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## REVIEW ON: PRICKLY WATER LILY

Mr. Nandusaheb P. Gavhane, Dr. Sudarshan Nagarale, Dr. Vishal Babar, Dr. Vijay D. Tambe, Ms. Nisha S. Mhaske

Dattakala Shikshan Sanstha's, Dattakala College of Pharmacy, Pune.

Pravara Rural Education Society's College of Pharmacy (D.Pharm) Nashik (M.S), India.

### Abstract

Prickly Water Lily or Gorgon Plant, is a floating plant with large (4 to 5 feet across), round, deeply veined, flat leaves. The leaves are "quilted" and have thorns on the surface as well as on the royal purple reverse. The day blooming cup-shaped flowers usually open under water but on rare occasions open above water. They are deep violet with an outer row of white petals. Sharp spines cover the surface of the sepals and stems and also both sides of the leaves. Tender seeds are edible and considered a delicacy in Manipur when added to mash boiled vegetables, called *eromba*. In north India, seeds are often roasted or fried, which causes them to pop like popcorn. These are then eaten, often with a sprinkling of oil and spices.

**Keywords-** Prickly Water Lily, Tender seeds, *eromba*, popcorn.

### Introduction

*Euryale ferox*, commonly known as prickly waterlily, makhana or Gorgon plant, is a species of water lily found in southern and eastern Asia, and the only extant member of the genus *Euryale*. The edible seeds, called fox nuts or *makhana* when dried, are eaten in Asia.

Though normally classified in the water lily family, Nymphaeaceae, the species is occasionally regarded as a distinct family, Euryalaceae. Unlike other water lilies, the pollen grains of *Euryale* have three nuclei.

*Euryale ferox* is a perennial plant native to eastern Asia and southern Asia, and is found from northeast India to Korea and Japan, as well as parts of eastern Russia. The Indian state of Bihar produces 90% of the world's fox nuts. It grows in water, producing bright purple flowers. The leaves are large and round, often more than a meter (3 feet) across, with a leaf stalk attached in the centre of the lower surface. The underside of the leaf is purplish, while the upper surface is green. The leaves have a quilted texture, although the stems,

flowers, and leaves which float on the surface are covered in sharp prickles. Other leaves are submerged. In India, *Euryale* normally grows in ponds and wetlands.

