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Studies on Nutritional and Anti-Nutritional Properties of *Cucumis melo* var. *Momordica* Duthie & Fuller

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Abstract

Vegetables play an important role in our day to day life as food as well as a nutritional source. Many foods being anti-nutritional, reduce the nutrient utilization of our body. As against this vegetable play an interesting role in building up our nutritional balance and helps in maintaining homeostasis. The present investigation aimed to assess the nutritional, mineral profiling and anti-nutritional analysis of *Cucumis melo* var. *Momordica* L. The processed *Cucumis melo* var. *Momordica* L. fruit was evaluated for organic and inorganic elements, phytochemical analysis, quantitative estimation, mineral, antinutritional factors and vitamin compositions. In the nutritional analysis, carbohydrates (27.5 g/100g FW), protein (20 g/100 g FW), starch (9.5 mg/g FW), the amino acid (3.2 mg/g FW) and lipid (2.2%) content was detected. Fruit of *Cucumis melo* var. *Momordica* L. had the highest moisture content (93.18%) and the total ash content (64.1%). The fruits of *Cucumis melo* var. *Momordica* L. has Vitamin C (156 µg kg-1) in higher than the other three vitamins evaluated, Eight macro elements and 6 microelements were also quantified. The fresh fruits had the highest content of nitrogen, calcium, magnesium and potassium. In *Cucumis melo* var. *Momordica* L. had very less amount of heavy metals such as arsenic, cobalt, lead and mercury. Nutritional and anti-nutritional analysis reveals that the *Cucumis melo* var. *Momordica* L. fruits could be used as a source of protein, vitamin and minerals and its fruits are highly recommended for consumption as they contain a low amount of the heavy metals are present.

Keywords: *Cucumis melo* var. *Momordica*, Nutritional analysis, Micronutrients, Anti-nutritional analysis and Vitamins.

1. INTRODUCTION

Medicinal plants are gifts of nature which are used in curing of various human ailments. In ancient India, medicinal plants were used to prevent various critical diseases. The plant kingdom is an important source of herbal drugs. Even in recent years, there has been an increasing awareness about the importance of medicinal plants. According to the World Health Organization, medicinal plants would be the best source to obtain a variety of drugs[1]. Medicinal plants usually produce secondary metabolites like alkaloids, terpenoids, steroids, tannins, flavonoids and other substances including phenols, proteins and carbohydrates. These substances provide Physiological action on our body and play a role in nutritional security. Particularly, plants that produce leafy vegetables give us minerals, vitamins and compounds with phenols. These leafy vegetables also possess iron and calcium in excess to other food grains.

Antinutritional factors are chemical compounds in plant tissues, which determine the absorption of nutrients in humans. They can have their effects directly or indirectly and ill effects may be a small side-effect to death. Major anti-nutritional factors are phytates, tannins, cyanogenic glycosides, nitrates and oxalates which are noteworthy to have health-related issues. The best way to reduce the contents of anti-nutritional factors is cooking and blanching. The medicinal plants are useful for healing as well as for curing of human diseases because of phytochemical constituents within them. Phytochemicals naturally occur in medicinal plant parts and they help us to protect and defend against diseases and anti-nutritional factors. Phytochemicals can be primary and secondary compounds. The primary constituents include chlorophyll, common sugars and proteins. The secondary phytochemicals include terpenoid, alkaloids and phenolic compounds.

Cucumis melo var. *Momordica* Duthie & Fuller is a climber with stem length ranging around 1.5 meters that may creep or sprawl around other plants using tendrils. The plant is known for its bitter fruit and harvested in gardens both in temperate and tropical regions. The fruit is often used for cooking and

also as a skin moisturizer. They are also used as an aid for abrasions and burns and as a stomachic. The flowers are used as expectorant for treating cough and emetic for vomiting. The seed is used to relieve cough, digestive febrifuge and vermifuge. The root is diuretic and emetic. The leaves are used to treat scrotal hernias. In the present study, a medicinal plant *Cucumis melo* var. *Momordica* L. had been analyses for the preliminary phytochemical characters, quantitative characteristics and nutrition and anti-nutritional analysis also studied.

2. MATERIALS AND METHODS

2.1 Identification of Plant Materials

The plant material was collected from Alangulam, Tenkasi District, Tamil Nadu. The taxonomic features collected from the species have been confirmed with the 'Flora of Presidency of Madras' (Gamble, 1928)[2] and the 'Flora of the Tamilnadu Carnatic'[3].

