

Date (*Phoenix dactylifera*. L) and it's seeds Phenolic Compounds and Fiber: A Promising Natural Therapeutic Agent: A Review

Akanksha Soni & Pritee Kale
VSS INSTITUTE OF PHARMACY, Badnapur

Submitted: 20-01-2024

Accepted: 30-01-2024

ABSTRACT:

The goal of this abstract is to explore the promising therapeutic potential held by date seeds which are typically discarded as waste in the date fruit industry. These often overlooked seeds are rich in phenolic compounds and dietary fiber that provide several health benefits including antioxidant and anti-inflammatory properties along with better digestive health while reducing chronic disease risks. Furthermore these seeds serve as a source of alkaloids, flavonoids tannins steroids along with vitamins plus high dietary fiber content making them an ideal ingredient in dietary supplements or food products. The antioxidants found within these seeds help prevent chronic ailments from occurring & progressing over time. Research shows that consuming normal amounts of date flesh or/and pits is beneficial for providing dynamic liver support plus being a low cost preventative measure against liver cytotoxicity. In summary then - through this review paper we aim to comprehensively evaluate the therapeutic potential presented through phenolic compounds & dietary fibers obtained from date seeds; focusing on their various applications & medical advantages.

I. INTRODUCTION

Date seeds are the small, hard, and oblong-shaped structures that are found inside the fruit of the date palm tree (*Phoenix dactylifera* L.). They represent a significant byproduct of the date fruit industry, as they are typically discarded as waste. However, research has shown that date seeds are a rich source of phenolic compounds and dietary fiber, both of which have potential therapeutic benefits. Phenolic compounds are known for their antioxidant and anti-inflammatory properties, while dietary fiber is associated with improved digestive health and reduced risk of chronic diseases such as cardiovascular disease and diabetes.

Phoenix dactylifera L. belonging to family Arecaceae, genus Phoenix that consist of 12 species native to tropical Asia and Africa. Taxonomy According to Wealth of India 1985:

Kingdom	Plantae
Division	Magnoliophyta
Class	Liliopsida
Order	Arecales
Family	Arecaceae
Genus	Phoenix
Species	Phoenix dactylifera
Binomial name	Phoenix dactylifera Linn

Due to their potential health benefits, there has been increasing interest in the utilization of date seeds as a functional food ingredient or as a source of bioactive compounds for use in various industries. This review paper aims to provide a comprehensive evaluation of the therapeutic potential of phenolic compounds and dietary fiber from date seeds, with a focus on their health benefits and potential applications.

Scientists have studied and characterized various dietary fibre sources as a result of the protective effects of fibre consumption in the prevention of heart disease and cancer, normalization of blood lipids, regulation of glucose absorption and production of insulin, and avoidance of bloating and diverticular problems. (J Salmeron et al.,1997)^[1] (VM Aldoori et al.,1998)^[2] (DJA Jenkins et al.,1998)^[3]. A lot of individuals in the region of the Middle East think that consuming dates, especially first thing in the morning and on a vacant stomach, can counteract the effects of any poisonous substances to which the individual may have been exposed. We therefore set out to determine whether date flesh and pits could mitigate or even reverse some of the deleterious effects that carbon tetrachloride (CCl₄) has on rats' livers. In the latter, acute viral hepatitis is modelled. (AlQarawi et al.,2001)^[4]. The effects of consuming normal amounts of date palm (flesh or/and pits) are more significant to the general

public, particularly because they are a dynamic liver support and a low-cost, effective preventative measure against liver cytotoxicity. The Phoenix dactylifera L. plant is the focus of this study and other studies because it may be a safe and effective plant with significant medical benefits. (AA Al-Qarawi et al.,2004)^[5].

Phytochemical analysis:

Alkaloids, flavonoids, tannins, steroids, and vitamins are all present in the entire plant of dates. According to its phenolic composition, it contains flavones, cinnamic acids, and falconoid glycosides. Thin layer chromatography (TLC) was used to identify steroid analogues of cholesterol, including sigma-sterol, campesterol, and alpha-sitosterol.(Ali Ahmed et al.,2016)^[6] According to (Al- Farsi et al.,2007)^[7] who conducted research on the useful features of date seeds, their composition consisted of 22.5-80.2% dietary fibre, 3.1-7.1% moisture, 2.3-6.4% protein, 5.0-13.2 fat, and 0.9-1.8% ash. Additionally, seeds are rich in phenolics (3102-4430 mg gallic acid equivalents/100 g), antioxidants (580-929 Im trolox equivalents/g), and dietary fibre (78-80 g/100 g).Due to their high dietary fibre content, date seeds have considerable nutritional value and can be used to manufacture dietary supplements and foods that are high in fibre.