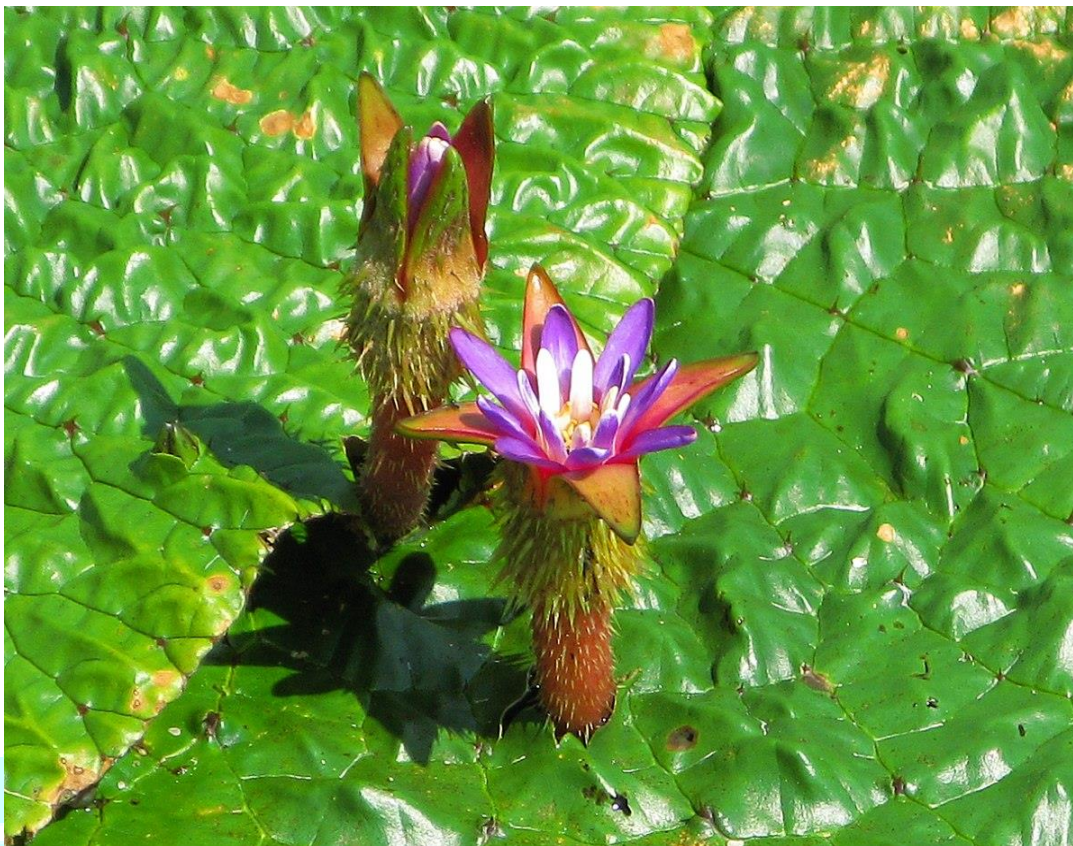
### Scientific Classification

Kingdom:	Plantae
Clade:	Tracheophytes
Clade:	Angiosperms
Order:	Nymphaeales
Family:	Nymphaeaceae
Genus:	<i>Euryale</i> Salisb.
Species:	<i>E. ferox</i>
Binomial name	
<i>Euryale ferox</i> Salisb.	



**Figure no. 1:** *Euryale ferox* Salisb Plant.





**Figure no. 2:** *Euryale ferox* Salisb Flower.

Common name: Prickly Waterlily, Prickly Water Lily, Gorgon Plant, Fox nut

Hindi: Makhana.

The plant prefers still water or, if grown in soil, a rich medium. However, it will not do well in the shade and is not cold hardy. When cultivated in temperate greenhouses, the plant is often grown as an annual. It is unlikely to succeed outdoors in cool climates, at least when grown as a perennial.

The plant produces starchy, white seeds and it is frequently cultivated as an edible plant in China and India. The fruit is soft and pulpy, about the size of a small orange and eaten in China as a cooling tonic food. The seeds are usually roasted, which causes them to pop like popcorn then eaten. In India, seeds are used in cooking, especially to make a porridge or pudding called kheer.

**Attributes of Plant**

Uses (Ethno botany):	Fruit and seeds are eaten.
Life Cycle:	Perennial
Recommended Propagation Strategy:	Seed
Country Or Region Of Origin:	Northern India to Southern Russia and the Far East
Climbing Method:	Tendrils
Edibility:	Fruit are consumed raw. Each fruit contains from 8 to 15 seeds that are usually roasted and then eaten.
Plant Type:	Perennial Water Plant
Woody Plant Leaf Characteristics:	Deciduous
Habit/Form:	Oval Spreading
Appendage:	Spines

**Table no.1:** Attributes of plant *Euryale ferox* Salisb.**Cultural Conditions**

Light:	Full sun (6 or more hours of direct sunlight a day)
Soil Texture:	Clay Loam (Silt) Sand
Soil pH:	Acid (<6.0) Alkaline (>8.0) Neutral (6.0-8.0)
Soil Drainage:	Frequent Standing Water
USDA Plant Hardiness Zone:	7b, 7a, 8b, 8a, 9b, 9a, 10b, 10a

