

The Antiviral and Antibacterial properties of *Plectranthus amboinicus* and *Piper longum* with the Addition to Focaccia Bread Nutritional Value and Sensory Evaluation

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ABSTRACT:

Focaccia is an Italian bread baked with herbs in a similar way to pizza, this can be utilized as a regular meal in daily basis, thus the bread prepared without cheese, it is considered as a good health supplement. The addition of herbs like *Plectranthus amboinicus* (Indian Borage) and *Piper longum* (long Pepper) to focaccia may increase the medicinal value. Borage is used as a medicine in treating contagious diseases like viral flu and cough through antiviral, antibacterial and antifebrile activity, likewise *Piper longum* acts as an antibacterial and have immunomodulation properties, *piper longum* is commonly known as Indian long pepper mostly used in siddha medicine to treat cough and respiratory disease. The upper respiratory infection mainly influence cough, sinusitis, sore throat, pharyngitis, also develop lung inflammation and this herb could be consumed in regular diet. The objective of this research is to analyze antiviral and antibacterial properties of *Plectranthus amboinicus* and *Piper longum*. Furthermore, to evaluate the Focaccia bread in addition with these herbs in preparation by sensory evaluation.

KEYWORDS: Indian borage, Long pepper, Phytochemical, Sensory Evaluation.

INTRODUCTION:

The Spices and herbs are added to foods for its unique taste and flavors, this also have a conventional history of utilization, with its legacy and harmony for a particular recipe. The nutrients and vitamins from proper nourishment associate with a healthy life, exhibiting the advantages of food by logical methods is a great task¹, especially while analyzing the phytochemical properties in combination of herbs, spices to foods. The production of food with medicinal herbs and spices involves the quantity of ingredients added for a balanced nutrition with medicinal benefits². Focaccia is a typical style of preparation in Italian food that is topped with herbs and spices mostly it is consumed as an appetizer during meal.

As the convention toppings rosemary and oregano are added whereas in this preparation *Plectranthus amboinicus* (Indian Borage) and *Piper longum* (Long Pepper) is used. The studies have revealed that the ethanolic extract of borage was profoundly dynamic against receptive oxygen species, Gram Positive Bacteria and Gram-Negative Bacteria³. Furthermore, it showed more of flavonoids, alkaloids, quinone, glycosides, amino acids, tannins and terpenoids⁴. The phenolic compounds like terpenoids present in Indian Borage has Antiviral and Antibacterial activity, this analysis work has Indian borage can be an interesting source of antioxidants, with a potential use in the daily nourishment⁵. The Focaccia prepared with Indian borage and long pepper has generally got required amount of ingredients under profoundly mingled conditions as the phytochemicals of these herbs demonstrates whether the food have medicinal value from Indian Borage and long pepper⁶, for example, herbs also got flavors with medical advantages, however in characterizing the benefits on consuming for a particular reason to cure diseases⁷, the various strategies to uncover them by logical methods on quantity of ingredients with sensory evaluation⁸. The spot

of herbs and flavors in the eating routine should be considered in studying medical advantages. This combination of ingredients on consumption of nourishment in regard with frequency, by which advantages may be seen on recognizing bioactive substances in spices and herbs with their properties in combining with nourishment, as well as the nutritional benefits on dietary cooking⁹.

MATERIALS AND METHODS:

The Recipe formulation is done with ingredients required for making Focaccia bread. The wheat flour is used due its healthy profile instead of usual all-purpose flour was acquired from a neighborhood supermarket. The herb Indian borage was bought from a local herbal garden, and the Long Pepper was obtained from a siddha herbal store at Pallavaram, Chennai. These ingredients are further processed and afterward put away in impenetrable holders before its real use. The antiviral and antibacterial properties are identified from the phytochemical compounds present in *Plectranthus amboinicus* and *Piper longum*.

The formulation of recipe was attempted in the Hotel and Catering Management Department of Vels Institute of Science Technology and Advanced Studies of Chennai during the month of November 2019 – January 2020. The Sensory Evaluation is carried Focaccia Bread prepared with Indian Borage and Long pepper with 25 panel judges using 9 points Hedonic Scale from various criterions starts from Like and dislikes on taste, texture, appearance and aroma.

