Assay of pharmacological features of phoenix Dactylifera in the view of traditional and modern medicine

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Abstract: Date palm is used in Traditional Iranian Medicine (TIM) and some other Complementary Medicines to prevent and treat some diseases such as limbs and face paralysis, renal and rheumatic diseases. Stanching diarrhea and revealing malignant wounds are some usages of the seed; however since the adverse effect of excess date palm usage has not been studied precisely, we decided to gather more information about date palm. *Method:* The aim of article is to collect scientific information about pharmacological effects of date palm published in the medical journals indexed in electronic references Medline, SID, PubMed, Google scholar. Articles published about date palm show traits like antioxidant, ant mutant, antiulcer, ant diarrheal, gastrointestinal transit and blood sugar and lipid effect. Liver and kidney protective, sexual stimulator and also allergic consequence are approved. In the view of Traditional Iranian Medicine, the excess use can cause liver and spleen dysfunction, headache, toothache and mouth ulcer. *Result:* the review shows that date palm affect the gastrointestinal transit, blood sugar, progress of pregnancy and memory. More researches are suggested about clinical effects and side effects of date palm utilization.

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INTRODUCTION

Restoration and development of Traditional Iranian Medicine is a priority of Iran's Health Plan, which is in line with WHO's call for returning to use of traditional treatments to those countries with a history of traditional medicine (Anthony et al.ed, 2008). Among other reasons, one may point to the broad variation in traditional medications mostly made of generally available herbal, mineral and animal materials and making it unnecessary to import chemical pharmaceutical raw materials (Mirghazanfari, 2004). In this respect, date palm, a member of Arecaceae family, is one of the most ancient plants used by humans with a 6000-year consumption history (Al-Farsi, 2008). In addition to its useful environmental and ornamental effects, date has great nutritional, economic and health benefits. Its nutritional value is due to its rich carbohydrate compounds, mineral salts, fiber, vitamin, amino acid and fatty acid. Notwithstanding its numerous advantages, date has some disadvantages, too, which are likely due to styptic influence of Tannin, to prevent which, attention must be paid to moderate consumption of this fruit and its beneficial companions. This paper tries to provide a glance to date's pharmacologic effects such as antioxidant and anti-inflammation, antiulcer, anti-diarrhea, effects on gastrointestinal (GI) transit, liver and kidney protection, anti-mutant, antivirus, anti-hyperlipidemia, effects on blood sugar and stimulation of sex hormones.

GENERAL SPECIFICATIONS

NAMES:

Scientific name: Phoenix dactylifera
English name: Date palm
Arabic name: Tamr(a)
Indian name: Khajur and Chehra
Persian name: Khorma

Date palm is a dioecious plant with average size (15-25 m long and 20-40cm diameter). There are over 100 million date palms worldwide (Al-Farsi, 2008). This tree has about 159 needle-like leaves. Also, there are small flowers directly on its needle-like leaves which can turn into fruits. Date is an oval-cylindrical fruit with one stone grooved down one side. Its color varies from pale yellow to light red depending on its ripeness (Barreveld, 1993). The tree's trunk is made up of strong cellulose fibers.

There are over 2000 varieties of fresh dates most of which are available eight months of the year. Dry dates can last much longer due to the high sugar content.

Three main cultivar groups of date exist: dry ('Dayri', 'Nabati', 'Ashrasi'), semi-dry ('Khadrawi',

'Zahdi', 'Rani') and soft ('Chipchap', 'Mazafati') (Hashempoori M,2003).

The development of date fruit is classified into four stages using Arabic terms: "Kimri", "Khalal", "Rutab" and "Tamr". During "Kimri" there is rapid increase in size and weight and decreasing rate of sugar, high acidity and high moisture content (up to 85%). In the Khalal stage, the weight continues to decrease, but there is increasing rate of accumulating of sugars; moisture decreases and the tannin starts to precipitate. At the "Tamr" stage the dates are drier and firm in texture with a darker color (Al-Shahib, 1993). Total sugar, pH and protein content are high. Contrarily, weight, moisture and total lipid content reduces within the same stage (Amira, 2011).

