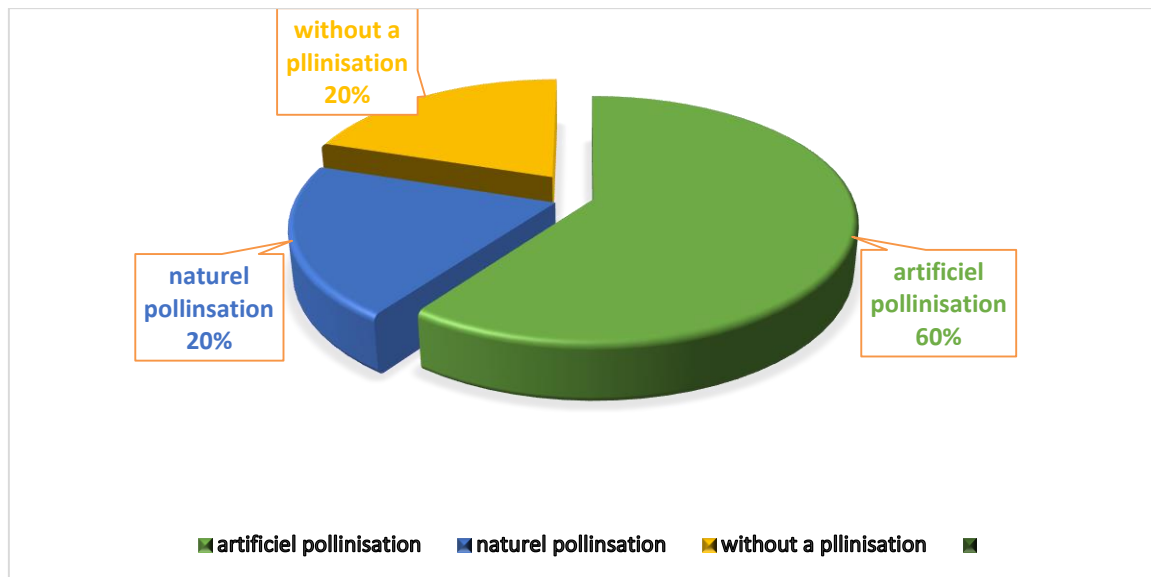
**Chapter VI:**  
**Results and Discussion**

In this chapter we will present the main results we obtained from the survey with the farmers, the results are as follows:

## II-1- Plant material

### II-1-1-Source of plant material

According to figure (18), we notice that the sources of plant material (Djebbars) vary according to their origins.



**Figure 18:** Source of plant material.

Most farmers (60%) self-produce the rejects in their palm groves, in order to exploit their palm groves areas to increase the numbers date palms especially Bouzarrou cultivar to develop the proportion benefits. In others, there is Djebbar comes from nurseries, whose price is around (5000-6000DA) on the market intended for direct planting and according to interviews, and (20%) of farmers pollinate in the pollination area (natural pollination) and the rest of agriculture (20%) does not pollinate, by negligence.

The comparison to the results of Touti 2018 in the municipality of Ouled Djellal (76.5%) of the agriculture of the region are self-produced of reject which is nearly similar to ours we obtained in Ain Zaatout region (60%) , which means that most of Biskra farmers are self-produced the reject to maintain the local variety from extinction.

## II-1-2- Pollination

The majority of phœniciculturists of Ain Zaatout apply the traditional method for a good production of dates, this operation is carried out manually by the attachment of the male spikelet's with female inflorescences after bursting of the spathes, and the rest of the agriculture does not apply the pollination to cause of the abandonment of this cultivars thanks to the three essential cause: hardy displacement, well drying and lack of precipitation

It is advisable to cut back the male spathes before the flowers bloom to conserve the pollen grains. Pollen should be collected a few hours after opening the spathe to prevent losses. The maturity of the pollen is recognized when the male husks compressed between the fingers produce a characteristic screeching sound. The best date for pollination depends on the variety in question and on climatic conditions and cultural practices. It usually runs from July to August.

Pollination does not repeat very often, Just 1 time. This frequency is mainly linked to:

- ❖ The lack of the worker who gave up farming and farming in the region for a good future in the city.
- ❖ The period of receptivity of the female flower. That of this cultivar (Bouzarrou, Dgoul, Degla Bieda) is longer compared to other cultivars. It moderately lasts up to 12 days.
- ❖ For the tallest palms, it is more difficult to achieve because the operator has to climb several times (up to five times) depending on the opening of the husks, then agriculture leaves there are pollination thanks to the lack of material and workers young
- ❖ Old trees (over 80 years old) become fragile and very dangerous and are neglected both by phœniciculturists for their low productivity and by climbers for the risk of falling they represent.

It turns out that many palm groves have been abandoned due to a shortage and high cost of skilled labor.

## II-1-4-New interesting genotypes:

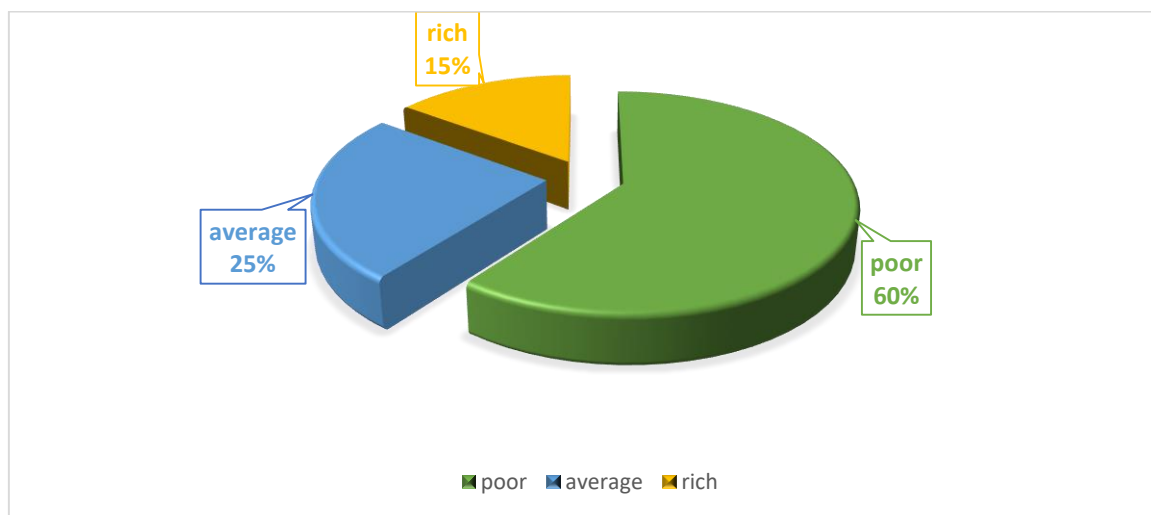
All the phœniciculturists of Ain Zaatout use the varieties from this region only, which are the most important in local consumption and the most resistant in the harsh climate: Bouzarrou, Degla Bieda, Dgoul, Gharss

In comparative point of view between agriculture of Ouled Djellal that focused on planting the most marketing date Palm (Deglat Noor) obtained by Touti 2018 and our results from Ain Zaatout region which it's farmers focused in planting the most resistant variety to their rough and cool climate (Bouzarrou).

