

Extraction of Mucilage and its Comparative evaluation as a Binder from Flower petals of *Hibiscus rosasinensis* Linn.

Priti Late*, Tejal Kasar, Mohini Upadhyia

Department of Pharmacognosy, Progressive Education Society's, Modern college of Pharmacy for ladies, Moshi, Pune 412105, India.

*Corres.author: pritilate@gmail.com
Phone: +91-8582915163

Abstract: The objective of present investigation was to extract the mucilage from flower petals of *Hibiscus rosasinensis* and explore its use as a binder in a Paracetamol tablets. The physicochemical characteristics of mucilage such as swelling index, solubility, loss on drying were studied and pH was found to be 6.5 which are nearer to the neutral value. The mucilage was also evaluated for its granulating and binding properties in tablets, using Paracetamol as a model drug. The wet granulation technique was used for the preparation of granules using a mucilage concentration of 5%, 10% and 15% w/v as a binder. The prepared granules from mucilage were evaluated for compressibility index (Carr's consolidation index) and flow properties, which were compared with granules prepared from starch (binder) at a concentration of 10% w/v. The tablets were prepared and evaluated for content uniformity, hardness, friability, disintegration time and *in vitro* dissolution profile. The tablets had a good physicochemical characteristics and the drug release was found to be 90.45% at a 5% w/v concentration of mucilage. The tablets prepared using 5% w/v of mucilage as binder could be considered as an optimum concentration for the preparation of tablets than 10% and 15% w/v mucilage (binder) concentration, which exhibits more hardness. Hence, *Hibiscus* flower petals mucilage at a concentration of 5% w/v has a potential for being substituted as a binder for the more expensive starch in tablet formulation.

Keywords: *Hibiscus rosasinensis*, binder, mucilage, pharmaceutical additive.

Introduction

The plant mucilage research arouses the tremendous interest for pharmaceutical application such as binder, diluent, disintegrant, thickener and gelling agent in solid and liquid dosage form, due to their local accessibility, low cost and eco-friendliness nature. Such diverse application of mucilage makes them as an attractive substitute for costly semisynthetic and synthetic excipients.¹ A majority of the investigation on natural excipients in drug delivery system have centered on protein and polysaccharides, due to their ability to produce a wide range of materials and properties according to their molecular structural alteration.²

The different species of *Hibiscus* are reported to possess various medicinal properties viz antitumor, antihypertensive antioxidant and antifertility. The *Hibiscus rosasinensis* is widely grown as an ornamental plant throughout the tropical and subtropical regions.³ In the present study, an effort was made to extract the mucilage from *Hibiscus rosasinensis* flower petals by the conventional and microwave method. The two different

methods were used to check the yield and efficiency of method of extraction. It was then evaluated to check the possibility of using this mucilage as binding/granulating agents in tablet formulation. The binders are the pharmaceutical excipient that is commonly employed in tablet formulation to improve the flow properties of the granules.

Materials and Methods

The flowers of *Hibiscus rosasinensis* were collected from a local area and were authenticated at the botanical survey of India, Pune.

Isolation of Mucilage

The mucilage was isolated from flower petals by conventional and microwave method. For the isolation of mucilage by conventional method, *Hibiscus* flower petals (50 g) were initially powdered for 5 minutes in a mechanical blender and soaked in distilled water (1000 ml) for 24 h in a round bottom flask. It was then boiled for 1 h under reflux with occasional stirring and kept aside for 2 h for the release of mucilage into water. The material was filtered through a muslin bag and hot distilled water (50ml) was added through the sides of the marc and squeezed in order to remove the mucilage completely. Equal volume of ethanol was added to the filtrate to precipitate out the mucilage and kept inside a refrigerator for one day for effective settling. It was then filtered, dried completely in an incubator at 37°C, powdered and weighed. For the isolation of mucilage by microwave method, the first step is similar to the conventional method before the heating. After blending and soaking procedure, the mixture was kept in a microwave oven at a 420 W intensity for 7 minutes. The beaker was removed from the oven and kept aside for 2 h for the release of mucilage into water. It was later processed in a similar way as done for the conventional method.⁴ The identity of isolated mucilage was confirmed by chemical tests.

