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Formulation and quality evaluation of agathi (*Sesbania grandiflora* (L.) Poir) leaves enriched pizza base a healthier substitute for the regular pizza base

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Abstract
One of the best selling items in today's food world for immediate gratification of hunger and taste is pizza. Pizza typically contains high levels of calories, sodium and fat. Excessive consumption of calorie-dense, sodium and fat-laden foods is associated with higher risks for some chronic diseases. The incidence of obesity related health issues in adolescents and early adults is of great concern. Altering the amounts of ingredients used can significantly improve the nutrient composition of these foods. Vitamins, minerals, dietary fiber, and phytochemicals present in plants contribute to the functionality of foods enriched with them. *Sesbania grandiflora* L.Poir commonly reffered to as Agathi or Agasthya is medicinally valued. The purpose of this study was to formulate pizza base enriched with shade dried agathi leaves and subject it to acceptability in comparision to plain pizza base. In the present study the addition of agathi leaves at differnt levels of 10, 15 and 20gm/100gm of refined wheat flour have been investigated. Results show that addition of agathi leaves bettered the crumb moisture content with only a little increase in crumb firmness. A substantial improvement in sensory characteristics was observed upon addition of agathi leaves. Acceptable sensory scores, which were comparable to refined wheat flour based pizza were observed at 10gm level of addition of shade dried agathi leaves for 100gm of refined wheat flour.

Keywords: Phytochemicals, crumb moisture, crumb firmness, sensory evaluation

Introduction
Pizza is typically a lean, yeast-leavened bread-type dough that is baked and topped similar in formulation to French bread and Middle Eastern flat breads. Commercial interest in pizza, which is traditionally consumed in European countries, notably in Italy, has now made its way into India. Experimenting with the taste buds has always been the mantra of food lovers in India. With increasing disposable incomes, spendthrift attitude and cross-cultural exchanges the exposure to various global cuisines has never been so easy. According to a research report, the demand for various fast food items is consistently rising in India. The most delectable of them all is Pizza, which has now emerged as one of the most favourite fast food items of the Indians especially the young generation. With changing life style and aggressive marketing by fast food outlets, Pizza is also becoming popular in small towns [1].

Pizza typically contains high levels of calories, sodium and fat. Excessive consumption of calorie- dense, sodium and fat-laden foods is associated with higher risks for some chronic diseases. The incidence of obesity related health issues in adolescents and early adults is of great concern [2]. Altering the amounts of ingredients used can significantly improve the nutrient composition of these foods. Vitamins, minerals, dietary fiber, and phytochemicals present in plants contribute to the functionality of foods enriched with them [3].

Plant foods can contribute significantly to human nutrition and health, because they contain almost all essential nutrients. *Sesbania grandiflora* L. Poir commonly referred to as Agathi, is traditionally revered plant of India. The whole plant of Agathi is medicinally valued. The leaves of Agathi are used as herb in Ayurvedic medicine. Their properties include much value as an anti-diabetic, anti-hypercholesterolemic [4]. Antioxidant [5]. Antimicrobial [6]. anti-inflammatory, hepatoprotective, and anti-urolithiatic properties [7]. Agathi contains natural antioxidants, which delay or prevent the spoilage of food. Foods enriched with these leaves and the chemicals derived from the leaves were found to posess antibacterial, activity.

Against the background of this information, the present investigation was undertaken with clear objective of evaluating the effects of the addition of agathi leaves on the sensory, textural, and baking characteristics of pizza base.

Materials and Methods

Experimental Materials

For the present study, fresh leaf samples of *Sesbania grandiflora* (L.) Poir were collected from the college garden. The leaves were collected from the same trees to avoid the effect of soil variation on the micronutrient content of the leaves. The collection and taxonomic identification of the specimens were carried out by an expert botanist, of the Botany Department of Sri Krishna Devarya University, Anantapur and the voucher specimen of the collected sample was deposited in the department herbarium for further reference. The specimen was assigned Herbarium No. SKU (No.45767) and taxonomically identified *as Sesbania grandiflora*(L.)Poir as per plant list 2010. Leaves plucked from trees in college gardens, were washed with water to remove any dirt particles and subjected to shade drying. Compressed baker's yeast was used for fermentation of bread. Commercial available refined Wheat flour, sugar, olive oil and salt were purchased from the local grocery stores at Anantapur, Andhra Pradesh, India.

