

DEVELOPMENT OF MILK AND CEREAL BASED EXTRUDED PRODUCTS

Thejaswini, M. L and H.G. Ramachandra Rao

Department of Dairy Technology

Dairy Science College, Bangalore-560024

Karnataka Veterinary, Animal and Fisheries Sciences University, Bidar

E-mail: mythriharsha@gmail.com

Abstract: Extrusion cooking of cereals is now widely practiced. Extruded cereals command a significant share of the snack foods in the market. Keeping in view these facts, an attempt has been made to develop milk-cereal based extruded products. In this study ragi, wheat and rice flour in different proportions i.e., Ragi and Rice flour i.e., 50:50 T₁, 70:30 T₂, 60:40 T₃ respectively and Wheat and Rice flour i.e., 50:50 S₁, 70:30 S₂, 60:40 S₃ respectively were optimized to prepare two different extruded products. Whereas, Ragi and Rice flour combination 70:30 was selected among various other combinations similarly 50:50 wheat and rice flour combination was selected among various other combinations in this research study.

Keywords: Extrusion, Cereal, Flour, Ragi.

Introduction: Though India is number one milk producing country in the world, its contribution to world trade is negligible. The gap can be bridged by value addition and product diversification. Today's consumers are increasingly seeking 'functional' foods for their health and well being as means of nutritional intervention in disease prevention. Dairy products enriched with the health attributes of functional ingredients such as breakfast cereals would be safe and viewed as potential novel foods for health promotion. Extrusion cooking of cereals is now widely practiced. Extruded cereals command a significant share of the snack foods in the market. The nutrient density of snack foods has been low and has stigmatized these products as 'junk' foods. Inclusion of whey proteins, casienates and some other milk proteins will improve the textural as well as nutritional properties of extruded products (Guha *et al.*, 1997).

Objectives: Keeping in view all the above factors, the present study is aimed to prepare, milk and cereal based noodle like products using ragi, rice and wheat flour. In this background the proposed research paper is aimed at the following objectives.

1. To standardize the processing parameters for the preparation of milk and cereal based extruded product using rice and ragi flour.
2. To standardize the processing parameters for the preparation of milk and cereal based extruded product using rice and wheat flour.
3. To study its sensory and proximate composition of developed milk and cereal based extruded products.

Materials and Methods

Process optimization to standardize the processing parameters for the preparation of milk and cereal based extruded product.

To standardize, the different combinations of Rice, Ragi and Wheat were tried to see the acceptability of the product over the control prepared. The resultant standardized combinations were served to panel of judges along with control to record the overall acceptability. Based on sensory evaluation by the panel, the best one was selected and used for the further studies.

The following ingredients were standardized to the processing parameters for the preparation of milk and cereal based noodles like products.

Preparation of rice flour based extruded product (control)

The quantity of ingredients (water, salt and spices) required was worked out for each trial. The ingredients were weighed and kept for use. The rice flour with the optional ingredients of known quantity was fed into the feeding system of the extruder and known quantity of water also added through the vent and left for 5-10min for proper kneading, and then extruder was switched to extrusion process, where gelatinization occurs and product flows through the die of inserted shape and the product coming out of the die was cut by the cutter for uniform size and collected in a neat tray and kept for oven drying at 60°C for 3h, where higher the moisture, longer will be the drying time. After drying the ready to cook rice based noodles were ready to use (Guha, 2000).

Preparation of Ragi and Rice flour based milk and cereal extruded product:

Milk and cereal based noodles like product was prepared by using three different combinations of Ragi and Rice flour i.e., 50:50 T₁, 70:30 T₂, 60:40 T₃ respectively and adding milk and optional ingredients such as salt and spices of known quantity constant for all the three combinations. Thus prepared products were served to the panel of judges for sensory evaluation along with the control (C). The one, which secured highest score upon control was selected for the further study.