2.2 Quantification of Ash and Moisture

The percentage of total ash and moisture content were analysis by according to standard method [4].

2.3 Determination of total ash

2 gm of dried plant powder was taken in a pre-weighed crucible made of silica and heated in dull red flame. After the crucible was free of carbon the crucible was collected and weighed again. The ash percentage concerning the air-dried plant was calculated.

2.4 Moisture content determination

Two grams of the fresh sample was weighed in a pre-weighed silica dish. It was dried in the oven at 105˚C and weighed at intervals of one hour until two successive constant weights were obtained. The loss of weight was recorded as moisture content.

2.5 Qualitative Determination inorganic elements from plant ash

1g ash was well mixed with 25 ml 50% HCL (V/V) for about 12 hours to deduct the mineral elements (Ca. Mg, Fe, S and P) and the solution is filtered using filter paper.

2.6 Qualitative Determination organic elements from plant powder

For organic elements detection using plant powder (oxalic acid, tartaric acid, citric acid and malic acid) one gram of powder was well dissolved in 25ml of 50% NaOH (v/v) for about 12 hours and then filtered using filter paper.

2.7 Phytochemical analysis

2.7.1 Extraction

Mature and healthy fruits were collected and washed thoroughly. Every part of the plant fruit (flesh, peel and seed) was cut into pieces and was shade dried at room temperature (25-30°C), for about two weeks. The dried plant fruit material was ground into a fine powder. About 10gm of dried powder was taken in extracts were successively by crude extract method using methanol solvent. The extracts were heated to dryness on a water-bath. The extracts from fruits were yielded quantities of extracts in methanol solvents were obtained and were further taken to evaluate the phytochemical studies. These extracts were concentrated and kept in brown bottles and used to treat preliminary phytochemical screening.

2.7.2 Phytochemical screening

The plant extracts were tested and found the presence of bioactive compounds such as terpenoids, alkaloids, anthranol glycosides, phytosterols, amino acids, phenols, tannins, flavonoids and saponins by standard methods [2,5].

2.7.3 Quantitative estimation of biochemicals

The following biochemicals total carbohydrates, total lipids, pigments [6] total Protein [7], carotenoids [8] and total phenol [9] were quantitatively estimated.

3. RESULTS AND DISCUSSION

In the present study, the moisture content of *Cucumis melo* var. *Momordica* L. fruit was to be present in the 93.18% and carbohydrates content of fruit of (*Cucumis melo* var. *Momordica* L.) were 27.5mg/g/FW respectively (Table 4; Fig. 1). Lipid content of plant was 2.2% for fruit respectively (Table 4; Fig.2). The protein content is less in fruit (20mg/g/FW). Phenols content is less in fruit 3mg/g/FW respectively (Table 4; Fig.2). Starch content of plant was 9.5mg/g/FW respectively. Amino acid and reducing sugar is less in fruit (3.2 and 18 mg/g/FW). The Cellulose content of fruit of *Cucumis melo* var. *Momordica* L. were 47mg/g/FW respectively (Table 4; Fig.2). The Chlorophyll-a content of fruit of *Cucumis melo* var. *Momordica* L.were 0.109mg/g/FW. The Chlorophyll-b content fruit of *Cucumis melo* var. *Momordica* L. were 3.108 mg/g/FW. The total chlorophyll content fruit of *Cucumis melo* var. *Momordica* L. were 2.66 mg/g/FW. The carotenoids content of fruit of *Cucumis melo* var. *Momordica* L. were 0.025 mg/g/FW. Compare with other macronutrients; the total calcium is more in *Cucumis melo* var. *Momordica* L. (4.58%). The total phosphorus and sodium were present in a minimum percentage in the fruit of *Cucumis melo* var. *Momordica* L. (0.22 & 0.16%) (Table. 5, Fig. 3). Compare with other micronutrients; the total iron was present in maximum in *Cucumis melo* var. *Momordica* L. (56.36ppm). The total boron and molybdenum were present in a minimum

percentage in the fruit of *Cucumis melo* var. *Momordica* L. (0.02 & 0.02ppm). In *Cucumis melo* var. *Momordica* L. the total flavonoids were present maximum level of 1.89 mg kg-1 respectively (Table. 6, Fig. 4). The minimum number of secondary metabolites were present in fruit of *Cucumis melo* var. *Momordica* L. is terpenoids and saponins (0.03 & 0.05 mg kg^{-1}) respectively (Table. 7, Fig. 5). In *Cucumis melo* var. *Momordica* L. fruit powder was present in a maximum amount in Vitamin – A (156µg kg^{-1}) respectively. The minimum amount of vitamin present in both Vitamin – C & Vitamin – D. Vitamin – E were present in fruit of *Cucumis melo* var. Momordica L. in (33µg kg^{-1}) respectively (Table. 9). The conclusion of the result suggests that the *Cucumis melo* var. *Momordica* L. can enhance our nutritional potential by taking it as a food additive.

