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REVIEW ON PHYTOCHEMICALS AND PHARMACOLOGICAL CHEMICALS OF DATE PALM (PHOENIX DACTYLIFERA)

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Abstract

Date palm (Phoenix dactylifera L.) is widely cultivated fruit tree having thousands of years of usage as food and medicinal plant. Its fruits, trunk and leaves contain a diverse array of phytochemicals with potential pharmacological activities. In recent years, the application of phytochemicals and biological active compounds, present in date palm, is getting attention of scientist to explore their role in the betterment of humans under malnutrition circumstances. The present review summarizes the current state of information on the phytochemicals and pharmacological activities of date palm tree. Phytochemicals found in date palm include polyphenols, flavonoids, carotenoids, tocopherols and triterpenoids. These compounds have been revealed with a wide range of anti-oxidant, anti-inflammatory, including biological activities and anti-tumor activities. Additionally, date palm has been found to have antidiabetic, hypolipidemic, and neuroprotective effects. These chemicals are also found affective against various diseases including cancer, cardiovascular issues and diabetes. These compounds have also been exposed to have cholesterol lowering anti-tumor effect and anti-inflammatory. In addition, the leaves of the date palm contain tannins, which have been found to have antimicrobial and antioxidant activities. The date palm's fruit contains various bioactive compounds, including dietary fiber, vitamins, phenolic and minerals compounds. These compounds have been shown to have a range of health benefits, including improving gut health, reducing the stress of oxidative, and reducing the cardiovascular disease risk. Additionally, the fruit of the date palm has been found to have prebiotic effects, promoting the growth of beneficial gut bacteria.

Keywords: *Phytochemicals, pharmacological chemicals, Date palm, oxidants, Disease risks*

INTRODUCTION

The date palm tree (*Pheonix dactlifera* L.) is the member of Palmae family (*Arecaceae*), which belongs to the region of tropical and subtropical and is the oldest plant in Arabian region having plantation of 7,000 years ago (Ahmed *et al.,* 1995). According to the FAO report, cultivation of date palm and its application and global industrialization is increasing day by day. The world leading producers of Date palm are Egypt (1,352,950 mt), Iran (1,023,130 mt), Saudi Arabia (1,078,300 mt), Algeria (710,000 mt) and UAE (775,000 mt) (FAOSTAT, 2010).

Enlisted Ranked wise counties main exporter of Date fruit in the world

Rank	Country	Export value (US $)
1	Egypt	146988000
2	Saudi Arabia	48004000
3	United Arab Emirates	30130000
4	Iran	28486000
5	Algeria	1978000
6	Iraq	16572000
7	Tunisia	11103000
8	Oman	10087000
9	Morocco	9791000
10	Yemen	7752000
11	Jourdan	6405000
12	Pakistan	3512000
13	Sudan	2203000
14	Mauritania	1644000
15	Libya	1305000

As high-value pastries have been sold worldwide, fresh fruit has remained an important survival product in many desert areas. This is mainly in the hot and dry areas of world production, especially in the countries of the Gulf Cooperation Council (GCC), where Saudi Arabia is considered as one of the world's leading producers, of the history, production of Saudi Arabia significantly over the past two decades has increased, and Phoenix dectlifera one of the main products in Oman, which account for 82% of the country's fruit production. Today, the production in Algeria is more than 400 cultivars, and the annual production volume is more than 400 thousand tons.
(http://faostat3.fao.org/home/index.html#VISUALIZE).
Three different stages of fruit development which are Khalal, Rutab and Tamar, and usually this date to full matured in the tamar stage with the development of the total amount of dry soluble matter (TSS) 60-70 Brix consumed at this stage. Most dates are consumed at turnip stage, (semi-mature) and Tamar (fully-mature), without being processed in practice. Thanks to the government's support and support to the manufacturing industry, the number of date processing has increased rapidly and continuously in recent years. A large amount of the waste produced from Kabkab and Waste day may have used economic benefits from the history of producing syrup (recorded interview with Co-aut. 1997).
It produces about 20 kilograms of dry leaves annually according to tree estimates. Other waste accounts for 10 per cent of fruit on average (Agriculture Ministry, 1998, Barreveld, 1993). Although agricultural wastes containing cellulose, hemicellulose, lignin and other compounds that can be used in many biological processes, and used in burned areas, are a serious environmental threat. Although several scientists, date palm cultivation, use and use of date palm fruit in therapeutic applications, reviews can be found in literature on relatively low chemical and pharmacological dates (Dung *et al.,* 2011), combining phytochemical importance, nutritional value and possible fruit health benefits (Vayalil, 2012). Dates have been used as festive foods for years due to their high polysaccharide content. It helps to prevent from many diseases due to its natural action, for example antioxidant, anti-inflammatory and antibacterial properties. The production and use of dates is increasing due to their beneficial value and inedible content (seeds) can also be used for the preparation of crude coffee, and for the feeding of animals used. Date seeds improved the function of the immune system and can also reduce the threat of cancer and cardiovascular infections, as it is substances, phenolic compounds and large amounts of nutrients such as fiber, fat, moisture, protein, ash and vitamins contains. In traditional medicine, powdered date seeds are used as a component to relieve fever and toothache, as well as liver disease, diabetes and gastrointestinal disease as a popular remedy for treatment (Sundar et al,. 2017). Date palm is a widely used edible fruit (Rani *et al.,* 2007). Dates palm (Phoenix dactylifera L.) The fruit is a sweet fruit with a content of sugar above 50%. This palm is normally grown in the local market together with others for small land owners. Dated periods are seen as "the tree of life," due to the high nutrient content, high performance and long life span (augstburger et al. 2002). The date's pulp contains sugar (70%), mostly glucose, sucrose and fructose, which is easily digestible. We take the food and protein, and less fat, we are also surrounded by vitamins like riboflavin, biotin, thiamine, ASC and folic acid. Fruit is rich in calcium, iron, cobalt, magnesium, fluoride, manganese, arsenic, potassium, zinc and many more (; Elias, 2008; Ali Mohamed & Khamis, 2004; Al Farsi & Lee, 2008).

Top main producer counties of Date Palm

1. Saudi Arabia
2. Egypt
3. Iran

4. Iraq
5. United Arab Emirates
6. Tunisia
7. Algeria
8. Oman
9. Morocco
10. Pakistan

Botanical description

The tip of the palm-plant describes all the Phoenix species which vertically grow with a tree-trunk that is powered by branch activity at the same end. In water resources the root system is deep and highly established, to sustain the through vertical development. The leaves of date palm are mature and can be several meters in area. The leaves of date palm are straight on the stems and arranged in a spiral. At the of tree the shielding is intense, creating a crown where a lot of leaves create a tip. The structure of leaves are thorny needles to protect plants from the loss of water and grazing of animal. During the life of the tree, these shoots come from suckers that may be able to increase.

