

Harvest and processing of *Makhana* (*Euryale ferox* Salisb.) – An unique assemblage of Traditional Knowledge

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The study deals with the involvement of traditional knowledge pertaining to harvest and processing of *Makhana* (*Euryale ferox* Salisb.) –potential aquatic cash crop. A group of farmers, locally known as *Mallah*–a fisher community, is traditionally skilled with aquatic resource management. Inherently, they remain engaged in cultivation, harvest and processing of *Makhana*, which has high economic value in North and Eastern India. The harvest of *Makhana* seeds from water bodies and their processing from black hard nut to white puff, ready to eat, through frying in hot earthen oven are cumbersome traditional methods blended with a series of concerted effort. Each activity from harvest to processing, unique assemblage of traditional knowledge has been discussed.

Keywords: *Makhana*, Traditional processing, Nutritional value, *Mallah*

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Makhana, *Euryale ferox* Salisb. is considered an aquatic cash crop in India^{1,2}. It is cultivated in several districts in North Bihar, where it is a main support for livelihood of the poor people^{3,4}. *Makhana* cultivated water bodies are also utilized along with fish culture. It is a perennial aquatic floating leaved herb, cultivated as a seasonal annual crop, which dies out after the fruits mature. The plant grows in fallow wetlands of standing shallow water of about 2.5 m depth and has rhizomatous stem. It was once distributed in India, covering a long range from Kashmir to Manipur along side the Himalayan stretch from Northwest to far East⁵⁻¹⁰. Now, its distribution has been confined within Bihar, along with adjacent states like Orissa, West Bengal, and Assam. It prefers tropical and sub-tropical climate, temperature between 20°C-35°C, humidity between 50%-90%, and rainfall between 100 cm-250 cm¹¹. *Makhana* is either eaten as raw puff or blended with vegetables, dal, etc. The seeds are edible after being processed and highly nutritious¹²⁻¹⁶. It falls under one of the superior food qualities, which is reflected in its high amino acid index (89%-93%) and

arginine+lysine/proline ratio (4.74-7.6)¹⁷. Caloric value (3.62 kcal/gm) is also remarkable as compared to staple foods^{2,18}. It has a prominent place in Indian dietary chart with medicinal values for respiratory, circulatory, digestive, renal, and reproductive diseases¹⁹⁻²⁷.

Methodology

A case study approach involving methods of observation, interaction, interview along with individual and group discussion was adopted for documentation. A group of people come from Bihar to harvest and process *Makhana* in Central Institute of Freshwater Aquaculture (CIFA) farm Bhubaneswar, Orissa which is a natural ground of *Makhana* (*Euryale ferox*) vegetation, a seasonal aquatic macrophyte (Fig. 1) growing during the period of March to August. This species starts flowering during mid March to April, followed by fruiting. The fruits coat ruptures after maturation of fruits, resulting in the spread over of all seeds in bottom. This process continues during June-August a long time scale. The *Mallah* community harvested *Makhana* seeds lying in the bottom of the swamps having water about 2 m depth. These activities took place during the peak

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monsoon period and continued till the end of October. *Makhana* harvest, however, is a very laborious method and requires skilled labours.

Collection

Makhana harvest takes place during morning at about 10 am and continues up to 3 pm. This is an age old traditional practice confined in few communities (Fig. 2). Four to five people together collect seeds from bottom at a time. They fix a bamboo pole, locally known as *Kaara* (Fig. 3), in one place and cover up to 2-3 m radius around it during collection. They together dip into water at the base of bamboo pole and then each diverges in different direction to the periphery. They drag seeds with the help of their palms and gather them to the base of the bamboo pole. One dip for one person lasts 30-45 min. The whole procedure of seed collection surrounding one pole takes 1-1.5 hr and depends upon the amount of seeds lying in the ground (Fig. 4). Collected seeds are washed and cleaned with the help of container, locally known as *Auka* (Fig. 3). The *Bidi* and matches box are kept in a small polythene bags, which are tied atop a *Kaara*.

Cleaning and storage

The day's collection comes to an end at about 3 pm (Figs 5 & 6). They pick up the collected seeds heaped in the bottom. They put them in a crescent shaped container, locally known as *Gaanja* (Fig. 3), which is then swung as well as shaken repeatedly by touching water surface, until all the seeds get cleaned; this practice remove all the unnecessary wastes adhered with seeds. Sometimes, triangular washing net was used for cleaning seeds. Clean seeds are then packed into small bags each with carrying capacity of about 20-30 kg and brought to the embankment. The seeds are again poured into a cylindrical container, locally known as *Auka* or *Khanjhi*, which is rolled over ground so as to rub seed coat, which get smooth afterwards. They bring the processed seeds to their hut and keep them as such overnight. Next day, female members spread them over a mat for drying for 2-3 hr under bright sunlight (Fig. 7), even for 7-8 hr in case of cloudy weather.

Post-harvest of Makhana

Gradation

All the processed seeds are sieved for gradation. The process arranges seeds as per their size by allowing them to pass through the sieving devices,

locally known as *Jharna*, a rectangular thin iron plate of 1,158 cm², bounded by wooden frame of 6.35 cm height (Figs 8-10). The entire gradation process requires 10 devices marked with No 1-10, based on their individual mesh size. No 1 device is having the total number of about 160 mesh, with individual largest pore of about 143 mm², No 10 having the total number of about 600 mesh, with individual smallest pore of about 39 mm². Gradation initially starts by using No 1 sieve, followed by sieve No 2-10 in order. Dried seeds are put in No 1 sieve and shaken so that bigger ones remain as such, while smaller ones pass through the same. Again passed seeds are sieved with No 2 and the process continues until No 10 sieve is used. All the graded seeds are stored separately.