### II-1-5-Conservation of plant material

Only 35% of phoeniculturists are conserving the plant material by planting the young offshoots in the palm fields for subsequent planting or sale.

However, the rest of the farmers (61%) plant the suckers around the palm grove as a windbreak to provide good protection against the stronger winds that prevail in this region and against the strong intensity of the sun.

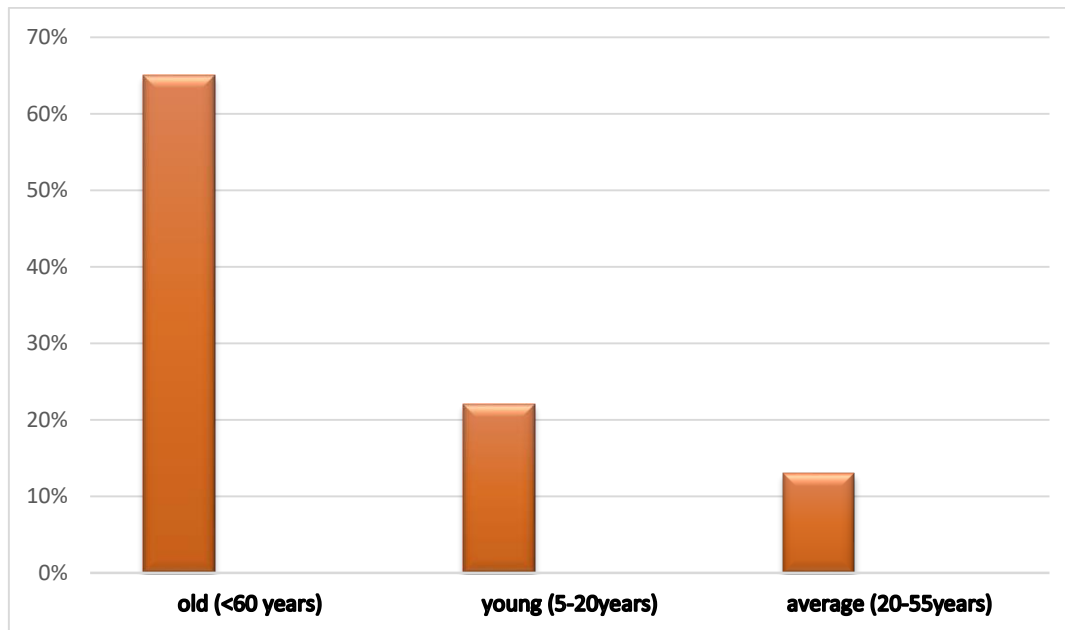


**Figure 19:** Mode of conservation of genetic material

## II-2- Male tree

### II-2-1-Age of male tree

According to the interviews that we do with phoeniculturists and the outings at the level of the farms surveyed from regions of Ain Zaatout, the age of male plants are different (Fig20), because of the regeneration or the production of Dokkars, despite which old plants are of less interest to farmers because its pollen production is low and they are dangerous because of its height but old plants are still used thanks to the lack of the number of young and adult plants (100 plants in the whole region) and keep them carelessly.



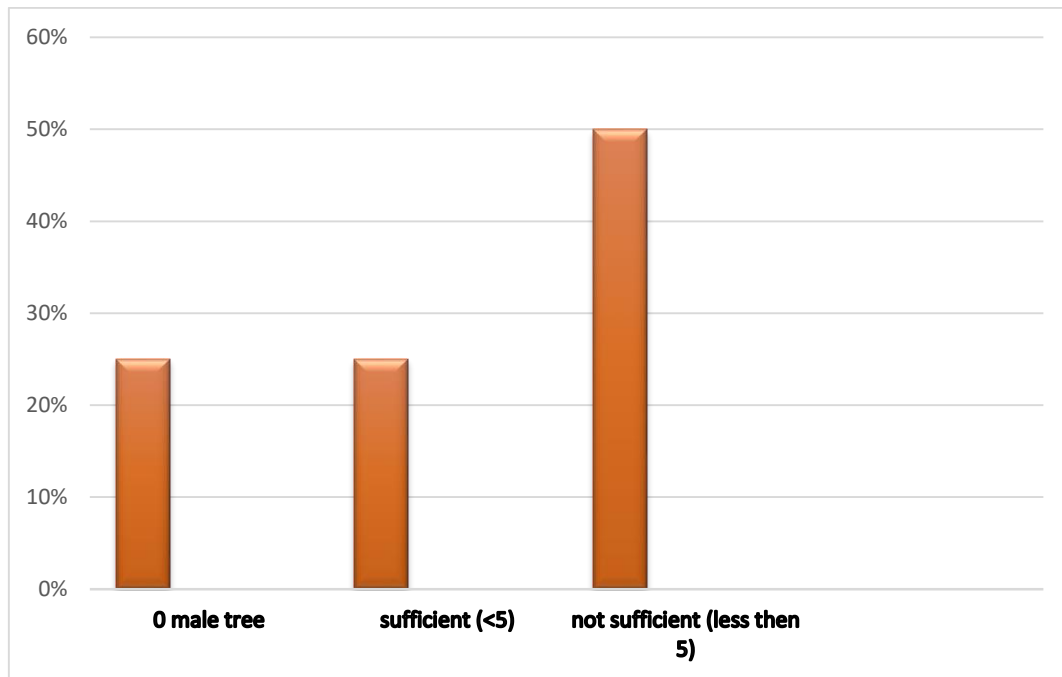
**Figure 20:** Age of male tree.

According to the IPIGRI scale (2005) and from these results it appears that at the level of farms in the regions of Ain Zaatout the number of old male plants characterized by very high nearly 65%, then young plants by 22% and 13% for adult feet. These data reflect the difficult situation of the region in terms of neglect of palm trees due to rural displacement and the lack which is more noticed in the last 10 years.

In comparison between the age of male palm tree obtained from Touti 2018 results in the common of Ouled Djellal, the male palm in that region are young and more productive unlike the male palm in Ain Zaatout region which are more old and aged and less productive ,we explain that's the agriculture concerned about saving the local variety .

### **II-2-2-Number of male plants (Pollination capacity)**

The presence of male compared to female plants varies considerably at the level of the farms visited. This report established by the IPIGRI scale (2005) determines whether the pollen resources (represented by dokkars) are sufficient for pollination of the plants. Females contained in the palm grove.



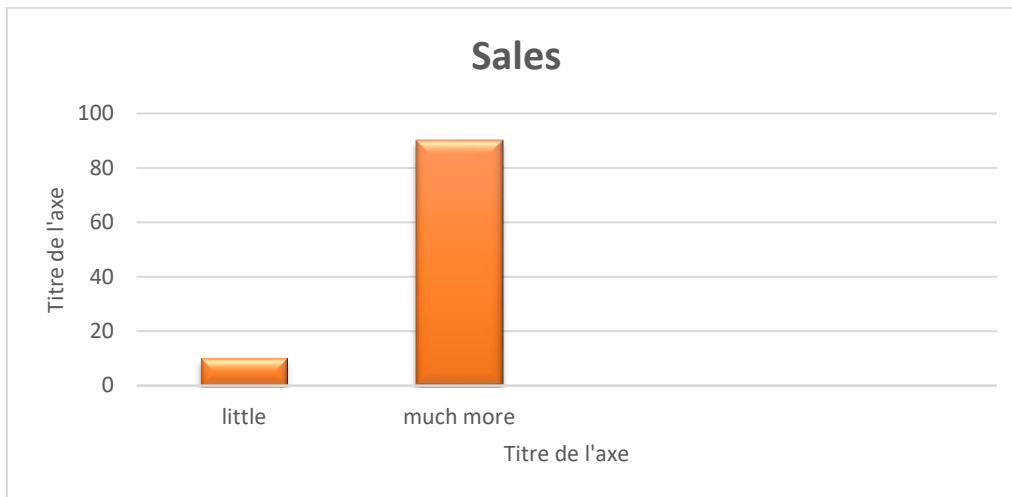
**Figure 21:** Pollination capacity of Ain Zaatout.

