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Research Article

A PHARMACOGNOSTICAL MONOGRAPH OF TRIGONELLA FOENUM- GRAECUM SEEDS

***RASHMI YADAV[1], RICHA TIWARI[2], PARTHA CHOWDHARY[2], CHANDAN KUMAR PRADHAN[2]**

M. Pharm student of Rameesh Institute of Vocational and Technical Education, Greater Noida (U.P), India, Senior lecturer of Rameesh Institute of Vocational and Technical Education, Greater Noida (U.P), India. Email: rashmiphar@gmail.com

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ABSTRACT

Trigonella foenum-graecum (Family- Fabaeace) plant is eaten in India since long. It is also known as Methi and used in Ayurvedic medicines for the treatment of wounds, abscesses, arthritis, bronchitis, and digestive disorders. In present investigation an attempt has been made for the standardization and Phytochemical evaluation of fenugreek seeds. The standardization evaluation comprises of detailed macroscopy, powder microscopy, and fluorescence analysis, physic-chemical constants such as ash value, extractive values, successive solvent extraction, moisture contents, foaming index and swelling index. The seeds extracts were also subjected to preliminary Phytochemical screening. The data obtained in present study will serve as valuable tool for identification, authentication and detection of adulterants, standardization and quality control of the drug.

Keywords: *Trigonella foenum- graecum*, Fenugreek, Standardization, Phytochemical screening.

INTRODUCTION

Trigonella foenum-graecum (Family Fabaeace) is called methika in Ayurveda and used as medicine for the treatment of wounds, abscesses, arthritis, bronchitis and digestive disorders etc since oldest time. [3] It is also eaten in winters as to improve immunity and protects heart, brain and other vital organs of body through its medicinal properties. In traditional Chinese Medicine it is also used for kidney problems and conditions affecting the male reproductive tract. The recent researches have proved it beneficial for Atherosclerosis, Constipation, Diabetes, High cholesterol and Hyper-triglyceridemia. [6] The seeds of fenugreek contain alkaloids, flavonoids, saponins, amino acids, tannins and some steroidal glycosides, proteins etc. [2] Standardization of fenugreek seeds is done for the establishment of quality and identity profile of the drug for the purpose of safety monitoring and overall quality assurance of the industrially as well as commercially important drug . Since there is no report in literature regarding the standardization parameters of fenugreek seeds. Therefore, in the present investigation an attempt has been made to standardize fenugreek seeds by using macroscopy and microscopical characters, powder microscopy, fluorescence analysis, physio-chemical values, and phytochemical screening. [1, 6]

MATERIAL AND METHODS

Plant material

The plant material was collected from local market of New Delhi. The plant was identified as ***Trigonella foenum-graecum*** family-Fabaeace by Dr. H.B Singh Taxonomist, National Institute of Science Communication and Information Resources (NISCAIR) New Delhi. The plant was carefully collected and air dried under shade. The air dried materials was powdered and passed through 40 mesh sieve size and stored in an airtight container for further use.

Standardization Parameters

Macroscopical characters

The morphological studies were carried out for shape, size, color, odor and taste and fracture identification of the fenugreek seed. [8]

Microscopic studies and powder analysis

The transverse sections of leaf and seed were prepared by using sharp razor then sections were treated with few amount of chloral hydrate. Best section was selected and mounted glycerin temporally and observed under light microscope. For powder microscopy powder of seed was taken on glass slide and observed under light microscope. [1]

Quantitative microscopy

Leaf constants such as stomata index, stomata number, vein islet, vein termination and palisade ratio of the drug were determined according to the method described. [1]

Physicochemical parameters

The various physio-chemical values of seed such as ash values, extractive values, successive extraction, moisture content, foaming index, swelling index, fluorescence Analysis were determined according to the standard method. [1, 8]

Phytochemical screening

The Phytochemical evaluation of drug was carried out as per the method described. Previously dried powdered seeds were extracted in a Soxhlet apparatus with petroleum ether, chloroform, methanol, and methanol: water and water successively. The extracts were evaporated to dryness under vacuum.

These extract were used for the analysis of different phyto-constituents *viz*. alkaloids, carbohydrate, phenolic, flavonoids, proteins, amino acids, saponins, steroids, mucilage and resins etc. [1,7].

RESULTS AND DISCUSSION

Standardization Parameters

Macroscopical evaluation

Seeds

The macroscopical characters of seeds are -Solid-rhomboidal, pebble like shape, 3-5cm long, 2mm thick, plain surface, yellow, bitter mucilaginous taste and have characteristic odor.

Leaves

The macroscopical characters of fenugreek leaf are trifoliate, stipules triangular, leaflets obovate to oblong, 10-30 mm long, 5-15 mm wide, obtuse to truncate at apex, narrowed towards the base; margins shallowly serrate to dentate, glabrous. Infloresences short, axillary racemes, green, pungent in taste and have smooth surface.

Microscopical characters

Transverse section

Transverse section of seed and leaf are present in the Fig: 1 and 2.

Seed Powder

The seeds which is the part used can be identified by presence of aleurone grains, parenchymatous cells of testa, epidermal cells of testa, parenchymatous cells of cotyledons and radical, hypodermis of testa, outer layer of the endosperm, fibers and oil containing cells presence in the Fig: 3-11.