A dioecious "tree of the Arecaceae family, Phoenix dactylifera is the backbone of Agriculture which cultivates food that can be grown in combination with other crops. This pattern of agricultural escapes is very popular in Central Mauritania (Munier, 1973) in the hot and dry areas of the Middle East, and in the Sahara of North Africa. Palm trees have historically been planted with palm branches which appeared at the beginning of their lives. It is the palm of an adult, and its ripe fruit. Only palm flowers are produced in the formation of secondary buds, branched clusters, at the end of the rosette since palm is a two-sided tree, there are male and female flowers found in different plants, after natural or artificial fertilization only female palms can bear fruit. Typically, the flowers are small, because there is a big tree, surrounded by a wide bud in a wide branch of the rib.

The calyx is the same as the leaves, with three prongs and the calyx. Palm flowers are normally three ovaries but only one can be a stone. The stamens possess linear fixed anthers carrying six digits. Palm pollination is usually caused by wind, and it is also common practice for artificial pollination to achieve greater efficiency. Each year a mature and perfectly fertile palm tree will bear hundreds of kilograms of fruit. Preserve-the fruit of a single seed, covered with a slightly yellowish, reddish-brown colour, cylindrical, round or oval, juicy and sweet medium skin. Fruit is usually found in spikelet's, with hundreds of different dates in each. The spikelet's are connected to the middle trunk and form a bundle. The number of wooden beams ranges between 5 and 30 depending on the range and the environmental conditions.

According to Hadrami *et al.,* (2011c), the most common method, traditionally, is to hold branches that are shared or traded between the grower and the plant. Gradually the shoots that were transplanted grow. Well-kept palms can produce 3 shoots a year, up to 10-40 in lifetime. The transplanted shoots begin to bear fruit in 5-8 years under normal conditions, and mature for about 30 years to complete. Because of the soil, microclimate and cultural practices, crops tend to decline after 100 years of cultivation. The second reproductive method is seed. This is the easiest way to do so, but it may take the palm seedlings 10 years to blossom and bear fruit. During the past few decades, significant strides have been made to establish new ways of growing large amounts of plants rapidly and reliably. Over the past few decades, this is based at the use of micro mixes, biotechnologies and different tissue culture, significant steps have been taken to quickly and reliably develop new ways of growing plant of large quantities (Jain, 2006;El Hadrami and El Hadrami, 2009;El Hadrami *et al.,* 2011b).

It is one of the oldest known fruit crop cultivated for at least 5000 years in North Africa and the Middle East (Zohary and Hopf, 2000). Iraq's earliest record of history and culture, developed as early as BCE 3000. Due to the long period of historical culture and the wide distribution and variety of date types, the precise origins of history are unknown, but the most possible evidence is in the Arabian Peninsula, North Africa and the Middle East, from ancient Mesopotamia to the dating culture, probably spread to Egypt in the middle of the second millennium BC. Subsequently, Islamic expansion accompanied the propagation of planting dates and entered southern Spain and Pakistan. The Spaniards first took and sent the data to the United States outside the Arab Peninsula, North Africa and Middle East and South Asia (Nixon, 1951). The Planting Day has a major impact on the history of the Middle East. There is no plan able to support a large population in the desert. Caravan routes existed for centuries, and were used primarily for data transportation. Date growth had become a holy symbol of early days of prosperity and fertility. Dates had great spiritual and cultural significance for the people of the Middle East. (Denoe, 1973; Nixon, 1951).

Morphology

The date palm (Phoenix dactylifera) (2N=36) is the most significant fruit tree in the South; which has been cultivated for a long time and has about 250 varieties (Rhouma, 1994, 2005). About 4 million palm trees cover an area of about 32,000 hectares. At the site of a remarkable variety of commercial date, Deglet Noor, nearly 55 % of this area has recently been widely cultivated. Despite their significant nutritional and economic value, the acreage of other dates decreases, and sometimes disappears. The palm tree is 15-25 m tall, the radius of the cross section is 20-40 cm. The barrel consists of cellulose fibers, which can be used in the production of plywood. Worldwide there are more than 100 million palm trees. Data are generated in different circumstances. Some date palms can grow fresh crops for 60 years with a volume of between 400-600 kg (100-150 kg of dry crops).

Karyotype

In an oasis in Siwa palm trees (Phoenix dactylifera var. Karama) grew up. At the Desert Research Center, Department of Genetic Resources, tissue culture laboratory, seedlings are obtained by micro-propagation techniques. The long-term development has been silica, perennials, monoecious, diploid (2N=36) with long generation time (Almaarry, 1995). When tissue culture techniques are used, somaclonal changes can occur, and one of these changes is the phenomenon of the chromosome (repetition, delecation, translocation and ploidy).

Hussein (2005) noted that plant chromosome bond analysis has several applications, including developing karyotypes to establish polymorphic bond models for studying structural anomalies and other cytogenetic studies. Madon et al. (2005). The cytology of pollen host cells in palm oil during meiosis was studied. four species of Sestrum from Brazil (C. amictum, C. intermedium, C. sendtnerianum and C.) (Fregonezi *et al.,* 2006)

Madon et al (2005), studied the cytology of palm oil pollen host cells during meiosis. Fregonezi et al.(2006) four Brazilian species of Sestrum (C. amictum, C. intermedium, C. sendtnerianum and C.) Analysis of strigilatum karyotypes using traditional feulgen staining, C-Giemsa and CCMA3/DAPI bands, responsive generation region (CSRs) and fluorescent in situ hybridization(fish) cold rDNA checkLanzone and De Souza (2006) studied the meiotic activity of a holographic chromosome in three members of the genus Antiteuchus (often known as stink bugs) using Orcein-stained sperm. This describes certain species of karyotypes (Chengqi, 2008). Fernandes et al. (2009) used traditional staining to study the karyotypes of these four South American species of Cestrum. Las Peñas et al. (2009); it analyzed the karyotypes of the four members of Cactus coyaceae Karyotypes can be used for a variety of purposes; such as researching chromosomal structures, cellular structure, taxonomic relationships and collecting knowledge on past evolutionary events. This study was conceived to assess chromosome aberrations (numbers). The Centella's position and size for Phoenix dactylifera to make karyotype is. Kalama.

Economic Value

The Arabian Peninsula country is the center of origin and is a major component of the date palm diversity center; the world's largest history of date fruit production and consumption. Palm is an integral part of the agricultural system in arid regions, especially in the Middle East Part of it, whether on a small-scale farm or on a large-scale plantation. In the first year, most plantations were mixed with vegetables, cereals, or forage crops, and then mixed with small fruits and vines, depending on the variety and growing conditions. The size, weight, color, shape, texture, softness, and maturity also vary, thus providing a lot of choice. The variety adapts to the climate of various Middle East oasis through the local climate, testimony and socioeconomic conditions, and the importance of fruit quality 9. It is estimated that there are 120 million palm trees in the world, two-thirds of the Arab countries. Arab countries account for about 800 different dates and 60% of 4'9 world production plays an important role in the nutrition and social life of Middle East Oasis communities (Jaradati et al. 2004).

