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Medicinal Properties of *Phoenix Dactylifera L*: A Review

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Abstract: ***Phoenix Dactylifera L. also known as date palm is monocotyledonous plant belonging to arecaceae family. Date palm is dioeceous, which means it has separate male and female saplings. In the present study, phytochemical composition and therapeutic properties of date palm fruits, seed and different other parts are discussed. Phoenix Dactylifera L. is cultivated in different parts of world major among which North Africa, Arabian Peninsula , Middle east including Iran, Iraq, USA, Pakistan, Saudi Arabia, Egypt, UAE, Sudan, South Sudan, Algeria, Tunisia, India, Spain, Maurutiana, Morocco, Mali, Oman, Tanzania, Australia and Libya Date palm fruits possess numerous medicinal properties like antioxidant, antimutagenic, immunomodulatory, anti-hyperlipidemic, gasoprotective, hepatoprotective, anti-cancer, anti-mutagenic, nephroprotective, anti-microbial and anti-inflammatory properties. Phoenix Dactylifera L. is enriched with alkaloids, fatty acids, amino acids flavanoids, anthraquinones, saponins, terpenoids and tannins. In addition to this, it possess considerable amount of essential mineral elements such as potassium, calcium, magnesium, phosphorous, iron and zinc.***
Keywords: Phoenix Dactylifera L., Phytochemistry, fatty acids, steroids, tri terpenoids

I. INTRODUCTION

Plants are key inception of medicine since ancient times as they are comprised of chemical entities having relevant biological and pharmacological properties [1, 2]. Plant based conventional medications are preferred over synthetic medicines due to its environment friendly properties and they are restraint of side effects [3]. Plant comprising of various bioactive phytochemicals possess diverse range of bioactivities like antioxidant, anticancer, analgesic, anti-microbial, anti-diarrheal, and so on [4]. *Phoenix Dactylifera L*. also known as date palm is monocotyledonous plant belonging to arecaceae family. Date palm is dioeceous, which means it has separate male and female saplings [5-6]. *Phoenix Dactylifera L*. is enriched with variety of phytochemicals like phenolic acids, flavanoids, fatty acids, pigments, vitamins, steroids and Triterpenoids. The fruit pulp of Phoenix *Dactylifera L* is known to exhibit antitussive, expectorant, demulcent, laxative and diuretic traits. In traditional medicine date palm fruits are used for boosting immunity and treating gastrointestinal tract disorders, edema, bronchitis, wound, cancer, as well as infectious diseases. *Phoenix Dactylifera L*. is cultivated in North Africa, Arabian Peninsula , Middle east including Iran, Iraq, USA, Pakistan, Saudi Arabia, Egypt, UAE, Sudan, South Sudan, Algeria, Tunisia, India, Spain, Maurutiana, Morokko, Mali, Oman, Tanzania, Australia and Libya [7,8]. In the present review, medicinal properties and phytochemical composition of different varieties of *Phoenix Dactylifera L*. are discussed.

Table 1: Botanical Classification of *Phoenix Dactylifera L* [9].

Kingdom	Plantae
Sub-kingdom	Virdiplantae
Infra-kingdom	Streptophyta
Super division	Embryophyta
Division	Tracheophyta
Sub-division	Spermatophytatina
Class	Mangoliospida
Super-order	Lilanane
Order	Arcales
Family	Arcacaea
Genus	Phoenix L.
Species	Phoenix Dactylifera L.

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II. PHYTOCHEMICAL COMPOSITION & MEDICINAL PROPERTIES OF *PHOENIX DACTYLIFERA L.*

