

Development and Evaluation of *Vermicelli* - A Extruded Product from Small Millets

Prakruthi N Raj Gangadkar V. Palanimuthu

Received 4 April 2020; Accepted 18 May 2020; Published on 4 June 2020

ABSTRACT

Small millets are staple diet in many tribal households. In India, a variety of traditional foods are made from them. In this study, five small millets namely, little proso, foxtail, kodo and barnyard millets were selected for development of extruded product. The above parboiled millets were first milled to obtain millet rice grains which were then ground to flour for further use. Blends of parboiled millet rice grain flours were used for formulation of vermicelli mixes. From 13 millet based vermicelli mixes that were formulated, four were selected as most promising that have potential for commercial exploitation. The vermicelli mixes contained wheat flour @ 50% as binder apart from blends of parboiled millet flours. Cooking characteristics of promising vermicelli products in terms of cooking time, swelling index, volumetric swelling

ratio and cooking losses were found to be in the range of 4.4 to 5.7 min, 215 to 275g, 1.7 to 3.6 and 2.6 to 8.2% respectively.

Keywords Millets, Extrusion, Vermicelli, Cooking characteristics.

INTRODUCTION

Millets are known as one of the most important cereal grains. Millets are consumed by more than 1/3rd of the world's population. Millets are small grained cereals and the smallest of them include little, proso, foxtail, finger and barnyard millets. India is the largest producer of millets and is predominantly rainfed and grown in diverse soils under varying rainfall regimes and in areas widely differing in thermo and photo periods, especially in semi arid regions, because of their short growing season. In India small millets are cultivated in about 2.62 million ha (Mha), with an annual production of around 1.78 million tones (MT) with a productivity of 678 kg/ha (Anon 2006). The major countries growing millets include India (area : 1.47 Mha : production : 1.033 MT), Nigeria (area : 0.35 Mha : production-0.36 MT), China (area-0.18 Mha : production-0.30 MT), Sudan (area-0.29m. ha; production-0.078MT), and Russian Federation (area-0.10mha; production-0.048 MT) (FAO 1994).

Dr. Prakruthi N Raj Gangadkar*
Assistant Professor, Bakery Training Unit,
Directorate of Extension, UAS, Hebbal,
Bangalore 560024, India

Dr. V. Palanimuthu
Professor, PHT Scheme, UAS, GKVK,
Bangalore 560065, India
e-mail : prakruthi84@gmail.com

*Corresponding author

The major millets growing in this country are Karnataka, Andhra Pradesh, Madhya Pradesh, Uttar Pradesh, Tamil Nadu, Maharashtra.

Millets have been utilized for human consumption from pre-historic time and it is considered as the way of life, food of the people and food for hungry. The dehusked grain is cooked into rice or milled into flour for consumption. Millets have certain specialties which yield products of superior nutritional and technological characteristics than the major cereals. They have remained as the food for the people of lower socio-economic strata and traditional consumers because of their coarse texture, characteristic flavor, intense colored seed coat and cultural attachments. With constantly increasing awareness of good nutrition for healthy living the consumption of millets is increasing among the affluent class also. However, non availability of processed products similar to rice or wheat has been the primary reason for their consumption being confined to traditional consumers. Extrusion of single or multi-cereal flours is quite popular for a long time for the production of value added products like noodles, spaghetti and other macaroni/pasta products. These nutria-cereals can be tried to develop new extruded products like vermicelli.

MATERIALS AND METHODS

All the small millets contain husk that had to be removed before their utilization. This operation necessitated the use of dehusking and polishing ma-

chinery. Since, exclusive equipment for milling the small millets are not available, the existing rice milling machinery like rubber roll sheller and friction type rice polisher were used for processing small millets. Generally, millet based vermicelli were produced by extruding doughs prepared from parboiled millet grain flours blended with binders like wheat flour (atta) or Maida. The parboiled millet grains namely little, foxtail, proso, kodo and barnyard millets were dehusked and polished. Milling of above millet grains was done in a burr mill to obtain fine that were sieved using BS-60 mesh. The other blending agents like wheat flour was obtained from local market and were also sieved using BS-60 mesh. The millet grain flours independently or in combination do not have desired extrusion characteristics. It was necessary to add some binder like wheat flour for better extrusion.

About different vermicelli formulations were designed using different millet flours and binding agent (Table 1). Vermicelli from the formulated mixes was extruded as per the standard technique. Dough with required consistency was prepared from the formulated vermicelli mix using optimum quantity of warm water. The prepared dough was steam cooked for about 3 min in a vessel placed on gas stove to gelatinize the starch (particularly) and immediately it was extruded in a hand extruder to obtain vermicelli. The extruder contained the die with 1mm diameter holes, 2 mm apart, and spread over entire surface. The extruded vermicelli was cut to 3 cm long pieces before drying. The extruded vermicelli was dried in shade to

Table 1. Formulation of millet flour based vermicelli.