Traditional status

Taking into account socio-economic and cultural value for the local population of Date palm as a socio-economic development (Jain, Al Khayri, Johnson 2011). In the past, nomads settled in the dancing palm groves and established their own territories. These populations serve as marketing / trading centers for products, animals and other products. Among these Oasis-based community products, past and present dates are the most important and popular products. Their value can be used for food and feed. Dried dates and tender dates are usually eaten outside. It can also be prepared in multiple ways to assemble, slice or produce other products for consumption in other regions. These include puddings, breads, cakes, cookies, ice cream, desserts and cereals. In recent years, a brand new industry has developed around the palm of your hand. For example, the history of the plant is more or less complex, and they have provided many local jobs on asphalt, drilling, crushing and screening equipment. The majority of the products can be made from jam, jelly, fruit, syrup, vinegar and alcohol (normally sugar), often in fresh powder. The unused waste of dates is dehydrated, don't waste it, crushed and mixed along with wheat residual straw to produced valuable feedstuffs. In addition to fruit, they sometimes cook young leaves and final shoots like vegetables. Seeds are also commonly fried and ground, and are used as a filling for coffee or flour in some countries. The use of palm trees for freshwater extraction is also popular in many North and West African countries sugar, molasses and alcoholic beverages are converted from sweet juice.

Date seeds are typically softened or crushed by feeding and submerged with water to feed pigs, horses, camel and goats, although the seeds of date and feeds of chicken may have some beneficial and nutritional possessions (EI Hadrami *et al*.,2011d). These have carbohydrates 60%, protein 5% and fat up to 10% and also have dietary fiber 6-12%. It is also a source of estrone, sterols and few polysaccharides that are dissolvable in alkali. Suitable for soap and cosmetics are lauric acid (8 percent), myristic acid (4 percent), palmitic acid (25 percent), magnesium (10 percent), oleic acid (45 percent), linoleic acid (10 percent), and caprylic acid. The seeds are usually aligned with the necklace. Palm leaves are commonly used for cushions, sieves, baskets, boxes and fans, and for religious uses. Chips are often considered a source of cellulose powder. Mature leaves are used for insulation boards, wraps, ropes, kells and hats because they are rich in fiber. It is also the source of fishing gear and equipment and goods such as fishing gear and brooms, for fuel and raw materials processing. Many medical applications refer directly or indirectly to date intake. Fruit is rich in tannins, making it an ideal treatment for bowel diseases. Prescriptions are often used for colds, sore throats and bronchial cough, such as infusions, hypoglycein,

syrup, and pasta. It is also used to alleviate fever, liver and abdominal pain, cystitis, edema and gonorrhea. Root is used for the treatment of toothache, and is a beneficial source of oestrogen pollen.

Uses

The Palm Date is a big crop that grows in many parts of the world and results in overproduction times. Date seeds (bones) account for about 10 percent of the fruits (Almana and Mahmoud, 1994). In the US, a waste stream in the garbage pit poses a problem for the industry. But finding a way out of the pit would yield enormous profit for the villagers. Historic pits are sometimes used in the Middle East for processing forage.

At the beginning of the diet, Vandepopuliere Al Yousef and Lyonnais (1995) ranged from 5 to 27 %. The diet has a better grilled mass than the date filled feed or diet regulation area. Some research into the impact of animal feed on large quantities of tannin, resistant starch (Hadarmi, 1999). and natural anabolic agents (Elgasim, Al-Yousef, Humeida, 1995), Mahmaud, and Almana (1994). Assessed sugar that can make a valuable contribution to fiber intake as an alternative source of fibers compared to dietary fiber and wheat bran, thus investigating the history of the pit, high value-added functional foods with facilities may be able to extract the material. The study's main components were: (1) performing chemical pit analyzes from three leading UAE varieties; (2) The main components, particularly proteins, fibers and oil, of these pits should be described.

Source of fibers

Even in countries with very limited wood supplies, paper consumption in the world is increasing. In addition, these strategies have been implemented with the rational and innovative use of large quantities of agricultural residues and marine life issues, Considered as a new cellulosic fibre source in these countries, like separate Portugal Crop Assessment Observations. (Antunes et al.2000; Cordeiro 2004), India (Dutt *et al.,* 2008), Malaysia (Wan Rosli *et al.,* 2003) Iran (Hejazi *et al.,* 2008), Sudan (khristova *et al.,* 2005), or Tunisia (Aguiar and M'henni, 2006, Gezguez et al. 2009). After harvesting fruit, palm tree waste from Tunisian agricultural land is piled up every year. Similarly, we must find a reasonable way to evaluate this rich renewable resource. For exampleA solution for meeting the growing demand for biodegradable and renovable materials is known as the use of natural fiber in composite material. In this regard, the agricultural residues (axes or leaves) of palm trees can be considered as a source of polymer matrix reinforcing fibers in the composite. This valuation was performed recently (Al-Sulaiman, 2002, about-Shark and hamid, 2004, Taha *et al.,* 2007, Bendahou *et al.,* 2008, Sbiai *et al.,*2008). Some studies have assessed the ability for palm-trees to buy pulp or paper products, most of which were produced for the production of palm-tree leaves (Ezzat, 1974, El Morsy, 1980, el Morsy *et al.,* 1981).

Current situation of date production

Around the world 37 countries export and trade date for the local consumption, and are currently on the rise and other countries grow crops for local consumption on the market in small areas.

Geographical distribution of the date palm

The date palm is widespread in a variety of geographical, soil and climate zones (El Hadram et al. 201a), and is the genus of Phoenix dactylifera. In Middle East and North Africa majority of tree are grown, but have been developed in Arizona, United State in California and Mexico. The general requirement for all palm growing parts is the optimum production of pollen requires high temperatures (35° C) and lower relative humidity during infection and maturation. All desert-adapted trees need large amounts of water to be collected by root systems or ground irrigation from the deep soil. Palms are rising on the southern latitude of 9-39^{O} on the southern edge of Sahara Desert and the Middle East, where almost no rain is present.

