IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT)
e-ISSN: 2319-2402,p- ISSN: 2319-2399.Volume 10, Issue 8 Ver. I (Aug. 2016), PP 14-18
www.iosrjournals.org

A Study on Development of Fortified Pasta with Ginger Powder

Piyush Mishra*, Devendra Kumar Bhatt
Institute of Food Technology (Center of Excellence), Bundelkhand University, Jhansi-284128, Uttar Pradesh, India

Abstract: *Pasta is a popular food and its quality can also measured by appearance of flavour and texture. Present study was undertaken to evaluate the quality of pasta supplemented with different quantities of ginger powder. In the present study four samples (C, C1, C2, and C3) of pasta were prepared by using refined wheat flour and different proportion of ginger powder. Sample C was prepared as control containing only refined wheat flour (100%) while sample C1 (refined wheat flour 99% ginger powder 1%), C2 (refined wheat flour 97% ginger powder 3%) and C3 (refined wheat flour 95% ginger powder 5%) were prepared by changing the concentration of refined wheat flour and ginger powder. All the four samples were evaluated for the physicochemical properties (ash, texture and viscosity analysis), nutritional properties (carbohydrate, protein, fat, and fibre), cooking time and sensory quality. On the basis of results sample C2 (refined wheat flour 97% ginger powder 3%) was found to be best in quality having more nutritional element and higher overall acceptability.*

Keywords: *ginger powder, pasta, supplementation, nutrition.*

I. Introduction

Pasta is traditionally Italian food made by refined wheat flour. It can also made by durum wheat or mixed grain. In India pasta is used as a fast food and if the nutritional properties of the pasta will be enhanced than it can be easily useful as regular food. Pasta made by refined wheat flour mixed with water after that it is kneaded and breaked after that it is put into the pasta extruder and extracted in various shapes; it is dried and cooked prior to eating. Pasta with ideal sensory and physical quality is characterized by elasticity and strength of the dough, high tensile strength and minimum cooking losses.

Pasta products are widely accepted by the children and elder persons, but the major problem is that they are not accepted pasta as a healthy food due to low nutrients and dietary fibres. The product can be made more healthy and acceptable by the incorporation of some ingredients such as ginger powder (saunth) having more nutraceutical compounds.

Many studies found that increasing consumption of plant foods like ginger decreases the risk of obesity, diabetes, heart disease and overall mortality while promoting a healthy complexion and hair, increased energy and overall lower weight. The phenolic compounds in ginger are used to help gastrointestinal irritation, stimulate saliva and bile production and suppress gastric contractions and movement of food and fluids through the GI tract.

II. Material And Method

2.1. Procurements of raw material

Ginger powder basically (saunth) and wheat flour (*Triticum aestival*) is used and procured from local market.

2.2. Evaluation of physicochemical properties of raw material

The content of protein was determined as per (IS: 7219:1973): Kjeldhal method, protein content was obtained by using the conversion factor of 6.25, crude fibre was determined by (IS: 11062) and carbohydrate content by difference method, ash and fat content were determined according to AOAC 2000 methods.

2.3. Sample preparation

Four Samples (C, C1, C2, and C3) were prepared using sample C as control containing only refined wheat flour (100%), while sample C1, C2 and C3 were prepared using different concentration of refined wheat flour and ginger powder. Proximate composition and concentration of different raw materials taken in the preparation of control (C) and other samples (C1-C3) is shown in Table 1. All the samples were passed separately through sieve no. 10 thrice to improve the mixing. Prepared samples were stored in an air tight polyethylene bag in cool and dry place for further study.