**Table no.2:** Cultural Conditions for plant *Euryale ferox* Salisb.

<b>Fruit Description</b>	
Fruit Value To Gardener:	Edible
Display/Harvest Time:	Fall Summer
Fruit Description:	The seed is about the size of a pea, each fruit containing from 8 to 15 seeds. The seed is used as a source of starch.
<b>Flower Description</b>	
Flower Color:	Purple/Lavender White
Flower Bloom Time:	Spring
Flower Petals:	4-5 petals/rays
Flower Description:	Inner row of white petals and an outer row of deep violet petals; flowers during the day, but water garden medium requires a depth of 3 to 8 inches of water for best flower production.
<b>Leaves</b>	
Woody Plant Leaf Characteristics:	Deciduous
Leaf Color:	Green Purple/Lavender
Leaf Feel:	Prickly, Rough
Leaf Shape:	Ovate
Hairs Present:	No
Leaf Length:	> 6 inches
Leaf Description:	Leaves are 4 to 5 feet long. Plant spreads to 15 foot flat pad on the water. Leaves have sharp spines. The leaves are round with a leaf stalk attached in the centre of the lower surface. The underside of the leaf is purplish, while the upper surface is green. The leaves have a quilted texture, although the stems, flowers, and leaves which float on the surface are covered in sharp prickles. Other leaves are submerged.
<b>Stem</b>	
Stem Is Aromatic:	No
Stem Description:	Stems have sharp spines.
<b>Landscape</b>	
Landscape Location:	Pond
Landscape Theme:	Asian Garden, Water Garden
Design Feature:	Accent, Specimen

**Table no.3:** Details of plant *Euryale ferox* Salisb.

## Cultivation & Collection

The plant is cultivated for its seeds in lowland ponds in India, China, and Japan. The Chinese have cultivated the plant for centuries. More than 96,000 hectares of Bihar, India, were set aside for cultivation of Euryale in 1990–1991. The plant grows best in locations with hot, dry summers and cold winters.

The makhana plant is either transplanted in pond in January – February or self-grown in ponds through left out seed during harvesting. The growing period of makhana is from March to August month. Flowering starts in the month of April followed by fruiting. There are several makhana seeds in one fruit, which released out after maturation of fruit. The immature makhana seed are whitish in colour and float for several days in ponds, before settling down in bottom. Harvesting of seeds from bottom starts in month of September and continues till December - January. The nuts then are sundried, roasted and immediately thrashed by a wooden hammer. The hard black covering of nut gets broken and makhana seed expanded as soon as thrashed, resulting into round white puff makhana. The tradesman now collect the makhana from the house of several processors at a varying rate between 1800 to 3000 n rupees epr quintal.

The collection of makhana seed is done by trend local tribal labours, which are called as adivasi. The harvesting of makhana seeds from bottom of the pond starts in the early morning and continues up to evening. The collected makhana seeds are locally termed as giri. The adivasi, makhana seed collectors are paid on the basis of weight of collected makhana giri in the evening. Four to five people together collect seeds from the bottom at a time, they fix a bamboo pole, locally known as kaara, in one place and cover up to 4-5 meter radius around it during collection.

They dived in the bottom together and drag the makhana seeds towards the base of bamboo from different directions. All the seeds around the bamboo base are collected within 1.0-1.5 hour depending upon the quantity of seed lying at the ground. A single labour usually collect around 10-15 kilogram of wet makhana seed daily and they are paid on daily basis depending upon the basis of weight of collected makhana seeds. The rate of payment of Adivasi varies between 200-300 rupees per kilogram of seed.

The collected seeds are picked up in a crescent shaped bamboo container locally called as ‘Gaja’. A single Gaja may contain about 2-5 kg of makhana seeds. The Gaja containing makhana seeds are swung repeatedly to clean the seeds in water the mud, stein & other debris get dissolved in water & only Fresh makhana seeds on left out. Generally snails come in along with seeds which later aerie cleaned off by hand choosing. Cleaned seeds are then camped out at kept in aluminium utensils locally called as tasla. The carrying capacity each tasla is around 20-25 kilogram seeds. The seed collector then gets their wages from growers or growers cum harvesters.





