



Research Article

Nutritional Composition of *Momordica dioica* fruits: As a wild vegetable

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ARTICLE INFO

Received 10/03/2015
 Received in revised form
 25/03/2015
 Accepted 25/04/2015
 Available online 01/5/2015

ABSTRACT

Samples of *Momordica dioica* Roxb. ex Willd fruits were collected from Jhadol Tehsil of southern Rajasthan. The fruits were washed, ground into powder and analyzed for the proximate, vitamins, mineral and Fatty acid compositions. The values (% DW) of moisture, ash, crude protein, crude fiber, crude fat and carbohydrate available were 87, 14, 52.06, 15.36, 4 and 14.58, respectively. Levels (g/100g DW) of vitamins A, B1, B2, B6, H and K were 2.5, 1.8, 3.5, 4.3, 6.5 and 15 respectively. The values (mg/100g DW) of minerals potassium, sodium, calcium, zinc, Copper and magnesium were 370, 58, 26000, 8.5, 1.7 and 14000 respectively. Comparing the mineral and vitamin composition with recommended dietary allowances (RDA), the result indicated that *Momordica dioica* fruits could be good supplement for vitamin B1, B2, B6, B9, Ca and Mg. The values (% DW) of fatty acids i.e. Oleic acid, Palmitic acid, Linoleic acid, Myristic acid and Stearic acid of fruits were 56.253, 12.157, 22.511, 3.589 and 3.547 respectively. The results indicated that *Momordica dioica* fruits could be a good supplement for some nutrients, minerals and fatty acids such as fiber, protein, carbohydrates, calcium, magnesium, Oleic acid, and Linoleic acid. The fruit could be promoted as a mineral and vitamin supplement for cereal-based diets in poor rural communities.

Keywords: *Momordica dioica*, micronutrients, proximate, vitamins, mineral and Fatty acid composition, southern Rajasthan.

1. Introduction

Analysis of the work done all over the world on a survey among native societies and review of the ethnobotanical literature reported many wild edible plants, which is not only satisfy hunger of the people but also provide a good source of nutrition have been proved nutritious too. It has been observed that many tribal communities live in undisturbed forest areas and that having the traditional food practices. This may emphasize on sound nutritional quality of wild edible plants, consumed by rural peoples as regular food or supplementary food. It was observed that during adverse conditions when food is not available due to drought, flood or other calamities, these tribes go for consuming other herbal edibles. The nutritional

composition of a large number of wild edible plants were used in emergency by various tribes in different parts of the world has been evaluated.

Fruits are referred to as juicy seed bearing structure of flowering plant that may be eaten as food (Hyson 2002). The diet of many rural and urban dwellers is deficient in protein resulting in high incidence of malnutrition and increase in dietary diseases; a situation in which children and especially pregnant and lactating women are most vulnerable (Black 2003). In developing nations, numerous types of edible wild plants are exploited as sources of food to provide supplementary nutrition to the inhabitants (Aberoumand 2009). Food and Agricultural Organization (FAO) reported that at

least one billion people are thought to use wild food in their diet (Burhingame 2000).

Momordica dioica is climber plant commonly known as Teasle Gourd, Kakrol, Kankro, Kartoli, Kantoli, Kantola, Kantroli, Bhatkarela, Kaksa, Ban karola, Jungli karela or small bitter-gourd. It is locally known as "Kikoda" and is relatively small oval to ovoid vegetable. The plant is perennial, dioecious climbing creeper with tuberous roots belonging to family Cucurbitaceae. Fruit is shortly beaked, densely echinate with soft spines, densely echinate with soft spines, green and yellow at maturity. This is climbing creeper generally found throughout India, Pakistan, Bangladesh, Himalayas to Ceylon.

2. Material And Methods

2.1. Plant Material

For the present studies the unripe fruits of *Momordica dioica* were collected from tribal dominated area of Jhadol Tehsil of southern Rajasthan. The plant material was collected in the month of September. The fruits were washed, dried and ground into powder for examination of its nutritional composition.

2.2. Proximate analysis

The methods recommended by the Association of Official Analytical Chemists, 18th edition (2005) were used for crude protein (921.20), crude lipid (922.06) and crude fibre (993.21) analysis. Indian standards were used to determine ash (IS: 2860:1964), carbohydrate (IS: 1656:2007) and reducing sugar (IS: 4079:1967).

