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To assess the nutritional rich multigrain flour used in noodles

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Abstract
Nutri-rich Noodles NJ2, NR1, and NA4 (Jowar, Ragi, and Amaranth) at the different ratio was the best formulated nutri-rich noodles, rich in nutrients and indicated excellent overall acceptability. jowar, ragi, and amaranth blended nutri-rich noodles has higher amount of protein as compared to other formulated noodles Fortification of 70%, and 80% grain in Jowar, Ragi, and Amaranth resulted in Nutri-rich Noodles and could be recommended to increase and improve the biological value of protein and other nutrients such as calcium and phosphorus During storage laminated bag was found to be good as compared to polyethylene bags for maintaining the good quality products under the period of 90 days Shelf life of the NJ2, NR1, and NA4 formulated Nutri-rich noodles (jowar, ragi, and amaranth) was found to be best in both the packaging materials for the period of the three months at ambient.

Keywords: loaded with calcium, controlling diabetes, battle anemia, useful of migraines, low glycemic index, source of protein and fiber rich

Introduction
Finger millet (*Eleusine coracana* L.) also known as Ragi in India is one of the important cereals which occupies the highest area under cultivation among the small millets. Nutritionally, when ragi is used as a whole grain, it is higher in protein and minerals in comparison to all other cereals and millets. Finger millet contains important amino acids *viz*., isoleucine, leucine, methionine and phenyl- alanine which are not present in other starchy meals. It has the highest amount of calcium (344 mg %) and potassium (408 mg Ragi is a great source of iron making it beneficial for individuals with low hemoglobin levels.
The changing food habits of children and teenaged groups have created a good market of noodles in India and abroad. The cooking of these noodles is very convenient and requires few minutes. Generally, in the preparation of noodles, wheat flour is in variably used as an important member of blend because the presence of wheat gluten has an added advantage which not only helps in easy extrusion but also gives a smooth and fissure free texture to the noodles. Several other combinations of blends can be explored in the preparation of noodles keeping food values of ingredients and their availability in mind.

Materials and Methods
The present investigations on Formulation and Standardization of wheat and jawar, ragi and Amaratha nutri- rich noodles were carried out in the Department of Food Science and Technology, JNKVV, Jabalpur (M.P.). The materials used and methods adopted for the purposes of investigation have been presented in this chapter.

Food commodities
Wheat, jawar, ragi, amaratha and packaging materials were procured from the local market, Adhartal, Jabalpur, MP.

Cleaning: The above food commodities were taken and cleaned to remove the stones, dust, woods and any other foreign materials from the grains.

Preparation of flours
Grains were thoroughly cleaned to remove dirt, dust, insect excreta/ feathers and admixture of other food grains. The clean graded grains were grounded in the electric grinder to make fine flour and sieved by 80 - 100 mesh sieve.

Different formulations for development of nutri-rich noodles

Nutri-rich noodles were made from wheat, jawar, ragi and amaratha in different combinations as given in below noted Table1. The procedure for development of products were described in the flow sheet attached.

Treatments	Wheat (g)	Jowar (g)
Control	100	-
NJ1	75	25
NJ2	50	50
NJ3	30	70
NJ4	20	80

Treatments	Wheat (g)	Ragi (g)
Control	100	-
NR1	75	25
NR2	50	50
NR3	30	70
NR4	20	80

Treatments	Wheat (g)	Amaranth (g)
Control	100	-
NA1	75	25
NA2	50	50
NA3	30	70
NA4	20	80

Nutritional composition of noodles

The nutritional evaluations of different kinds of noodles with respect to various constituents were carried out by the following procedures.

Determination of proximate constituents in noodles

The various proximate principles in noodles were made by the below noted procedures.

Determination of protein content

The protein content in sample was determined by using conventional Micro-Kjeldhal digestion and distillation procedure as given in AOAC (1992).

Reagents

1. Catalyst mixture- A mixture of 100 gm. K_2SO_4, 20gm of CuSO4 and 2.5 gm of SiO_2.
1. Sodium hydroxide 40%(w/v)
2. Boric acid 2 %(w/v).

