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RESEARCH ARTICLE

ISOLATION AND CHARACTERIZATION STUDIES OF MUCILAGE OBTAINED FROM *TRIGONELLA FOENUM GREACUM L.* SEED AND *TAMARINDUS INDICA* POLYSACCHARIDE AS A PHARMACEUTICAL EXCIPIENT

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ABSTRACT:

Now-a-days natural or herbal products are more often used in comparison to synthetic products because of its low toxicity, biodegradability, biocompatibility and its cheaper cost. The main aim of this study is to isolate and characterize mucilage obtained from *Trigonella foenum graecum L.* seed and *Tamarindus indica* polysaccharide as pharmaceutical excipients. Both isolated mucilages are extracted by different methods i.e., hot water extraction method and reflux method respectively. Ethyl alcohol is used in the isolation of mucilages. Solubility behaviour of isolated mucilages with different solvents was also studied. Different phytochemical characterization of isolated mucilages were studied like bulk and tapped densities, compressibility index, hausner's ratio and swelling index etc. and some identification tests were also carried out for presence of carbohydrate, fats, oils etc.

Keywords: Methi, tamarind, extraction, mucilage, excipients

1. INTRODUCTION:

Nature has gifted us with great and different varieties of flora and fauna. From the earliest centuries human has made effective use of the natural or herbal origin in the pharmaceutical field. Natural products are more often used in comparison to synthetic products¹⁻². Herbal or natural products are used because of its low accessibility, biocompatibility, low cost and its less toxic effects. Mucilages and gums obtained from natural sources are most widely used as pharmaceutical excipients for their different properties such as its binding, diluents and disintegrant properties in tablets, suspending, gelling properties in gel, thickening properties in oral liquids etc. In novel drug delivery formulations there are increased use of herbal products to provide less toxic and more effective dosage form. Many researchers have explored the utility of natural or herbal materials as pharmaceutical excipients. Majority of investigations on natural polymer in novel drug delivery system are centered on proteins and polysaccharides because of their ability to produce broad range of materials and its properties³⁻⁴.

The seeds of *Trigonella foenum graecum L.* are also known as fenugreek seed or Methi in Hindi. It is an herbaceous plant of leguminaceae or fabaceae family. The seeds of *Trigonella foenum graecum L.* are also used as vegetables and also functions as a preservative and added to pickles. The ripened fenugreek seeds have some medicinal use such as in treatment of dysentery, dyspepsia, enlargement of liver, diabetes and chronic cough⁵⁻⁶.

Under the category of polysaccharide, various natural gums are covered like acacia, karaya and tragacanth gum etc. Gums are used as a binder in tablets, thickeners in cosmetic manufacuturings. *Tamarindus indica* also known as imli in Hindi and belongs to Leguminaceae family. The part used to extract the polysaccharide is seeds of *Tamarindus indica*. The main component of *Tamarindus indica* seed has been found as a non-ionic, neutral, branched polysaccharide which consists of a cellulose-like backbone that carries xylose and galactoxylose substituents⁷.

2. MATERIALS AND METHODS:

The *Trigonella foenum graecum* seeds were procured from local market of Greater Noida, India and the seeds of *Tamarindus indica* was obtained as a waste material from local grocery shop of Noida, India. All other chemicals are used of analytical grade.

2.1. Extraction of *Trigonella foenum graecum L.* Seed: *Trigonella foenum graecum* seeds was extracted by hot water extraction method in which seeds were washed with water and dried at room temperature. The seeds were placed in water and then boiled it for 12 hrs at 45°C for release of mucilage into water. The material was then squeezed in a muslin cloth to remove the marc from the filtrate. The filtrate was then kept in refrigerator for cooling⁸.

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2.2. Extraction of *Tamarindus indica* seed polysaccharide: Tamarind seed polysaccharide was extracted under reflux in a condensation system using water as solvent. Temperature of extraction media was maintained at 70°C and duration of extraction was adjusted about 6 h. The extractor thimble was a Whatman cellulose thimble with 33 mm internal diameter and 80 mm external length⁹⁻¹⁰.

2.3. Isolation of *Trigonella foenum graecum L.* mucilage & *Tamarindus indica* polysaccharide: Equal volume of ethyl alcohol was added to filtrate to precipitate the mucilage, the mucilage was separated, dried in oven at about 50°C and powdered it. The powdered mucilage was stored in a air tight container⁹⁻¹⁰.

3. PHYSICOCHEMICAL CHARACTERIZATION OF ISOLATED MUCILAGES:

3.1. Organoleptic evaluation of isolated mucilage: The isolated mucilage was characterized for organoleptic properties such as color, odor, fracture and texture¹¹⁻¹².

3.2. Identification tests for carbohydrate, fat, gum and mucilage: Aqueous solution of extracted mucilage was used for chemical characterization. Tests for carbohydrate, gums, fat and mucilage were performed according to standard procedure. Test for carbohydrate shows positive result and other tests like presence of tannins, oils and fats in isolated mucilage shows negative results.

3.3. pH of mucilages: The mucilage was weighed and dissolved in water to get a 1% w/v solution. The pH of solution was determined using digital pH meter¹³.