The soluble sugars comprise glucose, fructose, raffi nose, stachyose, sucrose, and galactose in average concentrations of 3.5, 3.8, 3.2, 3.7, 3.5, and 2.2 g/kg respectively(8) Date seeds contain a high concentration of potassium (350-400 mg/100 g), phosphorous (200 mg/100 g), magnesium (70 mg/100 g), calcium (40 mg/100 g), as well as, to a lesser extent, iron (10-20 mg/100 g) (Al Juhaimi F et al.,2012)^[8] & (Al-Shahib W & Marshall RJ ,2003)^[9]

Antioxidants:

Diabetes, cardiovascular conditions, and cancer are the most common causes of illness and mortality worldwide. Among the fundamental mechanisms in the emergence and progression of are particularly prevalent in date seeds, can aid in the progression of chronic chronic diseases is oxidative stress. The current study investigates the effects of date seeds and assesses the status of oxidative stress on the blood and organs of male Wistar rats fed a basal diet with 0, 2, 4, or 8 g/kg of date seed powder (DSP) during a 13-week period. (Fatima Al-Meqbaali et al.,2016)^[10].

Due to their high concentration of phenolic components, particularly oleic acid, which ranges from 41.1 to 58.8%, date seeds have excellent antioxidant qualities. (Mannan Hajimahmoodi et al.,2010)^[11] (Hussah A. Al-Shwyeh ,2019)^[12] .Due to the presence of dietary phenolics, the antioxidant activity of date seeds ranges from 12540 to 27699 mol TE per 100 g. (Hussah A. Al- Shwyeh ,2019)^[12] .

Date seed oil also has useful qualities and is a promising source of oil because of the quantity of antioxidants and unsaturated fatty acids it contains. (Mohammad Fikry et al.,2019).^[13] The average value of the 15 types of Iranian dates' seeds oil yields was 9.5%, ranging from 6.2 to 13.2%. The highest oil yield in this scenario the highest one is communicated to the Piarom variety (6.4%), and the lowest one is relayed to the Shavi-shirin variety (13.2%). The antioxidant activity of the Shavi-talkh and Estamaran types were highest and lowest, respectively, at 55.5% and 5.1%, with the average being 30.1%. It was discovered that certain oils had an efficacy higher than trolox (34.0%), greatly reducing the concentration of DPPH free radical. These findings might increase interest in date seed oils for the food, cosmetics, and pharmaceutical industries.(Masoud Kazemi & Abolfazle Dadkhah ,2012)^[14] According to another study, date aqueous extracts contain antioxidant, antibacterial, and anti-mutagenic properties.Dates contain the highest level of polyphenols among dried fruits, according to a different study. The antioxidant activity of phenolic compounds is a result to their redox characteristics, which have a key function in absorbing and neutralizing free radicals. Studies on phytochemicals demonstrated strong antioxidant properties as well as the ability to reduce cancer incidence and mortality rates. Due of their high level of antioxidants, dates the antioxidant components 80400 mol/100 g and the carotenoids and phenolics with 3942 mg/100 g each. According to a recent study that looked at the antioxidant activities in different kinds of dates, including Fard, Khasab, and Khalas, Khalas had the best quality, the highest antioxidant activity, the most total carotenoids, and the most bound phenolic acids (Al-Farsi M et al.,2005).^[15]

Hepatoprotective activity :

Phoenix dactylifera is crucial in preventing cellular damage brought on by oxidative stress produced by the body produces free radicals (Pujari et al., 2011)^[16] Free radicals in the body induce oxidative damage that causes ageing, atherosclerosis, mutagenesis, neurodegenerative

illnesses, and depression. Lipids, proteins, and nucleic acids are attacked by free radicals, which result in problems. Phoenix dactylifera has been shown to have antioxidant and anti-mutagenic effects through in-vitro research. In a study, palm date syrup was evaluated on 25 New Zealand rabbits after carbon tetrachloride-induced hepatotoxicity. Enzymatic kits were used to primarily test for ALT and AST levels, and a spectrophotometer was used to quantify NADH disappearance. Blood was drawn from the heart. The rate at which NADH disappears is inversely correlated with ALT and AST activity. It was anticipated that ALT and AST levels would significantly decrease. In this experiment, three distinct syrup varieties—Saudi, Iraqi, and Rotab—were employed, each of which displayed a distinctive drop in enzyme levels. It was determined that among these types of Phoenix dactylifera, the total phenolic contents and flavonoids determine the hepatoprotective activity. Due to its high total phenolic and flavonoid levels, Rotab has the strongest hepatoprotective benefits. (Aktay. G. et al.,2000) ^[17]

In a different study, orchatoxin A was employed to cause hepatotoxicity in 28 wistar rats, and ajwa dates were assessed as a functional meal. This four-week study examined the liver tissues, ALT levels, and total bilirubin levels in order to determine the effects of aqueous extracts of Phoenix dactylifera flesh in the affected rats. Animal tests revealed that the extract has significant antioxidant activity. In comparison to the control group, bilirubin and ALT levels were decreased. Additionally, after being exposed to the aqueous extract of Phoenix dactylifera, normal tissues were seen under the microscope. When compared to rats treated with orchatoxin A, the number of histopathological changes was significantly decreased by extract treatment. Phoenix dactylifera may boost antioxidant enzymes. Phoenix dactylifera may enhance antioxidant enzymes that shield hepatocytes from oxidative stress, according to (Abdu SB et al.,2011). ^[18]