Table.1 Chemical composition of raw materials

Ingredient	Sample			
	C	C1	C2	C3
Refind wheat flour	1000	990	970	950
Ginger powder	-	10	30	50

2.4. Pasta Preparation

Different samples of pasta (C, C1, C2 and C3) is prepared using different concentrations of refined wheat flour and ginger powder in the ratio of 100:00; 99:01; 97:03, 95:05 respectively. In each case, an amount of 1000 g of the respective composition was taken for the preparation of pasta. Refined wheat flour and ginger powder is mixed with optimum amount of water in the mixing chamber of pasta extruder (Le Monferrina Masoreo Arturo and C.S.N.C., Italy) for 10 minute to distribute the water uniformly. The moist flour aggregate was extruded through pasta extruder fitted with an adjustable die. The speed of revolving sharp blade cutter in the front of the die was adjusted so that the length of the pasta finished at 2 cm for each sample. Drying of final pasta sample was carried out in hot air oven at 75ºC for 3 h. The dried product was packed in polyethylene bags. The main objective of the drying was to reduce the moisture content of the sample to about 8-10%. Final dried products of various samples were packed in high density polyethylene bags. The resultant dried products were then used for further study such as cooking time, chemical composition, viscosity, texture and sensory analysis.

2.5 Evaluation and optimization of pasta samples

The developed pasta products were analyzed for their different quality parameters. The cooking quality of samples was determined by the minimum cooking time as per AACC 2000. Rapid visco analyzer (RVA) was used to determine the pasting properties of raw material of pasta products. The texture of the product was determined with the help of stable micro system texture analyzer TA-XT2i. It was used in cutting mode to record the required force to cut the pasta sample. Sensory evaluation was carried out as per 9 point hedonic scale with the degree of liking: 1 = extremely dislike, to 9 = extremely like. Each pasta sample was cooked separately in a stainless steel pan, in the each case 100 g pasta sample was taken and cooked in 500 ml of water. The pasta was added in to the boiling water and was boiled for the time already determined. Boiled pasta was then drained, fried in a pre standardized method by using oil, mustard, onion and tomato with salt and used for sensory evaluation. A ten member panel of panellists evaluated the cooked samples of pasta and marked their observations in the sensory card. Each of the samples was randomly numbered using a three-digit code. Pasta was evaluated for colour, texture, aroma, taste and overall acceptability.

2.6 Statistical analysis.

The results are expressed as Mean ± SD (standard deviation). The statistical significance was analyzed using One-way Analysis of Variance (ANOVA) followed by Dunnett Multiple Comparisons Test by employing statistical software, Graph Pad, Instate 3. Differences between groups were considered significant at $P<0.05$ level.

III. Results And Discussions

3.1. Evaluation of chemical composition of raw material

The composition of the raw material is depicted in Table 2

Table.2.Chemical composition of raw materials

Raw material	Carbohydrate	Protein	Fat	Fibre	Ash
Refined wheat flour	74.52±0.003	10.67±0.9	1.20±0.08	0.48±0.12	3.55±0.03
Ginger powder	16.67±0.01	4.02±0.10	0.28±0.01	2.32±0.02	1.26±0.01

3.2. Nutritional composition of prepared pasta samples

The protein content of C, C1, C2 and C3 pasta samples were found to be 9.73, 9.58, 9.41, and 9.25 respectively. Fortification of pasta with different level of ginger powder lightly decreases the carbohydrate, protein, fat and ash content of the final products. While fibre content of prepared ginger pasta increases in comparison to control pasta, the result agreed with other researchers. The nutritional composition of prepared pasta samples is shown in Table 3.

Table.3. Nutritional composition of prepared pasta samples

sample	Carbohydrate	Protein	Fat	Fibre	Ash
C	73.00±0.56	8.72±0.22	1.14±0.01	0.46±0.01	3.52±0.05
C1	73.00±0.55	8.52±0.89	1.15±0.03	0.52±0.05	3.38±0.09
C2	72.13±0.46	8.37±0.88	1.11±0.04	0.52±0.04	3.08±0.04
C3	72.00±0.41	8.24±0.60	1.07±0.02	0.55±0.06	2.89±0.08

Note: All value are represented as Mean ± S.E.M. (standard error mean), n=6; data were analyzed by one-way ANOVA (Analysis of variance) employing Dunnett Multiple Comparisons Test using Graph Pad, Instate 3 software. Where C= Control sample, C1= 1% ginger powder sample, C2= 3% ginger powder sample, C3= 5% ginger powder sample.

