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Nutritional Evaluation and Value Addition of Drumstick Pods

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ABSTRACT: The study was conducted by laboratory techniques in the department of Food Science and Nutrition, College of Community Science, Acharya Narendra Dev University of Agriculture & Technology, Kumarganj, Ayodhya, during 2020-22 secession. The study on title "Nutritional Evaluation and value addition of Drumstick pods" was undertaken to determine the physical and nutritional composition of immature and mature drumstick (*Moringa oleifera*) pods. The proximate composition of drumstick leaves was investigated in the studies. The moisture content of immature and mature pods was found to be 9.2 and 5.8 g. Protein estimated by Lowery method, the protein content of immature pods 21.03 and mature pods 22.39g. Crude fat content in immature pods 0.26 and mature pods 4.60 g. Crude fiber content in immature pods35.52 and mature pods 37.63 g. Carbohydrate in immature and mature pods was 29 and 21 respectively. According to proximate analysis of the all nutrient it has been found that in the drumsticks pods calcium in immature pods234 mg /100 g and in mature pods239 mg /100 g. Phosphorus value in immature pods 100mg/100g and in mature pods 111mg /100 g. In this series Vitamin 'C' content in fresh immature pods 117mg/100g and in mature pods 113 mg /100 g. Fresh drumstick pods were successfully used for preparing different nutritive food products- pods subji, pods chokhadrum stick based food products is good for health. Moringa pods content high amount of dietary fiber and low fat, which helps for obese/ fat loss. Drumstick (*Moringa oleifera)* is one of the promising plants which could contribute to increased intake of essential nutrients and health promoting phytochemicals.

Keywords: Proximate analysis, essential nutrients, nutritive foods, phytochemical, Pods.

INTRODUCTION

Almost every part of the drumstick, including the bark, root, flower, fruits, leaves and seeds are highly potential of proteins, vitamins, and minerals, including potassium, calcium, phosphorus, iron, folic acid, and beta carotene. It is described as "God has created one of the most amazing trees." Leaves can be consumed raw, boiled, or stored as a dry powder for several months without losing nutritious content (Pandey *et al.,* 2012).

The leaves, flowers, immature pods (which are called long green pods) and roots are edible. Due to the flavour of its root, it is known as the horseradish tree. When the fruit is ripe, it turns brown and contains 10-12 seeds that, when fried, have a peanut flavour. The tender pods, chopped or cooked, can be used in different and delicious dishes. The leaves and green seeds have a similar flavour to that of asparagus (Sánchez-Machado *et al.,* 2010).

Moringa oleifera contains higher amount of vitamin A than carrots, higher extent of vitamin C than oranges, more calcium and potassium content than milk and bananas respectively. Additionally, moringa is richer in iron than spinach by 9 times, also more in fibre than oats by 4 times, and a protein quality similar to that of egg and milk protein, which is more easily digested and absorbed (Mahmood *et al.*, 2010).

El-Massry *et al.* (2013) studied the physical properties and chemical composition of Moringa different parts of moringa such as seedless pods, seeds, fresh and dried leaves etc. The obtained data revealed that the seeds and dried leaves of *Moringa oleifera* are good sources for ether extract, crude protein, ash and also crude fiber. Mineral contents of different parts of moringa were studied and the obtained results indicated that the *Moringa oleifera* crop is also rich in many important minerals especially Calcium, Potassium, Magnesium, Phosphorus, Copper, Iron and Zink. They identified eighteen different amino acid in moringa. The essential amino acids, such as arginine and glutamic acids are found in high percentages in Moringa. The results also revealed that the different parts of Moringa are rich sources for natural antioxidants and total antioxidant activity. They found that quercetin, caffeic acid and kaempferol are predominant phenolic compounds found in Moringa pods and seeds.

Nouman *et al.* (2020) Found the calcium and iron content of *Moringa oleifera* leaves are calcium and iron levels were measured in *Moringa oleifera* leaves

and found to be 2314-3487 ppm and 276-418 ppm, respectively ad were higher than in pods 2017-2032 ppm and 61-68 ppm, respectively. There were no significant differences in potassium content between cultivars pods contained more than four times as much phosphorus 1.5-1.7 percent than leaves 0.34-0.38 percent. They also reported high antioxidant activity in the leaves, stem, and roots. According to numerous studies, *Moringa oleifera* is a multipurpose nutritional plant that can be used and consumed in a variety of ways.