Chemical analysis of Shade Dried Agathi Leaves (SDAL)

The moisture, protein, total ash, crude fiber [8]. contents total lipids [9]. Were analysed in leaf samples. Ash solution was then analysed for mineral estimation such as calcium, phosphorus, iron [10]. and Total carotenoids were estimated [11]. Agathi leaf powder was extracted with 80% acetone and centrifuged at 10,000g for 15 min. The supernatant obtained was analyzed for total phenolics. The total phenolics were estimated using the Folin-Ciocalteau, by the method using gallic acid as standard [12]. and results were expressed as gallic acid equivalent (GAE). All analyses were carried out in triplicate and expressed as the mean value and standard deviation was calculated.

Product development

Basic pizza is made with refined wheat flour and is kneaded to develop gluten which enables the dough to support its rise. The proportions of basic essential ingredients wre listed in Table Pizzas were prepared using the method given by Beranbaum [13]. The baking formula includes all purpose flour, instant yeast, sugar, salt, water and olive oil. Flour, instant yeast and sugar are whisked together in a bowl, followed by whisking in of salt. Water is then added, stirred into the flour until all the flour is moistened and dough begin to form. Dough is placed in an oiled cup and proofed for 1 hour at room temperature in a covered container. Preheating the oven to 475°F or 240ºC 1 hour, flattened before baking. The dough is rolled into flattened circular shape of 7 inches diameter and left for five minutes before baking. The dough is then baked for 5 minutes with an oven temperature 475°F or 240ºC. The pizza is then removed and cooled. Pizza with good texture and extra crispness was selected for the incorporation of shade dried crushed agathi leaves. Table 1. gives the composition of pizza breads with different levels of agathi leaves. After removing from the oven, Pizza bases were immediately weighed and then placed on a wire grid for about 2 h cooling,

Colour values of pizza bases

The surface colour characteristics of pizza base samples were measured by a colour reader (Konica MINOLTA, CR–10) in terms of 'L', 'a' and 'b' values. 'L' values express the whiteness of the sample with 100 as perfect white and '0' as black. Values of 'a' and 'b' indicated red–green and yellow–blue chromatacity. Colour values of pizza bases were measured by placing sample in Petri plate. Colour reader was placed over petriplate and the colour was measured in terms of 'L', 'a' and 'b' values.

Sensory evaluation of pizza base

The samples were presented to a panel of 8 members and the evaluation for sensory parameters such as colour of crust, evenness of bake, flavour, taste and texture were carried out using a 9 point hedonic scale [14]. Thus all the samples were sensorially evaluated members using a developed score sheet.

Statistical analysis

All determinations were performed in triplicate. The statistical analyses were conducted using two-way ANOVA procedures. Differences in samples due to the addition of agathi were tested for statistical significance at the $p = 0.05$ level and at 0.01 levels.

Results and Discussion

Chemical analysis of Shade Dried Agathi Leaves (SDAL) powder

The proximate composition of SDAL is shown in Table 2. The chemical analysis revealed agathi leaves to be richer in nutrients and polyphenols. The leaves were found to be rich in protein, calcium, fibre and polyphenols. They were moderately rich in other nutrients which indicates agathi leaves to be potential source of nutrients with good nutrient availability. The proximate composition reported was comparable to the earlier [15]. Among the bioactive compounds agathi leaves were analysed for total polyphenols. The total polyphenol content of agathi leaves was estimated to be 44.40mg/100g gallic acid equivalent (GAE).

Physico- chemical characteristics

The surface characteristics or appearance factors could be the most important factors to be evaluated. Appearance factors initially attract a consumer to a product because the appearance is related to the colour quality of the product. Colour of pizza base products is evaluated at two places, the crust and the crumb. The crust colour and crumb colour values of control, and formulated breads C, PB1, PB2 and PB3 are presented in Table 3. Visual differences in brightness significant ($p \leq 0.01$) were observed in control and developed breads. Brightness (L) value decreased with increased level of addition of shade dried leaves the changes in redness (a) values decreased marginally in crust and crumb characteristics of developed breads significant at 1 percent level. A significant observation regarding the low 'a' value is a marked indication of addition of shade dried agathi leaves. Agathi leaves containing β–carotene undergo changes upon baking, thus influencing the colour characteristics of breads. Yellowness values (b) decreased markedly ($p \leq 0.01$) in the crust colour characteristics of developed bread.

