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Date palm fruit: a nutrient, medicament and cosmetic with a high economic value in Algerian Sahara - Case study: the region of Ouargla

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ABSTRACT

Date palm (*Phoenix dactylifera* L.) is a source for various products, it produces, every year, dates that are, traditionally, considered as a basic aliment for the aboriginal population as well as a commercial product. This phoenicicole mass is also used for different purposes (building, heating, fodder, cooking, agriculture, therapy and cosmetics). Nine sites are retained for investigation. They represent localities which are notorious for having kept, so far, knowledge and know-how in the use of dates as well as other organs of the date palm, and where these products are likely integrated in the socio-economic life of their populations. The aim of this study is to determine the raw material of production, the uses of the date palm organs, dates' fields of usage and the importance of the products derived from the phoenicicole mass in the commercial environment. We noticed that dates, used as a raw material, are available in a considerable tonnage. An important range of products made of dates are highly valuable, and are of culinary, medicinal and cosmetic nature. These products are biological and start making their place in modern trade, which might develop the local and national economy.

Key words: Date palm, Economic value, Products, Ouargla

1. Introduction

The date palm (*Phoenix dactylifera* L.) is the pivot of the ecosystem oasis. It is an important fruit crop in arid and semi-arid areas (Al-Wasel and El-Rayes, 2024). For a long time, it had a profound originality in the social and economic life of the oasis inhabitants (Bouammar and Bekhti, 2011) especially in the north of Africa. The edible part of date palm fruit is highly nutritious and really delicious and served as the conspicuous food for millions of people around the world (Noui et al., 2024). In Arabic and Islamic countries, date palm fruits are among the religious first meals in breaking Ramadan fast and therefore largely consumed for traditional purpose. However, they are attacked by various bio-aggressor species during storage and packaging (Colman et al., 2012). Algeria is one of the largest date producers in Africa and the world. It produces annually more than 1.15 million Tons (MARD, 2019) from 16.5 million date palms. In the Algerian Sahara, the date palm is a source of very diverse products, dates and various organs are used as construction materials, energy production, and fodder, for culinary, therapeutic, cosmetic and artisanal purposes (Ould El Hadj et al., 2001). The products obtained are organic, natural products, without synthetic additives (Jarvis and Hodgkin, 2000; Abdulridha, 2021).

The surface area planted with date palms in Ouargla region was 9016.32 hectares in 2011, rising to 9092.3 hectares in 2015 and 9561 in 2021. A significant increase has been noted through the companions, amounting to 545 hectares. The number of palms in all speculations shows a remarkable evolution from one campaign to the next. From 639,296 in 2011, this will rise to 1,036,933 palms in 2015 and 1,093,537 palms in 2021. This increase in numbers is in line with the increase in the area occupied by date palms, notably for the Ghars cultivar in 2011 the existing number was 457,392 palms, rising to 460,092 in 2015, and 524,897.76 in 2021, an increase of 67,506 existing palms. Indeed, Deglet Nour 42,900 palm trees in 2011 and 43,690 in 2015, to reach by (2021) 46,281,039 feet. The number of other varieties rose from 139,004 plants in 2011 to 139,934 plants in 2015, and will fall to 76,547.59 plants in 2021. This decline is the result of a number of socio-economic and technical constraints. However, the creation of new development areas in Ouargla region is the main result of the increase in cultivated areas and cultivars of high market value (C.D.A.R.S, 2021). Our study was based on the valuation of date palm products (oasis terroir products) and their economic importance in Ouargla region, renowned for its sense of local knowledge and know-how. The approach followed to carry out this study is as follows:

2. MATERIAL AND METHODS

2.1. Presentation of study area

Ouargla province is located in the North East of the great Algerian Sahara, situated 800 km south of the capital Algiers (31°56'N, 5°19'E, 150 m above sea level). It is considered to be one of the largest oases in the Algerian Sahara; it occupies the center of an endorheic basin called "Ouargla basin". It is located in the bed of the Oued M'ya, from the ruins of Sedrata and Gara Krime in the south to Hassi El-Khefif in the north. It is limited by:

- Sebkhet Safioune; North
- Ergs Touil and Arifdji; to the East
- Dunes of Sedrata; South
- East side of the M'zab ridge; to the west (Figure 1) (D.S.A, 2021).

