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Effect of toasting on cooking behaviour and acceptability of composite finger millet (*Eleusine coracana*) vermicelli with defatted soy flour

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ABSTRACT

Finger millet is the staple food for a large segment of population in India. It is nutritionally superior to wheat and rice with respect to protective nutrients such as dietary fiber, calcium and micro-nutrients. Hence finger millet offers many opportunities for utilization in diversified products like pasta by adopting appropriate processing techniques. In the present investigation the effect of incorporation of defatted soy flour and toasting of finger millet vermicelli on cooking and sensory quality was studied. Vermicelli was prepared by mixing finger millet flour, whole wheat flour and defatted soy flour at 10 and 15 per cent using 34 per cent of hot (75^0C) and cold water. Toasting was done for a period ranging from 2-5 minutes at 120^0C. Cooking qualities like cooked weight, hydrated volume and cooking loss was recorded. Vermicelli containing either 10 or 15 per cent defatted soy flour using hot or cold water indicated that the cooked weight and hydrated volume was higher for untoasted vermicelli as compared to toasted vermicelli. The cooked weight and hydrated volume was higher for 10 per cent incorporation. However cooking loss was less for toasted (at 3 minutes) vermicelli containing 10 per cent defatted soy flour using hot water (7.4%) as against 9.2 per cent for cold water. The subjective analysis on 5 point hedonic scale by semi-trained panels showed that toasted vermicelli had desirable sensory quality as indicated by statistical data which were significantly different ($P<0.05$). Vermicelli from hot water dough at 10 per cent defatted soy flour had comparatively higher sensory scores.

Keywords: Finger millet; defatted soy flour; cooking quality; sensory quality; toasting

INTRODUCTION

Finger millet is the most important millet crop of Karnataka and is a major source of energy and protein in the diet of population. It contains a high proportion of carbohydrates, dietary fiber, calcium and micronutrients. Finger millet is used in the form of dumplings or porridge or Roti. The millet grains offer many opportunities for utilization in diversified products. Hence finger millet based vermicelli deserves more attention. The popularity of pasta products can be attributed to its sensory appeal, versatility, low cost, ease of preparation, nutritional content and storage stability as

well as increased consumer interest in ethnic foods in the western world (Cole 1991). The inherent blandness of the product makes them congenial with many kinds of adjuncts such as sauces, toppings, flavourings etc enabling vermicelli to be used as the basis of different dishes with infinite variations. In India although consumption of vermicelli is reported to be very low namely 80 g per capita their production has increased in the recent past from 4.73 lakh tonnes to 6.46 lakh tonnes (Vetrimani et al 1999). Hence an investigation was made to study the effect of incorporation of defatted soy flour and toasting on cooking and sensory quality of finger millet vermicelli.

MATERIAL AND METHODS

Ingredients such as finger millet, wheat and defatted soy flour were obtained from the local market. Finger millet and wheat were thoroughly cleaned and grounded in laboratory mini mill to obtain whole grain flour and sieved using 60 mesh.

Formulation of finger millet vermicelli with defatted soy flour

Finger millet vermicelli were prepared using 45 per cent of finger millet flour, 45 and 40 per cent of wheat flour and 10 and 15 per cent defatted soy flour. Thus one set of finger millet vermicelli had 10 per cent defatted soy flour and another set with 15 per cent defatted soy flour.

Extrusion of finger millet vermicelli

The composite flour thus obtained was premixed for 2 minutes in a laboratory model (Dolly pasta machine) cold extruder. Further mixing was continued for 9 – 10 minutes using cold water at 30°C and in another set using hot water at 75°C. Water used for the dough was at 36 per cent level. The dough was extruded using a brass die with 1 mm holes spread over the entire surface at 2 mm apart. Cutter was attached to the extruder and extruded vermicelli were cut to 3 cm long pieces.

Drying of composite finger millet vermicelli

The extruded vermicelli were dried till it reached 9 per cent moisture. The samples were brought to room temperature and packed in polyethylene pouches.Toasting of composite finger millet vermicelli. The toasting was performed by transferring 50 g dried vermicelli sample over hot plate maintained at 120°C for 2-5 minutes.

Cooking quality of composite finger millet vermicelli

A 50 g sample was cooked in 500 ml boiling water for 10 minutes each in duplicate and the cooked vermicelli were drained over a screen to separate the liquid portion and weighed. Results were expressed as g/100 g of dry vermicelli. Cooking quality was determined for both toasted and not toasted samples and also

for hot and cold water variation. Hydrated volume was measured by using measuring cylinder and expressed as ml/100 g of dry vermicelli sample. The total solids or cooking loss in the liquid portion was determined by evaporating a known quantity of drained liquid over water bath followed by drying in an oven at 105^0C ±1 for 3 hours. The weighed solid was expressed in percentage (Anon 1976).

