

Date Palm Fruit(*Phoenix dactylifera L.*) As A Cosmetic Ingredient:A Review

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Abstract-Herbal cosmetics are being used more and more now-a-days. Amongst several herbal ingredients, Date Palm Fruit(*Phoenix dactylifera L.*) is one of such ingredient with potential use in herbal cosmetics as an active ingredient. The Date Palm Fruit (*Phoenix dactylifera L.*) is one of the most abundant fruits in the world and is an essential part of the diet, especially in many Arabian countries. Hundreds of varieties having a different texture, color and flavor are available. *Phoenix dactylifera L.* fruits are a rich source of sugars (glucose and fructose), vitamins (A, C, and B complex), fibers, minerals, and phenolic compounds having antioxidant and anti-inflammatory properties. Date Palm Fruits possess high nutritional and therapeutic value with significant anti-aging, antibacterial, antifungal, anti-acne, whitening, moisturizing properties. However, there is no systematic detailed review defining properties and applications of this herb which possesses many uses in cosmetics. This article is a comprehensive review on Date palm fruit extracts and its benefits and aims in exploring its application in the cosmeceutical industry.

Index Terms: Applications, Cosmetics, Date Palm Fruit, Herb, Varieties

I. INTRODUCTION:

Date palm tree(*Phoenix dactylifera L.*) is considered as one of the oldest and main staple and ancient crops in Southwest Asia, Middle East and North Africa. Dates can also be grown in Australia, Mexico, South America, southern Africa, and the United States, especially in southern California, Arizona, and Texas.[1],[2],[3]. Study of Fossils show Date palm trees thrived 50 million years ago. The *Phoenix dactylifera L.* fruit of the date palm was eaten as far back as 5,000-6,000 B.C.E., and they've been cultivated for about 6,000 years in the Middle East.[4]. During the past 3 centuries, the date palm tree(*Phoenix dactylifera L.*) were additionally introduced to new production regions in Australia, India, Pakistan, Mexico, southern Africa, South America, and also in U.S. [1]. *Phoenix dactylifera L.* belongs to *Arecaceae* family consisting more than 2,500 species and about 200 genera. *Phoenix* (*Coryphoideae* *phoeniceae*) is one amongst the genera with roughly 14 species. These are native to the tropical or subtropical regions of southern Asia or Africa[5]

Date trees typically reach about 36 meters in height. *Phoenix dactylifera L.* (dates) are oblong-cylindrical, 2.5–7.5 cm long, an inch (2.5 cm) in diameter, bright red to bright yellow in color, depending on variety. They are very sweet, containing about 75 percent sugar when dried.[6]

Varieties of Dates Palm Fruits

There are numerous varieties of Dates grown in various Date growing countries of the world, but few are important.

Table 1: Variety of date palm fruits

Sr. No.	Name of Date fruits	Origin	Reference No
1	Medjool, Boufeggous, Bouittob, Bouskri, Bouslikéne	Morocco	[7]
2	Deglet Noor	Iran	[6]
3	Ajwa,	Saudi Arabia	[29]
4	Barhi, Aghrass	Iraq	[7]
5	Hillawi, khadrawi, sayer	West Pakistan, U.S.A	[6]
6	Ahmar dli, Ahmar denga, Bou seker, Tenterguel, Lemdina, Tijib	Mauritania	[31]
7	Sukkari	Al Madinah	[38]
8	Amhat, Amri, Apremi	Egypt	[7]

Description, Ripening Behavior and Classification of Date fruits:

The date fruit is composed of a Pericarp, Mesocarp, Endocarp and one Seed (also called kernel, pit, or pyrene) (Fig. 1). The Pericarp, representing the foremost part of the fruit pulp, consists of enlarged parenchymatous cells and is split into outer-mesocarp and inner-mesocarp intermediated by 3–10 layers of tanniferous cells. The seed has a ventral side characterized by a

furrow of varying depth and width running along its length. The dorsal side of the seed is convex with a small shallow hole called the micropyle under which lies the embryo. Seeds from different date varieties differ in the depth of the furrow and the position of the micropyle (central or peripheral) [8]