Anti-diarrheal activity:

Rat's castor oil-induced intestinal transit time and frequency of diarrhoea were significantly reduced when given an aqueous extract of Phoenix dactylifera L. spathe at dose rates of 3, 6, and 12 mg/kg body weight (Abdalla and Al- Taher, 2008).^[19] In a dose-dependent manner, Phoenix dactylifera can lessen the intensity of diarrhoea. In

this investigation, castor oil was used to cause diarrhoea. (Rajeev Kumar et al.,2010).^[20]

Antibacterial activity:

The importance of antimicrobial activity lies in its potential use in preventing or treating infections caused by microorganisms. Antimicrobial substances can be used in a variety of settings, including medicine, agriculture, and food production, to reduce the risk of infection and promote health and safety. It is important to use antimicrobial substances judiciously to prevent the development of antimicrobial resistance, a growing concern in the medical community. The species Phoenix dactylifera and its components have a major impact on bacterial disease prevention or therapy. Phoenix dactylifera's antibacterial activity was tested by Sood and Ramesa utilizing the plant's leaf, seed, fruit, and bark. Three extracts (aqueous, methanol, and acetone) were tested against standard strains of gram positive (*S. aureus*, *S. pyogenes*), gram negative (*E. coli*, and *P. aeruginosa*). Antibacterial activity was assessed by disc diffusion method through zone of inhibition, and kanamycin was employed as the reference antibiotics.

All plant sections reportedly possess antibacterial activity in all extracts. Compared to acetone and ethanol, aqueous extracts have reduced antibacterial activity. The bactericidal activity of fruit and leaf extracts was superior to that of seed and bark. The most effective extracts against *S. aureus* and *E. coli* are acetone fruit extract and methanol leaf extract, respectively. All of the extracts, however, performed less than regular kanamycin. Additionally, this study provides an accurate phytochemical profile of the Phoenix dactylifera plant. It is claimed that fruit and leaves have more potent antibacterial properties than seeds and bark. (Ramesh Shari baht & Shooed

Al-divan ,2012). ^[21] Because they can extract a wider variety of substances than water, methanol and acetone extracts are more effective. This makes them better and more appropriate solvents for antimicrobial research. With the exception of *E. coli*, fruit part has the strongest antibacterial action due to its high component content. Phoenix dactylifera's alkaloids, flavonoids, and tannins may be the cause of its antibacterial properties. Pits of Phoenix dactylifera, according to Al- Daihan, are active against gram-negative bacteria. (Sood Al-daihan & Ramesa Shafi Bhat ,2016).^[22]

Anti-Inflammatory and Anti-Proliferative Activity:

Anti-inflammatory and anti-proliferative activities are important biological effects that can be exhibited by various natural and synthetic substances. These effects are often interrelated and can have important implications for the prevention and treatment of a variety of diseases, including cancer and chronic inflammatory conditions. Important physiological defense mechanisms against a number of dangers, including infection, burns, poisonous substances, allergies, and other stimuli, include inflammation. Unbalanced inflammation has been linked to the onset and development of many illnesses. Inflammation, cancer, diabetes, and other disorders are all significantly influenced by transcription factors like LOX and NF- κ B. An essential and vital stage in the prevention of disease is the regulation of transcription factors. Transcription factor inhibitors are crucial. The commonly used inhibitors have negative side effects and are also pricey. Natural materials work well as both anti-inflammatory agents and NF- κ B suppressants. Studies have shown that plant components including phenolics and flavonoids are powerful anti-inflammatory agents. Date fruits are highly effective anti-inflammatory foods and current research suggests that the enzymes such as COX-1 and COX-2 involved in lipid peroxidation will be inhibited by ethyl acetate, methanolic, and aqueous extracts of Ajwa dates. A study using an animal model demonstrated that Phoenix dactylifera pollen may have protective effects by regulating the expression of certain cytokines. Another study on dates found that the edible portion of the fruit's methanolic extract played a crucial part in lowering plasma fibrinogen and foot swelling. The leaves of dates are a rich source of natural antioxidants and anti-inflammatories, according to a study supporting dates as an anti-inflammatory. Pollen suspension and extract were induced in rats with atypical hyperplasia (APH), and the results showed that both had protective effects. According to (Elberry et al., 2011)^[23], they modulate cytokine expression and/or up-regulate autocrine/paracrine receptors. Phoenix dactylifera hot water fruit extract. According to (Karasawa et al. in 2011)^[24], can also enhance mice's cellular immune system.