3.3. Cooking time Cooking time of pasta sample was significantly decreased as compare to the control sample, in each case 50g of each sample was taken and cooked separately for the evaluation of cooking time. The result is shown in Table 4.

Table.4. Cooking time of prepared pasta sample

sample	Cooking time (minute)
C	5.48±0.02
C1	5.10±0.12
C2	4.70±0.04
C3	4.32±0.10

Note: All value are represented as Mean ± S.E.M. (standard error mean), n=6; data were analyzed by one-way ANOVA (Analysis of variance) employing Dunnett Multiple Comparisons Test using Graph Pad, Instate 3 software, *P<0.05.

3.4. Visco-elastic properties - Rapid visco analyzer (RVA, Starch Master of Perten, Sweden) was used to determine the pasting properties of raw material of pasta products. The peak viscosity (maximum viscosity of the sample during the heating and holding phase of the procedure) as well as the final viscosity (viscosity reading at the end of the test profile) was recorded for all samples. Sample is cooked at 95ºC then cooled to 65ºC, and its viscosity measured, using a RVA. The paste temperature of 65ºC is used to rapidly stabilize viscosity and minimize retro gradation.

Table.5. Viscosity Value Of Different Samples

Sample	**Peak viscosity**	**Hold viscosity**	**Final viscosity**
C	2886.67±63.62	1959.0±58.50	3368.67±151.43
C1	3065.33±104.14	2104.67±69.89	3455.67±83.16
C2	28770±86.81	1937.67±71.59	3256.33±96.70
C3	2769.67±88.79	1863.67±84.47	3259.33±246.62

It was found that there was significant difference in the peak viscosity and hold viscosity among different samples (P<0.05).

Table .6. Different variables of rapid viscosity

Sample	**variables**	**Sum of square**	**DF**	**Mean square**	**F Value**	**SIG**
Peak Viscosity	Between group	135084.66	3	45028.22	5.941	.020
	Within group	60632.00	8	7579.00		
	Total	195716.66	11			
Hold Viscosity	Between group	91656.250	3	30552.083	5.941	.020
	Within group	41142.00	8	5142.750		
	Total	132798.250	11			
Final Viscosity	Between group	82823.33	3	27607.778	1.106	.402
	Within group	199712.667	8	24964.083		
	Total	282536.00	11			

Note: All value are represented as Mean ± S.E.M. (standard error mean), n=6; data were analyzed by one-way ANOVA (Analysis of variance) employing Dunnett Multiple Comparisons Test using Graph Pad, Instate 3 software, *P<0.01

3.5. Texture analysis The texture of the samples was analyzed and it was found that the force (in g) required to cut the pasta sample was decreasing with increasing amount of ginger powder. The results of the analysis are presented in the table No 6. The cutting force of C, C1, C2 and C3 were 2410.12±0.40, 2392.00±1.07, 2129.90±1.60, 1843.00±0.87, respectively. The increase in the percentage of ginger powder is resulting in the softer texture of the product.

Table.7. Cutting force (g) of the pasta samples

sample	**Ginger powder**
C	1523.60±95.04
C1	1759.733±96.47
C2	1761.26±118.70
C3	1922.83±39.09

Note: All value are represented as Mean ± S.E.M. (standard error mean), n=6; data were analyzed by one-way ANOVA (Analysis of variance) employing Dunnett Multiple Comparisons Test using Graph Pad, Instate 3 software, *P<0.01.

