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Nutritional Analysis of *Paratha* prepared from Dehydrated Brahmi (*Centella asiatica*)

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Abstract

The present study was carried out with the objective to develop value added food product by incorporating dehydrated *brahmi* leaves with wheat and gram flour as well as to evaluate organoleptic quality, to determine nutritive value of prepared food products. Chemical analysis of dehydrated leaves for moisture ash, protein, fat, carbohydrate and energy were determined using the standard procedure of **AOAC, 2007**. Value added food product *Paratha* was made by using dehydrated leaves with proportion distributed 97:3, 96:4, 95:5 referred as T_1, T_2 and T_3 and control T_0 was prepared without the incorporation of dehydrated leaves. The data obtained during the study were analyzed statistically using analysis of variance (ANOVA), critical difference (C.D.) techniques and t-test. Results shows that dehydrated *Brahmi* leaves contains 13.9percent moisture,1.95percent ash, 13.5g protein, 2.3g fat, 68.3g carbohydrate, 348kcal energy,13.8mg iron, 189mg calcium and 26600µg total carotene. On the basis of sensory evaluation, treatment T_1 of prepared products was found to be most acceptable as compared to other treatments. Nutritionally, it was found that the nutrients content of best treatment T_1 of both the products, were significantly higher with regards to calcium, iron, total carotene as compared to the control T_0 due to the incorporation of dehydrated *brahmi* leaves. It is concluded that dehydrated *Brahmi* leaves can be successfully incorporated in the preparation of the value added food product.

Keywords: *Centella asiatica*, Dehydration, Micronutrients, *brahmi*, malnutrition, feasible

Introduction

Green Leafy Vegetables are rich sources of calcium, iron, β- carotene, vitamin C, dietary fiber and many trace minerals. There is a need to preserve the nature's storehouse of nutrients through convenient processing techniques. The most serious constraint for shelf-life enhancement is the activity of micro-organisms. Water in food is reduced to a very low level during dehydration, thus achieving better microbiological preservation and retarding many undesirable reactions during storage **(Ibarz and Barbosa-Canovas, 2000)**, owing to the reduction in water activity. Dehydration is the simplest method for preserving green leafy vegetables. Vegetable dehydration is generally done either for preserving the perishable raw commodity against deterioration or to reduce the cost of packaging, handling, storing and transporting. Green leafy vegetables are dehydrated so that it provides a concentrated source of micronutrients and can be a food-based approach to combat the micronutrient deficiencies, which is prevalent in our populations, especially during seasons of their non-availability. Dehydrated green leafy vegetables can be incorporated into traditional products at the household level or can be utilized in the formulation of processed foods at the industrial level. Value addition of food products with dehydrated green leafy vegetables can be advocated as a feasible food based approach to combat micronutrient malnutrition which is prevalent in our populations, especially during seasons of their non-availability **(Gupta *et al.*, 2011)**.

Centella asiatica (L.) is a tropical medicinal plant from Apiaceae family native to Southeast Asian countries such as India, Sri Lanka, China, Indonesia, and Malaysia as well as South Africa and Madagascar. It is a perennial, herbaceous creeper with kidney shaped leaves commonly found. *Centella asiatica*, commonly known as "Gotu kola, Asiatic pennywort, Indian pennywort, Indian water navelwort, wild violet, and tiger herb" in English, is a tropical plant. ***Centella asiatica L.*** is important herbal medicinal plant used for various applications **(James and Dubery, 2009)** and used in Indian Ayurvedic medicine as a nerve tonic **(Singh *et al.*, 2008)**. The use of *Centella* in food and beverages has increased over the years basically due to its health benefits such as antioxidant **(Pitella *et al.*, 2009)**, as anti-inflammatory **(Duke, 2001),** wound healing **(Kimura *et al.*, 2008)** memory enhancing property **(Singh *et al.*, 2008)** and many others. The potential of *Centella* as an alternative natural antioxidant especially of plant origin and its protection against age-related changes in brain antioxidant defense system, have notably

