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STANDARDIZATION AND EVALUATION OF GREENGRAM INCORPORATED SPAGHETTI

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Abstract

Pulses are poor man's meat due to their high protein content of 17-25 per cent which is nearly twice that of cereals. They have been consumed as a rich source of protein, supplementing the cereal or millet based diets and has an important role in human nutrition. Some pulses and legumes such as green gram and soya bean are excellent source of protein and fat. Supplementing the cereals with pulses, nutritive value of vegetarian diets can be improved in terms of proteins and minerals. Keeping this in view, the present investigation was undertaken to evaluate the influence of pulse flour blends on physical, nutritional, cooking and organoleptic characteristics of spaghetti prepared from composite flour of green gram, wheat semolina, rice and sorghum flour. Protein and fibre content increased significantly ($p<0.01$) with increase in level of pulse flour blend incorporation. Cooking time of developed spaghetti from composite flour was significantly ($p<0.01$) lesser than cooking time of control spaghetti. Cooking loss of developed spaghetti was on par with the control spaghetti. Mean overall organoleptic score of developed spaghetti from composite flour was in the range of highly acceptable criteria. Thirty percent level of composite flour blend incorporation was found to be acceptable.

Keywords: Spaghetti; extruded products; pulse flour blends; quality characteristics,

INTRODUCTION

Cereals are the cheapest source of food energy and contribute 70-80 per cent of daily energy intake (Mahajan and Chattopadhyay, 2000). But they have relatively low protein content and poor protein quality due to deficiency of one or two essential amino acids (Gopalan *et al*., 2007). Pulses occupy an important place in human nutrition. Pulses are poor man's meat due to their high protein content of 17-25 per cent which is nearly twice that of cereals (Singh *et al*., 2000). They have been consumed as a rich source of protein, supplementing the cereal or millet based diets and has an important role in human nutrition (Ofuya and Akhidue, 2005). The convenience foods market in India today provides the consumers with high quality tasty food that could be prepared in the minimum possible time and therefore suit their life styles (Nandita *et al*., 2007). Spaghetti as a shelf stable convenience product appeared in the Indian market in recent times. It is a very popular product now in

India and the most preferred food of every child and adult alike. Not only is this spaghetti popular with fast food restaurants but also very popular as a Continental and Italian delicacy (Sanghvi, 2008). The nutritional value of extruded products is not very high, as it is rich in starch, whereas its protein concentration and quality is significantly lower. Hence an effort was made to prepare spaghetti incorporated with pulse flour blends such as green gram wheat semolina, rice and sorghum which are easily available and a good source of protein.

Methodology

Spaghetti were prepared using 100 per cent wheat semolina flour and kept as control samples. Green gram flour, rice flour and sorghum flour were mixed in various proportions (5, 10,15 & 20 %) to develop spaghetti by the addition of salt and water. The pulse flour blends were sifted thrice to ensure thorough and uniform blending. Then the flours were weighed and fed in the barrel of extruder. They were mixed thoroughly by the shaft in the extruder. The mass was allowed to blend for 10-15 minutes to ensure thorough distribution of moisture. During mixing the required amount of water was added. The product was extruded using appropriate die. After extrusion, the spaghetti was steamed for 20 minutes using idly steamer. The steamed spaghetti was then cooled and dried in cabinet drier for 6-8 hours at 60°C. The dried spaghetti was cooled and packed in polyethylene bags.

The quality characteristics of prepared spaghetti were studied by analyzing physical, nutritional such as moisture content (AOAC, 1995), protein (Ranganna, 1995), fat (Cohen, 1917), crude fibre (Maynard, 1976), ash content (Hart and Fisher, 1971), amino acid profile (Bidilingmeyer *et al*., 1987) and cooking quality (Grant *et al.* 2004). The sensory attributes like colour, appearance, flavour, texture, taste and overall acceptability of the spaghetti were evaluated by a panel of ten untrained judges by using a score card with a nine point hedonic scale. Cost analysis of spaghetti were computed taking into account the fixed cost, variable cost, interest, depreciation and products profit.