ORIGIN AND DISTRIBUTION

Although precise origin is obscure historically, but there is evidence its' dating to 4000 BC. Of course resources confirm that it is indigenous from Northeast Africa. It grows a wide belt from the Atlantic Ocean through the Sahara, the Arabian Peninsula, into Iran and Pakistan (Barreveld, 1993). The extreme limits of date palm distribution are between 10°N (Somalia) and 39°N (Elche/Spain or Turkmenistan). Favorable areas are located between 24° and 34°N (Morocco, Algeria, Tunisia, Libya, Israel, Egypt, Iraq, Iran, etc.) (Abdelouahhab, 2002).

ECONOMY

The increasing global population and extensive need for foods on one hand, and the nutritional, industrial, economic, social and cultural value of date palm, on the other hand, require more attention for identifying and introducing the most important economic and productive date palm species. Date is one of scarce crops which, with the minimum investments compared to other fruit trees- can be a profitable resource for palm gardeners in economically distressed areas. On the other hand, its broad variety (400-600 species cultivated in Iran) can have a great influence on domestic non-petroleum exports (Hamempour, 2003). The date palm is one of the greatest producers of food per hectare, and world date production is well over 3 million tons (Abdelouahhab, 2002).

CONSTITUTES OF DATE

Date is easily produced and stored and is rich in nutrition. Date fruit contains a high percentage of carbohydrates (44-88%), fat (0.2-0.5%), 15 salts, protein (2.3-5.6%), vitamin, high percentage of fiber (6.4-11.5%), pigments and tannin. The weight of date pit is 5.6-11.5% of the date fruit (Al-Shahib, 1993). However, different tests indicate that constitutes and their proportions depend on the cultivated species (Amira, 2011). For example, in a study comparing 9 features of Oman's native (sun-dried) dates, the attributes color and desirability "Fard" was distinctly higher than "Khalas" ($p<0.01$). "Khalas" cultivar, containing higher sugar and selenium levels, and more energy, have a higher quality (Al-Farsi, 2005). Fresh dates have little fat and protein but are rich in sugar (mainly fructose and glucose). Fructose, glucose and sucrose are the only sugars found in both fresh and dried dates, the first two being major contributions. While fructose and glucose levels are almost the same, the former is twice sweeter and causes a feeling of satiation and reduces the total calorie intake. Average sugar content of fresh dates is 43.4g/100g and in dried dates, 64.1g/100g (Al-Farsi, 2008).

The protein in dates contains 23 types of amino acids. Thus it contains necessary amino acids. Glutamic acid, aspartic acid, lysine, leucine and glycine are the main amino acids of fresh dates. While the dried dates contain more glutamic acid, aspartic acid, glycine, proline and leucine (Al-Farsi, 2008).

One kilogram of the flesh of ripe Deglet Noor dates contains the following: water (220g), sugar (730g; 2740 calories), proteins (22g), Fats (2g) and minerals (19g,) K (6480mg), P (630mg), Ca (590mg), Mg (580mg), Fe (30mg) and Na (10mg), vitamin A (500 units), vitamin B1 (0.9mg), vitamin B2 (1mg) and vitamin B7 (22mg) (Abdelouahhab, 2002).

So, date is considered a good source of such minerals. Selenium is a co-enzyme for antioxidant enzyme glutathione peroxidase-1 (GPx1) and this makes its role a very important one in protecting human body against anti-oxidant stress and infections. However, the high level of selenium (0.31mg/100g) which is close to toxic values (0.85mg) is a major concern (Yang, 1994). Magnesium also reduces the probability of affliction by cancer and acne (Hashempour, 1999). The date contains at least 6 vitamins (Al-Shahib, 1993). The contents of B6, B3, B2 and B9 vitamins in 100g of date flesh provide 9% of an adult's daily RDA (Recommended Dietary allowance) (Al-Shahib, 1993).

