International Journal of Pharmaceutics & Pharmacology

Available Online: http://ijpp.edwiserinternational.com

Phytochemical Profile of Trigonella foenum graecum Linn.

*Vasant B Kadam**

Department of Botany and Research Centre, K.T.H.M.College, Nashik, Maharashtra, India

Article info

Received 24 May 2018
Revised 25 June 2018
Published 29 June 2018

*Corresponding author: Vasant B Kadam, Department of Botany and Research Centre, K.T.H.M. College, Nashik-2, India, E-mail: drvbkadam@yahoo.com

Abstract

The seasonal variation of protein, amino acids and alkaloids has been investigated in leaves, stem, roots and seeds of Trigonella foenum graecum. The leaves of Trigonella foenum graecum showed high level of protein content during summer season (5.131 mg/g dry wt.) than monsoon (4.563 mg/g dry wt.) and winter (4.637 mg/g dry wt.) season. Comparative account of amino acid content of leaves of Trigonella foenum graecum showed higher level in summer season (0.914 mg/g dry wt.) and lowest amount of amino acid content in the leaves during monsoon (0.832 mg/g dry/wt.) season. The leaves of Trigonella foenum graecum showed high level of alkaloid content in seeds (4.167 mg/g/dry wt.) and lower alkaloid content in root (range 1.006 to 1.231 mg/g dry wt.).

Keywords: Protein; Alkaloid; Amino acids; Trigonella foenum-graecum

Introduction

Since the ancient times, nature has been a huge source of medicinal agents. All over the world, plants have served as the richest source of raw materials for traditional as well as modern medicine [1,2]. The medicinal value of plants is mainly due to the presence of some chemical substances known as photochemical. They are basically plant metabolites, are synthesized in all parts of plant body itself and have some definite physiological action on animals [3,4]. In view of the increasing demand for protein and energy to support the growing world population, researchers have directed their efforts at exploring new and nonconventional sources of food that grow in the different regions of the world. Nature has bestowed upon us a very rich botanical wealth and a large number of diverse types of plants grow wild in different parts of our country. The important constituents of diet are carbohydrates, fats, proteins, vitamins, minerals and water [5]. Every constituent plays an important role and deficiency of any one constituent may lead to abnormal developments in the body. Plants are the rich source of all the elements essential for human beings.

Trigonella foenum graecum is commonly known as fenugreek (English). *Trigonella foenum-graecum* is reported to contain several active chemical constituents such as alkaloids, saponins, steroids, tannins, flavonoids, amino acids and trigonilline. The plant has been scientifically used for the treatment of wounds, inflammation, gastrointestinal ailments, as cholesterol lowering agent, diabetes, bronchitis, inflammation, chronic cough, liver disorder and as an anti-fertility agent. *Trigonella foenum-graecum* is one such plant that has been extensively used as a source of antidiabetic compounds from its seeds, leaves and extracts in different model systems [6-8]. Fenugreek is traditionally used in India, especially in the Ayurveda and Unani systems [7-9]. The seeds possess anti-diabetic potentials [10].

Materials and Methods

The plant material of *Trigonella foenum-graecum* were collected from our botanical garden, during different season's viz. summer, monsoon and winter continuous

two years for estimation of protein, amino acids and alkaloids.

The protein was quantitatively estimated by Lowry et.al [11]. 1 gm plant material was homogenized with 10 ml 80% ethanol. The extract was centrifuged at 5000 rpm for 5 min and the supernatant was discarded. 5% of 10 ml Trichloro Acetic Acid (TCA) or Per Chloric Acid (PCA) was add to residue and incubated at 80ºC for 20 minutes. The pallets were centrifuged, and the supernatant was discarded. Residue was washed with 10 ml distilled water and again centrifuged. The supernatant was discarded. 2% 10 ml Na_2CO_3 in 0.1 N NaoH was add to the residue and incubated for an hour at 30ºC. Again, centrifuged and residue was discarded. The final volume of supernatant was measured, and it was used as a sample for protein. 1 ml of aliquot of sample was taken and 5 ml reagent C was added to it and mixed thoroughly. The sample was incubated for 10 minutes and 1 ml of reagent D was added to it. The colour intensity was read at 660 nm using spectrophotometer. The protein concentration of an unknown sample was calculated using standard graph.

The estimation of total amino acid was adapted by Krishnamurthy et. al. method [12]. 500 mg plant material was grounded in mortar and pestle with few drops of cold 80% ethanol. Then 2.5 ml of distilled water and 10 ml of boiling 80% ethanol were added to it. The extract was centrifuged for 15 minutes at 10,000 rpm. Residue was discarded. The supernatant was collected, and total volume was made 15 ml with distilled water. 1 ml of sample was taken in a test tube and 3 ml alcoholic ninhydrin was added to it. Test tube was kept at 60ºC for 20 minutes. The test tubes were cooled, and 1 ml 50% ethanol was added. Read at 420 nm in spectrophotometer. Glycine was used as standard.

Quantitative estimation of alkaloids was carried out by the method of Sairam and Khanna [13]. Each sample was ground to fine powder. To each one-gram powder 0.75 ml 25% ammonium hydroxide, 1 ml 95% ethyl alcohol and 2 ml ethyl ether were added. The material was allowed to macerate for 12 hours and dried. The dried material was extracted with chloroform for 24 hours in a soxhlet apparatus and the extract obtained was evaporated to dryness, and the residue was mixed with 2.5 ml of 0.1 Methanol (90%) HCL. The extract thus obtained was centrifuged to take supernatant and discard pellet. The solution was evaporated, and the total alkaloids were weight after drying at 100ºC.

