

Makhana (Euryale ferox Salisb)-A Review

Pravin Masram^{1*}, Patel KS², Kori VK³ and Rajagopala S⁴

^{1,2,3,4}Department of Kaumarbhritya, I.P.G.T. & R.A., Gujarat Ayurved University, Jamnagar, Gujarat, India

Abstract

Euryale ferox Salisbury (Nymphaeaceae), known as *Makhana*, is distributed in tropical and subtropical regions of south-east and East Asia. It grows as an exclusive aquatic cash crop in shallow water bodies in north Bihar and lower Assam regions of India. It has nutritional and medicinal properties and supports cottage industry. It is cultivated in ponds, lakes, tanks and other aquatic bodies. Classical texts books of Ayurveda gave limited information about *Makhana*. In Bhavprakash Nighantu describe *Makhana*. Also various Nighantu author describes the *Makhana*. It is medicinal and nutritional herb is extensively used in Ayurveda and Chinese medicine. In India *Makhana* is used as food supplement and is contain of many dishes in Indian people food. In Ayurveda disease like *Daha*, *Raktapitta* and low quality of semen, *Makhana* is useful. In Chinese medicine treatment of diabetes mellitus *Makhana* having good impotence. So, these articles narrate the medicinal and nutritional properties of *Makhana*.

Keywords

Makhana, *Euryale ferox* Salisb, Ayurveda, Nutrition



Greentree Group

Received 12/01/16 Accepted 20/02/16 Published 10/03/16

INTRODUCTION

Makhana (*Euryale ferox* Salisb) is an aquatic crop, belonging to the family of Nymphaeaceae. It is commonly known as Gorgon Nut or Fox Nut, and it is grown in stagnant perennial water bodies like ponds, land depressions, oxbow lakes, swamps and ditches. *Makhana* seeds are also called as Black Diamond¹. It is a food item for the religious fast of various people. Popped *Makhana* is used in preparation of a number of delicious and rich sweet dishes, pudding and milk based sweets. Apart from these, *Makhana* is used for medicinal purposes as well, both in India and China as documented in the ancient literatures. The seed is analgesic and aphrodisiac, hence used in the preparations of a number of Ayurvedic medicines.

Aim and Objective: The present work aimed to review and give more information about nutritional value and medicinal uses of *Makhana*.

MATERIAL AND METHOD

This review was done by compiling of Pharmacology (Dravyaguna) and, magazines and research journals as well as PUBMED, MEDLINE database. The compiled information was review with the chemical

composition, nutritional value and medicinal properties of *Makhana*.

Plant description:

E. ferox Salisb is stem less, prickly, aquatics herb with rootstock short and thick. The leaves are submerged, oblong, orbicular corrugated about 6-100 cm in diameter; reddish green above, purple below and densely spinous. The flowers are solitary, submerged, and epigynous with four persistent, thorny sepals inserted on the torus above the level of the ovary, together with many seriate petals. Most flowers are cleistogamous, but chasmogamous flowers may also be produced. The inferior, multicarpellary ovary develops into a spongy berry like fruit which is densely prickly, the size of an orange, and contains 30-40 pea size seeds with hard black seed coat and a mucilaginous aril. The pulpy aril keeps the seeds floating for a few days after they dehisce, before they finally settle down to the bottom of the water².

Makhana Scientific description:³

Kingdom-Plantae

Unranked-Angiosperms

Order-Nymphaeales

Family-Nymphaeaceae

Genus- *Euryale*Salisb.

Species- *E. ferox*

Binomial name- *Euryale ferox* Salisb.

Ayurveda:

Makhana is not describing in the BrihatTrayi texts. However the term ‘*Ankolodya*’ is used by Charaka⁴. Thakur Balvant Singh is considered as

Table 1 Pharmacodynamics of *Makhana* in Ayurveda

Nighantu	Rasa	Virya	Vipaka	Karma
Bhavprakasha ^[19]				<i>Balya, vajikara, Grahi, Viryalpata</i>
KaidevNighantu ^[20]	<i>Tikta, Kashaya, Madhura</i>	<i>sheeta</i>	-	<i>Raktapittashamaka, BalakarakaLekhan, Garbhashtapaka. Dahashamak.</i>
Dhanvantari ^[21]	<i>MadhuraTikta,</i>			<i>Garbhashtapaka, Raktapittashamaka, Vatavardhaka</i>
Illustrated DravyagunaVijnana ^[22]	<i>Madhura</i>	<i>Sheeta</i>		<i>Raktapittahara, Garbhashtapana, Vrishya, Balya, Sukramehar and Dahahar</i>

