Formulation and Quality Evaluation of Fibre Rich Namakpare Using Nutricereal Kodo [Paspalum scrobiculatum] Millet

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Abstract- Kodo millet [Paspalum scrobiculatum L.] is grown-up mainly in India, West Africa and also in other East Asian countries. It is also known as kodra, varagu, arikelu, harka, and kodoa. Kodo rice is gluten-free and packed with vitamins and minerals. It has normal protein content, low fat and very high fibre content. It helps hydrate your colon to keep your system regular and keep you from being constipated. It is also rich in Anti-oxidants. So the present study was undertaken with the objective to formulate appropriateness mixes rich in fiber for namakpare using kodo millet. The mixes were studied for nutritive value and sensory characteristics. The namakpare were studied for proximate composition, sensory quality and acceptability. Sensory evaluation result showed that the incorporation of kodo flour in namakpare was most acceptable with 50 % followed by 40 and 60 %. Proximate composition result showed that kodo flour addition significantly improved the fiber content ranging 2.73 from 6.51 %. The result revealed that, the value of protein content ranging from 10.22 to 9.27%, value of fat ranging from 17.6 to 15.23% and carbohydrate value ranging from 62.2 to 59.25 % in the namakpare significantly decreased by increasing kodo flour.

Index Terms-Minor Millets, Kodo Millet, Namakpare, Sensory Evaluation, Proximate Composition, and Product Formulation.

1. INTRODUCTION

Minor millets are highly nutritious products and also most ignored food material in major parts of the world. Different kinds of traditional foods in India made from small millet grains from staple diet for many rural and urban families. Number of skills has been developed to enhance usefulness and profitable value of these grains. Kodo millet (*Paspalum scrobiculatum*) was domesticated in India about 3000 years ago and is known to be beneficial in diabetes, duodenal ulcer and high blood pressure. It is now available in a number of varieties with high yielding potential and is recommended to be grown in Madhya Pradesh, Karnataka, Tamil Nadu, Andhra Pradesh, Maharashtra and Uttar Pradesh (Sudha et al., 2014). Kodo millet is one among them which is very rich in carbohydrate and crude fibre. Kodo millets are rich in B vitamins, especially niacin, B6 and folic acid, as well as the minerals such as calcium, iron, potassium, magnesium and zinc. Kodo millets contain no gluten and are good for people who are gluten intolerant. Regular consumption of kodo millet is very beneficial for postmenopausal women suffering from signs of cardiovascular disease, like high blood pressure and high cholesterol levels. Kodo is high in fibre and prevents gain in weight. Kodo millet cooks very fast. It is a fantastic substitute for rice and can be used to make a variety of dishes. It can be consumed at every meal-breakfast, lunch and dinner.

Traditional preparations when modified like namakpare when incorporated with kodo flour could serve a means of enhancing nutritive value of food. Namakpare is popular deep fat fried indian snack traditionally prepared from refined wheat flour (Pragya and Sarita, 2012). The present study was undertaken with the objective to develop fiber rich namakpare mixes using kodo millet, to assess the nutritive value and sensory evaluation of the mixes.

2. MATERIAL AND METHODS

2.1 Procurement of raw material

Kodo, refined wheat flour, omum and fat were procured from local market of Jabalpur (M.P.).

2.2 Preparation of namakpare mix

Four types of convenience mixes were formulated in this category having varying proportion of kodo millet

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flour ranging from 40 to 60 %. The amount of fat and omum was kept constant.

Table No. 2.1 Preparation of Namakpare Mix

Ingredients	N_1 (g)	N_2 (g)	N_3 (g)	N_4 (g)
Refined wheat flour	100	60	50	40
Oil	30 ml	30 ml	30 ml	30 ml
Omum	5	5	5	5
Salt	To taste	To taste	To taste	To taste
Water	30 ml	30 ml	30 ml	30 ml
Kodo	-	40	50	60

Control recipe N_1 with refined wheat flour. Formulations N_2, N_3 and N_4 containing 40, 50 and 60 percent kodo respectively.

2.3 Method of preparation

Convenience mix, ajwain and salt were mixed thoroughly. Hard dough was prepared adding 30 g fat and required amount of water. The prepared dough was then divided into small units. The small units were then rolled out. Using a sharp knife it was cut horizontally and diagonally. These were then deep fried in hot oil in a pan.

2.4 Determination of sensory quality of namakpare

Sensory evaluation of namakpare was assessed using 'nine point hedonic scale' (1 to 9). The sensory quality attributes viz. colour and appearance, taste, texture, flavour, mouthfeel and overall acceptability were studied by score card method (Amerine *et al.*, 1965). These attributes were based on the following ratings, 1=dislike extremely, 2=dislike very much, 3=dislike moderately, 4=dislike slightly, 5= neither like nor dislike, 6= like slightly,7= like moderately , 8=like very much , 9=like extremely.

2.5 Determination of nutrient composition of namakpare

All the determinations were done in triplicate using the AOAC standard methods. The protein content of the food samples were analyzed according to Lowry's method (Lowry et al., 1951). The carbohydrate was determined by the method of Sadasivam and Manickam (1991). The fat content of the food sample was determined by soxhlets extraction method as described in A.O.A.C. (1990). Crude fibre of the sample was estimated by the method described in A.O.A.C. (1992). While calorific value, moisture content and ash content of the food samples were determined by (A.O.A.C., 1990).