Fahal *et al.* (2018) investigated *Moringa oleifera* plant secondary metabolites or phytoconstituents are regarded as a good and unique source for food supplements and pharmaceuticals. The importance of alkaloids, sterols, saponins, and tannins comes from their uses as antimicrobial properties for treatment of many pathogens. Phyto-sterols and flavonoids have role as immunomodulatory, anticancer, antioxidant, and anti-inflammatory agents. *Moringa oleifera* has remarkable medicinal and nutritional properties. The various parts of the tree, including the leaves, seeds, pods, roots, and bark have medicinal application. Human pathogens are inhibited by fresh leaf juice. The seeds also have antimicrobial properties. Fruits and pods have a broad range of antimicrobial and antifungal properties against common pathogens. The roots have antispasmodic and antimicrobial properties and are used to treat diarrhoea.

MATERIAL AND METHODS

The study was conducted in the Department of Food Science and Nutrition, College of Community Science, Acharya Narendra Dev University of Agriculture & Technology, Kumarganj Ayodhya. The drumstick pods (*Moringa oleifera*) were procured/collected from different plants in the Acharya Narendra Dev University of Agriculture and Technology, Kumarganj. The procured/ collected samples were utilized for physical analysis, chemical analysis and product development.

For dehydrate the leaves were use the method: Collect the pods, Washed with water, Drain in basket, Oven dry 60°C, Grinding in mixture, Stored in air tight containers. For moisture content, ash estimation and Crude fat was calculated by AOAC, 2000. For Crude fat using the Automatic SOCS plus Solvent Extraction System.

Crude protein content of the plant sample was estimated by Lowery *et al.* (1951). Reagent: 2% Na_2CO_3 in distilled water (reagent A), 0.5 % $CuSO_4$, NaOH in 1% copper sulfate, sodium hydroxide (reagent B), 50 ml of reagent (A) was mixed with 1 ml of reagent (B), reagent (C), Folin's reagent. The residue left after 80% ethanol extraction from protein analysis was hydrolyzed in 5.0 ml of 1 N NaOH for overnight and then centrifuged at 4000 rpm for 20 minutes. Supernatant was kept aside and residue was again hydrolyzed with 5.0 ml 1N NaOH for 1 hour and centrifuged. Both the supernatant were pooled and volume was made to 10 ml. The total protein was estimated in the supernatant by Folin's reagent. Procedure: 0.5 ml aliquot was taken in test tube, mixed with 5.0 ml of reagent (C) and allowed to stand for 10 minutes, thereafter, 0.5 ml of folin's reagent was added with instant mixing. After 30 minutes O.D. was read at 750 nm through Spectronic-20 against reagent the blank solution. A standard curve was prepared with graded concentration of bovine serum albumin.

Protein/100 g =

$$\frac{\text{G.F.} \times \text{O.D.} \times \text{Total volume}}{\text{Aliquot taken} \times \text{Weight of sample} \times 1000} \times 1000$$

Crude fiber estimated by FIBRA PLUS FES 2 apparatus.

Dry matter: Moisture value was subtracted from 100; the difference gave values of available dry matter. Total carbohydrates estimated by NIN, 1983.

Vitamin C was estimated by employing the standard method of analysis (AOAC, 1980). This method is based on the reduction of 2-6 dicholorophenol indophenol dye by ascorbic acid. This dye which is blue in alkali solution and red in acid solution is reduced by ascorbic acid to colourless form. The solution is quantitative and practically specific for ascorbic acid in solution.

For minerals estimation by acid digestion, calcium was determination by flame-photometer, Jackson 1973.The phosphorus was determined in the digested leaves material by Vanadate-molybdate phosphoric yellow colour method as describe by Jackson 1973.

$$\text{Protein content } \% = \frac{50 \times 100 \times \text{B} \times \text{C}}{\text{A} \times 1000000}$$

B stand for ppm, P in test solution taken for reading. C stand for 50 (digested volume is made up 50 ml). A stand for test solution in ml taken from the digested.

$$\text{Ca}\% = \frac{\text{R} \times 100 \times \text{Aliquate taken in ml}}{\text{Weight of sample} \times 1000000}$$

R stand for taken the reading by flame-photometer.