The analysis of the results that we obtained from Ain Zaatout shows that the sources of the pollen grain are different:

- ❖ Most Ain Zaatout Phoeniculturists (25%) have a sufficient number (> 5%) of male plants to not ensure pollination efficiency and meet the pollen requirements inside the plantation.
- ❖ In case of insufficiency (number of male plants (<5%) or no male plants (65%), farmers generally bring back the pollen from a neighboring farm for free or from a friend's farm. Too expensive spathe varies from 5000 to 6000 DA, this is an alternative to cover the pollen deficit, in particular for palm groves where male plants are absent or there is still pollination (neglected).

### II.2.3. male Genetic diversity

Phenotypically there is a small variability in dokkars in general as they often come from grains. Phoeniculturists, in most cases, do not give much interest to this type of palm which is not valued so as to create a selection of genotype with high pollinating potential. We have evaluated the genetic diversity of dokkars based on standards set by the IPIGRI scale (2005) which takes into account the number of phenotypes present in a given farm.



**Figure 21:** Male genetic diversity.

The results obtained show that the genetic diversity of male plants is: Poor in most holdings 90%, and the minority of holdings are rare 10%.

Some ancient phoeniculturists can distinguish between the different phenotypes of male plants by a few features following.

**The shape of the palms:** before the productive phase (3 years to 10 years), the male palms resemble the female genotypes known by the shape of the palms, they are 2 male genotypes which are similar to all the female genotypes on the farms.

**The flower:** stalks of both male and female date palms are produced inside a *spathe*. The spathe emerges from the axils of the leaves in early spring in mature date palms.

The date palm flowers form within the long stout spathe which, on bursting, exposes many thickly crowded floral branchlets inside. These are thicker and shorter in the male date palm

inflorescence, and the spikelets are long and slender in female date palm inflorescence.



**Figure 23:** Male palm and the spathe.

## **II-3-Female trees**

### **II-3-1-Varietal composition**

According to interviews with phoeniculturists, the list of cultivars located and cultivated is presented in the following table:



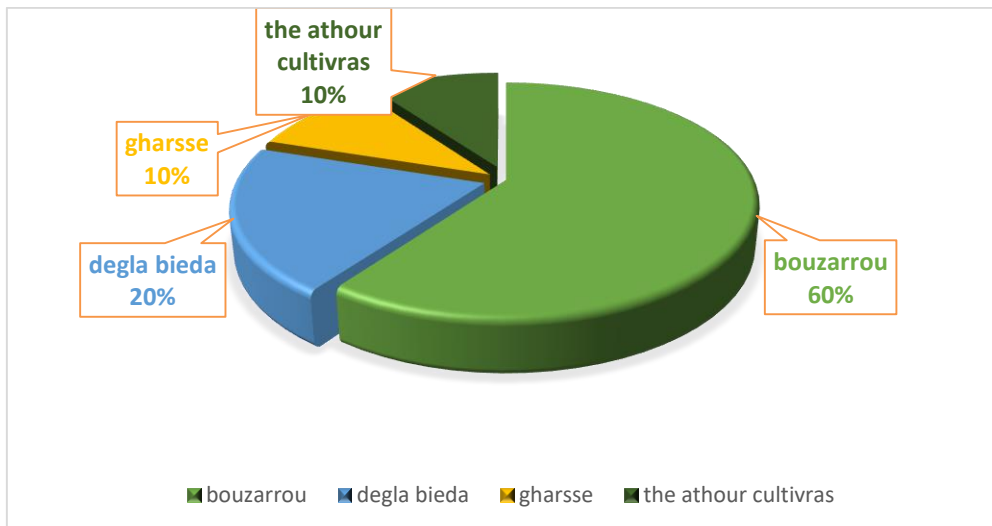
**Table 11:** List of date palm cultivars located on the farms surveyed.

N°	Nome in arabic	Name commun	Synonyms In chaoui	Nbr of Pieds	Age	Moste caractiristique important	origine
1	بوزرو	bouzarrou	/	1500	60-150 years	Very tall	Beni frah
2	دقلة نور	Daglat nour	/	rare	20-60 years	It's not mature due to the cold weather and it's unsuitable climate for it	tolga
3	دقلة بيضة	Dagla bieda	Degla thamlalt	500	60-100		Beni frah
4	الدقول	dghol	/	500	70-120 years	The fruit is varied in color (yellow, black, green)	Beni frah
5	الغرس	gharesse	/	More than 200	80 years		djamo ura
6	ي تيما	Litima	/	More than 100	5-20 years		Beni frah
7	عش بن شعيب	Ach ben chaib	Achouch n'chaib	rare	disappeared		Beni frah
8	الجوزي	jousi	/	few	50 years		Beni frah
9	الخدري	khadri	akhadri	few	60 years		Beni frah
10	دقلة الكحلة	Blacke Degla	Degla abrkan	More than 100	100 years		Beni frah
11	الهلوي	halouai	tahlouaketh	rare	50 years		Beni frah
12	تنطبوش ت	tantbouchete	/	few	90 years		Beni frah
13	لرشتي	larachti	/	few	80 years		Beni frah
14	دقلة سمارة	Degla smara	/	More than 50	60 years		Beni frah
15	بوحازم	bouhazem	bouhazeem	few	disappeared	The color of the fruit is close to the bleu	Ben frah

16	بوحلا س	bouhlassa	/	few	disappeared	It does not mature	Beni frah
17	كرواش	karouache	akarouache	few	desappeared		Beni frah
18	حلوة سعادة	Halouat saada	/	few	desappeared		Beni frah
19	صبع لعروس	Sboua laarouse	Dad ntaslith	Few	desappeared		Beni frah
20	توري	touri	touri	50	100 years		Beni frah
21	الحمرا	hamraya	thahmrakth	few	80 years		Beni frah
26	بوقرشية	/	bougrchiche	few	dessapea		Beni frah
22	بوكدان	boukdane	n	few	desappeared		Beni frah
23	ظفر القط	Dfour agaath		few	desappeared		Beni frah
24	ريق البنات	Rig lbname	Eladain ntahuoyin	few	desappeared		Beni frah
25	الغازي	alghazi	/	few	desappeared		Beni frah

We notice that the cultivar of "Bouzarrou" is strongly predominant (70%) while the other cultivars of secondary importance do not exceed 20%. The latter, not competing with the Bouzarrou variety, explain the current orientation of phoeniculturists towards monoculture. This choice is explained by the high yield and the resistance of the latter to the difficult and harsh climate and because it is requested for local consumption, it is a category with high nutritional value, therefore local consumption well compared to others. cultivars which are cultivated less and less by Phoenicicultures than Bouzarrou such as Deglat nour and Degla Bieda and Ghers which are less demanded by the local population because of its low productivity.

