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Lotus – A nutraceutical source

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Introduction

Protein-energy deficiency has been recognized as the most common form of malnutrition in regions where people mainly depend on starch-based diets and cereal porridges. Scarcity of protein rich food and food supplements has been responsible for the recurring problems associated with malnutrition in children and women in developing countries. Lotus seeds *(Nelumbo nucifera*) can play a significant role due to their edibility and medicinal properties. Nutritionally, lotus seeds are rich in proteins (10.6-14.8%) and essential minerals. Lotus seeds are in high demand in Ayurvedic medicinal preparations and widely used in medicines to treat tissue inflammation, cancer, diuretics, skin diseases.

TheLotus

Lotus is a perennial, large and rhizomatous aquatic herb with slender, elongated, branched stem consisting of nodal roots; leaves are membranous, peltate (60-90 cm and above) and concave to cup-shaped; flowers are white to rosy, sweet-scented, solitary, hermaphrodite, 10-25 cm diameter; fruits are ovoid having nut like achenes; seeds are black, hard and ovoid. *Nelumbo nucifera* belongs to the family Nelumbonaceae, which has several common names (e.g. Indian lotus, sacred lotus and Chinese water lilly). Lotus plants propagate vegetatively through rhizomes. Its seeds sold in the Indian markets (kamal gatta) as vegetable or raw material for Ayurvedic drug preparation.

Flower

Seed

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Nutritional value

Serial no.	Parts of plant	Nutritional value
1.	Rhizome	1.7% protein, 0.1% fat, 9.7% carbohydrate and 1.1% ash
2	Stem	6, 2.4, 0.2 mg/100 g calcium, iron and zinc respectively
3.	Seed	10.5% moisture, 10.6-15.9% protein, 1.93-2.8% crude fat, 70-72.17% carbohydrate, 2.7% crude fibre, 3.9-4.5% ash and energy 348.45 cal./100 g
4.	Minerals of lotus seeds	chromium (0.0042%), sodium (1%), potassium (28.5%), calcium (22.1%), magnesium (9.2%), copper (0.0463%), zinc (0.084%), manganese (0.356%) and iron (0.199%).

Pharmaceutical value

Traditional knowledge -: The whole plant serves as astringent, diuretic and sudorific and possesses antifungal, antipyretic and cardiotonic. Different parts of the lotus plant are useful in treatment of diarrhea, tissue inflammation and haemostasis. The rhizome extract has anti-diabetic and anti-inflammatory properties. The stem is used in indigenous Ayurvedic medicines as diuretic, anthelmintic and to treat strangury, vomiting, leprosy, skin disease and nervous exhaustion. Young leaves with sugar are useful to treat rectal prolapse and the leaves boiled with Mimosa pudica in goat's milk can be used to treat diarrhea. Leaf paste can be applied to the body during fever and inflammatory skin conditions. Flowers are useful to treat diarrehoea, cholera, fever, hepatopathy and hyperdipsia. The fruits and seeds of lotus are astringent and used to treat hyperdipsia, dermatopathy, halitosis, menorrhagia, leprocy and fever.

Alkaloids and flavonoids:-Lotus alkaloids dilate the blood vessels and reduce the blood pressure. Leaves are bitter, sweet and consist of several flavonoids and alkaloids. The embryos possess small amount of alkaloids, which are anti-spasmodic for the intestines and alleviates diarrhea. The embryos within lotus seeds possess an alkaloid iso-quinoline, which is sedative, antispasmodic and beneficial to heart. The major phytochemicals present in lotus seeds are alkaloids (e.g dauricine, lotusine, nuciferine, pronuciferine, liensinine, isoliensinine, roemerine, nelumbine, neferine). Thirteen flavonoids and seven of its glycosides were isolated from lotus plants along with four non-flavonoid compounds.

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Antioxidants:-Lotus seed extract possess hepatoprotective, free radical scavenging properties and antifertility properties. The antioxidant activity of hydro-alcoholic extract of lotus seeds using in-vitro and in-vivo models.

Anticancerous:-The ethanolic extracts of lotus inhibit the cell proliferation and cytokines in primary human peripheral blood mononuclear cells activated by phytohemagglutinin.

Antiviral: - Anti-HIV benzylisoquinoline alkaloids and flavonoids from lotus leaves [-(+)-1(R)-Coclaurine, (-)-1(S)-norcoclaurine and quercet in 3-O-b-D-glucuronide]. The first two compounds possess potent anti-HIV activity [EC50, 0.8 and <0.8l µg/ml; therapeutic index (TI), >125 and 152 >25 respectively], while the third was less potent (EC50 2l µg/ml).

Anti-obesity:- The pharmacological mechanism of the anti-obesity effect of lotus *N. nucifera* leaf extract in mice and rats. The extracts prevented the increase of body weight, parametrial adipose tissue weight and liver triacylglycerol levels in mice with obesity induced by high fat diet and the UCP3 mRNA expression in skeletal muscle tended to be high.

Conclusion

Lotus seeds hold promising future as an alternate protein supplement and potential pharmaceutical source. As lotus seeds have potential nutraceutical advantage, mixing its flour with other nutritionally rich legumes (e.g. soybean) or millets (e.g. finger millet) will be of immense value to develop low cost proteinaceous and healthy food supplements to combat malnutrition as well as specific ailment.