Research Article

Isolation and Characterization of Hibiscus Rosa Sinensis Linn (Shoe Flowers Plant)

Dipak B. Manjule*, Shaikh Gazi, Ulhas Surwase and Kadam Bhalchandra

ASPM's K.T.Patil college of Pharmacy, Osmanabad, Maharashtra, India.

ABSTRACT

New technological advance have brought many innovative natural polymers to the market and others to the brink of commercialization synthetic and natural occurring polymers in different forms, holds the promise of providing better drug efficacy, reducing toxicity and improving patients compliance. Natural polymers remain attractive primarily because they are natural products of plants, living organism, readily available, relatively inexpensive and capable of multitude of chemical modifications [1]. The natural polymers are better and best as compare to synthetic polymers, because synthetic polymers have certain disadvantages such as high cost, various side effects, toxicity and probable polluting agents. Leaves of hibiscus rosa sinensis linn contain high proportion of mucilage and this mucilage can be used for various therapeutic purposes. However, there are no reports till date on isolation and characterization mucilage of hibiscus rosa sinensis linn. Hence, the prime objective present study is isolation and characterization of hibiscus rosa sinensis linn. The said plant was characterized for its identification by chemical tests, solubility, pH, ash value, loss on drying, compressibility index, angle of repose, bulk density, and tapped density.

Keywords:, Hibiscus Rosa sinensis, mucilage ,isolation and characterization,excipients.

INTRODUCTION

Mucilages are common constituents of plants which have been ignored by pharmacists of the modern day. Anyway, they have very important functions which are the major constituents of herbal medications. The mucilages are better known for their physical properties and biocompatibility. The traditional use of excipients and mucilages in drug formulation was to act as inert vehicles to provide necessary weight, consistency and volume for the correct administration of the active ingredient, but in modern pharmaceutical dosage forms they often fulfill multi-fuctional roles such as modifying release, improvement of stability and bioavailability of active ingredient, enhancement of patients acceptability and ensure ease of manufacture. Mucilages and polymers have been successfully investigated and employed in the formulation of solid, liquid, and semisolid dosage forms and are specifically useful in the design of novel drug delivery systems [2]. Both synthetic and natural polymers have been investigated extensively for this purpose.Synthetic polymers are toxic, expensive, have environment related issues, need long development time for synthesis. However the use of natural polymers for pharmaceutical applications is attractive because they are economical, readily available, non toxic and capable of chemical modifications, potentially biodegradable and with few exceptions and also biocompatible. A large number of plant-based pharmaceuticals excipients are available today. Many researchers have explored the usefulness of plant-based materials as meet the requirements of drug delivery systems and thus compete with the synthetic excipients available in market. The fact for increase in importance of natural plant based materials is that, plant resources are renewable and if cultivated or harvested in a sustainable manner, they can provide a constant supply of raw materials.

However, substances from plant origin also pose several potential challenges such as being synthesized in small quantities and in mixtures that are structurally complex, which may differ according to the location of the plants as well as other variables such as the season. This may result in a slow and expensive isolation and purification process. The plant based mucilages and polymers have been studied for their applications in different pharmaceutical dosage forms like matrix controlled system, film coating agents, buccal films, microspheres, nanoparticles, viscous liquid formulations like ophthalmic solutions, suspensions, implants and their aaplicability and efficacy has been proven. These have also been utilized as viscosity enhancers, stabilizers, disintegrants, solubilisers, emulsifiers, suspending agents, gelling agents and bioadhesives, binders in the above mentioned dosage forms.

MATERIALS AND METHOD

Materials

The leaves of hibiscus rosa sinensis linn were collected, from local market. The leaves were authenticated from Govt Agriculture college Osmanabad,the specimen vouchure is been preserved in our college for future references .Laboratory grade acetone required for isolation was purchased from Rajesh chemicals Mumbai.

Extraction of mucilage

The fresh hibiscus rosaninensis linn leaves were collected and washed with water to remove dirts and debries. Leaves were powdered and soaked in water for 5-6 hrs, boiled for 30 minutes and left stand for 1hours to allow complete release of mucilage into water. The mucilage was extracted using multi-layer muslin cloth bag to remove the marc from the solution. Acetone (in the volumes of three times to the volume of filtrate) was added to precipitate the mucilage. The mucilage was separated, dried, in an oven at 40^0c, collected, ground, passed through #80 sieve and stored in dessicator at room temperature for further use[3].

Purification of the mucilage

The crude mucilage (1%) was obtained after extraction which was centrifuged at 10000rpm, decanted and precipitated in acetone following 1:2 mucilaginous solution acetone ratio, washed with isopropyl alcohol with 1:1 volume ratio and finally it was dried[4].