Although in date seeds 14 different fatty acids were detected, in flesh only 8 found at low concentrations as a range of saturated and unsaturated fats. Anthocyanin, due to its decay during dehydration process, only occurs in flesh, especially red cultivars (mean value of 0.87mg/100g). The phenolics content varies from 193.7 mg/100g in fresh dates to 239.5 mg/100g in dried dates. This difference may be explained arguing that phenolic

compounds are released when tannin is destroyed by heat or by enzymes such as polyphenol oxidase and glucosidase (Al-Shahib, 1993).

Total dietary fiber content is 7.5 mg/100g in fresh dates and 8 mg/100g in dried dates, 0.5 -3.9% of which is pectin. It has been demonstrated that pectin and pectin-containing foods reduce the metabolic risk factor associated with heart diseases. This may be beneficial in lowering blood cholesterol levels (Diet Assoc, 1987). As Pectinesterase activity in dates is increased at different stages of maturity reaching a maximum of 60.8 IU per 100g of tissue, the pectin is reduced (Al-Shahib, 1993).

Another component of dates is tannin the effects of which include precipitation of heavy metals, alkaloid, glycoside, gelatin and protein (Afsharipour, 2002). Normally, it reduces blood coagulation and while bleeding, it increases blood coagulability (Mohebi, 2008). When there is a low concentration of tannin in stomach it promotes the appetite but if its concentration is raised, it will have an astringent effect and inhibits digestion and when levels of tannins exceeding normal limit, it will result in irritation and abrasions in the mucosal lining of the stomach.

In intestine, tannin acts as an astringent and causes constipation which becomes ineffective in the adjacency of gastric acid and ferments (Ataei, 1959). Another compound in dates, Diostulence, is herbal cortisone with Anti-allergic Properties (Hashempour, 1991).

Cartenoids, proanthocyanidin, flavonolglycosides belonging to flavones and flavanones (such as lutein, quercetin and apigenin) are other components existing in dates (Siahpoosh, 2011).

Neutral -βD glucan is also found in dates (Ishurd, 2002).

APPLICATIONS IN TRANSITIONAL IRANIAN MEDICINE AND SOME OTHER COMPLENTARY MEDICINES

Temperament is a quality resulting from the interaction of opposite qualities present in elements consisting of minute particles so that most of the particles of each of the elements may touch most of the others. The primary properties in the aforesaid elements are four, namely, hotness, coldness, moistness and dryness. Some traditional practitioners view dates as warm and slightly dry, while others consider it warm and a little moist. Date is a pectoral fruit (date, fig, jujube and raisin) and a very effective preparation is made by boiling 50 gr. date fruit in 1000 grams water to cure roughness of the throat and to softens the pain of a sore throat (Mirheydar, 2002). It is beneficial to treat paralysis, twitch, kidney improvement, low back pain, joints softening and for lungs of cold-natured people. Drinking brewed date with fenugreek ameliorates phlegmatic fevers and grinding gallstone.

Of course date has some disadvantages, too. It is heavy and hard to digest and not good for the warm-natured people. Date fruit is not usually beneficial to those residing in places other than date-growing regions and causes pimple (burnt sputum), liver and spleen blockage, sputum disorder, headache, toothache and mouth ulcers. To eliminate these complications, one may consume pomegranate juice, sekanjebin and unskinned almond and, also, after eating dates in such non-date growing regions, he/she has to wash mouth with warm water in which sumac has been soaked and/or with vinegar, and finally one may prevent those complications with chewing tarragon and keeping it in their mouth for a while.

Date seed.

Date fruit seed is warm and dry and very astringent. In its brewed form it is good for treating gallstone and its powder is beneficial to stop diarrhea and its burnt powder is used to treat malignant ulcers.

