

Growing makhana for high income

Makhana (*Euryale ferox* Salisb.) is normally grown in stagnant water bodies like ponds, low depressions, lakes, etc. In the traditional system, 10% of the seeds germinate from the leftover seed of previous crop in the same pond. The harvesting or collection of scattered Makhana seeds from the bottom surface of the pond is very tedious and painful activity, which involves a lot of drudgery. There are a number of constraints that limit the cultivation of makhana.

MAKHANA (*Euryale ferox* Salisb.) also known as gorgon nut or fox nut is a kind of seed produced from an aquatic crop of the family-Nymphaeaceae. It is normally grown in stagnant water bodies like ponds, low depressions, lakes, etc. The Makhana plant grows in water, producing bright purple flowers. A single Makhana plant produces equal number of 8-9 leaves and flower arranged alternately, intermingled together that seems just like an octopus. Each flower after fruiting produces 8-13 seeds and a single plant produces about 100 seeds. The leaves are large and round about 1-2 m in diameter, with a leaf stalk attached in the centre of the lower surface. The upper surface of leaf is green while underside is purple in colour and floats on water. The surfaces are covered with sharp prickles/thorns. The roots are long, fleshy and fibrous in nature and generally in 2-3 clusters with number of air pockets, and the seeds are round and lumpy of about 0.5-1.5 cm in diameter. In a pond system, there are about 10,000 plants/ha and the seed yield in traditional system is around 1.8-2.0 t/ha. About, 80% of total Makhana comes from Darbhanga, Madhubani, Purnia and Katihar district of Bihar. The area under Makhana cultivation is about 13,000 ha.

Makhana is a good source of carbohydrate, protein and minerals. The raw Makhana contains 76.9% carbohydrate, 12.8% moisture, 9.7% protein, 0.9% phosphorous, 0.5% minerals, 0.1% fat, 0.02% calcium and 0.0014% iron whereas, popped Makhana contains 84.9% carbohydrate, 4% moisture, 9.5% protein and 0.5% fat. It also has some medicinal value and recommended for treatment regarding respiratory, circulatory, digestive, excretory and reproductive systems. The calorific value of raw and popped Makhana is 362 and 328 kcal/100 g, respectively.

Constraints to Makhana cultivation are no ownership of the pond, highly skilled operation, lack of credit facility, lack of scientific knowledge of cultivation, lack of improved variety, short lease period and labour intensive process. Also, Makhana is an important source of income for Mallah community, but not much attention towards the improvement of livelihoods of this community has been given and their socio economic situation is still very

grim. Majority of cultivators don't own ponds and so they don't get proper returns.

Cultivation practices

In traditional system, 10% of the seeds germinated from the leftover seed of previous crop in the same pond. In the month of March, the Makhana plant comes out to upper surface of the pond. Normally, 1×1 m row to row and plant to plant distance is maintained by thinning off extra plants. Young and healthy plants are collected from nearby pond and transplanted at an interval of 1×1 m spacing in the month of March-April. After 2-3 months of transplanting, bright purple flowers start appearing in the pond surface. The flower changes to fruit and burst after 35-40 days of flowering and the seeds float on water surface for 2-3 days and then settle down at the bottom of the pond.

Harvesting

Harvesting refers to collection of scattered Makhana seeds from the bottom surface of the pond. The harvesting of Makhana is very tedious and painful activity, which involves a lot of drudgery. A diver has to go deep into the bottom surface of pond and hold his breath for longer time as one can. Normally, the breath lasts for 1.5-2 min and in that short time the diver has to go down and work which includes awkward postures. During this operation, mud enters into the diver's ear, eye, nose and mouth. The divers also get skin diseases due to this problem. Therefore, some kind of diving suit should be supplemented to the divers involved in Makhana seeds so that they can be inside the water for longer duration and to reduce the drudgery involved in the harvesting of seeds from ponds. The collection of seeds in pond system is done in the month of August-October by divers of "Mallah" community in the morning around 6.00 – 11.00 AM.

First of all, the leaves and plants are cut with knife from the top surface of the pond. After 4-5 days all plant parts start to decay and get decomposed in the pond, and then only the divers get inside the pond. The collection of seeds in traditional system is done in the month of

Harvesting of Makhana



Makhana Plant



Makhana flower and fruit



Makhana seeds on water



Raw makhana seeds



Ganjaa: Traditional harvesting tool



Traditional way of harvesting in pond

August-October. In pond, one bamboo pole locally called “Kaara” is fixed in the pond and the divers go to the bottom surface, lie down and drag the mud near the pole with both palms. Like this the diver covers a radius of his height around the periphery of the pole. A heap of mud is formed near the base of bamboo pole which is later sieved with locally made bamboo screen called “Ganjaa”. The collected seeds in “Ganjaa” are then carried through the water surface where the seeds get cleaned. During this operation, many a times divers get injured due to the presence of sharp thorns of Makhana present in the pond. About 50-60% of the cost goes in paying the labour charges as a particular community is involved in collecting the seed and no other harvesting machine is available till

now. The charges of collecting seed increases with the number of times of harvesting. Normally, in a pond 2-3 times harvesting is done. Initially its starts with ₹ 15-20/kg for the first harvest, ₹ 30-40/kg for second harvest and ₹ 50-60/kg for third harvest and so on. The increase in cost is due to the fact that the collection of seed decreases as the harvesting times increases.

Market for Makhana

Makhana is an aquatic crop of eastern countries like Japan, Korea, Taiwan and India. In India, about 80% of Makhana comes from Bihar. About 50,000 tonnes of Makhana are produced annually worth ₹ 550 crores in market but, the actual data is still unknown. Due to its high protein and low fat content, Makhana has a huge demand in India as well as in other countries. About 80% of the Makhana grown in India comes from Bihar which is the only source of income to the rural community, i.e. *Mallah*. The major consumers of Makhana are United States followed by United Kingdom and Canada.

Table 1. Cost economics of Makhana cultivation grown in ponds

S. No.	Item	Cost (₹/ha)
A	Cost of cultivation (includes rent, seed required, interculture, harvesting, transportation, etc)	50040
B	Output: (average seed yield-1.8 t/ha and rate ₹55/kg)	99000
C	Net return/ha (A-B)	48960

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