

NUTRITIONAL, ANTINUTRITIONAL AND ANTIOXIDANT ACTIVITY OF FRESH AND DEHYDRATED MORINGA LEAVES

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ABSTRACT

The study was to determine the nutritional, antinutritional & antioxidant activity of moringa leaves. Proximate analysis of leaves was done by using the standard procedure of AOAC & preparation of leaf powder by oven drying technique. The leaves were dried in the oven at temperature 60 °C for 4 hour. Moisture content was significantly decreased from (74.70± 0.30 to 6.67 ± 0.19g/100g). While crude fat increase non-significantly (1.38± 0.032 to 5.54± 0.25g/100g), protein (7.79± 0.24 to 22.79± 0.20/100g), crude fibre (0.76± 0.023 to 12.06± 0.30/100g), Carbohydrate (14.41± 0.58g to 56.68± 0.50g/100g) & energy value (101.24± 1.12 to 367.84±1.05kcal/100g) increased. Protein, fibre, carbohydrate & energy were significantly increased in dehydrated sample. Total carotenoid & ascorbic acid increased significantly from 6372.77±24.60 to 17025± 131.80µg /100 g & 217.54±0.88 to 56.88±0.39mg/100 g. Calcium & iron content increased significantly from 432.33 ± 2.60 to 2146.66 ± 12.11& 0.70 ± 0.03to 23 ± 0.58mg/100g respectively. Phytate & oxalate content of fresh & dehydrated leaves were (5.01±0.16 to 8.73±0.20) & (95.0±0.96 to 386.05±1.90) respectively. Total polyphenols & total flavonoids were significantly increase (64.71±1.01 to 87.51±0.31) & (16.25±0.55 to 28.73±0.47).

KEYWORDS: Moringa, Drying, Temperature Effect, Nutritional Quality

INTRODUCTION

Leafy vegetables are rich in micronutrients, & are of great importance to the nutrition of population in developing countries. Leaves of this plant are a valuable source of natural source and good source of nutraceuticals. Leaves of moringa oleifera are richest source of minerals like calcium, potassium magnesium, iron and zinc vitamin c, beta-carotene, folic acid, pyridoxine and nicotinic acid, vitamin D and E also present in oleifera leaf. Because medicinal as well as functional food qualities moringa oleifera is known as miracle vegetable. Its consumption in daily diet can reduce the risk of various degenerative diseases as it possesses therapeutic and pharmacological value. (Paliwal *et al*, 2011)

MATERIAL AND METHOD

Experiment Site

The study was carried out at Department of Foods & Nutrition, Ethelind School of Home Science, Sam Higginbottom Institute of Agriculture, Technology & Science (Deemed-to-be University), and Allahabad.

Procurement of Raw Material

Moringa leaves were collected from university campus, SHIATS, Allahabad, India.

Preparation of Moringa Leaf Powder

Firstly Moringa leaves have been sorted & washed. After that dry the same at 60^oc for 4-5 hours to make them dehydrated. Then grinding of dehydrated leaves to convert into powder & Sieved the powder & obtained fine moringa leaf powder & stored in air tight container. (Joshi & Mehta, 2010)

Determination of Proximate Analysis

The proximate analysis of Moringa leaves was analyzed using AOAC 2005 method.

Determination of Antinutritional & Antioxidant Analysis

The antinutritional analysis of Moringa leaves was analyzed by using method described in Sadasivam & Manickam 2008. Polyphenol & flavonoids content assessed by the Folin-Ciocalteu method & DPPH method respectively.

Statistical Analysis

The data was subjected to statistical analysis using analysis of variance (ANOVA), Chi-square or t-test & other appropriate statistical techniques (Gupta; 2002).

RESULT & DISCUSSIONS

Table 1: Nutritional Composition of Fresh & Dehydrated Leaf

Particulars	Fresh Leaves	Dehydrated Leaves	Difference	T- Cal	T-Tab	Statistical Interpretation (p≤0.05)
Moisture %	74.70± 0.30	6.67 ± 0.19	68.03	25.51	2.78	S
Crude Fat (g)	1.38± 0.032	5.54 ± 0.25	-4.16	1.56		NS
Proteins (g)	7.79± 0.24	22.79 ± 0.20	-15.00	5.62		S
Crude Fibre (g)	0.76 ± 0.023	12.06 ± 0.30	-11.29	4.23		S
Ash(g)	1.70 ± 0.014	8.3 ± 0.12	-2.93	2.47		NS
Carbohydrates (g)	14.41 ± 0.58	56.68 ± 0.50	-42.27	15.85		S
Energy(Kcal)	101.24 ± 1.12	367.84±1.05	-266.60	99.97		S
Iron (mg)	0.70 ± 0.03	23 ± 0.58	-22.76	8.53		S
Calcium (mg)	432.33 ± 2.60	2146.66±12.11	-1714.33	642.87		S
Ascorbic acid (mg)	217.54±0.88	56.88±0.39	162.88	61.08		S
Total carotenoid (µg)	6372.77±24.60	17025± 131.80	-10652.55	3994.70		S
Oxalate (mg)	95.0±0.96	386.05±1.90	-291.053	109.14		S
Phytate (mg)	5.01±0.16	8.73±0.20	-3.72	1.39		NS
Total polyphenols(mg)	64.71±1.01	87.51±0.31	-22.79	8.54		S
Total flavonoids (mg)	16.25±0.55	28.73±0.47	-12.47	4.67		S

Moisture

Moisture content of the fresh & dehydrated Moringa leaves was 74.70 & 6.67%. The higher amount of moisture content in fresh leaves may be due to higher content of water in fresh leaves. Similar results were obtained by **Joshi & Mehta, 2010** in which they found the moisture content of Moringa leaves to be 75.9 & 6%.

