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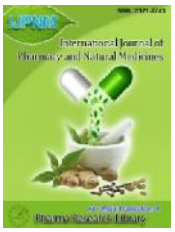

Research Article **Open Access**

Estimation of total carbohydrates content in different parts of *Trigonella foenum-graecum* Linn.

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A B S T R A C T

Fenugreek (*Trigonellafoenum-graecum* L.), plant is widely distributed throughout the world and which belongs to the family Fabacecae. The seasonal variation of starch , total sugar and total carbohydrates content have been investigated from leaves, stem , root and seeds of *Trigonella foenum-graecum* Linn. Comparative account to fstarchcontent of leaves, stem and root of *Trigonellafoenum-graecum* showed (range 5.176 to 22.684 mg/g dry wt.). The comparative account of total sugar content of leaves, stem and root of *Trigonella foenumgraecum* showed (range 2.358 to 9.637mg/g dry wt.) and comparative account of total carbohydrates content of leaves, stem and root of *Trigonella foenum-graecum* showed (range 7.534 to 32.321 mg/g dry wt.).Higher level of starch (49.017mg/g dry wt.), (12.720 mg/g dry wt.)and total carbohydrates (61.737 mg/g dry wt.) were found in seeds compared to leaves, stem and root of *Trigonellafoenum-graecum* Linn.

Keywords: Starch, total sugar, total carbohydrates, Trigonella *foenum-graecum* L.

A R T I C L E I N F O

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1. Introduction

Carbohydrates (saccharides) are divided into four chemical groups: monosaccharide, disaccharides, oligosaccharides, and polysaccharides. In general, the monosaccharide and disaccharides, which are smaller (lower molecular weight) carbohydrates, are commonly referred to as sugars. Carbohydrates perform numerous roles in living things. Polysaccharides serve for the storage of energy and as structural components the 5-carbon monosaccharide.

Saccharides and their derivatives include many other important biomolecules that play key roles in the immune system, fertilization, preventing pathogenesis, blood clotting, and development. In food science and in many informal contexts, the term carbohydrate often means any food that is particularly rich in the complex carbohydrate starch or simple carbohydrates, such as sugar. All human beings required a number of complex organic/inorganic compounds in diet to meet the need for their activities. The important constituents of diet are carbohydrates, fats, proteins, vitamins, minerals and water (Indrayan *et. al.*, 2005). According to New Wall *et. al.*, (1996), 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.

The phytochemical constituents and medicinal properties of most of the medicinal plants were recorded in the last few decades by a number of workers (Joshi, 2000; Nudrat and Usha, 2005; Deore and Kadam, 2016). These medicinal plants are subjected to various processes and are then administrated to the patients. The survey and documentation of medicinally important plants in each and every place is very much important for easy identification of local traditional healers, conservation and sustainable utilization. Plants have always played a major role in the treatment of human traumas and diseases worldwide. According to the World Health Organization (WHO) as much as 80% of world's population depends on traditional medicine for their primary health care needs (Azaizeh et al., 2003). Medicinal plants have been used as traditional treatments for numerous human diseases for thousands of years.

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 (Raju, et al. 2001; Srinivasan 2006; Khalki, et al. 2010). Fenugreek is traditionally used in India, especially in the Ayurveda and Unani systems (Grover et.al., 2002; Srinivasan 2006). In humans, fenugreek seeds exert hypoglycaemic effect by stimulating glucose-dependent insulin secretion from pancreatic beta cells, as well as by inhibiting the activities of L-amylase and sucrose (Amin *et al*. 1987). *Trigonellafoenum-graecum* was most effective in reversing the aberrations in the enzyme activities (Siddiqui, *et. al.*, 2006). Puri, *et al.*, (2002) had isolated an active compound from fenugreek that showed hypoglycemic properties in diabetic rabbits.

2. Materials and method

Carbohydrates were estimated by Mc Gready (1950), and Nelson (1941) methods.