Date palm fruit is enriched with variety of health boosting phytochemicals like carotenoids, flavanoids, phenolics, sterols, tannins and fatty acids. Date palm fruits exhibit numerous medicinal properties like antioxidant, antimutagenic, immunomodulatory, anti-hyperlipidemic, gasoprotective, hepatoprotective, anti-cancer, anti-mutagenic, nephroprotective, anti-microbial and anti-inflammatory properties . Ethanol extracts of 2 selected varieties of date fruits –Ajwa and Khalas possess anti-microbial activity against bacterial biofilms produced by *Bacillus subtilis* and *Pasteurella multocida* microbial stains . Al. Farsi et. al. revealed the presence of various phenolic acid constituents such Ferulic acid, caffeic acid, gallic acid, o-coumaric acid, p-coumaric acid, protocatechuic acid, syringic acid and vanillic acid in date fruits . Date fruit polyphenols extract restricts proliferation of colon cancer by promoting favorable bacterial growth . (1→3)-β-D glucans isolated from Libyan dates demonstrated anti-tumor potential against allogenic solid sarcoma 180 tumors . Siwa date palm fruit water extract exhibits protective action against CCl_4 induced hepatotoxicity in New Zealand rabbits . Date palm fruit extracts and ascorbic acid were assessed as defensive agents against thioacetamide induced hepatotoxicity in rats . Date palm fruit hydro ethanol extract enriched with phenols and flavanoids exerts cardioprotective action by promoting mobilization of progenitor cells towards the spot of myocardial injury giving rise to tissue reformation . Lauric acid, myristic acid, stearic acid, palmitic acid, oleic acid and linoleic acid are fatty acid constituents of date palm fruit flour . Flesh dates are enriched with amino acids such as aspartic acid, threonine, glycine, alanine, valine, isoleucine, leucine, phenylalanine, histidine, lysine, arginine, proline and tyrosine . The mineral constituents of date palm fruit include potassium, calcium, magnesium, iron, zinc, manganese, copper and phosphorous . Hammouda et. al. revealed the presence of flavanoid constituents rutin, quercetin hexoside sulphate, quercetin acetyl hexoside, isorhamnetin-3-O-rutinoside, isorhamnetin hexoside, chrysoeriol rhamnosyl-hexoside, isorhamnetin acetyl-hexoside, chrysoeriol hexoside sulfate, (+)-catechin and (−)-epicatechin at different ripening stages in Tunisian date palm fruits .

Phoenix Dactylifera L. seeds are enriched with alkaloids, flavanoids, anthraquinones, saponins, terpenoids and tannins. In addition to this, it possess considerable amount of essential mineral elements such as potassium, calcium, magnesium, phosphorous, iron and zinc . Methanol extract of date palm seeds enriched with flavanoids possess anti-microbial activity against gram positive (*Bacillus subtilis , Staphylococcus aureus*) and gram negative (*Escherichia Coli, Pseudomonas florescens*) bacterial stains . Date palm seed n-hexane extract and oleic acid isolated from it demonstrated anti-cancer activity against human cancer cell lines MCF-7(breast cancer), HepG2(liver cancer) and A-549(lung cancer) . Ajwa date seed aqueous extract exemplified hepatoprotective action against diethylnitrosamine induced liver cancer in Wistar rats . Polyphenol rich date palm seed extract exhibits anti-hyperglycemic and anti-adipogenic characteristics . Hydro alcoholic extracts of date seed exerts anti-inflammatory action by suppression of protein denaturation, equilibration of lysosomal membranes and impediment of C-reactive protein and fibrogen synthesis . Aqueous extract of two varieties of Saudi date seeds namely Ajwa and Sukkari substantiates anti-diabetic and hypolipidemic traits in streptozotocin induced diabetic rates . Methanol extract of date seeds promotes paraoxonase and arylesterase activities in hypercholestrolemic rats. Elevated paraoxonase and arylesterase activities results in lipid metabolism disorders and futile anti-oxidant potential of the body . Date palm seed and fruit extracts impart shielding to kidneys from diabetic nephropathy in type 2 diabetic rats .

Phoenix Dactylifera L. leaf extracts reduce the risk of cardiovascular disease due to its alpha amylase and lipase inhibitory traits . Date palm leaves extract possess anti-microbial action against *S.aureus* and *B.subtilits* . Polyphenol extract of date palm is compelling inhibitor of inflammatory precursor cyclooxygenase 2 enzyme . Hydro alcoholic extract of date palm leaves enriched with polyphenols exert anti-diabetic and anti-tumor activity against type 2 diabetes and human melanoma cancer cell lines respectively . Also it facilitates reduction in triglyceride levels in alloxan induced diabetic rats by inhibiting lipogenesis and stimulating lipolytic activity by modulation of hormone sensitive lipase or lipogenic enzyme and/or lipoprotein lipase . Methanolic extracts of date palm leaves aids in reclamation of hepatic anti-oxidant enzymes during paracetamol induced hepatic grievance [8-31].

Phoenix Dactylifera L. spathe is utilized as sedative, nerve tonic, tranquilizer and as an ailment for rheumatoid arthritis. Gas chromatography mass spectrometric analysis of volatile constituents of *Phoenix Dactylifera L.* spathe revealed the presence of carvacerol (35.45%) and linalool (24.10%) as its major components. Other constituents of volatile oil identified by GC-MS were found to be thymol (10.93%), spathulenol (7.55 %),, beta-caryophyllene (4.33%) and carvacerol methyl ether (2.44%) . Obode et. al. investigated inhibitory effects of *Phoenix Dactylifera L.* fruits on chief enzymes involved in hypertension. Ethanol and its differential solvent fractions were analyzed by gas chromatography mass spectrometry so as identify bioactive phytoconstituents. Elaidic acid methyl ester (11.28%) and 2 hydroxy cyclopentadecanone (10.85%) were identified as major constituents of ethyl acetate fraction. The major constituents of butanol fraction comprises of laurostearic acid (17.66%) and lauric acid methyl ester (10.21%).

