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Extraction and Evaluation of *Colocasia esculenta* and *Trigonellafoenumgraecum L.* Mucilage as a Pharmaceutical Adjuvant

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Abstract: This article represents the extraction and characterization of the mucilages from *Colocasia esculenta* and *Trigonella foenum-graecumL.* and comparison between their evaluation parameters.*Colocasia esculenta* and *Trigonella foenum-graecumL.* are commonly known as arviandmethi. Both mucilageswere extracted from water and isolated from acetone. Both mucilages were found to be soluble in water. pH of the colocasia mucilage and *Trigonella foenum-graecumL.* was 6.5 and 7.9 respectively. That's why they were less irritating. Both mucilages were swelling in cold water so they were suitable for controlled drug delivery. Due to this property they were suitable Excipient for novel drug delivery system like microspheres, nanoparticles buccal films etc. Isolated mucilages were insoluble in organic solvents and this property was used to separate them from extract. It was concluded that the isolated mucilages were suitable as an Excipient in pharmaceutical dosage forms for controlled drug delivery.

Key words: Controlled drug delivery · *Colocasia esculenta* · Extraction · Mucilage · Natural polymer

INTRODUCTION

Pharmaceutical excipients obtained from natural sources are preferred over synthetic one. These natural excipients have wide applications in the pharmaceutical industry. They are used as suspending agents, binding agent, protectives, thickening agents, gelling agents, coating agents etc. sustained release dosage forms have been formulated by these natural polymers. These polymers sustain the release of the drug due to their swelling property. In sustained release dosage forms they make a gel like thick layer which retard the release of the drug. These polymers can be hydrophilic and hydrophobic in nature. Water insoluble polymers are also known as hydrogels. These polymers have been used in industries other than pharmaceuticals like textiles, paper industries etc.These polymers have many advantages like they have natural in origin, low cost, easily available, biodegradable and nontoxic. Dosage forms having natural polymers provide a better consumer acceptance as compared to the synthetic one [1, 2].

Mucilage is composed of polysaccharide uranides and proteins. Mucilage which is concentrated or dried is known as gum. Mucilage is insoluble in water and gum is water soluble in nature. This is the main difference between the gum and mucilage. Mucilage is secreted by the mucilage secretary glands. Geographical and climatic conditions in India favor the cultivation of the natural products [3]. Mucilage provide consistency, necessary weight and desired volume to the formulation in order to administer the pharmaceutically active ingredient. They also provide improved stability and bioavailability of pharmaceutically active ingredient.Mucilages, gums and natural polymers widely accepted due to their ease of availability and they can easily incorporate in the solid, semisolid and liquid formulation. Now days they have been used in the preparation of the novel drug delivery systems. Natural polymers are preferable over the synthetic polymers because they are environment friendly, nontoxic, easily available, biodegradable, cost effective and their chemical modification is possible. Other advantages of the excipients obtained from the

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natural sources are they are easily cultivated and their supply is possible in a constant manner. Some disadvantages are also associated with the natural products. First challenge with them is that they cannot be synthesizing in large quantity. This may be result of some variables such as their habitat (location), season etc.Mucilages and natural polymers has been applied in different novel drug delivery systems like nanoparticles, microspheres, buccal films etc.[4]. Gums are pathological products that are produced when an injury occurs to a plant by destruction of cell walls (Gummosis). Mucilage is normal physiological products which are produced through metabolism in the cell i.e. intracellular. They are produced without any injury in plant. They form slimy masses in water [5].

In the field of food industry researchers have been prepared the products which are helpful to reduce fat, sugar, cholesterol etc., so in this area the xanthan gum, flaxseed mucilage and mixture of them have been used to prepare reduced fat mayonnaise. They dissolve readily in water [6].

This article is emphasizes on the extraction and evaluation of mucilage from corms of *Colocasia esculenta* and seeds of *Trigonella foenum-graecumL.* and comparison between them.*Colocasia esculenta*is commonly known as arvi and belongs to the family Araceae [7]. *Trigonella foenum-graecumL.* is commonly known as methi or fenugreek seed and belongs to the family leguminaceae. Seeds of methi are also used in the preparation of pickles and it also act as a preservative [8, 9].

MATERIAL AND METHODS

The corms of *Colocasia esculenta* was purchased from local market of New Delhi, India and the seeds were procured from local market of Greater Noida, India.