Worldwide date production

In 2009, FAO reports an area of 1.3 million hectares that was cultivated to date (FAO Statistics, 2010). Over the last decade the region has grown by 300,000 hectares. The highest areas (833,351 hectares) are situated on the continent of Asia, including the countries of the Middle East, followed by Africa (416,695 hectares) and North Africa (392,200 hectares). The contribution represents over 10 years Middle East-North Africa growth of 2.7 million tones. According to the FAO, the biggest producers in the world are Saudi Arabia (979017 tons) Iran (over 1 million tons), Pakistan, Algeria (540,000 tons) and other major generating countries, including Libya, Tunisia, Morocco, Oman, Mauritania, Bahrain, United State, Qatar, the United Arab Emirates, Spain and Kuwait. The United States leads by an average of 67,093 mercury / ha as regards annual production. It then entered Africa, with an average yield of 64.974 Hg / ha particularly in the northern regions. In the Middle East, yields are higher, but below the global average (53,798 mercury / ha)

Phytochemicals

Phytochemical Analysis:

Phytochemical analysis of collected meal, leaves, bark, and pits of coarse meal is as follow:

Molisch's test for carbohydrates

In 5 ml distilled water each 0.5 g powder was dissolved and filtered. Add to each solution a few drops of micronized reagent, then add 1 ml of concentrated H_2SO_4 tube. Then the mixture was kept for two minutes, then diluted with 5 ml of

distilled water. A positive test is considered to be forming a red or dark purple at an interface between two layers (Sofowora, 1993).

Test for alkaloids
Every 0.1 g of powder is dissolved and filtered separately into 5 ml of methanol. Each 2 ml filter from each sample was mixed and filtered in a water bath with 5 ml of a 1 per cent aqueous HCl solution. Take 1 ml from the filtrate into two test tubes. A few droplets of Dragendorf reagent were applied in the first portion. The precipitate with orange-red was good. In the second 1 ml, Mayer's reagent was added, and the presence of a pale yellow sediment as an alkaloid was a positive test (Sofowora, 1993).

Liebermann-Burchard test for steroids
The dissolution of 0.2 g of the sample's powder was dissolved in 2 ml acetic acid and cautiously applied to the solution in cold. Color changes were made from purple to blue or royal blue in order to show that a steroid ring is present (Sofowora, 1993).

Test for saponins
For each sample, 1 g coarse powder has been boiled and filtered with 5 ml of distilled water. Then add approximately 3 mL of distilled water to each filter & shake well for approximately 5 minutes. Continuous heating foaming is considered evidence of saponin (Sofowora, 1993).

Shinoda's test for flavonoids
Approximately 0.5 g per powder was heated, dissolved and filters in 5 ml ethanol. Rather, three parts of magnesium with a few drops of concentrated HCl were used to filtrate. Flavonoid presence is indicated by the color of the pink, purple or red to purple (Trease and Evans 2002).

Test for tannins
The rough powder is mixed separately with about 10 ml of distilled water and then is filtered by approximately 0.5 g each. One percent chloride solution was applied to a few 2 ml drops, And tannic acid was present when blue-black, grey, or blue-green sediments appeared (Trease and Evans, 2002).

Total tannin content
According to Hagerman, Harvey-Mueller, and Makkar (2000), for the analysis of tannin, date extracts were used to determine TPC in fruits to separate the PVPP (polyvinylpolypyrrolidone) use of tannin phenols. The total number of tannins represented mg GAE/100 g fresh weight,

Total flavonoid content (TFC)
Colorimetric aluminum chloride evaluated by the Zhishen, Mengcheng and Jianming (1999) approaches were the total flavonoid content (TFC) measurement. The TFC was measured in 100 g fresh weight as an equivalent of mg rutin (RE).

Total carotenoid content
Together with the models Talcott and Howard (1999), the total carotenoids will be extracted with slight amendments. T25 ultra-turrax homogenizer Ika, Staufen (Germany) is used to extract 10ml acetone /ethanol (1:1, v/ v) from (2 g), 0.1% butylated hydroxytoluene (BHT). Per 15,000 operations are conducted under yellow (radar) fluorescent lamps, in order to avoid light changes. The sample was purified after extraction with centrifugation (15,000 rpm, 10 minutes, 4 ° C). The residual residue was again removed until it became colorless. The spectrophotometer HP 8451 (Hewlett-Packard, Cambridge, United Kingdom) was used to calculate the total carotenoid thickness, with the equation: Maximum carotenoid content (µg / g) = Abs•V•106A •100•W. Abs is absorption of 440 nm where the average absorbance has been identified; V is the total amount of each extract (mL) and A1% is the average extinguishing amount of the carotenoid (2500).

Total anthocyanin content
The pH-difference system used to assess and measure total anthocyanins (Giusti & Wrolstad, 2001). A 0.1 per cent HCl methanol solution is the most appropriate solvent. The sample was homogenized at ultra-Turrax (1 rpm in 15,000 min), then tested for 15 minutes with ultrasound to get a cold temperature and two yellow fluorescent buffers (pH 1.0 and 4). For each sample two dilutions are made, one with a buffer pH 1.0 and the other with buffers pH 4.5HP8451 (Hewlett-Packard, Cambridge, UK) spectrophotometer 510 nm and 700 nm was calibrated after 15 minutes to dilute to match the absorption. The absorption difference = (A510nmpH 1.0-A700nmpH1.0)-(A510nmpH4.5-A700nmpH4.5) between the two anthocyanin extracts.

The concentration of monomeric anthocyanin in the specimen (µg/100 g FM) is expressed as the equivalent of 3-glucoside cyanide and is measured as: total anthocyanins (mcg/100gFM=ΔA×MW×V×100µ×L×W×1000M where the length of the path is 3-g (1 cm) and the sample mass (mg) is W.

Determination of the antioxidant activity

Dimethyl alkylene oxide solvent (DMSO) has been found to be an antioxidant activity because of high AA rates. The medication is similar to the previously mentioned TPC acetone aquatic extract in the section. They are stored under a nitrogen jet and stored at a temperature of -30 ° C to ensure the stability of the extract. There are antioxidant compounds in a variety of structures but action mechanisms also exist. Therefore no uniform opinion exists (Wu *et al.,* 2004). Therefore it is very important to use different methods of detection in screening process.

Radical scavenging assay of DPPH

The efficacy test for radical scavenging was 2, 2 -diphenyl-1-picrylhydrazyl (DPPG), performed with a 50 µL extract and a DPPG 0,09mM ethanol 2 ml solution. Dark absorption records after 1 hour, at 517 Nm. The work piece was measured using DMSO and WPC solutions, and use was made of an equivalent Terlox unit (TE). AA is measured by fresh weight mM of TE / 100 g.

Ferrous ions (Fe^{2+}) chelating activity

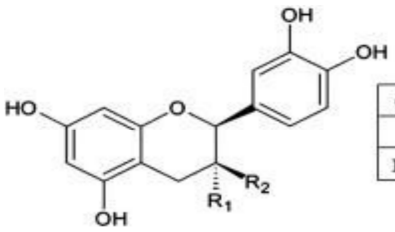
The activity of iron (FIC) was evaluated as follows: Mixture of the reaction for five minutes: 1 ml of extract, FeSO4 50 µL 2 mM, 2.850 mL of water. Then mixing 100 µL of 5 mM ferrozine and balanced in the mixture after 10 minutes, The absorption of the empty sample was measured with respect to 562 nm but did not use DMSO. Results in µM ethylenediamine-tetra-acetic acid are expressed per 100 g of fresh EDTA weight.