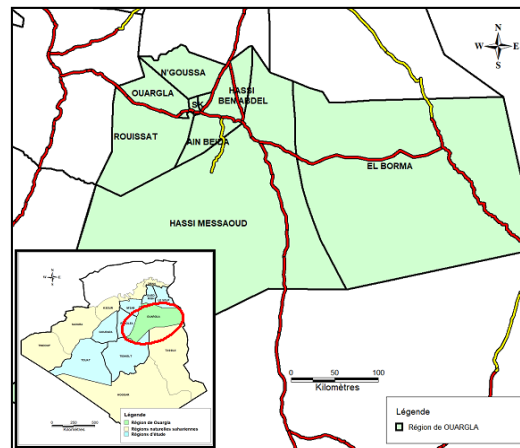


Figure 1. Delimitation of Ouargla province (C.D.A.R.S, 2021)

To show the economic value of the products derived from the date product in this region, the choice of sites was oriented towards ancient localities known for their ingenuity, with regard to processing products from dates and date palm organs. This is how nine sites have been selected, namely Ksar de Ouargla (31°57'58.68"North and 5° 19' 36.72" East), Saïd Otba (31° 58' 48" North and 5° 19' 50.06" East), Bour El Haicha (32° 1' 14.53" North and 5° 19' 48.45" East), N'goussa (32° 08' 24.29" North and 5° 18' 30.58" East), El Bour (32° 9' 38.53" North and 5° 20' 58.14" East), Adjadja (31° 57' 14.4.13" North and 5° 23' 24.19" East), Chott (31° 58' 14.19" North and 5° 22' 54.21" East), Sidi khouiled (31° 58' 50.49" North and 5° 24' 58.14" East), Rouissat (31° 55' 48.72" North and 5° 21' 18.13" East) (Figure 2) .

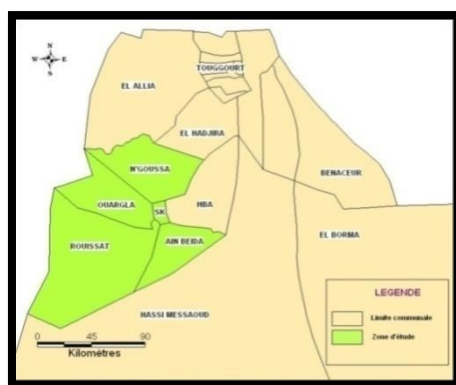


Figure 2. Study zones (C.D.A.R.S, 2021)

2.2. Methodology of the work

To achieve our objectives, we carried out several investigations among farmers and artisans who practice date products. This is an approach which is based on successive stages (Guerradi et al., 2005) and which can be summarized mainly as follows:

2.2.1. Context analysis

This first step of the methodology aims to pose the problem in a systemic context.

2.2.2. Delimitation of the relevant system

This step can lead us to distinguish the elements of the problem for which an in-depth analysis is necessary. Thus, the study focused on the components of the system likely to provide interesting information.

2.2.3. Data collection (information)

Data collection was carried out according to the following successive stages:

- Exploration of the knowledge of the different key informants

The exploration was carried out mainly through the various social structures specialized in activities relating to the date palm. These are the Directorate of Agricultural Services (DSA, 2021), the Directorate of Culture, the Directorate of Planning and Budget Monitoring (DPBM, 2013), the Development Commission Agriculture of the Saharan Regions (DCASR, 2021), the Chamber of Agriculture, the Subdivisions of Agriculture and the Chamber of Crafts (2012). In addition, heads of mosques (Zaouias) and managers of wells (Laayounes), as well as herbalists

and pastry chefs were also approached. These key informants are of paramount interest in the choice of study areas and the target population.

- Interviews with farmers

Visits and interviews with 200 farmers, shed light on the origin of the raw material used in the manufacturing and processing processes, namely the preferred date varieties, giving the best products.

- Interviews with artisans

The meeting with the artisans (120 people) took place in their own homes. The interview allowed us to collect as much information as possible about working methods, the choice of raw material, its treatments, its uses, development and manufacturing methods until the end products are obtained.

- Interviews with sellers and confectioners

These sellers, ten in number, are a source of information on the origin of date products, as well as the sales situation. Indeed, the economic aspect through the income and the promotion of the elaborated products are obtained and clarified by the interviews conducted with seven pastry chefs known by their seniority, experience and quality of their elaborated products, mainly aimed at probing their opinions as to the use of different date products and recipes.

3. Results and discussion

3.1. Characterization of the raw material

The raw material consists of existing cultivars, dates produced, date waste which must be known what will happen.