Preparation of Wheat and Rice flour based milk and cereal extruded product:

Milk and cereal based noodles like product was prepared by using three different combinations of Wheat and Rice flour i.e., 50:50 S₁, 70:30 S₂, 60:40 S₃ respectively and adding milk and optional ingredients such as salt and spices of known quantity were uniformly added for all the three combinations. Among treated and control product samples, the one which secured highest overall acceptability score were selected for further studies.

Results

Table 1: Effect of different levels of ragi and rice flour on sensory quality of ready to cook extruded milk-cereal based noodles like products

Treatment	Color & Appearance	Body and Texture	Flavor	Overall Acceptability
C	7.33 ^a	7.33 ^a	7.33 ^a	8.33 ^a
T ₁	7.00 ^a	7.00 ^a	6.33 ^{ab}	7.33 ^{ab}
T ₂	6.66 ^a	6.66 ^a	6.00 ^b	6.33 ^b
T ₃	7.66 ^a	7.66 ^a	8.33 ^a	8.66 ^a
F-Value	0.74	1.11	13.33	10.00
Pr>F Value	0.5570	0.3999	0.0018	0.0044
C D	2.46	2.01	1.42	1.64

Note: All values are average of three trials

Figures with the same superscripts in a column indicates no significant difference at P<0.01 level

C- Control (only Rice flour)

T₁- 50:50 (Ragi : Rice)

T₂- 60:40 (Ragi : Rice)

T₃- 70:30 (Ragi : Rice)

Table 2: Effect of different levels of ragi and rice flour on proximate composition of ready to cook extruded milk-cereal based noodles like products

Treatment	Moisture g (%)	Protein g (%)	Fat g (%)	Fibre g (%)	Ash g (%)	Carbohydrates g (%)
C	11.75 ^a	6.84 ^a	0.21 ^a	0.61 ^a	0.21 ^a	80.35 ^a
T ₁	7.12 ^b	9.93 ^b	15.82 ^b	0.31 ^b	7.75 ^b	59.04 ^b

T ₂	7.05 ^b	12.52 ^c	15.65 ^c	0.91 ^c	7.02 ^c	56.04 ^c
T ₃	6.81 ^c	15.62 ^d	15.61 ^d	1.35 ^d	7.72 ^d	52.87 ^d
F-Value	9567.4	37810.7	1844.3	565.2	50169.6	176404
Pr>F Value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
C D	0.12	0.09	0.08	0.09	0.08	0.14

Note: All values are average of three trials

Figures with the same superscripts in a column indicates no significant difference at P<0.01 level

C- Control (only Rice flour)

T₁- 50:50 (Ragi : Rice)

T₂- 60:40 (Ragi : Rice)

T₃- 70:30 (Ragi : Rice)

Overall acceptability tests were carried out with different proportions of ragi and rice flour i.e.,50:50 T₁, 60:40 T₂and 70:30 T₃ upon control (100 %, rice flour). It was found that the combination of T₃, had secured highest scores on overall acceptability with 8.66 compared to other two treatments with 7.33 and 6.33 respectively against control (8.33) and this combination delivered good qualities of color and appearance, improved body texture and acceptable flavor. Thus Ragi and Rice flour combination 70:30 is selected among various other combinations for further analysis.

Different proportions of ragi and rice flour viz., T₁, T₂ and T₃were subjected to chemical analysis. Investigation revealed that theT₃ combination of ragi and rice flour possessed almost similar composition as that of report submitted by Lorney *et al.*, (1976). Thus the combination of 70:30, ragi and rice flour respectively, was selected.

Table 3: Effect of different levels of wheat and rice flour on sensory quality of ready to cook extruded milk-cereal based noodles like products

Treatment	Color & Appearance	Body and Texture	Flavor	Overall Acceptability
C	7.33 ^a	7.33 ^a	7.33 ^a	8.33 ^a
S ₁	8.66 ^a	8.33 ^b	7.66 ^a	7.66 ^a
S ₂	6.66 ^a	6.33 ^c	6.66 ^a	7.00 ^a

S ₃	7.00 ^a	6.66 ^c	7.33 ^a	7.00 ^a
F-Value	4.61	7.00	0.90	1.83
Pr>F Value	0.0373	0.0126	0.4803	0.2192
C D	2.01	1.64	2.17	2.32