2.3. Vitamin analysis

The vitamins were determined according to the method by Ekinici and Kadakal (2005). The sample was prepared using solid-phase extraction, SPE in order to remove components that may cause interference with vitamins. Four parts of deionised water (20 g) were added into one part of Plant sample (5 g). The mixture was homogenized using a homogenizer at medium speed for 1 min. The homogenized samples were centrifuged. The Solid-Phase Extraction method of was used for the extraction of water-soluble vitamins (Cho et al. 2000). The stationary phase was flushed with 10 mL methanol and 10 mL water adjusted to pH 4.2 to activate the stationary phase. Homogenized and centrifuged sample (10 mL) was the loaded. The sample was eluted with 5 mL water (pH 4.2) then 10 mL methanol at a flow rate of 1 mL min⁻¹. The eluent was collected in a bottle and evaporated to dryness. The residue was dissolved in mobile phase. Before HPLC analysis all samples were filtered through 0.45 µm pore size FP 30/45 CA-S filters (Schleicher and Schuell, Darmstadt, Germany) at 7 bar max. Samples (20 µL) of solutions of the water-soluble vitamins were injected into the HPLC column. The column eluate was monitored with a photodiode-array detector at 265 nm for vitamin C, 234 nm for thiamine, 266 nm for riboflavin, 324 nm for pyridoxine, 282 nm for folic acid, 204 nm for biotin, 261 nm for niacin, and 204 nm for pantothenic acid. The mobile phase was filtered through a 0.45-µm

membrane and degassed by sonication before use. The mobile phase was 0.1 mol L⁻¹ KH₂PO₄ (pH 7)-methanol, 90:10. The flow-rate was 0.7 mL min⁻¹. The column was operated at room temperature (25°C). Chromatographic peak data were integrated up to 39 min. Identification of compounds was achieved by comparing their retention times and UV spectra with those of standards stored in a data bank. Concentrations of the water-soluble vitamins were calculated from integrated areas of the sample and the corresponding standards. (Ayieko et al. 2011).

2.4. Mineral analysis

Ca, Mg Na, K, Cu and Zn were investigated using atomic absorption spectrophotometer equipped with flame and graphite furnace. Air-acetylene flame was used for analyzed of these mineral contents.

2.5. Fatty acid Analysis

Oil from the date palm fruit was extracted by the soxhlet extraction using petroleum ether. The oil extracted was converted to methyl ester using the method described by Hall (1982). The fatty acid methyl ester was analyzed using Chemito Model 1000 FID gas chromatography.

3. Result and Discussion

3.1. Proximate composition

Proximate analyses of dry fruits of *Momordica dioica* were carried out on dry weight basis and have been reported in the table - 1. In that context, *Momordica dioica* have significant amount of protein (52.06g/100g). The crude fat content (4g/100g) is almost close with those reported by Aberoumand (2011a, 2011b) and Singh et al. (2009). The crude fiber value (15.36g/100g) is higher than value reported by Singh et al. (2009) and lower than value reported by Aberoumand (2011a, 2011b). The calorific value of *Momordica dioica* was estimated to be 302.56 kcal/100g DW, which is an indication that it could be a good source of energy.

3.2. Vitamin composition

Vitamin B-complex which is principally function in macronutrient metabolism are present in fruits of *Momordica dioica* in high concentration. Fruits of *Momordica dioica* are good source of all types of vitamins. Concentration of vitamin B₂ (3.5g/100g), vitamin B₆ (4.3g/100g), vitamin B₉ (3.6g/100g) and vitamin B₁₂ (4g/100g) is higher in fruits of *Momordica dioica* when compared with recommended dietary allowances (Nutrient Requirements and Recommended Dietary Allowances for Indians, 2009, Hyderabad).

3.3. Mineral composition

The mineral composition of fruits of *Momordica dioica*, expressed in mg/100gm is given in table 3. Nutritionally significant elements are compared with the recommended dietary allowances (Nutrient Requirements and Recommended Dietary Allowances for Indians, 2009, Hyderabad). *Momordica dioica* fruits shows that they contains higher level of calcium and

Table 1 Proximate composition of fruits of *Momordica dioica*

| S. No. | Parameter | <i>Momordica dioica</i> Roxb. ex Willd. |
|--------|-----------------|---|
| 1. | Water | 87 g/100g |
| 2. | pH | 6.5 |
| 3. | Crude protein | 52.06 g/100g |
| 4. | Crude lipid | 4 g/100g |
| 5. | Crude fibre | 15.36 g/100g |
| 6. | Ash | 14 g/100g |
| 7. | Carbohydrate | 14.58 g/100g |
| 8. | Total solids | 12.9 g/100g |
| 9. | calorific value | 302.56 kcal/100g DW* |

