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***Phoenix dactylifera*: Discoveries through the Eyes of Science**

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Abstract

Date palm (Phoenix dactylifera), one of the oldest cultivated plants found generally in the Arabia Peninsula for its nutritive fruit that played a vital role to the mankind over the centuries. In fact, the history of date palm fruit had been documented in Surah Maryam verse 25, “And shake towards yourself holding the trunk of the palm tree, fresh and ripe dates will fall upon you”, and the Holy Quran also gave prominence to the date palm fruit for its extraordinary values. Consumption of date palm fruit is prevalent among Muslims during the fasting month due to its rich source of carbohydrates and dietary fibers which are strictly required by human body to stay rejuvenate. Interestingly, intensive scientific researches on Phoenix dactylifera had revealed numerous novel chemical constituents and pharmacological properties that possess multiple beneficial effects, supporting its employment in order to treat a variety of ailments in various traditional systems of medicine. Through the advancement of science and technology nowadays, the fruits of date palm are extensively utilized in the food processing industries producing a wide range of value-added products, credit to its great importance in human nutrition. However, the generation of date palm fruit wastes in the date palm agro industry as well as date processing industries has lead to environmental problems, thus, creating fascinating prospects for future research and development, such as utilizing the wastes as animal feed for farm animals to improve the production of high quality and safer meat products for human consumption.

Keywords: *Phoenix dactylifera*, Date Palm, Nutritional, Pharmacological, Medicinal, Food Processing, Waste Management

1.0 Introduction

Science and religion are complementary and related to each other. Holy Quran contains many verses that provide information about the nature phenomenon and it is our job to observe and analyzed these entire phenomenons. The study of the food with a good quality is one of many studies that observed in Holy Quran because basically the food is very important thing in human life. One of the verses in Holy Quran is stated about dates and date palm. Dates or their scientific name *Phoenix dactylifera* is considered a symbol of life in the desert because it can resist in high temperature, drought, and salinity more than any other fruit species (El-juhany, 2010). Due to its important, Allah S.W.T has stated about dates 21 times in Holy Quran. Dates have become the Prophet Muhammad’s favorite food and daily dishes.

Date palm is one of the oldest fruit crops grown in the arid region of the Arabian Peninsula, North Africa and the Middle East. Date palm is able to survive in the parched and become a main food to the people of the desert. Dates can grow in a very hot and dry climate and require long hot summer with little rain and very low humidity during the period from fertilization to harvest. 21-27°C is the ideal temperature for the growth of date palm. Such conditions are found in oases in the Middle East (Chao & Krueger, 2007).

Dates contains a high nutritional value and is rich in protein, fiber, sugars, Vitamin A and C and minerals like iron, calcium, sodium and potassium (Farhangi et al., 2014.). Dates can prevent and cure chronic diseases such as heart disease and diabetes, to facilitate the process of childbirth, facilitates digestion, soothe the senses, preventing colon cancer, insomnia problems, prevent strokes and many other specialties of dates in traditional medication. The research in science in modern world has proven that the waste of dates is able to consume as animal feed to prevent the environmental problems and safer meat product for human consumption.

2.0 Objective of the Study

- i. To discuss the dates and date palm through Al-Quran and Hadith
- ii. To describe the benefit of dates in traditional medication and,
- iii. To discuss the future research and development of dates in dates wastes treatment.

3.0 Dates In Holy Quran and Sunnah

A good practice in nutrition show that our obedient to Allah SWT as he had commanded in Surah Al-Baqarah verse 172 which means:

“Believers! Eat the pure things where with We have provided you for sustenance and give thanks to Allah if it is Him that you serve.”

(Surah Al-Baqarah: verse 172)

Islam had taught us about nutrition practices such as the importance of the food's source, good way to eat and the cleanliness of the food as Allah SWT stated in Surah Al-Maida verse 88 which means:

“And eat of what Allah has provided for you (which is) lawful and good. And fear Allah, in whom you are believers.”