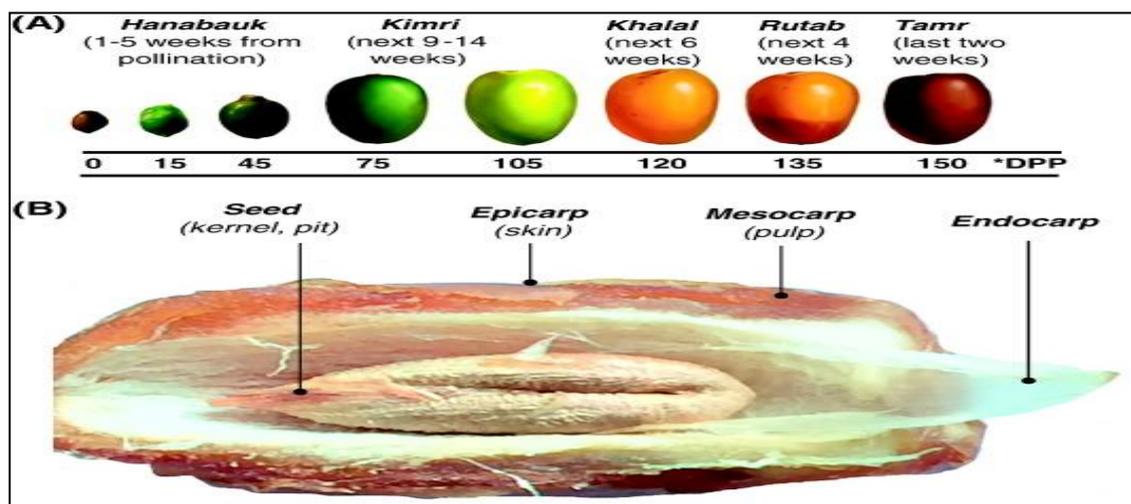


Figure 1: Stages of Date Palm Tree (*Phoenix dactylifera L.*).[9]

- (A) *Phoenix dactylifera L.* has different mature Stages according to DPP* (Days Post-Pollination) showing Khalal, Rutab and Tamar.
 (B) The date fruit at *Tamar* stage showing the Epicarp, Mesocarp, Endocarp and Seed

Phoenix dactylifera L. fruits has five different stages according to stages of growth and ripening i.e *Hanabauk*, *Kimri*, *Khalal* (or *Bisr*), *Rutab*, and *Tamar* as shown in Fig. 1. The fruits become edible in the final three stages because of decreased bitterness, increased sweetness, and improved tenderness, and succulence [9]. Depending on the various maturity stages throughout growth and development of the date, totally different external and internal changes are ascertained with color, sweetness, texture and chemical composition.[6]

II. PHYTOCHEMICALS PRESENT IN DATE PALM FRUITS:

Phytochemicals are plant-derived chemicals. They are classified into 2 main categories: Primary metabolites, that occur in all cells and play an important role in the reproduction and metabolism of those cells, for instance amino acids and carbohydrates (sugars), nucleic acids; Secondary metabolites such as terpenes (a group of lipids), phenolics (derived from carbohydrates), alkaloids (derived from amino acids) which are characteristic of a limited range of species and have a biological impact on other [10].

Many of biologically active constituents of medicinal, commercial and poisonous plants are classified as secondary metabolites. Date fruit is rich in phytochemicals such as carotenoids, polyphenols (e.g., phenolic acids, isoflavones, lignans, and flavonoids), tannins, and sterols. [11].

Below are the chemical constituents of one of the most famous dates- the Medjool dates which are most commonly used.



Figure 2: Medjool Date Palm fruit [12]

