

Feasibility and acceptability of fortified vermicelli prepared from barnyard millet and defatted soy flour

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ABSTRACT : The role played by millets in ensuring food security for flung rural areas is well documented. The protein content of millets varies from 6-10 per cent. Vermicelli serves as an important food security for people living in disadvantage areas. Vermicelli as a well established traditional food well liked by all age groups. The present study was undertaken to fortify vermicelli with malted millets and defatted soy flour to improve its nutritive value. Refined wheat flour was incorporated and replaced with barnyard millet flour and defatted soy flour. Blends in the ratio of 90:00:10, 70:20:10, 45:45:10, 20:70:10 were evaluated for organoleptic score and defatted soy flour was kept constant. Blends 45:45:10 was superior than those made from control and other blends and recorded highest sensory score 7.82. The nutritive value of selected vermicelli (blends 45:45:10)was found to be as follows moisture 8.10 per cent, protein 15.23 per cent, total carbohydrate 68.40 per cent, crude fat 2.58 per cent, crude fibre 3.5 per cent and ash 2.20 per cent . The developed product can serve to fulfill the protein requirement of the community.

KEY WORDS : Vermicelli, Small millets, Malting, Defatted soy flour

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Millets are mostly grown in marginal areas or under agricultural conditions where major cereals fail to give sustainable yield. These essential amino acids are of special benefit to people who depend on plant food for protein requirement. They contain a high proportion of carbohydrates, which are non-starchy polysaccharides and dietary fibres, help in prevention of constipation and lowering of cholesterol. Also, slow release of glucose to the blood stream during digestion of millet is beneficial to diabetic patients (Chen *et al.*, 1984 and Anderson *et al.*, 1991). Realizing the nutrient composition of these grains they are now referred as nutria-cereals. Traditionally, tribal's process millets by kunaita (a mud mill) and dehusked form of millets called 'kudai'. Millets are mostly grown in marginal areas or under agricultural conditions where major cereals fail to give sustainable yield. Their most common staple preparations are pej and khichadi (boiled dehusked millets) and other preparation like kanji and kheer are also made from different types of

kudai. Foods based on coarse millets are known as high bulk foods which often result in protein caloric malnutrition (Desikachar, 1980). Hence, there was need for development of nutritionally balanced and easily digestible foods by adopting simple traditional method for the preparation of low bulk with nutrient and energy rich foods. Millets contain maximum essential amino acids but are deficient in lysine which can be enriched with defatted soy flour (50%) protein; it is cheap and easily available in M.P. This can be used in place of wheat flour (traditionally used in vermicelli) to prepare vermicelli (sevai) since they have become major products of the cereal food industry and are popular on account of their sensory appeal, low cost, easy preparation at household level. In view of its advantages like low cost and better nutritional quality of the malted millets and defatted soy flour based vermicelli, the present investigation was carried out to evaluate organoleptic and nutritional characteristics of foods based on malted flours.

RESEARCH METHODS

The raw material barnyard millet (Sanwan) variety (RBM-11) were procured from the regional minor millets research station Rewa (MP), defatted soy flour was procured from Ruchi soya flour industries limited Mumbai, refined wheat flour, milk, sugar and pure ghee were purchased from local market.

For the preparation of malted barnyard (Sanwan) flour, the millet seeds were cleaned, washed and steeped in water for 18h with intermittent change of water after each 4h interval, then drained and allowed to germinate under a wet cloth for 48h at room temperature $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$. The seeds were dried in hot air oven at 65° for 20h. Devegetation was done by hand rubbing this called green malt. The green malt was kilned on a frying pan at 55°C temperature and powdered with hand operated mill sieved through 40 mesh sieve.

Preparation of vermicelli :

Malted milled flour was mixed with refined wheat flour with replacement of 10 per cent defatted soy flour and finally the combinations were as follows:

- Refined wheat flour : malted Sanwan flour : defatted soy flour : 90:00:10
- Refined wheat flour : malted Sanwan flour : defatted soy flour : 70:20:10
- Refined wheat flour : malted Sanwan flour : defatted soy flour : 45:45:10
- Refined wheat flour : malted Sanwan flour : defatted soy flour : 20:70:10
- Refined wheat flour : malted Sanwan flour : defatted soy flour : 00:90:10

The dough was prepared by using required quantity of distilled water by making hard dough. The dough was divided into small balls and then extruded through a manually operated single screw cold extruded vermicelli press and sundried for 8-12h. The dried vermicelli were packed in plastic jars (Fig. A).

Processing parameters of millet based vermicelli :

Kneading time of dough :

The time taken by preparation of dough was measured using a stop watch and expressed in minutes.

Water uptake by dough :

Water was added to mix ingredients using a burette till dough become stiff. The amount of water uptake by flour was measured in ml. Cooking quality and solid loss per cent of vermicelli was determined by ISI (1976) method.

