BIOGLOBIA Vol. 4 (2): 42 – 46, 2017 **ISSN: 2349-5626**

Nutritional and cultural use of Makhana (*Euryale ferox* Salisb) in North Bihar, India - A Review

AJAY KUMAR*, S. H. BAZMI AND NAND KISHORE JHA**

***SRF (UGC), Department of Botany, Millat College, Darbhanga-846004, India.
Rtd. H.O.D Dept. of Botany and Course Co-ordinator, Environment and Water Management, Millat College, Darbhanga-846004,India.
**Department of Botany, M.L.S.M College, Darbhanga-846004, India

***Corresponding author's e-mail: Kajaydbg@gmail.com**

Received: 14.08.2017 **Revised: 17.08.2017** **Accepted: 26.08.2017**

ABSTRACT

The paper provides a review report on the nutritional and cultural use of Makhana (*Euryale ferox* Salib) In North Bihar. *Euryale ferox* is an important aquatic, annual and seed propagated ***'cash crop'*** available in wild or semi-wild froms belongs to family-Nympheaceae. **Swarna Vaidehi** has fast originating variety of makhana. A survey on the nutritional and cultural use of makhana in North Bihar area has revealed its some distinct uses. In cultural prospects its use is specifically on different occasions like (i) Kojagara (marital ritual), (ii) Parikramaa (for maintaing counts during ritualistic circumambulation around a temple or avenue or ethenic tree) (iii) Shraaddha Karma (last Hindu rights) (iv) Prasad (edible offering at holy places) (v) Makhana Paagal (sweetened makhana use during Navratri and other festivals). Standard procedure was applied for nutritional profiling of the makhana samples. The nutritional value of makhana revealed that it contains maximum moisture content (10.5 to 34.7%), maximum seed protein (8.7%), crude fibre (0.5%), maximum carbohydrates (79.8%) and fat (0.5%) *etc.*

Keywords: *North Bihar, Aquatic, Cash crop, Nutritional, Cultural, Makhana (Euryale ferox Salisb).*

INTRODUCTION

Fox nut (*Euryale ferox* salisb) is an important aquatic crop, belonging to family Nympheaceae and commonly know as makhana. This plant is considered as a native of South-East Asia and China but distributed to almost every parts of the world. In India, it is distributed in west Bengal, Bihar, Manipur, Tripra, Assam, Jammu and Kashmir,Odisha, MP, Rajasthan, and UP (Kumar *et al*., 2011 and Mishra *et al*., 2003). However, it's commercial cultivation is limited to North Bihar. The major makhana producing districts include Darbhanga, Samastipur , Sitamarhi, Madhubani, Saharsa and Supaul specially.

Approximately, 80% of total production of processed makhana comes from Darbhanga, Madhubani, Purnia and Katihar districts alone. Area under makhana cultivation is about 13,000 ha. It cultivation procides livelihood to thousands of resource poor farmers particularly in Bihar. It is a cash crop (dry fruit) and marketed in the form of popped makhana commonly known as Makhanalawa, grown in stagnant perennial water bodies like ponds, swamps and ditches. Makhana seeds are also called as Black Diamond (Jha and Prasad, 2003). Ecologically, *Euryale ferox* Salisb. has been classified as an annual aquatic herb with gigantic floating leaves, emergent macrophyte of monotypic genus, growing in the littoral parts of the flood. Plain wetlands of stagnated shallow water (4-6 ft.) which are of perennial

in nature. Makhana is an absolutely seed propagated plant and its new plants arises upon the germination of its fully matured seeds (CSIR, 1952 and Kumar *et al*., 2011)

Makhana is considered as the pious and divine food item in Hindu religion it is used in all the worshiping ceremonies, Hawan, Pooja *etc*. In Addition to this, due to its heavenly nature, it is considered as the best offering to god and goddesses. In temples, being the non-cereal food, makhana is an ideal staple food of devotees during their religious fast (Mishra *et al.,* 2003 and Kumar *et al.*, 2011). Its pop is used for maintaining the counts during various rituals like 'Somavati Amaavasaya'. It is deeply associated with the last rites performed under Hindu traditions These pops are showered over a dead body while being led to cremation ground. It's white colour signifies purity and peace.

MATERIALS AND METHODS

Keeping in view its commercial importance of makhana, a regional centre was set-up to conduct research on various aspect of makhana in Darbhanga district of Bihar under the administrative control of ICAR Research complex for Eastern Region. It has been released as an ever first variety of makhana under the name of swarna vaidehi by institute variety release commities of ICAR-RCER, Patna (Singh *et al.,* 2014 and Singh, *et al*., 2012 b) This seeds are bold and its average productivity is 28-30 sq/h which is near about 45% higher to the seed yied of local cheak. In addition to high yield potential, this variety is resistant to common insect -pests and disease of makhana. According to this variety were first grounded into powdered flour and stored in a closed container at room temperature for research purposes (Singh *et al.*, 2012a and Singh *et al.*, 2014a) 50 gm of the makhana flour was then mixed with 200 ml of methanol the moisture was incubated for 24 hour and then filtered. The solvened was evaporated under vacuum and resulting extracts were stored at 4^0c (Fig. 1a-1f).

