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STUDY ON DEVELOPMENT OF PASTA PRODUCT WITH INCORPORATION OF OCIMUM SANCTUM (BASIL) TO ENHANCE THE SENSORY AND NUTRITIONAL QUALITY

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ABSTRACT

Pasta was prepared by incorporation of *Ocimum sanctum* (Basil) for better textural and sensory properties. The pasta was incorporated with the leaf extract of *Ocimum sanctum* at different concentrations of control, 5, 10, and 15.The natural antioxidants present in the *O. sanctum* leaf powder that was incorporated in the fruit leather showed extended shelf-life over three months when compared with control, without any added preservative at ambient temperature. Also the nutritional stability of the product was studied under two flexible packages of polypropylene and polyester out of that the products packed in polypropylene showed better storage stability.

Figures : 05 References : 12 Tables : 07

KEY WORDS : Basil, Fortification, Health conscious people, Nutrition, Pasta.

Introduction

Basil (*Opium basilicum*) is well known for its use in Italian cuisine. It is one of the primary ingredients in pesto sauce. Basil is also commonly included in Indonesian, Thai and Vietnamese cuisine. Basil is used in traditional Tamil and Ayurvedic medicine, which is a form of traditional medicine popular on the Indian subcontinent. It has enhanced the nutritive value in pasta product. Pasta, a ready-to-cook food, moulded into desired shape after the addition of water by means of cold extrusion or sheeting[5]. There are a number of types of basil, which differ in taste and smell. Sweet basil (the most commercially available basil used in Italian food) has a strong clove scent because of its high concentration of the chemical agent eugenol. Alternatively, lime and lemon basil have a strong citrus scent due to their high concentration of limonene. Pasta/macaroni, a traditional cereal based product is manufactured in larger quantities in Italy and USA. Popularity of these products are increasing worldwide because of convenience and nutritional quality[3]. It is a herbal and nutritive product that helps the body adapt to remove stress; ginseng is perhaps the most well known. Basil may also fall into this category. *Ocimum sanctum* L. is one such medicinal plant having numerous medicinal properties.*O. sanctum* L. (syn *O. tenuiflorum* L., Mint family: *Lamiaceae*), commonly known as "Holy Basil" in English and "Tulsi" in Hindi and Sanskrit, is a bushy plant with a unique fragrance found in the semitropical and tropical regions of the world. In ancient Hindu scriptures, Tulsi occupies the supreme position among the herbs, so much so that it is referred to as "Mother." The ancient works of *Padmapurana* and *Tulsi Kavacham* describes Tulsi as a protector of life, accompanying human beings from birth to death. The ancient sages or rishis ensured its integration into daily life by incorporating it in religious rituals. This plant is grown all over India for its medicinal as well as for religious purposes in houses, temples and gardens. It is also grown on commercial basis in vast stretches of farmlands to cater to herbal, cosmetic, and pharmaceutical industries in pasta. Some of the synthetic/non-synthetic additives that incorporated during processing of pasta products are acidifiers, antioxidants,emulsifiers, acidity correctors, preservatives and flavour enhancers[8]. The medicinal uses of Tulsi is well-documented and is extensively used in the Indian traditional systems of medicine, that is, Ayurveda, Unani, Siddha and the Asian folk medicine in India, Nepal, SriLanka, Malaysia, Indonesia and Burma for treating various diseases either alone or in combination with other herbal plants.[5] Tulsi has been used for thousands of years for its diverse healing properties and is regarded in Ayurveda as the "*elixir of life*" that promotes longevity. Sweet basil (*Ocimum basilicum* L.), native to India and Iran, is an economically important culinary herb

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TABLE-1 : Chemical composition of raw materials