The genetic diversity of cultivars (varieties), the choice of which is linked to a complex set of socio-economic factors (food and economic needs of the family) influenced in turn by the oasis environment (Javis and Hodgkin, 2000), is predominantly the Ghars variety (61%) followed respectively by the Deglet Nour variety (17%) and the other local varieties (Tafiziwine, Takarmoste, Tanslit, Litim, Dkoulete, etc. 22%).

3.2. Date yield per plant

From the results of the field investigations, it appears clearly that the yields per plant are very variable at the level of the study region. The average per plant, the highest (98 kg) is that of different local dates with low market value. Deglet Nour represents a yield of 68 kg per plant. Ghars records the lowest yields with 55 kg per plant.

The Ministry of Agriculture says that in each season, 30 to 50% of date production is made up of date waste (DSA, 2021). The large tonnages of dates remain lost and could constitute the raw material of high value for new products.

3.3. Selling price of dates

The selling prices of dates in Ouargla region fluctuate widely. The results obtained from the investigation are shown in the Table 1.

Table 1. Date selling prices (according to date traders, 2011/2021)

Price per quintal (DA)		
Types of dates	2011	2021
Ghars	2000 à 6000	10000 à 25000
Deglet Nour	4000 à 30000	6000 à 75000
Local varieties	100 à 1000	10000 à 25000
Date scraps	100 à 500	250 à 1500

3.4. Become dates

Almost 54% of the region's date production is destined for the market. These are mainly dates from the two cultivars with the highest market value: Deglet Nour and Ghars. For consumption, 28% of production is reserved for this purpose, while the processing of dates into products remains very low (3%). The dates used in this transformation process are: Ghars, Hamraya, Harchaya, Itim) and, to a lesser extent, harvest waste such as Deglet Nour Hchef (shrivelled or dried dates) and crop residues. However, large quantities of local dates and rejects are lost, at a time when they could more than cover the raw material requirements for the manufacture of a number of oasis products (food, animal feed and even pharmacological products) (Figure 3).

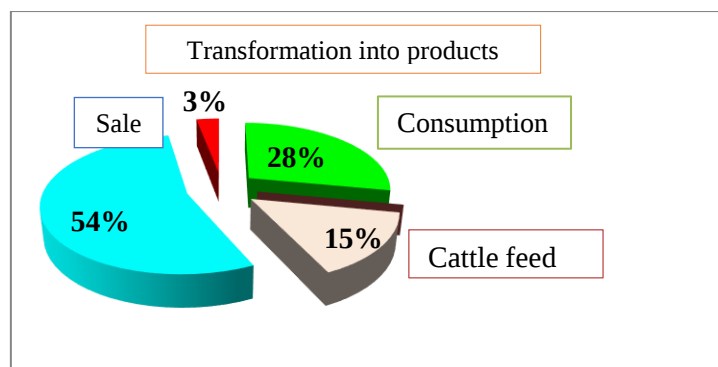


Figure 3. Fate of dates in the study area

3.5. Fields of use for dates and processed products

Dates are used mainly for the preparation of traditional dishes and for medicinal and cosmetic use.

Culinary field

The food habits of the Ouarglis were mainly based on dates. However, the family consumption of dates (as a fruit) was very high (85 kg/year/individual). According to the investigations, it is experiencing a great regression which hardly exceeds 40 kg/year/individual.

The survey carried out in the various localities of the region of Ouargla reveals that the dates are available throughout the year, through different methods of conservation in canvas bags called “*btana*” and in large jars made of clay called “*khabia*” in local language (Figure 4) and house hold transformation.

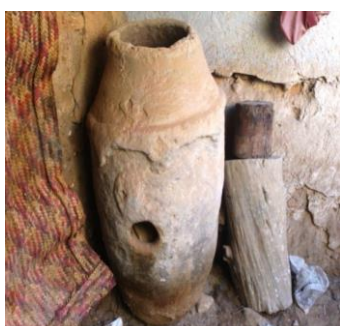
Jars made from “*khabia*” clay“*Btana*” canvas bags

Figure 4. Different methods of preserving soft dates in Ouargla region

The main peculiarities of the localities are presented in the Table 2 and figure 5.

