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Development of milk-cereal based extruded product.

-Its simple. Great ingredients make great food.

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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 (Pal, 2007). India is the leading producer of small millets namely, finger millet (ragi), kodo millet (kodo), foxtail millet etc. Thus fortification of these millets with milk and milk based products have been recognized nutritionally for being a good source of minerals like magnesium, manganese and phosphorus. Research has linked magnesium to a reduced risk for heart attack and phosphorus is important for the development of body tissue and energy metabolism. Millets are also rich in phytochemicals, including phytic acid, which is believed to lower cholesterol, and phytate, which is associated with reduced cancer risk.

Keeping in view all the above factors, the present study is aimed to prepare, milk and cereal based noodle like products.

OBJECTIVE:

1. To develop milk-cereal based extruded products.

METHODS:

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).

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 evalution 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.

Ragi and Rice flour:

Milk and cereal based noodles like product was prepared by using three different combinations of Ragi and Rice flour i.e., 50:50 T_1, 70:30 T_2, 60:40 T_3 respectively and adding milk and optional ingredients such as salt and spices of known

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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.

RESULTS AND DISCUSSION:

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

0- Control (only Rice flour)

1- 50:50 (Ragi : Rice)

2- 60:40 (Ragi : Rice)

3- 70:30 (Ragi : Rice)

The investigation was carried out with varying proportions of ragi and rice flour in ready to cook extruded milk & cereal based noodle-like products to observe the effect on sensory value *viz*. color and appearance, body and texture, flavor and overall acceptability.

The characteristic color of ready to cook extruded milk & cereal based noodle-like products was dark brown. It was observed from the results obtained that, the T_3 has secured highest score (7.66) compared to other treatments. This might be due to the fact that the decrease in ragi flour level decreased the color and appearance becomes dull as it contains high levels of iron, phosphorous and calcium, when it is mixed with rice flour. The dull color is obvious to the eye. Similar studies were submitted by Shashi *et al.,* (2007). Their finding mentions that millets are nutritionally good sources of minerals like magnesium, manganese and phosphorus linked to the color of the ragi flour.

The body, texture and flavor are very important sensory attributes of ready to cook extruded milk & cereal based noodle-like products. It was observed that the T_3 secured highest score (7.66 body and texture), (8.33 flavor) than other treatments because of ragi content. As the ragi content increased the product became crunchy so the sensory score increased as the ragi level increased.. Similar observations were reported by earlier research scholar Rayas-Durate (1996), he reported differences in texture with respect to firmness, pastiness and adhesiveness. Flavor characteristics such as earthy, raw bean and musty were observed in spaghetti containing rice flour at 25 and 30 % level. Thus from the investigation it was confirmed that increase in rice flour composition does not show better body, texture or flavor characteristics.

While the level of rice flour level decreased and ragi flour level increased, there was an evident decrease in the overall acceptability scores. This decrease in scores could be attributed to dull color, hard body & texture and poor flavors. Consequent to this finding, the best combination selected for further trials was 70:30 ragi and rice flour viz.,T_3. These results are comparable with the findings of Gangadkar (2008). Their conclusion mentions little millet flours as a main ingredient that varied from 70% to 90% in addition to black gram dhal flour at 10% resulted in very good sensory value.

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

0- Control (only Rice flour)

1- 50:50 (Ragi : Rice)

2- 60:40 (Ragi : Rice)

3- 70:30 (Ragi : Rice)

Effects of different levels of ragi and rice flour on chemical quality of ready to cook extruded milk & cereal based noodle-like products viz. moisture, protein, fat, fibre, ash and carbohydrates are elaborated. The moisture content of control and treatments T_1, T_2 and T_3 was found to be 11.75, 7.12, 7.05, 6.81 respectively. It is observed that higher moisture content in case of control is due to composition eg., usage of only rice flour - whereas for the treatments ragi and rice flour were blended. Highly statistically significant difference was obtained. Loreny *et al.,* (1976) reported moisture content in five varieties of millet grains as 7.9% to 14.3%.The protein content of control and treatments T_1, T_2 and T_3 was found to be 6.84, 9.93, 12.52 and 15.62 respectively. It was clear that, the T_3 showed highest per cent of protein (15.62) due to higher level ragi flour composition. Similarly Sahu (1987) reported a value of 8.5% protein in millet grains whereas Gangadkar (2008) reported a range of 11.9 to 16.02% of protein in millet based chakli containing 90% ragi flour. Also statistical data reveals highly significant difference. The fat content of control and treatments T_1, T_2 and T_3 was found to be 0.21, 15.82, 15.65 and 15.61 respectively. Figures show decrease in fat content with increase in rice flour composition. Statistically significant difference can be noted. These results were on par with the findings of Devaraju (2003) finding that fat content ranged between 14-15.68% pasta made from finger millet and rice flour composition. The fibre content of control and treatments T_1, T_2 and T_3 was found to be 0.61, 0.31, 0.91 and 1.35 respectively. The results obtained shows highest crude fibre in treatment 3, compared to all other treatments. This is due to ragi flour consists good amount of fibre content (3.5-3.9). This was statistically analyzed showing highly significant difference. This data matches with the research done by Devaraju (2003) on pasta made from finger millet and refined wheat flour combination showed almost nil fibre content. Whereas pasta made with the combination of wheat flour and finger millet based pasta had 2-2.5% fibre. The ash content of control and treatments T_1, T_2 and T_3 was found to be 0.21, 7.75, 7.02, and 7.72 respectively. Increase in ash content was

observed with increase in ragi flour content. This could be due to ragi flour contributing to the ash. Thus we can observe highly significant difference statistically. The values of ash content are in agreement with the findings of Kulkarni *et al.,* (1992). The carbohydrates content of control and treatments 1, 2 and 3 was found to be 80.35, 59.04, 56.79, 52.87 respectively. We can observe decrease in carbohydrate content with decrease in rice flour composition. This proves rice flour is directly proportional to the carbohydrate content. Statistical results also confirm highly significant difference. Similar results were reported by Gangadkar (2008) with nutri rich extruded products from small millets.

SUMMARY AND CONCLUSION:

Overall acceptability tests were carried out with different proportions of ragi and rice flour i.e.,50:50T_1, 60:40 $T_2$and 70:30 T_3 upon control (100 %, rice flour). It was found that the combination of T_3, 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., T_1, T_2 and T_3were subjected to chemical analysis. Investigation revealed that theT_3 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 for further studies.

CONCLUSION:

Food extrusion is an emerging technology which paved way for several value added, fortified, enriched, RTE, RTC etc food products. Hence the technology developed can be applied to the existing market samples of noodles, pasta and spaghetti kind of products and can be commercialized by organized Dairy sectors. The product has very good nutritional, therapeutic and functional properties and it could be recommended for health conscious adults, children and, in general, every age group people.

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