**Figure no. 3:** Bamboo Container Gaja for Makhana Harvesting



**Figure no. 4:** Makhana Harvesting Process

Post Harvest of Makhana	Gradation
	Frying
	Storing
	Trading

**Table no.4:** Post Harvest Process of Makhana

### Nutritional value of Makhana

Superfood makhana is rich in proteins and fibre and low in fat. 100 grams of makhana gives around 347 calories of energy. There are around 9.7 grams of proteins and 14.5 grams of fibre in makhana. Makhanas are a very good source of calcium. They also contain magnesium, potassium & phosphorus in a good amount. A few vitamins in less quantity are also present in makhana.

Magnesium is required for normal metabolism, it is involved in everything from muscle function, nerve function and even in the production of proteins. Makhana has ample amounts of carbs as well as other minerals like calcium and iron. Calcium is vital for healthy bones and teeth, while the iron is essential for healthy blood. Overall, fox nuts nutrition brings a lot to your diet especially if you are lacking in minerals and fibre.

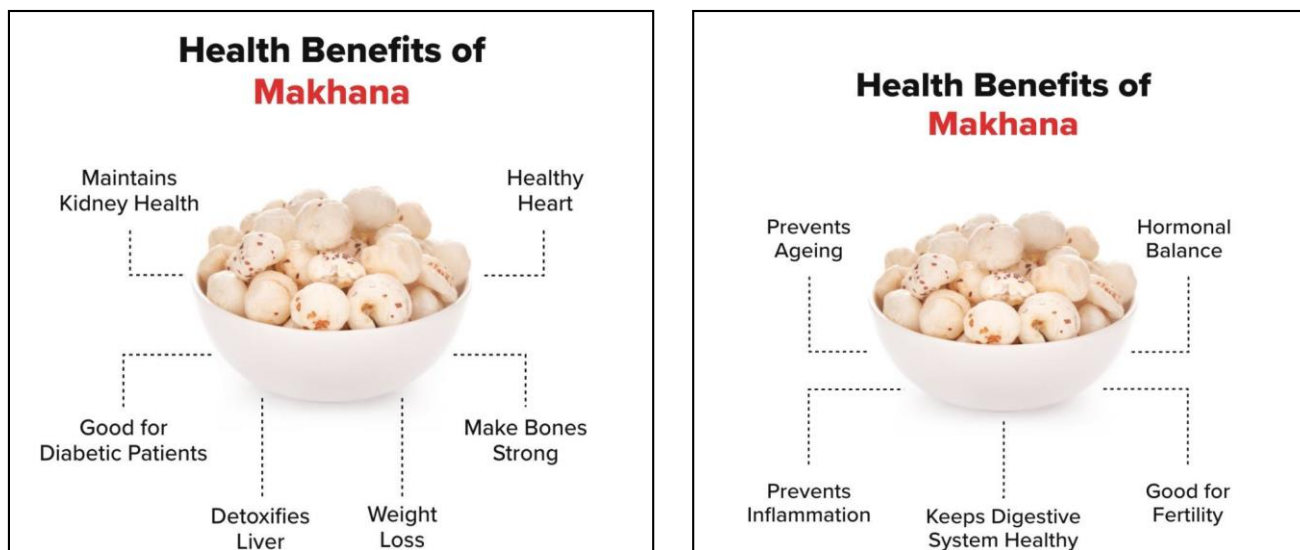
### Health Benefits of Makhana (Fox Nuts) Are:-

