Water chestnut processing: an entrepreneurial opportunity for livelihood security

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ABSTRACT

The major water chestnut producing state is Madhya Pradesh in the country where nuts are produced in five thousand hectares of tanks/ponds worth rupees 35 crores. It is the main source of income for the poorest families particularly Dheemer and Burman communities of the state. It is grown in 18 districts and Jabalpur district has a key position in production and processing of water chestnut. It is one of the cash crops. Water chestnut producers sell it in fresh form for quick profit. With the value addition of water chestnut in the form of flour, pickle and ready to eat products, these producers get employment throughout the year. The B-C ratio of value-added dry decorticated kernel and flour are 1:2.5 and 1:3 respectively emphasizing the potential of processed water chestnut to ensure livelihood security throughout the year.

Keywords: Water chestnut; value addition; livelihood security

INTRODUCTION

Water chestnut (*Trapa bispinosa* or *Trapa natans)* is an important plant of Indian Ayurvedic system of medicine which is used in the problems of stomach, genitor urinary system, liver, kidney and spleen. Water chestnut is used in the validated conditions in Pitta, burning sensation, fatigue, dyspepsia, hemoptysis, diarrhea, hemorrhage dysentery, strangely, intermittent fever, leprosy, inflammation, fractures, lumbago, pharyngitis, bronchitis, suppressing stomach and heart burning.

Water chestnut is an annual aquatic warm season crop. Botanically, it is known as *Trapa* belonging to the family Trapaceae. The Fresh tender kernel is sweet, delicious, nutritious and a good source of nutrients. The nuts are eaten raw when tender and fresh or after cooking (boiling and roasting). It is grown in May-June and fruit is harvested in October-November. The rhizome and fruiting torus of this plant are sold fresh in local market. Fresh rhizome is eaten after roasting while dried in whole; pieces or flour is used in different type of recipes. Because of the short shelf-life of the fruit, it is sold in nearby centres at cheaper rates.

Nutritional and biochemical analyses of fruits of *Trapa bispinosa* in 100 g showed 22.30 and 71.55 per cent carbohydrate, protein content was 4.40 and 10.80 per cent, percentage of moisture, fiber, ash and fat contents was 70.4 and 7.3, 2.1 and 6.4, 2.30 and 8.5 and 0.65 and 1.9 respectively. Mineral contents of the seeds were 32 and 102.9 mg calcium, 1.4 and 3.8 mg iron and 121 and 325 mg phosphorus in 100 g and seeds had 115.5 and 354.9 Kcal of energy in fresh and dry fruits respectively. Fresh nut is well known for its high water content ie 80 per cent (Puste 2004), starch (52%), protein (1.87%) and TSS (7-8%) (Singh et al 2010). Besides these quality attributes it is good source of fiber, vitamin B along with Ca, K, Fe and Zn (Adkar et al 2014, Alfasane et al 2011). It contains low cholesterol and is gluten free and has cooling and detoxifying effects. Mann et al (2011) reported that it is also known to aid in curing jaundice. It contains fair amount of flavonoid and antioxidant thus can be a potential source of nutrition.

Drying: Farmers didn't have any post-harvest management facility except sun drying. Mostly farmers sold their produce either fresh or dried (in the ratio of 60 and 40% subsequently). Under sun drying the moisture content of procured dry water chestnut was approximately 13 to 15 per cent. It took about 30 days for drying (moisture reducing from 80 to 15%).

Decortication: In traditional method, decortication of water chestnut was done manually. Dry kernel deshelling being a women-assigned work required hard physical activity which was highly drudgery prone and time consuming. Hand operated water chestnut decorticator was easy to handle and reduced the time requirement with increase in efficiency of decortication. In the last five years, Krishi Vigyan Kendra, Jabalpur promoted water chestnut decortication through decorticator. The decortication capacity was 35 kg/hour (at 7% moisture content). Thus two persons were required for half day for decortication of one quintal of dry kernel.

Making of flour: The flour was prepared through grinding of dried ground water chestnut kernels. The flour of it contains 64.85 to 70.75 per cent carbohydrates, 8.4 to 14.2 per cent protein, 10.16 to 48.3 mg phosphorus, 96 to 130 mg sodium, 1,350 to 1,800 mg potassium and 129 to 161 ppm iron and is very rich in iodine (Patel 2009). Its flour was consumed as sweet dish and Puri on various religious occasions as fasting diet. Water chestnut flour has received good acceptance and has excellent scope in future to be used in different specialized products in Indian market. The flour serves both as gluten free as well as antioxidant rich flour giving it a good scope of usage in future market.

Storage: There were appropriate packaging and storage methods of water chestnut to reduce the market glut to get better remuneration by the farmers. It is a lucrative crop which requires mass awareness about its nutritional qualities and consumption techniques for healthy conscious human uses. It can significantly improve the livelihood of farmers living in water surplus regions of rural India if cultivated with right agronomic techniques and processed appropriately after harvest. Various approaches have been made to enhance the shelf-life of water chestnut variety Red Spineless due to its sweetest and attractive colour among other productive varieties. During the storage and drying 5 per cent losses are recorded. A freshly harvested water chestnut has a moisture content of 80-82 per cent and dry matter of 18-20 per cent (Shafi et al 2017, Baba et al 2016).

