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Studies on physicochemical characteristics of drumstick (*Moringa oleifera*) PODS

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Abstract

Drumstick (*Moringa oleifera*) is one of the world's most nutritious crop and is one the most popular vegetables grown throughout India. It has helped mankind in combating malnutrition in children and increase immunity. It is a multi function plant cultivated in the tropics around the world for high protein, vitamins, minerals and carbohydrate content. The *Moringa oleifera* pods having average weight of pod (70.5 g), average weight of 100 pod (7061 gm), average length of pod (47.5 cm), width of pod (5.3 cm), number of seeds/pod 15 and weight (43.1 g)/100 seed. The moisture content of *Moringa oleifera* pods was 84.01 ± 2 per cent, total ash content was found to be 2.94±0.02 per cent. The crude protein, Crude fiber and fat content were 3.4±0.50, 5.1±0.70 and 0.1±0.002 per cent respectively. The potassium content of *Moringa oleifera* pods was 248 ± 9 mg/100g. From the research it was concluded that the *Moringa oleifera* pods having very good nutritional value and having good source of nutrition.

Keywords: *Moringa oleifera* pods, physical characteristics, proximate and minerals

Introduction

Moringa Oleifera belongs to a family *Moringaceae* commonly referred to as "The Miracle Tree" and 'drumstick tree' or 'horseradish tree'. The leaf of this plant increases woman's milk production and is sometimes prescribed for anemia; that's why it is also known as 'mother's best friend' its several medicinal, industrial and nutritional uses make it a significantly valuable plant in world wide. The leaves, fruit, flowers and immature pods of this tree are used as a highly nutritive vegetable in many countries. World Health Organization has promoted *Moringa* as an alternative to imported food supplies to treat malnutrition.

Moringa oleifera has an impressive range of medicinal uses with high nutritional value. Different parts of this plant contain a profile of important minerals, and are good source of protein, vitamin, B-carotene, amino acid and various phenolics. *Moringa* plant provides a rich and rare combination of zeation, quercetion, kaempferol and many other phyto chemical. It is very important plant for its medicinal value. Various part of plant such as leaves, roots, seeds, bark, fruit, flower and immature pods etc as cardiac and circulatory stimulant, posses antitumor, antipyretic, antiepileptic, anti-inflammatory, antiulcer, antiplasmodic, antihypertensive, antioxidant, antibacterial and antifungal (Bukar *et al.*, 2010) [4].

Moringa oleifera compounds leading to blood pressure lowering effect includes nitrile, mustard oil glycosides and thiocarbamate glycosides present in *Moringa* leaves (Anwar *et al.*, 2007) [1]. *Moringa oleifera* leaves significantly decrease blood glucose concentration, and type II diabetes (Ndong *et al.*, 2007) [13]. The extract from *Moringa* leaf is effective in lowering blood sugar levels within 3 h after ingestion (Mittal *et al.*, 2007) [8]. Recently, this tree has been advocated as an outstanding indigenous source of highly digestible protein, Ca, Fe, vitamin-c, and carotenoid suitable for utilization in many of the so called developing region of the world where under nourishment is a major concern. It has been reported a long time ago that *Moringa* plant alkaloid closely resembles ephedrine in action and can be used for the treatment of asthma. Alkaloid Moringine relaxes bronchioles (Kirtikar and Basu 1975) [7].

Pods have negligible amounts of tannin, but saponins and alkaloids are found in significant quantities in leaves and stem, respectively, though they should be considered non-toxic to ruminants. Seed pods of this tree are eaten as vegetables, which are reported to taste like asparagus. The fruit (pod) is used to treat diseases of the liver and spleen, particular pains, tetanus, paralysis and tonic (Mohammed *et al.*, 2012) [9].

Moringa is an important vegetable of South India. It has helped mankind in combating malnutrition in children and increase immunity. It is a multi function plant cultivated in the tropics around the world for high protein, vitamins, minerals and carbohydrate content, nutrition for both human and live stock.

It has high oil content with medicinal uses and water purifier. In India it is cultivated in an area of 30,000 ha with an annual production of 12 lakhs tones of pods. Both perennial and annual *moringa* are cultivated in Tamil Nadu. The crop comes to bearing during the month of March to August and the price of pods per kg on an average will be around Rs. 5. Further the price of the pods will shoot up to Rs. 15-20 kg during September and October as the productivity starts to decline. The pods are available in a very meager number during November to February owing to the season which coincides with heavy rainfall, low temperature which leads to the drop in flowers leading to poor pod set which is considered to be the off-season period of the year.

Ancient Indian literature states moringa as an “interesting plant” for its widespread use in medicine. In Ayurveda, it is stated that the leaves of the moringa tree prevent 300 diseases (Peter, 1979) [14]. Scientific research has proven that the leaves of moringa are in fact a powerhouse of nutritional value. It is a magic vegetable, can rebuild weak bones, and enrich anemic blood and a malnourished mother to nurse her starving baby. Doctors use it to treat diabetes in West Africa and high blood pressure in India, (Murakami *et al.*, 1998) [11]. Documented the world-wide status of moringa, which includes production systems, breeding, propagation, oil production, trade, seed powder as flocculent, moringa leaves for nutrition, health, medicinal uses and also reported the nutritive value of moringa and recommended this to remove micronutrient-based malnutrition in human in many countries. In the developing country, moringa leaves, pods or leaf powder are being used successfully as a complex food to nourish small children, pregnant or nursing women and AIDS patients by Ponnuswamy *et al.* (2010) [15].