Result and Discussion

Table 1

Physical and Nutritional characteristics of green gram incorporated spaghetti

Sl. No	Parameters		T_0	T_1	T_2	T_3	T_4
1.	Diameter (mm)	Raw	1.79	1.67	1.51	1.45	1.40
		Cooked	2.82	2.69	2.55	2.46	2.40
2.	Expansion Ratio		0.63	0.62	0.59	0.589	0.58
3.	Breaking Strength (N)		13.95	10.32	9.74	8.49	8.38
4.	Colour	L	37.41	37.47	37.52	38.66	46.58
		a	8.78	8.53	8.01	7.76	5.68
		b	15.49	15.64	15.83	16.37	16.65
5.	Bulk Density (g/cm^3)		1.282	1.250	1.225	1.190	1.162
6.	Moisture (g/100g)		6.60	6.69	6.71	6.74	6.78
7.	Protein (g/100g)		10.23	10.92	11.37	12.25	12.87
8.	Fat (g/100g)		0.785	0.840	0.905	0.957	1.103
9.	Fibre (g/100g)		0.365	0.541	0.955	1.180	1.527
10.	Ash (g/100g)		1.980	2.102	2.343	2.517	2.626
11.	Lysine (mg)		165.2	188.4	208.2	231.3	268.7
12.	Methionine (mg)		232	239.1	246.7	249.9	258.3

Physical and Nutritional characteristics of green gram incorporated spaghetti:

The diameter of raw as well as cooked spaghetti was increased with the increased level of incorporation of l pulse flour blends with wheat semolina. As the level of incorporation increased, the breaking strength was decreased. The 'L' values of spaghetti ranged from 37.05-46.58, 'b' values 15.64-16.65 and 'a' values 8.53-5.68 for T1 to T4 respectively. The bulk density of spaghetti was decreased with addition of pulse flour blends.

The nutritional composition such as moisture, protein, fat, crude fibre, ash and amino acid profile of spaghetti were increased with increased level of incorporation of pulse flour blends. Hegde (1997) stated that the moisture content of green gram flour incorporated cassava noodles gradually increased during 180 days of storage. Sugasini (2003) found that there was an increasing trend in moisture content and crude fibre content of legume incorporated wheat vermicelli. Thirumaran *et al.* (1992) reported that the processing of sweet potato flour for the production of vermicelli and spaghetti which was prepared by mixing with wheat flour and legume flours like green gram, bengal gram or defatted soy flour to increase the protein level of the product. Study made by Wood (2009) had revealed that chick pea blends fortified with semolina showed increased levels of amino acids expect cysteine and methionine. Glutamic acid and proline decreased with fortification.

Table 2

Cooking quality characteristics of green gram incorporated spaghetti

Sl. No	Parameters	T_0	T_1	T_2	T_3	T_4
1.	Cooking Time (mins)	10.30	9.00	8.18	7.13	6.40
2.	Cooked Volume (ml/100g)	228.50	223.00	219.50	216.85	209.25
3.	Cooked Weight (g/100g)	285.62	278.75	274.37	271.06	261.56
4.	Water Absorption (ml/100g)	148.50	143.00	139.50	136.85	130.75
5.	Cooking Loss (%)	7.45	7.57	7.93	8.11	8.16

Cooking quality characteristics of green gram incorporated spaghetti:

The cooking time, cooked weight, cooked volume and water absorption of spaghetti decreased with increased level of incorporation of pulse flour blends except cooking loss. Green gram incorporated spaghetti had the maximum cooking loss of 8.16 (T_4) followed by 8.11 (T_3), 7.93 (T2) and 7.57 (T_1) per cent. Vijayalakshmi (2004) stated that the cooking time mainly depend on the density of the product. Protein content in the products had also high impact on the cooking time of the products. Vani (2001) found that as the incorporation of pulse flour increased, the cooked volume decreased. Bahnassey and Khan (1986) reported the increased cooking losses with standard pasta (noodle and spaghetti - types) when fortified with legume flour and protein concentrates. The maximum cooking loss would be 8 per cent. Sowbhagya and Ali (2001) opined that a solid loss of less than six per cent is considered very good and about eight per cent is average.

Organoleptic characteristics of green gram incorporated spaghetti:

The control spaghetti had dark brown colour. The spaghetti had smooth edges and firm texture. The control spaghetti had cooked starchy flavour. The green gram incorporated spaghetti had the colour of light brown to yellow (T_1 to T_4). Initially all the criteria like colour, appearance, flavour, texture and taste received similar and sometimes higher scores than control sample. T_1 and T_2 samples scored the maximum score for all the sensory attributes among the other samples.

Conclusion

Extruded products are becoming more adaptive due to its various advantages over the traditional processed foods. Utilization of composite flour in extruded products offer different flavour and texture characteristics resulting in an element of novelty with enhanced consumer appeal and nutritive value. Hence utilization of cereals and pulses in extruded foods would lead to the development of nutritionally optimized foods at affordable cost.

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