Table 2 Chemical Composition *Makhana*^[23]

Determination	Whole starch	Protein free starch
Yield (%) from seed meal	52.5	n.d
Moisture (%)	14.4	13.5
Ash (%)	15	0.15
N (%) by kjedahl method	1.36	Nil
Protein (%) by amino acid analysis	7.32	Trace
Total carbohydrate (%)	77.33	86.85
Amylose (%), potentiometrically	n.d	25.3
Amylopectin (%) with respect to amylose	n.d.	74.7

]

Major chemical constituents: Amino Acid composition of the seed protein has been reported⁶.

Chemical Composition: (Table 2)

Nutritive Value:

Makhana (*Euryale ferox* Salisb.) having low fat content, high contents of carbohydrates, protein and minerals. The calorific value of

‘*Gilodya*’ i.e *Ceropegia tuberosa* Roxb. It may be concluded that ‘*Ankolodya*’ is substitute for *Padmabija*. (Seeds of Lotus)⁵

Pharmacodynamics in Ayurveda:

(Table 1)

raw seeds (362 k cal/100g) and puffed seeds (328 k cal/100g). The chemical constituents are 0.02 calcium 0.9 phosphorus and 0.0014 irons⁷. Nutritional studies shows that edible parts of the seeds contains 12.8% moisture, 9.7% protein, 0.1% fat, 76.9% carbohydrate, 0.5% mineral matters, and 1.45% iron besides a good proportion of sugar, ascorbic

acid and phenol. Amino acid index is higher than in staple foods, which signifies its unique food quality⁸.

Antidiabetic and Antihyperlipidemic of *E. Ferroxsalisb.*

Feroxsalisb. : The extract of *E. Ferroxsalisb.* seeds extract protect β -cells against ROS-mediated destruction by improvising the levels of antioxidant enzymes and minimizing hyperglycemia which could be due to release of insulin from remnant and recovered β -cells in pancreas in STZ-induced diabetic rats as confirmed by the ultrastructural, histopathological studies. The research clearly indicates that ethanolic extract of *E. Ferroxsalisb.* may be utilized as important source of natural antioxidants with antidiabetic and antihyperlipidemic potential and can be used as plausible food additives or as a functional food in future⁹.

Medicinal properties of *Makhana* :

1. The seeds contain sufficient amount of vitamins so, used to treat beriberi, a disease caused by deficiency of Vitamin B1¹⁰.
2. Feeding of *E. ferox*, stimulated humeral immunity and suggested its applications in mothers after delivery and invalids¹¹.
3. Makhana alleviates Vata and Pitta Dosh. It strengthens the heart and is very

useful in anemia. Makhana increases quality and quantity of semen, prevents premature ejaculation, increases libido and helps in female infertility. It strengthens body and increases energy level. Because of its aphrodisiac properties it is grouped under *Vrishyadi* group. The herbs under this group are used in *Vajikarana* therapy. Makhanna increases stickiness of secretions by increasing moisture level in body. Hence it increases quality and quantity of semen and useful in impotence. It helps to increase the fertility in women and reduces *Vata* and *Pitta*. It strengthens the body and reduces burning sensation and quenches thirst¹².

4. Makhana is used as a tonic and for the treatment of leucorrhoea and good immunostimulant¹³.

5. **Diabetes** - Diabetes is a metabolic disorder, which is accompanied by high blood glucose levels. It is a result of improper functioning of the pancreas, which secretes the insulin hormone. Fox nut is a sweet and sour seed. These seeds contain starch and protein which is excellent for diabetes¹⁴.

6. **Anti – aging**: Makhana is rich in antioxidants which works as age lock system and makes us younger for much longer .Makhana is effective for individuals with

high risk of premature ageing, premature white hairs, wrinkles and other signs of aging¹⁵.

