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Storage and consumer acceptability of foxtail millet vermicelli

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Abstract
The present study is to investigate about the storage quality and consumer preferences of foxtail millet vermicelli. Selection of foxtail millet vermicelli for storage was made from the three combinations, based on the production parameters and sensory evaluation. 1:1 (Semolina + Foxtail millet flour) was found to be acceptable. The foxtail millet vermicelli (1:1) and the wheat vermicelli of 500 grams were packed in polyethylene covers in an ambient condition for a period of 6 months. The samples were drawn every month and evaluated for the physical parameters, cooking quality, sensory characteristics, moisture and free fatty acid contents. For consumer preference and acceptability market survey was done by randomly selecting grocery shopkeepers using the self-structured questionnaire. No change was observed for the diameter and bulk density of raw vermicelli during storage for 6 months. Increase in cooked weight and cooked volume and decrease in cooking time and cooking losses were observed throughout the storage period. There was a significant increase in moisture and free fatty acid content during the storage period in both semolina and foxtail millet vermicelli. Organoleptic scores of foxtail millet vermicelli *upma* indicated that there were no significant changes up to 3 months of storage. The consumers showed interest in purchase of foxtail millet vermicelli and the marketing of the millet vermicelli was found to be profitable for the shopkeepers.

Keywords: Foxtail millet vermivelli, storage, consumer preferences

Introduction
Millets are one of the oldest foods known to humans and possibly the first cereal grain to be used for domestic purpose. Foxtail millet (*Setaria italica*) is one of the most important food crops of the semi-arid tropics, originated from China and is now planted all over the world (En *et al.*, 2008; Amadou *et al.*, 2011) [5, 2]. It is the second-most widely planted species of millet. These are small seeds, around 2 mm (less than 1/8 inch) in diameter, are encased in a thin, papery hull which is easily removed in threshing. Seed colour varies greatly between varieties. Nutritionally foxtail millet is fair source of protein i.e., 10-12 per cent, 351 K cal energy per 100 g, 2.29-2.7 per cent lysine, 0.59 per cent thiamine, 4-5 per cent fat and 17.62 per cent dietary fiber (Amadou *et al*., 2011) [2]. The utilization of millets including foxtail millet is less compared to cereals. They are considered to be the least allergenic and most digestible grains available. Compared to paddy rice, especially polished paddy rice, millets release lesser percentage of glucose over a longer period of time. This lowers the risk of diabetes. Millets are particularly high in minerals like iron, magnesium, phosphorous and potassium (Michaelraj and Shanmugam, 2013) [8]. Hence it is necessary to develop value added products of foxtail millet like instant mixes, canned foods, dehydrated foods, extruded food products like maggi, pasta, noodles, spaghetti, vermicelli. Growing urbanization, improved socio-economic status, rapid industrialization, changes in the lifestyles of the people have contributed to enhanced consumption of processed and convenient food products. The major challenge today is to meet the wide demands of the consumers and to develop inexpensive, nutritionally superior and highly acceptable foods.

Vermicelli is one such commonly consumed pasta product and normally used in the preparation of *upma, khichadi, payasam* etc. Many innovative recipes have also been developed with vermicelli and these include *burfis, halwa, puliyogare*, curd semia etc. As a result, the acceptance of the product in households has increased manifold. Vermicelli is considered as one of traditional Indian food item as it is based on sound foundation of culture, custom, natural environment and consumed by people over long time. Traditional vermicelli is prepared from wheat or semolina. (Inamdar *et al.*, 2005) [6]. Vermicelli are usually packed in packaging material like high density polyethylene covers, low density polyethylene covers,

metalized polyester polyethylene pouches and BOPP covers for safe storage and marketability (Sumathi *et al.*, 2009; Shobha *et al.*, 2015; Ranganna *et al.*, 2014) [16, 15, 12]. The incorporation of foxtail millet to the traditional recipes increases the nutritive value. Vermicelli made from millet contains high dietary fiber and low fat on which consumers are giving more importance for better health and prevention of degenerative diseases. Hence the incorporation of foxtail millet demands storability of the product. Promoting millet utilization in urban and rural areas, opening new markets for farmers to improve their income, developing highly improved products from millets is need of hour. Semolina vermicelli is prepared during summer and stored even upto one year. Hence the present investigation was undertaken with the following objectives, to study the storage quality of millet vermicelli, market ability and consumer preferences.