increased in recent years **(Subathra *et al.*, 2005)**. Free radicals have been claimed to play an important role in ageing process and capable of damaging many cellular components **(Gulcin *et al.*, 2003)**. *Centella asiatica* is a medicinal plant with pharmacological effects which favours for human health. The demand of the *Centella asiatica* is rise due to its health benefits and the phytochemicals presence. These phytochemicals are good source of antioxidant. Antioxidants present in leaves refer to positive influences on oxidative stress parameters which eliminates free radicals and hence promotes health benefits. Along with this its wide pharmacological activities show improvement in brain and neuroprotection effect. Centella is also commonly used for making herbal tea whereby the infusion is made by pouring a cup of boil water over the Centella materials either using dried Centella or fresh materials, letting it brew a few minutes before drinking. The Centella herbal tea can be prepared either using a mixture of many different herbal plants or a single plant. It is believed the Centella herbal tea is considered as source of antioxidant activities and it has many beneficial effects **(Naithani et al., 2006; Huda-Faujan et al., 2007)**. It is a common practice to process Centella into many products. These Centella based products are available in many forms such as powder, infusion, soluble and extract of fresh and dried plants. One of the processed products is Centella herbal drink, whereby the demand for this product is on the rise due to its health benefits and the phytochemicals presence (Kormin, 2005). Nutrient content of fresh *Centella asiatica* leaves per 100 g are 37 kcal calories, 391mg potassium, 171mg calcium, 2.0g protein, 6.7g carbohydrate, 0.2g fat, 87.7g moisture, 1.6g crude fiber, 1.8g ash. Other nutrients present in leaves per 100g are 32.0mg phosphorus, 5.6mg iron, 21mg sodium, 48.5mg vitamin C, 0.1mg niacin, 2649µg carotene, 442µg vitamin A **(Tee *et al.*, 1997).**

Methodology

The present study was conducted in the Nutrition Research Laboratory of the Department of Food Nutrition and Public Health, Ethelind College of Home Science, Sam Higginbottom University of Agriculture, Technology & Sciences, Allahabad-211007, U.P. The main ingredient ***Centella asiatica*** leaves were procured from the local market of Ranchi and the other ingredients wheat flour and gram flour were procured from the local market of Allahabad.

Dehydration of selected leaves

The dehydration of *Centella asiatica* leaves was done under the procedure given by **Srivastava and Kumar (2009)**.

Chemical analysis

Moisture, fat and ash of dehydrated *Centella asiatica* leaves were estimated by standard methods **(AOAC 2007)**. Total iron was analyzed by colorimetric method using α – α bipyridyl **(AOAC 2007)** and calcium by the method of **AOAC (2007)**. The carbohydrate was calculated by difference. Carbohydrate = 100-(% moisture + %fat + %protein + %ash). Protein estimation is done by the method developed by **Lowry *et al*. (1951).** Total carotene was extracted in acetone and estimated colorimetrically **(Ranganna 2001)**.

Formulation and preparation of food products

The product *Paratha* was prepared with the incorporation of dehydrated *Centella asiatica* leaves. The basic recipes were served as T_0. Each recipe had three variations T_1, T_2 and T_3 respectively; whereas the amount of one or more ingredients was varied on the basis of acceptability and the whole experiment was replicated three times. The evaluation was done according to the 9 point Hedonic scale based score card **(Srilakshmi, 2015)** under the supervision of five selected sensory panelist member from department. The nutrient content of the value added food products was calculated with the help of food composition table given by **Gopalan *et al.*, (2011)** as well as the nutritive value of leaves obtain by chemical analysis. Cost of the prepared products was calculated taking into account the cost of individual raw ingredients used in the preparation of food products as the prevailing market price.

Table 1 Details of Control and Treatments for value added products

Ingredients	Control	Treatments		
	T_0	T_1	T_2	T_3
Main ingredient (%)	100	97	96	95
Dehydrated *Centella asiatica* leaves	-	3	4	5

Statistical analysis

The data was analyzed by using ANOVA, CD and other appropriate statistical analytical methods **(Banerjee, 2004)**.

RESULTS AND DISCUSSIONS

Nutritional composition of dehydrated *Brahmi* leaves

The nutritive value of dehydrated *Brahmi* leaves (per 100 g) obtained by chemical analysis which are as follows – moisture content was found to be 13.9percent, ash content was found to be 1.95percent, protein content was found to be 13.5g, fat content was found to be 2.3g, carbohydrate content was found to be 68.3g, calcium content was found to be 189mg, iron content was found to be 13.8mg, total carotene was found to be 26600µg and energy was found to be 348kcal.

In support of nutritional composition of dehydrated *brahmi* leaves was also reported by **Gupta *et al.*, (2011)** the dehydrated *Centella asiatica* leaves contains moisture 7.9percent, fat 0.4percent, ash 2percent, iron13.97mg and calcium 178.9mg.

Table 2 Nutritional composition of the dehydrated *Brahmi* leaves per 100g.