In India, date palm resin is used to stop diarrhea and to treat urogenital duct diseases, and seedless date fruit is used to purify the chest and lungs, act as natural laxative, to reduce asthma and chest pains and to stop coughing. Also it is used to treat fever and gonorrhea and to increase sexual efficiency ([A]ghili khorasani, 2001).

TREATMENT APPLICATIONS AND PHARMACOLOGICAL EFFECTS:

ANTI-OXIDANT EFFECT

In addition to anthocyanins, other flavonins, phenolic acids and vitamins such as ascorbic acid and vitamin E may have a protective effect against oxidative damages to cells. The anti-oxidant properties of fresh and dried dates is measured in three ways: ORAC (Oxygen Radicals Absorption Capacity), FRAP (FRAP (Ferric Reducing Ability of Plasma) and DPPH (1,1-Diphenyl-2-picrylhydrazyl radical, 2,2-Diphenyl-1-(2,4,6- trinitrophenyl) hydrazyl). Chiara et al. (2007) indicated that only vitamin E and ethyl acetate compounds including flavonoids and tannins had effective antioxidant properties (Chaira, 2007). The effectiveness of aquatic extract of dates is higher than the methanolic extract (Siahpoosh, 2011).

In a study conducted by Biglar et al on some Iranian dates (fresh, half-dried and dried) the polyphenolic compounds and antioxidant capacity of

Kharak dates (dried) were higher than other varieties (Biglari,2008).

NEUROLOGIC EFFECTS

Since date strengthen nervous system, it is recommended to give some grains of date to children suffering infantile paralysis (Hashempour, 1991).

EFFECTS ON BLOOD GLUCOSE AND LIPID

The Glycemic Index is a numerical Index that ranks foodstuff based on their rate of glycemic response (i.e. their conversion to glucose within the human body). In a study of this index among five sample groups, the following results were obtained: 47.2, 45.3, 35.3, 37.3, and 28.9 for Rutab, Tamer (traditional sun-baked dates), commercial Tamer, Rutab/yoghurt and commercial Tamer/yoghurt, preparations, respectively. There was a significant difference between the results for rutab vs commercial tamer dates ($P<0.05$). Although dates in mixed meals with yoghurt have a minimal effect on glycemic effect, it failed to reach statistical significance (Al-Farsi, 2008).

EFFECT ON GI TRANSIT

Al-Qarawi and colleagues (2003) demonstrated that ethanol and water extracts of both date flesh and pits increased GIT by 4-22%. While water extract from dialyzed date flesh induced a dose-dependent decrease in GIT by 4-24%. Therefore, depending on the method of extraction, the date extract may induce an increase or a decrease in GIT ([A]l-Qarawi, 2003).

EFFECT ON BLOOD SUGAR FOR PATIENTS WITH DIABETES

Diabetes Mellitus Type 1:

The role of nutrition in metabolic control of the diabetic patients has already been proven. Good metabolic control prevents the late effects of diabetes (Diabetes control. Group, 1996 & Harris, 1998). In a study by Azar et al (2005) aiming at determining the blood sugar levels after consuming Rutab-type dates and comparing them with the effects of sugar cubes on blood sugar of type-1 diabetic patients, it was demonstrated that there was no significant difference between blood sugar levels after sugar cube and Rutab date consumption. Also the subcurve level of blood sugar was calculated within 2 hours after sugar cube and date consumption, yielding 1619.6±614 mg.min/dl for sugar cube and 1572±967 mg.min/dl for date, which showed no significant differences (Razaghi Azar, 2005).

Diabetes Mellitus Type 2:

In contrast to previous study, other studies suggest that foods containing dietary fiber and fructose have a better effect on blood sugar after the meals than those lacking such components (Sharafetdinov, 1999). Date, 50% of the carb content is fructose, can replace for meals of equal carbohydrate levels in a diabetic patient. According to Forghani (2002), average blood sugar increase in a date-consuming diet was 7.31 +36.07 and in bread-and–cheese diet, 30.94 +28.42, respectively. Research findings indicate that replacing bread's carbohydrate with dates' had a better effect in reducing sugar levels 2 hours after meals in patients with type 2 diabetes (Forghani, 2002).