Table 2. Main culinary characteristics of the localities studied

Localities	Culinary fields
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Ksar de Ouargla	Date vinegar (photograph 1, Figure 5) Takarwayt (date drink made from several incenses, sour orange, cloves, lemon) (photograph 2, Figure 5) Iddefi (date juice + goat milk butter + dried pepper powder) (photograph 3) Rosemary Ghars dates (dates cooked in goat's milk and rosemary powder)
Bour El Haicha	Rob (date syrup) (photograph 4, Figure 5)
Said Otba	Rob (date syrup) and zrizra (dates + wheat semolina + medicinal plants + goat milk butter)
Rouissat	Deffi (wazwaza) = (date drink and medicinal plants)
N'goussa	Rob (date syrup)
El Bour	Rob (date syrup)
Chott	M'rissa (red sauce made from date juice)
Adjadja	Rob (date syrup)
Sidi Khouiled	Rob (date syrup) R'fis (dates + wheat semolina + goat milk butter), Deffi (wazwaza) = (drink of dates and medicinal plants)



Photograph 1



Photograph 2



Photograph 3



photograph 4

Figure 5. Various by-products from date processing

The hole in the center of the *khabia* (Figure 4) is used to collect the honey from the packed dates. This syrupy liquid represents the appearance of bee honey (Figure 6). It is characterized by the absence of cloudiness and therefore does not require chemical or enzymatic clarification. The main drawback of this technique is the low production, varying from 10 to 15% of the weight of the dates. However, this process is the most efficient way to store dates at room temperature (20 to 35° C) for a few years (Alvarez and Rodriguez, 2000).

ROB (photograph 4, Figure 5) is a syrup obtained by cooking one part of dates and two parts of water over a long period of time, over four hours, which destroys its nutritional characteristics (photograph 5, Figure 5). On the other hand, the syrup obtained by soaking of dates in water at high temperature preserves the nutritional components of the product.



Figure 6. Honey-like exudate from stored dates

The date is a highly energetic berry that is easy to consume fresh (*Rotab* or *martoba* = botanical maturity) or at full maturity (*Tmar* = commercial maturity) or also preserved. The date provides a portion of carbohydrates, minerals and fiber significantly higher than a fresh fruit. Its caloric intake can reach 118 kcal to 282 kcal per 100 g against 50 to 70 kcal for another fruit, and its water content varies between 65 and 70% (Organisation d'al-Maaref Islamique, 2015).

The water content of date syrup is ranging between 14.94% and 25% and the high content of total sugars from 67.11% to 72%. The Brix degree of the syrup is between 72.45 and 74.88 and a pH values are between 4 and 4.90, it prevents the development of microorganisms (pathogenic bacteria) and inhibits enzymatic reactions facilitating conservation.

Date syrup is more interesting than syrups from the starch industry with regard to the richness of nutrients (mineral elements, vitamins in particular B1, reducing sugars, ash, crud proteins, crud fat etc.) (Afolabi et al., 2024). This syrup can be classified as a product with a low glycemic index of around 12% and can therefore be recommended for diabetics and obese people. Still, date syrup is a healthy bio product unlike sweeteners which can have harmful effects on the body. Indeed, it is a product that can be very interesting in the food industry, especially in the manufacture of beverages, in pastry and confectionery (Mimouni et al., 2016).

Therapeutic area

Traditional therapeutic preparations are also very numerous, dates and pollen are the most widely used products (Table 3).

Table 3. Main therapeutic uses based on dates and other additives in Ouargla region

Recipes	Medicinal use	Locality
Dates	Sunburn, dehydration, facilitates childbirth (gynecology), against anemia, against scorpion venom, kidney stones, child growth, against children's anxiety (anxiolytics), facilitates digestion (stomachics),	All locations Against scorpion venom, Kidney stones (Said Otba)
Ghars date paste, olive oil and salt	Chapped hands from cold	Ksar of Ouargla
Ghars date paste, onion, salt	To remove pus from papules and hydroceles	N'gousa, Bour El Haicha, Ksar of Ouargla, El Bour, Chott
Pâte de dattes <i>Ghars</i> , olive oil	Les fractures, aphtes	All locations
Ghars date and oregano	Against whooping cough (expectorant)	Said Otba
<i>Harchaya</i> Dattes and <i>Deglet Nour</i> , Rosemary.	Childbirth, breastfeeding	Ksar of Ouargla, N'goussa
Dattes and Rosemary	Stomach aches, against fear	Ksar of Ouargla
Ghars date paste, residue of boiled tea leaves	Healing diabetic wounds	Bour El Haicha
Steamed Ghars dates, D'han (sheep's or goat's milk butter), olive oil	To remove pus from papules and hydroceles	Bour El Haicha
Ghars date paste, juniper, olive oil	Sunburn	Bour El Haicha
<i>Rob</i> (date syrup), flour, dry spathe	Fractures	Bour El Haicha, Rouissat, Said Otba
<i>Ghars</i> Dates, salt, ginger, (<i>Matricaria pubescens</i>), dried garlic powder, the juniper, huile d'olive	Trauma	All locations except for the Ksar of Ouargla and Chott.

