

CULTIVATION OF MAKHANA, *EURYALE FEROX* FOR POTENTIAL UTILIZATION OF WETLAND AND ITS MANAGEMENT IN NORTH BIHAR, INDIA

ARVINDKUMAR

Post-Graduate Studies & Research Centre,

Department of Botany ,

T. N. B. College, BHAGALPUR -812007

T. M. Bhagalpur University, BHAGALPUR (BIHAR) INDIA

Email : akarvindkumar863@gmail.com

Received : 23.08.2017; **Accepted** : 01.10.2017**ABSTRACT**

These wetlands are ideal sites for Makhana (*Euryale ferox*) cultivation. It is an integral part of economy, culture and custom of Mithila region. Apart from its high nutritional value, Makhana cultivation helps in the sustainable management of wetlands in these areas. Wetlands, vital parts of hydrological cycle, are highly productive, support exceptionally large biological diversity and provide a wide range of eco-system services, such as waste assimilation, water purification, flood mitigation, erosion control, ground water recharge and microclimate regulation. From the study it may be concluded that cultivation of Makhana is imperative to utilize this vast unused or waste wetland ecosystem with impetuously for food, livelihood, engagement of household labours and ultimately, economic stability of rural people.

Figure : 00

References : 07

Table : 00

KEY WORDS : Biological diversity, Makhana, Nutritional value, Sustainable management, Wetland.

Introduction

Wetlands are the transitional phase in between dry terrestrial and permanently aquatic ecosystem, where, the soil is frequently waterlogged, and the water table is at or near the surface and the land is oftenly covered by shallow to certain depth of water, exists either permanently or semi-permanently or temporarily. Soil and water are the integral part of global natural resources, determined greatly wetlands and its diversity, habitats of thousands aquatic flora and fauna. North Bihar is known for its wetlands. These water bodies serve as the life line of the region by maintaining the ground water table and meeting the requirements of drinking and irrigation. This swampy, fertile, productive wetlands are continuously used by the rural farmers for production of fish variables and aquatic food crops like makhana. The plant is native to south-east Asia with the prevalence of tropics to sub-tropics

accomplished with humid to sub-humid environment. Makhana is an important crop in China, Japan, Malaysia, Thailand, Philippines, Nepal and Bangladesh. It is also grown wild in Russia and North America .In India, its cultivation is more pronounced in north-eastern part, particularly in northeast of Bihar, where 80% of India's total production occurs⁶. It is extensively grown in the stagnant water of wetlands, tanks, ponds, lakes and ditches. Its cultivation is done on traditional lines and farmers still follow age-old practice of cultivation. The vast wetland ecosystem of north Bihar may be effectively be utilized through the cultivation of makhana to meet the challenges of sustaining food security and economic outturn for the poor and marginal farmers of the area. Integrating aquaculture along with makhana cultivation could also help augment the wetland productivity to its optimum in these regions¹.

Description of Plant

Makhana (*Euryale ferox*) is an aquatic and floating leaf emergent macrophyte belonging to the family of Nymphaeaceae. It is commonly known as Gorgon Nut or Fox Nut. It is an endemic and endangered plant represented by only one species viz *Euryale ferox*. Makhana plant is characterised by its prickly leaves floating on water surface like lotus. It is a bisexual plant having small violet-blue flowers, with petals white in the centre, and up to 4 – 5 cm long. Each plant produces 15-20 fruits, which are round, spongy and prickly outside. Each fruit consists of 20-25 seeds, which are small (0.75 cm in diameter), black and encrusted with a thick sheath around the white edible part. The seeds are finally processed into edible form i.e. makhana. The whole fruit when immature are used as vegetable and ripe seeds can be stored well for use throughout the year.

Nutritional value and medicinal importance

These seeds are low in saturated fats, sodium and cholesterol and are high in magnesium, potassium and phosphorus. It contains 9.7% easily digestible protein, 76% carbohydrate, 12.8% moisture, 0.1% fat, 0.5% total minerals, 0.9% phosphorus and 1.4%mg iron/100g. It is high in fiber, so it helps to avoid constipation. They help the body to remove the waste and thus prevent the accumulation of toxins. It is digestive for all age groups. Due to its astringent property, it is helpful in diarrhoea and helps in improving appetite. It contains flavonoids which are antioxidants and reverse the adverse effects of free radicals in the body.