Physiochemical characterization of mucilage

Percent yield

The percentage yield was calculated on the amount of leaves of hibiscus species used for extraction process and amount of dry powder obtains individually depend upon solvents used[8]. The percentage yield was calculated using the formula mentioned below,

$$\text{Percentage yield} = \frac{\text{Wt of dried mucilage obtained}}{\text{Wt of leaves powder taken}} \times 100$$

Weight loss on drying

Weight loss on drying was determined for an appropriate quantity of mucilage at 105 ^{0}c for 2 hour and percentage loss of moisture on drying was calculated using formula[5].

LOD (%) = (weight of water in sample /weight of dry sample) ×100

Chemical test

Chemical identification tests for the dry mucilage powder such as proteins, aminoacids, alkaloids, carbohydrates, tannins, glycosides; starch, terpinoids, etc were performed using conventional techniques[6].

Angle of repose (ɵ)

Angle of repose (**ɵ**) was determined using funnel method.The mucilage powder was poured through a funnel that can be raised vertically until a maximum cone height (h) was obtained[7]. The radius of the heap(r) was measured and angle of repose was calculated

Angle of repose (ɵ) = $\tan^{-1}(h/r)$

Bulk and tapped density

A preweighted, presieved quantity of dried mucilage was poured into a graduated cylinder, and the volume recorded. The cylinder was tapped until the powder-bed volume reached a minimum value, and the tapped volume was recorded .the bulk and tapped densities were calculated

Bulk density = Mass/Bulk volume

Tapped density =Mass/Tapped volume

Compressibility index

Compressibility index gives the important property of granules .it also known as carrs index. It can be calculated by using formula:

$$\frac{\text{Tapped density-bulk density}}{\text{Tapped density}} \times 100$$

Hausner's ratio

Hausner's ratio is an index of ease of powder flow; it is calculated by following formula

Hausner's ratio = tapped density /bulk density

Particle size distribution

The particle size distribution of mucilage/polysaccharides was done powder was sprinkled on glass slide containing glycerin. The particle size of mucilage/polysaccharides was carried out using calibrated eye piece micrometer. About 100 particles size were counted in different fields[8].The particle size distribution of mucilage shown in fig1.

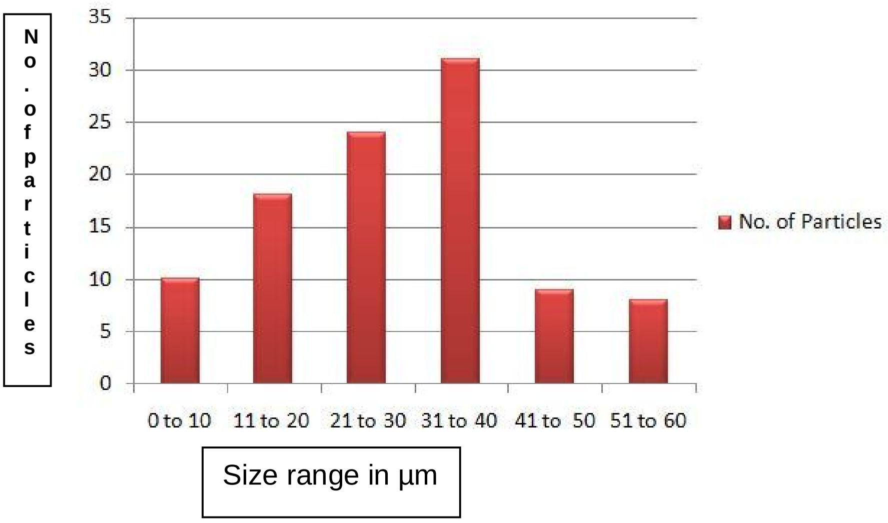

Fig. 1: Particle size distribution of dry mucilage powder

pH of solution

The pH of 1 % w/v solution of the dry powder mucilage in distilled water was measured using calibrated digital pH meter at room temperature[9].

Swelling ratio

In this study 1 g of dry mucilage powder was placed in a 100-ml stoppered graduated cylinder. The initial bulk volume of the dry mucilage was measured. 2 ml of alcohol (95%) was added for good dispersion and then distilled/demineralized water was added to sufficient quantity to yield 100-ml of uniform dispersion. The viscous solution was added at room temperature and the sediment volume of the swollen mass was noted after 24hr. The swelling ratio was calculated by determining the ratio of swollen volume to the initial bulk volume using the formula[9,10];

$$S = \frac{V2-V1}{V1}$$

Where;

S = swelling index

V1 = volume occupied by the mucilage prior to hydration

V2 = volume occupied by the mucilage after hydration.