Material and methods

Standardisation of foxtail millet vermicelli preparation was taken up by using wheat semolina and foxtail millet flour in different combinations. Based on the production parameters and sensory evaluation, 1:1 (Semolina + Foxtail millet flour) was found to be most acceptable. After standarisation they were evaluated initially and during storage period of six months at an interval of one month for physical parameters, cooking quality, sensory characteristics, moisture and free fatty acid contents. The foxtail millet vermicelli (1:1) and the wheat vermicelli (control) of 500 gram were packed in polyethylene covers in an ambient condition for a period of 6 months. The width of the dried vermicelli was measured using digital vernier caliper. Around 10 dried vermicelli strands were selected randomly and measured for width and expressed in millimeter (mm).Cooking qualities of vermicelli were assessed by considering parameters like cooking time, cooking weight and volume, cooking loss, expansion ratio and bulk density. Sensory characteristics of foxtail millet vermicelli were assessed for acceptability in the *upma* form.

The prepared *upma* was evaluated through sensory scores for appearance, colour, texture, taste, flavor and overall acceptability on a nine point hedonic scale by a panel of 12 semi trained members from Department of Food Science and Nutrition. Moisture was determined by taking about 10 g of powdered sample and dried in a hot air oven at 105^0 C till the weight of the moisture cup with its contents was constant. Each time the moisture cup was cooled in a desiccator before weighing. The moisture content of the sample was expressed in g/100 g of sample (AOAC, 2005).

$$\text{Moisture content (\%)} = \frac{\text{Initial weight (g)-Final weight (g)}}{\text{Weight of the sample (g)}}$$

The free fatty acid was estimated by titrating the chloroform extract of sample against potassium hydroxide in the presence of phenopthalene indicator. The amount of FFA was expressed as oleic acid equivalents (Sadashivam and Manickam, 2008) [13].

Market survey

Consumer preference

Market survey was done to document about the consumer preference and acceptability of foxtail millet vermicelli. An opinion survey was conducted to know the consumers knowledge about the availability of foxtail millet vermicelli in market with the help of well-structured interview schedule. The availability of foxtail millet vermicelli in Dharwad city was assessed by interviewing 40 randomly selected grocery shopkeepers using the self-structured questionnaire. Ten shops were selected randomly from Dharwad city and provided with the 10 packs of 100 grams of both foxtail millet based vermicelli and semolina vermicelli. The questions pertaining to awareness, purchasing pattern of vermicelli, preference were asked to the shopkeepers. The results obtained in this study were analyzed by the following statistical methods using SPSS statistical package (Version 16.0).For storage study two way ANOVA was used to test significant difference in the quality attributes of millet vermicelli during storage. The consumer knowledge and preference was evaluated and are expressed in terms of frequency and percentage.

Results and Discussion

Effect of storage on physical characteristics of vermicelli

The physical parameters such as diameter of both raw and cooked vermicelli were analyzed for semolina and foxtail millet vermicelli at monthly intervals for a period of six months. The results are presented in Table I. The diameter of the raw semolina vermicelli (0.81 mm) was significantly higher than foxtail millet vermicelli (0.66 mm) on zero day of storage. On the other hand the diameter of raw vermicelli of both millet and semolina vermicelli did not vary at the end of storage period. Throughout the storage period the diameter of cooked semolina vermicelli was found to be higher compared to cooked millet vermicelli. The raw bulk density of foxtail millet vermicelli (0.33 g/ml) was significantly lower than the semolina vermicelli (0.37 g/ml) at initial month of storage. However, significant change was not observed at the end of six months of storage period. The cooked bulk density of millet vermicelli significantly increased during storage period (initial 0.81, final 0.85g/ml) whereas in wheat though increase was seen it was not significant. Increase in the bulk density with progression in the storage period is due to increase in the diameter of swollen vermicelli strands. Even after six months the bulk density of control was significantly lower than that of millet vermicelli.