(Surah Al-Maida: verse 88)

3.1 Dates in Holy Quran

There are some healthy foods that have been mentioned in Holy Quran such as bananas, olives, figs, pomegranates, dates, honey and grapes. Each of the foods mentioned have their own nutrition and benefits. The date palm is mentioned more than any other fruit-bearing plant in the Quran. It is showed that date is a symbol often associated with Islam and Muslims. In Surah Maryam of the Holy Quran, Allah provided Prophet Isa's mother, Maryam with fresh dates when she was experiencing uneasiness and pain during her child birth (Aisyah et al., 2013).

- i.

وَهَزَمْنِي إِلَيْكَ بِجُذْعِ النَّخْلَةِ تَسْقُطُ عَلَيْكَ رَطْبًا جَنِيًّا

“Shake the trunk of the date palm toward you and fresh, ripe dates will drop down onto you.”
(Surah Maryam: verse 25)

Another verse that shows the existents and specialness of this fruit of date palm is including:
ii.

وَمِنْ ثَمَرَاتِ النَّخِيلِ وَالْأَعْنَابِ تَتَّخِذُونَ مِنْهُ سَكَرًا وَرِزْقًا حَسَنًا إِنَّ فِي ذَلِكَ
لَآيَةً لِّقَوْمٍ يَعْقِلُونَ

“And from the fruits of the palm trees and grapes whence derive strong drink and good nourishment. Indeed in that is a sign for a people who reason.” (Surah Al-Nahl: verse 67)

This verse talks about fruit such as dates and grapes as one of the rewards and portents of Allah SWT. It implies that the juice of dates and vines contain two things which is one is pure and the other is turn into alcohol after it becomes rotten. It is giving the choice to obtain pure healthy food or to drink it as intoxicant wine. It also clarifies the prohibition of wine.

iii.

وَزُرُوعٍ وَنَخْلٍ طَلْعُهَا هَضِيمٌ

“And corn-fields and date palms with spathes near breaking (with the weight of fruit)?” (Surah Asy-Syu’araa’: verse 148)

This verse stated that Allah SWT reward us with a heavy bunches of ripe, juicy and soft date palm fruit hanging from trees.

iv.

فَأَنشَأْنَا لَكُمْ بِهِ جَنَّاتٍ مِّنْ نَّخِيلٍ وَأَعْنَابٍ لَّكُمْ فِيهَا فَوَاحٍ كَثِيرَةٌ وَمِنْهَا تَأْكُلُونَ

“Then through water We caused of date-palms and vines to grow for to you were in you have an abundance of delicious fruits.” (Surah Al-Mu’minun: verse 19)

This verse stated that Allah SWT grows for you gardens of date palms and vines and through the abundant of fruit you can get the enjoyment in livelihood.

v.

وَجَعَلْنَا فِيهَا جَنَّاتٍ مِّنْ نَّخِيلٍ وَأَعْنَابٍ وَفَجَّرْنَا فِيهَا مِنَ الْعُيُونِ

“We made in it gardens of date-palms and vines, and We caused springs to gush forth.”
(Surah Yaasin: verse 34)

vi.

يُوجِبُ اللَّيْلَ فِي النَّهَارِ وَيُوجِبُ النَّهَارَ فِي اللَّيْلِ وَسَخَّرَ الشَّمْسَ وَالْقَمَرَ كُلٌّ يَجْرِي لِأَجَلٍ مُّسَمًّى ذَلِكَُمُ اللَّهُ
رَبُّكُمْ لَهُ الْمُلْكُ وَالَّذِينَ تَدْعُونَ مِنْ دُونِهِ مَا يَمْلِكُونَ مِنْ قِطْمِيرٍ

“He causes the night to phase into the day and the day into the night and he has subjected the sun and the moon, each running its course to an appointed term. That is Allah, your lord, to Him belongs the Kingdom but those whom you call upon, apart from Allah, posses not so much as the skin of a date stone.” (Surah Al Faatir: verse 13)

vii.