3.6. Sensory characteristics

Sensory evaluation of the products was carried out by using 9 point hedonic scale sensory test. The colour score of C, C1, C2 and C3 samples was 7.10±0.03, 6.51±0.02, 7.22±0.06, 6.56±0.07, respectively. It was observed that the colour of C2 was found best among all samples. The flavour score of C, C1, C2 and C3 samples was 7.80±0.03, 6.42±0.07, 7.26±0.07, 6.12±0.02, respectively. The score of C2 was found best in sensory evaluation. The texture, taste and overall acceptability score of C2 was 7.34±0.08, 7.02±0.03, and 7.20±0.38, respectively. There was improvement in colour and texture of the product. The taste might have some change with increasing concentration of ginger pasta. The product with 3 percent ginger pasta was found better in comparison to other combinations.

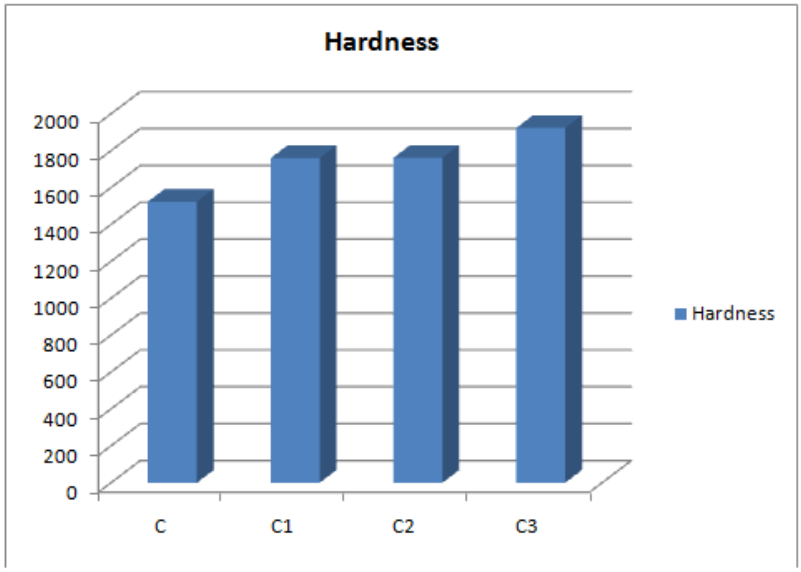

Fig 1 : Graphical representation of hardness of different pasta samples

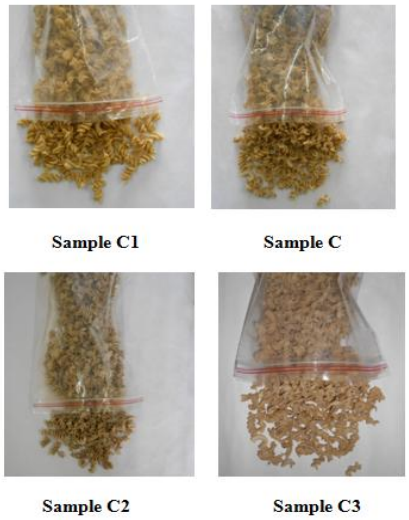

Table 8. Sensory scores of prepared pasta samples

sample	Sensory parameters				
	Colour	Flavour	texture	taste	Overall acceptability
C	8.00±0.66	7.30±1.16	7.50±0.70	7.80±0.78	7.63±0.55
C1	7.70±1.25	7.40±0.96	7.90±1.10	8.40±0.69	7.85±0.39
C2	7.70±0.94	7.60±1.07	8.10±0.73	7.70±0.94	7.77±0.46
C3	7.00±1.05	7.60±0.84	7.40±0.84	7.80±1.22	7.45±0.61

IV. Conclusion

The pasta was prepared with different proportions of ginger powder. The results showed that with increase in ginger concentration the fibre content increased and the cooking time decreased and the softness of pasta increased more than the control sample. It was found that the final viscosity of the sample was increasing with increase of ginger powder. Fortified pasta was highly acceptable with respect to sensory attribute and cooking time. On the basis of physico-chemical and nutritional properties, cooking time analysis of viscosity and sensory qualities pasta certain 97% refine wheat flour and 3% ginger powder (sample C2) resulted in better quality having more and high overall acceptability. Ginger powder prevents different diseases (diabetes, asthma, arthritis and heart diseases etc.). If we include ginger powder pasta in daily life style, it's prevent many diseases.