Cooking time of vermicelli :

20 g dried vermicelli was weighed separately, 250 ml of water was boiled and then weighed vermicelli were added. Cooking time was noted down till vermicelli become soft.

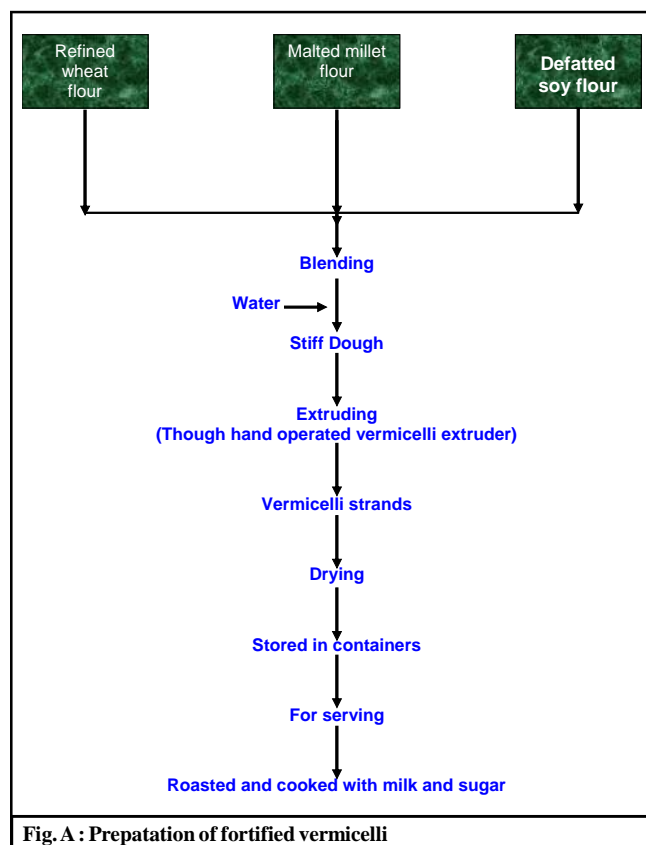


Fig. A : Preparation of fortified vermicelli

Cooked weight of vermicelli :

The cooked vermicelli placed over a screen to separate cooked vermicelli and the gruel. The weight of cooked vermicelli was taken. The cooked weight of vermicelli which also indicates the amount of water uptake during cooling was determined and expressed as g per 100 g of dry vermicelli sample.

Solid loss per cent :

The gruel was tested for solid content by evaporating a known weight of drained liquid on a boiling water bath heater, till all the water was evaporated, before weighing the solids.

Organoleptic evaluation of vermicelli :

The sensory quality evaluation of prepared vermicelli was done by a panel of 10 judges as described by Amerine *et al.* (1965) on a 9 point hedonic scale. The ratings were given on the sensory attributes like appearance, colour, texture, taste, flavour and overall acceptability .

Nutritional characteristics of vermicelli :

Moisture, protein, fat, carbohydrate, fibre, ash and minerals were estimated by standard procedure (AOAC 1995). Calorific value of vermicelli was calculated by the factor 4 for protein and carbohydrate and 9 for fat.

■ RESEARCH FINDINGS AND DISCUSSION

The results of the present study as well as relevant discussions have been presented under following sub heads:

Processing parameters of millet based vermicelli :

The vermicelli was prepared supplemented with malted sanwan millet flour with 10 per cent defatted soy flour. Various processing parameters such as kneading time, water uptake by the dough, cooking time, weight of cooked vermicelli and solid losses were determined and the results are summarized in Table 1. It was found that mixing of malted flour at various levels increased the kneading time from 4.0 to 4.7 min whereas water uptake by the dough decreased from 110 to 100 ml on increasing the level of malted millet flour. Kneading time and water uptake by the dough is inversely proportional. The cooking time was found to decrease from 4.20 to 3.10 min. which was conspicuous by lower than the time taken for cooking of control samples. The decrease in weight of the cooked sample was also found with the increased level of the minor millets in the sample. The cooked weight of vermicelli with different proportions of malted millet flour was found to significantly ($p < 0.05$) higher than the control. In general cooked vermicelli weight varied from 2.5 time to 1.92 times more than their original weight. The solid losses during cooking were reduced from 22.00 to 11.00 per cent in the control to pure sanwan malted flour. Therefore, it can be concluded that malted sanwan based

vermicelli showed lesser cooked weight and solid loss (%). Increasing the level of malted flour, reduces the bulk density of food (Gopaldas 1994) and decreases the solid losses resulting in decreased loss of nutrients. Very scant reported values are available to substantiate the present findings. However, most of the work available in the literature on the vermicelli made from traditional recipe, not including malted - non malted millet flour. Vertimani and Rahim (1994) and Sudha *et al.* (1998) also reported such work, which contradict the present finding only because of absence of malted millet flour. Since, malting process is known to bring remarkable modifications in the various functional properties of the flour, which affect the properties of the final product.

