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Development, sensory and nutritional evaluation of *Bajra* mix products

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All the products prepared with incorporation of ground nut flour, wheat flour, chickpea flour were acceptable. The various parameters such as moisture, fat, crude protein, carbohydrate, crude protein and total ash were analyzed. Organoleptic acceptability of incorporated products were analyzed by panel member. 20% incorporated *Laddus*, 20% incorporated *Papdi*, 40% incorporated *Tikki*, 40% incorporated biscuit and 40% incorporated *Pua* had better sensory characteristic than other incorporated products. *Bajra* is an important source of energy, protein, vitamins and minerals. It contains 9 to 13 per cent protein. It is rich in B vitamins, potassium, magnesium, iron, zinc, copper and manganese. It is gluten free grain. It is very high in calories it greatly helps growing children and pregnant women.

Key Words : Bajra mix products, Potassium, Iron, Zinc, Copper, Pregnant women

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INTRODUCTION

Bajra is the most widely grown type of millet. It has been grown in Africa and Indian subcontinent since prehistoric times. *Bajra* is an important source of energy, protein, vitamins and minerals. It contains 9 to 13 per cent protein. It is rich in B vitamins, potassium, magnesium, iron, zinc, copper and manganese. It is gluten free grain. It is very high in calories it greatly helps growing children and pregnant women (Gopalan *et al.*, 2013). *Bajra* grain is n; it has no husk, no tannin, contain five-seven per cent oil and has higher protein and energy levels than maize or sorghum. The unsaturated fatty acids making up the oil are oleic, linoleic, linolenic. The saturated fatty acids are palmitic and stearic. *Bajra* has higher protein content than other cereals grown under similar condition. *Bajra* is an underutilized grain crop commonly used as whole flour for traditional food preparation and hence confined to traditional consumers and to people of lower economic strata.

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Analytical procedure for *Bajra* flour:

Powder prepared was analyzed for various nutritional constituent *i.e.* moisture, crude protein, fat, carbohydrate, crude fibre, and total ash.

– Moisture content of *Bajra* flour was found 9.6 per cent.

– Crude protein content of *Bajra* flour was found 10.2 per cent.

– Fat content of *Bajra* flour was found 5.4 per cent.

– Carbohydrate content of *Bajra* flour was found 67.3 per cent.

– Crude fibre content of *Bajra* flour was found 1.43 per cent.

– Total ash content of *Bajra* flour was found 1.5 per cent.

Organolaptic acceptability of prepared products:

– Sensory evaluation of incorporated products

revealed that they were better in all attributes in terms of taste and flavour, body and texture, colour and appearance and overall acceptability.

– Organoleptic acceptability of incorporated *Laddus* revealed that 20% and 40% ground nut incorporated *Laddus* were liked extremely.60% incorporated *Laddus* were liked very much while 80% incorporated was liked moderately.

– Organolepetic acceptability of incorporated *Papdi* revealed that 20% chickpea flour incorporated *Papdi* was liked extremely while 40% and 60% incorporated *Papdi* were liked very much while 80% incorporated product was liked moderately.

– Organolepetic acceptability of incorporated *Tikki* revealed that 40% Bengal gram flour incorporated *Tikki* was liked extremely. 20%, and 40% incorporated *Tikki* were liked very much. 80% incorporated products was liked moderately.

– Organolepetic acceptability of incorporated biscuit revealed that 40% wheat flour incorporated biscuit was liked extremely. 20%, 60% and 80% incorporated biscuit were liked very much.

– Organoleptic acceptability of incorporated revealed that *Pua* 40% rawa flour incorporated *Pua* was liked extremely. 20%, and 60% incorporated *Pua* was liked very much. While 80% incorporated product was liked moderately.

Analytical procedure for *Laddus*:

– Protein content of 20%, 40%, 60%, 80% incorporated products were 18.95, 16.3, 13.64 and 13.47 per cent, respectively. The protein content of 20% incorporated products was higher than other products.