EFFECTS ON CHILDBIRTH PROGRESS

Poor progress of labor is the most leading cause of cesarean section. Eating and drinking during labor is one policy to prevent dystocia among low-risk nulliparous women (Hofmeyr, 2004 & Lowe, 2007).

Kordi and colleagues (2010) found that oral date honey syrup during labor was effective on labor progress in women at first childbirth. Findings showed that labor progress in active portion of first labor stage among three groups receiving date honey, placebo and usual care did not have significant statistic difference but in the second stage of labor and after a cervical dilatation of 4 cm to delivery, the natural progress of labor in date honey-receiving group was significantly higher than in those receiving placebo and usual care. Also, average duration of the active portion of first labor stage, second labor stage and from the beginning of active portion of the first stage to the delivery in groups receiving placebo and usual care was longer than date honey group (Kordi, 2010).

EFFECTS ON WEIGHT, MEMORY AND PAIN THRESHOLD

In a study on rats in which pain threshold was measured with warm container, it was demonstrated that dates had a distinct improving effect on memory, but not on weight and pain threshold (Zafari Zangeheh, 2009).

SIDE EFFECTS

Although dates are viewed as allergen, in Arabia it is a common belief that dates may be a cause of allergic rhinitis and nose itch. Even cases of angioedema and anaphylactic shock have been seen following date consumption (Harfi, 1998). One case of hypersensitivity was seen immediately after date consumption in a Spaniard (Gonzalo, 1997).

Kwassi et al. (1999) explicitly indicated that date is an allergenic fruit which has its own specific

allergens. However, patients respond in different ways to date extracts (Kwassi, 1999). Most date allergens are associated with peptides weighing 28-33, 14.3 and 54-58 KD (Kwassi, 2000). Since the patients sensitive to an allergen are sensitive to other similar allergens, too, the issue of cross-reaction becomes important (Bauer, 1966). Date has cross reactions with apple, apricot, asparagus, avocado, banana, fava bean, celery, kiwi, fig, mango, water melon, olive, peach, green pea, tomato, spinach, strawberry and potato (Kwassi, 2002).

DISCUSSION AND CONCLUSION

One goal of this article is accosting characters of date palm in modern and traditional medicine. As seen, there have been many studies on pharmacologic effects of date. In those studies, beneficial effects of this plant, including antioxidant property, effect on lowering blood sugar in diabetic patients, effects on GIT movements, have been pointed out. Ethanol and water extracts of both date flesh and pits increased GIT. Foods containing dietary fiber and fructose have a better effect on blood sugar after the meals than those lacking such components. Vitamin E and ethyl acetate compounds including flavonoids and tannins had effective antioxidant properties. On the other hand, modern medicine shows its others properties such as allergenicity.

Drinking brewed date with fenugreek ameliorates phlegmatic fevers and grinding gallstone; Although, in traditional medicine, it is believed that inappropriate use of date fruit might lead to adverse effects such as pimple (burnt mucus),which is heavy and hard to digest and not good for the warm-natured people. It causes closure of liver and spleen. More researches are suggested to conduct in this concern.

Table 1. Approx. composition of fresh dates

Varieties	Moisture g/100g	Protein g/100g	Fat g/100 g	Ash g/100g	Carbohydrates g/100g	Energy Kcal/100g	References
Fresh dates							
Naghal	44.1	2.0	0.2	1.2	52.6	207	(Ahmed, 1995)
Khalas	41.3	1.1	0.1	1.0	56.8	218	(Ahmed, 1995)
Barhi	39.7	1.8	0.2	1.1	56.9	222	(Ahmed, 1995)
Fard	37.6	1.5	0.2	1.3	59.4	229	(Ahmed, 1995)
Khasab	50.4	1.1	0.1	1.0	47.8	185	(Ahmed, 1995)
Average	42.4	1.5	0.14	1.16	54.9	213	

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