Table 1: Effect of storage on physical characteristics of vermicelli

Storage months	Raw vermicelli				Cooked vermicelli			
	Diameter		Bulk density		Diameter		Bulk density	
	Wheat	Foxtail millet	Wheat	Foxtail millet	Wheat	Foxtail millet	Wheat	Foxtail millet
0	0.81±0.01	0.66±0.03	0.37±0.01	0.33± 0.01	1.14±0.05	1.01±0.11	0.69±0.01	0.81±0.04
1	0.81±0.01	0.66±0.01	0.37±0.01	0.33±0.01	1.30±0.01	1.07±0.05	0.72±0.03	0.81±0.04
2	0.81±0.03	0.66±0.02	0.37±0.08	0.33±0.06	1.39±0.11	1.19±0.03	0.73±0.08	0.83±0.09
3	0.81±0.01	0.66±0.02	0.37±0.01	0.33±0.01	1.40±0.02	1.20±0.03	0.73±0.05	0.84±0.39
4	0.81±0.02	0.66±0.01	0.37±0.02	0.33±0.01	1.41±0.01	1.21±0.01	0.73±0.08	0.84±0.05
5	0.81±0.01	0.66±0.01	0.37±0.00	0.33±0.02	1.48±0.02	1.25±0.04	0.72±0.02	0.84±0.03
6	0.81±0.02	0.66±0.02	0.37±0.03	0.33±0.01	1.50±0.09	1.29±0.02	0.74±0.01	0.85±0.01

	F value	S.Em.±	CD	F value	S.Em.±	CD	F value	S.Em.±	CD	F value	S.Em.±	CD
Month (M)	0.25	0.31	NS	1.20	0.25	NS	0.58	0.27	NS	692.96	0.30	0.89**
Sample (S)	57.33	0.06	0.19**	9.19	0.15	NS	85.98	0.01	0.03**	7.47	0.09	0.28**
(M*S)	0.27	0.30	NS	1.00	0.16	NS	0.68	0.29	NS	0.77	0.09	NS

Effect of storage on cooking parameters of vermicelli

The vermicelli was analyzed for cooking qualities and results are presented in Table II. The cooking time of control vermicelli (3 minute 0 second) was significantly higher than the foxtail millet vermicelli (2 minute 30 second) on first day of storage. Later a significant decrease in the cooking time was observed from 3 months onwards i.e., 2 minute 45 second for control and 2 minute 15 second for millet vermicelli. There was a significant increase ($p \leq 0.01$) in cooked weight for both semolina and foxtail millet vermicelli after four months and further storage (initial; millet vermicelli 41.78 g/10 g, final; after six months 46.08 g/10 g, and in case of semolina vermicelli 40.68 g/10 g to 44.41 g/10 g respectively. Similar trend was observed for the cooked volume. The cooked volume of millet vermicelli at initial month was 40.82 ml; significantly ($p \leq 0.01$) increased up to 44.30 ml. In case of semolina vermicelli it was increased from 39.10 ml to 41.33 ml. Increase in weight and volume is mainly due to the reduction in the cooking loss and also increased in the diameter of the vermicelli.

The cooking loss of foxtail millet vermicelli (8.62 g/100 g) was significantly higher than the control vermicelli (6.93 g/100 g) at initial month of storage period (Table III). At the end of storage period the cooking loss was significantly ($p \leq 0.01$) decreased to 7.55 g/100 g in case of millet vermicelli and 6.06 g/100 g in case of semolina vermicelli. The reduction in cooking loss of vermicelli was mainly attributed to structural changes in protein network by semolina and foxtail millet (Madhumitha *et al.*, 2011) and also due to retro gradation of starch. Similarly Pandey, 2014 observed decrease in cooking loss for foxtail incorporated vermicelli (29%) and semolina vermicelli with the progression of storage period.

The initial expansion ratio of semolina and foxtail millet vermicelli was 1.45 and 1.35 respectively increased up to 1.56 to 1.48 respectively at the end of 6 months of storage period (Table III). The expansion ratio of control vermicelli was significantly higher than the foxtail millet vermicelli throughout the storage period.