Percola of date scraps, huile d'olive, (<i>lazel</i>) (<i>Calligonum azel</i>)	Après une douche chaude, badigeonner le corps, contre les infections cutanées.	Ksar of Ouargla
Rob, henna, wheat flour, egg, Cress	Fractures	N'goussa, Rouissat,
Dates, Mugwort or salt or Henna, or with Garlic	Skin infections.	N'goussa, Ksar of Ouargla Chott
Ghars date paste, olive oil or D'han (sheep's or goat's milk butter)	Blood congestion	N'goussa, Ksar of Ouargla, Sisdi Khouiled, Chott, Adjadja
Ghars date paste, D'han rance (rance sheep's or goat's milk butter) and olive oil	Rheumatism	N'goussa, Ksar of Ouargla Chott, Rouissat, Bour El Haicha, Said Otba
Ghars date paste, olive oil and henna	Burns	Sidi Khouiled, Said Otba
Ghars date paste and (<i>Salsola foetida</i>)	Migraine, hemorrhoids	N'goussa, El Bour.
Ghars Dates , (mor wa sbar)	hemorrhoids	All locations
Rob (date syrup) with Fenugreek	Anemia	Rouissat, Bour El Haicha, Said Otba
Ghars and D'han dates (sheep or goat milk butter)	Palm thorn bites and inflammation (anti-inflammatory)	Said Otba ,Bour El Haicha,
Ghars date paste, (Rue) (<i>Ruta tuberculata</i>), Juniper, Rosemary,	Blessures, papules et hydrocèles	N'goussa
Roasted chickpeas, (<i>Ajuga chamaepitys</i>), olive oil, D'han (sheep or goat milk butter)	Vomiting	All locations except for the Ksar of Ouargla.
Lemon juice, Rob (date syrup)	Calming agents (anxiolytics)	Said Otba
Long-preserved Ghars date, olive oil or rance "D'han" (rance sheep's or goat's milk butter)	For rheumatic pain (analgesics)	Said Otba

Ghars dates, warm milk	Calming agents for troubled people (anxiolytics)	Said Otba
Ghars dates, milk, ginger (<i>Zingiber officinale</i>)	Against fatigue	Said Otba
Datte Ghars, Henné (<i>Lawsonia inermis</i>), Fenugrec (<i>Trigonella foenum-graecum</i>), Menthe	For weight gain in children	Said Otba
Rob (date syrup), ciron juice, olive oil	Cough treatment (expectorant)	Said Otba
Ghars date, Dhan (sheep or goat milk butter), Sorghum grains (<i>Panicum spp</i>)	Treatment of fractures	Said Otba
Ghars date, Dhan (sheep or goat milk butter)	Healing bruises	All locations
Rosemary (<i>Rosmarinus officinalis</i>), Ghars date, Juniper (<i>Juniperus procera</i>), pomegranate bark,	Stomach pain (analgesics)	Said Otba
Ghars Date, (<i>Ammodaucus leucotricus</i>) and (<i>Haloxylon scoparium</i>)	antidiarrheal	Said Otba
Tacherwit Date, Juniper (<i>Juniperus procera</i>), wheat, pomegranate flower calyx, (<i>Haloxylon scoparium</i>), (<i>Artemisia compestris</i>), cumin (<i>Cuminum cyminum</i>), Nigelle (<i>Nigelle sativa</i>)	Carminative	Said Otba
Date and (<i>Thuya standishii</i>)	Hemorrhoids	Said Otba
Juniper	For labor pains (analgesics)	Said Otba, N'goussa