Antiviral activity :

Phoenix dactylifera acetone pit extract was tested for antiviral activity by Jassim and Naji in 2012, using *Pseudomonas aureginosa* as the

host cell against the lytic *Pseudomonas* phage. The results showed that *Pseudomonas* phage had antiviral activity with MIC 10ug/ml. Extract significantly reduces the *Pseudomonas* phage's ability to infect. The decimal reduction time, concentration exponent, and phage inactivation kinetics all show that Phoenix dactylifera has high antiviral properties. Jassim and Naaji claim that Phoenix dactylifera may be a cheap approach to protect against viral infections, and additional research on Phoenix dactylifera may be effective for HIV treatment, according to the inhibition of phage infectivity and bacterial lysis with Phoenix dactylifera pits extract (Sabah A. A. Jassim and Mazen A. Naji., 2012).^[25]

Delivery and Labor Relaxation :

P. dactylifera fruits can be consumed safely during pregnancy, according to research by (Al- Kuran et al., 2011)^[26]. According to the study, eating dates throughout pregnancy considerably lengthened labour and dilated the cervical region.

Anti Fungal Activity:

The antifungal activities of Phoenix Dactylifera's leaves and pits were discovered by Bokhari and Perveen in 2012. They examined the effects of leaf and pits extracts in water, methanol, and acetone on seven pathogenic fungus, including *F. oxysporum*, *F. solani*, *A. flavus*, *A. alternata*, *Alternaria* sp., and *Trichoderma* sp. was treated with two different varieties of dates, Barhee and Rothna, using the agar well diffusion and agar dilution methods.

Both types of water extracts had no impact on the growth of the tested fungus. Methanol pits and leaf extract demonstrated potent antifungal action against *A. alternata*. All extracts displayed poor to no antifungal efficacy when tested against *A. flavus*. Both kinds' methanolic extracts exhibited strong antifungal activity, with the exception of *A. flavus*. The following is the order of activity against practically all fungi based on the zone of inhibition: Acetone leaves extract followed by acetone pits extract then methanolic pits extract. Two types of Phoenix dactylifera extracts have antifungal capabilities, according to the study's conclusion.

Phytochemicals present in two kinds may account for the difference in how much fungus development is inhibited (Bokhari and Perveen, 2012).^[27] Boulouar et al., stated that the date fruit's dichloromethane extract also exhibits antifungal properties. (Boulouar et al., 2011)^[28]

Cerebroprotective And Neuroprotective Activity:

The cerebroprotective benefits of treating rats with date seed extract for cerebral ischemia were investigated. According to this study, seed extract considerably lessens neuronal damage.

Treatment with seed extract also retained the ultra structures of cortical neurons. Time lag was also improved, oxidative stress in the brain was reduced, and anti-oxidative enzymes were also restored. Phoenix dactylifera seed extract also lessens muscle deterioration, which acts as a preventative measure against ischemia reperfusion injury. Due to its antioxidant activity, Phoenix dactylifera has a cerebro protective effect. Phoenix dactylifera was beneficial, according to (Kalantaripour et al.,2012)^[29] and (Abdel-Rahman H et al.,2008)^[30], for treating brain ischemia. When Phoenix dactylifera fruit was administered to rats with ischemia brought on by bilateral common carotid artery blockage, its neuroprotective effects were investigated. Results show that Phoenix dactylifera is a neuroprotective agent because of its anti-oxidative capabilities and polyphenolic components such flavonoids, plant sterols, and ascorbic acids. (Pujari et al., 2011).^[16]

Anti-diabetic Activity:

(Michael et al.,2013)^[31] studied P. dactylifera fruit extract used to treat alloxan induced diabetes in rats. From this studied it was concluded that the antidiabetic activity has been shown due to the presence of active phytoconstituents i.e. flavonoid. Phoenix Dactylifera extract (PDE) contains a number of active substances, including flavonoids, steroids, phenol, and saponins, that have anti-diabetic properties. The epicarp of date fruits contains flavonoid chemicals that have been shown to significantly enhance various biochemical outcomes in diabetic mice. It shields against diabetes neuropathy. Alloxan was used to induce diabetes in male wistar rats. Phoenix dactylifera's ethanolic leaf extract was subjected to phytochemical analysis, which revealed the presence of flavonoids, saponins, steroids, and phenols but not tannins, alkaloids, or terpenoids. According to the study's findings, there is strong anti hyperlipidemic and antihyperglycemic activity. Additionally, the mechanism of action was shown. (Ehsan O.et al.,2012).^[32]

Anti-ulcer Activity:

The antiulcer activity of P. dactylifera was researched by (Gangwar et al.,2014)^[33]. At dose levels of 200 and 400 mg/kg, the chloroform extract of date palm leaves had demonstrated antiulcer activity, and the higher dose demonstrated the potent antiulcer activity in comparison to standard medication.