2.6 Statistical analysis

SPSS version 16 software was used for the purpose of statistical analysis.

3. RESULTS AND DISCUSSION

3.1 Sensory evaluation by nine point hedonic scale

Table no. 3.1 presents the sensory evaluation of kodo millet namakpare and it's revealed that namakpare with treatment N_1 obtained highest scores of mean value in all sensory parameters. It was observed that after treatment N_1 (Control) the mean sensory scores of treatment N_3 colour and appearance (7.6), taste and texture (7.7), flavour, mouth feel and overall acceptability (7.8) was compare higher as compared to the treatment N_2 and N_4.The results obtained showed that the mean scores of colour and appearance, flavour and mouth feel in statistically significant difference ($p<0.05$) between the mean sensory scores of the all combinations.

The results depicted that all the products were acceptable on nine point Hedonic scale. So these namakpare can be successfully used as snack items. Similar study was also done by Pragya and Sarita (2012) on iron rich namakpare mixes using finger millet.

3.2 Nutritive value of namakpare mixes using kodo millet flour

Table no. 3.2 shows the nutritional properties like moisture, ash, fat, protein, carbohydrate, crude fibre, and energy value of kodo millet namakpare made from different treatments. It's revealed that with the increase in the level of kodo flour in different treatments, level of fibre, moisture and ash content were significantly increased whereas the level of protein, fat, carbohydrate and energy value slightly decreased.

On analyzing nutritive value, it was observed that N_1, N_2, N_3 and N_4 namakpare had protein content of 10.22%, 9.9%, 9.5% and 9.2% respectively. Fat content of N_1, N_2, N_3 and N_4 namakpare had 17.6%, 15.8%, 15.4% and 15.2% respectively. Carbohydrate content of N_1, N_2, N_3 and N_4 namakpare had 62.2%,

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61.55%, 60.13% and 59.25% respectively. Fibre content was highest for N_4 (6.51%) followed by N_1 (2.7%), N_2 (5.28%) and N_3 (5.96%) respectively. Total ash content of N1, N_2, N_3 and N_4 namakpare was 2.3%, 2.6%, 3.5% and 4.1% while total moisture content were 4.4%, 4.6%, 5.2% and 5.4% respectively. Energy content of N_1 namakpare was 448.9 kcal/100g; N_2 content was 428.89 kcal/100g while N_3 content was 418.35 kcal/100g and N_4 411.18 kcal/100g respectively. The above results demonstrated that kodo millet flour namakpare are good source of fibre. The same study on the content of fiber was also reported by Shiny and Sheila (2014) on millet based high fiber biscuit.

4. CONCLUSION

The study concludes that formulation of kodo millet namakpare are not only acceptable well based on sensory properties, but also nutritionally dense with high fiber content. The fibre content of kodo millet flour incorporated namakpare was higher than the refined wheat flour namakpare. The study shows that kodo millet upto 60% can be successfully incorporated to formulate fiber rich namakpare mixes. These mixes are nutritious and acceptable. These mixes can be successfully used for preparing various snack items.

(A.1)

Table no. 3.1 Nutritive value of namakpare

Treatments	N_1	N_2	N_3	N_4	Significance
Protein	10.22±0.00	9.9±0.01	9.58±0.03	9.27±0.04	S
Fat	17.6±0.1	15.8±0.1	15.4±0.1	15.2±0.05	S
Carbohydrate	62.2±0.1	61.55±0.01	60.13±0.05	59.25±0.05	NS
Fibre	2.7±0.2	5.28±0.04	5.96±0.01	6.51±0.08	S
Moisture	4.4±0.2	4.6±0.2	5.2±0.05	5.4±0.2	S
Ash	2.3±0.1	2.6±0.15	3.5±0.15	4.1±0.05	S
Energy	448.90±0.01	428.89±0.07	418.35±0.03	411.18±0.17	S
Values are presented as Mean±SD					

S= significant, NS=Non significant at 0.05 level

Table No. 3.2 Sensory Evaluation by Nine Point Hedonic Scale

Treatments	N_1	N_2	N_3	N_4	Significance
Colour & appearance	8.4 ±0.5	7.2 ± 1.0	7.6±1.2	7.1±0.9	S[*]
Taste	8.3 ±0.7	7.6 ± 1.0	7.7±1.1	7.3±1.2	NS**
Texture	8.1 ±0.9	7.8 ± 0.8	7.7±1.0	7.5±1.1	NS**
Flavour	8.5 ±0.7	7.7 ± 1.0	7.8±0.9	7.4±0.9	S*
Mouth feel	8.4 ±0.8	7.9 ± 0.9	7.8±0.8	7.2±1.2	S*
Overall acceptability	8.2 ±0.9	7.2 ± 0.7	7.8±0.8	7.2±1.2	NS**
Values are presented as Mean±SD					

S*= Significance at 0.05 level, NS**=Non significance

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