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

with distinctive aroma and flavor. In addition to direct use of the herb as spice, the essential oil of its leaves and flowers is increasingly used as aroma additive in food and cosmetic industry and there are extensive efforts to enhance the yield of essential oil of *O. Basilicum*[10]**.** In one study, rabbits were exposed to oxidative stress (an increase in damaging free radicals). The rabbits were given 2 grams of fresh basil leaves each day for 30 days and cardiovascular and respiratory adaptation were monitored. The researchers measured a significant decrease in blood sugar levels and an increase in antioxidant activity. Pasta is one of the most ancient, nourishing and versatile dishes both from nutritive and gastronomic points of view[7]**.** The basil appeared in pasta to help the rabbits deal better with oxidative stress. According to research presented at the British Pharmaceutical Conference (BPC) in Manchester, pasta is popular among consumers due to its easy preparation and long shelf life, incorporating dietary fiber into the traditional pasta recipe can contribute to increased dietary intake. However, the addition of dietary fiber to pasta influences not only its nutritional properties but also its functional properties, including color, texture and cooking quality[6]. Basil also has properties that might help prevent some of the harmful effects of aging. The impact of technological treatments on pasta structure and consequences on its nutritional properties have not been investigated on legume-fortified pasta yet. The objective of this study was therefore to determine the impact of high level of legume flour addition combined to the use of drying and precooking treatments on pasta structure, and the repercussions on the *in vitro* starch digestibility[4]**.** Holy basil extract was effective at killing off harmful molecules and preventing damage caused by some free radicals in the liver, brain and heart and the term dietary fibre refers to the edible parts of plants oranalogous carbohydrates that are resistant to digestion and absorption in the human small intestine with complete or partial fermentation in the large intestine. Many types of soluble fibre may benefit individuals with metabolic[9]**.** Pasta, as a food rich in complex carbohydrates with low glycemic index is gaining wide acceptance in the recent years[2]. It also helps describe how the herb acts at a cellular level. Lab studies have demonstrated that basil has antibacterial properties; this may be because of the volatile oils it contains, which include estragole, linalool, cineole, eugenol, sabinene, myrcene, and limonene. The process by which whole foods influence satiety and subsequent energy intake has been a topic of much interest in nutrition research. Satiety is defined as the sensation of fullness between eating episodes (intermeal) that tends to inhibit further eating[11]. Basil restricts the growth of numerous bacteria, including *Listeria monocytogenes*, *Staphylococcus aureus*, *Yersinia enterocolitica* and *Pseudomonas aeruginosa*. Now a days eating pasta is perceived as one of the 'healthy options', since it is supremely versatile as a base to a meal and is easy to prepare in a way to satisfy both our notions of 'healthy eating' and our appetite[11]. There is a worldwide interest in production and availability of convenient foods that provide quality nutrition. Pasta, a wheat-based product, is a commonly consumed food as an ready-to-eat option, or one requiring only minimal in home preparation. As a prepared food, pasta has a complex matrix,where starch granules with different swelling grades

TABLE-2 : Chemical composition of raw materials

Raw material	Carbohydrate	Protein	Fat	Fibre	Ash
Refined wheat flour	71.65±0.05	11.66±0.12	1.16±0.08	0.52±0.18	3.62±0.05
Basil powder	16.71±0.01	5.02±0.12	0.32±0.03	2.42±0.01	1.25±0.01

TABLE-3 : Nutritional composition of prepared pasta samples

Sample	Carbohydrate	Protein	Fat	Fibre	Ash
C	76±0.52	8.71±0.26	1.15±0.01	0.42±0.01	3.51±0.03
C1	76±0.45	5.52±0.91	1.12±0.03	0.51±0.06	3.36±0.07
C2	73±0.36	8.42±0.92	1.10±0.05	0.52±0.02	3.02±0.02
C3	73±0.35	8.26±0.91	1.06±0.02	0.53±0.07	2.88±0.06

Note: All values 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 softwares. Where C= Control sample, C1= 1% Basil powder sample, C2= 3% Basil powder sample, C3= 5%,Basil powder sample.

are immersed in a protein net work[1]**.** This could mean that adding fresh basil to a salad not only adds flavor, it also helps reduce the number of harmful bacteria on the plate.

