



Nutritional value and medicinal uses of Monkey Jack fruit (*Artocarpus lakoocha*)

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Abstract

This review paper discusses the nutritional values and medicinal benefits with other uses of Monkey Jack fruit (*Artocarpus lakoocha*). The sweet sour pulp of ripen fruits is generally eaten fresh. Different portions of this fruits and spike of male flower are used to prepare curries, pickles and delicious sauce. The leaves of the plant are used as animal feed and stem as timber and firewood. Studies showed that it has valuable pharmacological properties and used as many medicinal products. *Artocarpus lakoocha* is containing strong antioxidants and these are flavonoids and phenolic acids. The bark of the tree exhibit methanolic extracts that have strong antioxidant activity. Moreover, heartwood extract also have potential skin-whitening properties. In conclusion, this perennial fruit plant has multipurpose uses. Fruit can be consumed as alternative nutritional food and plant used as raw materials of pharmaceuticals due to its pharmacological properties.

Keywords: Monkey Jack, *Artocarpus lakoocha*, food value, medicinal value, uses.

Introduction

Monkey Jack fruit (*Artocarpus lakoocha* Roxb., Moraceae) is a tropical fruit and originated from India. This fruit is available in some Asian countries like Bangladesh, Bhutan, Nepal, Myanmar, Sri Lanka, Thailand, Malaysia, Singapore, Vietnam, Cambodia and Laos. Fruits are highly nutritious and an important food item in the human diet. This fruits contain vitamins and most of the vitamins excellent source of antioxidant which are vitamin C and beta-carotene. Moreover, minerals those act as antioxidant such as zinc, copper, manganese and iron¹. This antioxidant from the plant source has important activities to maintenance normal health and protects the coronary heart disease and combat with cancer. For that reason these fruits become more curious among scientists, food manufacturers and consumers². World Health Organization estimated that about 80% of the world population depends on traditional herbal medicine for their primary health care³. The different components and chemical extract of this plant has been used to possible sources for new drugs⁴. It has been established by lot of scientist that consumption of tropical fruits can reduces the risk of no-communicable diseases like diabetes, cancer, coronary heart disease, neurodegenerative ailment⁵. It was also proved that antioxidant; anti-inflammation, antibacterial and cytotoxic activities have been found in medicinal plants and used as potentially therapeutic compounds⁶. Free radicals is one atom or molecule the have a properties to oxidative damage and excessive production as well as less antioxidant protection, that leads to onset of some diseases and enhanced aging⁷. The plant of *A. lakoocha* have contained flavonoids and phenolic acids,

these are strong antioxidants⁸. With more knowledge and scientific evaluation people are now adopting and habituated to use natural ingredients contain cosmetics instead of synthetic ingredients. Natural ingredients are effective, low cost and less adverse effects compared to synthetic agents that also have antioxidant properties and inhibiting tyrosinase activities. The demand of skin-whitening properties natural cosmetics are increasing day by day and a great of number of cosmetic companies have been developing natural ingredients contain cosmetics⁹⁻¹¹. Tropical and local delicious fruits play a significant role by providing supplementary nutrient diet and income generation to the people of rural areas. On the other ways it can be considered as vast sources of vitamins, minerals, dietetic fibers and polyphenols which have lot of health benefits¹². It is time to say that the nutrient values of Monkey Jack fruit would be explore more and more to increases awareness among the people to consume for healthy life and to grow more plants for production of cosmetics and receive other useful benefits. It is essential to conduct more scientific research regarding the wild edible fruits to assess the potentiality which would be cultivated and utilized as a source of food material for an ever increasing population¹³. There are lots of tropical and local plants species which have a great potential to be commercially utilized. A few research works has been done regarding potentiality of the monkey fruit plant. The paper is an overview of different aspects of *Artocarpus lakoocha* uses. The information outlined in this article have been collected from different journals in agricultural, food and medical sciences and visited of useful websites.

Food and other uses of *Artocarpus lakoocha*

The fruits are generally sweet sour pulp eaten fresh but mostly made into curries. Different parts of this fruits and spike of male flower are used to prepare pickles and delicious sauce. Moreover, the tree is also used as food and timber. Timber and wood from this tree used to made furniture, boats and cabinets¹³. It also used for heavy construction, poles, furniture and plywood for its hard and termite resistant capacities. The *A. lakoocha* fodder tree is highly preferred for its deliciousness and healthful values. Despite the slow growth rate, farmers preferred to cultivate more *A. lakoocha* for its high nutritious value¹⁴. It is one of the valuable fodder trees in Nepal, for the lower foothills of the Himalayas. It is also prepared food for lactating animals, which have effect to produce more milk. The leaves of *A. lakoocha* contain about 16% crude protein and one mature tree produces 60-200 kg fresh feedstuff in a year¹⁵. Different parts of this tree like fruits and male flowers are eaten raw, boiled, steamed or roasted. Moreover, a tree also has an important source of firewood and its sticky latex is present everywhere of the tree and has many uses. The canopy shaped tree provides huge shade and create the environment cooler for humans, plants and animals. The tree can be used for protection and occasionally it grown as an ornamental bonsai plant. *A. lakoocha* trees are cultivated with mixed cropping systems with other crop¹⁶.