Preparation Method of Focaccia:

Table 1. Method of Preparation

S. No.	Ingredients	Quantity	Procedure	Calories
1.	Wheat Flour	200gms	Sieve the flour with the salt	728
2.	Dry Yeast	1 Table Spoon	Add the diluted dry yeast in warm water to the wheat flour	156
3	Garlic	1 Table Spoon	Add the chopped garlic with flour and mic it well	17
4	Indian Borage	3 Sprigs	Fine Chop the fresh Indian borage and partly mix it with wheat flour	15
5.	Long Pepper	1 Table Spoon	Crush the long pepper in to fine powder and partly add it with wheat flour.	2
6.	Honey	1 tea spoon	Add the warm water and mix it with flour.	12
7	Sea Salt	Few flakes	Crush it well and mix it with butter.	1
8	Butter	10 grams	Melt the butter and add the rest of crushed long pepper and chopped Fresh Indian Borage.	75
9	Olive oil	20 ml	Add the oil with dough and knead well with herbal blend.	168
10	Total Calories			1174

Indian Borage (*Plectranthus amboinicus*):

The Indian Borage is used in traditional culinary preparation also now commonly used in Ayurveda and Siddha distinguished as many names in various languages, it is a semi-succulent lasting plant in herbs, with an impactful oregano-like flavor and smell¹⁰. The cause of *Plectranthus amboinicus* is obscure, yet it might be local to Africa, and potentially available in India. *Plectranthus amboinicus* is generally developed for medicinal purpose then recognized as a tropical herb to utilize as a conventional medication¹¹, the flavor and taste of this herb favors culinary preparation and for decorative purpose. Common names in English incorporated as Indian borage, French thyme, Indian mint, Mexican mint, Spanish thyme¹². The Terpenoids present in *Plectranthus amboinicus* contain antiviral, anti-inflammatory and antibacterial activity, thus this herb is a right choice in curing upper respiratory disease, the Alkaloids, Tannins provides a best source for antioxidants antioxidant, Glycosides, Flavonoids, Quinone improves phytochemical properties of this herb¹³. The flavonoids, and terpenes available in Indian Borage has the ability to control prevent Gram-positive and Gram-negative bacteria. The phenolic compounds also inhibit cough and tonsils.

Long Pepper (*Piper longum*):

The *Piper longum* is the botanical name for long pepper in south India it is called as Thippili and this is also known as pipili, traditionally this spice is used in south Indian culinary preparation for making accompaniments like rasam¹⁴, This blooming plant is belong to the family Piperaceae, this is farmed and available as a natural product individually and as a mixture with other herbs for medicinal purpose, mostly it is dried and utilized as a zest and flavoring in food¹⁵. The Long pepper has its own taste like spicy, however more sizzling than a normal pepper corn

which is a relative spice *Piper nigrum*, thus *Piper nigrum*, contain the alkaloid piperine¹⁶. The most seasoned realized reference to long pepper originates from old Indian course books of Ayurveda, where a therapeutic and dietary uses are portrayed in detail¹⁷. However, many examined this spice and found that it can be used as a medicament instead of a spice. Among the Greeks and Romans and before the European rediscovery of the American Continents, long pepper was a significant and notable ingredient. The old history of dark pepper corns is frequently interlinked with *Piper longum*, however a Greek native of Eresos recognized the long pepper and black pepper is a primary ingredient for herbal science. A roman author and naturalist and philosopher mistakenly accepted dried dark pepper and long pepper originated from a similar plant. The round dark pepper corns started to contend with long pepper in Europe from the twelfth century and had uprooted it by the fourteenth century. The mission for less expensive and increasingly reliable wellsprings of dark pepper powered the Age of Discoveries. As the dark pepper corns are added with many preparations, a spice with similar characteristics and more medicinal values could be better option in adding with food, thus long pepper is added with focaccia to make this dish with medicinal properties¹⁸.

RESULTS AND DISCUSSION:

Chemical Composition of Indian Borage and Long Pepper:

The Phytochemical composition of *Plectranthus amboinicus* has more flavonoids shows its unique purpose in culinary preparation and other chemical composition of *Plectranthus amboinicus* demonstrate its medicinal value with alkaloids, Terpenoids, Glycosides, Quinone, Tannins and Phenolic compounds are reasons for numerous therapeutic practices in Siddha and Ayurveda¹⁹ and it is used especially to cure respiratory diseases corresponding to congestion, bronchitis and sore throat²⁰. The antioxidants and Phenolic compounds also aid in treating digestive diseases to chronic digestive disease and dysentery, and so forth²¹. The leaves of Indian borage exhibit significant antioxidant potency. Piper longum are loaded with many phytochemicals like Alkaloids and phenolic compounds. The presence of Coumarins in long pepper exhibits the Anti-Viral and Anti-Inflammatory properties of this Spice, similarly the Terpenoids present in Indian Borage has antiviral, anti-inflammatory, antimicrobial and anti-parasitic properties and also it plays a role in boosting immune system.