Sensory evaluation of prepared vermicelli :

For the final launching of any food product in the market, the product should undergo the sensory evaluation test to show its acceptability. Data on mean scores of various sensory attributes of the vermicelli from different flours and blends are given in Table 2.

Colour and appearance :

On the basis of colour and appearance control vermicelli had the highest score of 7.90 followed by SVm_1 and SVm_2 which were at par with each other and were liked very much. Next treatments were SVm_3 and SVm_4 which were

Table 1 : Processing parameters of malted sanwan flour based vermicelli

Physical parameters	(Refined wheat flour + Malted sanwan flour + Defatted soy flour-10) Treatments				
	CVm (90+00)	SVm1(70+20)	SVm2 (45+45)	SVm3 (20+70)	SVm4 (00+90)
Kneading time of dough (min)	4.00	4.30	4.40	4.50	4.70
Water uptake by dough (ml)	110.00	106.00	105.00	104.00	100.00
Weight of sample before cooking (g)	10.00	10.00	10.00	10.00	10.00
Water used for boiling (ml)	100.00	100.00	100.00	100.00	100.00
Time taken for cooking (min)	4.20	4.00	3.80	3.40	3.10
Weight of sample after cooking (g)	25.00	24.32	23.00	21.24	19.25
Solid loss (%)	22.00	19.00	16.00	12.00	11.00

Table 2 : Mean score of sensory quality of cooked vermicelli based on fortified malted sanwan flour

Treatments	Sensory attributes				
	Colour and appearance	Taste	Texture	Flavour	Overall acceptability
CVm	7.90	7.70	7.80	7.90	7.80
SVm ₁	7.80	7.52	7.50	7.37	7.54
SVm ₂	7.80	7.90	7.50	8.00	7.80
SVm ₃	7.60	7.30	7.20	7.30	7.30
SVm ₄	6.80	7.00	6.90	7.00	7.00
Mean	7.54	7.52	7.38	7.51	7.49
S.E. ±	0.05	0.05	0.05	0.05	0.05
C.D. at 5%	0.18	0.18	0.17	0.17	0.17

*Results are average of 10 individuals

significantly independent and were liked moderately.

Taste :

As can be seen from the Table 2 that the formulation SVM₂ had significantly highest scores of 7.90 *i.e.*, liked very much followed by CVM, SVM₁, SVM₃ and SVM₄ which were significantly different from each other and were liked moderately.

Texture :

It is obvious from the Table 2 that the formulation CVM was liked the most with highest score (7.80) followed by SVM₁ and SVM₂ and both were statistically at par with each other and were liked very much. The formulation SVM₃ and SVM₄ was liked moderately with the least score.

Flavour :

It is clear from the Table 2 that all the treatments differed significantly from each other. The formulation SVM₂ scored highest (8.00) followed by CVM, SVM₁, SVM₃ and SVM₄, all the latter three were liked moderately.

Overall acceptability :

An appraisal of Table 2 showed that the highest score was exhibited by the formulation SVM₂ (7.82) followed by CVM, SVM₁, SVM₃ and SVM₄, SVM₂ and CVM were liked very much while SVM₁, SVM₃ and SVM₄ were liked moderately. Among all the vermicelli formulation the formulation SVM₂ was found to be the most acceptable formulation with respect to all sensory characteristics studies and selected for nutritive value.

Nutritive value of selected vermicelli :

The nutritive value *i.e.* moisture, protein, oil, carbohydrate, crude fibre, ash and energy were determined of the selected vermicelli. The mean values of different constituents are tabulated in Table 3. The nutrient composition of selected vermicelli of malted sanwan was carried out. The protein content of vermicelli made from

sanwan were 15.23 per cent, moisture 8.10 per cent, Total carbohydrate 68.40 per cent, crude fat 2.58 per cent, crude fibre 3.5 per cent and ash 2.20 per cent .

Conclusion :

It is concluded that effective use of both malted millets and defatted soy flour protein can go a long way toward correction of dietary protein inadequacies. Fortified vermicelli is not only easy to cook but also helps to preserve the nutrients at a low cost especially for the diet of children who are more prone to the nutritional problems. Shelf life of this vermicelli is approximately three months, therefore it can be stored and used as a ready to cook food for entire family or busy farm women of rural areas.

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Table: 3 Nutritive value of selected vermicelli	
Nutrients	SVM ₂
Moisture (%)	8.10
Protein (%)	15.23
Total carbohydrate (%)	68.40
Crude fat (%)	2.58
Crude fibre (%)	3.50
Ash	2.20
Calorific value (Kcal / 100g)	357.74

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