Materials and Methods

Collection of drumstick pods

The prominent variety of drumstick i.e. local variety (Koimtoor -1) majorly grown in Marathwada region was purchase from Parbhani local market.

The present investigation was carried out in Department of Food Engineering with collaboration of Department of Food Science and Technology and Department of Food Chemistry and Nutrition, College of Food Technology, VNMKV, Parbhani during year 2017-18.

Chemicals and glasswares

The chemicals of analytical grade and glassware required during investigation were used in the department of Food Engineering.

Methods

Physico-Chemical Properties

Physical Properties

Physical characteristics of *Moringa oleifera* pods were determined with the help of Vernier Calliper and Electronic Digital Weighing Balance.

Chemical Composition

Different chemical properties of samples such as moisture content, ash, fat, protein, crude fibre and carbohydrate were analyzed as per the methods given by the AOAC (2005) [2].

Mineral Content

The Mineral content of the *Moringa oleifera* pods such as Phosphorus, Calcium, Iron and Potassium were determined by the method given by (Ranganna, 1986).

Result And Discussion

Table 1: Physical Properties of *Moringa oleifera* pods

Sr. No.	Physical characteristics	Results
1	Weight of pod (gm)	70.5
2	Weight of 100 pod (gm)	7061
3	Length of pod (cm)	47.5
4	Width of pod (cm)	5.3
5	No. of seed per pod	15
6	Weight per 100 seed	43.1

*Each value is average of three determinations

It could be clearly observed from Table 1 that *Moringa oleifera* pods varied Physical characteristics such as average weight of pod (70.5 g), average weight of 100 pod (7061 gm), average length of pod (47.5 cm), average width of pod (5.3 cm), average number of seeds/pod 15 and average weight (43.1 g)/100 seed. It was also noticed through that table that the number of seeds in every pod of *Moringa oleifera* is perhaps higher than that any other famous vegetable such as green bean indicating that *Moringa oleifera* pods are full seeds and not empty. These results are in good agreement with the results reported by Oloyede *et al.* (2015).

Table 2: Chemical compositions of *Moringa oleifera* pods

Sr. No.	Chemical characteristics	Results
1	Moisture (%)	84.01 ±2
2	Ash (%)	2 ±0.02
3	Protein (%)	3.4 ±0.50
4	Fat (%)	0.1 ±0.05
6	Crude fiber (%)	5.1±0.70
5	Carbohydrates (%)	3.9 ±0.60

*Each value is average of three determinations

It was observed from the Table 2 that; the moisture content of *Moringa oleifera* pods was 84.01 ±2 per cent. The total ash content was found to be 2.94±0.02 per cent. The high moisture content indicates that *Moringa oleifera* pods may be susceptible to microbial growth. This is expected since the sample has been subjected to preservation to maintain the moisture content. The ash content is generally recognized as a measure of quality for the assessment of the functional properties of foods. Ash content is generally taken to be measure of mineral content of the organic food. The results were in agreement with Arise *et al.*, (2014) [3].

The crude protein, Crude fiber and fat content were 3.4±0.50, 5.1±0.70 and 0.1±0.002 per cent respectively. The amount of protein present in *Moringa oleifera* pods indicates that the plant can form a part of human diet. The carbohydrate content in *Moringa oleifera* pods was found to be 3.9 ±0.60 per cent. This showed that *Moringa oleifera* pods are good source of energy. The obtained results were carried out on wet weight basis and found comparable with the findings of Moyo *et al.*, (2013) [10], who determined the proximate analysis of drumsticks pods on wet weight basis. The good distribution of nutrient in the pods may explain the popular use of drumsticks pods by local users in treatment of disease.

Table 3: Mineral compositions of *Moringa oleifera* pods

Sr. No.	Mineral composition (mg/100gm)	Results
1	Phosphorus	110 ±5
2	Calcium	31±2
3	Iron	5.2 ±0.50
4	Potassium	248 ±9

*Each value is average of three determinations

The mineral analysis of *Moringa oleifera* pods reveals various major and trace elements like Phosphorous, calcium, iron and potassium (Table 3). The phosphorous, calcium and iron content in *Moringa oleifera* pods was 110 ± 5 , 31 ± 2 and 5.2 ± 0.50 mg/100g, respectively. The phosphorus content contributed in bone formation, energy metabolism and nucleic acid metabolism (Murray *et al.*, 2003) ^[12]. The calcium content result suggests that the pods may be of greater physiological significance to cure diseases related to bone system. Iron functions as haemoglobin in the transport of oxygen and is an important constituent of succinate dehydrogenase as well as a part of the heme of haemoglobin (Hb), myoglobin and the cytochromes (Chandra, 1990) ^[5]. The potassium content of *Moringa oleifera* pods was 248 ± 9 mg/100g. Potassium is the principal action in intracellular fluid and functions in acid-base balance, regulation of osmotic pressure, conduction of nerve impulse, muscle contraction particularly the cardiac muscle, cell membrane function. The high potassium content could be utilized for the management of hypertension and other cardiovascular conditions. The results of minerals content of *Moringa oleifera* pods were found to be similar with the data published by USDA (2014) ^[16].

Conclusion

Drumsticks (*Moringa oleifera*) have an impressive range of medicinal uses with high nutritional value. Different parts of this plant contain a profile of important minerals, and are good source of protein and crude fibre. It is very important plant for its medicinal value. The drumsticks were analyzed by different methods and various physicochemical characteristics and it shows that drumsticks content Moisture, Ash, Protein, Fat, Crude fibre and carbohydrates also mineral such as phosphorous, calcium, iron, potassium in superior amount that shows it is nutritional and healthy food.

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