TABLE-4 : Cooking time of prepared pasta sample

Sample	Cooking time (minute)
C	5.10±0.02
C1	5.10±0.05
C2	4.76±0.12
C3	4.85±0.15

Note: All values 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 softwares, *P<0.05.

Material and Method

2.1. Procurements of raw material

Basil powder basically and wheat flour (*Triticum aestivam*) 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

TABLE-5 : Viscosity Value of Different Samples

Sample	Peak viscosity	Hold viscosity	Final viscosity
C	2841±4.41	1941±2.38	3231±1.45
C1	2636±3.42	1862±2.12	3280±1.32
C2	2165±2.56	1766±2.23	3320±1.56
C3	2246±0.72	1376±3.35	2582±1.15

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

Note: All values 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

TABLE- 6 : Cutting force of the pasta samples

Sample	Basil powder
C	2516.12±0.36
C1	2386.10±1.05
C2	2126.86±1.53
C3	1841.00±0.82

Note: All values 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.

flour (100%), while samples C1, C2 and C3 were prepared using different concentrations of refined wheat flour and Basil powder. Proximate composition and concentration of different raw materials taken in the preparation of control (C) and other samples (C1-C3) are 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.

2.4. Pasta Preparation

Different samples of pasta (C, C1, C2 and C3) were prepared using different concentrations of refined wheat flour and Basil 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 Basil powder were 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 each case 100 g pasta sample was taken and cooked in 500 ml of water. The pasta was added into the boiling water and was boiled