(<i>Juniperus procera</i>), Rosemary, Ghars dates, Dhan (sheep or goat milk butter)		
Dried apricot, (<i>Artemisia compestris</i>), Ghars dates	heart problems	N'goussa
Deglet Nour dates dry, toasted wheat flour, coriander (<i>Coriandrum sativum</i>), Fenouil (<i>Foeniculum vulgare</i>) and (<i>Ammodaucus leucotricus</i>)	Regulating the heartbeat	N'goussa
Ghars dates, ginger, olive oil	Fortifying	N'goussa
Ghars dates, hot water	For thirst (dehydrated body), scorpion stings	N'goussa
Ghars dates, incense	female infertility (gynecology)	N'goussa
Dates, Rosemary (<i>Rosmarinus officinalis</i>), dried goat's milk butter	Fortifying	Ksar of Ouargla
Harchaya date, Juniper (<i>Juniperus procera</i>)	Stomach pain (analgesics)	Ksar of Ouargla
Dattes Ghars, oil, henna (<i>Lawsonia inermis</i>), Juniper (<i>Juniperus procera</i>), (<i>Artemisia herba alba</i>), (<i>Teucrium polium</i>) and melon seeds.	For newborn babies	Ksar of Ouargla
date vinegar	Sunburn, joint pain (anti- inflammatories), toothache, sore throat (analgesics)	Ksar of Ouargla
Date vinegar, <i>Cotula cineræ</i> Nigella, cumin, juniper and olive oil	Headaches (analgesics)	N'goussa, Rouissat,

Date vinegar and Henna	Fever (febrifuge), hair strengthening and anti-pigmentary	N'goussa, Ksar of Ouargla and Chott
Date vinegar and water	Hair film	Ksar of Ouargla
Date vinegar and clove	Headaches (analgesics)	N'goussa, Ksar of Ouargla and Chott
Date vinegar, dried lemon, henna	Headaches (analgesics)	N'goussa, Ksar of Ouargla
Date vinegar, Nigella, white wormwood, henna, rosemary, olive oil.	Headaches (analgesics)	N'goussa
Date vinegar, red grape leaf	Varicose veins	N'goussa, EL Bour
Date vinegar, oregano	Insect bite	N'goussa

Ghars dates are soft dates which contain 87.42% of total sugars, mainly glucose and fructose (82.12%) which is directly assimilated by the body. Glucose is widely used medicinally in the treatment of certain diseases, such as cardiovascular disorders, nervousness, hemorrhage, intoxication, stomach and lung diseases and anemia (Mimouni et al., 2016). Fructose can be assimilated by the body without the intervention of insulin, therefore beneficial for diabetics and obese people (El Baker, 1972; Acourene et al., 2007; Mimouni et al., 2016).

In addition, due to its ultra-energetic appearance, the date is one of the fruits richest in essential minerals: Potassium, Calcium, Phosphorus and Magnesium, as well as in vitamins A and B (Afolabi et al., 2024). Iron and Calcium are important elements for the growth of newborns, they are elements that go into the formation of blood and bone marrow. Dates contain 2.10 mg to 3 mg per 100g of dates and 50 mg to 62 mg/100g respectively (Berbendi, 2000; Paul, 2001). They also contain 63 mg of phosphorus, more than 670 mg of potassium and 50 mg of magnesium per 100g of dates. These elements are important for growth (Berbendi, 2000; Veronique et al., 2016). Al-Wasel and El-Rayes (2024) confirm that increasing levels of potassium improve date size, weight, crust color and total antioxidant.

They also contain manganese, zinc and an interesting amount of copper: the latter participates in the formation of hemoglobin and collagen (protein necessary for the structure and repair of tissues) in the body. Other enzymes made from copper are also involved in the body's defense against the free radicals that cause cancer. Dates are also a sufficient source of fluoride to protect teeth from cavities (Paul, 2001).

The group of vitamins (B), abundant in dates, is responsible for the digestive assimilation of sugars, lipids and proteins (Abdelsalem, 1994). They are immediate precursors of coenzymes essential to almost all living cells (Vilkas, 1993). The presence of Vit B1 and Vit B2 with respectively 0.05 mg and 0.07 to 0.11 mg per 100 g of dates, limits ulcers, hydrates the intestines, decreases the rigidity of the vessels and influences hormonal production. Dates also contain VitB6, which is present in the formation of red blood cells and antibodies. Vit A is very necessary for growth (especially babies), for night vision, essential for the development of bones, skin and hair. And Vit C which participates in the synthesis of connective tissue, hormones and healing. The amounts are respectively 0.13 mg, 600 IU and 2 mg per 100g of dates (El Baker, 1972; Abdelsalem, 1994; Djebali, 2002; Veronique et al., 2016).