The seed is analgesic and aphrodisiac. It is taken internally in the treatment of chronic diarrhoea, vaginal discharges, diabetes, gonorrhoea, and stomachache, kidney weakness associated with frequent urination, impotence, premature ejaculation and nocturnal emissions. It has been traditionally used to treat diseases like beri-beri also. Its medicinal properties are documented in the ancient literatures of both India and China^{3,4}. Bihar state accounts for over 80% of the Makhana production of the country. Madhubani, Darbhanga, Sitamarhi, Saharsha, Katihar, Purnia, Samastipur, Supaul, Kishanganj and Araria Districts are major producer of Makhana.

Cultivation , Harvesting and processing

Bihar accounts for more than 85 percent of

the *makhana* produced in the country. Northern part of Bihar, constituting districts of Madhubani, Darbhanga, Sitamarhi, Saharsha, Katihar, Purnia, Supaul, Kishanganj and Araria, is agro climatically suitable for *makhana* cultivation.

As per the estimates of the National Research Center for Makhana, Darbhanga (ICAR), total area under *makhana* cultivation in India is estimated to be 15000 Ha. It yields 1,20,000 MT of *makhana* seeds, which after processing yields 40,000 MT of *makhana* pop. The estimated value of the production at farmers end is Rs 250 Crore and it generates revenue of Rs 550 Crore at traders' level.

A water body where 1-1.5m water depth is maintained throughout the year is an ideal site for makhana cultivation. New plants come out from the seeds which have been left last year in the bottom of water bodies. An average 90-100 kg seeds will be required for one hectare in newly introduced areas². Excess of plant emerging out of seedlings are removed by thinning operation in order to find a proper gap of one meter between the plants. During April-June the entire water surface get covered with large orbicular floating leaves. Soon after flowering season begins and simultaneously fruits are set. During month of July-August when the ripen fruits burst, seeds float in the water surface but remain adhered under the leaves and then finally settle in the bottom of pond within a day or two. Seed are collected from the month of August onward by skilled professionals using locally devised expertise. During the entire process of cultivation neither any insecticide nor fertilizer is used. Therefore providing an extra benefit to the cultivator .

Ripen seeds settled down in the bottom of the pond are collected manually through brooming. The nuts are threshed manually by feet for removing mud and other undesirable deposits. The seeds are then thoroughly washed. Normally gorgon nuts collected in the last week of August and early September. The crop yield varies from 12-20 quintal/ hectare. Seeds are dried in open sun for a week and then fried in earthen pans over furnace by skilled people. Then seeds are beaten with wooden hammer for obtaining popped makhana 'lava'. The recovery rate of pop is approximately 40-42% of the seeds. Unpopped seeds are discarded manually. The pops are swollen and white in colour having reddish spots depending on quality.

Selection and packaging is done in gunny bags for storage under ordinary storage conditions for long periods⁵.

It is reported that about 13,000 ha are utilized in Bihar for Makhana cultivation and about 90,000 tones nuts are being harvested from these area per year. One hundred kg of nuts can produce about 35.0 kg of pops. There is a scope in revenue generation by cultivation of makhana, where major cost of about 84% goes to the method of makhana processing, as compared to the cultivation cost of about 15%.

Makhana growing water bodies are ideal reservoirs for air-breathing fishes like *Singhi*, *Magur*, *Kawai* etc., which derive their nutrition from the heavy organic detritus in the pond bottom. *Makhana* ponds could also be used for rearing fishes as well as for nursery ponds during September to January, which is the intervening period between the two successive *Makhana* crops^{1,7}.

Conclusion

Makhana is a major cash crop of North Bihar region where water based economy can flourish over the land based economy. This is because huge stretches of wetlands are prevalent in the region. Proper micro and macro management of wetlands can change the face and fortune of the region. The population burden of the region is becoming unsustainable because of unproductive land. These wetlands serve as the life line of the region so all possible efforts for proper and balanced utilization of its water bodies and sustainable development of its biotic resources is essential for maintaining the ground water table and meeting the requirements of drinking and irrigation. Besides, these wetlands constitute the reservoirs of fisheries and a diverse group of aquaphytes and help meet the energy and protein demands of the suffering humanity in far-off flood ridden localities.

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