Sterols

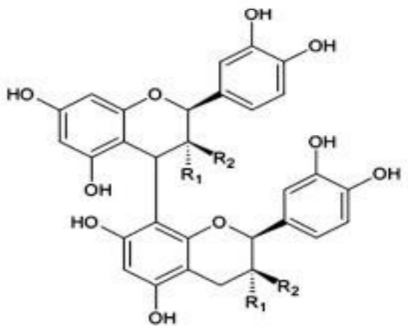
Steroids or steroid alcohols are the subgroup of steroids that have third-position hydroxides in the A-ring and are amphiphilic lipids. Being classified as phytosterols, plant sterol has many health benefits (Liolios *et al.,* 2008). The date fruit were tested and sterols were found to have some essential chemicals such as cholesterol, campesterol, stigmasterol, β-sitosterol and isofucosterol (Kikuchi and Miki, 1978).

Procyanidins

In fruitlets, berries, nuts, seeds, flowers and bark, procyanidins are the primary precursors of condensed tannins and blue-violet and red pigments (Fine, 2000). Hong et al. (2006) Using the method of extraction of acetone–water–acetic acid solvents. Procyanidine extraction is suggested in the chemical analysis at Khalal maturity level, Deglet Noor Procyanidine as polymer with highest molecular weight, decamers and heptadeccamers (Hong *et al*., 2006).



Compound	R_1	R_2
Catechin	-H	-OH
Epicatechin	-OH	-H



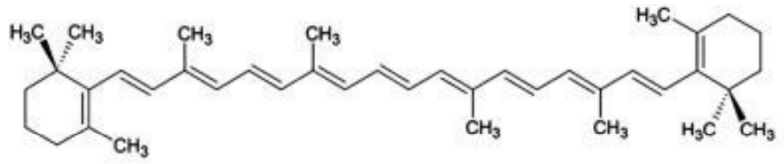
Procyanidin (β 4 → 8) Dimer

Carotenoids

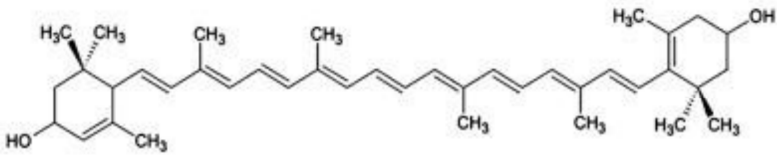
Carotenoids are believed to be the primary phytochemicals within lipid part of date fruit. The vitamin A antioxidant, which protects cells against harmful effects of free radicals, performance a central role in vision and acts (Julia *et al.,* 2015). The classification of carotenoids is based upon existence or lack of molecules of oxygen and separated into two major sub-categories: xanthophylls (which have atoms of oxygen) and carotenes. In the three stages of aging of edible products (Fard, Khasab, and Khalas) three different types of carotenoid compositions were studied; And the lutein and β-carotene data were found as the main carotenoids. (Boudries et cetera, 2007). A small number of fruit dates and Neoxanthin, violaxanthin, and antheraxanthin were found. Common carotenoids analyzed three different date fruit (Fard, , Khalas and Khasab) and confirmed that this variety was yellow due to haviey amounts of carotenoids, so Khalas, as predicted, was exposed to 4%-30% of the total carotenoid range after drying fruit (Al-Farsi *et al.,* 2005a).

A total of β-carotene is indicated for Deglet Noor, Tantebouchte and Hamraya, 6.4, 3.3 and 2.5µg/100 g, while a lutein content of 156, 28 and 33.6 µg/100 g is recorded for the Algerian fresh varietal (Boudries *et al.,* 2007, Al Farsi and Lee, 2008). During the transition from Khalal into Tamar, the level of carotenoids decreases significantly, and the level of deglet-Noor pro-vitamin A increase to some extent during the ripening processes, while the level of Tantebugte and Hamraya decreases (Boudries et al., 2007). Examination of dried and fresh khalas, Fard and Khasab in total carotenoid content demonstrated that the sun is lost during sun drying carotenoid loss (Al Farsi et al., 2005b).

Dried Date Fruit, which are 2,20 mg/100 g of sand apricanes, is a medium source of carotenoids in comparison to other dried fruit charotenoids (Martin-Sanchez *et al.,* 2014).



β-Carotene



Lutein

Phytoestrogens and Phytosterols

Phytosterols are still another important phytochemicals in the lipid-soluble portion of the date fruit. These compounds are only available for plants with a cholesterol-like chemical structure (al-Laith, 2009). More than 200 plant sterols, many of them in fruit and vegetables (Amoros et al. 2009) are included in the nature. Date Fruit contains several domesticated plant sterols. Initially, cystine phytosterol compound was first dislodged as β-sitosterol, stigmasterol, wild vegetable oils, and sitosterol from the edible portion of date fruit at the beginning of 1978 (Kikuchi and Miki 1978).

Nevertheless, the disparity between the fruit types of date fruits and the stage of maturation in the composition of plant sterols is still uncertain and has become a significant route for further research. Plant estrogen also binds to the receptor of estrogen and may have various effects on oestrogen or anti-estrogen (Al-Turki *et al.,* 2010). Phytoestrogens have been identified such as silkworm, daidzein, genistein, glycine, Mata rechinol, lalithiresinol, mat phenol, sequoiol riccirecinol, and peppermint (Thompson *et al.,* 2006).

Phenolic acid

Phenolic acid is considered one of the greatest metabolites of scented secondarily plants and includes the hydroxy role of one or more groups of carboxylic acids found on the aromatic benzene chain. They are regarded as effective antioxidants for the reason that they are free radical intruders or cleansers. Various study teams have identified phenolic acid rich day (Saleh et al., 2011; Benmadour et al., 2013; Sohami et al., 2015). Three specific fruits of omani have been reported, including the following derivatives of benzoic acid: protocatechic acid, p-hydroxybenzoic acid, gallic acid, syringic acid, vanillic acid, while cinnamic acid derivatives include: p-coumaric acid, o-coumaric acid, caffe acid and ferulic acid (Al-Fasi et al., 2005a).