– Fat content of 20%, 40%, 60%, 80% incorporated products were 41.11, 34.09, 27.07 and 16.41 per cent, respectively. 20% incorporated products was higher than other products.

– Carbohydrate content of 20%, 40%, 60%, 80% incorporated products were 30.50, 38.68, 46.86 and 57.21 per cent, respectively. The carbohydrate content of 80% incorporated products was higher than other products.

– Fibre content of 20%, 40%, 60%, 80% incorporated products were 2.51, 2.13, 1.75 and 1.65 per cent, respectively. The fibre content of 20% incorporated products was higher than other products.

– Total ash content of 20%, 40%, 60%, 80% incorporated products were 2.4, 1.92, 1.44 and 1.32 per cent, respectively. The ash content of 20% incorporated products was higher than other products.

Analytical procedure for *Papdi*:

– Protein content of 20%, 40%, 60%, 80% incorporated products were17.8, 16.6, 13.8 and 12.9 per cent, respectively. The protein content of 20% incorporated products was higher than other products.

– Fat content of 20%, 40%, 60%, 80% incorporated products were 11.35, 12.25, 13.15 and 9.07 per cent, respectively. The fat content of 60% incorporated products was higher than other products.

– Carbohydrate content of 20%, 40%, 60%, 80% incorporated products were 53.44, 55.4, 57.36 and 62.18 per cent, respectively. The carbohydrate content of 80% incorporated products was higher than other products.

– Fibre content of 20%, 40%, 60%, 80% incorporated products were 3.95, 3.13, 2.31 and 1.75 per cent, respectively. The fibre content of 20% incorporated products was higher than other products.

– Total ash content of 20%, 40%, 60%, 80% incorporated products were 2.34, 1.98, 1.62 and 1.45 per cent, respectively. The ash content of 20% incorporated products was higher than other products.

Analytical procedure for *Tikki* :

– Protein content of 20%, 40%, 60%, 80% incorporated products were 15.04, 13.28, 11.52 and 11.14 per cent, respectively. The protein content of 20% incorporated products was higher than other products.

– Fat content of 20%, 40%, 60%, 80% incorporated products were14.37, 14.25, 14.13 and 11.39 per cent, respectively. The fat content of 20% incorporated products was higher than other products.

– Carbohydrate content of 20%, 40%, 60%, 80% incorporated products were 51.54, 52.98, 54.42 and 59.13 per cent, respectively. The carbohydrate content of 80% incorporated products was higher than other products.

– Fibre content of 20%, 40%, 60%, 80% incorporated products were 1.3, 1.00, 0.78 and 0.56 per cent, respectively. The fibre content of 20% incorporated products was higher than other products.

– Total ash content of 20%, 40%, 60%, 80% incorporated products were 0.95, 0.97, 0.99 and 1.09 per cent, respectively. The ash content of 80% incorporated products was higher than other products.

Analytical procedure for biscuit:

– Protein content of 20%, 40%, 60%, 80% incorporated products were 10.34, 10.32, 10.30 and 11.05 per cent, respectively. The protein content of 20% incorporated products was higher than other products.

– Fat content of 20%, 40%, 60%, 80% incorporated products were 18.25, 18.91, 19.57 and 13.03 per cent, respectively. The fat content of 60% incorporated products was higher than other products.

– Carbohydrate content of 20%, 40%, 60%, 80% incorporated products were 56.88, 56.4, 55.92 and 61.02 per cent, respectively. The carbohydrate content of 80% incorporated products was higher than other products.

– Fibre content of 20%, 40%, 60%, 80% incorporated products were 2.04, 1.9, 1.76 and 1.34 per cent, respectively. The fibre content of 20% incorporated products was higher than other products.

– Total ash content of 20%, 40%, 60%, 80% incorporated products were 1.14, 1.08, 1.02 and 1.11 per cent, respectively. The ash content of 20% incorporated products was higher than other products.

