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Antioxidant Activity of *Centella asiatica* and Its Compatibility in Breakfast Foods

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Abstract
With recent advances in medical and nutrition sciences, natural products and health-promoting foods have received extensive attention. Nutritional studies are now focusing on the examination of foods for their protective and disease preventing potential, instead of negative attributes such as micro-organism count, adulterants, fatty acids and inorganic pollutant concentration. The present study was carried out with the purpose of evaluating the antioxidant and antimicrobial activity of *Centella asiatica* and its compatibility in breakfast foods. *C asiatica* leaves were dried and evaluated for the antimicrobial activity by well diffusion method. In addition, antioxidant assay namely DPPH and phytochemical analysis were checked. It was incorporated in to three ready to cook breakfast foods including Atta, wheat flour(refined) and rava and products namely poori, chapathi and upuma were prepared and subjected to sensory analysis. The most acceptable proportion along with the standard was analysed for nutrient content. An attempt was made to create awareness on the leaves incorporated breakfast foods among elderly. *C asiatica* shows antimicrobial activity in ethanol methanol and water extracts. The leaves powder possesses radical scavenging activity and the phytochemical analysis showed that a positive result of flavonoids phenols and alkaloids. The incorporation of leaves powder does not affect the sensory qualities of the breakfast product. The *C asiatica* incorporated breakfast foods had a welcoming response among elderly. *C. asiatica* is potential herb with an array of health-care applications. More studies are required to characterize and establish the chemical compounds responsible for a wide range of therapeutic activity.

Keywords
Centella asiatica, antimicrobial activity, antioxidant assay, breakfast foods, popularization.

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INTRODUCTION
Plant-based drug discovery has drawn the attention of researchers, especially the one used as traditional medicines. *Centella asiatica* is traditional Ayurveda medicine widely used in India and across Asia for treating a variety of diseases. The aerial parts and roots are used for medicinal purpose, and its chemical constituents have wide therapeutic applications in areas of antimicrobial, anti-inflammatory, anticancer, neuroprotective, antioxidant, and wound healing

activities. Many of its uses have been proven scientifically, and bioactive ingredients have been validated [1]. The present study was carried out with the purpose of evaluating the antioxidant and antimicrobial activity of *Centella asiatica* and its compatibility in breakfast foods.

MATERIALS AND METHODS

Preparation of *Centella asiatica* leaves Powder:

Centella asiatica is a valuable medicinal herb. Fresh leaves of *Centella asiatica* can be blanched and dried for purpose of making product that can be preserved long time. The method of preparation [2] of *C asiatica* powder is given in Graph 1.

Graph 1

Powder preparation of *Centella asiatica* leaf

Matured *Centella asiatica* leaves

Cleaning/Washing

Blanching (85˚C for 30 sec)

Drying (75˚C for 3hrs)

Powdering

Antimicrobial Activity of Centella asiatica leaves powder:

The powdered *centella asiatica* leaves are checked for its antimicrobial activity by well diffusion method. Antimicrobial property can be determined by mixing the powder with a solvent. The solvent can be ethanol, methanol and water. The microbes used for testing of antimicrobial activity are *Ecoli, Pseudomonas aerogenosa, Staphylococcus aureus, Klebsiella pneumoniae.*

Antioxidant activity of Centella asiatica leaves powder:

The human body naturally produces free radicals and the antioxidants to counteract their damaging effects. However, in most cases, free radicals far outnumber the naturally occurring antioxidants. In order to maintain the balance, a continual supply of external sources of antioxidants is necessary in order to obtain the maximum benefits of antioxidants. Antioxidants benefit the body by neutralizing and removing the free radicals from the bloodstream[3]. Antioxidant assay is done for *centella asiatica* leaves flour by using the method DPPH assay and by phytochemical analysis.

Formulation of Breakfast foods:

A typical daily dose of *Centella asiatica* reported was approximately 600 mg of dried leaves or infusion, single-dose capsules (300 mg to 680 mg), a 10-mg concentrated extract, also available in capsules [4].

The details regarding varying proportions of *Centella asiatica* leaf powder incorporated in Atta, Wheat flour(refined) and Rava is given in Table I.

Table I

Varying proportion of *Centella asiatica* leaves powder incorporated in Atta, Wheat flour(refined) and Rava

S.No	Variations	Atta/Wheat flour/Rava	*Centalla asiatica* leaves powder
1	Standard	100g	-
2	Sample A1/A2/A3	100g	150mg
3	Sample B1/B2/B3	100g	300mg
4	Sample C1/C2/C3	100g	450mg
5	Sample D1/D2/D3	100g	600mg

The composite blends formulated as per Table I was subjected to sensory analysis by preparing to respective breakfast items namely Chapathi (Atta) Poori (Refined Wheat flour) and Upma (Rava) to select the most acceptable proportion.