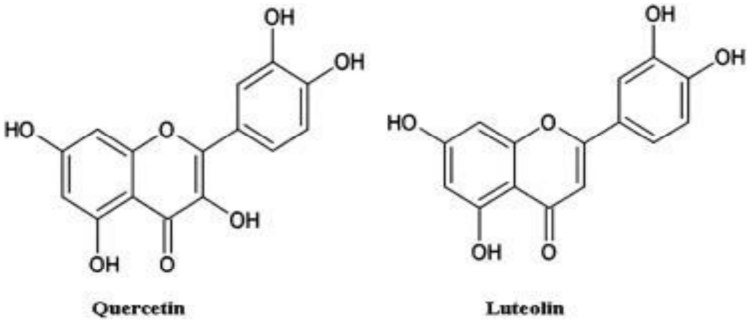
Seven different fruit varieties were cultivated in Algeria in another study, recognizing essential phenolic acids such as ferulic acid, p-coumaric acid, and synaptic acid. Three various 5-O-caffeoyl-shikimic acid isomer were found, as were xanthoxylin acid, hydrocephalic acid, and kamaroilquinic acid (Mansuri et al., 2005). The most important PHA in Saudi Arabia is the derivative of GAA, CUA and ferullic acid, compared with standard UV and phenolic acid compounds (Hamad et al., 2015) with peak retention times (Karasawa et al., 2011). Phenols were found to be significantly larger in the palm stage, respectively, than 0.729g/100 g and 0.559 g/100 g/ t (wt/wt) in the entirely matured tamer stage (Lemine et al, 2014). Moreover, at the stage of ripening with khanil, the number of phenolic compounds has dropped by 25 percent to date from Tunisia (Awadh et al., 2011). Changing the total phenolic content at 4 ° C was examined in Khalas and Shashi, with significant increase in phenol content following 6 months, and doubling the phenol content after 12 months (Al-Najada and Mohammed, 2014).

Flavonoids

Flavonoids consist of 15 carbon-skeleton secondary metabolites, comprising two aromatic rings A & C, linked to C with a het heterocylic pyron ring connection. Flavonoids include flavonoles, flavonols, flavanols, isophlavones, flavanol-s, and

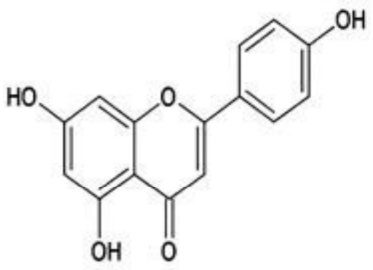
anthocyanidine. are classified as groups. Flavonoids Flavonoids have significant antioxidant and anti-inflammatory effects in a large variety of fruit and vegetables (Moss and Ramji, 2016). Arrangement in the state of disturbed state of flavonoid glycosides and procyanidins, palm ironing / tandem mass chromometry (LCESI / MS), and this is 13 quercetin flavonoid glycoside. The 19 forms of isomeric epigenine, luteolin and quercetine have also been identified as containing flavonoid sulfate.

Diglet Noor, harvested through liquid chromatography tandem mass/ionization spectronometry (MS / LCESI) at the Khal stage of maturation, found to have 19 isomeric glycosides, including 19 flavonoids of isogenic, luteoline and quercetine. Furthermore, flavonoid sulfates were reported (Hong et al., 2006). The variety Corcombebe has the highest flavoid levels among Tunisia's 10 varieties and is therefore the most effective anti-radical (Chara et al., 2009).). In Oman, three cultivars (Farad, Khasab, and Khalas), edible in two phases are examined according to the flavonoides content; Rutab and Tamar (Singh, and others, 2012). Plant pulp is good for the health benefits of certain cardiovascular diseases and certain types of cancer processes including antioxidants and free radical purifying (Tapas et al. 2008). It was reported that the highest level of flavonoids is presented in Tunisia.



Quercetin

Luteolin



Apigenin

Natural Products

Natural products are organic derivatives of primary or secondary metabolism molecules, generally done through biocatalysis involving biocatalysts (enzymes). Because natural products are a natural biosynthesis, they are associated with very important molecules of biopolymer in living cells, including DNA, RNA, and Protein (Receptor and Enzymes, that are similar medical objectives (Marbet et al., 2016). As a example in coffee beans the constituent of caffeine display biological activity in the dealing of CNSs (Silva et al., 2013; Kaster et al., 2015). Isolated from grapes (Vitis vinifera), the benefits of anti-diabetic, cardiovascular and anti-cancer are reported to prolong life (Sajish and Schimme 2015; Dance 2016). It is estimated that 62 percent of modern medicinal products are of natural origin, of which (14 percent) are natural product imitations or contain natural drugs. Either completely manufactured (27) percent or manufactured to imitate natural products (11 percent) are the other 38 percent of synthetic pharmaceutical products (Newman and Cragg 2016). The World Health Organization (WHO) has reported ca. In addition. 80% of the global population is based on primary health care in traditional medicine (Awad et al., 2011). Extract of natural products from dates are characterized by a wide range of beneficial health effects, including infectious and antifungal effects and antioxidants (Al-Qarawi *et al.,* 2004; Vayalil, 2012; Rahmani *et al.,* 2014).

Therapeutic Options

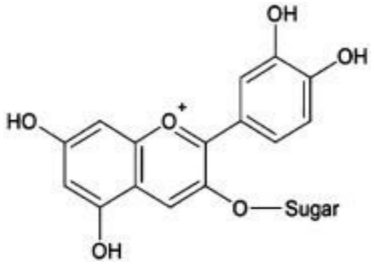
Anti-oxidants are of particular concern as that behave as free radical Scavengers linked to several disease counting cancer cardiovascular (Moss and Ramji 2016), Alzheimer's (Frostet al 2014) and parkinson's disorder (Kim etal. 2015). Reactive oxygen (ROS) forms are more oxidative than body detoxification capabilities as they undergo greater oxidation. Naturally it produces antioxidants like dismutase superoxide (SOD), catalase and peroxidase glutathione (GSHPx) in order to defend in contradiction of neutralized free radical, free radicals and make them inoffensive for further cells (Nathan and Cunningham-Bussel 2013).

The usefulness of such antioxidants has been demonstrated in reducing oxidative loss in human DNA bases (Kotepui 2016), as well as in protecting in contradiction of disease of heart (Haasym and Oledzki 2014) and protecting in contradiction of peroxidation of lipids (Basu et al., 2014). This is not necessary for generating body radicals to be

neutralized. Antioxidant activities related to ordinary antioxidants like Vitamin C, Beta-Carotene and Vitamin E have been shown to be found in phenolic compounds (Rautiainen etcoll. 2016). The research found that for dates, greater exposure to the sun, and extreme temperatures in comparison with other fruit, most polyphenols were required (Vinson et al., 2005). The composition differs from variety to variety, according to soil conditions and farming practices such as planting days in Algeria, changes in the nutritional quality of the fruit, etc. at Oman (Seleh et al., 2011; Al-Farsi et al.,2005b; Chaira et al., 2009). Following Hawthorn, the most common antioxidant activity in China was found to be the second most highly antioxidant (Guo *et al.,* 2003). Subchronic rat liver exposure Tests of dimetoate hepatoxicity and data extracts indicate that liver damage has been restored (Saafi et al., 2011). Other research study on extraction of date fruit (deglet noor variety) protects in contradiction of hepatotoxicity oxidative damages. Work in several studies of the hydrothermal immunomodulatory effects since then in tamer levels, trim and figs within mice (Mansoori et al., 2005). Additionally, treatment with the two compounds with the aid of testosterone in serum for alloxal diabetic male rats substantially reduced the overall rate of phosphorous activities (Singh *et al.,* 2012). Water and ethanol were strongly antibacterial in the measurement of microbial activity of some Egyptian dating strains of fruit against five pathogens (El Sohaimy *et al.,* 2015). A cardioprotective effect was observed on the body with the extract of the liophilized aqueous date (Ajwa varieties). Improves myocardial infarct cell proliferation to 40 % to prevent endogenous antioxidant degradation and lower lipid peroxidation.