The other rare cultivars which are lower categories, low valued therefore they are the old palms that they remain.



**Figure 24:** Varietal composition.

In comparative way Touti 2018 in the common of Ouled Djellal fond no more than 15 palm date tree variety as for the common of Ain Zaatout we found more than 26 different variety explained by the genetic diversity in Ain Zaatout region .

## 2-2 The flora associate

Ain Zaatout municipality is famous for its diversity in terms of vegetation cover especially medicinal plant which is found everywhere in the region, in particular the mountains and those are some examples for those plant:



**Figure 24:** Izri (*Artemisia herba Alba*).

This table represent some species of the medicinal plant:

**Table 09:** List of the most common medicinal plant in Ain Zaatout region.

(sit of Ah Frah (Ain Zaatout) of Auras (Last update: 05 February 2010 consulted 25/09/2020)

scientific (Latin)	English	French	Farhi	Comments
<i>Artemisia arborescens</i>	Powis castle	Absinthe arborescente	Meriw	medicinal
<i>Artemisia campestris</i>	Tall wormwood	Armoise des champs	Thagoofth	medicinal
<i>Artemisia herba alba</i>	Wormwood	Armoise blanche	Izri	medicinal
<i>Asparagus albus</i>	Wild or White asparagus	Asperge blanche	Azzoo	
<i>Bunium incrassatum</i>			Thalghooda	
<i>Capparis spinosa</i>	Spineless caper	Câpres	Thamilalooth	medicinal
<i>Citrullus colocynthis</i>	Colocynth		Handhal	medicinal
<i>Cuminum cyminum</i>	Cumin		Ishammen	medicinal
<i>Foeniculum vulgare</i>	Fennel	Fenouil / Aneth doux	Habt H'lawa	medicinal
<i>Globularia alypum</i>		Globulaire	Thassalgha	medicinal
<i>Globularia vulgaris</i>		Globulaire alypum ou Séné de Provence	Thassalgha	medicinal
<i>Hyoscyamus niger</i>	Black henbane	Jusquiame	Guinguidh	medicinal
<i>Ilex aquifolium</i>	Common holly	Houx	Igri, Igersel, Irsel	
<i>Inula viscosa</i>	Inula	Inule visqueuse	Amagar aman	
<i>Juniperus phoenicea</i>	Phoenicean juniper	Genèvrier de Phénicie	Zimba	medicinal
<i>Juniperus oxycedrus</i>	Prickly juniper	Genèvrier oxyèdre	Thakka	medicinal

- ❖ And also it's famous for here diversity in types of fruit trees such as olives and vegetable grower such as pepper .but due to the lack of precipitation and the lack of water recently all of those species are threatened with disappearance.

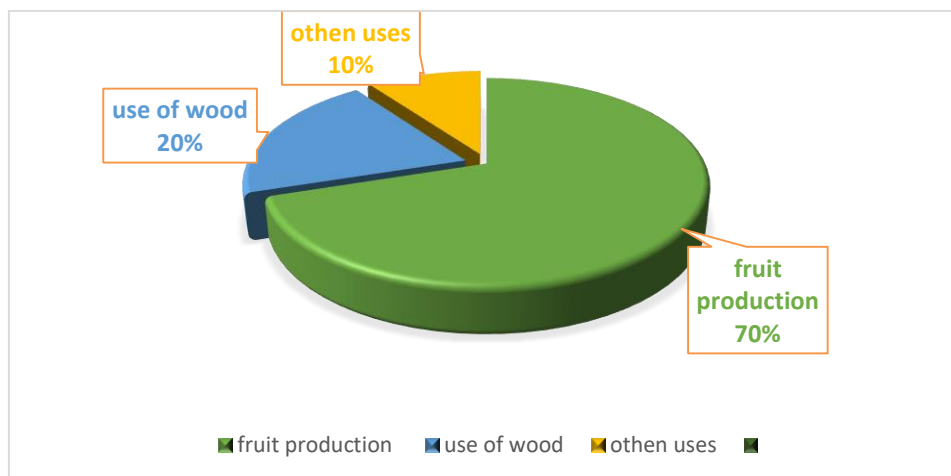
➤ This table represent some of the fruit trees and vegetables grower in ain zaatout region

**Table 10:** Most famous flora existed in the region of Ain Zaatout .

	Species (dominant	Scientific Name	Name in chaoui	Number of trees(more than
Fruit trees	olives	Punica granatum	azmour	18000 tree
	Fig tree	ficus	emitchane	100 tree
	berries	Morus nigra	thkirssa	20000
	apricot	Prunus armeniac	/	1000
	grapes	Vitis spp	/	1000
	peaches	prunus	/	100
	apples	Malus domestica	/	50
	lemons	citrus	/	700
	Red plum	Prunus domestica	Thit n'tfounaste	100
Vegetable grower	onion	Allium cepa	labsale	20qtr
	zucchini	Cucurbita pepa	/	/
	Red pumpkin	Cucurbita	T'kabouthe n'bouchoka	/
	tomatoes	Salanum lycopesicur	atmtoume	/
	pumpkin	Ccurbita pepa	thakhsathe	/
	pepper	Piper nigrum	/	/
	bean	Vicia faba	ibagone	/
	corn	Zea mayss	M'stoura	/
	mustard	sinapis	/	/

### II-2-2-Use of cultivars

The analysis of the results we obtained from the phoeniculturists shows that the use of the cultivar is different.



**Figure 25:** Use of cultivar.

We notice from the figures that most phoeniculturists use cultivars for fruit production (70%) especially Bouzarrou which is in great demand for local consumption, so they used from its dry palms (7%) as fences, breezes wind, in the making of baskets, to make the roof of house... etc., they can even be used in the paper industry and also .3% for other uses like the bunches of dates used by the minority, as traditional brooms and garden fencing.

#### II-2-2-1-Use of Fruit

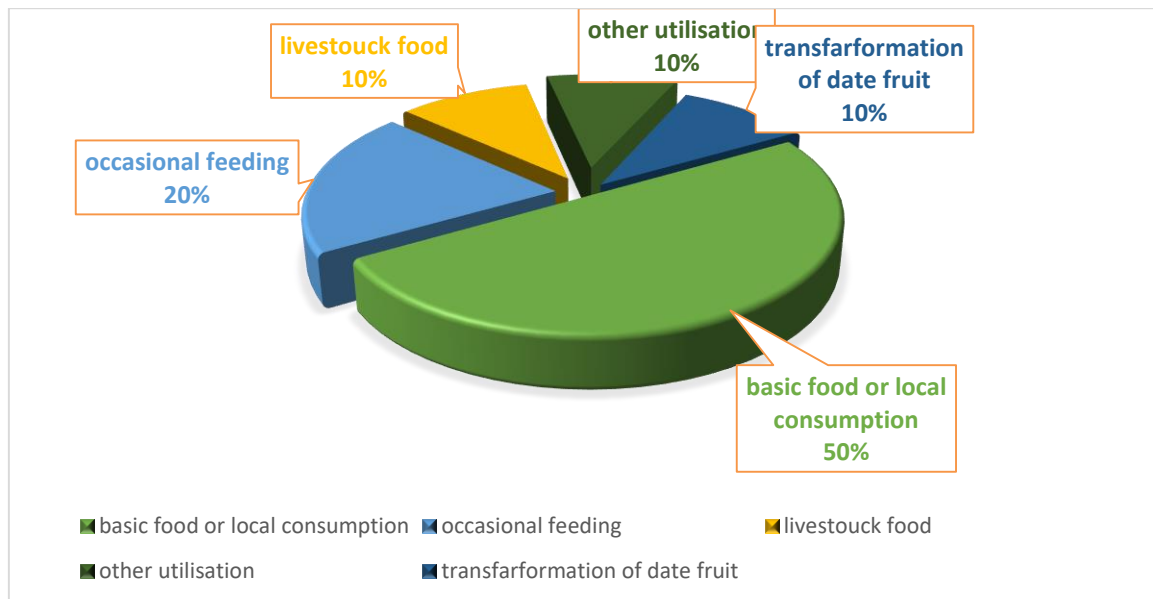
The varieties most commonly encountered and the most used are: Bouzarrou (date with high sugar and resistance), Degla beida (date of semi-dry consistency) and Ghars (date of soft consistency).

