



ANALYSIS OF NUTRITIONAL COMPOSITION AND ANTI-NUTRITIONAL FACTORS OF FRESH LEHSUA LEAVES (*DIGERA ARVENSIS*) AND ITS PRODUCTS DEVELOPMENT

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ABSTRACT

Digera arvensis is the most widely cultivated species of the genus Amaranth, which is the only genus in the family Amaranthaceae. English common names include: False amaranth, kanjaro, lehsua. The aim of the study is to find out the nutritional composition of the selected underutilized vegetables and to evaluate the sensory acceptability of the prepared products. Methods described by AOAC (2005) were used for the determination of nutritional composition of lehsua leaves. Leaves of Lehsua were incorporated into six conventional food products namely Roti, Daal, Khichadi, Besan Chakali, Vegetable crispy ball (Vegetable Pakoda) and Mathari at the level of 40, 60 and 80 percent into the various recipes. The formulated products were subjected to sensory analysis by panel members with the help of nine point hedonic scale. In 100 g of fresh lehsua leaves energy was 27 Kcal, ash 3.4 g, Moisture 91.3%, total carbohydrate 1.01 g, protein 4.51 g, fat 0.51 g, β - Carotene 923 μ g, iron 18.72 mg, oxalic acid 187 mg and phytate 110.1 mg. Result showed that the incorporation of Lehsua leaves in Roti, Daal, Khichadi, Besan Chakali, Vegetable crispy ball (Vegetable Pakoda) and Mathari was most acceptable with 60 percent followed by 40 and 80 percent. Hence it is concluded that Leaves of Lehsua, can be

successfully incorporated into different conventional food products and are helpful in improving the nutrients content of developed recipes.

Keywords: Underutilized vegetables, Nutritional composition, Sensory acceptability, Conventional food products

Introduction

False Amaranth is an annual herb, growing to 20-70 cm tall. It can be seen growing wild in waste areas. Stems are simple or branched from the base, nearly hairless. Leaf stalks are long, up to 5 cm, base is narrowed, and the tip pointed. Flowers are borne on slender spike-like racemes, which can be as large as 30 cm long. In India, the young leaves and shoots of False Amaranth are made into curries, or the entire plant is boiled and seasoned.

The present study was aimed to analyze the nutritional composition, anti-nutritional factors of the Lehsua (*Digera arvensis*) leaves, to prepare value added products using Lehsua (*Digera arvensis*) leaves and to evaluate the sensory acceptability of the prepared products.

Methodology

The present investigation was conducted in the Nutrition Research Laboratory, Department of Foods and Nutrition, Ethelind School of Home Science, Sam Higginbottom Institute of Agriculture, Technology and Sciences (Deemed to be University), Allahabad, U.P. In order to determine the nutritional and anti-nutritional characteristics of Lehsua (*Digera arvensis*) leaves, standard methods described below as follows-:

Procurement of raw materials:

Lehsua (*Digera arvensis*) leaves were procured from local areas of SHIATS, Allahabad, India and other raw materials were collected from the local market of Allahabad.

Determination of nutrients and anti-nutrients content of selected underutilized green leafy vegetables:

Nutrients and anti-nutrients estimation of *Lehsua leaves* for moisture, ash, protein, fat, carbohydrate, β -Carotene, iron, phytate and oxalate content were analysed using standard procedures of AOAC (2005).

Products development:

Lehsua (*Digera arvensis*) leaves were used for the development of value added locally familiar food products namely *Roti*, *Daal*, *Khichadi*, *Besan Chakali*, *Vegetable crispy ball (Vegetable Pakoda)* and *Mathari* at the incorporation level of 40, 60 and 80 percent. The basic recipe was standardized and served as control (T_0). Three value added treatments i.e. incorporation with Lehsua (*Digera arvensis*) leaves at 40 percent, 60 percent, and 80 percent levels were referred to as T_1 , T_2 and T_3 respectively for each of the six products developed. All the controls and treatments for all products were replicated three times.



Fig 1: Products developed by incorporating Lehsua (*Digera arvensis*) leaves

Organoleptic evaluation of the prepared products:

The organoleptic evaluation of prepared products was done by a panel of 10 judges to assess the acceptability of the products. The evaluation was done using the 9 point Hedonic scale based score card (Srilakhmi, 2007).

Results and discussion

The data collected on different aspects as per the methodology have been tabulated and analyzed statistically. The results obtained from the analysis are presented and discussed as follows.