Vermicelli product	Little millet flour (%)	Proso millet flour (%)	Foxtail millet flour (%)	Barn yard millet flour (%)	Kodo millet flour (%)	Wheat flour (%)	Maida (%)
V ₁	80	-	-	-	-	10	10
V ₂	50	-	-	-	-	25	25
V ₃	50	-	-	-	-	50	-
V ₄	-	50	-	-	-	50	-
V ₅	-	-	50	-	-	50	-
V ₆	-	-	-	50	-	50	-
V ₇	-	-	-	-	50	50	-
V ₈	50	-	-	-	-	-	50
V ₉	-	50	-	-	-	-	50
V ₁₀	-	-	50	-	-	-	50
V ₁₁	-	-	-	50	-	-	50
V ₁₂	-	-	-	-	50	-	50
V ₁₃	30	10	10	-	-	50	-

Table 2. Organoleptic quality of millet based vermicelli products. * Significant.

Vermi-cell mix	Color	Appearance	Texture	Mouth feel	Overall acceptability
V ₁	7.3	7.4	7.5	7.6	7.4
V ₂	7.1	7.4	7.6	7.0	7.0
V ₃	5.9	8.8	8.9	8.8	8.9
V ₄	8.8	8.8	8.6	8.6	9.0
V ₅	8.9	8.8	8.6	8.7	8.8
V ₆	7.0	7.8	7.9	7.9	7.9
V ₇	7.7	7.8	7.8	7.9	7.9
V ₈	7.2	7.2	7.4	7.0	7.2
V ₉	7.6	7.6	7.4	7.2	7.3
V ₁₀	8.0	8.1	8.2	8.2	8.1
V ₁₁	8.0	8.4	8.3	8.2	8.3
V ₁₂	8.1	8.4	8.3	8.2	8.2
V ₁₃	9.0	8.9	8.9	9.0	9.0
F-test	*	*	*	*	*
CD@5%	0.23	0.42	0.37	0.46	0.47
SEm	0.09	0.33	0.08	0.35	0.15

about till it reached to about 9% moisture. The cooked vermicelli was analyzed for cooking characteristics like cooking time, Swelling index (Kurien and Subramanyan 1964). Volumetric swelling ratio (Kurien and Subramanyan 1964), Cooking losses (Ranganna 2000) and sensory evaluation of cooked vermicelli.

RESULTS AND DISCUSSION

Development of millet based vermicelli

From various feeler trails, thirteen types of millet based vermicelli products were produced and Organoleptic evaluations (without cooking) of 13 products were conducted and the results are presented in Table 2. From the 13 millet based vermicelli mixes., mixes four best mixes namely V₃, V₄, V₅ and V₁₃ were selected for further study based on the sensory scores. The vermicelli products from these four mixes had consistently obtained high scores for all the sensory attributes like color, appearance, texture, month feel and overall acceptability as seen Table 2. The proportion of various millet grain flours selected vermicelli mixes (V₃, V₄, V₅ and V₁₃) and the vermicelli products (VP₁, VP₂, VP₃ and VP₄) made out of them is depicted in Table 3. The selected four vermicelli products were analyzed for cooking characteristics which included cooking time, swelling index, volumetric swelling

Table 3. Selected mixes for preparation of vermicelli.

Vermi-mix code	Vermi-cell product	Little millet flour (%)	Proso millet flour (%)	Foxtail millet flour (%)	Wheat flour (%)
V ₃	VP ₁	50	-	-	50
V ₄	VP ₂	-	50	-	50
V ₅	VP ₃	-	-	50	50
V ₁₃	VP ₄	30	10	10	50

ratio and cooking losses were found to be in the range of 4.4 to 5.7 min, 215 to 275g, 1.7 to 3.6 and 2.6 to 8.2% respectively. Sowbhagya and Ali (2001), reported that vermicelli with less than 8 min cooking time to have better overall acceptability, and better appearance, texture and flavor. In the present findings the developed vermicelli products had lesser cooking times. Devaraju (2003), studied the cooking quality of extruduct product with finger millet composite four the cooking weight i.e., swelling index by weight from hot water hot water dough was 235g/100g, for the experimental vermicelli the swelling index ranged from 230.7 to 282.5g respectively. The swelling index values of vermicelli products in the present study also were similar. Sensory evaluation was carried out to assess the quality attributes of different cooked vermicelli products. The results of sensory evaluation for various attributes like appearances, color, month feel, texture and overall acceptability using a panel of ten judges on a nine point hedonic scale were found to be in the range of 8.3 to 8.6, 8.2 to 8.3, 8.0 to 8.4, 8.6 to 8.7 and 8.6 to 8.9 respectively (Table 4) and hence these products have potential for commercial exploitation.

Table 4. Sensory score of cooked products of vermicelli. * Significant.

Product	Appearance	Color	Month feel	Texture	Overall acceptability
V ₁	8.20	8.30	8.60	8.30	8.60
V ₂	8.30	8.40	8.70	8.40	8.90
V ₃	8.30	8.50	8.60	8.30	8.70
V ₄	8.20	8.60	8.60	8.00	8.90
Mean	8.25	8.45	8.62	8.25	8.77
F value	*	*	*	*	*
SEm ± (0.05)	0.14	0.16	0.16	0.13	0.13
CD (0.05)	0.41	0.46	0.46	0.38	0.37

CONCLUSION

Out of 13 millets based vermicelli mixes that were formulated, 4 vermicelli products with high sensory scores were selected as most promising formulations. The vermicelli products were well accepted by the panelists as can be seen from high sensory scores for all sensory attributes. A sensory evaluation of pre millet based vermicelli is comparable with millet based vermicelli, developed. A huge potential exists for these products as it is ready to prepare and convenient product for the manufacturers as well as for the working women community. It also adds variety for the consumers.

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