Sedative Activity:

According to (Rahimi et al., 2017)^[34], P.dactylifera's hydro-alcoholic extract has a sedative effect. A dose level of 125 and 250 mg/kg was shown to be suitable for maintaining the low and high frequency waves in this study's electroencephalography (EEG) results.

Anti-Cancer and Antimutagenesis Activity:

Globally, there are many different types of cancer. A significant factor in the onset and spread of cancer is a change in the usual method of action of genes. The present course of treatment, which combines radiotherapy and chemotherapy, is successful but also has drawbacks. Medicinal plant components like flavanoids and phenol play a vital role in the prevention of cancer by controlling genetic pathways without causing any negative side effects. Although the components of dates have demonstrated anticancer effect, its precise mode of action in the prevention of tumours is unknown. A study using an animal model revealed that the anticancer effects of the date fruit's glucans were dose dependent, peaking at 1 mg/kg of tumour tissue. According to an experimental study, rats fed with ajwa dates extract prior to ochratoxin had much less severe histological lesions and lower serum levels of total bilirubin and ALT enzyme activity than rats given with OTA.

The components of dates have a significant impact on the inhibition of phase I enzymes like CYP450 and the stimulation of phase II enzyme activity. An experimental investigation revealed that date pits' antigen toxicity is caused by their capacity to scavenge alkyl radicals or to impede cytochrome P-45's ability to aromatize. There have Foods with antioxidant activity have been shown to reduce the risk of cancer and cardiovascular disease and to extend life by 60%. On Salmonella typhimurium, the anticancer effects of date palm were discovered using vital capacity tests and the Ames test. Rat liver extract from Phoenix dactylifera pollen grains was administered to the bacteria to measure the prevention percentage.(Teng J et al., 2008)^[35] (Barzin G et

al.,2011).^[36] In another study, it was observed that fruit extract of *Phoenix dactylifera* has potent anti-mutagenic activity and this study also demonstrates free radical scavenger like activity of fruit extract of *Phoenix dactylifera*. (Praveen K. Vayalil.,2002)^[37] A polysaccharide called glucan was discovered from Libyan dates, and research into its anticancer properties revealed that it possesses strong antitumor properties that may be attributed to (1-3) D-glucan connections. Dates were the subject of this investigation for the first time because of their purported anticancer properties (Ishurd and Kennedy, 2005).^[38]

Male Infertility and Testicular Dysfunction:

The use of natural remedies to enhance sexual performance is progressing. *Phoenix dactylifera* pollens can raise testosterone levels in cirrhotic patients, improving their sexual well-being. (Ahmed et al., 2008).^[39] 50 Sprague-Dawley rats were fed *Phoenix dactylifera* pollen suspension for 35 days as part of the experiment. Blood and serum samples served as the investigation's starting points, and a microscope was used to examine the morphology of the testis, epididimis, seminal vesicle, and prostate. It was observed that following therapy, sperm characteristics such as motility, count, and morphology improved, particularly with doses of 120 mg/kg. DNA denaturation has also been shown to be reduced by *Phoenix dactylifera* pollen suspension, particularly at high concentrations. While there was minimal effect of *Phoenix dactylifera* pollens on prostate and seminal vesicle or histology of reproductive organs during this investigation, weight of testis and epididimis also rose. Dates have been shown to contain flavonoids and estradiol, both of which improve the health of sperm. So, enhancing male reproduction in the process. The gonadotrophin-like effects of *Phoenix dactylifera* may be caused by its steroidal components. Consequently, *Phoenix dactylifera* pollen can be utilised to treat issues with male infertility. (Bahmanpour et al., 2006)^[40]

Female infertility and hormone levels:

Estradiol, Estrone, and Estriol are the three estrogenic hormones found in females; Estradiol is the most potent hormone for women of reproductive age, whereas Estrone is a hormone found in menopausal females. Estrone has also reportedly been found in Egyptian palm pollen. In a study that used column chromatography to analyze an extract of date palm pollen grains, estradiol and estriol were first determined. Examined pollen

extract fractions in n-hexane and ethyl acetate revealed 10 and 5 chemicals, respectively, including estradiol and estrone. In this work, the presence of estradiol in dates was first identified using HPLC. Strong antioxidant activity of *Phoenix dactylifera* pollen extract is also supported by this investigation. This is the first study to show how to analyze *Phoenix dactylifera*'s phytochemical composition. This study has shown that *Phoenix dactylifera* can be utilized to treat female infertility caused by hormonal deficiencies. (Abbas and Ateya, 2011).^[41] Another study that used 24 immature white female albino rats to examine the effects of polar (methanol and anhydrous methanol) and non-polar (petroleum ether and ether) extracts of *Phoenix dactylifera* seeds on uterine weight and degree of vaginal opening also established the plant's estradiol-like activity. These two extracts' effects were contrasted with those of estradiol. Following investigation, it was discovered that estradiol has the greatest impact on the aforementioned parameters, followed by polar extract, and non-polar extract has the least impact. According to the study's findings, both extracts show varying degrees of estrogen-like action in rats. As an interesting side note, this study also demonstrated the safety of both extracts because adult male and female albino mice were used in acute toxicity experiments. (Ammar et al., 2009)^[42]

Treatment against cryptosporidiosis:

Cryptosporidium infection, which is harmful and causes immunodeficient hosts, was studied by (Mahmood et al., 2016)^[43] There is no suitable treatment for this illness. In order to treat immunosuppressed mice, *P. dactylifera*'s aqueous extract was employed. After examining every immunological parameter, it was determined that *P. dactylifera* use produced meaningful results.