Medicinal values of *Artocarpus lakoocha*

In several studies it revealed that *A. lakoocha* has many medicinal uses. There are some pharmacological activities has been found into plant and these are anti-inflammatory, antiviral, anticancer and anti-HIV properties¹⁷. The consumed *A. Lakoocha* fruit pulp is act as refresher of liver as well as seeds and milky latex can used as purgative. Tree bark contains 8.5 percent tannin and is used to treat skin lesion¹³. Powder formed bark is applied to cure any wound and also used to draw out purulent matter from any abscess. The seed and bark of the plant are useful for stomach and liver disease. The unripe fruit is hot, sour, sweet, causes tridosa impotency, loss of appetite, blood complaint. The ripe fruit is sour sweet, tonic to liver¹⁸. The seed are good purgative for children². The fruit contains β -amyrin acetate and lupeol acetate having a potential antihyperglycemic and hypolipidemic effects that could be used as a lead compound for production of effective in diabetes and atherosclerosis medicine. The juice and seeds from this plant are used as purgative and the bark is used as astringent. However, root is used as refresher and the leave are used in treating dropsy¹⁹. Powered form heartwood extract has been using as an effective and economical skin-whitening agent²⁰. Free radicals products can directly influence cell growth and development^{21,22}. However, external radicals like ultra violet radiation-generating single oxygen that has effect to cellular aging²³. *A. lakoocha* plant is used in traditional Thai medicine for anti-inflammatory therapy and as well as an anti-skin aging

agent²⁴. The hydroglycolic extract of *A. lakoocha* heartwood exhibited as important antioxidant and tyrosinase inhibitory activities which are commonly used as antioxidant and skin-whitening agents in cosmetic products²⁵. Extract of *A. lakoocha* also have contain liposomes having phospholipid bilayers and have an aqueous cavity that can entrap, protect and deliver the water soluble substances into deep skin which can effectively enhance the skin permeation^{26, 27}.

Studies revealed that the lotion containing plant heartwood extract-loaded liposomes had better skin whitening effect than the lotion containing non-encapsulated plant heartwood extract²⁵. Anti-glycation and anti-oxidation of phytochemicals can prevent cellular aging²⁸. In vitro, 25 $\mu\text{g/ml}$ phytooxyresveratrol (POV) extracted from *Artocarpus lakoocha* have effective anti-aging activity and prevent cellular aging due to its antioxidant and anti-glycation activities. Studies revealed that 25 $\mu\text{g/ml}$ of POV can prevent DNA damage and was non-toxic to cell. However, more and more studies are required to formulate suitable pharmaceutical formulations²⁹. Recently it is scientifically proved that *A. lakoocha* extract was effective for the treatment of taeniasis^{30,31}. In India, *A. lakoocha* is widely used as medicinal plant for the treatment of some specific diseases. The bark of *A. lakoocha* exhibited methanolic extracts which is a strong antioxidant activity as well as it have Flavonoids and Phenolic content². Moreover, the roots of *A. lakoocha* also found two new stilbene derivatives, lakoochins A (1) and B (2). Both Lakoochins A (1) and B (2) exhibited antimycobacterial activity with the respective MIC values of 12.5 and 50 $\mu\text{g/ml}$. It was explored that Lakoochins A (1) was cytotoxic against the breast cancer (BC) cell line at IC50 6.1 $\mu\text{g/ml}$ level but inactive at 20 $\mu\text{g/ml}$ toward nasopharyngeal carcinoma (KB) cells; whereas compound 2 possessed cytotoxicity against the BC and KB cell lines with IC50 values of 3.1 and 6.1 $\mu\text{g/ml}$, respectively³². Dried aqueous extract of *A. lakoocha* has been used for treatment of tape worms²⁵. Ethanol extraction of *A. lakoocha* extract contained antioxidants and polyphenolic compounds, especially tannins and flavonoids³³. The root of *A. lakoocha* is an astringent and is used as a purgative; while saturated extract is used as a poultice for skin ailments and bark is used to treat headache¹⁶.

Conclusion

The ripen fruits is generally eaten fresh. Unripe fruit and male flower spike of *A. lakoocha* are used to prepare curries, pickles and sauce. On the other hand, the tree is also used as animal feed, timber and firewood. Moreover, the fruit can be used as food supplement to combat malnutrition and reduces the risk of several diseases. Mass campaign can be done among the people to enhance the awareness regarding the nutrient values of this tropical fruit for consumption as well as healthy life. More and more research works would require to find out the valuable properties of this fruits and to develop suitable pharmaceutical formulations for human being.

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