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## Formulation and nutritional assessment of value added vermicelli

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### Abstract

An investigation was carried out to develop finger millet enriched vermicelli and their sensory and nutritional evaluation was carried out. Three types of vermicelli were prepared by replacing 70%, 50% and 60% of refined flour with finger millet of brown and white cultivar alone and in combination with green gram. All types of vermicelli were found acceptable. Vermicelli prepared from white cultivar of finger millet got higher score for color and appearance than brown cultivar. Experimental vermicelli were found superior in terms of fiber, mineral, calcium, iron, copper, zinc and  $\beta$  carotene. Finger millet and green gram flour can be successfully incorporated in the vermicelli for nutrient enrichment.

**Keywords:** Vermicelli, finger millet, green gram, acceptability, enrichment

### 1. Introduction

Finger millet (*Eleusine coracana*) (Ragi) is an indispensable traditional climate smart crop of Jharkhand. In recent years, it has gained importance, because of its nutritional strength in terms of dietary fiber, starch pattern, as well as high calcium and iron content. Despite the nutritional and health benefits, the consumption and cropped area under finger millet has decreased significantly due to urbanization, changing food preferences, non-exposure of these grains as well as unavailability of products suiting to the taste of rural and urban dwellers. The further promotion of finger millet requires diversification of products in terms of health food, ready to eat foods, pasta products etc. <sup>[1, 2]</sup>

Vermicelli is a form of pasta that has been known and produced in India for a long time <sup>[3]</sup>. It is a popular instant food product. It falls under the category of extruded product and is made from wheat flour. It is liked by people from all walks of life, irrespective of age. With changing lifestyles, greater awareness about health and preference for instant food items have made vermicelli very popular and an item of mass consumption. Urbanization has changed the lifestyles of not only urbanites but even of semi-urban and rural areas. This along with increase in the purchasing power of people has fueled demand for many fast food or instant food items and vermicelli is one of such products. Vermicelli has, thus, become a very popular instant food variety since last few years and its demand is steadily growing. With the addition of other nutritious ingredients such as finger millet and pulse flour, it will also become a nutritive product and thus even make it popular among health conscious people. With this view, an attempt was made to enhance the nutritive value through incorporation of finger millet and green gram and their sensory and nutritional evaluation was carried out.

### 2. Materials and Methods

#### 2.1 Procurement of Materials

The seeds of white and brown cultivar of finger millet were procured in a single lot from the Department of Plant Breeding and Genetics, Birsa Agricultural University Ranchi, whereas refined wheat flour and other ingredients were procured from the local market. The seeds cleaned of dust cracked and broken seeds and other foreign materials were handpicked.

#### 2.2 Preparation of finger millet flour

The grains were washed in tap water and dried in the sun for two days. The grains were conditioned with 5% water, tempered for about 10 minutes milled using plate mill and sieved through 60 mesh sieve [British standard]. The flour was packed in HDPE bags until used for product development.

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### 2.3 Preparation of greengram flour

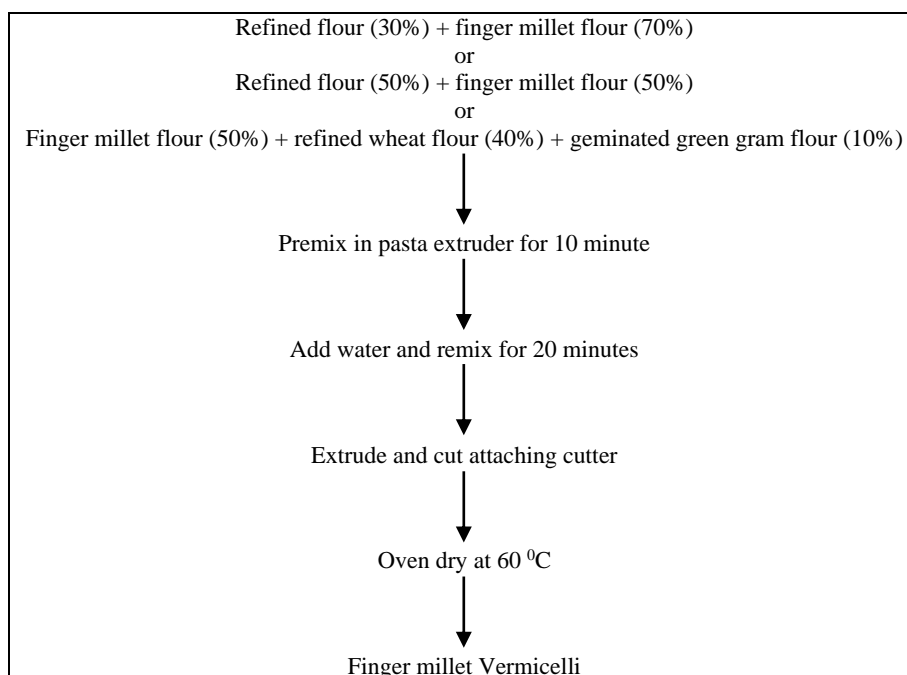
Green gram were cleaned, soaked and germinated for 24 hrs at 30 °C ±2 °C and dried in a dehydrator at 60±2 °C for 6 hours. Dried germinated grains were milled to get fine flour. The flour was sieved through 40 mesh sieve and stored in HDPE bags for further use.