Treatment for Alzheimer disease:

At dose levels of 100, 200, and 400 mg/kg, (Hussain et al., 2015)^[44] investigation looked at how *P. dactylifera* leaf extract prevented chemically induced memory loss in mice using scopolamine and streptozotocin. The antioxidant and neuro-protective properties of the plant extract are also present. According to the findings of this study, fruits may be able to help those with Alzheimer's disease.

II. CONCLUSION:

Recent findings display that both the date fruit itself in addition to its constituent seeds harbor a wealth of phenolic compounds together with fiber - indicating they represent an appealing all-natural choice regarding therapeutics. In fact, positive bioactive additives located inside date end result/seeds demonstrate considerable ability are: treating continual illnesses significantly together with diabetes, cancer or in addition related cardiovascular problems. Furthermore, thank you largely because of robust stages of dietary fiber contained therein, universal digestion and body weight control appear to benefit from incorporating those gadgets normal intake.

Primarily based on an inclusive overview of gift-day literature, it's clean that integrating each dates and their seeds mechanically into one's consuming behavior proves a smart way of ensuring finest fitness safety against sicknesses. But comprehensive research ought to continue before we are able to harness all of the capability healing blessings natural products like those provide - in conjunction with any unexpected poor results.

REFERENCES:

- [1]. J Salmeron, A Ascherio, EB Rimm, GA Colditz, D Spiegelman, DJ Jenkins, MJ Stampfer, AL Wing, and WC Willett —Dietary fiber, glycemic load, and risk of NIDDM in men. *Diabetes Care* 20: 545–550. 1997
- [2]. VM Aldoori, EL Giovannucci, HRH Rockett, L Sampson, EB Rimm, and WC Willett — A prospective study of dietary fiber types and symptomatic diverticular disease in men. *J Nutr* 128: 714–719. 1998
- [3]. DJA Jenkins, CWC Kendall, and TPP Ransom —Dietary fiber, the evolution of the human diet and coronary heart disease. *Nutr Res* 18: 633–652. 1998
- [4]. AlQarawi AA, Abdel-Rahman HA, ElMougy SA: Hepatoprotective activity of licorice in rat liver injury models. *J Herbs Spices Med Plants*. 2001; 8:7–14.
- [5]. AA Al-Qarawi, HM Mousa, BEH Ali, H Abdel-Rahman, and AA El-Mougy —Protective effect of extracts from dates (*Phoenix dactylifera* L.) on carbon tetrachloride-induced hepatotoxicity in rats. *Int J Appl Res Vet Med* 2:176–80,(2004.)
- [6]. Ali Ahmed, Naheed Bano, Muhammad Tayyab —Phytochemical and Therapeutic Evaluation of Date (*Phoenix dactylifera*). *A Review. Journal of Pharmacy and Alternative Medicine* ISSN 2222-4807 (online) ISSN 2222-5668 (Paper) An International Peer-reviewed Journal Vol.9, 2016
- [7]. M Al-Farsi, C Alasalvar, M. Al-Abid, K Al-Shoaily, M Al-Amry, and F Al-Rawahy, —Compositional and functional characteristics of dates, syrups, and their by-products. *Food Chemistry*, 104, 943–947, (2007).
- [8]. Al Juhaimi F, Ghafoor K, Ozcan MM (2012) Physical and chemical properties, antioxidant activity, total phenol and mineral profile of seeds of seven different date fruit (*Phoenix dactylifera* L.) varieties.
- [9]. Int J Food Sci Nutrition 63:84–89
- [10]. Al-Shahib W, Marshall RJ (2003) The fruit of the date palm: its possible use as the best food for the future? *Int J Food Sci Nutr* 54:247–259
- [11]. Fatima Al-Meqbaali, Hosam Habib, Aws Othman, Saeda Al-Marzooqi, Alia Al-Bawardi, Javed Yasin Pathan, Serene Hilary, Usama Souka, Suleiman Al-Hammadi, Wissam Ibrahim, Carine Platat —The antioxidant activity of date seed: preliminary results of a preclinical in vivo study. *Emirates Journal of Food and Agriculture*. 2017. 29(11):822-832.
- [12]. Mohammad Reza Shams Ardekani, Mahnaz Khanavi, Mannan Hajimahmoodi, Maryam Jahangiri, and Abbas Hadjiakhoondia, —Comparison of Antioxidant Activity and Total Phenol Contents of some Date Seed Varieties from Iran. *Iran J Pharm Res*. 2010 Spring; 9(2): 141–146.
- [13]. Hussah A. Al-Shwyeh —Date Palm (*Phoenix dactylifera* L.) Fruit as Potential Antioxidant and Antimicrobial Agents. *J Pharm Bioallied Sci*. 2019 Jan-Mar; 11(1): 1–11
- [14]. Mohammad Fikry, Yus Aniza Yusof, Alhussein M. Al-Awaadh, Russly Abdul Rahman, Nyuk Ling Chin, and Hasanah Mohd Ghazali. —Antioxidative and Quality Properties of Full-Fat Date Seeds Brew as Influenced by the Roasting