1. Fox nuts have really high protein content. This is why they make such an important part of fasting food because a handful can provide you with energy to last the entire day. Most snacks are either deep-fried or have a high amount of preservatives and additives. Having a bowl of fox nuts will fill you up and also keep the calories in check.
2. Fox nuts make for great anti-ageing food as they have an abundance of anti-oxidants. A handful every day can keep you looking younger and making your skin glow. The catch is that they must not be consumed as a fried snack. Gallic acid and chlorogenic acid as well as epicatechin are some of the beneficial antioxidant substances found in Makhana nuts. These may play a role in reducing the risk of heart disease, cancer and chronic conditions like diabetes.
3. Fox nuts are great snack food for diabetics and heart patients as they contain good fat and have a low quantity of saturated fats. These properties make makhanas good weight-loss food. In certain animal studies, makhana extract was shown to reduce triglyceride and cholesterol levels and improve symptoms of fatty liver disease. A similar study showed a reduction of the same markers in rats with diabetes. Although further studies are required, the benefits of fox nuts make it promising as a food item for those looking to protect their heart health.
4. Fox nuts are high in fibre. The digestive process gets sorted with them as they prevent constipation and add bulk to the stool.
5. Fox nuts are great detoxifying agents. They aid in flushing out toxins from the body. They are really beneficial to the spleen which is like a graveyard for cells in the body. It recycles the RBCs (red blood



cells). The spleen is the nerve centre of the immune system because it also stores white blood cells and platelets.

6. Having fertility issues? Fox nuts will come to the rescue. Touted as an aphrodisiac, they help with premature ejaculation, improve the quality of semen and help women suffering from infertility.
7. Fox nuts have a low glycemic index which means that they release glucose slowly in the blood. This keeps you feeling full for longer.
8. Those suffering from wheat allergies can gorge on fox nuts as they are gluten-free but still high in protein and carbohydrate content.
9. They are high in magnesium and potassium and low in sodium. This makes fox nuts an ideal snack for those watching their weight. High potassium and low sodium is a great combination for patients suffering from hypertension. The potassium brings down the blood pressure and sodium tries to bring it up. So those who suffer from high blood pressure can snack on fox nuts without facing any spikes in their blood pressure.
10. Fox nuts have a natural compound, kaempferol that reduces inflammation in the body. Inflammation is responsible for most modern diseases like diabetes, arthritis, rheumatism. Also, fox nuts have antibacterial properties.
11. Apart from magnesium, potassium, and sodium, foxnuts also contain a high amount of calcium. This means they fall under the category of foods that are good for the bones as well as the teeth.
12. Makhana is also high in thiamine content which means they help in aiding cognitive function as well. The consumption of foxnuts helps the body to produce acetylcholine and thus contributes to the process of neurotransmission. This process of neurotransmission is key to maintaining the good functioning of the nerves.
13. Fox nuts are naturally bestowed with astringent properties which mean people with weak kidneys can easily snack on fox nuts. Fox nuts have anti-inflammatory and antioxidant properties which help to reduce inflammation and the effects of oxidative stress.
14. Mental health conditions such as anxiety, depression and insomnia are quite common these days owing to stress and lifestyle changes. Insomnia particularly can be debilitating as lack of sleep over time can lead to failing health and lowered cognitive ability thus affecting productivity. Instead of turning to store-bought medications to tackle the problem of insomnia try a quick home remedy at home with a hand few fox nuts. This desi antidote can be easily brewed with only milk and dates. All you need to do is soak a few dates and fox nuts in water for a few hours. Drain them and put them in a blender along with a glass of milk. You need to drink up this fox nut smoothie before you go to bed. For added sweetness, you can add honey. Consume this daily for a few days and notice an improvement in your sleep quality.



**Figure no. 5:** Makhana benefits

## Conclusion

Makhanas are a complete snack. They are full of essential nutrients and provide great health benefits. These little nuts are an amazing snack option and perfect to satisfy those mid-day cravings. Though Makhanas are great, there are potential side effects like allergies, gastrointestinal problems, etc. if you are someone who has a sensitive stomach, be a little careful while consuming too many makhanas. By eating makhanas, you will not only improve your health but also support local farmers of the country involved in Makhana cultivation.

## Acknowledgement

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