

Original Research Article

Protein and Total Free Amino Acid Content evaluation of improved and local varieties/germplasm of Spine gourd *Momordica dioica* Roxb. (family - Cucurbitaceae)

ABSTRACT: -

Spine gourd (*Momordica dioica* Roxb., $2n = 2X = 28$) is a nutritionally rich, perennial and dioecious cucurbit with good assortment of adaptability. Varieties of spine gourd improved germplasm/varieties collected from farmers' field and were sown in Completely Randomized Design (CRD) with Three replications at Acharya Narendra Deva University of Agriculture and Technology Ayodhya, Uttar Pradesh, India during monsoon season 2020. Biochemical characteristics of spine gourd analysis revealed that maximum Protein content (3.09mg/100g) was found in variety Kheri-3,1. Total free amino acid content (6.90mg/100g) was found in variety NDMD-2. Minimum protein content was found in the variety Arka Bharat (2.94mg/100g) and Total Free Amino acid content was reported in the variety Ambika-K-13,6 (6.27mg/100g). Based on observation, variety Kheri-3,1 and NDMD-2 were found superior in both Protein and Total Free Amino acid parameters followed by germplasm Arka Bharat and Ambika-13,6 respectively.

Keywords: - Protein, Total Free Amino acid, saponin *M. dioica* (SMD), Dioecious

INTRODUCTION

Distributed throughout Asia and Europe, the spiny gourd (*Momordica dioica* Roxb., $2n = 2X = 28$) is a dioecious, perennial, and nutritionally rich vegetable [1]. Vegetables are an excellent source of nutritional fibre, vitamins, and minerals. Vitamins C (ascorbic acid), Thiamine (B1), Niacin (B3), Pyridoxine (B6), Folic acid B9 (sometimes called vitamin Bc), minerals, and dietary fibre are all found in abundance in vegetables [2]. A daily diet rich in vegetables has been strongly associated with a lower risk of heart disease, stroke, certain cancers, and other chronic illnesses [3]. It is an edible vegetable with a high nutritional value. The fruit's edible portion has 84.1% moisture, 3.1% protein, 0.97% ether extract, 7.7% carbohydrates, 2.97% fibre, and 1.1% ash. In addition, it has 4.6 mg of iron, 33 mg of calcium, 42 mg of phosphorus, 2 mg of vitamin A, 45.2 mg of thiamine, and 176.1 µg of riboflavin. Ascorbic acid is also present in the fruit. This vegetable and its fruits are suggested for the treatment of diabetes as mentioned in Ayurveda. It has spermicide, anthelmintic, antipyretic, and astringent properties. It possesses analgesic, hypoglycemic, antimicrobial, anti-inflammatory, antilipid peroxidative, and antioxidant qualities. Pitta, asthma, leprosy, bronchitis, fever, tumours, urine secretion, excessive salivation, and heart disease can all be treated with this fruit. An effective home treatment for inflammation is fruit juice.

Sneezing is induced by the fruit powder, which helps to cleanse the nose. Nephroprotective effect has been demonstrated by fruit ethanol extracts [4]. It has a tuberous root system and is a perennial dioecious climber. It has a tuberous root system and is a perennial dioecious climber [5]. The alkaloid present in seed is called momordicin and that present in roots, called *Momordica foetida* [6]. In research on the acute toxicity of the saponin *M. dioica* (SMD), mice were given a single oral dosage of 5000 mg/kg/b.w.; no death was noted, and after 14 days, the mice's behaviour remained normal. A single animal demonstrated that dosages of 500 and 250 mg/kg/b.w. of SMD were safe, with no mortality for sub-acute but with a repeated dose of 1000 mg/kg/b.w. Dosage administration of 1000, 500, and 250 mg/kg/b.w. via oral route in rats over 28 days. The group displayed poisoning symptoms associated with therapy. When rats were given SMD at dosages of 500, 250, and 100 mg/kg/b.w. for 90 days, their haematological and biochemical parameters were normal, and their overall findings were comparable to those of the control group [7].

MATERIALS AND METHODS

The present investigation was conducted in Biochemistry laboratory at Acharya Narendra Deva University of Agriculture and Technology Ayodhya, Uttar Pradesh, India during Monsoon season of 2020. The techniques and material employed for the study are described here under briefly. The pic 1 shown field, roots and fruits of spine gourd.

Experimental Material:

Ten varieties/germplasms Spine gourd (*Momordica dioica* Roxb.) namely Arka Bharat, Kiron Mala, NDMD-5, Kheri-3,1, Krishnapur, RFM-37, NDMD-2, Kheri-LMP, PHULE-MD-5,1 and Ambika.K-13,6 was used as experimental material.