Levulinic acid methyl ester (37.06%) and neopentyl glycol (16.05%) were identified as major constituents of aqueous fraction. *Phoenix Dactylifera L.* is enriched with phytoconstituents possessing cardio-protective traits such as taurine, coumarins, linolenic acid, Squalene, lauric acid, palmitic acid, phytol, beta-sitosterol and isosorbide . Cyclododecane (66.97%), dodecane (5.05%), 1-eicosene (4.99%), 1-pentadecanol (4.75%) and 1-hexadecene (3.37%) were identified as volatile oil phytoconstituents of zahdi date palm. This essential volatile oil fraction of zahdi date palm possesses anti-oxidant and anti-bacterial traits . GC-MS analysis of healthy and brittle leaf disease affected *Phoenix Dactylifera L.* fruits of Algeria demonstrated the role of fatty acid in plant defense interaction. Fatty acids are reported to be involved in effector-triggered and systemic protection of plants . Gas chromatography mass spectrometric analysis of fatty acid methyl esters of date palm seed confirmed the presence of methyl undecanoic acid methyl ester, nonanedioic acid dimethyl ester, docosenoic acid methyl ester, tetracosanoic acid methyl ester, hexacosanoic acid methyl ester and tricontanoic acid methyl ester. Other steroid and triterpenoid constituents in date palm seed were found to be beta sitosterol, 6-stigmasta-22-en-3-one, stigmasta-4-en-3-one, and lup-(20)29-en-3-one. The most abundant fatty acid ester constituent of date palm leaves were found to hexadecanoic acid ethyl ester, 9-octadecenoic acid ethyl ester and Octadecanoic acid ethyl ester . Mustafa Hameed et. al. demonstrated anti-cancer and anti-oxidant activities of Iraqi *Phoenix Dactylifera L.* chick extract. GC-MS analysis of *Phoenix Dactylifera L.* confirmed the presence of following phytoconstituents : n-Hexadecanoic acid, cis-Vaccenic acid, Octadecanoic acid, 1-Heptatriacotanol, Hexadecanoic acid, 2-hydroxy1-(hydroxymethyl)ethyl ester, 9,12-Octadecadienoic acid (Z,Z)-, 2-hydroxy-1-(hydroxymethyl) ethyl ester, Oleic Acid, Squalene, Diosgenin and gamma.-Sitosterol. Cis-Vaccenic acid and Squalene are used in ailments of different types of cancer . The major constituents of essential oil of Siwe Cultivar date palm pollens identified by GC-MS analysis were found to be P-cymene-4-ol (13.51%), caryophyllene (9.51%) and caryophyllene oxide (3.71%). Along with this, oleic acid and linoleic acid are the most abundant fatty acid in essential oil fraction of Siwe Cultivar date palm pollens . The major fatty acid constituents of Mejhdool date palm fruit pulp extract were found to be oleic acid (52.34%), linoleic acid (30.56%), palmitic acid (6.75%), vaccenic acid (4.8%), and stearic acid (3.98%). However , most abundant phytoconstituents of Mejhdool date palm seed were found to be oleic acid (45.92%), lauric acid (17.24%), palmitic acid (10.76%), myristic acid (10.72%), and linoleic acid (9.06%) [32-40].

III. CONCLUSION

The present review provides insight in phytochemical composition and medicinal properties of different parts of *Phoenix Dactylifera L.* Date palm fruits possess numerous medicinal properties like antioxidant, antimutagenic, immunomodulatory, anti-hyperlipidemic, gasoprotective, hepatoprotective, anti-cancer, anti-mutagenic, nephroprotective, anti-microbial and anti-inflammatory properties. *Phoenix Dactylifera L.* fruits are enriched with phenolic acids erulic acid, caffeic acid, gallic acid, o-coumaric acid, p-coumaric acid, protocatechuic acid, syringic acid and vanillic acid . Rutin, quercetin hexoside sulphate, quercetin acetyl hexoside, isorhamnetin-3-O-rutinoside, isorhamnetin hexoside, chrysoeriol rhamnosyl-hexoside, isorhamnetin acetyl-hexoside, chrysoeriol hexoside sulfate, (+)-catechin and (−)-epicatechin are the different flavanoid constituents in *Phoenix Dactylifera L.* fruits at different ripening stage. Beta sitosterol, 6-stigmasta-22-en-3-one, stigmasta-4-en-3-one, and lup-(20)29-en-3-one are the noteworthy steroids and triterpenoid components of date palm seeds. The major fatty acid components of date palm seeds and fruits include oleic acid , linoleic acid , palmitic acid , vaccenic acid , lauric acid, myristic acid and stearic acid. Hence date palm is enriched with diverse phytochemicals with numerous health benefits. So, it may serve as optimistic therapeutics for ailment of life threatening disease or may be helpful in boosting the potential of existing drugs.