3.4. Swelling index of isolated mucilages: The swelling characteristics of *Trigonella foenum graecum L.* and

Tamarindus indica seed mucilages were tested in distilled water. The swelling index is the volume in ml occupied by 1 gm of the substance. The swelling indices of the selected mucilages were determined by accurately weighing 1 gm of mucilages, which was further introduced into a 25 ml glass stoppered measuring cylinder then 25 ml of distilled water was added and the mixtures were shaken thoroughly every 10 min for 1 hr and then allowed to stand for 24 hr at room temperature. The volumes occupied by the mucilages were measured. The procedure was repeated thrice and then the mean values were calculated¹⁴.

3.5. Bulk & Tapped densities: The pre-weighed quantities of mucilages were poured in graduated cylinders and the volume was recorded. Then the powder was subjected to tapping in a bulk density apparatus until constant volume were obtained¹⁵.

3.6. Powder compressibility and Hausner's ratio: Powder compressibility is also known as Carr's index. Carr's index and Hausner's ratio were calculated from the bulk and tapped densities¹⁰.

3.7. Powder flow property: It is also known as angle of repose. The angle of repose was determined by the fixed height funnel method¹⁰.

3.8. Infrared spectra of the isolated mucilages:

Hundred milligrams of the powdered pectin was mixed with potassium bromide (400 mg) and was compressed in a hydraulic press to form a pellet at 15 tons pressure. The pellets were scanned from 4000 to 400 cm⁻¹ in Bruker FTIR spectrophotometer for Methi and in Shimadzu FTIR spectrophotometer for Tamarind⁹.

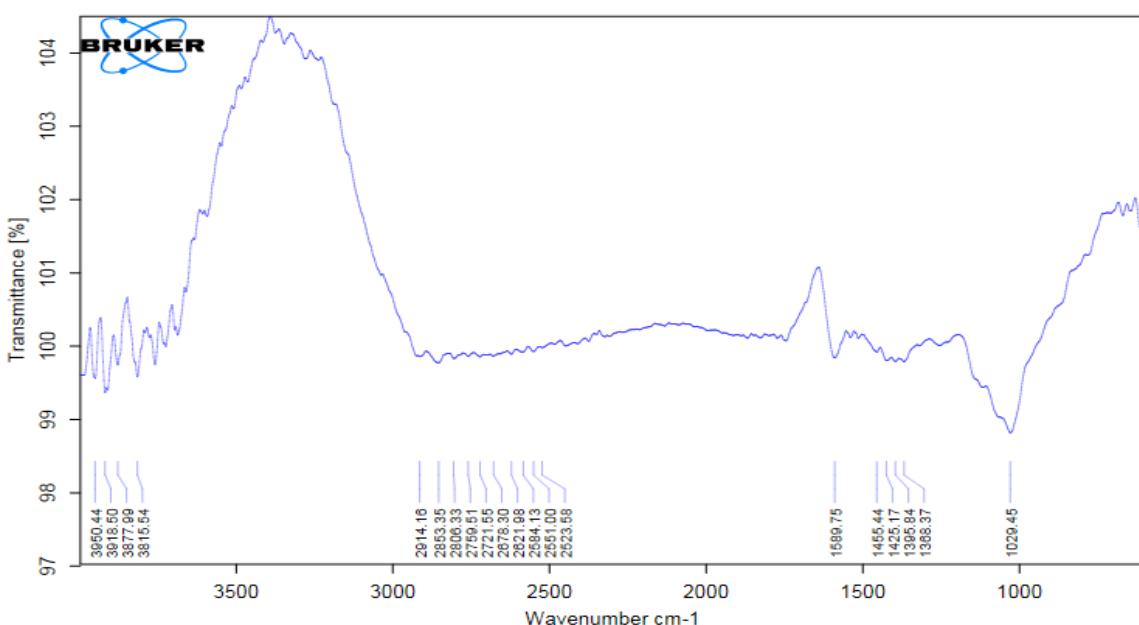


Figure 1: FTIR Spectroscopy of *Trigonella foenum graecum L.*

Frequency(cm ⁻¹)	Assignment
3654	O-H stretch
2914.16	C-H
2853.35	C-H
2621.98	C=C
1425.17	C-H Bend
1368.37	C-H Rock
1029.45	C-H Bend out of plane