وَفِي الْأَرْضِ قِطْعٌ مُّتَجَوِّراتٌ وَجَنَّاتٌ مِّنْ أَعْنَابٍ وَزُرْعٌ وَنَخِيلٌ صِنَوَانٌ وَغَيْرُ صِنَوَانٍ يُسْقَى بِمَاءٍ وَاحِدٍ
وَنُفَضِّلُ بَعْضَهَا عَلَىٰ بَعْضٍ فِي الْأَكْلِ إِنَّ فِي ذَٰلِكَ لَآيَاتٍ لِّقَوْمٍ يَعْقِلُونَ

“And on the earth there are many tracts of land neighbouring each other. There are on it vineyards, and sown fields, and date palm: some growing in clusters from one root, some standing alone. There are irrigated by the same water, and yet We make some excel others in taste. Surely there are signs in these for a people who use their reason.” (Surah Al-Rad: verse 4)

The other verse that stated about date palm are Al-An'am verse 141, Al-Baqarah verse 266, Al-Qamaar verse 20, Ar-Rahman verse 11 and 68, Al-Hasy verse 5, Al-Haaqqah verse 7, Abasa verse 26 to 29, Al-Isra' verse 91, Al-Kahfi verse 32, and Taha verse 71.

3.2 Dates in Hadith and Sunnah

The Prophet Muhammad SAW encouraged Muslims to practice the simply and moderate diet by eating when we hungry and stop before full. This is the way how Prophet Muhammad taking care of his health and encouraged us to follow his act and character. The Prophet Muhammad recommended us to break fasting with fresh dates. In another hadith, the Prophet said,

- i. *“If you have a date, break your fast with it, if you do not have it, break the fast with water as it is purifying.”*
(Al-Tirmidhi and Abu Dawood)
- i. *“People in a house without dates are in a state of hunger.”*
(Muslim)
- ii. *“There is a tree among the trees which is similar to a Muslims (in goodness) and that is the date palm tree.”*
(Bukhari and Muslim)
- iii. *“The one who eats 7 dates in the morning will be protected that day from poison and envy.”*
(Abu Naa'im, Abu Dawood, Al Hakem and Al Tirmidhi)
- iv. *“Indeed in dates there is a cure.”*
(Muslim and Ahmad)
- v. *“My wife (Sayyidina Abu Musa) gave birth, then I take the baby to the Prophet, He gave him the name, Ibrahim and put the chewed dates into his mouth and prayed for his blessings.”*
(Muslim)

3.3 Benefit of Dates in Traditional Medicinal

Date is a drupe and has one seed, which differ in size, shape, color and quality of flesh (El-Juhany, 2010). Dates can be considered as a food that provides excessive nutrients with countless potential health benefits and it can be used as a traditional medicine for various diseases.

Dates contained high calcium and iron which can form milk in a body. Dates can helps in producing milk for nursing mother. The Prophet Muhammad even said, *“Give this dates to your pregnant wife and whoever eats this fruit during pregnancy, the child that born will be gentle and polite.”* The uterus of pregnant woman will be strong and ease the process during child birth by only drinking the juice from the dates. Dates is also can prevent the post-delivery bleeding due to the presence of some constricting substance. The extract of dates is also can help the infertility problems of woman.

The daily intake of dates with any meals and washed eyes with boiled dates can help people who have night blindness and ophthalmic disorder. The blended date seed can be the best medicine for diabetic patients. Ali *et al.*, (2009) had reported that dates contain low to medium glycemic index values and therefore can control the glycemic and lipid control of diabetic patients.

Syrup, paste and decoction of dates are reliable as a treatment for asthma, sore throat, colds, and bronchial catarrh. The mixture of 50 g dates, 50 g fig, 50 g hibiscus and 50 g raisin and boiled in 1 liter of water. This mixture must be taken three times daily and it is believed can control the throat and chest infection.

Dates mixed with milk and cinnamon can be considered as aphrodisiac and can help those who have sexual problems. It is also believed can solve the problems infertility of males. In the previous study by El-Moughy *et al.* (1991), the young rat was tested to shown the sexual hormone balance and the date pollens produce an estrogenic principle, estrone that has been shown to have a gonadotropic effects.