### 2.4 Preparation of vermicelli

Vermicelli were prepared using refined wheat flour, finger millet flour of brown and white cultivar and germinated green gram in ratio of 30:70:0 (Type IB & Type IW) and 50:50:0 (Type IIB & Type IIW), 40;50:10 ( type IIIA & Type IIIW) and the control contained 100% refined wheat flour. Ingredients used to prepare vermicelli are given in Table 1. The selected ingredients were processed as shown in figure 1 to produce value added vermicelli.

**Table 1:** Chemical composition of vermicelli

SI No	Ingredient	Types of vermicelli			
		Control	Type I	Type II	Type III
1.	Refined Wheat flour(g)	100	30	50	40
2.	Finger millet(g)	-	70	50	50
3.	Green gram (g)	-	-	-	10



**Fig 1:** Flow chart for processing of finger millet based vermicelli

### 2.5 Sensory evaluation

The sensory quality of the developed products in respect of color, appearance, aroma, texture and taste were judged by 20 semi- trained panelists using 9- point hedonic scale [4]. The sensory panel consisted of food scientists, home scientists, housewives and students representing most sections of the society.

### 2.6 Chemical analysis

Three identical preparation of each type of vermicelli prepared from brown cultivar were pooled together into one sample, ground in cyclotech grinder and kept in airtight container for future chemical analysis. All analysis were done in triplicate.

Vermicelli were analyzed for moisture, total nitrogen, crude fiber, and total ash. A factor of 6.25 was used to convert nitrogen into protein [5].

For determination of calcium and iron about 0.5 g of sample was digested with diacid mixture (HNO<sub>3</sub>: HClO<sub>4</sub>:5: 1, V/V). After complete digestion, the sample was heated to near dryness and volume was made to 50 ml with double distilled water. Estimation of calcium and iron was done using atomic absorption spectrophotometer [6]. Phosphorus was determined

calorimetrically [7]. β – Carotene was separated by column chromatography and estimated calorimetrically [8].

### 2.7 Statistical Analysis

Data were subjected to analysis of variance (ANOVA) using complete randomized design [9]. Critical difference at P≤0.05 was estimated and used to find significant difference, if any.

## 3. Results and discussion

### 3.1 Sensory Evaluation

The scores of the organoleptic evaluation of vermicelli are given in Table 2. Three types of vermicelli were prepared by replacing 70%, 50% and 60% of refined flour with finger millet alone as in Type I and Type II and with finger millet and germinated green gram as in Type III. Vermicelli prepared only with refined flour served as control. Both black and white cultivar of finger millet was used for vermicelli preparation. Though colour, appearance, texture, taste and overall acceptability containing finger millet up to 70% were significantly different from its control, yet it was organoleptically acceptable. The scores obtained by Type II and Type III vermicelli with respect to colour and appearance were in the category of ‘moderately liked’. However, scores for colour and appearance of Type II and Type III vermicelli

prepared with white cultivar were higher than brown cultivar and were as good as control. Though texture of all three experimental vermicelli were significantly different from its control, yet it was organoleptically acceptable. The results showed that there were non significant differences in the scores of aroma of all types of vermicelli. Though taste of

vermicelli containing 70% finger millet was significantly different from control, yet it was acceptable, whereas taste of Type II and Type III were found as good as control. Overall acceptability of experimental vermicelli was in the category of “moderately desirable”.

