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Isolation and Characterization of Mucilage from Dioscorea Species

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ABSTRACT

The present review discussed on plant mucilage and its versatile excipients property as tablet binders, disintegrating, emulsifying, suspending, gelling, stabilizing, thickening and film forming agents of mucilage obtained from certain plants. The aim of present study was to isolate the mucilage from Dioscorea species *e.g. D. alata, D. rotundata, D. esculenta*. The Dioscorea species mucilage used as binding agent, disintegrating agent, chelating agent, pasting properties. The mucilage of dioscorea species was isolated from the tuber via maceration followed by precipitation method using acetone. The isolated mucilage was dried at 60^{o}C for 25 minute and stored. The mucilage of dioscorea species was used in sustained drug delivery system as binding agent.

INTRODUCTION

Excipients are the largest components of any pharmaceutical formulation. They can be of natural or synthetic origin and synthetic excipients have become commonplace in today's pharmaceutical dosage forms.[1] It is common knowledge that both synthetic and semi-synthetic products have enjoyed a long history of use, frequently offering unique properties and advantages over naturally derived compounds, including a low sensitivity to various ingredients or moisture, resulting in more efficient and effective pharmaceutical products. [2]

The interest towards polysaccharides of natural origin is continuously growing during the past decade. Fields of interest for their applications are widening, ranging between food supplements, cosmetics, pharmaceuticals, and biomedical uses. Exploitation of new sources of polysaccharides of different origin is well documented in recent literature. Since this tendency is involving biomaterials science in a pressing way. From a chemical point of view, the perspective is to replace traditional methods for production and modification of natural polysaccharides with more eco friendly, efficient, and targeted methodologies. [3]

Application of polysaccharide:

- Polysaccharides are solid, jelly-like materials formed from colloid polysaccharides, proteins and synthesized polymers.

- Polysaccharides are applied in the food, cosmetic, paint, pharmaceutical, photographic, petroleum and chemical industries, and have additional potential uses.

- Polysaccharides are used in catalysis, separation of materials, drug delivery, and tissue engineering.

- Polysaccharides are used seaweeds, plants, animals and micro-organisms have been used in food, cosmetic, paper, textile, oil, pharmaceutical, medical, and other industries as viscous enhancing.

- Polysaccharides that are produced commercially from, water-holding, emulsifying, oil-drilling, coating, encapsulating, protective, gelling and other agents.

- Some polysaccharides are paid attentions to develop in biomedical applications.[4]

MATERIALS AND METHODS

Dioscorea alata tubers were procured from the local market of Mandleshwar. All the other solvents, reagents and chemicals used were of analytical grade.

Isolation of mucilage from *Dioscorea alata* Tuber [5-7]**:**-The yam tuber was peeled and weighted. The 500 gm weighed yam was cut into small pieces. Then the yam pieces were blended with 1.5 liter distilled water which contains 0.33 % sodium metabisulphite. The slurry was kept in a beaker for 25 minute. After that supernatant layer was separated in another beaker. The yam mucilage was precipitated from supernatant using Acetone in ratio of 2:1. Mixed properly with glass rod. This solution was kept in a Hot air oven at 50ºC for One hour. Than filter the solution and separate the precipitated mucilage. After filtration it was dried in Hot air oven at 60ºC in Petri dish for 25 minutes. The dried mucilage was crushed and powdered; the crushed powder put in airtight container.

Characterization of mucilage:-Isolated polysaccharide was characterized as the well established reported procedure in published literature [8].

✓ **Organoleptic evaluation of Mucilage**:-The organoleptic properties were determined as Color and Odor.

✓ **Solubility behavior**:-Solubility of polysaccharide was determined in different solvents. About 10 mg mucilage was dissolved in 10 ml of different solvents.

✓ **Test for polysaccharide: -** The Iodine test. About 100 mg dried mucilage powder was taken for the testing of Polysaccharide.

✓ **Percentage yield**:- The percentage yield was determined between given tuber and dried mucilage. The percentage yield was calculated using formula-

Practical yield / Theoretical yield × 100

✓ **Bulk density**:- The bulk density was determined by accurately 20 gm of dry polysaccharide in a measuring cylinder. The bulk density was calculated using formula –

Bulk density =Mass / Volume

✓ **Tapped density**:-Tapped density was determined by accurately 20 gm of dry polysaccharide in a measuring cylinder. It was determined by Tapped density apparatus and calculated using formula –

Tapped density = Mass of powder / Tapped volume of powder

✓ **Powder compressibility**:-About 20 gm of finely powdered mucilage was transferred into a measuring cylinder and calculations were done using bulk & tapped density apparatus. Carr's index and Hausner ratio was calculated using formula-

Carr's Index = TD – BD / TD × 100

Hausner ratio = BD /TD

✓ **Swelling Index**:-The swelling behavior of dried mucilage powder was tested in Distilled water. Known mass of powder was used for determination of swelling behavior. The solution of mucilage was introduced in measuring cylinder and shakes it every 30 minute. The swelling behavior was calculated using formula-

Swelling index = [(Final volume – Initial volume) / Final volume] × 100

✓ **Viscosity:**-The viscosity of mucilage was determined by Ostwald viscometer. For determination of viscosity, 1 gm powder was dissolved in distilled water.

$$S=w\times t_s p_s / t_w p_s$$

where, s= Viscosity of solution

w= Viscosity of water

t= time

p =Density

✓ **Powder Flow Property**:-About 20 gm of Powder was used for determination of flow property. Powder flow characteristic were measured by fixed funnel method.

$$\tan \theta = H / R$$

✓ **Infrared spectra of the isolated mucilage:-** The IR spectra of mucilage was determined by FTIR spectrophotometer.