- Conditions| Antioxidants (Basel). 2019 Jul; 8(7): 226.
- [16]. Masoud Kazemi And Abolfazle Dadkhah —Antioxidant Activity of Date Seed Oils of Fifteen Varieties from Iran| ORIENTAL JOURNAL OF CHEMISTRY Est. An International Open Free Access, Peer Reviewed Research Journal ISSN: 0970-020 X CODEN: OJCHEG 2012, Vol. 28, No. (3): Pg. 1201- 1205
- [17]. Al-Farsi M, Alasalvar C, Morris A, Baron M and Shahidi F. Comparison of antioxidant activity, anthocyanins, carotenoids, and phenolics of three native fresh and sun-dried date (*Phoenix dactylifera*L.) varieties grown in Oman. J Agric Food Chem 2005; 53: 7592-7599.
- [18]. Pujari, Rohini R Vyawahare, Neeraj S Kagathara, Virendra G —Evaluation of antioxidant and neuroprotective effect of date palm (*Phoenix dactylifera* L.) against bilateral common carotid artery occlusion in rats| NISCAIR-CSIR, India IJEB Vol.49(08) [August 2011]
- [19]. Aktay. G., Deliorman, D. Ergun, F. Yesilada, E. and Gevik, C. (2000). Hepatoprotective effects of Turkish folk remedies on experimental liver injury. J. Ethnopharmacol., 73:121-129
- [20]. Abdu SB. The protective role of Ajwa date against the hepatotoxicity induced by Ochratoxin A. Eryp J Nat Tox 2011; 8: 1-15.
- [21]. Abdalla, Y. and Al-Taher, E. (2008). Possible anti- diarrhoeal effect of the date palm (*Phoenix dactylifera*) spathe aqueous extract in rats. Scientific Journal of King Faisal University vol.-9No.1 1429- 1435
- [22]. Rajeev Kumar, Ram Jee Sharma, Khemraj Bairwa, Ram Kumar Roy, Arun Kumar.| Pharmacological review on natural antidiarrhoeal agents|. Scholars Research Library Der Pharma Chemical, 2010, 2(2): 66-93
- [24]. Ramesh Shari baht & Shooed Al-divan. —Antibacterial properties of different cultivars of *Phoenix dactylifera* L. and their corresponding protein content| Annals of Biological Research 2012 Vol.3 No.10 pp.4751-4757 ref.39
- [25]. Shooed Al-divan & Ramesh Shari Bhatt —Antibacterial activities of extracts of leaf, fruit, seed and bark of *Phoenix dactylifera* AFRICAN JOURNALS ONLINE (AJOL) (2016) Vol. 11 No. 42.
- [26]. Ahmed A Elsberry, Shagufta T Mufti, Jaudah A Al-Maghrabi, Essam A Abdel-Sattar, Osama M Ashour, Salah A Ghareib & Hisham A Mosli. — Anti-inflammatory and antiproliferative activities of date palm pollen (*Phoenix dactylifera*) on experimentally-induced atypical prostatic hyperplasia in rats|. Journal of Inflammation volume 8, Article number: 40 (2011).
- [27]. Koji Karasawa, Yuji Uzuhashi, Mitsuru Hirota, and Hajime Otani. —A Matured Fruit Extract of Date Palm Tree (*Phoenix dactylifera* L.) Stimulates the Cellular Immune System in Mice|. J. Agric. Food Chem. 2011, 59, 20, 11287–11293.
- [28]. Sabah A. A. Jassim and Mazen A. Naji. —In Vitro Evaluation of the Antiviral Activity of an Extract of Date Palm (*Phoenix dactylifera* L.) Pits on a *Pseudomonas* Phage|. Evidence-Based Complementary and Alternative Medicine/2010.
- [29]. Al-Kuran O, Al-Mehaisen L, Bawadi H, Beitawi S, Amarin Z. The effect of late pregnancy consumption of date fruit on labour and delivery. J Obstet Gynaecol 2011;31(1):29-31.
- [30]. Najat A. Bokhari and Kahkashan Perveen. —In vitro inhibition potential of *Phoenix dactylifera* L. extracts on the growth of pathogenic fungus|. Journal of Medicinal Plants Research Vol. 6(6), pp. 1083- 1088, 16 February, 2012
- [31]. Nouredine Boulenouar , Abderrazak Marouf & Abdelkrim Cheriti. —Antifungal activity and phytochemical screening of extracts from *Phoenix dactylifera* L. cultivars|. Natural Product Research Vol.8. Pages 1999-2002,11 Aug 2011
- [32]. Kalantaripour, T. P., Asadi-Shekaari, M., Basiri, M., Najar, A. G —Cerebroprotective effect of date seed extract (*Phoenix dactylifera*) on focal cerebral ischemia in male rats|. Journal of Biological Sciences 2012 Vol.12 No.3 pp.180-185 ref.3.
- [33]. Al-Qarawi AA, Abdel-Rahman H, Mousa HM, Ali BH, El-Mougy SA. Nephroprotective action of *Phoenix dactylifera* in gentamicin-induced