Protein content in spine gourd:

Lowery's approach [8] was used to determine the protein content of grain. The basis of this approach is the protein's interaction with the Cu^{2+} ion in an alkaline media, as shown in the protein estimation biuret method. In addition to these three, the protein's tyrosine amino acid plays a role in the reduction of phosphomolybdate and phosphor tungstate. One gram sample was obtained, homogenised with 10 millilitres of distilled water, then centrifuged for fifteen minutes at 4000 rpm. The leftovers were thrown away. One millilitre of the supernatant was then collected and combined with one millilitre of 10% trichloric acid. After 30 minutes, the residue was removed and dissolved in 5 milliliters of 0.1 N NaOH. A test tube containing 0.5–1.0 ml of sample extract was filled with 1 ml of distilled water. Subsequently, 5 milliliters of alkaline copper reagent were added and well mixed. 0.5 ml of folin reagent was added after 10 minutes, and it was then allowed to sit at room temperature for 30 minutes. Lastly, using spectronic-20, color intensity was measured at 660 nm in comparison to a blank reagent.



Pic. 1 Images showing cultivation field, fruits and roots of Spine gourd

Total free amino acid content in spine gourd:

The Jayaraman (1981)[9] approach was utilized to determine the total free amino acid. After extracting 0.5 g of the material with 80% ethanol, it was centrifuged for 10 minutes at 5000 rpm. A appropriate aliquot of 0.5 ml was placed in a test tube, and 4 ml of distilled water was added to the volume. After that, 1 milliliter of ninhydrin solution (0.2 N acetate buffer at pH 5.5) was added, and the mixture was left in the water bath for 15 minutes. After the allotted time had passed, the test tube was cooled, and 1 milliliter of 50% ethanol was also added. Color was measured with Spectronic 20 at 550 nm. Using a standard curve for graded concentration standard proline, the total free amino acid was computed.

RESULT AND DISCUSSION

The results of the laboratory experiments of the present investigation are given below. The observations recorded in the spine gourd were analysed statistically. The result is published in the form of tables, graphs, photographs and salient features are described as follows.

1. Protein content (g)

Table 1 highlights that protein content varied from 2.94 - 3.09(mg/100g) in various varieties of spine gourd. Maximum protein content was found (3.09 mg) in Kheri -3,1 variety followed by 3.06 mg in variety NDMD-5 and RFM-37 and lowest protein content was found in variety Arka Bharat (2.94mg) followed by Kiron Mala (2.97mg) and PHULE-

MD.5,1(2.97mg).A significant variation was observed in various spine gourd varieties as shown in Figure 1.

Table 1. Variation in Protein content (g/100g) in spine gourd Variety/germplasm.

S. No.	Varieties/Germplasm	Protein content (g/100g)
1.	Arka Bharat	2.94
2.	Kiron mala	2.97
3.	NDMD-5,1	3.06
4.	Kheri-3,1	3.09
5.	Krishnapur	2.98
6.	RFM-37	3.06
7.	NDMD-2	3.04
8.	Kheri-LMP	3.06
9.	PHULE-MD-5,1	2.97
10.	Ambika-K-13,6	3.05
	'F' test	Sig
	SE m+₋	0.008
	CD at 5%	0.025