We notice from the figure that most dates are consumed fresh (50%), the Bouzarrou and Degla Bieda varieties are consumed much more than the others, especially Bouzarrou it is the preferable variety because of its availability in abundance and also it is sweet and semi-dry. Thus, we notice that 10% of the dates are processed in several products depending on the variety and the use as Bouzarrou which transforms to Basissa (Rouina), and also they are used to prepare traditional cakes especially Makroudh and which is prepared on the occasion of the various festivals (religious festivals, weddings...), and Z'rir in baby showers; and the variety used is Ghars because it is soft and very sweet. We will find according to phoeniculturists (20%) that people use dates for occasional events for example in spring, the variety of Ghars is used to prepare R'fiss Tounsi and B'radj and also the driest date (10 %) used in livestock feed. and

the rest (10%) is used in traditional medicine such as Rob which is against respiratory problems, coughs, diarrhea, intestinal bleeding and inflammation of the eyelids.

Date exudate is considered to be an effective remedy for coughs and anemia. Z'rir are used for the recovery of fractures while

Rfis, Bassisa are used as a fortifier for women giving birth, re-establishing the uterus after childbirth and for stomach aches and stomach pains.

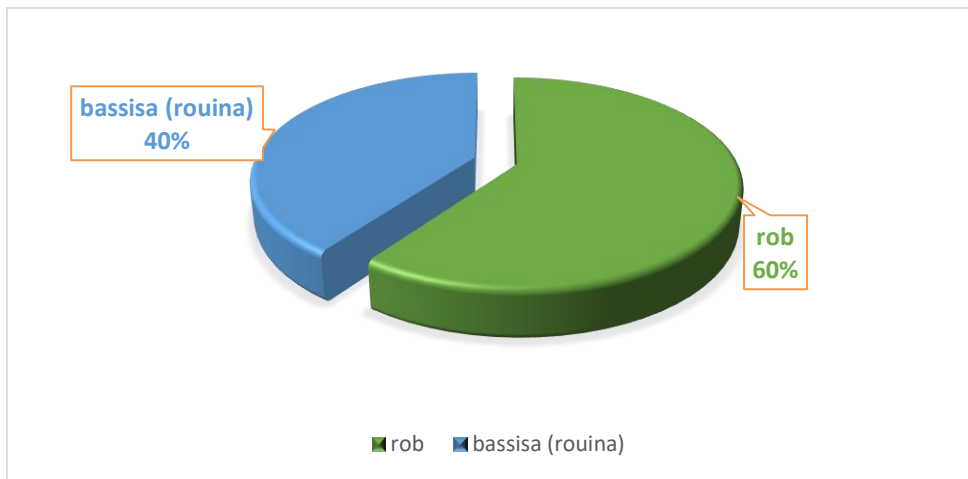


**Figure 26:** Use of fruit.

### II-2-2-2-Date transformation

Dates are the raw material for the preparation of a number of food products. They also accompany cooked dishes, such as bassisa (rouina), z'rir, in a wide variety of recipes specific to each region.

They enter into the composition of many pastries in the form of date pastes, so the famous Makroudh are very popular (Ould El Hadj et al., 2001) and Benchelah and Maka (2008).



**Figure 27:** Date transformation.

According to the figure, the most prepared products are: bassisa (rouina) (60%), followed by roub (40%) during our survey, we found that 95% of respondents use the variety mkintichi khla and mech dagla of good quality in the preparation of flour; it is the most suitable thanks to its abundance on the market. Its floury texture makes it more suitable for drying and grinding and also for storage,

This is explained by the fact that Rob, Bassisa (R'ouina), are ancestrally manufactured at the household level and extended to craft businesses.

We can say about the comparison between Touti 2018 in Ouled Djellal area and in Ain Zaatout area are the almost the same in the types and methods of date transformation

## 2-3 Irrigation

Ain Zaatout region is famous with two big fountain which are:

- ❖ Gueddili watering
- ❖ Thafoughalt watering

For Ain Zaatout (Beni Farah) water pouring from fountains is a matter of survival. Because rain is not frequent, most of the grown crops and fruit trees rely on regular irrigation by a large network of waterways (This extensive water distribution system is largely based on three main fountains: Ikhf Ounsouf, Thafoughalt and Gueddili. Smaller farming areas like Liana and Ain l'Gat have their own independent fountains although the water debit is far smaller. So the system of the irrigation in Ain Zaatout region is collective between the farmer ( tow days of irrigation to every area )





**Figure 28:** Mazzer, Ain Sh'ka, Fedan Sder and the less known Thasharsharth n'Alou Mahra springs 2020.

**Table 12:** The list of the fountains existed and disappeared Ain Zaatout region

Name / Location	Type	Date of execution	Depth (m)	Debit (l/s)	Salinity (mg/l)
Ain Zaatout N°2	Drilling	1988	173	18	13
Ain Zaatout N°4	Drilling	1991	100	20	13
RESERVOIRE N°2	Well	1994	77	2,	28
REEERVOIRE N° 1	Well	1994	73	2,	28
Tizi N°1	Drilling	1985	253	18	13

A. E.P N°2	Drilling	1987	200	20	13
Ain Zaatout N°3	Drilling	1989	185	20	13
Tizi N° 2	Drilling	1994	170	18	13
Sidi Ali	Drilling	1992	148	18	13
Oued Taghite	Drilling	1994	120	18	13
Ain Guedili	Well	1993	50	2,	28
Lycee	Well	1993	32	2,	28
A.E.P N°4	Well	1992	77	2,	28
Ain Zaatout CV	Drilling	1993	200	20	13

## 2-4 Fertilization and plant protection

Most of the farmers in the region Ain Zaatout use the organic fertilization c to their plants without any use of chemical fertilizer additives due to the richness of the soil with mineral substances such as k, P, C they burn the trunk of the palm tree to protect it from insects, and this is why we notice that most of the palms in the region have a black trunk color only.

As for the perfection from the insect and diseases the farmer and agriculture of Ain Zaatout region used the traditional method : burning the stem palm to prevent the entry of the insect and infection with diseases , so we find most of the palm burnt out and black in color ( see figure 27) .