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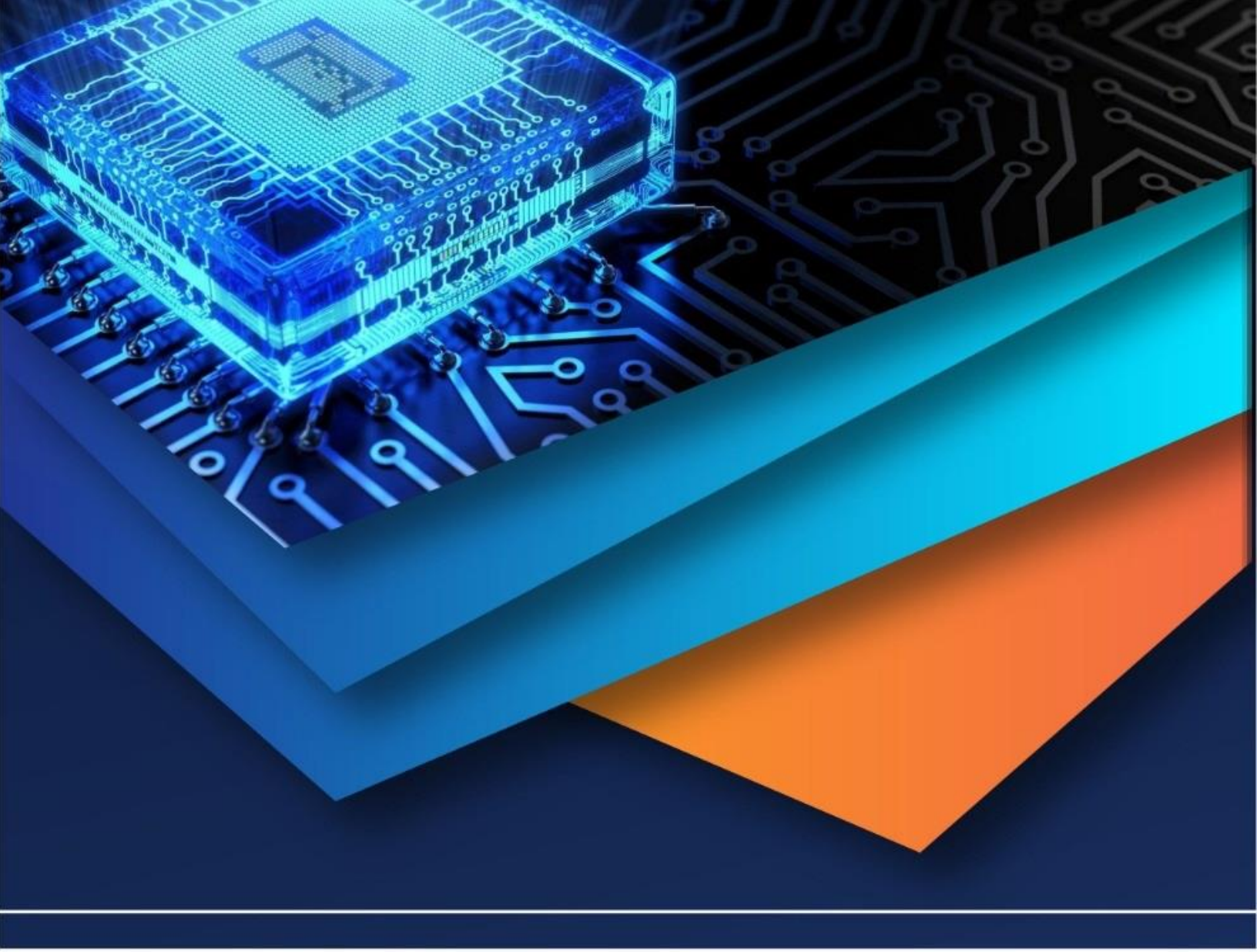
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