*DW = Dry weight

Table 2 Vitamin composition of fruits of *Momordica dioica*

| S. No. | Vitamins (g/100g) | <i>Momordica dioica</i> | Recommended dietary allowances (mg/day)* |
|--------|----------------------------------|-------------------------|--|
| 1. | Vitamin A | 2.5 | - |
| 2. | Vitamin B1 (Thiamine) | 1.8 | 1.7 |
| 3. | Vitamin B2 (Riboflavin) | 3.5 | 1.7 |
| 4. | Vitamin B3 (Niacin) | 1.9 | 18 |
| 5. | Vitamin B5 (Pantothenic Acid) | 18 | - |
| 6. | Vitamin B6(Pyridoxine) | 4.3 | 2.0 |
| 7. | Vitamin B9 (Folic Acid) | 3.6 | 0.2 |
| 8. | Vitamin B12 (Cyanocobalamin) | 4 | 0.001 |
| 9. | Vitamin C (Ascorbic Acid) | - | 40 |
| 10. | Vitamin D2 & 3 (Cholecalciferol) | 3 | - |
| 11. | Vitamin H (Biotin) g/100g | 6.5 | - |
| 12. | Vitamin K (Phytonadione) | 15 | - |

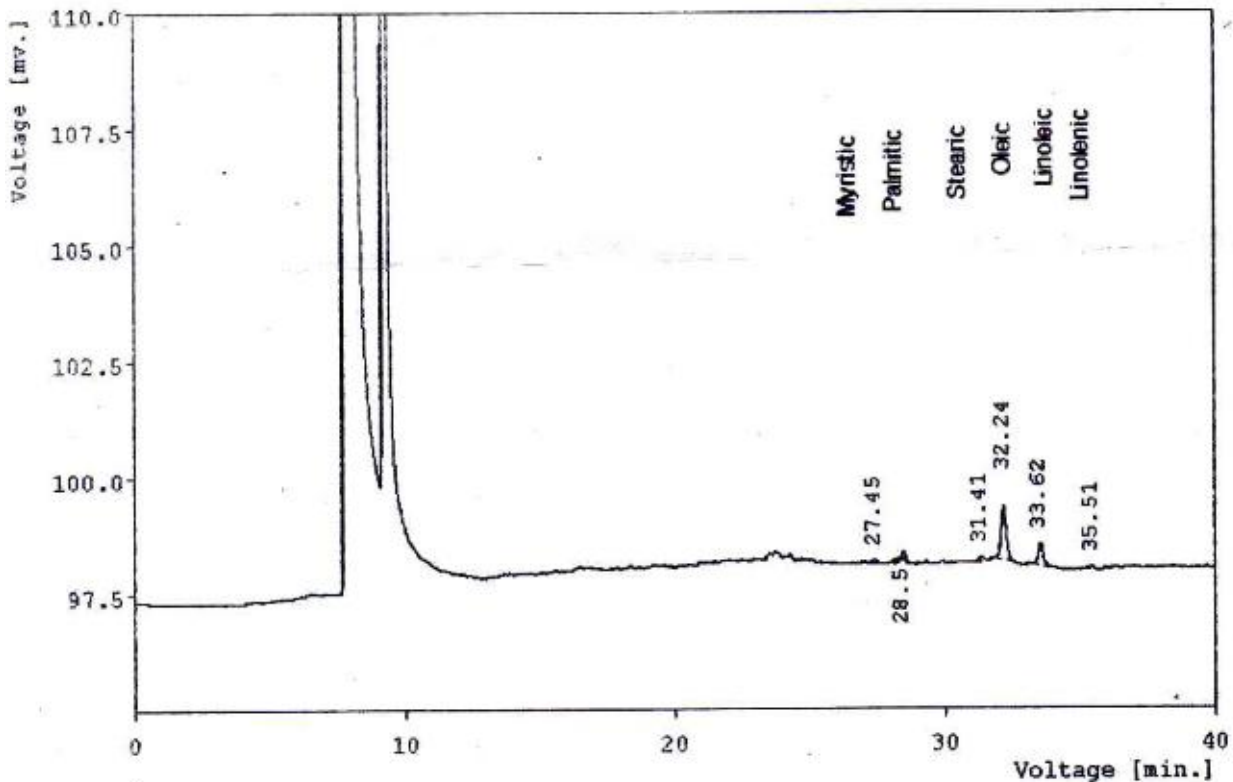
Table – 3 Mineral Composition of fruits of *Momordica dioica*