Selection of Most Acceptable Proportion

Three different breakfast products namely Poori, Chapathi and Upuma incorporated with *Centella asiatica* leaves powder in four different proportions and were subjected to sensory analysis

The breakfast foods were subjected to sensory evaluation by trained panel of 10 members of sensory panels. The score card used for the present study was based on 5-point hedonic scale with the criteria namely appearance, color, flavor, texture and taste. The standard along with four different variations of *centella asiatica* leaves powder incorporated breakfast foods were prepared, coded and subjected to sensory analysis

Nutrient Analysis:

Standard and selected proportion of *Centella asiatica* incorporated breakfast foods were analysed for the nutrients including Energy, Protein, Fat and Carbohydrate.

Popularization

Popularization of Nutraceutical breakfast products was done among 30 old age persons. An awareness session on health benefits of *C asiatica* was done and then the score cards along with standardized products were distributed. The scores obtained them were consolidated.

RESULTS AND DISCUSSION

Antimicrobial Activity of *Centella asiatica* Leaves Powder:

In agreement with the current trend of giving value to natural and renewable resources, the use of natural antimicrobial compounds, particularly in food and biomedical applications, becomes very frequent. (Lucera et.al., 2012). The details regarding antimicrobial activity of *Centella asiatica* leaves powder is given in Table II.

Table II

Antimicrobial Activity of *Centella asiatica* Leaves Powder

Plant extract	*Escherichia coli*	*Pseudomonas aerogenosa*	*Staphylococcus aureus*	*Klebsiella pneumonia*
Ethanol	14mm	6mm	6mm	9mm
Methanol	12mm	8mm	10mm	10mm
Water	6mm	4mm	6mm	8mm

From the above Table, it is observed that ethanol and methanol extracts showed good antimicrobial activity than water extract.

Antioxidant Activity of Centella asiatica Leaves Powder:

The DPPH assay of *centella asiatica* leaves powder was studied in which the result showed that the presence of radical scavenging activity. The details regarding Phytochemical analysis of *Centella asiatica* leaves powder is given in Table III.

Table III

Phytochemical Analysis of *Centella asiatica* Leaves Powder

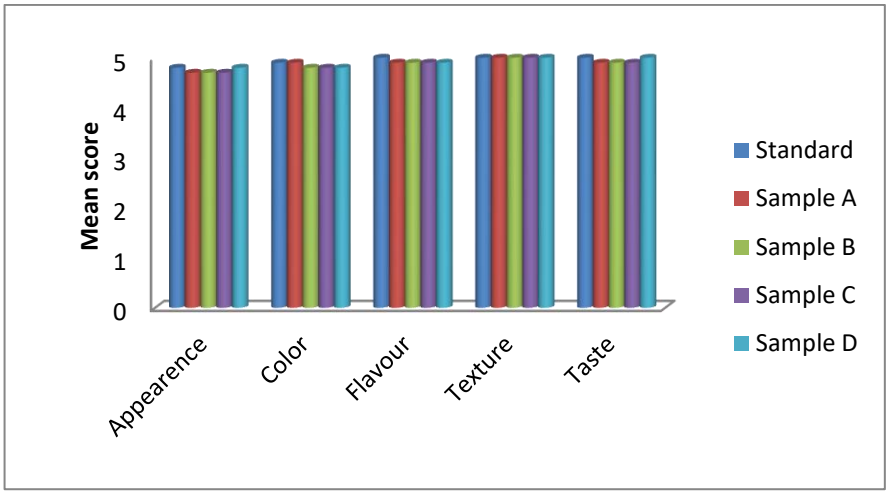
S.No	Secondary metabolites	Ethanol	Methanol	Chloroform	Water
1	Alkaloides	+	+	+	+
2	Flavanoids	+	+	+	+
3	Saponins	–	–	–	–
4	Phenols	+	+	+	+

The presence of phytochemicals namely alkaloids, phenols and flavanoids were identified in the solvent extracts.