Note: All values are average of three trials

Figures with the same superscripts in a column indicates no significant difference at P<0.01 level

C- Control (only Rice flour)

S₁- 50:50 (Wheat : Rice)

S₂- 60:40 (Wheat : Rice)

S₃- 70:30 (Wheat : Rice)

Overall acceptability tests were carried out with different proportions of wheat and rice flour i.e.,50:50 S₁, 60:40 S₂ and 70:30 S₃ respectively upon control (100 %, rice flour). It was found that the combination of 50:50 S₁, wheat and rice respectively had secured highest scores on overall acceptability with 7.66 compared to other two treatments with 7.00 and 7.00 respectively against control (8.33). S₁ combination delivered good qualities of color and appearance, improved body texture and acceptable flavor. Thus 50:50 wheat and rice flour combination was selected among various other combinations for further analysis.

Table 4: Effect of different levels of wheat and rice flour on proximate composition of ready to cook extruded milk-cereal based noodles like products

Treatment	Moisture g (%)	Protein g (%)	Fat g (%)	Fibre g (%)	Ash g (%)	Carbohydrates g (%)
C	11.75 ^a	6.84 ^a	0.21 ^a	0.61 ^a	0.21 ^a	80.35 ^a
S ₁	10.82 ^b	10.74 ^b	9.82 ^b	3.82 ^b	7.70 ^b	57.08 ^b
S ₂	9.92 ^c	10.94 ^c	8.03 ^c	3.44 ^c	7.67 ^b	59.99 ^c
S ₃	6.94 ^d	11.04 ^d	8.13 ^d	3.62 ^d	7.76 ^b	62.82 ^d
F-Value	5076.8	12239.7	123551	6935.1	76644.4	4360.9
Pr>F Value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
C D	0.14	0.09	0.06	0.08	0.06	0.78

Note: All values are average of three trials

Figures with the same superscripts in a column indicates no significant difference at $P < 0.01$ level

C- Control (only Rice flour)

S₁- 50:50 (Wheat : Rice)

S₂- 60:40 (Wheat : Rice)

S₃- 70:30 (Wheat : Rice)

Different proportions of wheat and rice flour viz., S₁, S₂ and S₃ were subjected to chemical analysis. Investigation revealed that the S₁ combination of wheat and rice flour possessed almost similar composition as that of report submitted by Gangadhkar (2003). Thus the combination of 50:50 wheat and rice flour respectively was selected.

Summary and Conclusion

Extrusion-technology is gaining increasing popularity in the global agro-food processing industry, particularly in the food and feed sectors. Extrusion cooking technologies are used for cereal and protein processing in food. Keeping in view these facts, an attempt has been made to develop milk-cereal based extruded products. In this study ragi, wheat and rice flour in different proportions i.e., Ragi and Rice flour i.e., 50:50 T₁, 70:30 T₂, 60:40 T₃ respectively and Wheat and Rice flour i.e., 50:50 S₁, 70:30 S₂, 60:40 S₃ respectively were optimized to prepare two different extruded products. Whereas, Ragi and Rice flour combination 70:30 was selected among various other combinations similarly 50:50 wheat and rice flour combination was selected among various other combinations in this research study.

References

- [1] GANGADKAR P N R., 2008, Development of nutria-rich extruded products from small millets. *M. Tech Thesis*, UAS, Bangalore.
- [2] GUHA M., ALI S. Z. and BHATTACHARYA S. Twin screw extrusion of rice flour without a die effect barrel temperature and screw speed on extrusion and extrudate characteristics. *J. Food Engineering*, 32, 251-267 (1997).
- [3] GUHA M., 2000. Processing and quality of rice based extruded product, *Thesis* submitted to Jadavpur university, dept. of grain science and tech- CFTRI,
- [4] LORENY, K., MACFARLAN, G. and HINZE, G., 1976. The mineral composition of proso and foxtail millets. *Leb. Wis, Tech.*, 9: 357-359.