Analytical procedure for *Pua* :

– Protein content of 20%, 40%, 60%, 80% incorporated products were 10.04, 10.34, 10.64 and 11.65 per cent, respectively. The protein content of 80% incorporated products was higher than other products.

– Fat content of 20%, 40%, 60%, 80% incorporated products were 17.55, 18.35, 19.23 and 19.44 per cent, respectively. The fat content of 80% incorporated products was higher than other products.

– Carbohydrate content of 20%, 40%, 60%, 80% incorporated products were 59.44, 58.14, 56.56 and 56.54 per cent, respectively. The carbohydrate content of 20% incorporated products was higher than other products.

– Fibre content of 20%, 40%, 60%, 80% incorporated products were 0.75, 0.95, 1.15 and 1.35 per cent, respectively. The fibre content of 80% incorporated products was higher than other products.

– Total ash content of 20%, 40%, 60%, 80% incorporated products were 0.35, 0.54, 0.75 and 0.95 per cent, respectively. The ash content of 80% incorporated products was higher than other products.

METHODOLOGY

The method and procedure applied in the section of sample, variable identified and measurement along with the statistical tool used in analyzing the data to arrive at a valid and reliable research topic under investigation an important part of any research venture.

Study :

– Preparation of sample.
– Nutritional analysis of sample prepared.
– Sensory evaluation of development products.
– Nutritive value of development products

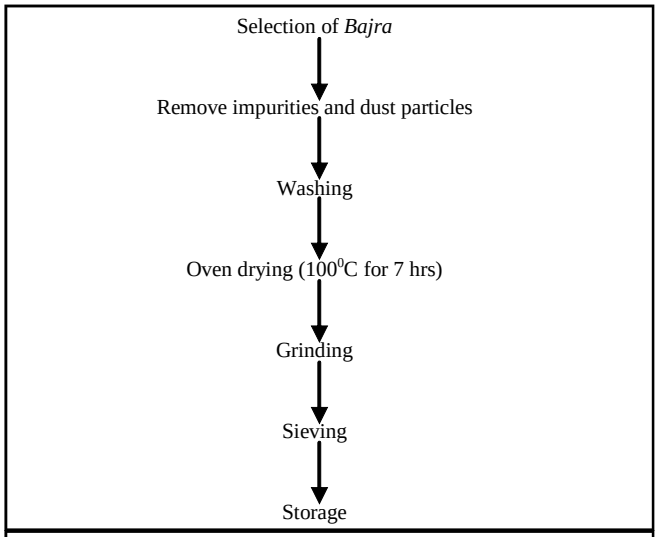

Fig. A : Flow chart of preparation of sample

Preparation of *Laddus:*

Laddu in which ground nut flour was replaced by *Bajra* flour at 20, 40, 60, 80%, respectively, were prepared

Ingredients for *Laddus:*

The ingredients used for making *Laddus* is given in Table A alongwith weight.

Table A : Amount of ingredients (in g)

Ingredient	T_1 (20%)	T_2 (40%)	T_3 (60%)	T_4 (80%)
Bajra flour	20	40	60	80
Ground nut flour	80	60	40	20
Sugar ground	50	50	50	50
Hydrogenated fat	30	30	30	30
Chopped dry fruits	10	10	10	10

Preparation of *Papdi:*

Papdi in which chickpea flour was replaced by *Bajra* flour at 20, 40, 60, and 80%, respectively, were prepared.

Ingredients for *Papdi* :

The ingredients used for making *Papdi* is given in Table B alongwith weight.

Table B : Amount of ingredients (in g)

Ingredients	T_1 (20%)	T_2 (40%)	T_3 (60%)	T_4 (80%)
Bajra flour	20	40	60	80
Chick pea flour	80	60	40	20
Hydrogenated fat	50	50	50	50
Salt, black pepper	1 tsp	1 tsp	1 tsp	1 tsp

Preparation of *Tikki :*

Tikki in which Bengal gram flour was replaced by *Bajra* flour at 20, 40, 60, and 80%, respectively, were prepared.