Fig.1a

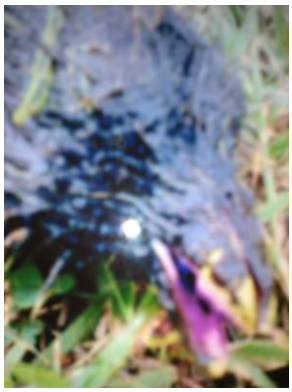


Fig.1b

Fig.1c

Fig.1d

Fig.1e

Fig.1f

RESULTS AND DISCUSSION

People of North Bihar use makhana as an ingredient of the marital ritual called Kojagaraa. It is essential for a bride's parents to send a gift of popped makhana to the groom's house for distribution amongst their kid on the occasion of Kojagaraa in the first year of the marriage. Makhana pops are ceremonially distributed to all the guests/villagers who visit the groom's place on that day. Makhana pop used for maintaining counts of Parikramaa (moving circumferentially around either a tree or on a special occasion like Somavati Amaavasya. a makhana pop forms an iterm of ritual offering during last rites in a Hindu family. Makhana pops also form a components of the holy Prasad sold at Hindu religious shrines almost all over the country (Table 1).

Makhana forms an ingredient of the Chhappan Bhog (sacred culinary offerings of 56 types) items on the occasion of Nisha Puja *(i.e* worship specifically performed in the night of Ashtami (8^{th} instant of the Navaratra). Here makhana is offered in two forms *i.e*. Makhaan Paagal (caramelished Makhana) as well as Makhaan Tasmai (khee/dessert paayas.)

1. **Moistute content:** Moisture content was determined and expressed in percent (% by wt.) Perusal of data presented in Table 2, revealted that maximum moisture content range (10.5-34.7) was recorded.

Table 1
Use of makhana (*Euryale ferox* Salisb) at cultural point in North Bihar

Sr. No	Practices	Occasion	Details
01	Kojarara (a marital ritual)	Aashwin Purnimaa (Full moon night in october month)	(a) Makhana pops are gifted by bride party to the groom. (b) Offered as an ingredient of Prasaad to goddes "Laxmi"
02	Parikramma	Somavati Amaavasaya (A Monday on a no moon day)	For maintain counts of the circumambulation around a temple or ethenic or avenue tree.
03	Shraaddha Karma (Last rites)	Death Rituals	Makhana pops form an item of offering during last Hindu rites.
04	Prasaad (Edible offerings at holy place)	Throughout the year.	Pops sold at Hindu religious shrines.
05	Makhaan Paagal (sweetened makhana)	During Navratri	As a constituent of 56 Bhog (offerings to Goddess Durga)

2. **Carbohydrate:** Makhana is excellent source of quality carbohydrate. Phytochemical analysis was also done with respect to total carbohydrate (% by wt.). Maximum total carbohydrate (79.8%) was recorded in popped seeds.

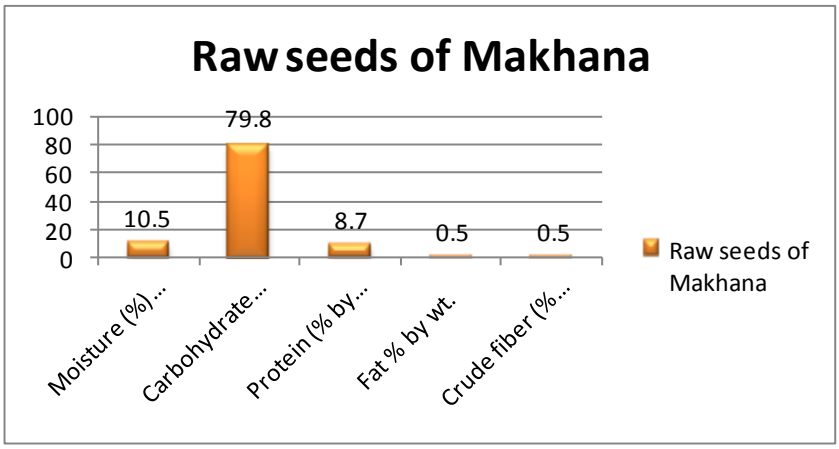
3. **Protein content:** Makhana contains high quality easily digestible protein. The crude protein content of the seeds varies widely depending on many factors. The seeds coat contains less protein and more carbohydrate in comparison to cotyledons and whole seeds. Perusal of data presented in Table 2 revealed that among the samples maximum seed protein (8.7%) was obtained.