Quantitative microscopy

Leaf constants

Leaf constants study such as stomata index, stomata number, vein islets, vein termination were carried out. The results are present in Table 1 and Fig: 12-14.

Physio- chemical parameters

All physio-chemical parameters ash value, extractive value, moisture contents, foreign matter foaming index, swelling index and fluorescence analysis were performed and the results are present in Table 2 and 3.

Phytochemical screening

Phytochemical screening was useful for the determination of the presence of significant chemical of constituents. The results are present in **Table 4.**

Table 1: Quantitative Microscopy of Fenugreek leaf

Vein termination number	Vein islets number	Stomata number	Stomatal index	Palasade ratio
5-6	10-12	3-4	**20.6**	**1.7**

Table 2: Physio- chemical constants of Fenugreek seeds

S. No	Parameters	Results % w/w
1	**Foreign Matter**	1.16
2	**Loss on Drying**	12.62
3	**Foaming index**	259.95
4	**Swelling index**	10.5
5	**Ash Values**	
	Total Ash	3.3
	Acid Insoluble Ash	0.4
	Water Soluble Ash	1.6
6	**Extractive Values**	
	Cold Extract	
	Pet Ether	1.1
	Chloroform	2.1
	Acetone	3.1
	Methanol	4.2
	Hydro methanol	6.2
	Aqueous	9.7
	Hot Extract	
	Pet Ether	2.8
	Chloroform	5.3
	Acetone	6.0
	Methanol	8.8
	Hydro methanol	13.46
	Aqueous	13.70
	Successive Extract	
	Pet Ether	2.02
	Chloroform	0.424
	Acetone	0.634
	Methanol	2.35
	Hydro methanol	2.82
	Aqueous	3.19

Table 3: Fluorescence analysis of Fenugreek seed

S. No	Reagent	Day Light	254 nm	366 nm
1.	Drug powder as such	Yellow	Cream yellow	Dark yellow
2.	Drug + Conc. H_2SO_4	Dark yellow	Light green	Brownish dark
3	Drug + Conc. H_2SO_4 + Distilled Water.	Dark yellow	Light Green	Light brown
4.	Drug + Conc. HCl	Dark yellow	Yellowish green	Dark Brown
5.	Drug + Conc. HCl + Distilled Water	Yellow	Yellowish green	Brown
6.	Drug + Conc. HNO_3	Dark yellow	Brownish yellow	Black
7.	Drug + Conc. HNO_3 + Distilled Water	Yellow	Brown	Black
8.	Drug + Methanol	Yellow	Yellowish green	Green
9.	Drug + Chloroform	Yellow	Yellowish green	Light Brown
10.	Drug + Petroleum ether	Light yellow	Yellow	Yellow
11.	Drug + acetone	Yellow	Greenish yellow	Green
12.	Drug + Picric acid	Yellow	Yellow	Black
13.	Drug + Sodium Hydroxide	Yellow	Greenish yellow	Brown
14	Drug+ sodium hydroxide+ dist. water	Yellow	Yellow	Light brown

Table 4: Phytochemical screening of fenugreek seeds extracts

Extract constituents	Pet ether	Chloroform	Acetone	Methanol	Methanol: water	Water
Alkaloids	-	-	+	+	+	+
Carbohydrates	-	-	-	+	+	+
Glycosides	-	-	-	+	+	-
Tannins	+	-	-	+	+	+
Flavonoids	-	-	+	+	+	+
Amino Acids	+	-	+	+	+	+
Proteins	+	-	-	+	+	+
Mucilage	-	-	-	+	+	+
starch	-	-	-	+	+	+

(+) present, (-) not present

Microscopy

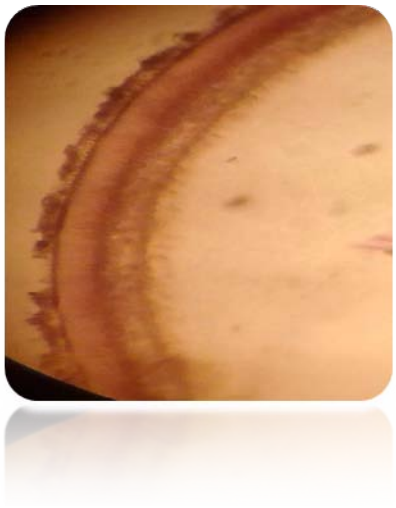

Fig. 1: Transverse section of seed.

