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A Review on Nutritional Properties of Palmyra Palm (*Borassus flabellifer L.)*

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Abstract: ***Palmyra Palm (Borassus flabellifer) is one of the majestic plants with several nutritional properties and medicinal benefits. It is native of south East Asia and has great utility in the economies of these countries. The immense benefit of this tree to mankind can be considered by the fact that every part of the plant is usable. In India, Tamil Nadu is the main cultivator of this diecious plant and used for the production of palm sugar, oil, alcoholic beverage, fibers, fuel etc. Beside these benefits, Palmyra fruit is considered as a rich source of sugar, fiber, micronutrients and have potent antioxidant activity due to presence of several polyphenolic content. It also has numerous medicinal properties and used by the locals for the treatment of various ailments.***

Keywords: Palmyra palm, phytochemicals, antioxidant, flabelliferins, spirostan

1. Introduction

Palmyra palm is commonly named as fan palm, Brab tree or toddy palm. The scientific name of palmyra palm i. e., *Borassus flabellifer* came from the Greek words 'Borassus' and 'flabellifer' which means fruit with leather covering and fan bearer respectively. Being originated in Indian subcontinent, Palmyra palm is considered as the nature's gift that has ability to withstand adverse climatic conditions (Krishnaveni *et al.*2020)

Asian palmyra, found throughout South and South - East Asia is vital for local economies. Unlike its related species, such as feather palm and coconut, only a couple of genetic markers are available for Asian Palmyra palm. For local agriculture and economies, palm trees are very important as theirinflorescence sap is used for palm sugar production and fruit widely consume. They grow in a slow rate needs 12 to 20 years for production of the first inflorescence flowers, only after than sex of plant can be defined. (Swatdipong *et al.*, 2017).

It is a multipurpose tree of great utility, occurs extensively in Tamil Nadu state, India. Figuring in history, literature, and folklore of the state, it's exploited for food from the fruit and tuberous seedlings; beverage and sugar from the sap; fiber from the leaf and leaf base for brushes, cordage, weaving, and plaiting; trunk wood for construction and fuel; and various minor products (Davis *et al.*, 1997).

As multiple of quality of tree¸ it can be considered as immense benefit to mankind in a manner that every part of the tree is utilized by humans. The trees are large in size from 15 to 20 meter tall, and have circumference around 1.5 to 2 meters at base. Leaves are large as 2 meter long with shaped as fan, leathery, green, and thick. The upper surface of the tree is smooth and rough from the lower surface. Leaves folded with thick mid rib. (Bhaskar *et al.*, 2017)

According to Tharmaratnam *et al.* (2018), Palmyra fruit has a great popularity worldwide due to its nutritive and medicinal value. Sri Lanka annually collects around 1500 tons of fruit during season when inflorescence of the female palm become mature, and start to give fruits. One palm tree gives around 200 - 300 fruits in one season. September and October are the seasons in which fruiting happens. In the month of August Palmyra fruits becomes mature and ripened fruit starts falling from the month of September and October. To reduce the wastage of palmyra fruits, a far better preservation technique is required. Palmyra fruit pulp is persevered with benzoate of soda, sodium metabisulphite (SMS) or combination of both preservatives to form it readily available in off seasons (Sivaji *et. al.*, 2018)

As Palmyra is a di - oecious palm, recently a high growth of monoecious Palmyra palm has taken place in Andhra Pradesh. The word 'co - sexual' is used when single plant can perform functions of both sexes. It can be present as separate male and female flowers (monoecious) or can be present in just one flower (hermaphrodite) (George *et al.*, 2008).

Ambrose *et al.* (2018) reviewed that Palmyra palm is having genus of six species of fan palms. The female tree produces edible products viz, the endosperm, pulp and tuber. The juicy fruit opens from the top by cutting, where it contains 3 sockets inside, kernel as the soft jelly, translucent like ice, filled with watery sweet liquid. Also named as ice apple since it resembles to ice. It acts as coolant for the parching throat in summers and relished during months of summers.

