



Organoleptic and nutritional analysis of value added food products incorporation of lahsua leaves powder

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Abstract: This study an attempt was made to assess the organoleptic acceptability and nutritive value of value added food products prepared from the incorporation of less utilized dehydrated lahsua leaves which are usually discarded or are used as animal fodder. The lahsua (*Digera arvensis*) leaves powder was done through tray drying at 60- 65°C for 15 hours. The products prepared were biscuit and namakpare by incorporation of dehydrated lahsua leaves powder at 15, 20, 25% and served as treatments T₁, T₂ and T₃ respectively. T₀ without incorporation of dehydrated lahsua leaves powder served as control. Organoleptic evaluation was carried out using the nine point hedonic scale and nutritional composition was calculated using the food composition table given by ICMR. On the basis of findings, it was observed that namakpare and biscuit T₁ (15 percent) was found to be best with regards to flavour and taste and overall acceptability. It was also observed that calcium, iron, protein and total carotene content in prepared products increased significantly as the incorporation levels increased. Thus dehydrated Lahsua leaves powder can be incorporated in the preparation of different food products to improve their nutrient contents.

Key words: *Digera arvensis*, Incorporation, Nutritional composition, Organoleptic acceptability

Introduction

Malnutrition can be tremendously reduced with an increase use of foods rich in energy, proteins, iron and vitamins, most especially those from the rural environment. In order to have a healthy population that can promote development, the relation between food, nutrition and health should be reinforced (Yisa *et al.*, 2010). Underutilized plant species have a potential not fully exploited to contribute to food security and poverty alleviation. Promotion of their use should be done in a sustainable fashion. Green leafy vegetables are basically any part of a plant is it leaves roots, seeds or fruits that can be eaten. This food of plant origin contains many bioactive compounds and thus serves as an important source of minerals, vitamins and certain hormone precursors in addition to protein and energy sources. Micronutrient malnutrition poses a serious threat to the health of vulnerable groups of population. Among the plant foods green leafy vegetables are the cheapest and locally available food, rich in micronutrients. Lahsua (*Digera arvensis*) is found to be underutilized leafy vegetables in Northern India. In the present study was observed that underutilized green leafy vegetables which are equally nutritious to any other traditional green leafy vegetables can be incorporated in daily dietaries. *Lahsua (Digera arvensis)* herbs are distributed throughout India and are commonly seen after rains especially in the eastern and northern provinces of India. It has an impressive range of medicinal uses with high nutritional value. Different parts of this plant contain a profile of important minerals, and are a good source of protein, vitamins, beta-carotene, amino acids and various phenolics (Seshadri and Nambiar, 2003). Micronutrient malnutrition poses a serious threat to the health of vulnerable groups of population. Among

the plant foods green leafy vegetables are the cheapest and locally available food, rich in micronutrients. Leafy vegetables are dense in micronutrients, and are of great importance to the nutrition of population in developing countries. Nutritive value of commonly consumed leafy vegetables has been studied extensively, but there is very less information available on nutritive value of unconventional leafy vegetables (Neeta and Usha, 2014). Lahsua (*Digera arvensis*) and Pakar (*Ficus infectoria*) are found to be underutilized leafy vegetables in Northern India. In the present study was observed that underutilized green leafy vegetables which are equally nutritious to any other traditional green leafy vegetables can be incorporated in daily dietaries (Gupta *et al.*, 2010).

Material and Method

The investigation was conducted in the Nutrition Research Laboratory, Department of Foods and Nutrition, Ethelind School of Home Science, SHIATS, Allahabad.

Procurement of raw materials: Underutilized fresh leaves of the Lahsua (*D. arvensis*) were procured from the field of villages nearby the SHIATS, Allahabad. The raw materials for the recipe development were purchased from the local market of Allahabad district. Only the fresh and sound leaves were collected. These leaves were washed with the help of clean water so as to remove the dirt and other disease causing organisms.

Processing of the Sample: The leaves were thoroughly washed in water 2- 3 times to remove the adhering dust and impurities and were dried in tray drying at 60-65°C for 15 hours, powdered and stored in airtight containers and storage at ambient temperature in dry place (Srivastava and Kumar 2009).

Development of value added food products: Two products were prepared with the incorporation of dehydrated Lahsua leaves powder namely Namakpare and biscuit. For each product, the basic recipes (control- T_0) have three variations T_1 , T_2 , T_3 respectively where the amount of *Lahsua* leaves powder were varied.

Organoleptic evaluation: Sensory evaluation of the food products for their acceptability was done by a panel of 5 judges. The panel members were instructed about the product and its characteristics. Panel members were selected based on their performance in initial evaluation trials. Sensory descriptors of the samples were colour and appearance, taste and flavour, body and texture and overall acceptability. There are five numbers of judges for the sensory evaluation. The nine point hedonic scale was used for sensory evaluation (Srilakshmi, 2007).