Fig. 2: Transverse section of leaf

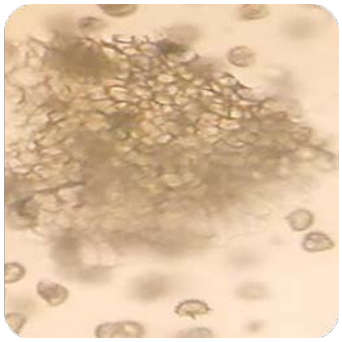

Plate 3: Epidermal cell

Plate 4:Epidermal cells of testa

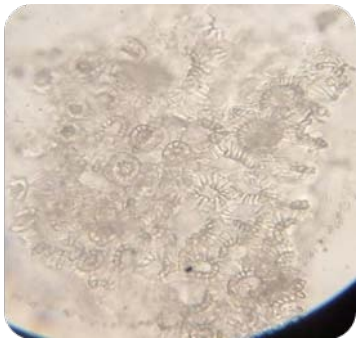

Plate 5:Hypodermis of testa

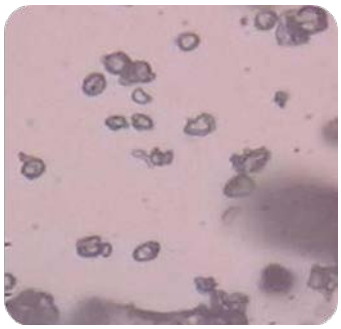

Plate 6: Aleurone grains

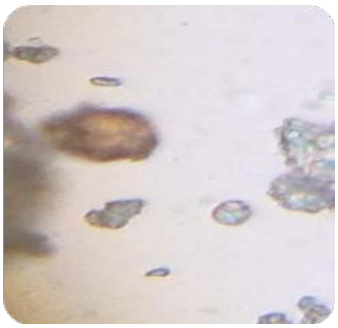

Plate 7: Oil glands

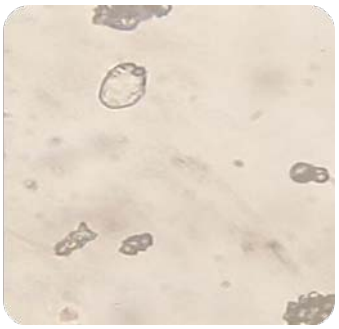

Plate 8: Parenchymatus cells of radicle

Plate 9: Fiber of seed

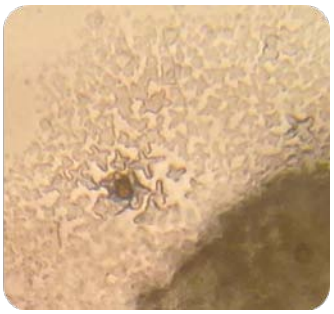

Plate 10: Outermost layer of endosperm

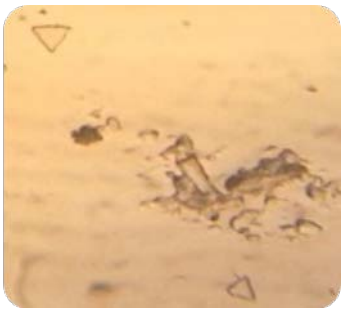

Plate 11: Prism type crystal

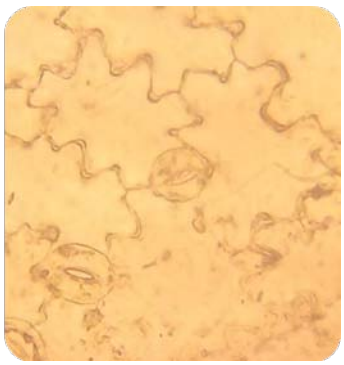

Plate 12: Anomocytic stomata

Plate 13: Palaside cell in epidermal cell

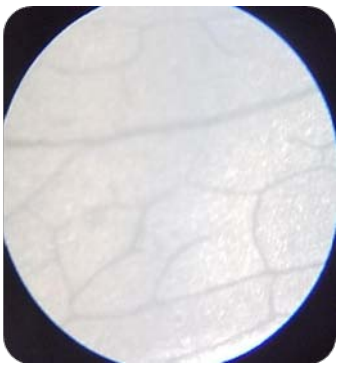

Plate 14: Veins of leaf

CONCLUSION

To ensure reproducible quality of herbal products, proper control of starting material is utmost essential.

Thus in recent years there has been an emphasis on standardization of medicinal plants of therapeutic Potential. According to World Health Organization (WHO) the macroscopic and microscopic description of a medicinal plant is the first step towards establishing its identity and purity and should be carried out before any tests are undertaken. Morphological evaluation is a technique of qualitative evaluation based on the study of morphological and sensory profiles of whole drugs. Evaluation of foreign matter was done for determination of contaminant and adulterative matters in drug. Evaluation of ash value helps to determine the quality and purity of crude drug. Evaluations of extractive values are useful for the qualitative and quantitative evaluation of crude drug. It shows the presence of specific constituents and their solubility in different solvents. In this study hot extractive value were found to be more in comparison to cold extractive values and in the successive solvent extraction polar solvents were have more extractive value in comparison to non- polar solvents. Phytochemical screening was useful for the determination of the presence of significant chemical classes of constituents. The results indicated the presence of alkaloid, flavonoids, amino acid, tannins, protein, starch, mucilage and saponins. Swelling index is useful for the determination of presence of the mucilage content in the drug. Foaming index is useful for the determination of the presence of saponins contents in the drug. Fluorescence evaluation is the type of luminescence in which the molecule emits visible radiation passing from a higher to lower electronic state. This evaluation indicates the presence of constituents. All evaluation of *Trigonella foenum graecum* seeds was successfully performed.

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