Sensory quality of composite finger millet vermicelli

The cooked vermicelli samples were evaluated for appearance, texture, flavor, hand feel and overall acceptability on a 5 point hedonic scale. Score sheet was used for the evaluation of cooked vermicelli. The maximum score was five ranging from poor to excellent. Two-way analysis of variance was applied on the sensory mean scores of 10 panel members for different quality characteristics in order to find out the difference between control and experimental products.

RESULTS AND DISCUSSION

The composite finger millet vermicelli when subjected to toasting for periods ranging from 2-5 minutes containing 10 and 15 per cent defatted soy flour using cold water for dough (Table1, 2) showed mean cooked weight of 272.7 and 250.9 g than with hot water 255.9 and 233.3 g respectively. As the time of toasting increased the gradual decrease in cooked weight was observed both in cold and hot water dough for finger millet vermicelli at 10 and 15 per cent defatted soy flour. However an indirect relationship exists between the cooked weight and water absorption. Sudha et al 1998 reported that the finger millet vermicelli with hot water displayed low water absorption of 16.1per cent which was further reduced to 13 per cent on toasting. Toasting had adverse effect on the starch swelling property of the finger millet flour and thus affecting cooked weight to decrease.

Composite vermicelli with 10 and 15 per cent defatted soy flour made from hot water dough had comparatively lower cooking loss of 9.2 and 9.8 per cent however with cold water it was 11.0 and 12.1 per cent respectively. The minimum cooking loss of 7.4 per cent was recorded for finger millet vermicelli with 10 per cent defatted soy flour using hot water for dough with 3 minutes of toasting. However Sudha et al 1998 reported that 3-4 minutes of toasting was necessary for minimum cooking loss further use of hot water (75^0C) for dough making decreased the solid loss during cooking from 22.1 to 16.1 per cent by toasting of vermicelli at 120^0C for 3 minutes.

Table1. Effect of degree of toasting on cooking and sensory quality of composite finger millet vermicelli using 10 per cent defatted soy flour

Time of toasting (min)	Cooked weight (g/100g)		Cooking loss (%)		Sensory scores (max score 5)	
	Hot	Cold	Hot	Cold	Hot	Cold
2.0	295.0	268.0	11.2	10.5	3.27	3.34
2.5	284.0	263.0	10.6	9.3	3.26	3.45
3.0	282.5	258.0	9.2	7.4	3.86	4.37
3.5	264.5	248.0	10.3	8.5	3.14	3.25
4.0	266.5	253.0	11.5	9.3	3.0	3.22
4.5	265.5	256.0	12.7	10.6	2.99	3.11
5.0	254.5	245.0	11.3	9.0	2.76	3.30
Mean	272.7	255.9	11.0	9.2	3.18	3.43
SEm±	3.77	2.168	0.287	0.289	9.17	0.113
F value	45.65*	12.32*	35.93*	45.57*	19.73*	16.22*
CD	10.45	6.01	0.79	0.801	25.41	0.313

*Significant at 5% level; Cold-dough made with cold water at 30^{0}C; Hot-dough made with hot water at 75^{0}C

Table 2 Effect of degree of toasting on cooking and sensory quality of composite finger millet vermicelli using 15 per cent defatted soy flour

Time of	Cooked weight toasting (min)		Cooking loss (%) (g/100g)		Sensory scores (max score 5)	
	Hot	Cold	Hot	Cold	Hot	Cold
2.0	271.5	234.0	13.1	11.4	3.20	3.38
2.5	255.0	238.0	12.8	10.2	3.11	3.34
3.0	251.5	242.5	10.7	8.2	3.69	3.80
3.5	251.5	235.0	12.0	9.1	3.47	3.30
4.0	248.5	239.5	12.4	10.3	2.88	3.07
4.5	246.0	235.0	12.2	9.5	2.64	2.98
5.0	232.5	209.0	11.6	9.8	2.59	2.86
Mean	250.9	233.3	12.1	9.8	3.08	3.25
SEm±	2.91	3.06	0.293	0.26	0.11	8.29
F value	25.83*	21.36*	82.63*	91.67*	8.94*	16.03*
CD	6.07	8.48	0.81	0.72	0.31	22.97