Table 1: Physio-Chemical characterization of mucilage

S. No.	Parameters	Results
1	Solubility	Slightly soluble in water
2	Odour	Characteristics
3	Taste	Mucilaginous
4	Appearance	Amorphous
5	Percentage yield	5.33 %
6	Identifications a)mounted in 96% ethanol b)mounted in ruthenium red	Transparent angular masses Particles stained red
7	pH	6.82
8	LOD	9.1 %
9	Swelling index	20
10	Ash value	2%
11	Sulphated ash	0.60%
12	Test for carbohydrates (Molish test)	+
13	Test for tannins	+
14	Test for glycosides	-
15	Test for starch	-
16	Test for terpenoids	-
17	Flavonoids	+

+ present, - absents

Table 2: Flow properties of the mucilage powder

S. No.	Parameter	Results
1	Average particle size	28.90 µm
2	Angle of repose	28.75
3	Bulk density	0.75gm/cm3
4	Tapped density	1.13gm/cm3
5	Carr index (%)	35.73
6	Hausner's ratio	1.55

RESULT AND DISCUSSION

The mucilage was extracted from hibiscus species for pharmaceutical use. The product extracted was acceptable with characteristic, odour, mucilaginous taste and coarse powder aspects. The percent yield of the dry mucilage powder was found in distilled water 5.5 %. The chemical tests were performed on the extracted mucilage powder for the identification of active constituents such as proteins, tannins, glycosides, starch, terpenoids, flavonoids, and alkaloids, etc, which ensured the presence of tannins, carbohydrates flavonoids and absence of glycosides, terpenoids. The pH of 1% w/v solution of the mucilage powder in distilled water was 6.82 which indicates product is acidic in nature. The swelling index of mucilage powder was found to be 20. In powder characteristization studies, angle of repose, bulk density, tapped density, cars index and hausners ratio were performed and results was found, 28.75^0, $0.75 gm/cm^3$, $1.13 gm/cm^3$, 35.73% and1.55 respectively.

CONCLUSION

The use of natural mucilages for pharmaceutical applications is attractive because they are economical, readily available, non-toxic, and capable of chemical modifications, potentially biodegradable and with few exceptions also biocompatible. Natural mucilages can also be modified to have tailor-made products for drug delivery systems and thus can compete with the synthetic controlled release excipients available in the market. These can be used not only in tablets formulations but also in sustaining the release of the drugs, proving useful for development of gastro retentive dosage form, bioadhesive systems, microcapsules etc. Hence, we can conclude that the use of mucilages as an pharmaceutical excipient and polymers can prove an alternative to synthetic polymers in drug discovery and drug design.

ACKNOWLEDGEMENTS

The authors are thankful to the Shri Sudhir .K. Patil sir, Executive President, ASPM Osmanabad, for providing research facilities and constant encouragement to carry out the work.

REFERNCES

1. Chasin Mark, langer Robert. Biodegradable polymers as drug delivery systems. Special Indian, Marcel Dekker, INC, Newyork, 1990.
2. Avachat Amelia M, Dash Rakesh R and Shrotriya Shilpa N. Recent Investigations of Plant Based Natural Gums, Mucilages and Resins in Novel drug Delivery Systems. Indian Journal of Pharmaceutical Education and Research. 2011;45(1):86-99.
3. Ameena K, Dilip C, Saraswathi R and Krishnan PN. Isolation of mucilages from Hibiscus rosa-sinensis linn and Okra (Abelmoschus esculentus linn) and studies of binding effects of the mucilages. Asian pacific Journal of Tropical Medicine. 2010:539-543.
4. L- Medina- Torres, E Brito-D e-La Fuente, R- Kathain. Rheological Properties of Mucilage Gum (Opontia ficus indica) Food Hydrocolloids. 2000;14:417-424.
5. Kokate CK. Practical Pharmacognocy, 3rd edition, Vallabh Prakashan,Delhi,1991.
6. Bharat MR and Kawatikawar PS. Isolation and Characterization of Remusatia vivipara Tubers Mucilage. International Journal of Pharmacy and Biological Science. 2011;1(4):457-461.
7. Martin A, Swarbrick J, Cammarata. In Physical Pharmacy, 3rd edition, Lippincott Williams and Wilkins,1991.
8. Shah Viral and Patel Rucha. "Studies on mucilage from Hibiscus rosa-sinensis linn as oral

disintegrant. International Journal of Applied Pharmaceutics. 2010;2(1):18-21.
9. Malik Karan and Arora Gurpreet. Lallemantia Reylenne seeds as superdisintigrant, Fromulation and evaluation of Nimusulide Oral Dispersible Tablets. International Journal of Pharmaceutical Investigation. 2011;1(3):192-198.
10. Ravikumar, Patil Swati and Patil MB. Isolation and evaluation of Disintegrant Properties of Fengugree Seed Mucilage. International Journal of Pharmatech Research. 2009;1(4):982-996.