Table 2: Effect of storage on cooking quality of vermicelli

Storage months	Cooking time			Cooked weight			Cooked volume		
	Wheat	Foxtail millet		Wheat	Foxtail millet		Wheat	Foxtail millet	
0	3.00±0.00	2.30±0.00		40.68±0.22	41.78±0.50		39.10±0.81	40.82±0.40	
1	3.00±0.00	2.30±0.00		41.31±0.45	42.32±0.22		39.50±0.20	41.25±0.05	
2	3.00±0.00	2.30±0.01		41.83±0.20	42.96±0.02		39.86±0.05	41.59±0.03	
3	2.45±0.00	2.15±0.00		42.23±0.19	4.443±1.46		40.23±0.05	41.98±0.17	
4	2.45±0.00	2.15±0.00		42.91±0.75	45.05±0.64		40.36±0.05	42.33±0.03	
5	2.45±0.00	2.15±0.00		43.62±0.14	45.55±0.13		40.70±0.08	43.85±1.33	
6	2.45±0.00	2.15±0.00		44.41±0.38	46.08±0.05		41.33±0.15	44.30±0.10	
	F value	S.Em.±	CD	F value	S.Em.±	CD	F value	S.Em.±	CD
Month (M)	98.11	0.18	0.58**	124.86	0.84	2.50**	93.66	0.34	1.04**
Sample (S)	139.68	0.23	0.71**	61.38	0.30	0.99**	13.33	0.48	1.72**
Interaction (M*S)	159.68	0.26	0.73**	1.85	0.41	1.26*	1.58	0.43	1.37**

Each value is mean of three replications

Table 3: Effect of storage on cooking quality of vermicelli

Storage period (months)	Cooking Loss (g/100g)			Expansion Ratio		
	Wheat	Foxtail millet		Wheat	Foxtail millet	
0	6.93±0.70	8.62±0.13		1.45±0.02	1.35±0.02	
1	6.75±0.07	8.48±0.13		1.48±0.03	1.36±0.06	
2	6.64±0.03	8.23±0.22		1.48±0.02	1.38±0.01	
3	6.42±0.08	8.07±0.05		1.52±0.01	1.40±0.08	
4	6.37±0.15	7.91±0.24		1.51±0.02	1.40±0.02	
5	6.15±0.08	7.84±0.55		1.52±0.03	1.45±0.08	
6	6.06±0.12	7.55±0.81		1.56±0.23	1.48±0.02	
	F value	S.Em.±	CD	F value	S.Em.±	CD
Month (M)	540.08	0.19	0.61**	114.84	0.16	NS
Sample (S)	13.70	0.47	1.43**	10.27	0.03	0.10**
Interaction (M*S)	0.23	0.30	NS	0.76	0.08	NS

NS: Non-Significant, ** significant at 1% level, each value is mean of three replications

Effect of storage on moisture and free fatty acid content of vermicelli

The storage effect on moisture and free acid contents of vermicelli are depicted in Table IV. The initial moisture content of the control (11.84%) was found to be significantly higher ($p<0.01$) than the foxtail millet vermicelli (10.91%). Later the moisture content decreased to 10.31 per cent in control vermicelli and 9.12 per cent in millet vermicelli at the end of 2 months of storage period. From third month onwards the moisture content increased ($p<0.01$) gradually with the progression of storage period. At the end of storage period moisture content of both control and millet vermicelli were increased to 10.56 per cent and 9.79 per cent respectively. The moisture content of vermicelli after six months was low when compared to the initial score (wheat 11.84% and 10.56% and foxtail millet 10.91% and 9.79% respectively).

The free fatty acid content of foxtail millet vermicelli (1.25 g oleic acid) was found to be significantly (p<0.01) higher than the control (1.04 g oleic acid) on first day of storage period. With the progression of storage period there was significant increase (p<0.01) in the free fatty acid content of both control and foxtail millet. At the end of six month the free fatty acid content of control and millet vermicelli was found to be 3.02 g oleic acid and 3.26 g oleic acid respectively. Throughout the storage period free fatty acid content of foxtail millet vermicelli was found to be significantly high compared to the control vermicelli.

The increase in the moisture content was mainly due to the uptake of moisture from the atmosphere during the storage period and increase in free fatty acid content was due to the increased moisture content. Similar trends were obtained by Shobha *et al.* (2015) [15] reported increase in moisture and peroxide value for maize incorporated vermicelli. Pandey, 2014 also reported that, with the progression of storage period, the moisture and free fatty acid content increased in foxtail millet incorporated vermicelli.