**Figure 29:** Protection from the insect and diseases.

## II-5- Harvest:

The harvest stage is different from one cultivar to another, depending on the ripening dates of the fruits, we note:

- Early cultivars (August-mid Sep): Ghars, Degla Bieda.
- Seasonal cultivars (mid Sep-Oct): Bouzarou, Mkintichi Khla.
- Late cultivars (November-December) such as Deglet Noor and other varieties.

The method of thinning bunches, spikelets or dates is determined by the grower, depending on: cultivar, importance of date size, climatic conditions and the effect of the type of thinning on yield.

The harvesting methods are very traditional like the collection in a total way: example Gharsse , Degla Bieda and Bouzarou.

According to all phoeniculturists, dates from Bouzarrou and Ghares and Degla Bieda are collected completely (full diet), by hand, at the complete pre-maturity stage,

Comparison to Touti 2018 in Ouled Djellal region and Ain Zaatout region , the agriculture of Ouled Djellal is variable in technical method used in the harvest ( traditional and garpillage)

unlike the farmers of Ain Zaatout whom used only the traditional harvest method, which means the farmers in the study region are underdeveloped And not opened to the modern agriculture

## 2-6 Appreciation of the date quality

Most of the residents of the region of Ain Zaatout consume the local date and believe that it is rich in sugars because of its sweet taste, and as it was in the past the main dish of the poor, and this is why we conclude after asking farmers and local residents that local dates such as Bozarrou ; Dgoul and Ghares are very good in quality and sweet taste do not compete with Deglet Nour, but the local food remains the best to the locales .



**Figure 30:** Some species of locale date (Dgoul; Gharss; Bouzaarou And Degla Bieda.).

## 2-7-Technical practices

According to our survey in the past the agriculture was more interested with their exploitation so they applique a lot of technical rout such as:

- Cleaning the Palm at pollination time they remove the old Palm leaf so they can climb up to the palm and put the dust pollen in the female flower
- And they had this strange way to climb up to the palm which is recognized by the locales so in the time of the pollination young men's have to stay bare foot for two weeks or more and go everywhere without Shoes to make their legs Rough so they can climb up to the highest one without rope.
- The agriculture of Ain Zatout in the past and the present do not reduce the size of the limp because they don't care about the quantity they only car about the test sweet.
- The planation type in the region is non-aligned (Random) and it's very. Dense in some exploitation (<300/ha) like Fedan Sdare and Ain Lgat , and normal in other exploitation (121-200/ha) in Liyana and Gedilli , and negligible (50-100/ha) in Amniai





**Figure 31:** The dense area with palm (Fedan Sdare (Ain Zaatout region)).

## II-8- Resistance against biotic and abiotic factors

### ➤ Biotic factors (pathogens)

According to our study all phoeniculturists confirm that bouzarrou is the cultivar most resistance to diseases, to attacks by pests. Among which, the most formidable currently, at the economic level, are the carob moth (*Ectomyelois ceratoniae*) and the boufaroua (*Oligonychus afrasiasticus*) whatever the phoenicultural basin. The first group of susceptible cultivars is represented by Mech Degla, Degla Beida, dry dates in general and late maturing. The damage by the corn borer begins on the palm tree and continues in stocks. Early maturing cultivars (so-called common varieties) are not affected. The cultivar Ghars is the preferred prey of the White scale (*Parlatoria blanchardi*). The damage is greater in poorly maintained palm groves. As for diseases, generally fungal appear as a result of poor irrigation / drainage and / or lack of maintenance causing the

proliferation of invasive weeds such as Diss. Nowadays phoeniculturists practice an effective fight against its diseases

### ➤ Abiotic factors( drought)

Ain Zaatout palm groves are silently dying due to a terrible and lasting water shortage. This has been going on for several years. Water is running out more and more. Some phoenicultures note that thousands of palm trees, sometimes centuries old, are in danger of death. In addition, some palm groves have not been irrigated for more than 10 years. Farmers use boreholes but not all can afford pumping costs that exceed 450 dinars per hour. Farmers have increased the number of alerts in recent years for emergency measures to be taken to preserve this resource. They note that it is impossible to replace a dying date palm in the short to medium term. For them, it is necessary to drill and find water and they cannot do it on their own. With the water shortage, production is falling, further weakening the situation for farmers. Hundreds of farmers have been forced to sell their palm trees at very low prices or to abandon their farms in recent years due to water scarcity.

### 2-9 Status of palm grove in the past and present

We notice in tow picture the different between the state of date palm in the past (more than 20 years in the past) and the present (2020/08/15), because of the genetic erosion that represent in the flowing point:



**Figure32:** The state of the Palm in Ain Zatout in the present 2020.





**Figure 33:** The state of palm in Ain Zatout in the past (more than 10 years in the past).

- Drying of watering wells and springs due to lack of rain and snow (almost non-existent) due to the change of climate in the region and the high temperature.
- Difficulty agricultural paths and mountain roads.
- Rural displacement and the local agriculture abandoned the palm trees and turning to cultivate other types of trees such as olives due to the quality and characteristics of dates (low quality) headed out only to local consumption and lack of marketing.
- The tendency of the local youth towards other types of activities such as services and trade, and his neglect of agricultural activity.

## Conclusion

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At the end of our work on the inventory of date palm genetic resources in Ain Zaatout, we obtained a series of results that we summarize in the following.

It appears from this survey, that the genetic biodiversity of the date palm in the municipality is moderate, this biodiversity is mainly represented by 3 cultivars: Bouzarrou, Degla Beida, Ghars with 2000, 1000 and 600 trees respectively. Phoeniculturists prefer to cultivate Bouzarrou since it is the most climate-resistant cultivar in the region and the most cultivable and matures well probably due to his low need of high temperature. Also, the palm groves of Ain Zaatout have experienced a terrible and lasting water shortage for several years. The number of boreholes remains insufficient, which makes it more critical to safeguard the date palm genetic resources in this village.

Also we concluded from this survey that the Ain Zaatout region is Full of the genetic diversity of vegetation and fruit trees especially medicinal plant and olive

Estimation of the age of the palm tree revealed that for these cultivars above, the palm tree are mostly old (> 60 years). And have unequal percentages of adult tree (30-50 years) due to genetic erosion in the area. And this unlike the rest of the cultivars whose plant age is young (3-10 years) which does not satisfy to ensure their preservation. The genetic diversity of Dokkar in the Ain Zaatout region is not distinguished by agriculture, therefore represented by one single phenotype and rich ensuring self-sufficiency in pollen.

For the preservation of the plant genetic resources of the date palm against irreversible genetic erosion the intervention of different factors (state and phoeniculturists) is required :

- Raising awareness and encouraging phoeniculturists to breed endangered cultivars.
- The rejuvenation of old plantations.
- The establishment of new diversified plantations.
- The conservation of cultivars resistant to diseases and bio-aggressors and to multiply them.
- Paving of roads and paving of mountain paths leading to the farmer.
- Encouraging farmers to participate in international markets and exhibitions in order to introduce local varieties.
- Urgent intervention by the authorities to dig boreholes to a depth of 2000 meters and the installation of pipes and irrigation canals.
- "The state ensures the Transfer of fresh water by pipeline to Ain Zaatout.



