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Market potentiality, economic analysis and consumer acceptability of foxtail millet (*Setaria italica*) based laddu

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Abstract

Foxtail millet (*Setaria italica*) is the second-most widely planted species of millet. It is known for its health benefits. *Laddu* are ball-shaped sweets popular in the Indian Subcontinent. *Laddus* are made of flour, ghee and sugar with other ingredients that vary by recipe. They are often served at festive or religious occasions. Hence, an attempt was made to develop foxtail millet based value added *laddu* and to study the market potentiality, economic analysis and consumer acceptability of the foxtail millet *laddu*. Standardization trials indicated that acceptable foxtail millet *laddu* could be developed by incorporating 50 per cent foxtail millet flour, 50 per cent Bengal gram dhal flour, 45 per cent ghee and 75 per cent sugar powder in the standard *laddu* recipe. The developed foxtail millet *laddu* was highly accepted. There was no availability of foxtail millet *laddu* in market. Consumers preferred foxtail millet *laddu* over traditional *besan laddu*. Marketing of these millet *laddus* was found to be profitable for the shopkeepers. Foxtail millet *laddu* may have a good scope for enhancing nutrition security. At present there is demand for ready to eat foods and therefore it has opened challengeable avenue to start production of such foods at commercial scale to benefit innumerable population and it can be taken as income generating activity by the entrepreneurs.

Keywords: Foxtail millet *laddu*, sensory evaluation, market potentiality, economic analysis and consumer acceptability

Introduction

Traditional food refers to foods that are passed through generations and also refers to foods consumed over the long-term duration of civilization that have been passed through generations. They are based on sound foundation of culture, custom, natural environment and consumed by people over long time. The traditional food of India has been widely appreciated for its fabulous use of locally grown crops. Indian traditional food is known for its large assortment like sweet, savoury and spicy traditional foods. Further, the significance of traditional foods is more appreciable when their nutritive value is known. In this regard, India has a rich treasure of traditional foods specifically prepared for festivals, rituals, and physiological conditions (Inamdar *et al.*, 2005) [8].

Traditional food products have the potential to contribute to poverty elimination through employment opportunities, household food security, improved diets and cultural identity. With changing consumption patterns, globalization of trade, increasing migration and urbanization and demographic changes, some of the traditional food products are being lost from the diet. The future for small-scale food processing and of traditional food products in particular is optimistic. The small-scale food processing sector is a thriving growth area with huge potential for further development. Through their impact on food and livelihood security, social and cultural wellbeing, traditional food products are set to play an increasingly important role in food security, sustainable growth and poverty reduction in developing countries (Ali and Battcock, 2001). Foxtail millet (*Setaria italica*) is nutritious and important underutilized grain, grown in various parts of India. It grows well even under adverse agro climatic conditions. Foxtail millet is a good source of protein (12.3 g/100 g), dietary fibre (14 g/100 g) and carbohydrates (60.9 g/100 g). Besides, it is rich in minerals (3 g/100 g) and phytochemicals (Gopalan *et al.*, 2010) [7]. Foxtail millet is a good source of β carotene (126-191 μ g/100 g, Goudar *et al.*, 2011) [6]. *Laddu* is an Indian sweet made from a mixture of flour, sugar, and shortening and other ingredients that vary by recipe, which is shaped into a ball.

Value addition to existing foods with foxtail millet is a simple and feasible way of enhancing nutritional values of foods and in turn the health benefits. The food products based on traditional food preparations easily become acceptable to people. Hence the present investigation is aimed to know the market potentiality, economic analysis and consumer acceptability of foxtail millet based *laddu*.

Material and Methods

The present study was carried out in the Department of Food Science and Nutrition, College of Community Science, University of Agricultural Sciences, Dharwad Karnataka. The raw materials like foxtail millet, Bengal gram dhal flour, Ghee and sugar powder were purchased from the local market of Dharwad, Karnataka. The millet grains were washed, rinsed, shade dried and milled from the local commercial milling machine.

Besan laddu are popular sweet dish which often prepared and served during festivals and religious occasions. Standard recipe of *besan laddu* include Bengal gram dhal flour (150 g), ghee (75 g), sugar powder (128 g) and the roasting time 45 minutes. Fig. 1 represents the flow diagram for preparation of optimized *laddu*. Firstly, heat the ghee in frying pan. Add Bengal gram dhal flour and foxtail millet flour to it. Roast it till colour turns to golden brown and develops aroma. Roasting process enhances flavour of the Bengal gram dhal flour, foxtail millet flour and millet mix (Sudha *et al.*, 2021)^[13]. Allow it to rest to warm temperature. Add powdered sugar to the roasted flour mix with ghee (which turned to dough consistency). Mix well and make small balls by hands. However, standardization trials indicated that acceptable foxtail millet *laddu* could be developed by incorporating 50 per cent foxtail millet flour, 50 per cent Bengal gram dhal flour, 45 per cent ghee, 75 per cent sugar powder and 40 minutes roasting time in the standard *laddu* recipe. The developed *laddu* had good binding property and was highly acceptable by sensory evaluation (Sudha, 2016)^[12].