Table 4: Effect of Storage on Moisture and Free Fatty Acid Content of Vermicelli

Storage period (months)	Moisture (%)			Free fatty acid (gram oleic acid)		
	Wheat	Foxtail millet		Wheat	Foxtail millet	
0	11.84±0.11	10.91±0.09		1.04±0.04	1.25±0.04	
1	11.15±0.05	10.87±0.04		1.11±0.07	1.31±0.34	
2	10.31±0.02	9.12±0.08		1.86±0.05	1.88±0.07	
3	10.44±0.33	9.56±0.06		2.14±0.01	2.43±0.21	
4	10.66±0.48	9.86±0.01		2.56±0.07	2.98±0.38	
5	10.79±0.69	9.92±0.01		2.92±0.03	3.12±0.42	
6	10.56±0.85	9.79±0.24		3.02±0.13	3.26±0.59	
	F value	S.Em.±	CD	F value	S.Em.±	CD
Month (M)	1.38	0.03	0.12**	14.93	0.04	0.13
Sample (S)	1.93	0.02	0.06**	1.96	0.07	0.21
Interaction (M*S)	29.67	0.07	0.21**	0.76	0.03	0.10

** Significant at 1% level, each value is mean of three replications

Effect of storage on organoleptic quality of vermicelli.

The initial scores for overall acceptability of semolina vermicelli was 7.81 with appearance, colour, flavour, taste and texture scores of 8.15, and 8.29, 7.71, 7.58 and 7.10 respectively Table V. The initial scores for overall acceptability of foxtail millet vermicelli was 8.19 with appearance, color, flavor, taste and texture scores of 8.12, 8.05, 8.10, 7.95 and 7.75 respectively. The initial overall acceptability scores of foxtail millet vermicelli was higher (8.19) compared to semolina vermicelli (7.81). The same trend was seen after one, two and three months of storage period. The scores of foxtail millet vermicelli was significantly higher (8.19) compared to semolina vermicelli (7.83 even after two months of storage).After of storage there was no difference with respect to appearance, colour, flavour, taste, texture and overall acceptability scores between foxtail millet vermicelli and semolina vermicelli. The overall acceptability score of foxtail millet was 7.83 which indicated 'like moderately'. After three months of storage foxtail millet vermicelli developed slight bitterness which may be due to polyphenol content in the foxtail millet. Similarly, Sumathi *et al.*, 2009 [16] reported that Ready-To-Eat crisp extrudates from pearl millet showed the bitter taste after three months of accelerated storage period. Shobha *et al.*, 2015 [15] also reported the decrease in the sensory scores after three months of storage period for maize incorporated vermicelli.

Table 5: Effect of storage on organoleptic qualities of vermicelli #

Storage Months	Appearance			Colour			Flavor			Taste			Texture			Overall acceptability		
	Wheat	Foxtail millet		Wheat	Foxtail millet		Wheat	Foxtail millet		Wheat	Foxtail millet		Wheat	Foxtail millet		Wheat	Foxtail millet	
0	8.15±0.05	8.01±0.12		8.29±0.21	8.08±0.21		7.71±0.28	8.26±0.15		7.58±0.23	7.89±0.19		8.10±0.13	7.84±0.12		7.81±0.01	8.19±0.23	
1	8.20±0.25	8.12±0.69		8.30±0.28	8.05±0.36		7.79±0.23	8.10±0.85		7.60±0.01	7.95±0.36		8.23±0.09	7.75±0.69		7.79±0.18	8.12±0.28	
2	8.18±0.15	8.09±0.86		8.31±0.13	7.96±0.09		7.81±0.26	8.13±0.18		7.51±0.08	7.92±0.78		8.15±0.36	7.81±0.07		7.83±0.23	8.11±0.29	
3	8.21±0.01	8.06±0.36		8.32±0.15	8.03±0.25		7.79±0.01	7.86±0.85		7.62±0.15	7.73±0.25		8.01±0.28	7.78±0.12		7.85±0.34	7.83±0.16	
	F value	S.Em.±	CD	F value	S.Em.±	CD	F value	S.Em.±	CD	F value	S.Em.±	CD	F value	S.Em.±	CD	F value	S.Em.±	CD
Month (M)	108.96	0.15	NS	0.69	0.15	NS	38.20	0.08	0.24**	250.33	0.10	0.31**	395.17	0.31	NS	268.19	0.04	0.12**
Sample (S)	507.12	0.24	NS	38.17	0.41	NS	23.39	0.11	0.31**	977.11	0.09	0.27**	71.8	0.48	NS	206.12	0.05	0.16**
(M*S)	75.81	0.17	NS	1.12	0.19	NS	53.90	0.43	1.30**	698.78	0.28	0.85**	5.28	0.45	NS	9.83	0.25	0.74**

Each value is mean of three replications

Estimation of cost for production of vermicelli.