Reagents:

1) Somogy's reagent: (4 gm. $CuSO_4$ +24 gm. anhydrous Na_2CO_3 +16 gm. Na-K tartrate (Rocheette salt) + 180gm Anhydrous Na_2SO_4.

2) Nelson arsenomolybdate reagent: (24gm $(NH_4)6MO_7O_{24}$, $4H_2O$ Ammonium molybdate) + (3gm Na_2SO_4, $7H_2O$). Both solutions were mixed and incubated at 37 ^{0}C for 24 hours before use and were stored in brown bottle.

3) Standard sugar solution was prepared by dissolving 10 mg glucose in 100 ml distilled water.

Procedure:

1gm of sample was crushed with 10 ml 80% ethanol in mortar and pestle by adding acid free sand and then filtered through watman filter paper. The filter and residue were collected separately. The alcohol residue was taken in 250 ml in conical flask. 150ml distilled water and 5ml conc. HCL were added in it. Hydrolyzed for 30 minutes and cooled to room temperature. Na_2CO_3 was added bit-by bit until the extract became neutral (pH = 7). The extract was filtered. Residue was discarded .Total volume of filtered was served as a sample for starch. First filtrate was taken in conical flask and condensed on water bath up to 2-3 minutes then distilled water was added to the filtrate, and then filtered, after mixing residue was discarded and the volume of filtrate was served for reducing sugar.

20 ml of this filtrate was taken in 150 ml conical flask, 2ml of conc. HCl was added to it and corked. It was then hydrolyzed for 30 minutes and cooled at room temperature. Na_2CO_3 was added bit-by bit until the extract became neutral (pH=7). Then this extract was filtered and residue was discarded. The final volume of the filtrate was measured. It served as a sample for total sugar. 0.5 ml of aliquot sample was taken in each test tube and 1 ml of Somogy's reagent was added in it. All test tubes were placed in boiling water bath for 30 minutes, cooled the tubes to room temperature and 1ml of arsenomolybdate reagent which is poisonous was added to it. The content was mixed thoroughly. Then the content was diluted to a volume of 10ml and its absorbance measured OD at 560 nm in Spectrophotometer.

3. Results and Discussion

The continuous two year investigation showed that leaves generally accumulated total carbohydrate ranges from 24.998 mg/g dry wt. to 32.321 mg/g dry wt. higher level of total carbohydrates observed at summer 32.321 mg/g dry wt. as compared to winter 29.270 mg/g dry wt. and monsoon 24.998 mg/g dry wt. In stem it was observed that at summer 18.026 mg/g dry wt. of total carbohydrates accumulates higher than winter i.e. 16.012 mg/g dry wt. and monsoon 14.623 mg/g dry wt. Summer show highest level of total carbohydrates .While in root total carbohydrates ranges from 7.534 mg/g dry wt. to 10.993 mg/g dry wt., higher level observed in summer 10.993 mg/g dry wt. as compared to winter 9.466 mg/g dry wt. and monsoon 7.534 mg/g dry wt. The total carbohydrates content of seeds was higher (61.737 mg/g dry wt.) as compared to leaves, stem and roots of all seasons. The percentage of total carbohydrates were found to be increasing order of seeds< leaves < stem <root (Table No. 1 and Graph No. 1).