Concentrated sulphuric acid AR (spgr 1.81 Mixed indicator 2 parts 0.2 %(w/v) Methyl red and 1 parts 0.2% (w/v)

1. Methyl blue in absolute alcohol.
2. Standard sulphuric acid (0.1N)

Procedure

2gm of dry defatted sample was transferred into 500ml conical flask to which 200ml of 0.255 N boiling sulphuric acid was added then it was boiled for 30 minutes, kept the volume constant by the addition of water at frequent intervals. The mixture was cooled and filtered through a muslin cloth and the residue was washed with hot water till free from acid. The material was then transferred to the same beaker and 200ml of boiling 0.313 N NaOH was added. After boiling for 30 minutes the mixture was cooled and again filtered through muslin cloth. The difference in weight represents the crude fiber content.

$$\text{Crude Fibre (\%)} = \frac{\text{Difference in weight of crucible}}{\text{Weight of sample}} \text{ X } 100$$

Determination of total carbohydrates

Total carbohydrates in the samples were estimated by hydrolysis method as described in AOAC (1984).

Reagents

1. Conc. HCl (AR sp gr 1.25)
2. Fehling's solution

- Fehling's solution A: 34.64 gm. of CuSO4.5H2O was dissolved in 500ml of distilled water.
- Fehling's solution B: 173 gm. of sodium potassium titrate and 50 g of sodium hydroxide were dissolved in 500 ml of distilled water. The Fehling's solution was prepared by mixing the equal volume of solution A and solution B. It was prepared fresh daily.

1. Sodium Hydroxide 40 %(w/v).
2. Methyl blue indicator 0.1 % (w/v) in 95% alcohol.
3. 3N HCl – 68.18 ml concentrated HCl was made up to 250 ml with distilled water.
4. Dextrose 1%- 1 gm of dextrose was dissolved in 100 ml distilled water.

Procedure

2.5gm sample was taken in the flask and suspended in 200 ml of distilled water. 20ml of 3N HCl was added refluxed in an air condenser for 3 hrs. On cooling, it was neutralized with alkali to pH 7.0, filtered and volume was made to 250 ml with distilled water.

Factor x 250

$$\text{Dextrose \%} = \frac{\text{Titrated value X weight of sample}}{\text{Total carbohydrate (\%) = Dextrose \% X 0.9}} \text{ X}$$

Procedure

0.5gm of sample was weighed accurately and transferred to a kjeldhal flask taking care to see that the material did not stick to the neck of the flask. The catalyst mixture of about 1g and concentrated sulphuric acid (5ml) were added. Then the flask was placed in an inclined position in digestion chamber and heated for about 4-6 hours till the liquid became clear (green blue color).

Distillation

The content in the flask were allowed to cool and the digestion material was transferred quantitatively to a vacuum jacketed flask of micro kjeldhal distillation apparatus and the ammonia liberated by the addition of 10 ml of 40% NaOH on heating was absorbed in 20 ml boric acid containing 2-3 drops of mixed indicator in 100ml conical flask.

$$\text{N (\%)} = \frac{\text{Normality of H2SO4 X Volume of 0.1N H2SO4 X 14}}{\text{Weight of sample x 1000}} \text{ X Crude protein (\%) = N X 5.}$$

Determination of Ash content procedure
The ash content present in the sample was determined according to the procedure given in AOAC (1992).

$$\text{Ash (\%)} = \frac{\text{Weight of ash Weight of sample}}{\text{X 100}}$$

Determination of crude fibre
The crude fiber was determined by the method as described in AOAC (1992).
Reagents 1.Sulphuric acid 0.255 N 2. Sodium hydroxide 0.31

Estimation of calcium
Calcium in the acid digested sample was determined by the verse ate titration method as described by black (1965)

Reagents
1. Buffer solution - 67.5g of NH4CI was dissolve in 200 ml of distilled water and 570 ml of conc. NH4CL was added. The volume was made up to 1 liter with distilled water pH 9.0.
2. Standard EDT A (Ethylene diamine tetra acetic acid): Solution (0.01): 1.86gof EDT A was dissolved in distilled water and made up of one liter and standardized it.

1. Hydroxylamine hydrochloride 5%.
2. Potassium Ferro cyanide 4%
3. Triethanolamine.
4. NaOH, 20% (w/v)
5. Indicator calcon.

Procedure
5ml of aliquot of the• acid digested samples were pipette into 250 conical flask. The volume was made approximately to 150 ml with distilled water. Buffer solution (15 ml) 10 drops each of hydroxylamine hydrochloride potassium Ferro cyanide, triethanolamine, 1 ml of 20 % NAOH and 10 drops of calcon indicator were added mixed thoroughly and titrated with EDTA, till blue color persist.

Estimation of Iron
Iron content in the sample was determined calorimetrically by the procedure as dedcribed in A manual of Laboratory Techniques (1983).