Extraction of Mucilages: Mucilages were extracted in following steps:

Step 1: corms of *Colocasia esculenta* and seeds of *Trigonella foenum-graecumL* were used for the isolation of mucilage. In case of arvi we remove the outer surface of the corms and cut them into small slices. These small slices were washed with the water to clear the impurities and dirt present on the surface. Small slices of same size were incorporated in the water and allowed it to boil for at least 3-4 hrs for sufficient release of mucilage in water. The boiled slices of corms were filtered with the muslin cloth in order to separate the marc from the filtrate. Filtrate was refrigerating for cooling. In the caseof *Trigonella foenum-graecumL* seeds of methi were washed with water to clear the dirt present on outer surface then seeds were dried to remove moisture at room temperature. Seeds of methi were incorporated in water and allowed it to boil for at least 12 hrs at 40°C for sufficient release of the water. Extract of seeds were filtered through the muslin cloth in order to separate the marc from filtrate. Filtrate was refrigerating for cooling [10].

Step 2: Isolation of mucilages: Equal quantity of ethyl alcolol was added to the filtrate in order to separate mucilages. Mucilages were separate in the presence of the Separated mucilages were dried hot air oven at 40°C. dried mucilages were subjected to size reduction until they reached at powdered state. Finally they stored in an air tight container [10].

Physicochemical Evaluation of Isolated Mucilages

Organoleptic Evaluation of Isolated Mucilages: Parameters likecolor, odor, fracture and texture were evaluated for both mucilages [11].

Identification Tests for Carbohydrates, Proteins, Fats: Test solutions were prepared for then both mucilages. Water was used for the preparation of solution. Chemical tests were performed for both mucilages and standard methods were used for the same [11].

Swelling Index: To calculate the swelling index of the powdered mucilages, 1 gm of powdered mucilages were taken and transferred to it to a 50 ml measuring cylinder having glassstopper. 50 ml water was added to the measuring cylinder and mix it in order to make a solution with stirring in every 10 mints for at least 1 hour. These solutions were kept for 24 hours at room temperature. After 24 hour volume covered by the mucilages were noted [11]. Refer Table no. 1

pH of the Extracted Mucilages: 1%w/v solutions were prepared in water for both mucilages. Digital pH meter was used to determine the pH of solution [11]. Refer Table no1.

Solubility of the Extracted Mucilages: solubility of mucilageswasdetermined in different solvents through adding them into solvents [11].