Ingredients for *Tikki* :

The ingredients used for making *Tikki* is given in Table C alongwith weight.

Table C : Amount of ingredients (in g)

Ingredients	T_1 (20%)	T_2 (40%)	T_3 (60%)	T_4 (80%)
Bajra flour	20	40	60	80
Bengal gram flour	80	60	40	20
Massed potato	10	10	10	10
Hydrogenated fat	50	50	50	50
Salt, red chilli powder	1tsp	1tsp	1tsp	1tsp

Preparation of biscuit:

Biscuit in which wheat flour was replaced by *Bajra* flour at 20, 40, 60, and 80%, respectively, were prepared.

Ingredients for biscuits:

The ingredients used for making biscuits is given in Table D alongwith weight.

Table D : Amount of ingredients (in g)

Ingredients	T_1 (20%)	T_2 (40%)	T_3 (60%)	T_4 (80%)
Bajra flour	20	40	60	80
Wheat flour	80	60	40	20
Sugar ground	50	50	50	50
Hydrogenated fat	50	50	50	50
Coconut powder	10	10	10	10

Preparation of *Pua:*

Pua in which *rawa* was replaced by *Bajra* flour at 20, 40, 60, and 80%, respectively, were prepared.

Ingredients for *Pua* :

The ingredients used for making *Pua* is given in Table E alongwith weight.

Table E : Amount of ingredients (in g)

Ingredients	T_1 (20%)	T_2 (40%)	T_3 (60%)	T_4 (80%)
Bajra flour	20	40	60	80
Rawa flour	80	60	40	20
Sugar ground	50	50	50	50
Hydrogenated fat	50	50	50	50
Chopped dry fruits	10	10	10	10

Sensory evaluation of developed products:

The acceptability of *Bajra* based *Ladoo*, *Papdi*, biscuit, *Tikki*, and *Pua* were evaluated by 5 judges using a 9 point hedonic scale (Ranganna, 1986) to test the liking or dislike of developed products. Semi trained panel did the evaluation.

OBSERVATIONS AND ASSESSMENT

The study deals with chemical analysis of *Bajra* flour and incorporation of Bengal gram flour, wheat flour and ground nut flour in *Bajra* flour based products (Shadang *et al.*, 2014). Therefore the results are presented and discussed under the following head :

– The chemical composition/ nutritive value of *Bajra* flour.

– The nutritive value of prepared *Bajra* products.

– The organoleptic acceptability of *Bajra* products with incorporation of Bengal gram flour, wheat flour and ground nut flour.

Bajra flour was prepared by oven drying from dry *Bajra*. The sample was analyzed for various nutrients and results were presented. A wide range of nutrients performs various functions in the body. The grain components not only determine shelf life and nutritional quality but also determine end uses in development of designer food for specific target groups.

Conclusion:

On the basis of present attempt entitled "Development, sensory and nutritional evaluation of *Bajra* mix products" the data, interpreted the obtained results has been carefully discussed and concluded on the following manner: The present study is carried out to develop *Bajra* flour products in the form of *Laddus*, *Papdi*, *Tikki*, biscuits and *Pua*. It reveals encouraging results. All the products prepared with incorporation of

ground nut flour, wheat flour, chickpea flour were acceptable. The various parameters such as moisture, fat, crude protein, carbohydrate, crude protein and total ash were analyzed. Organoleptic acceptability of incorporated products were analyzed by panel member. 20% incorporated *Laddus*, 20% incorporated *Papdi*, 40% incorporated *Tikki*, 40% incorporated biscuit and 40% incorporated *Pua* had better sensory characteristic than other incorporated products. All incorporated products (*Laddus*, *Papdi*, *Tikki*, biscuit and *Pua*) had better quality with respect nutrition (Muhammad *et al.*, 2012).

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