Product Development Pods subji- 50 g, Potato- 25g, Tomato-23.5g, Onion-13 g, Green chilli-2, Spices- ¼ tsp, Fenugreek seeds-1/8 tsp, Turmeric- 1/6 tsp, Salt- ¼ tsp, Oil-14.8 ml. method- Washed and cut the drumstick pods in small size, peeled and cut potatoes in a small pieces . Heated oil in a pan, add fenugreek seeds, chopped onions, green chili and garlic and fried them. Added tomatoes, turmeric, salt, garam masala, cover it. Then added cut vegetables, water and cooked it. Cooked till vegetables become soft. Served hot with chapati / rice.

Drumstick pod C*hokha*- Drumsticks pods- 50 g, Onion-14 g, Garlic-2-3 cloves, Green Chilli-2, Salt- ¼ tsp, Mustered oli-5 ml. Method- Put drumstick pods in a cooker. Added little water and boil it. Drained water and mashed pods. Added finely chopped onion, garlic, green chili, salt and mustard oil in mased pod and mixed well. Served it with chapati.

RESULT AND DISCUSSION

Physical parameters of drumstick (*Moringa oleifera*) pods: Data presented in Table 1 show the physical characteristics of drumstick pods. The colour of immature pods was light green and colour of mature

pods was dark green.. Average weight of immature and mature pods was 714.28 and 5260 of 100 gm.

The data given in Table 2 shows the proximate composition of different parts of drumsticks. The moisture content of immature pods was 7.10 percent and mature pods was 5.80 percent. El-Massry *et al.* (2013) reported moisture content in pods 85.65 ±0.3 per cent. Also reported 17.20 ±0.7 per cent crude protein in pods of *Moringa oleifera.* Whereas, in the present study in immature and mature pods contained higher amount of crude protein i.e. 21.03 and 22.39 per cent.

The crude fat content of immature pods 0.26, and mature pods 4.6 percent (Gopalakrishnan *et al.,* 2016) found 0.1 per 100 gram fat in pods of *Moringa oleifera.* Sánchez-Machado *et al.* (2009) found 19.34±0.2 percent in immature pods.

Crude fibre value was highest in mature pods ie. for 37.63 per cent followed by immature pods 35.52 per cent, (Gopalakrishnan, 2016) found 4.8 per 100 gm fibre in pods of *Moringa oleifera* (Sánchez-Machado *et al.,* 2010) found fibre content in immature pods was 46.78±2.2 percent on dry weight basis.

Total ash content of mature pods was 9.02 per cent and 7.10 per cent in immature pods Sánchez-Machado (2010) reported, 7.62 ± 0.3 and 9.68 ±0.7 per cent ash in immature pods *Moringa oleifera* on dry weight basis. However, in the present study the ash content was less than those reported by them. El-Massry *et al.* (2013) reported that pods contain ash 12.33 ±0.2 percent of *Moringa oleifera.*

The carbohydrate content of different parts of moringa namely immature leaves, mature leaves, immature pods 29 and mature pods 21per 100 gram. El-Massry *et al.* (2013) reported lower values for carbohydrate in pods 26.37±2.1 per cent. Gopalakrishnan *et al.* (2016) found 3.7g carbohydrate in moringa pods.

The energy content was minimum in mature pods (142 Kcal) followed by mature pods. The energy value of immature pods 202 and mature pods 142 Kcal per 100 gram. El-Massry *et al.* (2013) reported 178.24Kcal per 100 gram energy in Moringa pods.

Data illustrated in Table 2 depicts mineral and dry mater content of different parts of drumsticks. The calcium content of immature pods 234 and mature pods 239. Phosphorus content in immature drumsticks pods contain 100 and mature pods 111 mg per 100 gm.