Table 2:Chemical Composition Of Date Palm Fruit, Medjool

Principle	Percentage Of RDA	Cosmetic Property Of Chemical Constituent	Reference
Carbohydrate	58%	Moisturizing agent	-
Total sugar	62-75%	Act as humectants, prevent from sun-damaged	[13]
Total fat	<1%	Act as emollient	[14]
Dietary Fiber	18%	-	-
Moisture content	10-20%	-	-
Protein	3%	Hair conditioner, moisture binding property	[15]
Vitamins			
Folate	4%	Skin Conditioner ,Anti-photo-aging	[16]
Pantothenic acid	16%	Hair conditioner, moisturizing effect	[17]
Niacin	10%	Improve the appearance of hair, skin.	[18]
Pyridoxine	19%	Hair & skin conditioner	[19]
Riboflavin	4.5%	Skin Conditioning Agent	[20]
Thiamin	4%	Skin Conditioner	[21]
Vitamin A	5%	Wrinkle-fighter, lighten brown spots, anti acne	[22]
Vitamin C	3%	Moisturizing effect, anti-aging, anti-acne	[23]
Vitamin K	2	Anti-aging, improves under eye dark circles	[24]
Electrolyte			
Potassium	16%	-	-
Sodium	10%	-	-
Minerals			
Calcium	6.5%	Anti-aging property	[23]
Iron	11%		
Magnesium	13%		
Manganese	13%		
Phosphorus	9%		
Copper	40%		
Phytonutrients			
Carotene-β	3-4%	Antioxidant, Anti ageing	[25]
Lutein-zeaxanthin	3-6%	Antioxidant, Anti ageing	[25]
Syringic acid	1.24mg	Anti ageing, anti oxidant	[23]
Ferulic acid	2.74mg		
Gallic Acid	5.53mg		
Quercetin	1.5mg		
Tannins	0.02-1.8%	Anti inflammatory,antioxidant,Astringent effect	[25]

Here is a brief study of different cosmetic properties of Date Palm fruit (*Phoenix dactylifera*L.) and its uses and application in various skin care cosmetic products.

a. Anti-Aging And Anti- Inflammatory Property:

There are several studies pertaining to anti aging property of this herb. In a study carried out by Zineb G.et.al they demonstrated dates as a good source of anti-oxidant[28] while Vinson JA.et.al has showed that dates have the highest concentration of polyphenols among all the dried fruits [29]. Guo et al. studied found that date fruits possess the second highest antioxidant activity after Hawthorn among 28 fruits commonly consumed in China[30]. Among the Date varieties medjool is sweetervariety.It showed that the sugar fraction isolated from dates had the highestFerric-Reducing Ability of Plasma (FRAP) activity, as compared to other known refined sugars.[31]. Water extract of Ajwa Fruit has showed higher contents of total phenols than alcoholic. This study showed that date fruits are hydrophilic antioxidants this property is due to presence of polyphenols specifically flavanols [32].Among the sixMauritanianDate Fruit i.e.Ahmar dli,Ahmar denga, Bou seker, Tenterguel, Lemdina,Tijib etc.Bou seker cultivarat the *blah* stageexhibited the highest antioxidantactivity [33]. The date palm L. fruit extract improves characteristics necessary for the perception of skin aging and functions as a skin care ingredient[23]. Antioxidant power of red palm fruit oil can slow down the premature aging processes by protecting the skin against damaging UV rays [34].

The *P. dactylifera* extract also possesses anti-inflammatory activity, which may be due to the presence of flavonoids and other polyphenol compounds[35]. In a recent experiment by Meer, S.et.al it is reported that there was a marked decrease within the erythroderma with application of the cream formulation containing date fruit extract [23].

b. Antimicrobial Effect:

The date palm fruit extract has adequate antibacterial and antifungal activity. Presence of different polyphenols is responsible for its antifungal activity especially against *Fusariumoxysporum f. sp. Albedinis (Foa)*[36].The date syrup polyphenols decreased the growth for *S. aureus* and *E. coli*,and have discovered that it acts as a prooxidant by generating hydrogen peroxide that mediates bacterial growth inhibition as a result of oxidative stress [37]

Date leaves' extracts showed inhibitory effect on the growth of *S. aureus* and *B. subtilis* and resistance to *P. aeruginosa* and *E. coli*. MIC of methanol and ethanol (70%) leaves' extract was 100 and 250 mg/ml for *S. aureus* and *B. subtilis*, respectively; however, all the bacteriaumhave resistance to date fruits extracts[38].The antimicrobial activity of date palm (*P.dactylifera L*) may be due the presence of phenolics, flavonoids and terpenoids.[39].The methanolic extract of Sukkari Date Fruit gives antifungal activityagainst *Fusarium oxysporum*, *Fusarium spp.*, *Fusarium solani*, *A. alternate* due to presence of alkaloids, flavonoids, saponins, terpenoids, steroids, tannins, cardioglycosides, amino acids and proteinsand the aqueous and methanolic extract of Sukkari Date Fruit gives antibacterial effect against *Bacillus subtilis*, *Escherichia coli* and *Pseudomonas aurogenosa* [40].