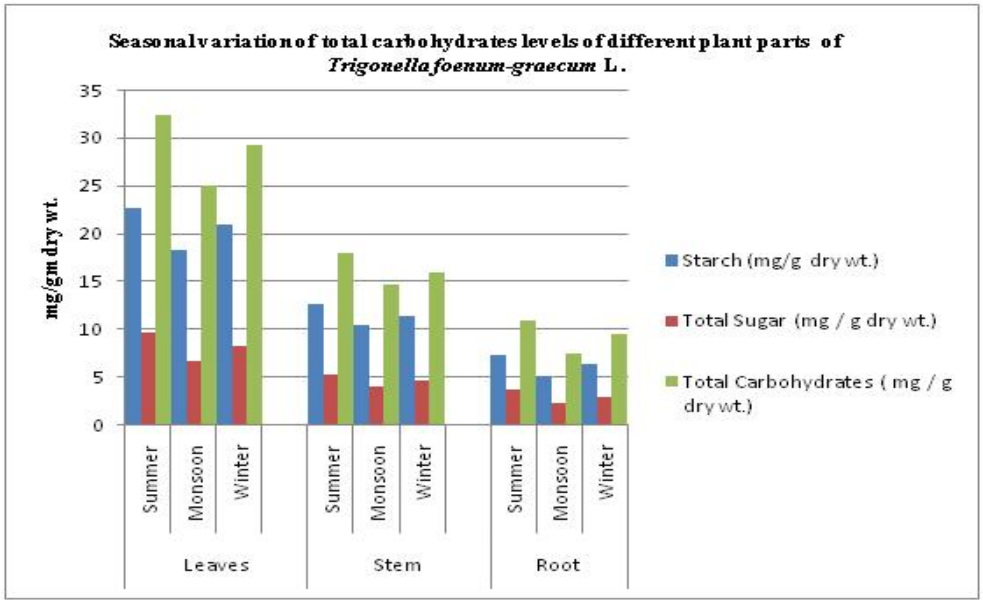
In leaves total sugar accumulated high level observed at summer season (i.e. 9.637 mg/g dry wt. than winter i.e. 8.305 mg/g dry wt. and monsoon 6.753 mg/g dry wt., while

in stem range of total sugar is from 4.112 mg/g dry wt. to 5.347 mg/g dry wt., highest level observed at summer 5.347 mg/g dry wt. as compared to monsoon 4.112 mg/g dry wt. and winter 4.645 mg/g dry wt. respectively. The total sugar of root show lower level than leaves, stem and seeds. The range of total sugar content in the roots are 2.358 mg/g dry wt. to 3.698 mg/g dry wt. , higher level observed at summer 3.698 mg/g dry wt. as compared to winter 2.984 mg/g dry wt. and monsoon 2.358 mg/g dry wt. The total sugar of seeds shows higher level (12.720 mg/g dry wt.) than leaves, stem and root of all seasons. The percentage of total sugar were found to be in increasing order of seeds <leaves <stem <roots (Table No. 1 and Graph No. 1).

The range of starch content in leaves show from 18.245 mg/g dry wt. to 22.684 mg/g dry wt., highest level observed at summer season i.e. 22.684 mg/g dry wt. as compared to winter i.e. 20.956 mg/g dry wt. and monsoon 18.245 mg/g dry wt. In stem starch accumulation observed high at summer 12.679 mg/g dry wt. as compared to winter 11.367 mg/g dry wt. and monsoon 10.511 mg/g dry wt. The starch accumulation in root show lower than leaves, stem and seeds. In seeds show higher accumulation of starch 49.017 mg/g dry wt. than leaves, stem and root of all seasons tested. The concentration of starch were found to be increasing order of seeds< leaves < stem < roots (Table No. 1 and Graph No.1)

Table 1: Seasonal variation of total carbohydrates levels of different plant parts of *Trigonella foenum-graecum* Linn.

Plant part	Season	Starch (Mg/g dry wt.)	Total Sugar (Mg/g dry wt.)	Total Carbohydrates (Mg/g dry wt.)
Leaves	**Summer**	22.684	9.637	32.321
	Monsoon	18.245	06.753	24.998
	Winter	20.965	08.305	29.270
Stem	**Summer**	12.679	05.347	18.026
	Monsoon	10.511	04.112	14.623
	Winter	11.367	04.645	16.012
Root	**Summer**	07.295	03.698	10.993
	Monsoon	05.176	02.358	07.534
	Winter	06.482	02.984	09.466
Seeds	--	49.017	12.720	61.737



Graph 1

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