Dates are also rich in fiber, 1.8% to 12.7% (Al-Shahib and Marshall, 2002; Afolabi et al., 2024). These fibers (insoluble fibers that are not absorbed by the intestines) facilitate intestinal transit. In fact, soluble fiber plays a role in lowering cholesterol levels and therefore helps reduce the risk of cardiovascular disease. In addition, dates are also indicated to neutralize the acidity of the stomach (Badawi, 1993). Dates are still rich in phenolic compounds in an immature state. Cinnamic acids, flavones, flavanones and flavonols (2.49 - 8.36 mg/100 g wet weight) which have anti-inflammatory, antioxidant effects, lower blood pressure and strengthen the system immune (Henk et al., 2003; Mansouri et al., 2005).

Through their laxative effect, dates are an essential food for pregnant women before delivery, because they are serving the colon and intestines and thus simplify delivery. This has been confirmed by a lot of research. In fact, there is a hormone in dates that has the same effect as "oxytocin", a hormone that facilitates childbirth by stimulating contractions of the uterus and protects against postpartum infections (Abdelsalem, 1994).

The entire phoenicole mass can be used as a basic raw material for the extraction of active ingredients from a large number of drugs. For the treatment of cough, excipients with a noticeable effect are based on sucrose, potassium, chloride and sodium. Analgesic and febrifuge drugs are based on carbonates and sodium. Anti-inflammatory drugs are prepared by

sodium and ethanol. In return, stomach aches are treated with antidotes containing sucrose, sodium and cellulose. The latter and magnesium form the excipient with a notorious effect of anxiolytics. However, rheumatism is treated with ethyl alcohol, sodium, sulphates and in some preparations with glucose. In ophthalmology, the active ingredients of the treatments are sodium chloride, phosphorus, potash and sulphate (Veronique et al., 2016).

Cosmetic field

The use of dates in cosmetics is an ancient practice. The oasis population of Ouargla region has long been able to develop very effective cosmetic recipes. Indeed, all the recipes are based on dates, including Ghars and medicinal plants (Table 4).

Table 4. Main cosmetic recipes based on dates used in Ouargla region.

Recipes	Cosmetic use	Locality
Date juice <i>Ghars</i> , Henné,	Face shine	Ksar of Ouargla
Date juice <i>Ghars</i> Mesrghin, Djawi (benjoin), mestkia <i>Pistacia lentiscus</i> (Lentisco, lentisque), ambre gris (<i>Ambar</i>), perfumes, saffron, sembliia, (<i>Liriope spicata</i>) musk and oumennas (myrrh tree gum = <i>Commiphora myrrha</i>)	To roll the incense (<i>Bkhour</i>)	Ksar of Ouargla
Dates Ghars, cloves, nutmeg, musk, sembliia, (<i>Liriope spicata</i>) and perfume	Body deodorant	Ksar of Ouargla
Date juice, safran, Henné, olives oil	Soap	Ksar of Ouargla, N'goussa
Date juice, safran, henné, olives oil	Facial radiance	Ksar of Ouargla
Dates Ghars, dried beans	Epilation	Bour of Haicha
Dates Ghars, bean skins, Deglet Nour diet pedicels, Henna, Cloves, saffron..	Body cleansing	Ksar of Ouargla
Dates and Henna	Hair tonic	Ksar of Ouargla
Date paste	Calm the spicy effect of the chili on the hands	All locations

Degla Baida, goat's milk	Against blackheads	N'goussa, Said Otba
Dates hot water	Body cleansing	All locations
Dates Ghars, Henna, savon Marseille, hot water	Softening of hands and feet	N'goussa
Dates Ghars, Henna, goat's milk	Facial radiance	N'goussa
Firewood incineration ash	Teeth whitening and scaling	Ksar of Ouargla, N'goussa, Bour el Haicha

Cosmetic recipes are generally aesthetic recipes and relate to dermatology. The effectiveness of these recipes lies in the role of the building blocks. Dates contain a high content of antioxidants, carotenoids (Lycopenes, Carotenes, Lutein) (Barreveld, 1993) and phenolic compounds which protect the cells of the body precisely from damage caused by free radicals (Al Farsi and Lee, 2008; Gerald, 2010).