Table- 1: Inorganic elements present in the fruit ash of *Cucumis melo* var. *Momordica* L.

S. No	Test	Fruit
1.	Sulphur	+
2.	Calcium	-
3.	Magnesium	-
4.	Iron	+
5.	Phosphorus	-

Table -2: Organic elements present in the fruit powder of *Cucumis melo* var. *Momordica* L.

S. No	Test	Fruit
1.	Oxalic acid	+
2.	Tartaric acid	-
3.	Citric acid	+
4.	Malic acid	+

Table -3: Preliminary phytochemical analysis of methanol extract of *Cucumis melo* var. *Momordica* L. fruit.

S. No	Tests	Methanol Extract
1.	Alkaloids	+
2.	Reducing sugar	-
3.	Anthranol glycosides	-
4.	Saponins	-
5.	Phytosterols	+
6.	Phenols	-
7.	Tannins	+
8.	Flavonoids	+
9.	Amino acids	+
10.	Catechin	-
11.	Coumarin	+
12.	Terpenoids	+
13.	Xanthoprotein	+
14.	Phenol	-
15.	Anthro quinones	-

Table- 4: Quantitative estimation of different phytochemical compounds of the fruit of *Cucumis melo* var. *Momordica* L. fruit.

S.No	Phytochemical compounds	Value (mg/g/FW)
1.	Carbohydrates	27.5
2.	Protein	20
3.	Phenol	3
4.	Starch	9.5
5.	Amino acid	3.2
6.	Cellulose	47
7.	Reducing sugar	18

Table -5: Macronutrients present in the fruit powder of *Cucumis melo* var. *Momordica* L.

S. No	Micronutrients	ppm
1.	Total Manganese	5.63
2.	Total Boron	0.02
3.	Total Copper	0.05
4.	Total Zinc	1.23
5.	Total Molybdenum	0.02
6.	Total Iron	56.36

Table - 6: Micronutrients present in the fruit powder of *Cucumis melo* var. *Momordica* L.

S. No	Macronutrients	Percentage (%)
1.	Organic carbon	1.52
2.	Total Nitrogen	2.05
3.	Total Phosphorus	0.22
4.	Total Potassium	3.69
5.	Total Sodium	0.16
6.	Total Calcium	4.58
7.	Total Magnesium	2.84
8.	Total Sulphur	0.53

Table 7: Secondary metabolites present in the fruit powder of *Cucumis melo* var. *Momordica* L.

S. No	Secondary metabolites	mg kg-1
1.	Total Alkaloids	2.36
2.	Total Flavonoids	1.89
3.	Tannin	0.28
4.	Lignin	0.22
5.	Glycosides	0.13
6.	Serpentines	0.10
7.	Terpenoids	0.03
8.	Saponins	0.05

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Table 8: Heavy metals present in the fruit powder of *Cucumis melo* var. *Momordica* L.

S. No	Heavy Metals	ppm
1.	Lead	0.02
2.	Mercury	0.001
3.	Cadmium	0.09
4.	Arsenic	Nil
5.	Selenium	0.02
6.	Chromium	0.02
7.	Cobalt	0.01

Table -9: Vitamins present in the fruit powder of *Cucumis melo* var. *Momordica* L.

S. No	Vitamins	µg kg-^{1}
1.	Vitamin - A	156
2.	Vitamin - B	72
3.	Vitamin - C	23
4.	Vitamin - D	23
5.	Vitamin - E	33

Fig. 1: Amount of phytochemical compounds present in the fruit of Cucumis melo var. memordica L.