It mainly contains gums, albuminoids, fats, steroidal glycosides, and carbohydrates as sucrose. It contains spirostan type steroids like barassoisides and diosin. The coat of seed extracted from Palmyra tree possesses antimicrobial activity. Where male inflorescence shows an anti - inflammatory activity. All different parts of Borassus flabellifer L. comprise biological and pharmalogical functions like anthelmintic, diuretic, antioxidant, wound healing etc. (Jamkhande *et al.*, 2016)

The flabelliferins (steroidal saponins) of palmyra are of importance and have a significant role in food because of their bioactivity. (Baeckstrom *et. al.*, 2002)

As per Shani *et al.* (2014) It also were used in folk medicine for multiple purpose, like stimulant, antilaprotic, diuretic, antiphlogistic. Fruit of this plant is considered as sedative,

laxative and aphrodisiac in nature and can show useful results in hyperdipsia, dyspepsia, flatulence, skin disease, haemorrhage, fever and general debility. As in inflammatory reaction, roots and juice of the plant can benefit. It also provides good antacid antiperiodic, which is useful in heart burn, splenomegaly and bilious fever, which can be obtained by burning of the inflorescence of the plant.

Geographical distribution

Palms are characteristic of tropical and sub - tropical regions across the planet, also are among the oldest monocotyledonous flowering plants and have an upscale fossil record. Palms exhibit a tremendous geographic variation in species richness, phylogenetic composition and life forms, With >2400 species. At a worldwide scale, Palmyrashow distinct spatial patterns of species richness. Palms are often abundant in tropical and sub - tropical ecosystems and are so for 80 million years. Palms are a keystone resource for pollinator and frugivore communities, and will have shaped the evolution of dependent animal groups (Balslev *et. al.,* 2011)

Being local to tropicalregions of Africa, Asia and New Guinea**,** Palmyra palms are economically useful and widely cultivated, in South–East Asia. The Palmyra palm tree is one of the foremost important trees of Cambodia and India. It's native toSouth and South - east Asia, within the IndoMalaya eco - zone. It is cultivated mainly in Indonesia, India, Jawa, Laos, Malaya, Myanmar, Socotra, parts of China, Sri Lanka, Sulawesi, Thailand, Vietnam, Philippines, South and South - East Asia (Jana*et. al.,* 2017)

Borassus flabellifer is distributed through South - East Asia to New Guinea and particularly found in India, Burma (Myanmar) and Cambodia. There are some theories which believed that B. flabellifer could also be a variety generated from Borassus aethiopum Mart. of Africa. Various researches suggest that distribution of palmyra followed Indian trade routes in prehistoric times. In India, Palmyra palm is found in very dry regions of Tamil Nadu, Andhra Pradesh, Odisha, West Bengal, Bihar, Karnataka and Maharashtra. Tamil Nadu is one of the chief cultivators of palmyra palm. Out of nearly 102 million palms in India, half of them is in Tamil Nadu. The palms provide opportunity for increasing the use and also provide a source of income to the poor within the agricultural areas (Aman*et. al.,* 2018)

Nutritional properties of *Borassus flabellifer*

According to Arunachalam *et al.* (2011) Palmyra is found to be quality source of carbohydrate, fiber, fat, amino acids, and protein. Analysis of macro and micronutrient composition suggest it a potent source of sodium, potassium, calcium, magnesium, zinc, and iron. In vitro antioxidant activity evaluation shows potent antioxidant activity of palmyra palm due to presence of various phenolic contents. The fresh pulp of Borassus flabellifer is found to be rich in vitamins A, B complex and C. The tree also contains albuminoids and fats. Male inflorescence constitutes spirostan - type steroid saponins like borassosides and dioscin; 20 known steroidal glycosides is additionally contained by it with carbohydrates like sucrose. It is also filled with a bitter compound called flabelliferrins; known as steroidal saponins. Borassus flabellifer also contains 28 chemical constituents which have been identified from ethanol root extract of the tree. This tree also contains 2 - Furanmethanol, Propane, 1 - (1 - methylethoxy), 2 - Cyclopenten - 1 - one, 2 - hydroxy - , 2, 4 - Dihydroxy - 2, 5 - dimethyl - 3 (2H) - furan - 3 - one, Glycerin, 1, 3 - Propanediamine, 1, 2 - Propanediol 2 - acetate, 2, 6 - dimethoxy - , 6H - Purin - 6 - one, 2 - amino - 1, 7 - dihydro - , 6H - Purin - 6 - one, 2 - amino - 1, 7 - dihydro - , 1, 4 - Benzenediol, 2 - methoxy - , Phenol, 3, 4 - dimethoxy - , Benzene, Butane, 1 - (ethenyloxy) - 3 - methyl - , Propane, 1, 1 - diethoxy - , 1H - Imidazole - 4 - carboxamide, 5 - amino - , 4H - Pyran - 4 - one, 2, 3 - dihydro - 3, 5 dihydroxy - 6 - methyl - , Resorcinol, Phenol, 5 - (1, 5 - dimethyl - 4 - hexenyl) - 2 - methyl - , (R) - , 7H - Furo [3, 2 - g] benzopyran - 7 - one, n - Hexadecanoic acid, Pentanoic acid, 10 - undecenyl ester, Octadecanoic acid, Phenol, 1 - (1, 5 - dimethyl - 4 - hexenyl) - 4 - methyl - , Phenol, 4 - [2 - (dimethylamino) ethyl] - , 1 - Butanol, 2 - amino - , 3 - Hydroxy - 4 - methoxybenzoic acid, Phenol (Gummadi *et al.,* 2016)