Market potentiality, economic analysis and consumer acceptability and of foxtail millet *laddu*

a. Market survey

The availability of foxtail millet *laddu* in the Dharwad city (Karnataka, India) was assessed by interviewing 40 randomly selected shopkeepers using the self-structured questionnaire. Information was collected from the shopkeepers with regard to knowledge, availability and sale of foxtail millet *laddu*.

b. Economic analysis

Economic analysis of production of foxtail millet *laddu* was done by taking into consideration of fuel, labour, ingredients, packaging material label, transportation and milling charges.

c. Market potentiality and consumer acceptability

Developed foxtail millet *laddu* were packed in HDPE covers with nutrition label and kept in the 10 shops. Each shop was provided with 10 packets of *laddu* both control (*Besan laddu*) and developed foxtail millet *laddu*. Each packet contain four *laddus* of 25gm each. Hence each packet weighed 100 gm. Feedback was taken from the shopkeepers about the millet *laddu* using self-structured questionnaire. Information was collected from the shopkeepers with regard to the availability, frequency of purchase of *laddus*, consumers preference in purchasing the respective *laddu* and does the sale of foxtail millet *laddu* would be profitable etc.

Suitable statistical methods were used for the data in the present study. The shopkeeper knowledge and consumers preference was evaluated and expressed in terms of frequency and percentage.

Results and Discussion

Foxtail millet *laddu* was developed by incorporating 50 per cent foxtail millet flour, 50 per cent Bengal gram dhal flour, 45 per cent ghee and 75 per cent sugar powder in the standard *laddu* recipe. The developed *laddu* had good binding property and was highly acceptable by sensory evaluation. In some of the other value added products like foxtail millet based burfi, muffin, bread, vermicelli, pasta and extruded snacks upto 50 per cent incorporation of foxtail millet was carried out and were highly acceptable (Srivastava and Singh, 2003, Garwadhiremath 2011, Deshapande and Poshadri, 2011, Balloli *et al.*, 2014, Ranganna *et al.*, 2014)^[11, 5, 4, 10]. Sensory evaluation indicated 50 per cent incorporation of foxtail millet flour in preparation of *laddu* was highly accepted (Yenagi *et al.*, 2010)^[15]. Similar findings were reported by Garwadhiremath (2011)^[5] in the optimization of foxtail millet based muffin where 5 per cent decrease in addition of fat was made.

To know the market potentiality and consumer acceptance of foxtail millet *laddu* survey was done. The availability of foxtail millet *laddu* in the Dharwad city was assessed by interviewing 40 randomly selected shopkeepers using the self-structured questionnaire. It was concluded that none of the shopkeepers had the knowledge of foxtail millet *laddu* and were not available in the shops.

Shelf life is an important determinant of marketability, consumer acceptance and possible inclusion in daily food pattern. These respective *laddus* could be stored well upto 75 days when packed in HDPE covers. Nutritive labels and cost of one packet was also mentioned on the label. Nutritional analysis of foxtail millet *laddu* revealed (Sudha, 2016)^[12] that protein, fat, crude fibre, ash and carbohydrate of 11.61, 17.52, 2.64, 1.11 and 66.85 per cent respectively. The mineral composition of developed *laddu* include calcium (9.34 mg/100 g), iron (2.72 mg/100 g), zinc (0.44 mg/100 g), copper (0.18 mg/100 g) and manganese (0.60 mg/100 g).

Developed foxtail millet *laddu* were packed in HDPE covers and kept in the 10 shops. Each shop was provided with 10 packets each packet weighing 100g with 4 *laddus* of *besan* and developed foxtail millet *laddu*. The economic analysis of *besan* and foxtail millet *laddu* and *besan laddu* was done (for 1 kg of *laddu* preparation Table 1) and the cost of 100 g packet of each was Rs. 23.65 and Rs. 22.35 respectively including the price of ingredients, HDPE packets (as packaging material), labels, labour charge, fuel, transportation and milling charges (Table 1). Therefore, with 25 per cent profit the *laddus* were sold *i.e.* for *besan laddu* (Rs. 30) and foxtail millet *laddu* (Rs. 28). These *laddus* packets were kept for one month for sale. From 100 packets of each *besan* and foxtail millet *laddu* 78 and 86 packets were purchased respectively. Feedback was taken from the shopkeepers about the millet *laddu* using self-structured questionnaire. It was revealed that none of the consumers knew about the availability of foxtail millet *laddu*. None of the shops earlier sold foxtail millet *laddu* and presently also they did not have foxtail millet in the shop. Seventy per cent of shopkeepers expressed that consumers preferred to purchase foxtail millet *laddu* and 30 per cent of consumers preferred *besan laddu*. It may be because of awareness of millet nutrition and lesser