| Mineral | Recommended dietary allowances (mg/day)* | | | | |
|------------------|---|---------------------|------------|--------------|-------------------------------|
| | Available quantity in <i>Momordica dioica</i> in mg/100g DW | Children 7-10 years | Adult male | Adult female | Pregnant and lactating mother |
| Calcium | 26000 | 600 | 600 | 600 | 1200 |
| Magnesium | 14000 | 100 | 340 | 310 | 310 |
| Potassium | 370 | 1600 | 2000 | 2000 | 2000 |
| Sodium | 58 | 1005 | 2092 | 1902 | 1902 |
| Copper | 1.7 | - | 2 | 2 | 2 |
| Zinc | 8.5 | 8 | 12 | 10 | 12 |

* Sources - National Institute of Nutrition, Hyderabad.

Table 4 Fatty acid composition of fruits of *Momordica dioica*

| S.No. | Fatty Acids | <i>Momordica dioica</i> |
|-------|--------------------------|-------------------------|
| 1. | Myristic Acid (%) | 3.589 |
| 2. | Palmitic Acid (%) | 12.157 |
| 3. | Stearic Acid (%) | 3.547 |
| 4. | Oleic Acid (%) | 56.253 |
| 5. | Linoleic Acid (%) | 22.511 |
| 6. | alpha-Linolenic Acid (%) | 1.943 |



Result Table - Calculation Method Uncal

| Peak No. | Reten. time | Area [mV.s] | Height [mV] | W05 [min.] | Area [%] | Height [%] |
|----------|-------------|-------------|-------------|------------|----------|------------|
| 1 | 27.453 | 0.9594 | 0.087 | 0.187 | 3.589 | 4.099 |
| 2 | 28.507 | 3.2501 | 0.253 | 0.160 | 12.157 | 11.861 |
| 3 | 31.413 | 0.9483 | 0.095 | 0.180 | 3.547 | 4.466 |
| 4 | 32.240 | 15.0394 | 1.165 | 0.193 | 56.253 | 54.591 |
| 5 | 33.620 | 6.0184 | 0.486 | 0.193 | 22.511 | 22.771 |
| 6 | 35.513 | 0.5195 | 0.047 | 0.173 | 1.943 | 2.212 |
| - | Total | 26.7352 | 2.134 | | | |

Figure-1 GC-FID chromatogram of FAMES in fruits of *Momordica dioica* Roxb. ex Willd.

magnesium and adequate level of copper and zinc, but had low level of potassium and sodium. The fruits of *Momordica dioica* contained higher level of calcium, magnesium and zinc, when compared with values reported by Aberoumand (2010a, 2010b, 2011a, 2011b) and Aberoumand & Deokule (2009a, 2009b). Amount of copper is equal to recommended dietary allowances for all categories of people.

3.4. Fatty acid composition

Table 4 shows the major fatty acids of the fruits of *Momordica dioica*. The GC-FID chromatogram of FAMES in fruits of *Momordica dioica* (Figure-1) presents the fatty acid composition of the sample. *Momordica dioica* fruits are rich source of oleic acid (56.253). Oleic acid was the principal mono - unsaturated fatty acid. It was significant to note particularly high content of linoleic acid (22.511%), which was an essential fatty acid. On the other hand another essential fatty acid was very

low i.e. alpha-Linolenic acid (1.943%), Stearic acid (3.547%) and myristic acid (3.589%).

5. Conclusion

The results of the nutritional analysis show that *Momordica dioica* fruits are a good source of fiber, protein, mineral, vitamin and fatty acids. The results suggest that, if consumed in sufficient amounts, the *Momordica dioica* fruits could contribute greatly towards meeting human nutritional requirements for normal growth and adequate protection against diseases arising from malnutrition. From the results, *Momordica dioica* fruits are recommend for continued use for nutritional purposes, considering the amount and diversity of nutrients they contain. Chemical analysis alone however, should not be the exclusive criteria for judging the nutritional quality of plant parts. Thus, it becomes necessary to consider other aspects such as

the presence of anti-nutritional/toxicological factors and biological evaluation of nutrient contents

6. Acknowledgements

The authors are thankful to UGC, New Delhi for providing financial assistance to carry out the present work. The authors are also thankful to Gujarat laboratory, Ahmadabad for providing facilities to carry out biochemical analysis of the plant material.

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