4. **Fat content:** Makhana contains least fat and is good for the health point of view. Seed were also analysed for fat estimation purposes (% by wt.) Table 2 clearly indicate that no seed sample contains fat >0.5% Maximum (0.5%) fat was reported in the popped seeds sample.

5. **Crude Fiber:** Makhana is not a very good source of dietary fiber and its lower the blood cholesterol levels (Singh *et al.*, 2014 a). It is a good sources of both soluble and insoluble crude fiber. Table 2 confirms that raw seeds contain more crude fiber as compare to popped seeds. Maximum crude fiber (0.5%) was obtained in the raw seed.

Table 2
Nutritional value of makhana (*Euryale ferox* Salisb)

Sr. No	Parameters	Raw seeds of Makhana
01	Moisture (% by wt.)	10.5-34.7
02	Carbohydrate (%) by wt)	79.8
03	Protien (% by wt.) N x 6.25)	8.7
04	Fat (% by wt.)	0.5
05	Crude fiber (% by wt)	0.5
	Total	**100%**



ACKNOWLEDGEMENTS

The authors thank Prof. Vidyanath Jha, Principal, M.R.M. College, Darbhanga, Bihar for his kind co-operation and proper guidance and Head, Department of Botany, Course co-ordinator of EWM and Principal of Millat College, Darbhanga for encouragement..

REFERENCES

1. Anonymous. 2014. Annual Report 2013-14. ICAR Research Complex for Estern Region Patna Bihar.*p.*37-38.
2. CSIR.1952. The Wealth of India. CSIR Publication, New Delhi.
3. Das, S., Der, P., Raychaudhary, U., Maulike, N. and Das, D. K. 2006. The effect of *Euryale ferox* Salisb. (Makhana), an herb of quatic origin on myocardial ischemic repurfsion injury. *Molecular and Cellular Biochemistry*. 289 (12):55-63.

4. Jha, S. N. and Prasad, S. 2003. Post-harvest technology of gorgon nut. In : Mishra , RK Jha, Vidyanath and Dharai, PV (eds) Makhana, ICAR, New Delhi, *p*. 194-214

5. Jha, V., Barat, G. K. and Jha, U. N. 1991. Nutritional evaluation of *Euryale ferox* Salisb (Makhana). *J.Food Sci.Tech.* 28 (5):326-8.

6. Kumar, L., Gupta, V. K., Khan, M. A., Singh, S. S., Janardan, J. and Kumar Ashok. 2011. Field based Makhana cultivation for improving cropping intensity of rice fields : *Bihar J. Horti*. 1 (1) : 71-72.

7. Kumar, L., Singh, A. K. and Bhatt, B.P.2016. Nutritional status of recently developed makhana (Gorgon Nut) vriety-swarna Vaidelhi. *J. Agri. Search* 3 (4) : 199-205.

8. Kumar, A., Bazmi, S. H. and Rahmatullah Md. 2017. Wetland management and utilization in North Bihar with special reference to wetland resources. Wisdom herald.8(3):323-328.

9. Kumar, A., Bazmi, S. H. and Rahmatullah, Md. 2016. Biodiversity and their socio-economic importance of Wetlands of Madhubani District (North Bihar). *Bioglobia* 3 (1) : 28-34.

10. Kumar, R. 2012. Ethnobotanical and Ethnomedicinal studies in floodplain Wetlands of North Bihar. Ph.D. Thesis, L. N. Mithila University, Darbhanga.

11. Kumari Anubha. 2013, Studies on morphological and cytological characterization of Makhana germplasm and its ethnobotancal aspects. Ph. D. Thesis, L. N. Mithila University, Darbhanga.

12. Mandal, R. N., Saha, G. S. and Sarangi, N. 2010. Harvesting and processing of Makhana (*Euryale ferox* Salisb)- an unique assemblange of traditional knowledge. *Ind. J. Traditional Knowledge*. 9 (4):684-88.

13. Mishra, R. K., Jha, V. and Dharai, P. V. 2003. Makhana (eds.) ICAR, New Delhi, 340 *p*.

14. Singh, A. K., Bharadwaj, R. and Singh, I. S. 2014a. Assessment of nutritional quality of development faba bean (Vicia fabal.) lines. *J. Agri. Search*. 1(2):96-101.

15. Verma, A. B., Jha, V. and Devi Santha. 2003. Leaf and floral hypertrophy of Makhana caused by *Doassaniopsis euryaleae* In Mishra, R.K. Jha, Vidyanath Jha and Dharai, P.V. (eds) Makhana, ICAR, New Delhi, *p*. 163-168.

16. Verma, A. K., Banerji, B. K., Chakraborty, D. and Dutta, S. K. 2010. Studies on Makhana (*Euryale ferox* Salisb). *Curr. Sci.* 99(6):795 -800.