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Screening and Biochemical Quantification of Phytochemicals in Fenugreek (*Trigonella foenum-graecum*)

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ABSTRACT

The preliminary phytochemical analysis and its quantification were performed in leaves, stem and seeds of different extracts in *Trigonella foenum-graecum*. From the observation, the Green leafy vegetable (GLV) was good with regards to phytochemicals. GLV have considerable amount of carbohydrates, phenols, sterols, saponins, quinones, alkaloids, terpenoids and tannins. On the contrary slight presence was reported for proteins, glycosides, flavonoids, leucoanthocyanidines in the GLV and phytochemicals like volatile oils, catechol, cyanogenic glycosides, anthocyanin and lignin were absent. The study was further extended to quantify some of the biochemical constituents like carbohydrates, proteins, chlorophyll and carotenoids in which all revealed it's most significant presence. Overall, from the findings of this study it could be concluded that the selected GLV are immense source of phytochemicals, thus validate this GLV to encourage eating them every day.

Keywords: *Trigonella foenum-graecum*, Carbohydrates, Proteins, Chlorophyll ,Carotenoids.

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INTRODUCTION

Most of the plants have ethnomedical traditions known to possess various pharmaceutical and nutraceutical properties in their extract. The selected green leafy vegetable **Fenugreek (*Trigonella foenum-graecum*)** helps in balancing Cholesterol, lowering sugar-level, curing skin inflammation(wounds, rashes, boils) treating arthritis, asthma, sore throat, in which the phytoconstituents, the derived products such as flavonoids, alkaloids, terpenoids, steroids, saponins, anthocyanin, tannin etc., were involved[5].

The present study deals with the identification of potential phytochemical and further probe to evaluate the biochemical parameters in Fenugreek (*Trigonella foenum-graecum*) to impart the functional arena.

MATERIALS AND METHODS

Fenugreek seeds were collected from local market and sowed. After 35 days of its growth seeds, leaves, stem were collected and preparation of aqueous, acid, and alkaline extract were carried out [1, 3]. Qualitative analysis of phytochemicals in seed, stem and leaves in the extracts were performed [2].

The biochemical parameters such as carbohydrates, proteins, chlorophyll and carotenoids were carried out in dried powder of *Trigonella foenum-graecum* as described by Sadasivam and Manickam [6]

RESULTS AND DISCUSSION

Preliminary phytochemical analysis

The preliminary phytochemical analysis was performed in leaves, stem and seeds of the GLV after subjecting them to aqueous, acid and alkali extracts. With these extracts it was recorded that the GLV have considerable amount of carbohydrates, phenols, sterols, saponins, quinones, alkaloids, terpenoids and tannins. On the contrary slight presence were reported for proteins, glycosides, flavonoids, leucoanthocyanidines and phytochemicals like volatile oils, catechol, cyanogenic glycosides, anthocyanin and lignin were absent.

Qualitative Phytochemical Analysis

Qualitative analysis of carbohydrate and proteins

Table I illustrates the qualitative analysis of carbohydrates and proteins in the leaves, stem and seeds of selected GLV. It is evident from Table I that the leaves of Fenugreek were found to have moderate presence of carbohydrates and protein. In the case of stem and seeds, protein and carbohydrate level of fenugreek was found to be strongly present. Babu et al.,

(2007) reported the presence of carbohydrates and proteins in both *Origanum vulgare* and *Althea officinalis* based on the preliminary phytochemical analysis carried out which correlates with the present study [2].

Table I: The qualitative analysis of carbohydrate and protein of *Trigonella foenum-graecum*

Nutrients	<i>Trigonella foenum-graecum</i>		
	Leaf	Stem	Seed
Carbohydrate	+	++	++
Protein	+	++	++

++ = Strong presence

+ = Moderate presence

Qualitative analysis of phenols, catechol, sterols, flavonoids and alkaloids

The qualitative analysis of phenols, catechol, sterols, flavonoids and alkaloids in the leaves, stem and seeds of the selected GLV is shown in Table II which reveals that *Trigonella foenum-graecum* had high content of sterols and alkaloids whereas the flavonoids occur in moderate level in leaves, seeds and absent in stem. The catechol was found to be completely absent in GLV. In the case of phenols seeds contain higher amount compared to leaves and absent in stem. Siddiqui et al., stated based on the phytochemical analysis that *Hibiscus rosasinensis* has high content of phenols, sterols and alkaloids which is similar to the results found [7].