Chemical Analysis of fresh Lehsua leaves:

Results shows (Table-1) that the Nutrients in fresh *Lehsua* leaves per 100 g are found, Energy 27 Kcal, Moisture 91.3 %, Ash 3.4 g, Protein 4.51 g, Total Carbohydrate 1.01 g, Fat 0.51 g, Iron

18.72 mg, β - Carotene 923 μ g, Oxalate and phytate content in fresh *Lehsua* leaves (*Moringa oleifera*) leaves per 100 g are found 187 mg and 110.1 mg respectively.

Sensory analysis of products prepared by incorporation of fresh *Lehsua* (*Digera arvensis*) leaves

The products were standardized and subjected to organoleptic evaluation within one hour of preparation which was considered as zero days. All experimental recipes were evaluated in terms of colour and appearance, body and texture, taste and flavor and overall acceptability.

a) Sensory score of Roti

It can be seen from table-2 that sensory scores of *Roti* with incorporation of fresh *Lehsua* Leaves; the colour and appearance was highest in T₂ (8) followed by control T₀ (7), T₁ (7) and T₃ (6) and body and texture was highest in treatment T₂ (8) followed by T₁ (7), T₃ (7) and control T₀ (6). The taste and flavour was highest in T₂ (8) followed by control T₀ (8), T₁ (7), and T₃ (7) and overall acceptability was highest in T₂ (8) followed by T₁ (7) T₃ (7), and control T₀ (7). The significant difference was found between the control and treatments of taste and flavour indicating that the addition of fresh *Lehsua* Leaves improves the taste and flavour of the *Roti*.

Table 2: Sensory analysis of *Roti* prepared by incorporation of fresh *Lehsua* (*Digera arvensis*) leaves

Parameters	T₀	T₁	T₂	T₃
Colour and Appearance	7	7	8	6
Body and Texture	6	7	8	7
Taste and Flavour	8	7	8	7
Overall Acceptability	7	7	8	7

b) Sensory score of Daal

It can be seen from table-3 that sensory scores of *Daal* with incorporation of fresh Lehsua Leaves; the colour and appearance was highest in T₂ (8) followed by T₃ (7), control T₀ (7) and T₁ (6) and body and texture was highest in treatment control T₀ (8) followed by T₂ (7), T₃ (7), and T₁ (6). The taste and flavour was highest in T₂ (8) followed by T₃ (8), control T₀ (7) and T₁ (6) and overall acceptability was highest in T₂ (8) followed by control T₀ (7), T₃ (7) and T₁ (6). The significant difference was found between the control and treatments of taste and flavour indicating that the addition of fresh Lehsua Leaves improves the taste and flavour of the *Daal*.

Table 3: Sensory analysis of *Daal* prepared by incorporation of fresh Lehsua (*Digera arvensis*) leaves

Parameters	T ₀	T ₁	T ₂	T ₃
Colour and Appearance	7	6	8	7
Body and Texture	8	6	7	7
Taste and Flavour	7	6	8	8
Overall Acceptability	7	6	8	7

c) Sensory score of Khichadi

It can be seen from table-4 that sensory scores of *Khichadi* with incorporation of fresh Lehsua Leaves; the colour and appearance was highest in T₁ (8) followed by control T₀ (7), T₂ (7) and T₃ (7) and body and texture was highest in treatment T₂ (8) followed by T₁ (7), T₃ (7) and control T₀ (6). The taste and flavour was highest in T₂ (8) followed by T₃ (8), T₁ (7) and control T₀ (7) and overall acceptability was highest in T₂ (8) followed by T₁ (7), T₃ (7), and control T₀ (7). The significant difference was found between the control and treatments of taste and flavour indicating that the addition of fresh Lehsua Leaves improves the taste and flavour of the *Khichadi*.

Table 4: Sensory analysis of *Khichadi* prepared by incorporation of fresh Lehsua (*Digera arvensis*) leaves

Parameters	T ₀	T ₁	T ₂	T ₃
Colour and Appearance	7	8	7	7

Body and Texture	6	7	8	7
Taste and Flavour	7	7	8	8
Overall Acceptability	7	7	8	7

d) Sensory score of besan chakali

It can be seen from table-5 that sensory scores of *Besan Chakali* with incorporation of fresh Lehsua Leaves; the colour and appearance was highest in T₂ (8) followed by T₁ (7), T₃ (7) and control T₀ (7) and body and texture was highest in treatment T₃ (8) followed by T₂ (7), control T₀ (7) and T₁ (6). The taste and flavour was highest in T₂ (8) followed by control T₀ (8), T₁ (7) and T₃ (7) and overall acceptability was highest in T₂ (8) followed by control T₀ (7), T₁ (7) and T₃ (7). The significant difference was found between the control and treatments of taste and flavour indicating that the addition of fresh Lehsua Leaves improves the taste and flavour of the *Besan Chakali*.