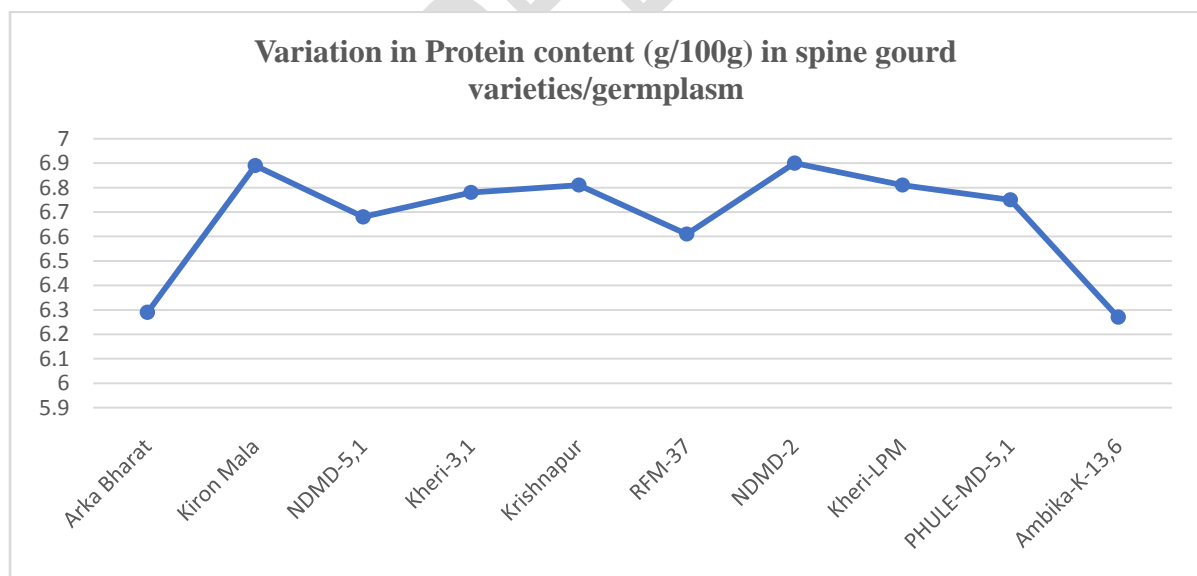


Figure 1. Variation in Protein content (g/100g) in spine gourd varieties/germplasm

2. Total free amino acid content (mg/100)

The data regarding total free amino acid content is shown in Table 2 and graphically presented in Figure 2. The data showed that total free amino acid content varied from (6.27 – 6.90 mg/100g) in various varieties of spine gourd.

Table 2.Variation in Total Free Amino acid content (g/100g) in spine gourd variety/germplasm

S. No.	Verities/germplasm	Total Free Amino Acid content (mg/100g)
1.	Arka Bharat	6.29
2.	Kiron Mala	6.89
3.	NDMD-5,1	6.68
4.	Kheri-3,1	6.67
5.	Krishnapur	6.81
6.	RFM-37	6.61
7.	NDMD-2	6.90
8.	Kheri-LMP	6.81
9.	PHULE-MD-5,1	6.75
10.	Ambika-K-13,6	6.27
	'F' test	Sig
	SE m+₋	0.014
	CD at 5%	0.041

Maximum total free amino acid content was found in NDMD-2 (6.90 mg/100g) in variety followed by Kiron Mala (6.89 mg /100 mg) in variety. Minimum total free amino acid content was found in variety Ambika-13,6 (6.27 mg/100g) followed by Arka Bharat (6.29 mg/100g). A significant variation was observed for total free amino acid content in various spine gourd varieties as shown in figure. 2.

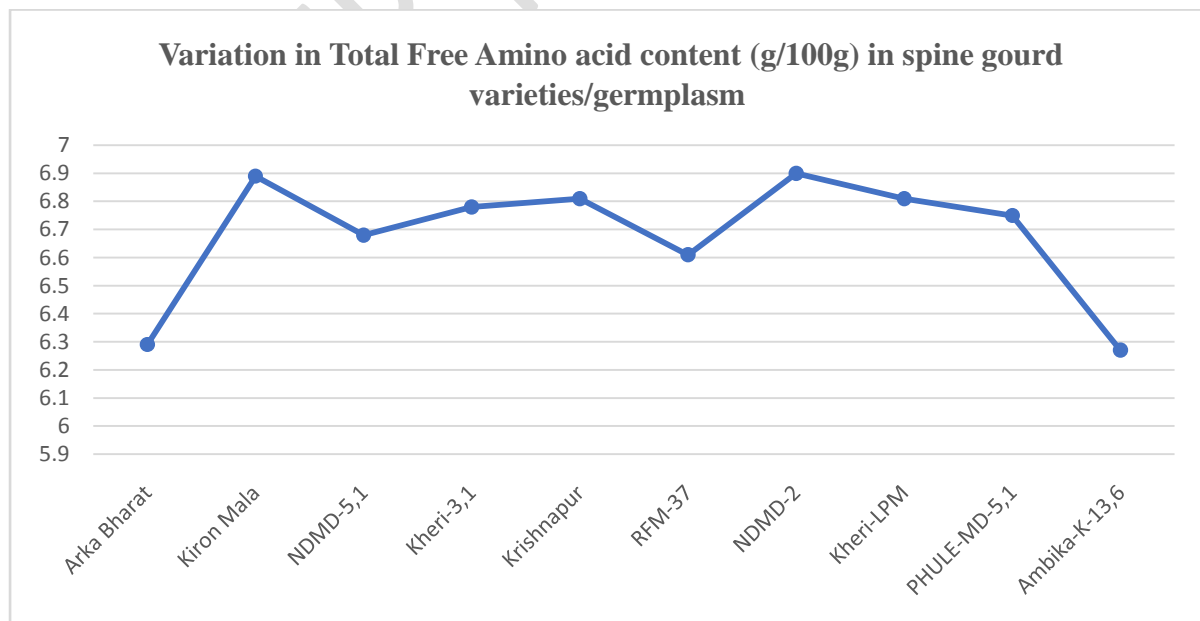


Figure 2.Variation in Total Free Amino acid content (g/100g) in spine gourd variety/germplasm

DISCUSSION

The data about protein content have been shown in Table 1. The table highlights that protein content varied from 2.94 - 3.09(mg/100g) in various varieties of spine gourd. Maximum protein content was found in (3.09 mg) Kheri -3,1 which was significantly superior over the rest of the variety followed by 3.06 mg in variety NDMD-5 and RFM-37 varieties. Spine gourd germplasm and observed an increase in the amount of protein due to rainfall in comparison to no rainfall. These results are in close conformity with **Yadav and Srivastava (2002), Abu-Salem and Abu-arab (2011), and Sreeramaet al., (2012) [10, 11, 12, 13]**.