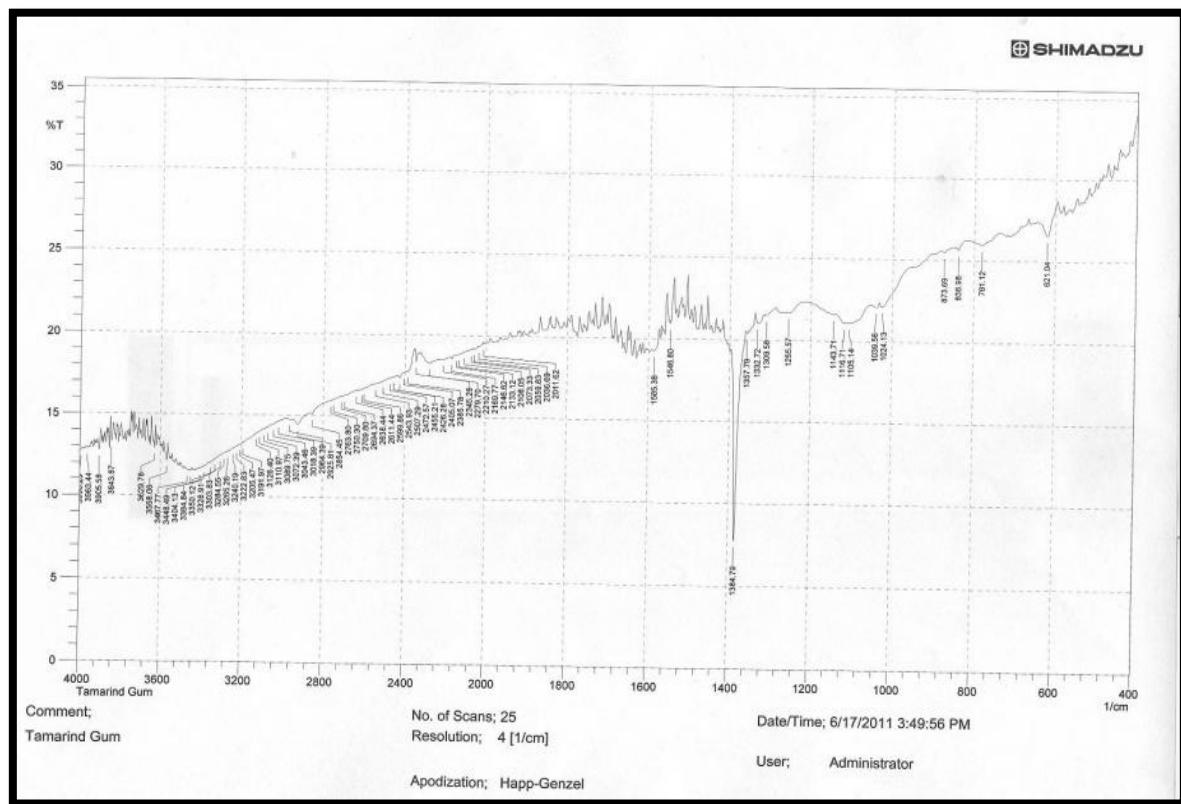


Figure 2: FTIR Spectroscopy of *Tamarindus indica*

Frequency(cm^{-1})	Assignment
3645.87	O-H Stretch
3508.70	O-H Stretch
2925.81	C-H Stretch
1505.80	N-O asymmetric stretch
1384.79	C-H rock
1332.72	C-H bend

4. RESULTS AND DISCUSSION:

Trigonella foenum graecum L. and *Tamarindus indica* were isolated and then subjected to identification. Isolated mucilage also showed presence of carbohydrates and remaining phytoconstituents such as tannins and fats were absent. This result considered as a proof for purity of isolated mucilage.

The organoleptic properties of the isolated mucilages were depicted in table1 in which colors of both isolated mucilages were found to be light brown with characteristic odor.

Table1: Organoleptic properties of isolated mucilages

Parameter	Fenugreek	Tamarind
Color	Light Brown	Light Brown
Odor	Odorless	Odorless
Taste	Tasteless	Tasteless
Fracture	Rough	Rough
Texture	Rough & Irregular	Rough & Irregular

The pH of both isolated mucilages (*Trigonella foenum graecum L.* and *Linum usitatissimum*) was found to be 7.9 & 6.1 respectively and both mucilages have good flow property. Micromeretic studies of isolated

mucilages like bulk density, tapped density, Carr's index etc were carried out and depicted in table2. The solubility behavior of both mucilages were carried out using different solvents by which it was found that both isolated mucilages are soluble in hot water and swells to form gel in cold water and both isolated mucilages are insoluble in acetone, ethyl alcohol, methanol and chloroform.

Table2: Micromeritic studies of isolated mucilages

Parameters	Results	
	Fenugreek	Tamarind
Bulk density(gm/ml)	0.66 ± 0.043	0.63 ± 0.03
Tapped density(gm/ml)	0.94 ± 0.098	0.83 ± 0.04
Yield (%)	15.16	-
Bulkiness(ml/gm)	1.48 ± 0.099	1.58 ± 0.072
Carr's index	28.2 ± 3.11	24.17 ± 1.20
Hausner's ratio	1.39 ± 0.057	1.03 ± 0.07
Ash Value(%)	1.02	0.56
Water-soluble Ash	0.68	0.42
Acid-soluble Ash	0.56	0.30
pH	7.9	6.1
Angle of repose (°)	29.20	29.45
Swelling index (%)	90	90

CONCLUSION:

From the above study, we conclude that *Trigonella foenum graecum L.* and *Tamarindus indica* seed mucilages can be used as a pharmaceutical excipients to prepare different dosage forms. *Tamarindus indica* had a rich source of polysaccharide in comparison to *Trigonella foenum graecum L.* and both isolated mucilages showed good flow property.

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