Reagents
1. Sulphuric acid 30 % Saturated potassium per sulphate solution
2. 1gm of potassium persulphate was dissolved in distilled water and solution was made up to 100 ml
3. Potassium thiocynate solution 40 g of potassium thiocynate was dissolved in 90 ml of distilled water, 4 ml acetone was added and the volume was made up to 100 ml with distilled water.

Standard iron solution
0.7002 g ferrous ammonium sulphate was dissolved in 100 ml. distilled water and after addition of 5 ml 1 % HClthe solution was made up to 1 liter and mixed thoroughly (1 ml =0.1 mg Fe). The standard solution was prepared freshly. Working standard solution (0.01 mg Fe/ml) was prepared by diluting the above solution.

Storage studies
The shelf-life studies were carried out in tin boxes, laminated pouches and low density polyethylene bags for a period of 90 days at ambient conditions 500 gm of each samples instant mixes were packed and kept at room temperature for 90 days. The samples were drawn periodically after 45 and 90 days interval and subjected to sensory evaluation.

Statistical analysis of data
The results/data of the analysis for different parameters were analyzed statistically to assess the degree of variation within the treatments as compared to the control. The data were subject to analysis of variance (ANOVA) and least significance difference to determine the difference between means, analyzed by Genstat computer package using Completely Randomized Design (CRD) at 5% level of significant.

Table 1: The skeleton of analysis of variance

S. No.	Source of variance	d.f.	SS	MSS	F calculated	F table value (5%)
1.	Treatments	(t-1)		TSS	TMS	TMS/EMS
2.	Error	(n-t)		ESS	EMS	
	Total	(n-1)				

Results and Discussion
The present investigations were carried out in the Department of Food Technology for the Formulation and development of “Formulation and Development of nutritious Noodles" and its quality evaluation. The results obtained during the course of investigation have been described in this chapter in the form of tables.

Physiochemical properties of grains
Following contents available in the grains, which are using to developed the nutri rich Noodles.

Table 2: Proximate composition of nutri rich Noodles developed from wheat and Jowar

Treatment	Proximate composition (%)						
	Protein	Fat	Ash	Carbohydrates	Fiber	Mineral	Energy (kcal)
NJ1	10.9	1.2	2	71.5	1.3	0.85	345.6
NJ2	10.7	1.1	1.9	73.23	0.95	0.11	349.42
NJ3	10.5	1.0	2.1	72.93	1.4	1.3	348.32
NJ4	10.2	0.9	1.8	70.8	1.26	1.4	337.14
CD at 5%	0.13	0.06	0.19	0.48	0.26	0.27	6.15
SEM	0.43	0.19	0.06	0.14	0.07	0.08	1.86

Table 3: Proximate composition of nutri rich Noodles developed from wheat and ragi

Treatment	Proximate composition (%)						
	Protein	Fat	Ash	Carbohydrates	Fiber	Mineral	Energy (kcal)
NR1	10.00	1.70	2.00	73.40	1.80	1.10	356.10
NR2	9.15	1.40	2.20	72.50	2.40	1.60	348.60
NR3	8.41	1.10	1.50	72.30	2.80	2.00	343.94
NR4	8.02	1.00	1.90	70.96	3.10	2.20	337.32
CD at 5%	0.95	0.30	0.34	0.90	0.30	0.25	10.161
SEM	0.28	0.09	0.10	0.27	0.09	0.07	3.068

Table 4: Proximate composition of nutri rich Noodles developed from wheat and amaranth

Treatment	Proximate composition (%)						
	Protein	Fat	Ash	Carbohydr ates	Fiber	Mineral	Energy (kcal)
NA1	12.00	2.90	2.30	69.10	2.60	2.60	360.90
NA2	12.80	4.30	1.00	65.30	3.00	3.00	363.10
NA3	13.80	5.40	2.50	64.60	3.46	3.46	376.04
NA4	14.60	5.90	2.70	63.30	3.30	3.30	377.90
CD at 5%	1.00	0.37	0.37	0.34	0.42	0.42	6.41
SEM	0.30	0.11	0.11	0.10	0.12	0.12	1.94

Conclusion

Nutri-rich Noodles are a rich source of protein, carbohydrate and fibers food product consumed and liked by everyone especially children who require more protein and energy. The intake of millets (Bajra, Jowar, Ragi, and Amaranth) is suggested to be beneficial for the prevention and mantinance of human body. Therefore the present study was under taken on development of Nutri-rich noodles at home scale level using cereals and millets. The results obtained on various parameters like overall acceptability and nutritional attributes during various storage periods

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