7. **Chinese medicine:** According to principles of traditional Chinese medicine fox nut or Makhana is used to strengthen spleen and kidneys. It is indicated in conditions like spermatorrhea, premature ejaculation, neuralgia, incontinence, chronic diarrhea etc. According to herbalists it is helpful in preventing early discharge of semen and restores sexual vigor in older men. Makhana helps in conditions like arthritis, erectile dysfunction and premature aging. This herb has antioxidant properties and helps in digestion, rejuvenates respiratory system and prevents frequent urination¹⁶.

8. Euryale ferox seed is consumed medicinally or for food in China. The study on Makhana revealed it to contain significant antioxidant activity, which may be associated with its medical applications as a proteinuria inhibitor of diabetic nephropathy¹⁷.

9. Makhana seeds benefit the spleen, kidney, and heart. The seed also has calming properties that alleviate restlessness, palpitations, and insomnia. It is also rich in calcium. It is a highly regarded herb for

restoring sexual vigor and youthful energy in older men. It regulates blood pressure, relieves numbness and aching near waist and knees. It is suitable for arthritis, helps fighting impotency and premature aging. Makhana is very useful for women during and post pregnancy period. It also helps your respiratory system, veins and digestion. Popped Makhana contains almost 12% of protein (excellent especially for vegetarians) It reverses the aging process over a period of time¹⁸.

Discussion: Makhana is very useful drugs for medicinal purpose as well as food supplement. Makhana also named as Fox nut, *Phool*Makhana, lotus seeds, Gorgon nut, Euryale Ferox. The plant fox nut belongs to the family Nymphaeaceae. It grows in water and is found in India, Korea, China, Japan and Russia. In India, it is popularly known as Makhana. They are the edible seeds of lotus flower which can be roasted or fried. These are used in many dishes of India. They are also considered as very pious food and used in many rituals. Along with this they are also highly beneficial in terms of nutritional values. Makhana is superior to dry fruits such as almonds, walnut, coconut and cashew nut in term of sugar, protein, ascorbic acid and

phenol content. Makhana seeds are low in saturated fats, sodium and cholesterol and are high in magnesium potassium and phosphorus. It contains easily digestible protein, carbohydrate, moisture, fat, total minerals, phosphorus and iron. These chemical constituents are very useful for human body and they also provide rich source of nutrition. It is avoid constipation due to having high fiber. Makhana is helpful in diarrhea and improving appetite. Makhana contains flavonoids which are antioxidants and reverse the adverse effects of free radicals in the body. They also prevent the inflammations in the body. These free radicals are the main cause of many degenerative diseases like diabetes mellitus, heart problems. Makhana is known as anti-aging foods because of powerful antioxidants. It acts as an aphrodisiac and increases quality and quantity of semen, prevents premature ejaculation, increases libido and helps in female infertility. Fox nuts regulate the blood pressure as they are low in sodium and high in potassium, So a very beneficial food for the hypertensive people. Makhana contain iron, so it is also helpful in anemia. According to Ayurveda, Fox nut alleviates *Vata* and *PittaDosh* due to *Madhura rasa*, *MadhuraVipak* and

SheetaVirya. Makhana is *Raktapittahara*, *Garbhashtapana*, *Vrsya*, *Balya* properties and mainly indicate in *Sukrameha* and *Daha*. Makhana having good source of energy, carbohydrate, protein and mineral, so it will be use the management of Protein Energy Malnutrition (PEM). According to the Chinese medicine, fox nut or Makhana is used to strengthen spleen and kidneys. According to herbalists it is helpful in preventing early discharge of semen and restores sexual vigor in older men. It is also recommended for the women during pregnancy and post natal weaknesses. Makhana regulates blood pressure, relieves numbness and aching near waist and knees. It increases moisture level in body tissues. They also helps to lower the blood sugar levels, so a healthy snack for diabetics.

CONCLUSION

Makhana is herb is use to nutritional food as well as me medicinal purpose. In Ayurveda it is very useful drug many disease. In Chinese medicine *Makhana* use for treat to spleen and kidney disease.