Acknowledgements

The present study was supported by the Centre of Excellence Uttar Pradesh India, and Bundelkhand University Jhansi, Uttar Pradesh India, to provide the necessary research facilities for the successful completion of research work.

Conflict Of Interest

The authors declare no conflict of interest.

References

[1]. Connell, D.W. and Sutherland, M.D. , 1969. Re-examination gingerol shogaol and zinger one-the pungent principals of ginger (Zingiber officinale).
[2]. Hui. 1993.characterization of major anocynins in acidified green ginger , journal of chineese sgrichem sec 31: 587-595.
[3]. Mandiratta , S.K., Anjneyulu, A.S.R ., Laksmanan , V., Naveena, B.M., Bisht G.S , 2000. Tenderizing and antioxidant effect of ginger extract of sheep meat. J. Food. Science Technology., 37:651-655.
[4]. Espin, J C, Conesa, Garcia, M.T., Baberan, Tomas, F.A., 2007 nutraceuticals: facts and fiction. Phytochmistery . 68 (22-24): 2986-3008.
[5]. Smewing, J. 1997. Analyzing the texture of pasta for quality control. Cereal Foods World 42:8-12.
[6]. Smith, O.B.,1969. History and status of specific protein-rich foods. Extrusion processed cereal foods, in protein – enriched cereal foods for world needs, milner., M., Ed., Am. Assoc. Cereal Chem., St. Paul, Minn.140.
[7]. Malcolmson, L. J., Matsuo, R. R., and Balshaw, R. 1993. Textural optimization of spaghetti using response surface methodology: Effects of drying temperature and durum protein level. Cereal Chem. 70:417-423.
[8]. Rossen , J.L. and Miller, R.C.,1973. Food extrusion. Food Technol. (Chicago), 27(8): 46.
[9]. Chung, Chin Eun, Lee, Kyung Won, and Cho, Mi Sook., 2010.Noodle consumption patterns of American consumers.,Nutr Res Pract.; 4(3): 243–251.
[10]. Hulme, A.C.,1971. Biochemistry of fruits and their products Vol 2. Academis press, London.
[11]. Narendhirakannan R.T., Subramanian. and Kandawamy, M.2005.Mineral Content of Some Medicinal Plants Used in the Treatment of Diabetes Mellitus. Biological Trace Element Research Vol. 103, pp 109-115.
[12]. Pin,Su Hou. and Tsung, Wang Han.,2009. Characterization of ginger proteases and their potential as a rennin replacement, Journal of the Science of Food and Agriculture **89 : 1178 –1185.**
[13]. Vinick, Mark.L., D.C., C.A.S.,2004. The therapeutic Properties and usages of five common spices:-coriander, cumin, fennel, gingerand turmeric A review of the literature submitted to the California College of Ayurveda, to satisfy the research paper requirement towards the C.A.S. Degree (Clinical Ayurvedic Specialist.
[14]. Thomas, Oladejo Adepoju., and Oriaku, Justina, Nwangwu.,2010. Nutrient composition and contribution of noodles (abacha) and local salad from cassava (Manihot spp) to nutrient intake of Nigerian consumers, African Journal of Food Science Vol. 4(7), pp. 422 – 426.
[15]. Smewing, J. 1997. Analyzing the texture of pasta for quality control. Cereal Foods World 42:8-
[16]. Singh,G. , Kawatra, Asha.And Sehgal, S,2001. Nutritional composition of selected green leafy vegetables, herbs and carrots. Plant Foods for Human Nutrition 56: 359–364.