El-Massry *et al.* (2013) reported 28.97 ± 0.4 mg per 100 gram calcium on dry weight basis in pods. Gopalakrishnan *et al.* (2016) reported 30 mg per 100gram calcium on dry weight basis in pods. El-Massry *et al.* (2013)reported the phosphorus content inpods 112.32 ± 0.3 mg per 100 gram. Gopalakrishnan (2016) reported 110 mg per 100gram phosphorus in dry weight basis in pods. Vitamin 'C' content in immature pods 117 mg per 100 gm and mature pods 113 mg per 100 g.

Table 1: Physical parameters of drumstick (*Moringa oleifera*) pods.

Parts /Parameters	Colour	Shape	Weight (g) of 100 leaves/pods/seeds
Immature Pods	Light Green	Stick	714.28
Mature Pods	Dark green	Stick	5260

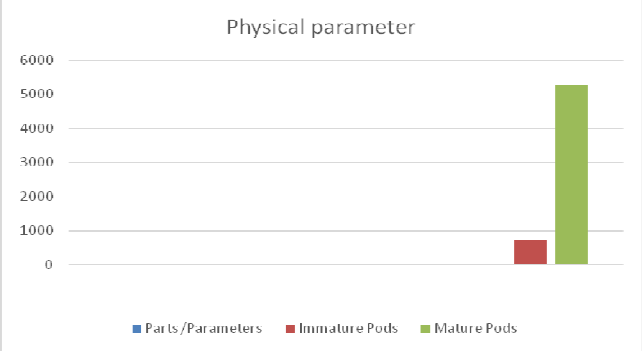

Fig. 1. Graph of physical parameter of drumstick pods.

Table 2: Proximate composition of drumstick pods (*Moringa oleifera*) per 100 gram.

Parameters /Parts	Pods		Mean
	Immature	Mature	
Moisture (g)	7.10	5.80	6.45
Crude Protein (g)	21.03	22.39	21.71
Crude Fat (g)	0.26	4.60	2.43
Crude Fibre (g)	35.52	37.63	36.57
Total Ash (g)	7.10	9.02	8.06
Carbohydrate (g)	29	21	25
Energy (kcal)	202	142	172
Calcium (mg/100)	234	239	236
Phosphorus(mg/100)	100	111	105
Dry Matter (%)	93	94	93
Vitamin 'C'(mg/100)	117	113	115

*All values are on dry matter basis

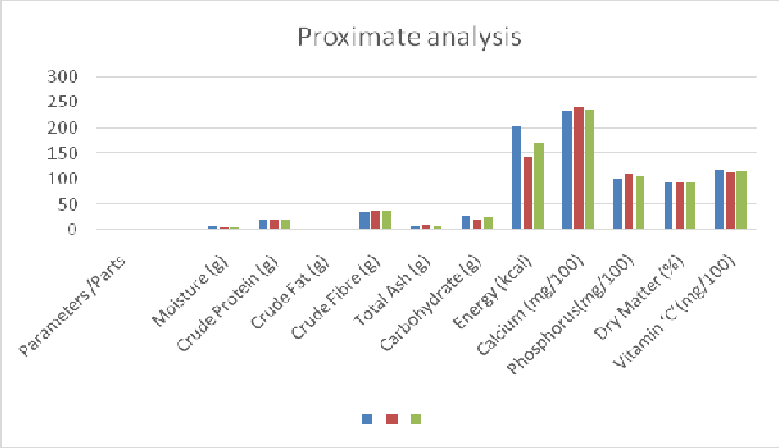

Fig. 2. Graph of proximate analysis of drumstick pods.

CONCLUSIONS

Physical, chemical and nutritional attributes of drumstick pods. The pods were found be rich in minerals like calcium and phosphorus and vitamin 'C'. Use of moringa pod in day Several value added products can be prepared from fresh drumstick pods Drumstick pods *ubji* Drumstick pod C*hokha*. Eating drumstick based food products is good for those suffering from malnutrition. It is essential that the nutrients of this wonder tree are exploited for a variety of purposes. *Moringa oleifera* leaf powder should be advocated for supplementation in household diets especially in rural and disadvantaged communities.

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Conflict of Interest. None.

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