Sensory evaluation of developed products

Products can be evaluated sensorially and objectively. Sensory evaluation is used as a bench mark for indicating the quality of new products and existing products. Since most foods show a composite of many differences, different sensory taste are utilized for sensorial evaluation of developed products. Sensory scores of pizza bread containing different levels of shade dried leaves are tabulated in Table 4. There was a generalized response of decreased sensory scores with increased level of incorporation of shade dried agathi leaves in pizza base formulations. The statistical scores showed significant difference ($p \leq 0.05$) towards evenness of bake colour of crust, aroma, taste and texture differed significantly ($p \leq 0.01$) from the control. The addition of agathi leaves improved the aroma of Pizza base samples. All the samples scored significantly higher for aroma when compared to the control Pizza. Increasing substitution levels increased the aroma scores of white breads as compared to the control sample.

Table 1: The optimized formulation of the pizza base.

Ingredients (g/100g)	Level of incorporation			
	Control	PB1	PB2	PB3
Flour (g)	100	100	100	100
Instant yeast	1.4	1.4	1.4	1.4
Salt	2.9	2.9	2.9	2.9
Sugar	1.7	1.7	1.7	1.7
Olive oil	16	16	16	16
Water	70	70	70	70
Shade dries agathi leaves	–	10	15	20

C-Control Pizza Base
PB1-10gm of shade dired agathi leaves based Pizza Base
PB2-15gm of shade dired agathi leaves based Pizza Base
PB3-20gm of shade dired agathi leaves based Pizza Base

Table 2: Nutrient and bioactive composition of shade dried agathi leaves (SDAL).

Component	Content
Moisture	72.76±1.0
Fat	3.40 ± 0.2
Ash	3.51 ± 0.2
Protein	8.70± 0.5
Total carbohydrate	14.6 ±0.24
Fibre	2.38±0.05
Calcium (mg)	1130±42.7
Iron (mg)	6.70±0.25
Phosphorous(mg)	75.25±1.25
Total Carotenoids (mg)	42.3±1.15
β –carotene (mg)	15.2±0.23
Total polyphenols (mgGAE/100g)	44.40±1.25

Values reported on dry weight basis Values are Mean±SD of three values

Table 3: Colour values of drumstick leaf supplemented breads

Sample	L		A		b	
	Crust**	Crumb**	Crust**	Crumb**	Crust**	Crumb^{NS}
C	59.97 ± 0.86	68.23 ± 0.29	10.9 ± 0.08	1.1 ± 0.08	31.23 ± 0.17	7.5 ± 0.22
PB1	50.63 ± 0.79	62.33 ± 4.51	7.1 ± 1.28	0.93 ± 0.12	9.1 ± 1.13	8 ± 1.06
PB2	50.37 ± 1.97	56.5 ± 2.06	5.03 ±0.19	1.43 ± 0.29	10.2 ± 2.97	9.13 ± 0.66
PB3	47.37 ± 1.45	51.23 ± 0.63	2.2 ± 0.36	2.93 ± 0.57	5.46 ± 1.41	7.3 ± 1.71
$F_{calculated}$	31.02	17.21	55.98	15.38	90.04	1.06
CD (p<0.05)	30.71	42.21	21.05	5.25	67.08	--
CD (p<0.051	57.33	78.78	46.37	9.80	125.22	--

$F_{tabulated}$ = 4.066 ($p \leq 0.05$) 7.591 ($p \leq 0.01$)
NS - Non-significant
Values are mean ± SD of 3 replicates

Table 4: Sensory quality of pizza base containing different levels of shade dried agathi leaves