According to Awal *et. al., (*1995), the isolation of a galactomannan from soft kernel of palm by extraction with aqueous 10% sodium hydroxide showed that it contains a sufficient amount of mannose (78.32%) and galactose (27.64 - 28.06%). The galactomannan was reported to contain galactose and mannose within the molar ratio 1: 2.4, consisting of a backbone of (1 ~ 4) - /3 - D - mannopyranosyl residues with galactose and mannose side - chains.

The fruit pulp is proved to help in curing skin inflammations. Beside these, nausea, vomiting and worm infestation can also be treated by using palmyra fruit. It is also used as an expectorant and as a liver tonic from ancient time. Thin layer of palm fruit jelly application to the affected area shows soothing effect and immediately calms the itchiness associated with prickly heat. palm fruit, keeps the body hydrated during summer. Digestive problems and other stomach ailments can be treated by the regular consumption of the fruit. It is also used as a laxative. Palm fruit is a good option in diet. It can prevent malnutrition in children and adults. (Nisha *et al.,* 2020)

Essential minerals, vitamins, and biological compounds are contained by Palmyra palm.10 kinds of vitamins are shown by Palm granulated sugar (mainly vitamin E 52.15–55.12 mg/100 g), 5 - hydroxymethylfurfural (2.18 to 41.92 mg/100 g) and phenols groups, and aldehyde group and 38volatile compounds that belong to the alcohol, ketones, pyrazines, acids. Moreover, sugar do also exhibit a high total phenolic content (2.77–8.94mg gallic acid equivalent/100 g), and ferric reducing antioxidant power (FRAP) and 2, 2 - diphenyl - 1 - 1picrylhydrazyl (DPPH) radical scavenging activity (20.15%–37.88%) value (322.68–378.23µmol Fe2+/mL). (Lu*et al.,* 2020)

As per Sandhiyadevi*et al., (*2021) Palmyra sprout also referred to as Palmyra tuber. Palmyra sprouts are cultivated in Tamil Nadu. These sprouts also have extensive nutritional properties. Nutritional values of Iron in palmyra palmare (1.7mg for Flour and 0.94mg for sweet) per 100g, Carbohydrate is (85.1g for Flour and 36.92g for sweet) per 100g, Calcium is (53mg for Flour and 41mg for sweet) per

100g, and Energy is (384 Kcal for Flour and 247 Kcal for sweet) per 100g.

A variety of phytochemicals that have the ability to exert effect on human body is contained by Palmyra. Among them *Borassus flabellifer Linn.* Has a unique medicinal importance as different parts of the trees are being used for their nutritional and medicinal properties (Jamkhande *et al.*, 2016).

To collect the data forreviews various search engine were used like Google scholar, NCBI, PubMed. Apart from this, review article with their author's name and year is mentioned for the reference. During the selection of researches, studies that are relevant to nutritional profile, anti - nutrients content, physical and medicinal properties of the palmyra palm were kept in mind.

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