The daily consumption and taken twice of a cup of hot boiled of seven dates is believed as a remedy for lithontriptic and diuretic. The disease of kidney and hepatic also can be treated by a drink made from powdered of date seeds. One can solve the problem of less body weight by consumed dates with the paste of cucumber. The calories contain in dates are sufficient to meet the requirement of a human body.

Dates and honey paste is used to treat diarrhea and dysentery in children. This paste also can strengthen the gum during children teething process. The dates is can also stimulate and revitalize the children's brain and help them to a better growth. Dates is also suitable for memory booster, especially among childrens.

Sugar in dates is 50-57% glucose, so when we consume dates, the energy will absorb by the body immediately. It is totally different with the sugar in other fruit which is known as fructose and sucrose which requires enzyme for glucose to be broken out to become energy. So it can be conclude that dates are the preeminent energy booster and particularly suitable for health conscious people (El-juhany, 2010). Dates also can be a treatment for obesity because the nutritious element in dates can be a hunger-resistive. Dates will offer the body with a sufficient sugar and stimulate the intestine which can reduce the intake of food.

Dates contain high percentage of carbohydrate, total sugar (44-88%), fat (0.2-0.5%), 15 salts and minerals, protein (2.3-5.6%), vitamins and dietary fibre (6.4-11.5%) (Farhangi et al., 2014). There are 15 minerals in dates and each of the mineral has percentage in range 0.1-916 mg/100 g dates, depending on the type of mineral. Potassium is found at a high concentration in the flesh and the seed. Due to its high potassium content, the date can reduce the risk of stroke and this mineral helps making the heart beat regularly, activating muscle contraction, regulate healthy nervous system and regulate the blood pressure. Dates are also free from cholesterol, low fat and rich in vitamins and minerals. High iron content in dates is very useful in treating anemia and fluorine content in dates can help to slow down the process of tooth decay.

Magnesium is naturally contained in dates and it is difficult to discover magnesium in other fruits (Devshony, Eteshola, & Shanib, 1992). The American Heart Association stated that magnesium is a great supplement to strengthen the heart and blood circulatory system. Individual who suffer from stress are more likely to get disease in cardiovascular system such as heart problem and high blood pressure. If a person is in stress, the blood pumping to the body's cell would be quicker. It will cause difficulty in heart to pump the blood to the body's cell and ultimately contributed to the cardiovascular system's problem (Aisyah et al., 2013). Dates can be a medication for alcoholic intoxication. Seven dates (as stated in Hadith) is satisfactory to eliminate body from accumulated toxins in the cells.

Other mineral and salt that are found in dates including boron, cobalt, copper, manganese, phosphorus, sodium and zinc. The dates contain 23 types of amino acids that help to improve digestive system and the skin of dates also contain fibre which is good to prevent a colon cancer. The fibre content in dates can help in bowel movement and constipation.

In the folklore, the dates are considered as medicine to prevent many diseases including cancer, heart disease, stroke and relief against pain. It is also can provide strength, fitness and memory booster to human being. The dates have a great cultural and traditional significance in human's life and it will become an idyllic food in the future. The further research of the function of dates and its value added food product must be expanded as well as the date's pits and date's palm waste management.

4.0 Nutritional Value and Pharmacological Properties of Date Palm

Proximate analysis on date palm had revealed the nutrients and phytochemicals contented in its fruits, supporting its employment in order to treat a variety of ailments in various traditional systems of medicine besides for general consumption (Table 4.1) (Al Farsi and Lee, 2008). Intensive scientific researches have been conducted onto *Phoenix dactylifera* over the years under the field of natural products chemistry, a branch of organic chemistry, had discovered numerous pharmacological properties that possess multiple beneficial effects. Phytochemical investigations have revealed that the fruits contain valuable compounds known to possess multiple beneficial effects viz. anthocyanins, phenolics, sterols, carotenoids, procyanidins and flavonoids. Dates contain vitamins which are essential for carbohydrates, fat, protein metabolism, synthesis of DNA and as an antioxidant to protect tissues from oxidative stress. The presences of insoluble fibers like cellulose, hemicelluloses, pectin, and lignin which are present in the date flesh are important for the health of the digestive tract especially in reducing the risk of bowel cancer, and diverticular disease as well as in improving the cardiac vitality. The high potassium and low sodium contents in dates are desirable for people suffering from hypertension whereas the presence of selenium may have been responsible for the myriad beneficial effects.