Sensory Evaluation of Standard and Centella asiatica Leaves Powder Incorporated Breakfast Foods

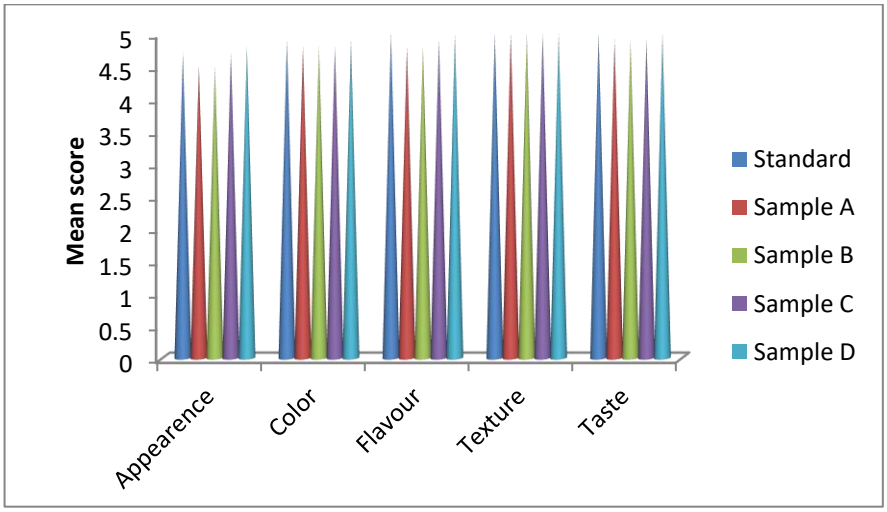
Graph 2

Mean Score for Sensory Analysis of Poori



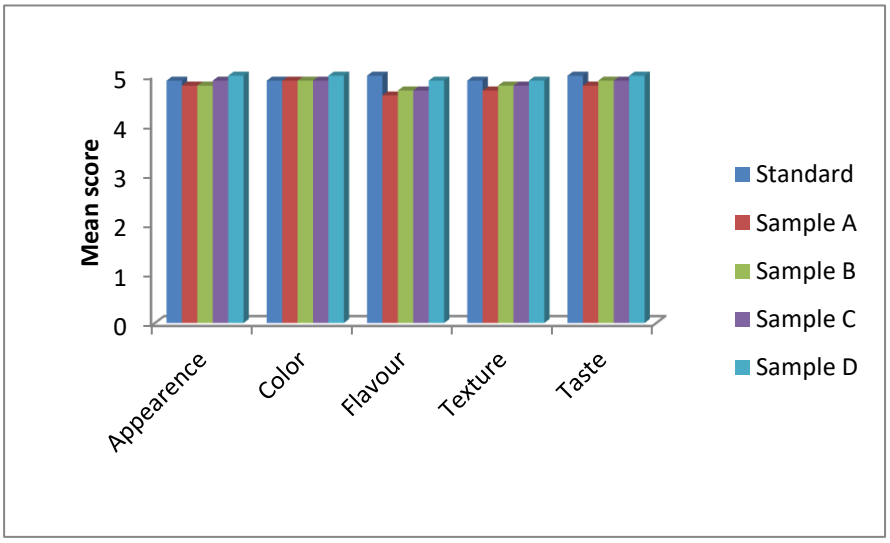
Graph 3

Mean Score for Sensory Analysis of Chappathi



Graph 3

Mean Score for Sensory Analysis of Upuma



From the sensory analysis 600mg of centella leaf powder incorporated breakfast foods were selected as best product.

Nutrient Analysis of Nutraceutical Breakfast Foods

The details regarding nutrient content of standard and *C asiatica* incorporated breakfast foods is given in Table IV.

Table IV

Nutrient analysis of *Centella asiatica* incorporated Breakfast foods

S.NO	NUTRIENTS (per 100g)	Atta		Wheat Flour (refined)		Rava	
		Std	Sample	Std	Sample	Std	Sample
1	Energy (K Cal)	374.19	376.45	389.67	392.03	360.16	362.34
2	Protein(g)	7.40	7.45	8.62	8.68	8.12	8.17
3	Carbohydrate(g)	78.43	78.91	81.62	82.12	79.29	79.77
4	Fat(g)	2.85	2.85	2.57	2.57	0.53	0.53

From the above Table, it is observed that there is a negligible increase in the nutrients like protein and carbohydrates on incorporation of *C asiatica*.

Popularisation study

Table V

Mean Sensory Score for *Centella asiatica* incorporated breakfast foods on popularization among Selected Elderly Subjects

S No	Criteria	Max Score	Overall Acceptability
1	Poori	5	4.66
2	Chappathi	5	4.66
3	Upma	5	4.8

The *C asiatica* incorpord breakfast foods had a welcoming response among the selected elderly subjects

SUMMARY AND CONCLUSION

From the present study it can be concluded that, the selected *centella asiatica* leaves powder possess the antimicrobial activity. The addition of *Centella asiatica* leaves powder in breakfast foods did not change the sensory qualities of the breakfast foods. The product can be stored for two and half month time period without any spoilage because of the antimicrobial property. The *centella asiatica* leaves powder incorporated breakfast foods were accepted by the old age people.

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