



ISSN NO. 2320-5407

Journal Homepage: -www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI:10.21474/IJAR01/1203
DOI URL: <http://dx.doi.org/10.21474/IJAR01/1203>



INTERNATIONAL JOURNAL OF
ADVANCED RESEARCH (IJAR)
ISSN 2320-5407
Journal homepage: <http://www.journalijar.com>
Journal DOI:10.21474/IJAR01

RESEARCH ARTICLE

ANALYSIS OF NUTRITIONAL COMPOSITION AND ANTI-NUTRITIONAL FACTORS OF FRESH KARMWA LEAVES (*IPOMOEA AQUATICA*) AND ITS PRODUCTS DEVELOPMENT.

Anisha Verma¹, Neerubala² and Bhawna Srivastava³.

1. Assistant Professor, Department of Foods and Nutrition, Ethelind School of Home Science, Sam Higginbottom Institute of Agriculture, Technology and Sciences, Allahabad- 211007, (U.P.)
2. Associate Professor, Department of Foods and Nutrition, Ethelind School of Home Science, Sam Higginbottom Institute of Agriculture, Technology and Sciences, Allahabad- 211007, (U.P.)
3. JRF, Department of Foods and Nutrition, Ethelind School of Home Science, Sam Higginbottom Institute of Agriculture, Technology and Sciences, Allahabad- 211007, (U.P.)

Manuscript Info

Manuscript History

Received: 16 June 2016
Final Accepted: 19 July 2016
Published: August 2016

Key words:-

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

Abstract

Water Spinach is scientifically known as *Ipomoea aquatica*, is a popular ingredient in various cuisines such as desserts and salads and it is often eaten raw because of its deliciously sweet taste. It can be steam and boiled, just like regular spinach. The aim of the study is to find out the nutritional and anti-nutritional composition of the water spinach to prepare value added products with the incorporation of Water Spinach and to evaluate the sensory acceptability of the prepared products. Methods described by AOAC (2005) were used for the determination of nutritional and anti-nutritional composition of karamwa leaves. Leaves of Karamwa were incorporated into six conventional food products namely *Roti*, *Daal*, *Khichadi*, *BesanChakali*, *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 100g of fresh karamwa leaves energy was 36 Kcal, ash 6.92g, Moisture 85.11%, total carbohydrate 3.98 g, protein 3.2g, fat 0.8 g, β - Carotene 298 μ g, iron 4.3 mg, oxalic acid 125 mg, phytate 75mg. Result showed that the incorporation of Karamwa leaves in *Roti*, *Daal*, *Khichadi*, *BesanChakali*, *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 Karamwa, can be successfully incorporated into different conventional food products and are helpful in improving nutrients content of developed recipes.

Copy Right, IJAR, 2016., All rights reserved.

Introduction:-

Water Spinach (*Ipomoea aquatica*) is a semi-aquatic, tropical plant grown as a vegetable for its tender shoots and leaves. It is found throughout the tropical and subtropical regions of the world, although it is not known where it

Corresponding Author:- Anisha Verma

Address:- Assistant Professor, Department of Foods and Nutrition, Ethelind School of Home Science, Sam Higginbottom Institute of Agriculture, Technology and Sciences, Allahabad- 211007, (U.P.)

originated. This plant is known in English as water spinach, river spinach, water morning glory, water convolvulus, or by the more ambiguous names Chinese spinach, Chinese Watercress, Chinese convolvulus, swamp cabbage or kangkong in Southeast Asia. Occasionally, it has also been mistakenly called "kale" in English, although kale is a strain of mustard belonging to the species *Brassica oleracea* and is completely unrelated to water spinach, which is a species of morning glory.

(https://en.wikipedia.org/wiki/Ipomoea_aquatica)

The leaves of water spinach are extremely nutritious, containing abundant quantities of vitamins and minerals. They are excellent sources of dietary fiber, protein, calcium, iron, vitamin A and vitamin C.

The present study was aimed to analyze the nutritional composition, anti-nutritional factors of the Karamwa (*Ipomoea aquatica*) leaves to prepare value added products using Karamwa (*Ipomoea aquatica*) 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 Karamwa (*Ipomoea aquatica*) leaves, standard methods described below as follows:-

Procurement of raw materials:-

Karamwa (*Ipomoea aquatica*) 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 Karamwa leaves for moisture, ash, protein, fat, carbohydrate, β -Carotene, iron, phytate and oxalate content were analysed using standard procedures of AOAC (2005).

Products development:-

Karamwa (*Ipomoea aquatica*) leaves were used for the development of value added locally familiar food products namely Roti, Daal, Khichadi, BesanChakali, Vegetable crispy ball (Vegetable Pakoda) and Mathari at the incorporation level of 40, 60 and 80 percent incorporation. The basic recipe was standardized and served as control (T_0). Three value added treatments i.e. incorporation with Karamwa (*Ipomoea aquatica*) 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 Karamwa (*Ipomoea aquatica*) leaves.

Organoleptic evaluation of the prepared products:-

The organoleptic evaluation of prepared products was done by a panel of 5 judges to assess the acceptability of the products. The evaluation was done on the 9 point Hedonic scale based score card (Srilakhmi, 2007).

Statistical Analysis:-

Data obtained from the organoleptic evaluation was analyzed using Analysis of Variance and Critical Difference Techniques (Gupta and Kapoor 2002).