cost of product. In general, frequency of purchase of *besan laddu* was asked to shopkeepers and it was revealed that 60 per cent of consumers purchase the *besan laddu* monthly however 40 per cent purchase twice in a month. Seventy per cent of shopkeepers reported that the consumers showed interest in purchasing the foxtail millet *laddu* while 30 per cent of shopkeepers reported that consumers showed interest in purchasing the *besan laddu*. Eighty per cent of shopkeepers revealed that about ‘6-10’ consumers purchased the foxtail millet *laddu* while 20 per cent of shopkeepers said only ‘1-5’ consumers purchased the foxtail millet *laddu*. In every shop, ‘1-5’ consumers enquired the price of foxtail millet *laddu* but did not purchase, as told by the shopkeepers. About 6-8 consumers enquired about foxtail millet *laddu* after the sale of foxtail millet *laddu* in shops. Sixty per cent shopkeepers expressed that low cost of foxtail millet *laddu* was also the factor for sale of the foxtail millet *laddu*. Seventy per cent of the shopkeepers expressed the sale of foxtail millet *laddu* as

profitable (Fig. 2 and 3). Similar findings were with the foxtail millet vermicelli (Reddy and Karakannavar, 2018)^[14] i.e consumers preferred to purchase the foxtail millet vermicelli because consumers gave more importance to the product which is highly nutritious and rich in fiber and mineral content. The marketing of foxtail millet vermicelli was profitable but it needed some more promotion, because the consumers are unaware about the new product i.e foxtail millet vermicelli. Cardello *et al.*, (2007)^[3] reported that taste was consistent rate as the most important factor that influence consumption and repeat purchase. Kusumad (2011)^[9] concluded that, farmers can better utilize their marginal lands by cultivating foxtail millet on them. Value added products of foxtail millet brought more returns to the farmers than the foxtail millet grains. Hence, suggested the farmers to involve in value addition of foxtail millet and get better returns rather than selling it in raw form. In this study, majority of the shopkeepers expressed sale of *laddu* as profitable venture.

Table 1: Economic analysis of foxtail millet *laddu* and *besan laddu* (For 1 Kg)

Particulars	Foxtail millet <i>laddu</i>			<i>Besan laddu</i>		
	Quantity (g)	Rate (1 Kg)	Amount (Rs)	Quantity (g)	Rate (1 Kg)	Amount (Rs)
Bengal gram dhal flour	225	88	15	450	88	40
Foxtail millet	225	66	20	-	-	-
Ghee	204	376	77	225	376	85
Sugar	339	46	16	384	46	18
Labour charge (Rs)	37.50			37.50		
Fuel (Rs)	20			20		
HDPE packets (Rs)	10			10		
Label (Rs)	2			2		
Transportation (Rs)	24			24		
Milling charges(Rs)	2			-		
Total (Rs)	223.50			236.50		

Table 2: Evaluation of market potentiality of foxtail millet *laddu**

Type of <i>laddu</i>	Number of shops	Packets provided	Packets sold (%)
Foxtail millet <i>laddu</i>	10	100	86
<i>Besan laddu</i>	10	100	78