The cost of production of 5 kg vermicelli was calculated and is depicted in Table VI. It could be seen from the table that the total cost of production of 5 kg foxtail millet vermicelli was Rs. 495 which was higher than that of cost of production of semolina vermicelli (Rs 410). The cost of packaging materials was Rs 30 and for the preparation of vermicelli including electricity charge, labour charge was about Rs 200. Since the cost of foxtail millet is high compared to semolina and involves milling cost of foxtail millet vermicelli is high (Rao and Muralikrishna, 2001) [11]

Table 6: Cost estimation for vermicelli production*

	Wheat			Foxtail millet		
	Quantity (kg)	**Rate (Rs)**	**Amount (Rs)**	**Quantity (kg)**	**Rate (Rs)**	**Amount (Rs)**
Semolina	5	36	180	2.5	36	90
Foxtail millet	-	-	-	2.5	66	165
Milling	-	-	-	2.5	4	10
Preparation of vermicelli	5	40	200	5	40	200
Packaging	5	6	30	5	6	30
Total			410			495

*For 5 kg

Market study

Consumer knowledge about foxtail millet vermicelli selling/ availability

Majority of consumers (92.5%) were completely unaware about foxtail millet vermicelli in the market, only 7.5 per cent of consumers are aware about. All the shopkeepers (100%) reported that they are not marketing foxtail millet vermicelli. Before placing the millet vermicelli in the shops, shopkeepers reported many of the consumers preferred to purchase the semolina vermicelli than the other vermicelli because the semolina vermicelli was one of the popular traditional food items liked and eaten by people over many years and they were also unaware about the newly developed vermicelli. All the shopkeepers (100%) opined that consumers will purchase vermicelli once in 2-3 months

Consumer acceptability of foxtail millet vermicelli

After placing the millet vermicelli packets for one month in the shop, in an interview with the shopkeepers, 80 per cent of them reported that the consumers have shown interest and purchased foxtail millet vermicelli and they did not express any misconcepts about packaging. Most of the shopkeepers (90%) reported that selling of foxtail millet vermicelli was profitable and consumers showed interest and they preferred to purchase the foxtail millet vermicelli because consumers gave more importance to the product which is highly nutritious and rich in fiber content. The marketing of foxtail millet vermicelli was profitable but it needed some more promotion, because the consumers are unaware about the foxtail millet vermicelli.

Market potentiality

The market potentiality of vermicelli was assessed and the results are depicted in Table VII. Among the 100 packets (100 g each) of foxtail millet vermicelli and wheat vermicelli kept in 10 shops, 89 packets of foxtail millet were sold in one month as against 81 packets of wheat vermicelli indicating consumer's preference to purchase foxtail millet vermicelli if available.

Table 7: Evaluation Of Market Potentiality Of Foxtail Millet Vermicelli*

Type of vermicelli	Number of shops	Packets provided	Packets sold (%)
Wheat vermicelli	10	100	81
Foxtail millet vermicelli	10	100	89

*For period of one month

Conclusion

The diameter and bulk density of the cooked vermicelli were increased significantly with progression in storage period and no change was observed for the diameter and bulk density of raw vermicelli. Increase in cooked weight and cooked volume and decrease in cooking time and cooking losses were observed throughout the storage period. There was a significant increase in moisture and free fatty acid content observed during the storage period in both semolina and foxtail millet vermicelli. Organoleptic scores of foxtail millet vermicelli upma indicated that there were no significant changes up to 3 months of storage. The developed foxtail millet vermicelli can be stored up to three months without affecting its physical and nutritional quality. Rather upto two months foxtail millet vermicelli was more liked compared to wheat vermicelli. Millet vermicelli was better accepted by the consumers and is profitable to the shopkeepers. Only few consumers have knowledge about foxtail millet vermicelli and none of the consumers were aware of the availability of the foxtail millet vermicelli. The consumers showed interest in purchase of foxtail millet vermicelli and the marketing of the millet vermicelli was found to be profitable for the shopkeepers. Millet vermicelli was better accepted by the consumers and is profitable to the shopkeepers. Therefore rural people can take up production of foxtail millet vermicelli as an income generating activity.

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