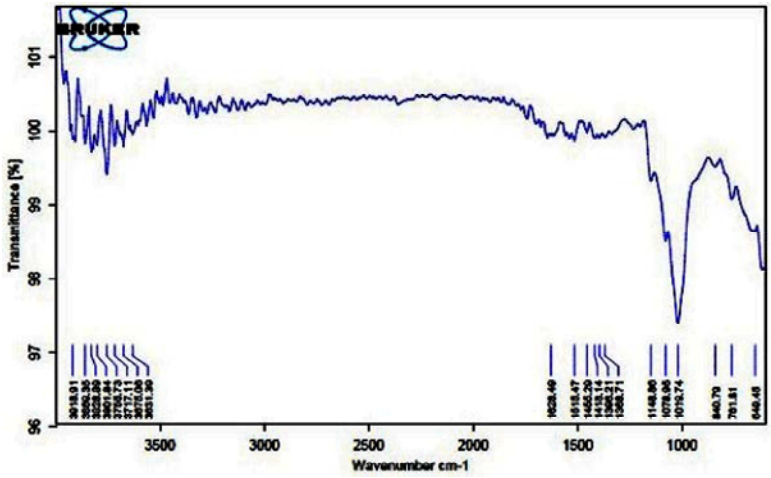

Fig. 1: Infrared spectroscope of Colocasia mucilage

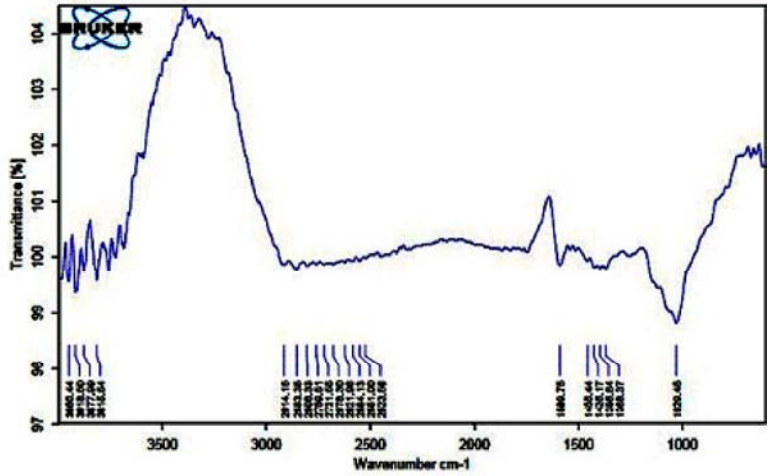

Fig. 2: Infrared spectroscope of Fenugreek mucilage

Table 1: Micromeretic properties of the extractedmucilages

	Values	
Parameters	Colocasia	Fenugreek
Bulk Density	1.12±0.21	0.66±0.043
Tapped density	1.12±0.17	0.94±0.098
Bulkiness	0.9±0.18	1.48±0.099
Carr's Index	5.7±5.33	28.2±3.11
Hausner's ratio	1.05±0.06	1.39±0.057
Yield	1.4%	15.16%
Swelling index	77.27%	90%
pH	6.5	7.9
Angle of Repose	16.69°±1.38°	29.20°

Carr's Consolidation Index (Compressibility) and Hausner's Ratio: These properties are the derived properties of the powder and depend on the particle size and particle size distribution of the powder. Both properties are calculated from the bulk and tapped densities. Hausner's ratio is the ratio between the tapped and bulk density as shown in Table 1 [1].

Bulk and Tapped Density: Fixed (standard) quantities of isolated mucilages were transferred into the graduated measuring cylinder. Volume covered by the powder was noted for both mucilages. Measuring cylinder was kept in bulk density apparatus till the standard timing. Tapped volume of powder was noted to determine the bulk and tapped density as shown in table 1 [12].

Flow Properties of the Powder: flow property of the powders was determined by calculating the angle of repose. Fixed height funnel method was used to calculate the angle of repose as shown in table 1[13].

Angle of repose was calculated from the following formula:

$\text{Tan } \theta = h/r,$

where, h= height of the cone of powder
r = radius of the cone

Table 2: Frequencies and peaks observed in I.R. spectra of isolatedColocasia mucilage [15]:

Frequency (cm^{-1})	Assignment
3631.39	O-H Stretch
1515.47	N-O asymmetric stretch
1455.55	C-H bend
1368.71	C-H rock
1148.86	C-O stretch
1078.86	C-O stretch
840.79	C-Cl stretch

Table 3: Frequencies and peaks observed in I.R. spectra of isolated fenugreek mucilage [15]

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

I.r. Spectroscopy of the Isolated Mucilages: 100 mg powder of mucilage was weighed accurately and mixed with 400 mg potassium bromide. This mixture was compressed in hydraulic press in order to form pellet at pressure of 15 tons. These pellets were kept in I.R. spectrophotometer and scanned it from 4000- 400cm^{-1} [14].

RESULT AND DISCUSSION

Extraction of mucilage was done by *Colocasia esculenta* with the help of water and various evaluation parameters were performed for isolated mucilage. First of all various chemical test were performed for identification of carbohydrates, proteins, fats and oils etc. on the basis of results we found that the isolated mucilage from *Colocasia esculenta* and *Trigonella foenum-graecumL* gives positive test for carbohydrates and negative test for proteins and fat & oils. Isolated mucilages were evaluated for organoleptic properties. Isolated mucilage from arvi was soluble in hot water and showed selling property in cold water. It was found that the isolated mucilage was insoluble in organic solvents like ethyl alcohol, acetone, chloroform and methanol.In case of *Colocasia esculenta* the color of isolated mucilage was found to be light brown, odor of mucilage was characteristic and fracture and texture was found to be rough and irregular. In case of *Trigonella foenum-graecum L* mucilage the color of mucilage was found to be light brown. Mucilage was odorless. Taste of the mucilage was characteristic. Fracture was rough and texture was rough and irregular.Micromeretic studies were also done for both mucilages and comparative study is shown in the Table 1.

CONCLUSION

Isolated mucilages were soluble in the hot water, swell able in cold water and insoluble in organic solvents like ethyl alcohol, acetone, methanol and chloroform. They were showed the presence of carbohydrate and they were passed for all organoleptic properties. pH of the isolated mucilage were found to be 6.5 for *Colocasia esculenta* and 7.9 for fenugreek. So they were less nonirritating. Angle of repose of colocasia mucilage and fenugreek mucilage was found to be 16.69° and 29.20°respectively. This shows that the isolated powdered mucilages had excellent flow properties. Swelling property was confirming the suitability of mucilage as an Excipient in novel drug delivery systems for controlled drug delivery.

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