Medicinal plants contain very active substances:

- ❖ Polyphenols: these are anti-inflammatories and antiseptics;
- ❖ Flavonoids: polyphenolic, antioxidant, anti-inflammatory and anti-viral pigments;
- ❖ Essential oils: like terpenes are antiseptics;
- ❖ Tannins: promote muscle contraction, they contain bitter substances that stimulate the salivary glands and gastric secretions, which increases appetite and improves digestion;
- ❖ Medicinal plants are also rich in minerals (Paul, 2001).

Olive oil is rich in polyphenols, with actions:

- ❖ Anti-oxidants: helps fight free radicals with deleterious effects (cell attack, DNA modification, lipid oxidation).
- ❖ anti-inflammatory drugs: reduction of the presence of cell adhesion molecules, increase the availability of nitric oxide, suppress platelet aggregation, protect LDL against oxidation to delay atherosclerosis and reduce inflammatory reactions.
- ❖ Anticancer drugs: hydroxytyrosol and oleopein have an anticancer effect on colon, blood, breast cancer.

- ❖ Anti-aging: the presence of hydroxytyrosol improves mitochondrial function which prevents cell aging and therefore the aging of the body.
- ❖ Cardiovascular protective.

Currently other benefits of these polyphenols are recognized, including their antibacterial effect, and the prevention of diabetes and Alzheimer's disease (Alvarez and Rodríguez, 2000). According to the same authors, olive oil also contains provitamin A, flavonoids, minerals and fatty acids.

Marketing of date products in the region of Ouargla

Date products are mainly date paste, natural Ghars date honey, Rob (date syrup) and date vinegar (Table 5).

Table 5. Selling price of date products

Product type	Price of one kg (DA)	User population
Date paste	150	Pastry chefs and women
Date powder (date flour)	300	Nutrition for children and lactating women (fortifying)
Natural date honey	1600 à 2000	All the population
Rob (date syrup)	800 à 1200	All the population
Date vinegar	250 à 350	All the population

All the products made from dates fall into the range of local products. They have a historical depth, a history, which has existed for some time, and which is based on shared know-how (Techoueyres and Amilienv, 2005). The products are marketed throughout the year. However, all of these products are in great demand among tourists. This encourages agro-tourism which covers all the tourist activities practiced on a working farm (Perret et al., 2001). These activities are complementary to agriculture and help to consolidate the economic situation of the farm. The tourist activities on a farm can be varied: Sale of farm products (fresh or processed) or services (leisure, sports or cultural activities), accommodation and catering (Jacques and Emmanuelle, 2001).

The estimated profit from preparing Rob is as follows:

- To obtain one kg of rob you must use 2 kg of Ghars dates and a quintal of rob requires 2 quintals of Ghars dates;

- The kg of Ghars dates costs between 30 and 70 DA, on average 50 DA. The kg of rob costs on average 1000 DA on the market and the quintal gives 10.000 DA.
- The kg of natural honey from Ghars costs on average on the market 1800 DA and the quintal 180,000 DA.

The comparison on the local market of the prices of "Achifa" honey and natural bee honey is as follows:

- "Achiffa" honey costs 600 DA per kg, which gives 600,000 DA per quintal;
- Bee honey costs 5,000 to 7,000 DA per kg, the quintal gives 500,000 DA to 700,000 DA.

The results of this economic approximation indicate the importance of Rob and natural date honey. Despite their nutritional importance and low production costs, they remain less important than other honeys on the market and far from the interest shown in them by several Arab countries (Saudi Arabia, Egypt, Emirates, etc.).

4. Conclusion

Ouargla region is considered a region par excellence with a phoenicultural vocation. In addition to its socio-professional activities, which depend directly or indirectly on the date palm, all the products made from phoenicultural biomass fall within the range of oasis terroir products. All classes of the population exploit and use these products, especially women. Indeed, the products of women are generally the various medicinal and cosmetic preparations. The resulting products have advantages that cannot be found in industrial products. They are, in fact, reputed to be organic, natural and additive-free products. These products require outlets, aid and state subsidies, at a time when the date palm and dates provide the raw material for a very diversified industry (agrifood, pharmaceutical, carpentry, textiles, construction, organic farming). ... Etc.). The availability and diversity of industrial products on the local market and the openness of the consumer to the outside world require the preservation of this heritage by improving knowledge and maintaining these practices, as well as the encouragement of phoeniculture and the support for phoeniculturists and artisans. The expansion of the agro-food industry and agro-tourism in oasis regions can effectively contribute to give new impetus to the local and national economy.

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