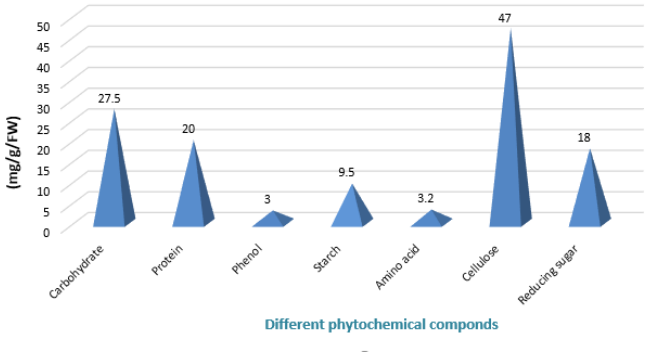


Fig. 2: Amount of phytochemical compounds present in the fruit of *Cucumis melo* var. *memordica* L.

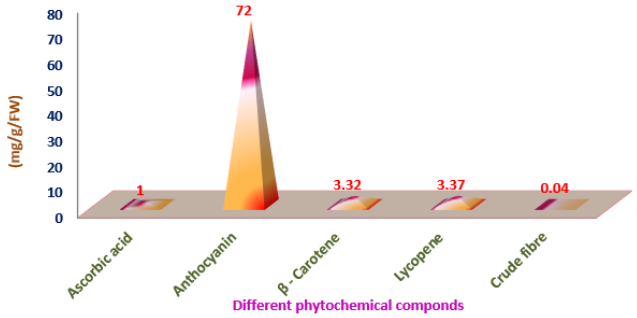


Fig. 3: Amount of Macronutrients present in the fruit of *Cucumis melo* var. *memordica* L.

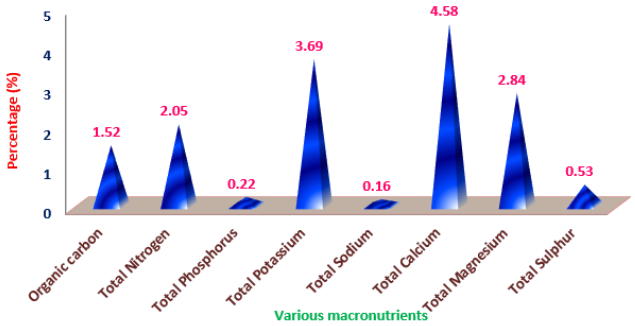


Fig. 4: Amount of Micronutrients present in the fruit of *Cucumis melo* var. *memordica* L.

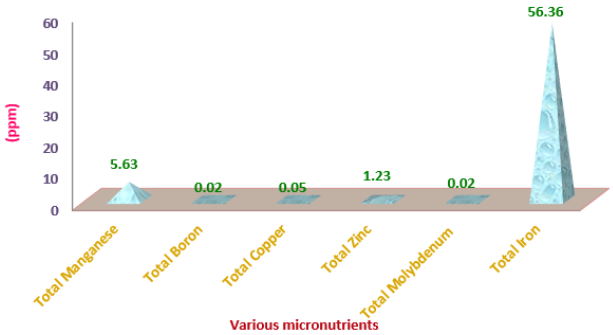
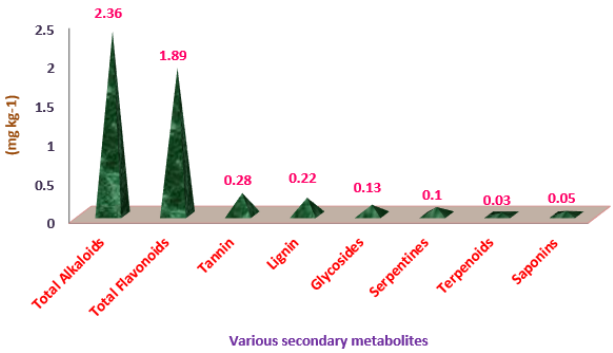


Fig. 5: Amount of Secondary metabolites present in the fruit of *Cucumis melo* var. *memordica* L.



The results of the screening of phytochemicals revealed the presence and absence of various phytochemicals in the rhizome of *Cucumis melo* var. *Momordica* L. Steroids, Saponins, phenolic groups, tannin and reducing sugars. Terpenoids most commonly present in the methanol extracts of fruit. Various pharmacological actions like cholesterol synthesis inhibition anti-inflammatory, anti-malarial, anti-viral, anti-cancerous and anti-bacterial activities are exhibited by 'Terpenoids'. Terpenoids are useful in attracting mites and herbivorous insects. Generally, the secondary metabolites of plants possess therapeutic, antifungal and antimicrobial properties. Standardization and quality control of plants is of growing concern for ensuring the purity of raw material before processing. In the future, using advanced chromatographic techniques, mass spectroscopic techniques and other advanced techniques the pure compounds will be isolated for making medicine and other useful compounds.

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