Sensory Attributes	Level of incorporation				$F_{calculated}$	CD (p<0.05)	CD (p<0.01)
	C	PB1	PB2	PB3			
Colour of crust**	8.63 ± 0.48	8.5 ± 0.5	7.5 ± 0.5	5.88 ± 0.60	41.33	5.30	8.21
Evenness of bake*	8.75 ± 0.43	8.5 ± 0.5	8.38 ± 0.48	8.10 ± 0.5	2.97	1.30	--
Aroma**	8.20 ± 0.43	8.63 ± 0.48	8.12 ± 0.48	7.38 ± 0.86	49.37	6.53	10.16
Taste**	8.88 ± 0.33	8.55 ± 0.33	7.78 ± 0.71	6.25 ± 0.43	147.72	9.11	14.10
Texture**	8.5 ± 0.5	8.5 ± 0.5	7.33 ± 0.71	7.75 ± 0.43	12.16	2.99	4.64

$F_{tabulated}$ = 2.947 ($p \leq 0.05$); 4.568 ($p \leq 0.01$)
Values are mean ± S.D. of 8 replicates

Conclusions

From the present paper it may be inferred that shade dried agathi leaves could be added to bread up to levels of 10 gm/100gm of refined wheat flour without significant adverse effects regarding the crust colour, crumb grain structure and uniformity. The breads containing agathi leaves at all levels were scored higher for flavour in comparison to the control breads. Besides sensory properties, agathi leaves based pizza bases were more acceptable in many nutritional and functional aspects.

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References

1. Anita Goyal, Singh NP. Consumer perception about fast food in India: An exploratory Study. British Food Journal. 2007; 109(2):182-195.
2. Hurley J, Liebman B. What a pizza delivers. Nutrition Action Health Letter, 2002; 29:1-6.
3. Singh V, Garg AN. Availability of essential trace elements in Indian cereals, vegetables and spices using INAA and the contribution of spices to daily dietary intake. Food Chem, 2006; 94:81-89.
4. Ghanshyam Panigrahi, Chhayakanta Panda, Arjun Patra, Extract of Sesbania grandiflora Ameliorates Hyperglycemia in High Fat Diet-Streptozotocin Induced Experimental Diabetes Mellitus, Scientifica, 2016.
5. Maisuthisakul P, Suttajit M, Pongsawatmanit R. Assessment of phenolic content and free radical-scavenging capacity of some Thai indigenous plants. Food chemistry, 2007; *100*(4):1409-1418.
6. China RS, Mukherjee S, Sen S, Bose S, Datta H, Koley S *et al.* Antimicrobial activity of *Sesbania grandiflora* flower polyphenol extracts on some pathogenic bacteria and growth stimulatory effect on the probiotic organism Lactobacillus acidophilus, Microbiological Research, 2012; 167:500-506.
7. Doddola S, Pasupulati H, Koganti B, Koganti VS. "Evaluation of *Sesbania grandiflora* for antiurolithiatic and antioxidant properties," Nature Medicine, 2008; 62:300-307.
8. AOAC Association of Official Analytical Chemists. Edn 16, Washington D.C, U.S.A. 1995.
9. Huber D J, Newman DW. Relationship between lipid changes and plastic ultrastructural changes in soyabean cotyledons. J. Exp. Biol, 1975; 27:490-511.
10. Raghuramulu N, Madhavan NK, Kalyansundaram. A Manual of LaboratoryTechniques National Institute of Nutrition, ICMR, Hyderabad, 2003, 319-320.
11. Ranganna, S Handbook of Analysis and Quality Control for Fruit and Vegetable Products.Edn 2. Tata McGraw-Hill Publishing Company Limited, New Delhi. 1986, 40-42.
12. Kahkonen MP, Hopia AI, Vnorela HI, Rauha JP, Pihlaja K, Kujala TS *et al.* Antioxidant activity of plant extrats containing phenolic compounds. J. Agric Food Chem. 1999; 47:3954-3962.
13. Beranbaum LR. The bread bible. Library of Congress catloging – In – publication – USA. 2003.
14. Peryam DR, Pilgrim PJ. Hedonic scale method for measuring food preferences. Food Technology, 1957; 11: 9-14.
15. Gopalan C, Rama Sastri BV, Balasudrahmanian SC. (12th ed). Nutritive value of Indian Foods. National Institute of Nutrition, ICMR. Hyderabad, 2005, 48-67.