- nephrotoxicity. Pharm Biol 2008;46(4):227-30.
- [34]. Michael HN, Salib JY, Eskander EF. —Bioactivity of diosmetin glycosides isolated from the epicarp of date fruits, Phoenix dactylifera, on the biochemical profile of alloxan diabetic male rats. Phytother Res 2013;27(5):699-704.
- [35]. Ehsan O, Qadir MI, Malik SA, Abbassi WS, Ahmad B (2012) Efficacy of nanogold-insulin as hypoglycemic agent. J. Chem. Soc. Pak., 34(2): 365-370.
- [36]. Gangwar AK, Ghosh AK, Saxena V. Standardization & antiulcer activity of Phoenix dactylifera Linn. leaves. World J Pharm Pharm Sci 2014;3(7):1164-72.
- [37]. Rahimi S, Alaei H, Reisi P, Zolfaghari B, Siahmard Z, Pourshanzari A. —The effect of hydro- alcoholic of Phoenix Dactylifera extract on sleep and EEG in rat. Avicenna J Phytomed. 2017 Nov-Dec; 7(6): 511–518
- [38]. Teng J, Wang ZY, Jarrad DF and Bjorling DE. Roles of estrogen receptor a and b in modulating urothelial cell proliferation. Endorenal Cancer 2008; 15: 351-364.
- [39]. Barzin, G., Entezari, M., Hashemi, M., Hajiali, S., Ghafoori, M., Gholami, M. —Survey of Antimutagenicity and Anticancer effect of Phoenix dactylifera pollen grains. Advances in Environmental Biology 2011 Vol.5 No.12 pp.3716-3718 ref.19
- [40]. Praveen K. Vayalil. —Antioxidant and Antimutagenic Properties of Aqueous Extract of Date Fruit (Phoenix dactylifera L. Arecaceae) J. Agric. Food Chem. 2002, 50, 3, 610–617.
- [41]. Omar Ishurd, John F. Kennedy. —The anti-cancer activity of polysaccharide prepared from Libyan dates (Phoenix dactylifera L.) Carbohydrate Polymers Volume 59, Issue 4, 15 March 2005, Pages 531- 535.
- [42]. Mohamed Bastway Ahmed, Nabil Abdel-Salam Hasona and Hanan Abdel-Hamid Selemain. —Protective Effects of Extract from Dates (Phoenix Dactylifera L.) and Ascorbic Acid on Thioacetamide-Induced Hepatotoxicity in Rats Iranian Journal of Pharmaceutical Research (2008), 7 (3): 193-201
- [43]. S. Bahmanpour, T. Talaei, Z. Vojdani, M.R. Panjehshahin, A. Poostpasand, S. Zareei, M. Ghaemina. —Effect of Phoenix Dactylifera Pollen on Sperm Parameters and Reproductive system of Adult Male Rat IJMS Vol 31, No 4, December 2006.
- [44]. Fawkeya A. Abbas & Abdel-Monem Ateya. —Estradiol, Esteriol, Estrone and Novel Flavonoids from Date Palm Pollen. Australian Journal of Basic and Applied Sciences, 5(8): 606-614, 2011
- [45]. Ammar, H.O., Salama, H.A., Ghorab, M. — Nanoemulsion as a Potential Ophthalmic Delivery System for Dorzolamide Hydrochloride. AAPS PharmSciTech 10, 808–819 (2009)
- [46]. Mahmood NM, Ramadan NF, Hassan SM, Sabry H, Magdy MM. —Therapeutic effect of Phoenix dactylifera against cryptosporidiosis in immune compromised micel Glo Adv Res J Med Sci 2016;5:088-95.
- [47]. Hussain SM, Taha M. A laboratory quest on use of date fruit (Phoenix Dactylifera, L) extract in prevention of chemically induced memory deficit models in mice. Asian J Biomed Pharm Science 2015;5(49):5.