Additionally, the preclinical studies suggest that date palm possesses diverse medicinal uses including free radical scavenging, antioxidant, antimutagenic, antimicrobial, anti-inflammatory, gastroprotective, hepatoprotective, nephroprotective, anticancer and immunostimulant activities (Figure 4.1). These observed pharmacological properties may be attributed to the presence of a high concentration of minerals and various other phytochemicals of diverse chemical structure. For instance, the presence of compounds such as phenolics with a potential to scavenge free radicals, increase antimutagenic effects and to stimulate the immune system may contribute towards the various pharmacological effects. Thereby, the date palm are serving as an important healthy food in the human diet.

Table 4.1: Composition of the Various Essential Nutrients and Phytochemicals in Date Palm (Al Farsi and Lee, 2008)

Composition	Lowest Reported	Highest Reported
Moisture (g/100g)	7.20	50.40
Fat (g/100g)	0.10	1.40
Ash (g/100g)	1.00	1.90
Protein (g/100g)	1.10	2.60
Carbohydrates (g/100g)	52.60	88.60
Fructose	13.60	36.80
Glucose	17.60	41.40
Sucrose	0.50	33.90
Fiber (g/100g)		
Soluble	0.40	1.30
Insoluble	3.03	7.40
Total	3.57	10.90
Minerals (mg/100g)		
Magnesium	31.00	150.00
Sodium	1.00	261.00
Calcium	5.00	206.00
Phosphorus	35.00	74.00
Potassium	345.00	1287.00
Manganese	0.01	0.40
Iron	0.10	1.50
Zinc	0.02	0.60
Copper	0.01	0.80
Selenium	0.24	0.40
Vitamins (µg/100g)		
A (Retinol)	3.00	44.70
B1 (Thiamin)	50.00	120.00
B2 (Riboflavin)	60.00	160.00
B3 (Niacin)	1274.00	1610.00
B6 (Pyridoxal)	165.00	249.00
B9 (Folate)	39.00	65.00
C (Ascorbic acid)	400.00	16,000.00