Table II: The qualitative analysis of phenols, catechol, sterols, flavonoids and alkaloids of *Trigonella foenum-graecum*

Nutrients	<i>Trigonella foenum-graecum</i>		
	Leaf	Stem	Seed
Phenols	+	-	++
Catechol	-	-	-
Sterols	++	++	++
Flavonoids	+	-	+
Alkaloids	++	++	++

++ = Strong presence

+ = Moderate presence

- = Absence

Qualitative analysis of glycosides, cyanogenic glycosides, saponins and quinones

Table III represents the qualitative analysis of glycosides, cyanogenic glycosides, saponins and quinones in the leaves, stem and seeds of the selected GLV. It is evident from the table III that GLV were found to have high content of quinones whereas saponins were in moderate amounts in leaves, stem and seeds. The cyanogenic glycosides were absent. However glycosides were present moderately in stem and seeds but absent in leaves which has resemblance with the results of Asaolu et al., which states that *Cnidosculosus aconitifolius* has high content of saponins and quinones but glycosides are in moderate amounts[1].

Table III:The qualitative analysis of glycosides, cyanogenic glycosides, saponins and quinones of *Trigonella foenum-graecum*

Nutrients	<i>Trigonella foenum-graecum</i>		
	Leaf	Stem	Seed
Glycosides	-	+	+
Cyanogenic Glycosides	-	-	-
Saponins	+	+	+
Quinones	++	++	++

++ = Strong presence

+ = Moderate presence

- = Absence

Qualitative analysis of anthocyanin, leucoanthocyanidines, tannins, volatile oils, lignin and terpenoids.

The qualitative analysis of anthocyanin, leucoanthocyanidines, tannins, volatile oils, lignin and terpenoids in the leaves, stem and seeds of the GLV are given in Table IV. It is evident from the table IV that GLV (Fenugreek) registered a high content of terpenoids and moderate presence of tannins whereas anthocyanin, volatile oils and lignin were reported to be absent in this GLV. The leucoanthocyanidines were moderately present only in the seeds of Fenugreek. Gorinstein et al., (2009) also reported the presence of terpenoids, tannins and absence of anthocyanin, lignin and volatile oils in Cynodon dactylon [3].

Table IV: The qualitative analysis of anthocyanin, leucoanthocyanidines, tannins, volatile oils, lignin and terpenoids of *Trigonella foenum-graecum*

Nutrients	<i>Trigonella foenum-graecum</i>		
	Leaf	Stem	Seed
Anthocyanin	-	-	-
Leucoanthocyanidines	-	-	+
Tannins	+	+	+
Volatile oils	-	-	-
Lignin	-	-	-
Terpenoids	+	++	++

++ = Strong presence

+ = Moderate presence

- = Absence

Biochemical Analysis

Table VI depicts biochemical analysis of chlorophyll, carotenoids, total carbohydrate, protein of *Trigonella foenum - graecum* (L.). The chlorophyll content was about 1.573 ± 0.034 (mg/g) whereas its carotenoids content was 20 times higher ranging to 20.563 ± 1.58 (mg/g). As evident from table VI that the green leafy vegetable, Fenugreek was found to be superior amount of carotenoids which has the similarity with the findings of Jacob et al., in which H.sabdariffa was found to have maximum amount of carotene followed by A.tristis. The total carbohydrate and the protein were found to be 0.24(mg/g) and 0.164 (mg/g)

respectively. Hassan and Umar, stated that carbohydrate and protein content found less in *S. obustum*[4].

Table VI: Chlorophyll, Carotenoid, Total Carbohydrate and Protein content in *Trigonella foenum-graecum* (L.)

Parameters	<i>Trigonella foenum-graecum</i>
Chlorophyll (mg/g)	1.573±0.034
Carotenoids (mg/g)	20.563±1.58
Total Carbohydrate(mg/g)	0.240±0.038
Protein (mg/g)	0.164±0.034

Values are mean of triplicates± SD of six samples

CONCLUSION

Overall, from the findings of this study it could be concluded that the selected GLV are immense source of phytochemicals, which are interesting source of dietary fibers. The results obtained, thus validate these GLVs to encourage eating them every day which emphasize that diet rich in GLVs confer health promoting benefits. The above study thus calls for evaluation of antioxidants like glutathione peroxidase, glutathione reductase, lipid peroxidase, reduced glutathione and free radical scavenging activity.

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