RESULTS AND DISCUSSION

Isolation of mucilage: From the two methods employed such as acetone precipitation and ethanol precipitation method, acetone precipitation method was preferred since it gave high yield.

Characterization of the isolated mucilage

1. Organoleptic properties: The Organoleptic properties of mucilage as given in table No.1.

Table No. 1:- Physical property of mucilage

S. No.	Properties	Results
1.	Color	Light Brown
2.	Odor	Odorless
3.	Taste	Characteristic
4.	Texture	Rough

2. Solubility Behavior: The solubility of isolated mucilage was determined in different solvents. About ten mg of mucilage was suspended in 10 ml of different solvents in tightly closed test tube. The solubility of mucilage was determined & is shown in table no.2.

Table No.2:- Solubility of mucilage

S. No.	Solvents	Solubility
1.	Cold Water	Slightly soluble
2.	Hot water	Soluble
3.	Ethanol	Insoluble
4.	Acetone	Insoluble
5.	Benzene	Insoluble
6.	Hydrochloric Acid	Insoluble
7.	6.8 Phosphate buffer	Insoluble

3. Test for Polysaccharide: About100 mg of dried powder was taken and 1 ml of 0.2 N Iodine solution was used. The dried mucilage was dispersed in iodine solution and observed.

4. Percentage Yield: About 500 gm tuber was taken for the isolation of mucilage. After isolation of mucilage, it was dried and weighed. The result of percentage yield is given in table No.3.

5. Bulk density: Bulk density is defined the ratio of the mass of powder to the bulk volume and it is expressed as g/cm^3. The 20 gm of dried mucilage powder was taken in a clean and dry measuring cylinder. The bulk volume was recorded. The result of bulk density is given in table No.3.

6. Tapped density: Tapped density was determined by placing a graduated measuring cylinder, on mechanical tapping apparatus. The 20 gm of powder was transferred in measuring cylinder. The tapped volume was measured by tapping the powder to constant volume. The result of tapped density is given in table No. 3.

7. Carr's Index: The compressibility Index is measures of the propensity of a powder to be compressed. The compressibility was determining the difference between bulk and tapped density.20 gm of powder was weighed accurately and transferred in measuring cylinder. The results of car's index and Hausner ratio are given in table No.3.

8. Angle of Repose: Angle of repose of powder was determined by fixed funnel and cone method. A Petri dish was taken and its diameter was determined. A funnel was fixed above the Petri dish and Known quantity of powder was poured from funnel. The results of angle of repose of power mucilage as given in table No.3.

9. Swelling Index: 10 mg of mucilage powder was taken for determination of swelling index. Then transferred into a 50 ml of measuring cylinder with 25 ml of distilled water. After that it was stand for 12 hrs. The result of swelling index is given in table No. 3.

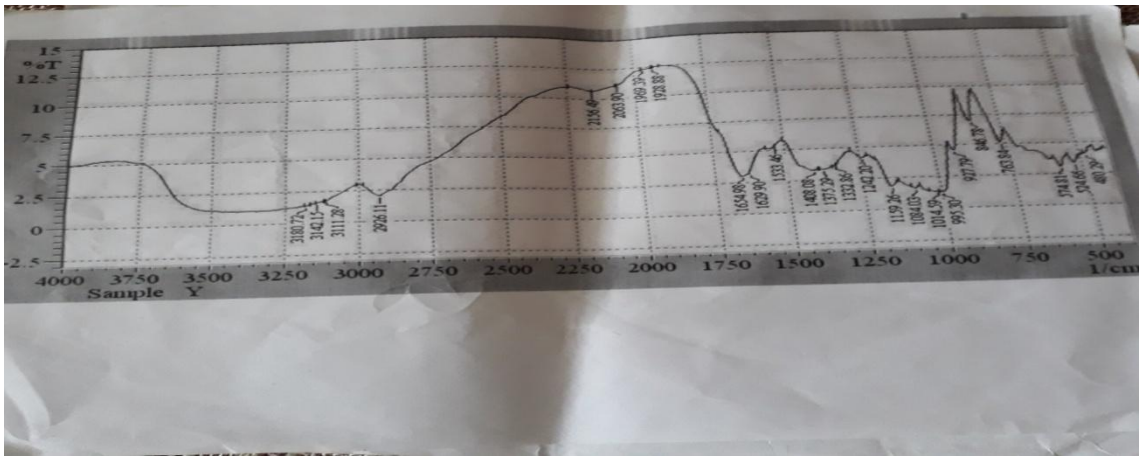
10. Viscosity: Viscosity of mucilage powder was determined 1 % solution of mucilage with distilled water. The viscosity was measured by Ostwald viscometer. The result of viscosity is given in table No.3.

11. pH of mucilage: pH of mucilage was determined by 1 % solution and measured by digital pH meter.

Table No.3:- Evaluation parameters of mucilage

S. No.	Evaluation parameters	Results
1.	Percentage yield	9 %
2.	Polysaccharide test	+
3.	Bulk density	0.64 gm/ml
4.	Tapped density	0.71 gm/ml
5.	Carr's Index	10.46 %
6.	Hausner ratio	1.10 %
7.	Angle of repose	29.68º
8.	Swelling Index	7.40 %
9.	Viscosity	1.1032 cps
10	pH	6-7

12. FTIR study of Dioscorea Polysaccharide:-



CONCLUSION

The project deals with the isolation of mucilage from natural source i.e. Dioscorea and its physicochemical and Micrometric characterization. The chemical characterization of mucilage revealed the presence of carbohydrates. The physical characterization of mucilage was all in range which indicates it is safe to be used as excipients. The micrometric characterization indicated the good flow property of mucilage.

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