Table 2. Phytochemicals of *Plectranthus amboinicus* and *Piper longum*

S. No.	Phyto Chemicals	<i>Plectranthus amboinicus</i>	<i>Piper longum</i>
1	Alkaloids	+	+
2	Sugar and Carbohydrates	+	+
3	Terpenoids	+	-
4	Coumarins	-	+
5	Flavonoids	+	-
6	Amino acid	+	+
7	Glycosides	+	-
8	Protein	+	+
9	Quinone	+	-
10	Tannins	+	+
11	Phenolic compounds	+	+
12	Steroids	s-	-

The isolated aqueous extract of piper longum has antibacterial activity against many clinical strains like gram positive and gram-negative bacteria²². The occurrence of several chemical compositions like terpenoids, alkaloids, glycosides, piperine, flavonoids, quinones, tannins and phenolic compounds. The antiviral and antibacterial activity of both *Plectranthus amboinicus* and *Piper longum* is showing active results against many microorganisms. The composition of Piperine available in long pepper improve medicinal value for the diverse usage in treating various ailments related to cough and upper respiratory disease, by its controlling nature that partially surge in penetrability with further remedies like combining with *Plectranthus amboinicus*.

Sensory Evaluation of Focaccia Bread:

The Focaccia bread prepared with various blends and labeled as F1, F2 and F3 to distinguish with each other. These Focaccia breads are given to the Panel Members for a sensory evaluation with a label F1, F2 or F3 on the dish. The sensory evaluation with 9-point Hedonic Scale grade list is issued with three varieties of Focaccia bread samples to each panel judge and asked to give their feedback on F1, F2, and F3 based on 9-point hedonic scale. These Focaccia

bread could be served during Hi Tea i.e. between lunch and dinner, thus these breads are given at Hi Tea. Similarly, the Information's are obtained from panel members related to Aroma, Taste, Texture, Temperature, Consistency and overall Acceptance on Focaccia bread samples. The purpose of this evaluation is to recognize the role of ingredients towards the overall acceptance of the samples. Bread prepared with the addition of *Solanum trilobatum* in various ratios and shapes was sent for sensory evaluation and their likes and dislikes are identified through hedonic scale.

Table 3. Sampling with Unique Identification for Focaccia Varieties

S. No.	Sample Name	Ingredients	Name of the Snack
1	F1	Indian Borage, Garlic, Honey, Wheat Flour, Dry Yeast, Sea Salt, Butter and Olive Oil.	Borage Focaccia
2	F2	Indian Borage, Long Pepper, Garlic, Honey, Wheat Flour, Dry Yeast, Sea Salt, Butter and Olive Oil	Focaccia with Borage and Pepper
3	F3	Oregano, Basil, Garlic, Honey, Wheat Flour, Dry Yeast, Salt, Butter and Olive Oil.	Italian Focaccia

Outcomes of Sensory Evaluation

Table 4. Sensory Evaluation of Borage Focaccia

Criterion	Like Extremely	Like Very Much	Like Moderately	Like Slightly	Neither Like Nor Dislike	Dislike Slightly	Dislike Moderately	Dislike Very Much	Dislike Extremely
Colour	10	2	5	5	2	1	0	0	0
Taste	12	7	2	2	2	0	0	0	0
Aroma	7	6	5	4	2	1	0	0	0
Appearance	11	3	5	2	1	1	1	1	0
Texture	4	8	5	3	2	1	1	1	0
Acceptance	15	4	1	2	1	1	1	0	0

Table 5. Sensory Evaluation of Focaccia with Borage and Pepper

Criterion	Like Extremely	Like Very Much	Like Moderately	Like Slightly	Neither Like Nor Dislike	Dislike Slightly	Dislike Moderately	Dislike Very Much	Dislike Extremely
Colour	8	5	4	3	2	2	2	0	0
Taste	7	5	4	4	2	1	1	1	0
Aroma	5	8	3	4	1	2	1	1	0
Appearance	5	6	5	3	2	2	1	1	0
Texture	10	4	3	3	2	1	2	0	0
Acceptance	12	6	3	2	1	1	0	0	0