Protein

The protein content in the dehydrated powder increased by 15 % from the fresh sample of Moringa leaves. The fresh Moringa leaves contain 7.79 % protein & dehydrated leaves contain 22.79 % protein. **Gopalakrishnan et al, 2016** also reported that protein content of fresh & dehydrated leaves were significantly different i.e. 6.7% in fresh leaves & 29.4% in dried leaves of moringa.

Fat

The fat content was higher in dehydrated leaves in compare to fresh leaves. The fresh Moringa leaves contain 1.38g/100g while dehydrated leaves contain 5.54g/100g. **Satwase et al, 2013** also reported that fat content of fresh & dehydrated leaves were significantly different i.e. 1.7% in fresh leaves & 9.21% in dried leaves of moringa.

Ash

The ash content was higher in dehydrated leaves in compare to fresh leaves. The fresh Moringa leaves contain 1.70g/100g while dehydrated leaves contain 8.3g/100g. **Satwase et al, 2013** also reported that ash content of fresh & dehydrated leaves were significantly different i.e. 1.9 % in fresh leaves & 8.8 % in dried leaves of moringa.

Crude Fibre

The fibre content was higher in dehydrated leaves in compare to fresh leaves. The fresh Moringa leaves contain 0.76g/100g while dehydrated leaves contain 11.29g/100g. **Gopalakrishnan et al, 2016** also reported that crude fibre content of fresh & dehydrated leaves were significantly different i.e. 0.9% in fresh leaves & 12.5% in dried leaves of moringa.

Carbohydrate

The carbohydrate content was higher in dehydrated leaves in compare to fresh leaves. The fresh Moringa leaves contain 14.41g/100g while dehydrated leaves contain 56.68g/100g. Similar results were obtained by **(Joshi & Mehta, 2010)** in which they found the carbohydrate content of Moringa leaves to be 12.5 & 28.32%.

Energy

The energy value was higher in dehydrated leaves in compare to fresh leaves. The fresh Moringa leaves contain 101.24kcal/100g while dehydrated leaves contain 367.84kcal/100g. **Gopalakrishnan et al, 2016** also reported that energy content of fresh & dehydrated leaves were significantly different i.e. 92kcal in fresh leaves & 329kcal in dried leaves of moringa.

Calcium

Concentration of total calcium in fresh & dehydrated leaves was 432.33 & 2146.66 mg/100g respectively. Calcium content of dehydrated leaves was higher in compare to fresh leaves. Similar results were obtained by **(Joshi & Mehta, 2010)** in which they found the calcium content of Moringa leaves to be 440 & 3467mg/100g. Another study done by **Gopalakrishnan et al, 2016** have reported the estimated calcium content of fresh & dehydrated content was reported to be 440 & 2185mg/100g respectively.

Iron

Maximum iron content was observed in dehydrated leaves (23 mg/100g) followed by fresh leaves (0.70mg/100g). Similar results were obtained by **Joshi & Mehta, 2010** in which they found the iron content of Moringa leaves to be 0.85 & 19mg/100g. **Singh & Prasad, 2013** reported in their study the iron content of fresh & dehydrated Moringa leaves to be 0.72mg & 25.5mg/100g respectively.

Total Carotenoids

The carotenoid content was higher in dehydrated leaves in compare to fresh leaves. The fresh Moringa leaves contain 6372.77µg/100g while dehydrated leaves contain 17025µg/100g. Similar results were obtained by **Joshi & Mehta, 2010** in which they found the carotene content of Moringa leaves to be 6780µg & 37800µg/100g.

Ascorbic Acid

The ascorbic acid content was higher in fresh leaves in compare to dehydrated leaves. The fresh Moringa leaves contain 217.54mg/100g while dehydrated leaves contain 56.88mg/100g. Similar results were obtained by **Joshi & Mehta, 2010** in which they found the ascorbic acid content of Moringa leaves to be 220mg & 56mg/100g.

Phytate

Phytate content was higher in dehydrated sample in compare to fresh sample. Fresh leaves contain (5.01mg/100g) & dehydrated leaves contain 8.73mg/100g.

Oxalate

Oxalate content was higher in dehydrated sample in compare to fresh sample. Fresh leaves contain (95.0mg/100g) & dehydrated leaves contain (3860.5mg/100g).

Polyphenols

Polyphenols was higher in dehydrated sample in compare to fresh sample. Fresh leaves contain (64.71mg/100g) & dehydrated leaves contain (87.51mg/100g).

Total Flavonoids

Significant ($P < 0.05$) differences in flavonoids of fresh & dehydrate leaves were observed. Flavonoids were higher in dehydrated sample in compare to fresh sample. Fresh leaves contain (16.25 mg/100g) & dehydrated leaves contain (28.73mg/100g). Result is supported by **Nupo et al, 2013**, the findings which stated that fresh & dehydrated *Solanum nigrum* L. Leaves contains 321-2026.6 mg/100g of total phenolics content & 273.1-1698.2 mg/100g of total flavonoids

CONCLUSIONS

In summary and keeping a view of aforesaid analysis and there results, it can be concluded that dehydrated moringa leaf powder are richer than fresh Moringa leaves (which are normally consumed as vegetables) in terms of macronutrients & micronutrients properties and beneficial in proper growth & good health for human when used/consumed as food supplement.

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