Total amino acid content in all varieties and germplasm of spine gourd was found in the range of (6.27 – 6.90 mg/100g) mg. The maximum total free amino acid was noticed in variety NDMD-2 (6.90 mg/100g) followed by Kiron Mala (6.89 mg /100 mg). Total free amino acid content varied significantly in all the varieties and germplasm of spine gourd. The similar findings have been recorded by **Islam et al. (1991)[14]** in spine gourd.

The physical and biochemical characters of spine gourd were recorded after the harvest of crop. The biochemical evaluation of the spine gourd just after harvest. The fruit after the harvest were collected and brought to biochemical laboratories for analysis.

CONCLUSION

Based on above stated observations it can be concluded that the germplasm Kheri-3,1 having the highest protein content(3.09mg/100g) is better for a protein-rich diet, especially for those suffering from diabetic problems. The highest total free amino acid content was found in variety NDMD-2 (6.90mg/100g), so this variety is more suitable for general consumption for normal as well as diabetic people to fulfill their amino acid needs. So, for a healthy living, free from diabetes as well as amino acid deficiency, both varieties offer a better option to farmers for cultivation and enhanced earnings.

REFERENCES

1. Rai GK, Singh M, Rai NP, Bhardwaj DR and Kumar S. In vitro propagation of spine gourd (*Momordica dioica* Roxb.) and assessment of genetic fidelity of micro-propagated plants using RAPD analysis. *Physiol. Mol. Biol. Pl.* 2012;18(3):73-80.
2. Wargovich MJ. Anticancer properties of fruits and vegetables. *Horticulture Science* 2000;2(1):73-575.
3. Tomas-Barberan FA and Espin JC. Phenolic compounds and related enzymes as determinants of quality in fruits and vegetables. *J Sci. Food Agric.* 2001;5(1):853-876.
4. Baratakke RC, Patil CG, Poornima B and Sankannavar SH. Molecular tool for sex identification (female) in *Momordica dioica* Roxb with reference to medicinal values. *International Journal of Ayurveda and Pharma Research*, 2013;4(4):487-490.
5. Sharma GK. Medical ethnobotany in the Shivalik Range of the Himalayas, *Journal of the Tennessee Academy of Science.* 2004;7:12-14.
6. Sadyojatha AM, Vaidya VP. Chemical constituents of rhizome of *Momordica dioica* Roxb. *International seminar on recent trends in pharmaceutical sciences.* 1995; 46:18-20.
7. Jha DK, Koneri R and Samaddar S. (2019) Antidiabetic Activity of Phytosaponin in STZ Induced Type I Diabetes in Rats. *Research J. Pharm. and Tech*, 2019;12(8):3919-392.
8. Lowry's OH, Roserbrough NJ, Farm AL and Randall RJ. Protein measurement with folin phenol reagent. *J. Biochem.* 1995;193-265.
9. Jayarama, J. Laboratory manual of Biochemistry. *Willey Eatern Ltd.* New Delhi. 1981.
10. Yadav V and Srivastava GP. Biochemical composition and nutrition value of important genotypes of spine gourd (*Momordica dioica* L.) *India J. of Agriculture Biochemistry.* 2002;15 (1/2):45-50.
11. Sreerama YN, Neelam DA, Sashikala VB and Pratap VM. Distribution of nutrients and antinutrients in milled fractions of spine gourd fruit coat phenolics and their distinct modes of enzyme inhibition. *Journals of Agriculture and food Chemistry.* 2010;58 (7): 4322-4330.
12. Abu-salem FM and Abou-Arab EA. Physico-chemical properties of temph produced from spine gourd seeds. *J. Americ. Sci.* 2011;7 (7):107-118.
13. Sreerama YN, Sashikala VB, Pratap VM and Singh V. Nutrition and antinutrients in spine gourd fruit: evaluation of their flour functionality, *food Chemistry.* 2012;131(2):462-468.
14. Islam MR, Hirayama H, Funatsu G. Complete Amino Acid Sequence of Luffin-a, a Ribosome-inactivating Protein from the Seeds of *Luffa cylindrica*. *Agric. Biol. Chem.*, 1991;55:229 - 238.