*Significant at 5% level; Cold-dough made with cold water at 30^{0}C; Hot-dough made with hot water at 75^{0}C

Table 3 Effect of degree of toasting vs untoasting on cooking and sensory quality of composite finger millet vermicelli using 10 per cent defatted soy flour

Sample	Cooked weight (g/100g)		Hydrated volume (ml/100g)		Cooking loss (%)		Sensory scores (max score 5)	
	Cold	Hot	Cold	Hot	Cold	Hot	Cold	Hot
Not toasted (45% FM+45% WWF+10% DFS)	312.5	304.2	314	308.5	12.7	11.3	3.11	3.37
Toasted (3 min at 120^{0}C) (45% FM+45% WWF+10% DFS)	282.5	258.0	286.5	260.0	9.2	7.3	3.86	4.37
Mean	297.5	281.0	300.3	284.2	10.9	9.3	3.48	3.88
SEm±	8.728	13.36	7.95	14.00	1.01	1014	0.22	0.295
F value	144.28*	426.88*	605.0*	1010.7*	324.9*	396.0*	47.80*	50.94*
CD	24.19	37.03	22.03	38.80	2.79	3.15	0.60	0.817

*Significant at 5% level; Cold-dough made with cold water at 30^{0}C; Hot-dough made with hot water at 75^{0}C
FM- Finger millet flour; WWF- Whole wheat flour; DFS- Defatted soya flour

Cooked weight and cooking loss were more for composite vermicelli made with 15 per cent defatted soy flour compared to vermicelli with 10 per cent. However Collins and Pangoli (1997) reported that the average cooking loss for samples with zero per cent defatted soy flour was 10.4 per cent and cooking loss at 10 per cent defatted soy flour was 1.8 fold over the loss for the control. In conclusion it can be said that with increasing level of defatted soy flour the cooking loss tended to increase. The decrease in cooked weight could be attributed to increased cooking loss.

Vermicelli from hot water dough had comparatively higher sensory scores both in 10 and 15 per cent defatted soy

flour. Comparatively sensory quality scores were found higher for 10 per cent defatted substitution. The highest score of 4.37 was seen for composite vermicelli at 10 per cent defatted soy flour using hot water for dough at 3 min of toasting. However sensory quality assessed by Sudha et al (1998) showed significant difference at 5 per cent level for texture and taste for cold and hot water dough however hot water dough had higher sensory scores. Statistically significant difference at 5 per cent level was found in cooked weight, cooking loss and sensory quality of composite vermicelli at 10 and 15 per cent defatted soy flour using either cold or hot water for dough making.

The untoasted composite finger millet vermicelli either at 10 or 15 per cent defatted soy flour from cold or hot water for dough (Table 3, 4) had higher cooked weight, hydrated volume and cooking loss but lower sensory scores. Toasting affected the cooked weight but improved the sensory quality especially texture of vermicelli. Stickiness due to leaching of more starch in cooked sample reduced considerably on toasting. Statistically

Table 4. Effect of degree of toasting vs untoasting on cooking and sensory quality of composite finger millet vermicelli using 15 per cent defatted soy flour

Sample	Cooked weight (g/100g)		Hydrated volume (ml/100g)		Cooking loss (%)		Sensory scores (max score 5)	
	Cold	Hot	Cold	Hot	Cold	Hot	Cold	Hot
Not toasted (45% FM+45% WWF+15% DFS)	298.3	295.6	300.1	298.1	13.7	12.0	2.95	3.17
Toasted (3 min at 120^{0}C) (45% FM+45% WWF+15% DFS)	251.5	242.5	254.5	245.0	10.7	8.2	3.69	3.80
Mean	274.9	269.1	277.3	271.5	12.2	10.1	3.30	3.48
SEm±	13.55	15.41	13.18	15.41	0.87	1.07	0.216	0.186
F value	302.1*	182.0*	719.5*	147.6*	372.1*	1441.7*	203.6*	29.9*
CD	37.55	42.71	36.53	42.71	2.41	2.965	0.598	0.515

*Significant at 5% level; Cold-dough made with cold water at 30^{0}C; Hot-dough made with hot water at 75^{0}C
FM- Finger millet flour; WWF- Whole wheat flour; DFS- Defatted soy flour

significant difference at 5 per cent level was found for cooking and sensory quality parameters.

CONCLUSION

Composite finger millet vermicelli with 10 per cent defatted soy flour using hot water for dough and toasted for 3 min were best in terms of cooking and sensory quality.

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