Marketing: The major value chain players in Madhya Pradesh are small traders, big traders and processors (located outside the state). After harvesting water chestnut growers usually immediately sell the fresh water chestnut at the rate of Rs 15-25/kg to local traders and local traders finally sell it in the big markets like Jabalpur, Khitola etc or hold the production for drying. Khitola is a big Mandi of dried kernel (Gotti) while Jabalpur Mandi is a market place of fresh fruits. The sun drying takes about 30-40 days for complete drying and the quantity reduces to 80-82 per cent. The net recovery of dried water chestnut (Gotti) is 18-20 per cent.

METHODOLOGY

ICAR- Krishi Vigyan Kendra, Jabalpur, Madhya Pradesh conducted intervention on income generation of water chestnut through value addition from the year 2018 to 2020. Water chestnut was procured from Panager block of Jabalpur district. The data were collected from the local water chestnut farmers. The farmers were given trainings and demonstrations on the processing of water chestnut (Plate 1).

RESULTS and DISCUSSION

Fig 1 shows yearly timeline activities of water chestnut growers depicting cleaning of pond in the month of January and February. The seed germination activity is done from the month of January to March. The transplanting of vine is from March to April with simultaneous gap filling work from April to May. The surface weeding and fertigation are done from June to September with continuous insect and disease management activity from May to September. The harvesting and fresh selling is done in the month of November to December. Also fresh selling is done in the month of January and drying and decortication are done in the month of January to March. The storage activity is done from April to August whereas processing activity from March to April and Sep to November.

Table 1 shows that the recovery of value-added dry decorticated kernel and flour was 20 per cent ie 7.4 q from 37 q of fresh water chestnut. The average expenditure on production of fresh, dry

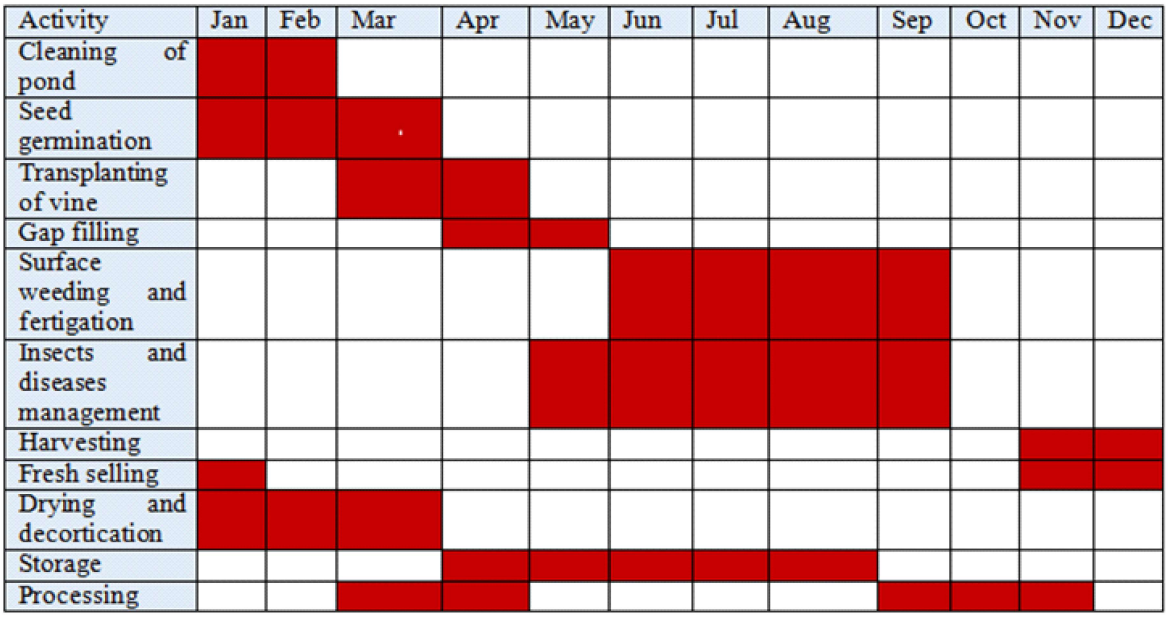

Fig 1. Timeline of activities of water chestnut growers

Table 1. Income and expenditure details of water chestnut growers

Component	Fresh selling	Dry decorticated kernel	Processing of flour
Production (q)	37	7.4 (20%)	7.4 (20%)
Expenditure (Rs)	1,284	2,484	3,604
Net income (Rs)	2,800	6,400	12,000
B:C	1:2.1	1:2.5	1:3
Rank	III	II	I

Plate 1. Demonstration of different processing methods by the homescale scientist to the farmers

decorticated and flour was Rs 1,284, 2,484 and 3,604 per quintal respectively and the average income from fresh selling was Rs 2,800, 6,400 and 12,000 respectively. The B-C ratio was 1:2.1, 1:2.5 and 1:3 for fresh, dry decorticated and flour selling respectively.

CONCLUSION

With a widespread problem of unemployment among youth in the nation and demand for processed and healthy foods by the nutrition-aware population provide an opportunity of entrepreneurship for water chestnut growers. Water chestnut processing activity would help to solve the problem of small water chestnut growers by reducing post-harvest losses and creating employment. The final consumer would get quality products of their choice in convenient form at an affordable price. The study revealed that water chestnut growers could get income throughout the year by value addition. To produce high quality of value-

added water chestnut flour, proper grading, packaging and selling were required. Keeping in view the socio-economic impact of water chestnut, the adoption of optimized preconditioning processing for water chestnuts would lead to high flour recovery together with additional health benefits associated with higher resistant starch content and low glycemic index. Value addition is the effective way to increase the income of water chestnut producers for their livelihood security.

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