Nutritive value of the value added food products developed by lahsua leaves powder: The nutritive value of the control and value added food products incorporation of Lahsua leaves powder was calculated following I.C.M.R. pattern of calculation using the value per hundred gram of each raw ingredient from the book of Nutritive value of Indian Foods (Gopalan 2007).

Statistical analysis: Analysis of variance technique (ANOVA) and critical difference were used to analyze the data (Gupta *et al.* 2002).

Results and Discussion

Organoleptic evaluation of value added food products: In case of biscuit, T_1 (5%) scores the best with regard to all sensory characteristics viz. colour and appearance (8.3), body and texture (8.1), taste and flavour (8.1) and overall acceptability (8.13). In

namakpare, T_1 (5%) scores the best with regard to all sensory characteristics viz. colour and appearance (8.5), body and texture (8.5), taste and flavour (8.5) and overall acceptability (8.5) (Table-1). The result is supported by Gupta *et al.* (2010) also developed recipes. In *mathri* 15% level of dehydrated Quail grass leaves in *mathri* was highly acceptable and the score for overall acceptability was 8.3 ± 0.18 .

Nutritional composition of value added products: Using the *Lahsua* leaves powder the two value added products were prepared and to analyze the proximate composition, minerals and total carotene content. Nutritive value of prepared product namely *namakpare* and *biscuit* (Table-2) incorporated with lahsua leaves powder as total carotene, calcium and iron were increased in the prepared product as compared to control.

Protein content: Protein content of selected products ranged between 9.1 to 15.08 g/100g. According to increasing level of incorporation of lahsua leaves powder, protein content of the sample was highest in *biscuit* (15.08g/100g) followed by *Namakpare* (10.9g/100g) value of the product (Table 2). *Biscuit* has the highest content of protein is because of the addition of milk. Milk contains the highest amount of protein. Similar study was also done by Shanthala *et al.* (2005) on acceptability of curry leaves powder. Protein content was found in biscuit (10.0g/100g) with the incorporation of dehydrated curry leaves powder. Similar study was done by Rana (2013) in which protein content was found 7.5 ± 0.06 g/100g protein in *mix vegetable* prepared by incorporation of curry leaves.

Carbohydrate and energy content: Carbohydrate content of the developed product was found to be in the range of 52.60 to

Table-1: Average sensory scores of different parameters in control and treated sample of prepared products with lahsua leaves powder

Treatments	Namakpara				Biscuit			
	Colour	Texture	Taste	Overall acceptability	Colour	Texture	Taste	Overall acceptability
T_0	7.8±0.2	7.5±0.23	7.5±0.23	7.5±0.06	8±0.20	8.1±0.21	8.2±0.08	8.0±0.15
T_1	8.5±0.05	8.5±0.14	8.5±0.05	8.5±0.7	8.3±0.12	8.1±0.2	8.1±0.23	8.13±0.18
T_2	8.4±0.1	8.2±0.05	8±0.10	8.2±0.06	8.1±0.17	7.9±0.2	8.1±0.19	7.9±0.13
T_3	6.9±0.3	6.8±0.38	6.6±0.40	6.8±0.27	7.8±0.10	8.1±0.2	7.8±0.31	7.87±0.17

Table-2: Mean nutrient compositions (in g) of the products developed by incorporating *Lahsua* leaves powder (per 100 g)

Treatments	Namakpara					Biscuit				
	Protein	Fiber	Fat	Carbohydrate	Energy	Protein	Fiber	Fat	Carbohydrate	Energy
T_0	9.1±0.08	1.80±0.005	5.85±0.03	73.22±0.46	393±0.40	13.11±0.08	0.27±0.004	10.2±0.09	98.97±0.29	462.1±0.35
T_1	9.4±0.10	1.95±0.01	5.3±0.18	65.70±0.62	360±2.3	13.4±0.16	1.21±0.008	9.1±0.08	88.13±0.14	410.2±0.25
T_2	10.1±0.09	2.26±0.02	5±0.14	59.5±0.63	335±0.86	14.13±0.07	1.55±0.02	8.1±0.06	84.2±0.16	392.3±0.5
T_3	11.1±0.13	3.18±0.13	4.7±0.25	52.60±1.12	303±1.6	15.08±0.05	1.71±0.009	7.1±0.08	80.38±0.28	375.2±0.19

Table-3: Mineral contents of the products prepared by the incorporating *Lahsua* leaves powder (per 100 g)

Mineral	Treatments (Namakpara)				Treatments (Biscuit)			
	T_0	T_1	T_2	T_3	T_0	T_1	T_2	T_3
Iron (mg)	2.3±0.1	22.8±0.07	26±0.05	33±0.11	1.72±0.03	24.1±0.01	28.7±0.03	35.4±0.05
Calcium (mg)	22±0.7	335.2±0.11	435.7±0.12	540±0.46	359.3±0.5	431.9±0.35	456.2±0.4	580±0.06