Anthocyanins

The anthocyanins are water soluble, red, purple or blue vacuum pigments. In many berries, vegetables, cereals and flowers, these are commonly used with health benefit (Wang et al., 1997). The higher amount of anthocyanin discovered within Khasab (1.5mg/100g) followed by Khalas (0.87mg/100g) and Fard (0.9mg/100g) is indicated by fresh date variety analysis, and anthocyanin is related to the colour. Claim that the presence of anthocyanin only occurs during fresh days and may be sun-dry (Al Farsi *et al.,* 2005b).



Pharmacological:

The effectiveness of drug uses was poor and drug efficacy reduced due to the advent of conflict and tolerability of remaining drugs. In the pharmaceutical industry there is an growing trend to substitute artificial medicine with natural plant based products. Such natural sources, rich in phytochemicals, have increased anti-inflammatory properties (Chirumbolo, 2012). Traditionally and traditionally, the dates in Ajwa are anti-inflammatory, heap toxic, cancer and cardiac diseases that have many of the problems and disorders (Hussain Mallhi et al., 2014; Al-Yahya et al., 2015; Ragab et al., 2013). The following segment describe the pharmacological characteristic of the pit and flesh of Ajwa.

Antioxidant activity

Ajwa cultivars are common in Arab countries and are also antioxidants because of their high phenolic, melatonin, vitamin content, carotenoids and melatonin (Chiara et al., 2009; Al Farsi et al.,2005; Al-Farsi and Lee, 2008). In water and alcohol extracts, antioxidants of Ajwa fruit have been studied.

In Ajwa, antioxidants are mainly hydrophilic in lipid membrane systems and exhibit high antioxidant activity (Al-Farsi et al., 2005). The strong antioxidant contribution of today's aqua fruit extracts is a strong compared to alcohol extracts. Saleh et al. (2011) Search for MTT ethyl-acetate (3-(4,5-Dimethylthiazol-2-yl), methanol and water extract, Ajwa has an average peroxidation of lipid inhabitation of 250% of the inhabitation of 88, 70% and 91%, respectively (Zhang et al., 2013a, b). The experimental model Rabbits Ajwa dates showed increased serum antioxidant enzyme levels and lower lipid hydroperoxide levels in rabbits containing antioxidant lead (Ragab *et al.,* 2013). Inhibiting free radicals thereby reduces disease propagation is the possibility of Ajwa dates playing an anti-oxidant role. These strong effects on antioxidants are further confirmed in another research by Ajwa (Al-Yahya et al., 2015; Zhang et al., 2015; Ahmad et al., 2016).

To this date the extract from Ajwa is evaluated so that anti-oxidant which is essential like per oxidase, Glutathione peroxidase and carnitine acyltransferase (Al-Yahya et al., 2015). In a current study containing several Ajwa fruit extracts. Solid antioxidant 74.19 µg/mL of gallic acid were found in the extract of methanol (Arshad, Jelani, Haroon and Masood, 2015).

Antiviral, antifungal and antibacterial activities

To test the Pseudomonas phage antiviral activity Ajwa date drums for acetone extraction. Results indicated antiviral activity at MIC<10µg/mL. The pit extract's antiviral potential clearly characterizes variables such as the concentration scale, phage motility, and fractional time reduction. The resolution of the infectious phage is inhibited, making it the best

option regarding HIV treatment (Jassim and Naji, 2010). The dates Ajwa leaves and pits have been reported to inhibit Aqeuous, methanol and acetone extracts Alternate Fusarium sp., F. Oxysporum Alternaria spp. F. Solani, Trichoderma sp. and that's A. Flavus sp, man. An inhibitory activity of 51.5 percent against A. Alternate showed by the leaf extract, while inhibitory activity was 29.4%, 38.5% and 6.3 % compared to F. Solani, F. Guy. Its F.Oxysporium and Fusarium. Oxysporium, The ajwa pits also presented 40.9 percent inhibitory activity in contradiction of A. Alternata and 38.5% vs F. Fusarium, minor aggression against F was detected too. F. Oxysporium, Solani. Oxysporium. The action pattern was also reported by Boulenouar Cheriti (2011), Marouf,as an extract of methanolic pits> extract of the methanolic leaves >extract of the Acetone pits > extract of the propanone leave (Bokhari & Perveen 2012).

Anti-inflammatory activity

Inflammation is physiologically more effective defensive to prevent a variety of factors including infection burns and chemicals (Dubey, Sanadya,Sati& Sharma 2011), Inflammatory leukocyte unnecessary free radical production causes some difficulties including arthritis and diabetes (Zhang et al. 2015). Conditions of inflammation contribute to various diseases and lead to them.

Cancer, Inflammation, Diabetes and some other syndromes are transcription factors (LOX and NF-kBPost-studies have demonstrated the excellent anti-inflammatory agents for plant ingredients, such as flavonoids and phenols (Talhouk, Karam, El-Jouni, & Barbor 2007). The date for methanol extract and water-based cutting Ajwa has been tested in albino rats, with anti-inflammatory effects, in order to increase the stages of COX 1 and 2. Ethyl ethanoate, methanol and water abstracts from Ajwa fruits constrain COX-1 and COX2 cyclooxygenase lipid peroxidation enzymes. These studies also show that Ajwa fruit contains anti-inflammatory components including polyphenols, fibers, steroids and minerals (zhang et al., 2013a,Zhange et al.,2013b, zhang et al., 2015, Zhang et al., 2014). Lyophilized extract Ajwah date decreased the concentration of apoptotic marker forms such as caspase-3 and Bax to 250 mg / ml to lower their expression in pro-inflammatorycytokinesincludingIL-6,IL-10 and TNFa, as well as in vivo and ex vivo models (Al-Yahya et al., 2015). Ajwa also dates the application of 250 micrograms of a lyophilizing extract and displays solid cardioprotective special properties in the rodent model with a decreased edema, myonacrosis and inflammatory cell penetration (Al-Yahya et al, 2015).