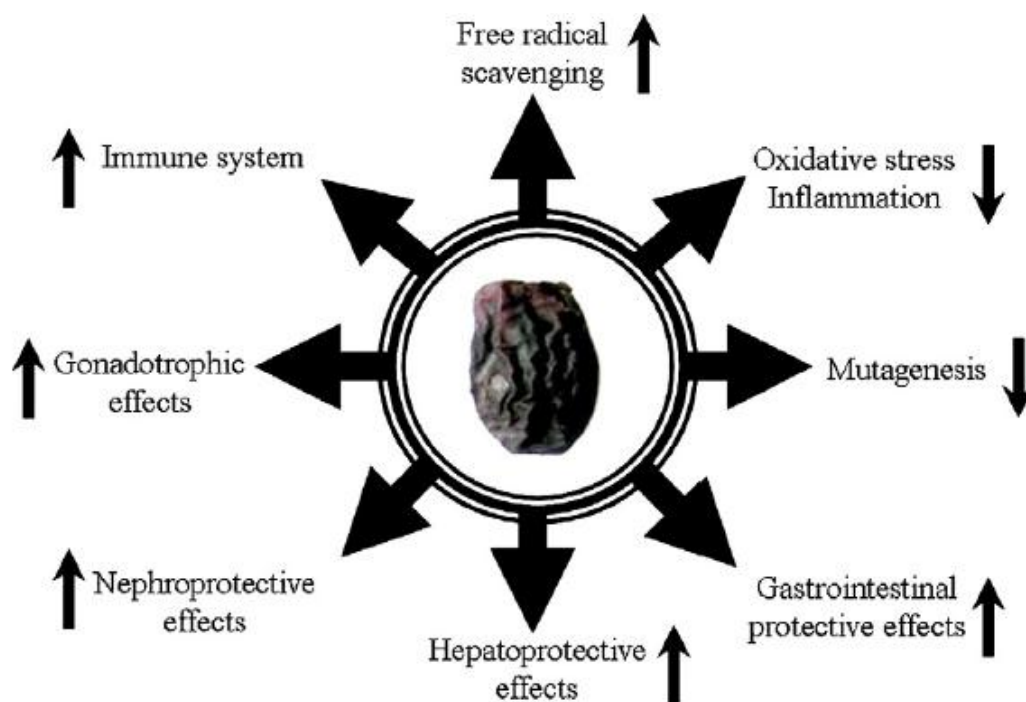


Figure 4.1: Pharmacological activities of date fruit (Baliga *et al.*, 2011)

5.0 Value Addition and Waste Management

The fruit of date palm are extensively utilized to manufacture a wide range of value-added products, for instance, date juice concentrates (spread, syrup and liquid sugar), fermented date products (wine, alcohol, vinegar, and organic acids) and date pastes (bakery and confectionary) apart from direct consumption in general (Chandrasekaran and Bahkali, 2013).

Due to the advancement of technologies nowadays, large production of variety of date products are feasible, and a plethora of applications of the substances extracted from date fruits are now discovered. For instance, pectin from date fruits function as a thickener or gelling agent in processed foods such as confectionery products, jams, table jellies, soft cheeses, and yoghurts (Ramadan, 1995; Al-Hooti *et al.*, 2002). Until present, there are numerous food formulations and confectioneries utilizing date paste as one of their major ingredients due to its abilities to function as a sugar substitute (Alhamdan and Hassan, 1999). Meanwhile, date syrup, the main and general by-product of date, is being used in the preparation of foodstuffs such as jams, marmalades, concentrated beverages, chocolates, ice-cream, confectioneries, sweets, snacks, bakery products and health foods (Riedel, 1986).

Furthermore, few by-products are also produced through chemical modifications of date seeds such as polyol and mayonnaise. Polyols, known as sugar-free sweeteners, are compounds with multiple hydroxyl functional groups available for organic reactions and are commonly added to foods because of their lower calorific content than sugars. Polyols were produced from date seeds through oxypropylation and liquefaction techniques using organic solvents in the presence of a catalyst (Briones *et al.*, 2011).

However, the generation of enormous amount of wastes from the date palm agro industry as well as date processing industries such as date fruits that fell from the tree before maturity, date fruit seeds (pits), and date press cakes, are leading to serious environmental

problems apart from contributing to a huge loss of raw materials (Chandrasekaran and Bahkali, 2013). These by-products are earning limited usages such as animal feedstuff (Besbes et al., 2006), for instance, date seeds are discarded or used as fodder for domestic farm animals in Tunisia. Interestingly, several studies have demonstrated that both dates supplementation or even dates replacement of animal feedstuff can improve animal performance due to high energy content and high palatability of dates (Chandrasekaran and Bahkali, 2013)., thus, providing an alternative to improve the production of high quality and safer meat products for human consumption in this ever increasing human population that escalate the need for more healthy and secure agricultural products.

6.0 Conclusions

Date palm is relatively abundance with tremendous potential and countless possibilities for further research and development for the goodness of human being. Considering the fact that dates are relatively cheap, nutritious and is devoid of toxic effects, it is safe to suggest that their consumption should be recommended on a daily basis for better health, vitality and vigor. Date palm fruit is an ideal substrate for deriving a range of value added products in food and nutraceutical industries in the coming future employing bioprocessing technologies which have immense scope for application in the valorization of date fruit by-products and wastes.

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