Table-4: Total carotene of the products prepared by the incorporating *Lahsua* leaves powder (per 100 g)

carotene	Treatments (Namakpara)				Treatments (Biscuit)			
	T_0	T_1	T_2	T_3	T_0	T_1	T_2	T_3
	2512±0.02	2962±0.02	3009±0.13	3540±0.1	2945±0.07	3700±0.1	4230±0.11	4600±0.06

In all tables: ± Standard deviation

80.38 g/100g. According to increasing level of incorporation of lahsua leaves powder, Biscuit shows the highest carbohydrate (83.38 g/100g) and lowest was *namakpara* (52.60g/100g) (Table-2). The same study on the content of carbohydrate was also reported by Gupta *et al.* (2010) on many types of underutilized green leafy vegetables. Energy values ranges from 303 to 462.1 Kcal/100g (Table-2). The maximum energy values were observed in *biscuit* which has energy rich ingredients like refined flour, sugar and oil. Similar study was also carried by Nath *et al.* (2005) on utilization of underutilized of dehydrated ane greens. Energy content was found in laddoo (320kcal/100g) with the incorporation of dehydrated ane greens powder.

Iron content: Table-3 shows that iron value ranges from 2.3 to 35.4mg/100g. According to incorporation increasing level of incorporation of lahsua leaves powder, iron content was higher in *biscuit* 35.4mg/100g, followed by *Namakpare* i.e. 33mg/100g. In this analysis, an outstanding finding was made on iron content in the product developed by *Lahsua* leaves powder. Similar study was also done by Gupta *et al.* (2010) on many types of underutilized green leafy vegetables. Sharma and Dunkwal (2012) also reported that incorporation of dried spirulina powder to biscuit has shown significant increase in the nutritional content of the developed biscuit; especially the iron content of biscuit was dramatically increased from 2.62mg/100g to 17.62mg/100g from control to spirulina based biscuits. Gupta and Yadav (2009) reported that 8.68±0.74g/100g iron in *chilla* prepared by incorporation of *Pakar (ficus infectoria)* leaves.

Calcium content: According to increasing level of incorporation of *Lahsua* leaves powder, table-3 shows that calcium content was observed highest in the *biscuit* i.e. 580mg/100g and least in *Namakpare* 540 mg/100g because of the addition of the milk. Milk contains the highest amount of calcium and *Lahsua* leaves powder also a good source of calcium. Calcium with the name of “super nutrient” has been proven clinically associated with reduced risk of various non-communicable diseases such as osteoporosis (Nieves *et al.*, 2005) and it also helps to reduce colorectal cancer risk by promoting the apoptosis in human colorectal epithelium that reduce colorectal neoplasms (Fedirko *et al.*, 2009). Few researches have promoted the intake of plant-based diet such as soybean and green leafy vegetable as a source of calcium instead of dairy or animal products. This is because animal protein could increase bone loss and risk of fracture through promoting calcium excretion and acid-base metabolism (Park *et al.*, 2011).

Total carotene content: Table-4 shows that the range of total carotene in all the prepared products was 2512 to 4600 µg/100g. According to increasing level of incorporation of lahsua leaves powder, *Biscuit* was found to be highest in total carotene content i.e. 4600µg/100g. The result is supported by Indrani Dasappa *et al.* (2010) Effect of replacement of wheat flour with 5, 10 and 15% dried Moringa leaves on the rheological, micro structural, nutritional and quality characteristics of cookies was studied. Total carotene contents increased with increasing amount of dried Moringa leaves from 0 to 15%.

The present study recommends the prospect of more aggressive introduction and utilization of lahsua leaves by the food sector. It also implies that it may be worthwhile for industry to take up the production of lahsua leaf powder. Such promotion of lahsua

leaves incorporation into the diet in India and other countries could go a long way towards not only alleviating micronutrient deficiencies, but also towards the development of functional foods for several chronic degenerative disorders. These efforts could also be an additional source of income generation, employment and exports.

On the basis of findings, it can be concluded that the incorporation of *Lahsua* leaves powder in the prepared products increases the nutrient density or nutritional qualities. *Lahsua* leaves powder can be successfully incorporated in various products which are beneficial to health. The incorporation of levels of *Lahsua* leaves powder increased the value of iron, calcium and total carotene in all the two products. *Lahsua* leaves powder highly nutritious, being a good source of calcium, iron, fiber and high vitamins and minerals. Thus development of *Lahsua* leaves powder incorporated value added products increases their nutritive value and functional properties. To include in the daily diet of all age groups people to make healthy life.

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