Table 5: Sensory analysis of *Besan Chakali* prepared by incorporation of fresh Lehsua (*Digera arvensis*) leaves

Parameters	T₀	T₁	T₂	T₃
Colour and Appearance	7	7	8	7
Body and Texture	7	6	7	8
Taste and Flavour	8	7	8	7
Overall Acceptability	7	7	8	7

e) Sensory score of vegetable crispy ball (vegetable pakoda)

It can be seen from table 6 that sensory scores of *vegetable pakoda* with incorporation fresh Lehsua Leaves; the colour and appearance was highest in control T₀ (8) followed by T₁ (7), T₂ (7) and T₃ (6) and body and texture was highest in treatment T₂ (8) followed by control T₀ (7), T₁ (7) and T₃ (6). The taste and flavour was highest in T₂ (8) followed by control T₀ (7), T₁ (7) and T₃ (6) and overall acceptability was highest in T₂ (8) followed by control T₀ (7), T₁ (7) and T₃ (6). The significant difference was found between the control and treatments of taste and flavour

indicating that the addition of fresh Lehsua Leaves improves the taste and flavour of the *Vegetable pakoda*.

Table 6: Sensory analysis of *Vegetable pakoda* prepared by incorporation of fresh Lehsua (*Digera arvensis*) leaves

Parameters	T ₀	T ₁	T ₂	T ₃
Colour and Appearance	8	7	7	6
Body and Texture	7	7	8	6
Taste and Flavour	7	7	8	6
Overall Acceptability	7	7	8	6

f) Sensory score of mathari

It can be seen from table 7 that sensory scores of *Mathari* with the incorporation fresh Lehsua Leaves; colour and appearance was highest in T₂ (8) followed by control T₀ (7), T₁ (7) and T₃ (6) and body and texture was highest in treatment T₁ (8), followed by control T₀ (7), T₂ (7) and T₃ (6). The taste and flavour was highest in T₂ (8) followed by control T₀ (8), T₃ (8) and T₁ (7) and overall acceptability was highest in T₂ (8) followed by control T₀ (7), T₁ (7) and T₃ (7). The significant difference was found between the control and treatments of taste and flavour indicating that the addition of fresh Lehsua Leaves improves the taste and flavour of the *Mathari*.

Table 7: Sensory analysis of *Mathari* prepared by incorporation of fresh Lehsua (*Digera arvensis*) leaves

Parameters	T ₀	T ₁	T ₂	T ₃
Colour and Appearance	7	7	8	6
Body and Texture	7	8	7	6
Taste and Flavour	8	7	8	8
Overall Acceptability	7	7	8	7

Result showed that the incorporation of Lehsua leaves in *Roti, Daal, Khichadi, Besan Chakali, Vegetable Crispy Ball (Vegetable Pakoda) and Mathari* was most acceptable with 60 percent followed by 40 and 80 percent.

Conclusion

From the results summarized above, it can be concluded that Lehsua leaves can be suitably incorporated in various traditional products. Nutrients in Lehsua Leaves per 100 g are found Energy 27 Kcal, Moisture 91.3%, Ash 3.4 g, Protein 4.51 g, Total Carbohydrate 1.01 g, Fat 0.51 g, Iron 18.72 mg, β - Carotene 923 μ g, Oxalate 187 mg and phytate 110.1 mg. Sensory scores of products prepared with the incorporation of Lehsua leaves i.e. *Roti, Daal, Khichadi, Besan Chakali, Vegetable crispy ball (Vegetable pakoda) and Mathari* was most acceptable with 60 (T₂) percent followed by 40 (T₁) and 80 percent (T₃). Lehsua Leaves is a good source of protein, total carbohydrate, iron and β -Carotene.

References

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Table 1: Nutrients and anti-nutrients content of fresh Lehsua (*Moringa oleifera*) leaves per 100g

Nutrients	Lehsua leaves per100 g
Energy	27 Kcal
Moisture	91.3%
Ash	3.4 g
Protein	4.51 g
Total Carbohydrate	1.01g

Fat	0.51g
Iron	18.72 mg
β - Carotene	923 μ g
Oxalic Acid	187 mg
Phytate	110.1mg