The operation with NMR approach of various Ajwa extracts was demonstrated by Abdul Hamid et al. (2015). In addition, Ajwa dates freezes, which have been dried and excerpts show remarkable nonsensical prevention compared with other extracts the results of the studied were based on the fact that the dates are critical for Ajwa activity in inhibiting the extractive nitric oxide (Abdul-Hamid et al., 2015)

Activities of Nephrotoxic and Hepatoprotective

Nephrotoxicity is a common issues of various antibiotic medications and Ochratoxinis mycotoxin produced by antibiotics that can disturb the kideny or cause kideny disaster (Shekaari, Najar, Basiri and Kalantaripour, 2012). The possible anti-toxin date of ajwa was tested for rabbits. Oral doses of ochratoxin increased significantly and weakened proximal tubules to serum creatinine and rabbit uric acid levels. Besides this, Ajwa extract decreases the amount of fluid urea and Creatinine. The occurrence of injury is decrease in the extract of the date Ajwa combined with ochratoxin (Ali et al. 2011a, Ali et al. 2011b). Abu Bakr has studied, next to ochratoxin A hepatotoxicity, the remedial result of the aqueous extract in rats. For rats pretreated with Ajwa, the expression of bilirubin and ALT enzymes dates back to the aqueous extract with this drug. In another study we documented a positive effect in gentamicin from the rat-treated nephrotoxicity model Ajwa and pit. The concentration of creatinine and urea in the Blood Plasma (Al-Qarawi, Abdel-Rahmann, Musa, Eli and Mougy, 2008) decreases considerable in the combination of ajwah (50%(v / w)) or pit water (2:1(w / v)), with food products. Ajwa date extract serving (300 mg / kg / day for 14 days) is considerably reserved to minimize albino rats ' antioxidant in case of lead acetate toxicity induced (Ragab*et al.,* 2013).

Antidiabetic activity

Plants perform a chief role in treating diabetes and its complications, with diabetes retinopathy, through regulating molecular and metabolic ways (Gupta et al.2011). The phytochemicals are able to regulator the function of pancreatic tissue through increased making of insulin and decreased glucose absorption into the intestinal wall. Saponins, phenols, hormones and flavonoids, which perform an important part in diabetes prevention, may be the reason for antidiabetic movement of Ajwa extract (Hussaine Mallhi et al. 2014).

The effects of a-glucosidase enzymes and glucose absorption are reduced by phenolic compounds in the kidneys and small intestine. Nevertheless, in human body the release of insulin is regulated by phenolic compounds. A large portion of the Ajwa fruit perform a powerful anti-diabetic role by screwing out free radicals (Zhang et al. 2015). Concerning the blood glucose levels of a diabetic rat, a concentration of 100g / L in the aqueous extract may induce streptozotocin. In addition, the use of Ajwa seed extract in long periods improves the role of kidney liver and the oxidative stress balance with induced diabetes in the rat streptozotocin (Hasan & Mohieldein, 2016).

Antioxidant activity

For the first time in vitro experiments have shown that the aceous extract of date fruits is an efficient scavenger of superoxide and hydroxyl radicals and a process dependent upon application for the inhibition of iron-pumped butterfly

peroxidation and oxidation of proteins in the rat brain (Vayalil 2002). Therefore, other researchers with different date variations have completed these studies (Al-Farsi et al., 2005b; Mansouri et al., 2005; Abdul & Allaith, 2008) Tunisian anti-oxidant activity year recently calculated by (Chaira *et al.,* 2009).

The study found that the variety of Korkobbi dominated the better lipoperoxy radical selection operation, while the Rothi cultivar successfully searched for the radicals of hydroxy. The writers believe that Korkobbi was accountable for the key anti-radical properties of the maximum level of flavonoids (Chaira et al., 2009). The studies of animals also showed that antioxidant enzyme gene expression in rat cardiography is increased when p-coumaric acid is feeding orally (Yeh *et al.,* 2008). Dates observed are due to antioxidants, such as anthocyanins, phenolic compounds, flavonoid glycosides and the sun-drying and developing procyanidins that exists thereby minimize activities of antoxidant (Al Farsi., 2005b; Abdul & Allaith, 2008).

It is also recorded that selenium is contributed to the antioxidant effects in dates. Recent studies have revealed that this necessary trace element primarily applies its function of antioxidant in the form of residual of selenocysteine integral to ROS detoxifying selenoenzymes GPx, thioredoxine reductases and selenoprotein (Steinbrenner and Sies, 2009). When measured in total, its very clear that different radical scavengating and antioxidant effects could result in various phenolic compounds and selenium (Ferguson et al. 2004).

Activity of Antimutagenic

Vayalil studies showed that extract of date fruit-controlled properties of antimutagenic in experiment of Ames mutagenicity. The extract along with the metabolism induced by pyrene in salmonella sample pressures TA-98andTA-100 has a volume dependent reserve ofbenzo(a), mutagenicity. A low 3.6 mg / platform concentration and 4.3 mg / platform induced the revertant reserves of 50% in TA-98 and TA-100 (Vayalil, 2002).

The component of dates for proanthocyanidin, anthocyanins (Dauer et al., 1998; Gasiorowski et al., 1997), Beta-carotene and all phenolic acids reported anti-mutagenic effects (Birossvá *et al.,* 2005). All of the above components can be combined for the anti-mutagenic effects found in the research Ames and requires confirmation in the animal systems of the investigation in the date fruit.

Hemolytic activity effect of Streptococcus pyogenes

Date slowed down in vitro experiments Extracts of the development of S. Pyogenes. Bacterial incubation with extract of date fruit in 24 hours at the 5, 10, and 20% dilution led to a 30.8% reduction in parallel partners' amount of microbes in the amounts of 64.7 and 88.5%.

The dates extract further neutralized streptococcal exotoxin streptolysin O's hemolytic activity, likely because of erythrocyte membranes and streptolysin O enzyme inhibition at low levels. Fractional studies showed that the inhibitory material was not protein-like and steroidal in nature since its inhibitory effect had not been reduced by the extract's deproteinisation (Abuharfeil et al. 1999). Independent studies have demonstrated a known membrane protection effect on dated anthocyanins, carotenoids, procyanidine and flavonoids and those compounds are relatively probably protected against harm by the erythrocyte membrane (Hocman, 1988; Tapas *et al.,* 2008).

Conclusion

In conclusion, cell cultures animal and human studies indicate that date palm can affect human health and disease positively phytochemical components may function independently, additively and synergistically within the entire palm fruit matrix to improve their biological characteristics; this needs to be further explored in well-made experiments. It must be remembered that it is not possible to translate the results of in vitro and animal studies into biological endpoints that will be observed in humans. More work should therefore be undertaken to examine the effectiveness of date palm in humans in the prevention and treatment of various diseases. Additionally, data on absorption, distribution, metabolism and action mechanisms of date palm phytochemicals and pharmacological in humans must help in evaluating successful dietary portion of date fruit. It is also worth investigating whether the biological properties of the dates remain improved by adding phytochemicals and pharmacological chemicals obtained from other fruits and vegetables. Ultimately, given the number of studies currently performed with date-effects, it will be appropriate to re-examine them in a few years.

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