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 Karamwa leaves:-

Results shows (Table-1) that the Nutrients in fresh *Karamwa* leaves per 100 g are found, Energy 36 Kcal, Moisture 85.11%, Ash 6.92 g, Protein 3.2g, Total Carbohydrate 3.98 g, Fat 0.8g, Iron 4.3mg, β - Carotene 298 μ g. Oxalate and phytate content in fresh *Karamwa* (*Ipomoea aquatica*) leaves per 100 g are found 125mg and 75mg respectively.

Sensory analysis of products prepared by incorporation of fresh Karamwa (*Ipomoea aquatica*) 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.

Table 1:- Nutrients and anti-nutrients content of fresh *Karamwa* (*Ipomoea aquatica*) leaves per 100g

Nutrients	Lehsua leaves per100 g
Energy	36 Kcal
Moisture	85.11%
Ash	6.92 g
Protein	3.2 g
Total Carbohydrate	3.98 g
Fat	0.8 g
Iron	4.3mg
β - Carotene	298 μ g
Oxalic Acid	125mg
Phytate	75mg

Sensory score of Roti:-

It can be seen from table-2 that sensory scores of *Roti* with incorporation of fresh *Karamwa* Leaves; the colour and appearance was highest in T₁ (8) followed by T₂ (7), control T₀ (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 T₃ (7), T₁ (7) and control T₀ (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 *Roti* indicating that the addition of 60 percent fresh *Karamwa* Leaves improves the taste and flavour of the *Roti*.

Table 2:- Sensory analysis of *Roti* prepared by incorporation of fresh *Karamwa* (*Ipomoea aquatica*) leaves.

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

Sensory score of Daal:-

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

The significant difference was found between the control and treatments of taste and flavour indicating that the addition of 60 percent fresh Karamwa Leaves improves the sensory acceptability of the *Daal*.

Table 3:-Sensory analysis of *Daal* prepared by incorporation of fresh Karamwa (*Ipomoea aquatica*) leaves.

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

Sensory score of *Khichadi*:-

It can be seen from table-4 that sensory scores of *Khichadi* with incorporation of fresh Karamwa 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 control T₂ (8) followed by T₀ (8), T₁ (7), and T₃ (6). The taste and flavour was highest in T₂ (8) followed by T₁ (8), control T₀ (7), and T₃ (7) and overall acceptability was highest in control T₂ (8) followed by T₁ (7), T₀ (7) and T₃ (6). The significant difference was found between the control and treatments of taste and flavour indicating that the addition of 60 percent fresh Karamwa Leaves improves the taste and flavour of the *Khichadi*.

Table 4:-Sensory analysis of *Khichadi* prepared by incorporation of fresh Karamwa (*Ipomoea aquatica*) leaves.

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

Sensory score of *besanchakali*:-

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

Table 5:-Sensory analysis of *BesanChakali* prepared by incorporation of fresh Karamwa (*Ipomoea aquatica*) leaves

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

Sensory score of vegetable crispy balls (vegetable pakoda):-

It can be seen from table 6 that sensory scores of *vegetable pakoda* with incorporation fresh Karamwa Leaves; the colour and appearance was highest in T₂ (8) followed by control T₀ (8), T₁ (7), 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 control T₀ (8) followed by T₂ (7), T₁ (7) and T₃ (6) 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 Karamwa Leaves improves the taste and flavour of the *Besancheela*.

Table 6:- Sensory analysis of *BesanCheela* prepared by incorporation of fresh Karamwa (*Ipomoea aquatica*) leaves.

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

Sensory score of mathari:-

It can be seen from table 7 that sensory scores of *Mathari* with the incorporation fresh Karamwa Leaves; colour and appearance was highest in T₂ (8) followed by T₃ (8), control T₀ (7) and T₁ (7) and body and texture was highest in T₂ (8) followed by T₁ (7), control T₀ (7) and T₃ (7). The taste and flavour was highest in T₂ (8) followed by T₁ (8), control T₀ (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 Karamwa Leaves improves the taste and flavour of the *Mathari*.

Table 7:-Sensory analysis of *Mathari* prepared by incorporation of fresh Karamwa (*Ipomoea aquatica*) leaves.

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

Result showed that the incorporation of Karamwa leaves in *Roti*, *Daal*, *Khichadi*, *BesanChakali*, *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 Karamwa leaves can be suitably incorporated in various traditional products. Nutrients in Karamwa Leaves per 100 g are found Energy 36 Kcal, Moisture 85.11%, Ash 6.92g, Protein 3.2g, Total Carbohydrate 3.98g, Fat 0.8 g, Iron 4.3mg, β- Carotene 298 µg, Oxalate 125mg and phytate 75mg. Sensory scores of products prepared with the incorporation of Karamwa leaves i.e. *Roti*, *Daal*, *Khichadi*, *BesanChakali*, *Vegetable Crispy Ball* (*Vegetable Pakoda*) and *Mathari* were most acceptable with 60 (T₂) percent followed by 40 (T₁) and 80 percent (T₃). Karamwa Leaves is a good source of protein, iron and β-Carotene.

References:-

1. AOAC (2005), Official methods of Analysis. Fourteenth edition. Association of Official Analytical Chemists, Washington, DC.
2. Gupta, S. C. and Kapoor, U. K., (2002); "Fundamentals of Applied Statistics" 2nd edition, Chand and Son, pp: 51-85.
3. Joshi Pallavi and Mathur Beena (2010) Preparation of value added products from the leaf powders of dehydrated less utilized green leafy vegetables. *Journal of Horticulture and Forestry*. 2 (9) 223 – 228
4. Srilakshmi, B. (2007) Food Sciences" 5th Edition New Age International Publishers 194-198.