*For period of one month
Each packet weighs 100g

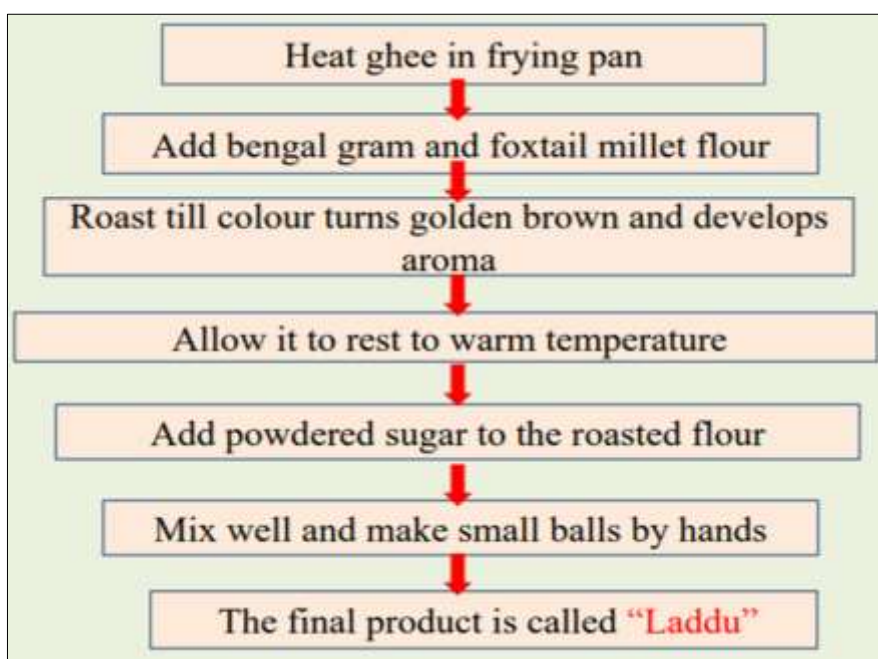


Fig 1: Flow diagram for preparation of optimized foxtail millet based *laddu*

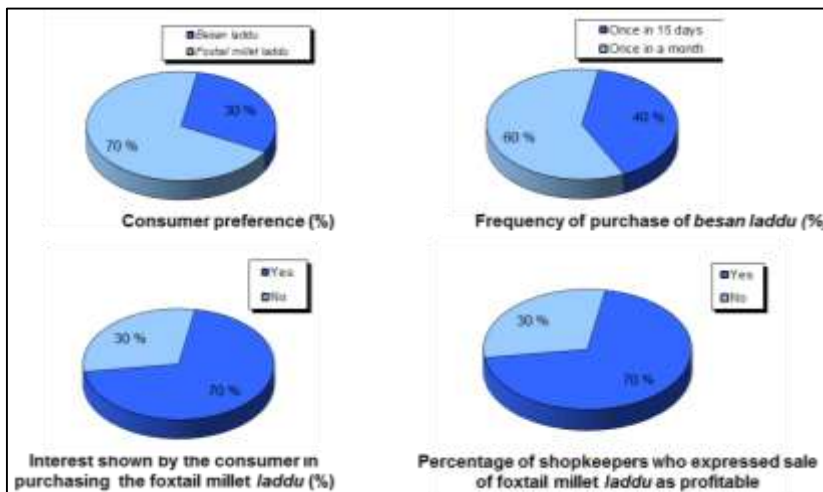


Fig 2: Market potentiality and consumer acceptability

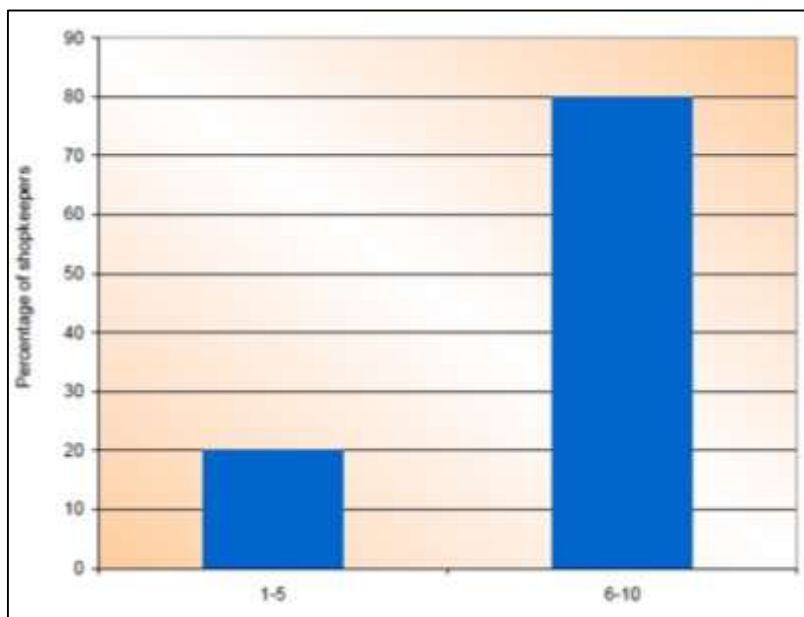


Fig 3: Number of consumers purchased Foxtall millet laddu

Conclusion

With improvement in food technology, convenience food and ready to eat foods are emerging in market. Standardization trials indicated that acceptable foxtail millet laddu could be developed by incorporating 50 per cent foxtail millet flour, 50 per cent Bengal gram dhal flour, 45 per cent ghee and 75 per cent sugar powder in the standard laddu recipe. The developed laddu had good binding property and was highly acceptable by sensory evaluation. Foxtail millet laddu may have a good scope for enhancing nutrition security. At present there is demand for ready to eat foods and therefore it has opened challengeable avenue to start production of such foods at commercial scale to benefit innumerable population and it can be taken as income generating activity by the entrepreneurs.

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