c. Moisturizing effect

In a recent experimental study,the application of cream formulation containing date fruit extract showed a marked increase within skin moisture contents.[23]

The presence of phenolic acids and vitamins like Ascorbic acid and Vitamin E is reported within flesh and the pit of the date palm fruit(*Phoenix dactylifera L.*) [41].

The Clinical trials conducted using topically applied Date fruit formulation to treat photoaging showed that Date fruit is significantly superior in increasing epidermal glycosaminoglycan and dermal thickening [42].

Date fruit extract also helps in stimulating dermal fibroblasts, which increases collagen synthesis, resulting in an improvement of the hydration level [23].

Red Palm Oil contains saturated fats and lipids,vitamin E, which serves as perfect moisturizer for skin and hair [43].

d. Anti-Acne Effect:

Anthocyanidins polymers have the antifungal properties whichare screened that offer a very important value of these molecules for many applications regarding to pharmaceutical engineering [44].

In a recentstudy a topical cream containing *Phoenix dactylifera L.* fruit extract showed decrease in skin sebum contents (anti-acne effects)[23].

Dates are rich in many types of fatty acids amongst which oleic and linoleic acid are the most important[45].

These fatty acids inhibit the enzyme α -1 reductase, which causes a decreased production of sebum [46].

e. Whitening Effect:

Skin color is determined by pigmentation and protects the body against UV radiations. It is due to the presence of a pigment named melanin. Melanocytes help to synthesize melanin stored in melanosomes. Melanosomes are spread into the skin by melanocytes with the help of dendrites and with the spread of these melanosomes, the melanin also spreads [47].

In a recent study a topical cream containing *Phoenix dactylifera L.* fruit extract showed a significant decrease in skin melanin with the application of cream from Weeks 1 to 8 [23]. This might be attributed to its Vitamin C and Niacin content.

f. Date Fruit For Hair :

Red Date Palm has applications in hair care.



Figure .3 Red Date Palm fruit [34]

Table 3: Major Nutrient content of Red palm oil [48]

Chemical constituent	Concentrations in 14gm
Total Vitamin E	11.20mg
α -tocopherol	2.26mg
α -tocotrienol	2.97mg
δ -tocotrienol	1.28mg
γ tocotrienol	4.68mg
Total Carotenes	7 mg
α -carotene	2.59mg
β -carotene	3.32mg
Sterols	6mg
Squalene	5mg

Red Date Palm Oil is rich in Vitamin E which promotes cell growth of skull skin and hair follicle which gives strong hair. Vitamin E content decreases hair loss and graying of hair. The presence of carotenes in red palm oil also responsible for the growth of hair and prevent the hair from becoming weak and brittle. Red Palm Fruit Oil contains the antibacterial components which help to maintain cleaner scalp that is free from parasites such as lice and dandruff and create the healthy conditions for hair growth [43]. Iron and Vitamin C present in Date Palm fruit prevent hair loss. Date palm fruits are the rich source of vitamin B and iron which attribute long, dense, and strong hair. Protein and calcium provide moisture to hair root and prevent from damaged and rough hair [49].

IV. CONCLUSION:

There are various synthetic ingredients available in the market but they are expensive and may show adverse effect on skin and hair. In this systematic review, the cosmeceutical studies conducted on *Phoenix dactylifera L.* indicate the immense potential of this plant in the treatment of conditions such as aging, acne, inflammation, dryness of skin and hair, bacterial and fungal infection, whitening of skin etc. As the global interest towards herbal cosmetic is increasing due to safety issues of synthetics, fruits such as 'Dates' can be considered as 'safe for use' in as a cosmetic active. This review targets *Phoenix dactylifera L.* as a potentially safe and affordable, effective fruit that has important cosmeceutical values and benefits.

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