Results and Discussion

The protein content of leaves was higher (5.131 mg/g dry wt.) in summer over than winter (4.637 mg/g dry wt.) and monsoon (4.563 mg/g dry wt.). The range of protein content of stem was from (3.013 mg/g dry wt. to 3.576 mg/g dry wt.). The range of protein content in root was from (1.176 mg/g dry wt. to 1.387 mg/g dry wt.) and show higher in summer. The protein content of root was very low in all season. The protein content of seeds was higher (23.220 mg/g dry wt.) as compared to leaves, stem and roots of all seasons. The protein content showed increasing order of root <stem<leaves< seeds. (Table 1 and Figure 1).

The amino acids content of leaves was (0.914 mg/g dry wt.) in summer, (0.869 mg/g dry wt.) in winter and (0.832 mg/g dry wt.) in monsoon. Higher being observed during summer i.e. (0.914 mg/g dry wt.). The range of amino acids content in stem were (0.518 mg/g dry wt. to 0.610 mg/g dry wt.). Maximum concentration of amino acids was noted during summer (0.610 mg/g dry wt.). The range of amino acid content of root was low from (0.019 mg/g dry wt. to 0.025 mg/g dry wt.). The amino acids content of seeds was higher (9.434 mg/g dry wt.) as compared to leaves, stem and roots of all seasons. Generally, the concentration of amino acids was found to be in increasing order of root<stem< leaves<seeds. (Table 1 and Figure 1).

The alkaloids content of leaves was ranging from (2.458 mg/gm dry wt. to 3.100 mg/gm dry wt.) and attained its peak concentration (3.100 mg/gm dry wt.) during summer season. The range of alkaloid content was from (1.872 mg/gm dry wt. to 2.270 mg/gm dry wt.) in stem and from (1.006 mg/gm dry wt. to 1.231 mg/gm dry wt.) in root during the three seasons tested. Highest concentration observed in summer season i.e. (1.231 mg/gm dry wt. and 1.093 mg/gm dry wt.) in winter. Seeds content highest (4.167 mg/gm dry wt.) amount of alkaloid content compared to leaves, stem and roots of all seasons (Table 1 and Figure 1).

Table 1: Seasonal variations of protein, amino acids and alkaloids of various parts of *Trigonella foenum-graecum.*

Plant parts	**Seasons**	**Protein mg/gm.dry wt.**	**Amino acids mg/gm.dry wt.**	**Alkaloids mg/gm.dry wt.**
Leaves	Summer	5.131	0.914	3.100
	Monsoon	4.563	0.832	2.458

	Winter	4.637	0.869	2.742
Stem	Summer	3.576	0.610	2.270
	Monsoon	3.013	0.518	1.872
	Winter	3.241	0.561	2.041
Roots	Summer	1.387	0.025	1.231
	Monsoon	1.176	0.019	1.006
	Winter	1.262	0.021	1.093
Seeds	--	23.220	9.434	4.167

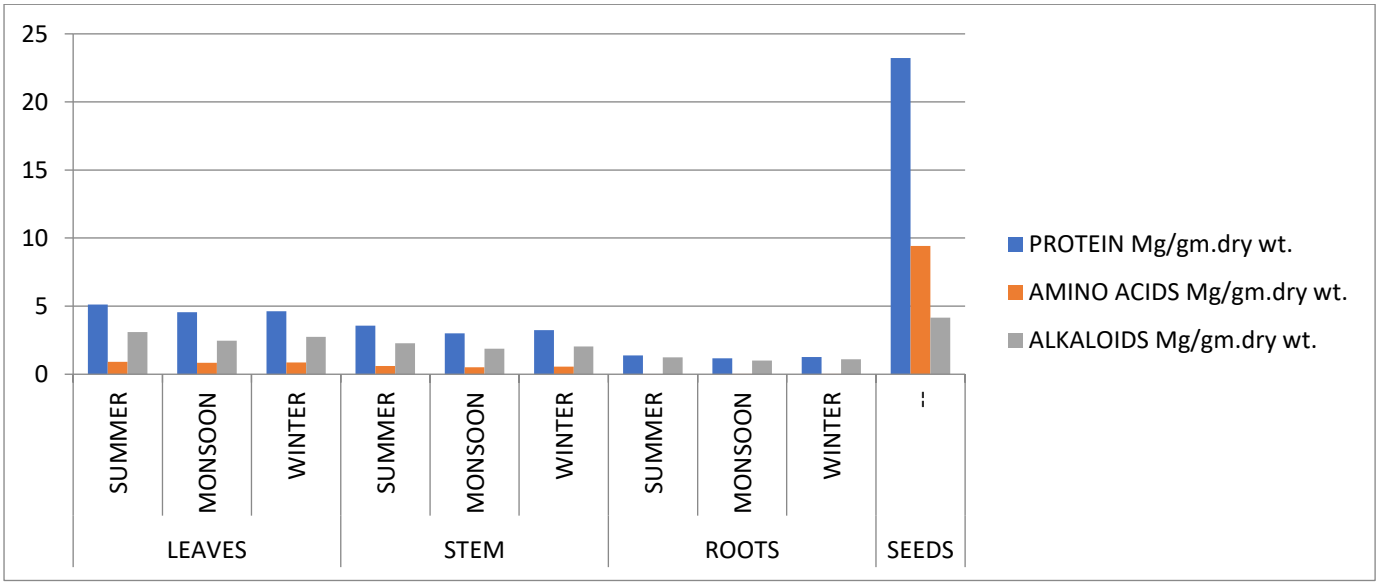

Figure 1: Seasonal variations of protein, amino acids and alkaloids of various parts of *Trigonella foenum-graecum*.

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This manuscript was peer-reviewed
Mode of Review: Single-blinded
Academic Editor: Dr. Bijay Kumar Mohanty