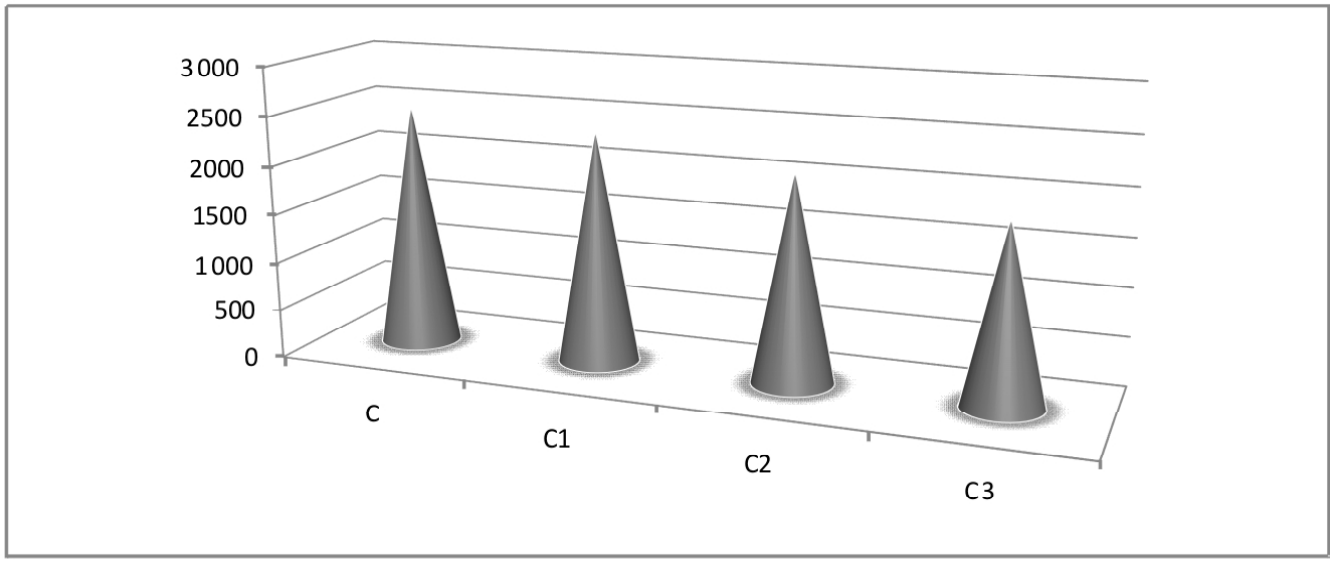

Fig. 1 : Graphical Representation of Hardness Of Different (Basil) Pasta Samples

Fig. 2 : Sample C

Fig. 3 : Sample C1

Fig. 4 : Sample C2

Fig. 5 : Sample C3

TABLE- 7 : Sensory scores of prepared Basil pasta samples

Samples	Sensory Parameter				
	Color	Flavor	Texture	Taste	Over all Acceptability
Control	7.20±0.63	7.20±0.78	7.50±0.52	7.10±0.73	7.25±0.31
C1	6.50±0.97	7.20±0.78	7.50±1.26	7.70±1.25	7.22±0.60
C2	8.30±0.82	7.80±0.91	7.90±0.99	8.20±0.91	8.05±0.49
C3	7.80±1.03	7.90±1.19	8.00±0.66	7.70±1.05	7.06±0.60

Note: All values 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, InStat 3 software, *P<0.01, **P<0.05.

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.

Results And Discussions

3.1. Evaluation of chemical composition of raw material

The composition of the raw material is depicted in Table 2

3.2. Nutritional composition of prepared pasta samples

The protein content of C, C1, C2 and C3 pasta samples were found to be 8.71±0.26, 5.52±0.91, 8.42±0.92, and 8.26±0.91 respectively. Fortification of pasta with different levels of Basil powder lightly decreased the carbohydrate, protein, fat and ash content of the final products. While fibre content of prepared Basil pasta increased in comparison to control pasta, the result agreed with other researchers. The nutritional composition of prepared pasta samples is shown in Table 3.

3.3. Cooking time. Cooking time of pasta sample was significantly decreased as compared 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.

3.4. Rapid Visco Analyser (RVA) : 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 was cooked at 95ºC then cooled to 65ºC, and its viscosity measured, using a RVA. The paste temperature of 65ºC was used to rapidly stabilize viscosity and minimize retro gradation.

3.5. Texture analysis : The texture of the samples was analyzed and it was found that the force (in g) required cutting the pasta sample was decreasing with increasing amount of Basil powder. The results of the analysis are presented in the table No 6. The cutting force of C, C1, C2 and C3 were 2516.12±0.36, 2386.10±1.05, 2126.86±1.53 and 1841.00±0.82 respectively. The increase in the percentage of Basil powder is resulting in the softer texture of the product.

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,7.20±0.6.50,±0.97,8.30±.82 and 7.80±1.03 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 was7.20±0.78, 7.20±7.78, 7.80±0.91 and 7.90±1.19 respectively. The score of C2 was found best in sensory evaluation. The texture, taste and overall acceptability score of C2 was 7.90±0.99,

8.20±0.91 and 8.05±0.91 , respectively. There was improvement in colour and texture of the product. The taste might have some change with increasing concentration of Basil pasta. The product with 3 percent Basil powder was found better in comparison to other combinations.

It was observed that with the addition of Basil powder for making pasta, cooking time of Basil pasta consistently decreased because Basil is having mucilaginous characteristics. Therefore the texture of pasta showing consistently decreasing hardness as the Basil was giving smoothness to the product. RVA (Rapid Visco Analyzer) measure pasting properties of the flour, high peak viscosity C2 sample with compare to the control (C), it's preferred to the pasta production due to given better texture of pasta. Over all on the basis of, physico-chemical, nutritional, cooking time, viscosity (pasting properties) and sensory quality of pasta certain sample C2 resulted in better quality having high overall acceptability.

Conclusion

The pasta was prepared with different proportions of Basil powder. The results showed that with increase in Basil 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 Basil 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% Basil powder (sample C2) resulted in better quality having more and high overall acceptability. Basil powder prevents different diseases (diabetes, asthma, arthritis and heart diseases etc.). If we include Basil powder pasta in daily life style, it's preventing many diseases.

Conflict Of Interest

The authors declare no conflict of interest.

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