Nutrients (per100g)	Amount
Moisture (%)	13.9
Ash(%)	1.95
Protein (g)	13.5
Fat (g)	2.3
Carbohydrate(g)	68.3
Energy(kcal)	348
Iron (mg)	13.8
Calcium (mg)	189
Total carotene (µg)	26600

Sensory Analysis

Paratha

Paratha was prepared by incorporation of dehydrated *brahmi* leaves and wheat flour in proportion of treatments T_1 (97:3), T_2 (95:5), T_3 (96:4) and control T_0. In relation with sensory attributes indicates that T_1 had the highest score followed by T_2, T_0, T_3.

Figure 1 *Paratha* prepared by incorporation of *Centella asiatica* with wheat flour.

Table 3 Average sensory score of different parameters in control and treated sample of *Paratha.*

Control and treatment	Colour and appearance	Body and texture	Taste and flavour	Overall acceptability
T_0	7.5 ± 0.1	7.5 ± 0.1	7.5 ± 0.05	7.5 ± 0.08
T_1	8.2 ± 0.2	8.2 ± 0.1	8.1 ± 0.1	8.1 ± 0.08
T_2	7.8 ± 0.2	7.6 ± 0.05	7.6 ± 0.05	7.6 ± 0.1
T_3	6.9 ± 0.05	6.8 ± 0.1	6.6 ± 0.08	6.7 ± 0.05
F tab	4.76	4.76	4.76	4.76
F cal	5.8	12.3	26.6	35
C.D	0.78	0.54	0.41	0.34

S= Significant, NS = Non Significant (P ≤0.05)

Nutritive value of the prepared products (*per* 100g)

Nutritive value of *Paratha* revealed that highest moisture content was found in T_3 (12.28g) followed by T_2 (12.26g), T_1 (12.24g) and T_0 (12.2g). Ash content was highest in T_3 (1.42g) followed by T_2 (1.41g), T_1 (1.408g) and T_0 (1.4g). Protein content was highest in T_3 (12.16g) followed by T_2 (12.15g), T_1 (2.13g) and T_0 (12.1g).Fat content was highest in T_0 (2.5g) followed by T_3 (2.48g), T_2 (2.4g) and T_1 (1.71g). Carbohydrate content was found highest in T_0 (69.4g) followed by T_1 (69.35g), T_2 (69.35g) and T_3 (69.34g). Energy was found highest in T_0 (364kcal) followed by T_1 (364kcal), T_2 (363kcal) and T_3 (363kcal). Calcium content was found highest in T_3 (55.05mg) followed by T_2 (53.64mg), T_1 (52.23mg) and T_0 (48mg). Iron content was highest in T_3 (5.34mg) followed by T_2 (5.25mg), T_1 (5.16mg) and T_0 (4.9mg). Total carotene content was found highest in T_3 (1357.55µg) followed by T_2 (1091.84µg), T_1 (826.13µg) and T_0 (29µg).

Therefore, it can be observed that with increase in amount of dehydrated *brahmi* leaves in *paratha* the percentage of moisture, ash, protein, calcium, iron and total carotene increased.

According to **Hashim (2011)** the best formulation for the noodle was found to be addition of 10percent Centella extract, 5g of salt and 5g of sodium hydroxide. This formulation provides the best sensory acceptance and highest presence of flavonoids.

Table 4 Average nutrients content in control and treatments of *Paratha* per 100g.

Nutrients	Control (T0)	Treatment (T1)	Treatment (T2)	Treatment (T3)
Moisture (g)	12.2	12.24	12.26	12.28
Ash (g)	1.4	1.408	1.41	1.42
Protein (g)	12.1	12.13	12.15	12.16
Fat (g)	2.5	1.71	2.4	2.48
Carbohydrate(g)	69.4	69.35	69.35	69.34
Energy (kcal)	364	364	363	363
Calcium (mg)	48	52.23	53.64	55.05
Iron (mg)	4.9	5.16	5.25	5.34
Total carotene (µg)	29	826.13	1091.84	1357.55

On the basis of the findings, it is concluded that dehydrated *Brahmi* leaves can be successfully incorporated in the preparation of the value added food product such as *Paratha.*

Nutritionally, it was found that the nutrients content of best treatment T_1 of the *paratha*, were significantly higher with regards to calcium, iron, total carotene as compared to the control T_0 due to the incorporation of dehydrated *brahmi* leaves.

Conclusion

According to the sensory evaluation, treatment T_1 of the product *paratha* got highest score among the following treatments. This proportion was found to be 97:3 was perfect in all means of sensory perceptions. On the basis of nutritional analysis it was found calcium, iron, total carotene of the best treatment T_1 was higher in comparison to the control T_0 due to the incorporation of dehydrated *brahmi* leaves. With this conclusion, it was found that incorporation of dehydrated *brahmi* leaves are useful in improving micro nutrient deficiencies and helpful in wound healing property and effective for human health.

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