**Table 2:** Sensory evaluation of developed vermicelli

Item	Colour	Appearance	Aroma	Texture	Taste	Overall Acceptability
Control	8.2±0.20	8.3±0.15	8.20±0.13	8.30±0.15	8.0±0.25	8.24±0.14
Type I(B)	7.17±0.29	7.32±0.21	7.70±0.26	7.0±0.25	7.1±0.23	7.31±0.18
Type I(W)	7.20±0.20	7.30±0.26	7.80±0.29	7.1±0.18	7.20±0.13	7.40±0.26
Type II (B)	7.50±0.22	7.32±0.30	7.80±0.24	7.6±0.16	7.5±0.20	7.68±0.18
Type II(W)	7.80±0.13	7.80±0.13	7.60±0.14	7.7±0.14	7.7±0.18	7.67±0.15
Type III(B)	7.40±0.26	7.60±0.22	7.80±0.22	7.4±0.22	7.6±0.16	7.52±0.17
Type III(W)	8.0±0.14	7.90±0.23	7.70±0.15	7.50±0.19	7.5±0.14	7.64±0.12
CD at 5%	0.60	0.58	NS	0.54	0.56	0.51

Values are mean± SE of twenty replications

Type I (B) = 70% Black Ragi Type II (W) - 50% White Ragi

Type I (W) = 70% White Ragi Type III (B) – 50% black Ragi + Green gram

Type II (B) – 50% Black Ragi Type III (W) – 50% white Ragi + Green gram

### 3.2 Chemical Composition of Vermicelli

Moisture content ranged from 7.52 to 8.6 percent (Table 3). Type III vermicelli exhibited highest moisture content as compared to control, Type I and Type II, which might be due

to higher protein content which indicated possible relationship between water absorption and protein content. Earlier study also reported an increase in moisture content of bakery products with increase in protein content [10, 11].

**Table 3:** Chemical Composition of Vermicelli (on dry weight basis)

Name of the nutrient	Control	Type –I	Type –II	Type –III	C.D P<0.05
Moisture (%)	8.21±0.15	7.52±0.29	8.12±0.20	8.6 ±0.15	0.686
Protein (%)	9.66±0.008	8.50±0.33	9.03±0.31	11.39±0.08	0.744
Fat (%)	0.82±0.01	1.18±0.13	1.09±0.064	1.08±0.13	N.S
Ash (%)	0.71±0.02	1.77±0.02	1.42±0.24	1.77±0.012	0.04
Fibre (%)	0.29±0.009	1.44±0.026	0.94±0.072	1.26±0.021	0.13
Calcium (mg/g)	21.0±2.08	232.33±7.21	194.16±3.0	192.33±3.93	14.89
Iron (mg/g)	3.49±0.02	4.56±0.02	4.36±0.03	4.50±0.02	0.08
Phosphorus (mg/100g)	109.66±2.90	221.00±2.08	195.00±2.88	210.00±2.88	8.98
β carotene (µg/100g)	21.00±2.08	32.66±1.45	30.00±1.15	42.33±1.45	5.20
Cu (mg/100g)	0.18±0.01	0.31±0.03	0.27±0.03	0.32±0.01	0.05
Zn (mg/100g)	0.55±0.02	1.65±0.04	1.34±0.05	1.54±0.04	0.09

Values are Mean±SE of three replications

Type I = 70% Ragi

Type II = 50% Ragi

Type III = 50% Ragi & 10% green gram

Protein content of different types of vermicelli varied from 8.50±0.33 to 11.39±0.08 percent. The protein content of Type II was significantly lower as compared to control and type III, which might be due to incorporation of higher percentage of finger millet flour. Highest protein content was observed in type III which is attributed to incorporation of green gram flour. Non significant difference in fat content was observed among all the treatments. Ash content varied from 0.71±0.02 to 1.77±0.02 percent. Significant increase in ash content was observed in vermicelli prepared incorporating higher concentration of finger millet flour as well as incorporation of green gram flour. Control vermicelli contained lower crude fiber content, which was significantly higher in type I, II and III. Maximum fibre content was observed in type I followed by type III and type II which might be due to incorporation of higher percentage of Ragi flour. Calcium content of control, Type I, type II and type III vermicelli were 21±2.08, 232.33±7.21, 194.16±3.0 and 192.33±3.96 mg/100g, respectively, where as iron content ranged from 3.49±0.02 to 4.56±0.02 mg/100g. Calcium and iron content of type I, II and III were significantly higher as compared to control. Maximum Calcium content was observed in Type I

(232.33mg/100g) followed by Type III and Type II. Non significant difference in calcium content was observed among Type II and III where as non significant difference in iron content was observed among Type I and III macaronies. Significantly higher phosphorus content was observed in Type I followed by Type III and Type I. Similarly higher phosphorus content of β- carotene, Cu and Zn was observed in experimented vermicelli which might be incorporation of finger millet and green gram. The finding of this study is in agreement with earlier study [3].

### 4. Conclusion

Finger millet flour can be substituted to an extent of 70% for development of nutritious vermicelli. Substitution of finger millet flour alone and along with green gram flour increased the total mineral, fiber, Calcium, iron, Phosphorous, Copper, and Zinc content of vermicelli, which have potential to be exploited for commercial venture.

### 5. Acknowledgement

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