## Conclusion

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In the future, this study should be followed by others to explore the biodiversity of date palm cultivars and assess the ability of this species to face the hard conditions in particular the cold climate and high altitude, which are not the natural environment for date palm growth. This assessment on the basis of morphological, biochemical and molecular markers will clarify the different adaptation mechanisms of date palm and allow the establishment of a selection program for date palm breeding.

## Reference List

- 1) Abul-Soad AA (2011a) Micropropagation of date palm using inflorescence explants.
- 2) Abul-Soad AA (2011a) Micropropagation of date palm using inflorescence explants. In: Jain SM, Al-Khayri JM, Johnson DV (eds) Date palm biotechnology. Springer, Dordrecht, pp 91–118 Abul-Soad AA (2011b) Date palm in Pakistan, current status and prospective. Report USAID Pakistan
- 3) Abul-Soad AA, Mahdi SM (2010) Commercial production of tissue culture date palm (*Phoenix dactylifera* L.) by inflorescence technique. *J Genet Eng Biotech* 8:39–44 Abul-Soad AA, Mahdi SM (2012) Micropropagation of date palm males and females. *Bless Tree* 4:80–86
- 4) Abul-Soad AA, Markhand GS, Shah SA (2009) Study on potential impact of lowering of groundwater on date palm plantations. Final report, Hagler Bailly Pakistan (Pvt.) Ltd. Islamabad, Pakistan
- 5) Abul-Soad AA, Markhand GS, Memon S (2010) DuPont Tyvek® bags impact on dates. Final report. DuPont Pakistan Operations (Pvt.) Ltd. Lahore, Pakistan
- 6) Abul-Soad AA, Maitlo WA, Markhand GS, Mahdi SM (2011c) Date palm wilt disease (sudden decline syndrome) in Pakistan, symptoms and remedy. *Blessed Tree* 3:38–43
- 7) Abul-Soad AA, Mahdi SM, Markhand GS (2015) Date palm status and perspective in Pakistan. In: Al-Khayri JM, Jain SM, Johnson DV (eds) Date palm genetic resources and utilization, vol 2. Asia and Europe. Springer, Netherlands, pp 153–205
- 8) Abul-Soad AA, Emara KS, Abdallah AS, Mahdi SM (2016) Conservation of superior Egyptian date palm genotypes through in vitro culture of inflorescence explants. In: Proceedings of the 2nd international conference for date palm (ICDP), Qassim University, Qassim, Kingdom of Saudi Arabia, 10–12 October 2016 (Under publication)
- 9) Annomyns1998
- 10) Belguedj M. 1996. Caractéristiques des cultivars de dattes dans les palmeraies du Sud-Est Algérien, N° 11, INRAA. El-Harrach, Alger
- 11) Bouguedoura N., Ben Khalifa A., Bennaceur M., 2010- le palmier dattier en Algérie , situation ,contraintes et apports de la recherche .15-18 pp .in IRD Ed .INSTITUT DE RECHERCHE POUR DEVELOPPEMENT ,Collection colloque et séminaires .Paris
- 12) Benziouche S.E. & Cheriet F. (2012). Structure et contraintes de la filière dattes en Algérie, *New Medit*, No.4,p.49-57
- 13) Brac de la Perrière RA, Benkhalifa A (1989) Identification de cultivars de dattiers (*Phoenix dactylifera* L.) du sud-ouest algérien. *Plant Gen Res Newsletter*, FAO/IBPGR.78/79:13–20 Cao BR, and Chao C-CT (2002) Identification of date cultivars in California using AFLP markers. *HortSci* 37:966–968
- 14) Benkhalifa A (1992) Gestion de la diversité génétique du palmier dattier en Algérie. Paper presented at the workshop constitution et organisation d'équipes de recherches scientifiques que dans les domaines de foresterie et des arbres fruitiers, Marrakech, 13–15 April

- 15) Bashah MA (1996) Date variety in the Kingdom of Saudi Arabia. Guide booklet for palms and dates. King Abdul aziz Univ Press, Jeddah, pp 1225–1319
- 16) Chevalier A (1952) Recherches sur les Phoenix africains. *Rev Intl Bot Appl* 32:205–236
- 17) DJERBI M., 1994- Précis de phoeniculteurs. Ed .FAO
- 18) Dransfield J , Uhl, W , Asmussen , C B Baker,W J , Harley M M , Et Lewis Ce (2008) *Genera Palmarum The Evolution And Classification Of Palms* Royal Botanic Gardens , Kew , Richmond , Uk 596p.
- 19) Dowson VHW (1982) Date production and protection. Technical paper no. 35, FAO publication, Rome, Italy
- 20) Direction des services agricoles (D.S.A) : Les données statistiques de l'année2009
- 21) Ferry M.,Bouguedoura N., El Hadrami I., 1996 –Patrimoine génétique et technique de propagation in vitro de la culture du palmier dattier .*Science et changements planétaires- Sécheresse* ,vol.9,n.2.AUF Canada
- 22) Ferry M, Gomez S, Jimenez E, Navarro J, Ruiperez E, Vilella J (2002) The date palm grove of Elche, Spain: Research for the sustainable preservation of world heritage site. *Palms* 46:139–148
- 23) Jaradat AA (2011) Biodiversity of date palm. Land use, land cover and soil sciences. Encyclopedia of life support systems (EOLSS), developed under the Auspices of the UNESCO, Eolss Publishers, Oxford, p 31. Available: <http://www.eolss.net/sample-chapters/c10/E1-05A-66.pdf>. Accessed 5 Aug 2016
- 24) Jaradat AA (2015) Genetic erosion of *Phoenix dactylifera* L.: perceptible, probable, or possible. In: Ahuja MR, Jain SM (eds) *Genetic diversity and erosion in plants*, vol 8. Springer, Netherlands, pp 131–213
- 25) Johnson D.V (2011) date palm biotechnologies from theory to practice in S.M
- 26) Hannachi, S, Ben Khalifa, A, Khtri, D, Brac de la Perriere R A (1998) inventaire variétale des palmeraies algérienne .commissariat au développement de l'agriculture
- 27) Hannachi S., Benkhalifa A., Khitri D et Brac de Perrière R.A., 1998-Inventaire de la palmeraie algérienne. 33-225 pp
- 28) Krueger RR (2001) Date palm germplasm: overview and utilization in USA. In: *Proceedings the first international conference on date palms*. Al-Ain, March 1998, pp 2–37
- 29) Munier P., 1973-*Le palmier dattier*. Ed. G-P. MAISONNEUVE et LAROSE, 11. Rue Victor- Cousin, 11, Paris (Ve), 31 p, 32 p, 187 p.221p.
- 30) Munier P (ed) (1973) *Le palmier-dattier—techniques agricoles et productions tropicales*. Maisonneuve et Larose, Paris
- 31) Mowry H (1952) Native and exotic palms of Florida (revised by Dickey RD and West E). *University of Florida Bulletin* 152
- 32) Mueller UG, Wolfenbarger LL (1999) AFLP genotyping and fingerprinting. *Trends Eco Evo* 14:389–394
- 33) Moore HE (1973) An annotated checklist of cultivated palms. *Principles* 7:119–183