Process of white puff

First frying

As soon as seeds get dry, they require frying; otherwise they become spoiled (Figs 11 & 12). Frying is done in a round aluminum pot placed on earthen oven, which is prepared by digging out of earth. Its periphery is with three ridges made up of sticky consolidated mud plastered with semisolid cow dung for long lasting. Mostly, ladies take part in frying. About 600 gm nuts, dry seeds called as *Nut*, are put in aluminum pot heated above earthen hot oven for 5 minutes at a time and stirred fast and continuously with the help of frying stick, known as *Larna*, comprising about 20 sticks made up of either bamboo or iron, each 38 cm long. A *Larna* has a convenient wooden handle at its base.

Storage

After frying, nuts are preserved in container made up of long bamboo strips or reeds, one kind of long grass; it is plastered with semisolid cow dung (Fig. 14). The upper portion of the container is shielded with course cloth so as to maintain inside temperature.

Second frying

Once fried, they are to be fried 2nd time after 60 hr to have puff ready to eat. The entire process is called as *Bhaja/Lava*: about 200 gm fried nuts are put at a time for 2-3 minutes in aluminum pot heated above earthen hot oven. During frying first person takes out 6-12 fried nuts from pot with wooden spoon, called *Sipi*, and hands them over to the left palm of second person sitting beside him. He immediately place them on a wooden plate, called *Pata/Aphara* and his right

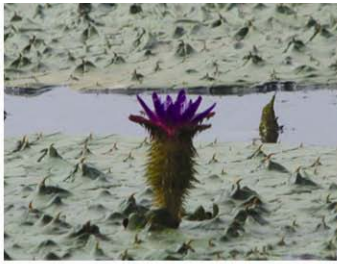


Fig.1 A *Makhana* flower



Fig.3 Man holding a *Kaara*



Fig.4 *Makhana* collection



Fig.5 Man dragging a bag



Fig.2 Collection of *Makhana*



Fig.6 The duo in action



Fig.7 *Makhana* sun drying



Fig.8 Different sieves, *Jharna*



Fig.9 Gradation of *Makhana*



Fig.10 Graded *Makhana* seeds



Fig.11 *Earthen oven*



Fig.12 Frying of *Makhana* seeds



Fig.13 Cleaning of *Makhana* puff



Fig.14 Puff kept in bamboo



Fig.15 Storing of puff



Fig.16 Bags with puffs



Fig.17 *Makhana* ready for market

palm holding a wooden hammer, called *Pitna/Thapa*, thrash them within a matter of few seconds. The fried nuts get expanded as soon as thrashed, resulting into formation of white puff by removal of black seed coat. One white puff gets expanded 3 times more than that of the nut.

Rubbing and storage

A haul of white puffs are put in container and rubbed with palm so as to remove the residues of black seeds coat still adhered with puffs (Fig 13). Clean puffs are stored in bags (Figs 15 & 16) or are kept in a small packet for marketing (Fig. 17).

Nutritional values and medicinal importance

Nutritional studies show that edible parts of the seeds contains 12.8% moisture, 9.7% protein, 0.1% fat, 76.9% carbohydrates, 0.5% mineral matters, and 1.45% iron, besides a good proportion of sugar, ascorbic acid, and phenol²⁸. Amino acid index is higher than that in other staple foods, which signifies its unique food quality¹²⁻¹⁵. Medicinally, it is also very important to have remedy for several human ailments: culinary, digestive, renal, and reproductive problems. The seeds are used for the treatment of stomachache, articular pain, seminal loss, diabetes, spleen, and gonorrhoea diseases. Different parts of the entire plant are used for medicinal purposes as remedy for rheumatism, polyurea, spermatorrhoea, parturition, and bile disorder¹⁹⁻²⁷. The puffs are easily digestible and good for human health because of its low fat content.

Economics

It is reported that about 13,000 ha area are utilized in Bihar for *Makhana* cultivation and about 90,000 tons nuts are being harvested from those area per year. One hundred kilogram of fruits can produce about 35.0 kg of seeds. It is also reported that about 36,000 tons processed seeds are marketed every year. 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%²⁹.

Gender involvement and drudgery

Harvest and processing are considered a tedious and laborious task. Out of their entire activities spent for *Makhana* harvest and processing, it has been estimated roughly that male spent 50% of labour,

followed by female 40%, and children 10%. A long range of age groups are involved in these activities, and respective works are performed by either male or female or together. All the activities are not the equal in drudgery point of view. There are points which have been measured based on the hardship involved in each activity; in such case 2nd frying scores 10 points, followed by seeds collection 8 points, and others in order. Drying is considered a less difficult activity and anybody can do without much effort, scoring only 0.5 point.

Epilogue

Makhana is an important aquatic crop, but is still neglected, probably because of lack of awareness among the rural masses in other parts of India than Bihar. In India, there are a lot of fallow wetlands, which remain unutilized round the year. In such case, *Makhana* cultivation may fetch more revenue to the poor masses. It only requires sincere efforts including dissemination of traditional knowledge as well as awareness to cultivate *Makhana* – a unique food resource.

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