Table: 6 Sensory Evaluation of Italian Focaccia

Criterion	Like Extremely	Like Very Much	Like Moderately	Like Slightly	Neither Like Nor Dislike	Dislike Slightly	Dislike Moderately	Dislike Very Much	Dislike Extremely
Colour	3	3	5	4	6	3	2	0	0
Taste	11	3	5	2	1	1	1	1	0
Aroma	12	6	3	2	1	1	0	0	0
Appearance	10	4	3	3	2	1	2	0	0
Texture	2	7	6	4	5	0	2	0	0
Acceptance	14	2	2	2	2	1	1	1	0

Figure 1. Focaccia with Indian Borage

Focaccia with Indian Borage:

As the table 4. Demonstrates the feedback of culinary experts based on hedonic scale and proves that this focaccia bread prepared with the combination of Indian borage and Long pepper shows a positive response in terms of acceptability. Furthermore, in fig 2. A sensory evaluation of focaccia bread prepared with the combination of Indian borage exhibits the overall acceptance from culinary experts compared with a traditional focaccia prepared with oregano and basil, which is in practice, this proves focaccia prepared with Indian borage is almost satisfying the consumer requirement in terms of taste, color and texture, whereas the aroma is little lesser in comparing to the focaccia prepared with oregano and basil.

The consumption of focaccia is healthier when it is consumed in regular basis as it is prepared with wheat flour, in addition an Indian borage has given a medicinal significance for respiratory ailments as well as in treating cough. Thus adding India borage will be a better option for making focaccia.

Figure 2. Focaccia with Indian Borage and Long Pepper

Focaccia with Indian Borage and Long Pepper:

Indian borage and long pepper mostly used for making Ayurveda and siddha medicines for its antiviral and antibacterial property and it is a good option to add in daily food, as well for making recipes with garnish and as a mix with long pepper for more health benefit to the individuals who suffers with viral disease and cough. Long pepper gives a close taste of regular pepper corns adding it along with borage will enhance the aroma and taste. The results of survey questioner based on 9 points hedonic scale at table 5. Has proved acceptable, which is exhibited in fig 2. That is proving the acceptance on taste, appearance, color and aroma better than a focaccia prepared with only Indian borage, thus making focaccia bread with the addition of Indian borage and long pepper not only improve the medicinal value of the food, it also gives a better aroma and taste comparatively.

Combining long pepper with focaccia will assist in curing those who suffer from upper respiratory issue with sinusitis, cough, sore throat, intake of this particular dish in regular basis is worthy as it is loaded with fiber, vitamins and medicinal value. The fig 2. Validates the focaccia bread with Indian borage and long pepper has obtained higher overall acceptance based on sensory evaluation.

Focaccia Bread:

Focaccia is a flat bread baked in oven along with various spices and herbs in Italian food preparation, the ingredients may vary according to the type of focaccia like “Focaccia al rosmarino”, only rosemary sprinkled on top and some may also prepared with cheese and herbs topping, whereas the dough prepared in similar way to prepare pizza.

The fig.3 shows the evaluation done with taste, aroma, texture, in comparison with the focaccia by the results obtained in table 6. Validates better response in comparison with the focaccia prepared with Indian borage and also with long pepper, here the regular focaccia has it unique taste in association with the results obtained in table 4 and table 5, as well it also displays a good overall acceptance. However consuming focaccia with Indian borage provides a greater chemical composition to fights against respiratory disease.

Figure 3. Italian Focaccia with Rosemary

CONCLUSION:

The *Plectranthus amboinicus* and *Piper longum* are used to treat cough, sore throat and upper respiratory diseases by Ayurveda and siddha from ancient times. The phytochemical composition of these herbs are having strong significance in curing antiviral and antibacterial diseases and it is also used as a traditional medicine to cure upper respiratory ailments in Ayurveda and siddha²⁰. The sensory evaluation results determined that, adding *Plectranthus amboinicus* and *Piper longum* with focaccia bread will be a healthier substitute for those who have cough, sore throat, and other upper respiratory issues, it can be consumed in regular intervals to treat this symptoms. The phytochemicals thymol present in monoterpenoid of Indian borage and the alkaloid piperine in long pepper substantiates the evidence on curing upper respiratory ailments. Even though an Italian focaccia has obtained maximum satisfactory level of culinary experts on aroma and taste, the focaccia bread prepared with Indian borage and Long pepper has similar features in comparison. Thus, preparing focaccia with Indian borage and long pepper has increased the medicinal value in diet.

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CONFLICT OF INTERESTS:

There is no conflict of interests.

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