- 34) 26-Miller W, Smith JG, Taylor N (1930) Phoenix. In: Bailey LH (ed) The standard cyclopedia of horticulture, vol 3. Macmillan, New York
- 35) 26-Martius CFPV (1836–1853) *Historia Naturalis Palmarum*, 3 vols. T. O. Weigel, Munich, Germany
- 36) Nixon RW (1978) Growing dates in the United States. No. 207, U. S. Dept. Agric. Government Printing Office, Washington. P 50
- 37) Sawaya WN (2000) Proposal for the establishment of a regional network for date-palm in the near East and North Africa. A draft for discussion, FAO/RNE. Available: [http://www.fao.org/docs/eims/upload/211145/Date\\_Palm\\_Proposal.pdf](http://www.fao.org/docs/eims/upload/211145/Date_Palm_Proposal.pdf). Accessed 5 Aug 2016
- 38) Sedra H, 2013 –le palmier dattier base de la mise en valeur des oasis au maroc techniques phoenicoles et création des oasis-INRA-Editions : Division de l'information et de la communication BP.6512 Rabat –Instituts Maroc ,22-33pp
- 39) Toutain G., 1967. Le palmier dattier. Culture et production. I.N.R.A.M., Al Awama, 87 pp.
- 40) The Plant List (2012). Available: <http://www.theplantlist.org/tpl1.1/search?q=Phoenix>. Accessed 16 Mar 2016
- 41) Uhl NW, Dransfield J (1987) *Genera palmarum: a classification of palms based on the work of Harold E. Moore, Jr, L.H. Baily Hortorium and the International Palm Society*, Lawrence, KS, pp 214–217
- 42) Wrigley G (1995) Date palm, *Phoenix dactylifera*. In: Smartt J, Simmonds NW (eds) *Evolution of crop plants*, 2nd edn. Longman, London, pp 399–403
- 43) Zaid A and Wet. 2002-Date palm cultivation.-FAO, plant production and protection paper. 156p.
- 44) Zabar AF, Borowy A (2012) Cultivation of date palm in Iraq. *Ann Univ Mariae Curie Sklodowska* 22:39–54
- 45) Zaid A, de Wet PF (2002) Pollination and bunch management. In: Zaid A (ed) *Date palm cultivation. FAO Plant Prod. & Prot. Paper 156 Rev, vol 1*, pp 227–269

## Summary

Ain Zatout's phoenicultural heritage is characterized by a very interesting biodiversity but threatened by genetic erosion. Our study aims to carry out a diagnosis on the situation of date palm plant genetic resources in the town of Ain Zaatout. On the basis of a questionnaire we conducted a survey with 10 phoeniculturists and selected 8 farms in each of the 4 sectors (Fedan Sdar, Liyana, Maloua, Ain Lgat) of the commune. The results show that this region is characterized by the predominance of varieties of Bouzarrou, Degla Beida and Ghars.

Estimation of the age of the palm tree revealed that for these cultivars above, the palm tree are mostly old (> 60 years). And have unequal percentages of adult tree (30-50 years) due to genetic erosion in the area. And this unlike the rest of the cultivars whose plant age is young (3-10 years) which does not satisfy to ensure their preservation. The genetic diversity of Dokkar in the Ain Zaatout region is not distinguished by agriculture, therefore represented by one single phenotype and rich ensuring self-sufficiency in pollen. The main causes of genetic erosion of date palm in Ain Zaatout region are multiplied: the rural exodus of residents and particularly the reluctance of residents to cultivate palm varieties due to the lack of a market for them. Local varieties (Bouzarrou) thanks to the intensity of competition in the national market (Deglat Noor).

**Key words:** Date Palm, Plant Genetic Resource, Genetic Erosion, Cultivar, Mal Palm, Ain Zaatout ,Mountain

## ملخص:

يتميز تراث النخيل في منطقة عين الزاوتي بتنوع بيولوجي مثير للاهتمام ولكنه مهدد. تهدف دراستنا إلى تشخيص حالة الموارد الوراثية لنخيل التمر في مدينة عين زعطوط. بناءً على الاستبيان ، أجرينا مسحاً لعشرة مزارعين واخترنا 8 مزارعين في كل قطاع من القطاعات الأربعة (فيدان سدر وليانا وملاوي وعين كاتق). وأظهرت النتائج أن هذه المنطقة تتميز بغلبة أصناف البوزو والدقلة البيضاء والغرس.

أظهر تقدير عمر أشجار النخيل بشكل رئيسي في هذه المزارع المذكورة أعلاه أن نخيلاً أقدم (< 60 عامًا) ولها نسب متفاوتة من الأشجار الناضجة (30-50 عامًا) بسبب نقص وراثي في المنطقة . يتناقض هذا مع الأصناف الأخرى التي لها عمر نباتي صغير (3-10 سنوات) ، وهي ليست كافية لضمان الحفاظ عليها. لا تتميز داکار في منطقة واحدة بالتنوع الجيني ولا يتميز بها المزارعون ، وبالتالي فهي تتميز بنمط ظاهري فريد وغني يضمن الاكتفاء الذاتي من حبوب اللقاح. تتعدد الأسباب الرئيسية للتآكل الوراثي لنخيل التمر في عين زوتوز ، مثل تهجير السكان من الريف ، ولا سيما عزوف السكان عن زراعة أصناف نخيل التمر بسبب عدم وجود سوق لها. -هذه الأصناف المحلية (البوزو) بسبب المنافسة الشديدة في السوق الوطنية (دجلة نور).

يتميز تراث نخيل تمر في أولادجلال بتنوع بيولوجي مهم للغاية ولكنه مهدد بالانقراض الوراثي. تهدف

الكلمات الدلالية: نخيل التمر، دقلة نور، الموارد الوراثية، الانقراض الوراثي، أعين زعطوط، الصنف، الذكارة الجبال .

## Résumé

Le patrimoine phoenicicole d'Ain Zaatout est caractérisé par une biodiversité très intéressante mais menacée d'érosion génétique. Notre étude vise à réaliser un diagnostic sur la situation des ressources phylogénétiques de palmier dattier dans la commune d'Ain Zaatout, Sur la base d'un questionnaire nous avons mené une enquête avec 10 phoeniciculteurs et choisi 8 exploitations dans chacun des 4 secteurs (Fedan Sdar, Liyana, Maloua, Ain Lgat) de la commune. Les résultats montrent que cette région caractérisée par la prédominance des variétés de Bouzarrou, Degla Beida et Ghars.

L'estimation de l'âge des pieds a révélé que pour ces cultivars précités les pieds sont en majorité vieux (>60ans). Et ont des pourcentages variables de adulte pieds (30-50 ans) à cause de l'érosion génétique dans la région. Et ce contrairement au reste des cultivars dont l'âge des pieds est jeunes (3-10 ans) ce qui ne satisfait pas pour assurer leur préservation. La diversité génétique du Dokkar dans la région d'Ain Zaatout ne se distingue pas par l'agriculture donc représentée par un seul phénotype et riche assurant une autosuffisance en pollen. Les causes essentielles de l'érosion génétique de palmier dattier dans la région de Ain Zaatout sont multiples : l'exode rural des résidents et particulièrement la réticence des résidents à cultiver les variétés de palme à cause de l'absence d'un marché pour les variétés locale (Bouzarrou) grâce à l'intensité de compétition dans le marché nationale (Deglat Noor).

**Mots clés :** palmier dattier, ressource phylogénétique, érosion génétique, cultivar, ain zaatou, male palme, les montagne