REFERENCES

1. Prem Kumar Sundaram, BikashSarkar and SurajitMondal, Design and Performance Evaluation of Pedal Operated Makhana (*Euryale ferox Salisb*) Seed Grader, Research Journal of Agricultural Sciences 5(3): 428-431, May-June (2014)
2. Mamta Shankar, NehaChaudhary, Dheer Singh, A Review on Gorgon Nut International Journal of Pharmaceutical & Biological Archives 2010; 1(2):101 – 107
3. https://en.wikipedia.org/wiki/Euryale_ferox . 13 September 2015
4. VidhyadharShukla, Ravi DattTripathi, Charaka Samhita (Vaidyamanorama Hindi Commentary), vol 1. Chikitsasthana Varanasi: Chaukhamba Sanskrit Pratishthana; 2010, Sutrasthan, chapter-27/117, p 400
5. Sastry JLN. Illustrated DravyagunaVijnana, Vol. II. 1st ed. Varanasi: ChaukhambhaOrientalia; 2010. p.591
6. Sastry JLN. Illustrated DravyagunaVijnana, Vol. II. 1st ed. Varanasi: ChaukhambhaOrientalia; 2010. p.591
7. MamtaShankar ,NehaChaudhary, Dheer Singh. A Review on Gorgon Nut, International Journal of Pharmaceutical & Biological Archives 2010; 1(2): 101 – 107
8. RN Mandal, GS Saha,NSarangi, Harvest and processing of *Makhana* (*Euryale ferox Salisb*)- An unique assemblage of Traditional Knowledge, Indian Journal of Traditional Knowledge, Vol .9 (4), October 2010, pp 684-688
9. Danish Ahmed, Vikas Kumar, AmitaVerma, Girija Shankar Shukla, and Manju Sharma' Antidiabetic, antioxidant, antihyperlipidemic effect of extract of *Euryale feroxsalisb*. with enhanced histopathology of pancreas, liver and kidney in streptozotocin induced diabetic rats, Springerplus. 2015; 4: 315. Published online 2015 Jul 3. doi: 10.1186/s40064-015-1059-7PMCID: PMC4489967
10. Ho H, Cheu Y, Luo I. The detection of vitamin B, and C in Chinese drugs. Journal of Taiwan Pharmacy Association, 1953; 5:5-20.
11. Puri A, Sahai R, Singh KL Immunostimulant activity of dry fruits and plants materials used in Indian traditional medical system for mothers after child birth and invalids. Journal Ethnopharmacology, 2000;71(1-2):89-92.
12. <http://www.ayurhelp.com/articles/medicinal-properties-foxnut-euryale-ferox> or

%E2%80%9Cmakhana%E2%80%9D#.VnZ
5Cb-81C0. 20 December 2015

13. <http://www.krishisewa.com/cms/articles/miscellaneous/355-makhana.html> asses
on 13 September 2015

14. http://manjumakhana.com/benefits_Fox_nut.php .13 September 2015

15. http://manjumakhana.com/benefits_Fox_nut.php. 13 September 2015

16. http://manjumakhana.com/benefits_Fox_nut.php 13 September 2015

17. Song CW, Wang SM, Zhou LL, Hou FF, Wang KJ, Han QB, Li N, Cheng YX. Isolation and identification of compounds responsible for antioxidant capacity of *Euryale ferox* seeds. J Agric Food Chem. 2011 Feb 23;59(4):1199-204. doi: 10.1021/jf1041933. Epub 2011 Jan 31.

18. http://manjumakhana.com/benefits_Fox_nut.php. 13 September 2015

19. BhavprakashNighantu, KrushnadevChunekar, GangasahayPandey, Varanasi, ChaukhambhaBharti Academy, Reprint 2010, p.566

20. KaidevNighantu , P. V. Sharma , Guruprasad Sharma, Varanasi, ChaukhambhaOrientalia; 2006. p.270

21. DhanvantariNighantu, P.V.Sharma,Guruprasad SharmaVaranasi,

ChaukhambhaOrientalia; 2005, 4th edition. p.147

22. Sastry JLN. Illustrated DravyagunaVijnana, Vol. II. 1st ed. Varanasi: ChaukhambhaOrientalia; 2010. p.591

23. Nath BK Chakraborty AK. Studies on the physico-chemical properties of the starch of *Euryale ferox*. Starch. 1985; 37:361-63.