Phytochemical characterization of mucilage

The mucilage solution was tested for the presence of carbohydrate by performing the Molisch's and Ruthenium red test. The dried mucilage was then observed for solubility, pH, loss on drying, swelling index, viscosity and ash value.⁵ The organoleptic and physicochemical evaluation parameters are given in Table 1.

Table 1. Organoleptic and physicochemical characterization of mucilage

Sr.no	Parameter		Inference
1	Color		Brown
2	Odour		Odourless
3	Taste		Mucilageous
4	Appearance		Sticky
5	Ash values (%w/v)	Total ash	2
		Acid insoluble ash	1.5
		Water soluble ash	2.5
6	Surface tension		904.68
7	Loss on drying (%)		15%
8	Swelling index		2 ml
9	Viscosity		2.008 poise
10	Melting point		112°C
11	pH		6.5

Drug-excipient compatibility study

This study has been done to check whether drug and excipient of formulation are compatible or not. The drug and excipients must be compatible with one another in order to produce a product that is stable, safe,

efficacious, attractive and easy to administer. FTIR was used to investigate and predict the physicochemical interactions between mucilage and drug.⁶

Preparation and evaluation of tablets

The *Hibiscus* mucilage was used in a concentration of 5, 10 and 15% w/v for the preparation of granules by wet granulation method using Paracetamol as a model drug. The formula for a preparation of tablets at different concentration of mucilage (binder) is given in Table 2. The prepared granules were evaluated for bulk density, tapped density, angle of repose, Carr's consolidation index and Hausner ratio, to check the compressibility and flow properties. The different characterization parameters of prepared granules are given in the Table 3. The prepared granules were compressed into a flat faced tablet of mean average weight 200 mg $\pm$ 7.5%, diameter 8 mm $\pm$ 0.1mm in eight station rotary tableting machine at an arbitrary pressure load unit of 6 tones. The compressed tablets were then evaluated for weight variation, hardness, friability, content uniformity, disintegration and dissolution test.

Table 2. Formula for preparation of Paracetamol tablets

Ingredients (mg/tablet)	HF_{5%}	HF_{10%}	HF_{15%}	S_{10%}
Paracetamol	100	100	100	100
Lactose	70	60	50	60
SSG	10	10	10	10
Maize starch	-	-	-	20
Mucilage	10	20	30	-
Talc	9	9	9	9
Magnesium stearate	1	1	1	1

SSG: Sodium starch glycolate; S_{10%}: Granules prepared by using maize starch at 10% w/v concentration; HF: Granules prepared by using *Hibiscus* flower mucilage at 5, 10 and 15% w/v concentration

Table 3. Characterization of the granules prepared by different concentration of binders

Batches	Bulk density (gm/ml)	Tapped density (gm/ml)	Carr's consolidation index (%)	Hausner ratio	Angle of repose (°)
HF _{5%}	0.399	0.487	18.19	1.22	29.15
HF _{10%}	0.350	0.456	15.42	1.29	28.35
HF _{15%}	0.432	0.486	11.10	1.12	29.05
S _{10%}	0.461	0.462	17.32	1.00	29.25

Result and Discussion

The mucilage yields for a flower petals by conventional and microwave method was found to be 3.9% and 6.84% respectively. This indicates that the microwave method of extraction of mucilage is more efficient and gives more yield as compared to the conventional method. The identification of the isolated mucilage (carbohydrate) was confirmed with the positive result of Molisch's test (purple color formation) and Ruthenium red test (formation of pink color) respectively. The extracted mucilage was slightly soluble in water and was practically insoluble in ethanol, acetone and chloroform. All the evaluation parameters for mucilage were found to be within the acceptable limit. A 1% w/v solution of mucilage in water showed a pH of 6.5, which is near to the neutral pH. This suggests that *Hibiscus* flower mucilage may be less irritating to the GIT, when used in the uncoated tablets. The drug and mucilage interaction was also checked by comparing the IR spectra of pure drug with the combined spectra of pure drug and mucilage. There was no shift observed in the frequencies of drug in combination with mucilage. This shows that the drug and polymer are compatible and suitable for a preparation of granules for tableting as shown in Fig 1.

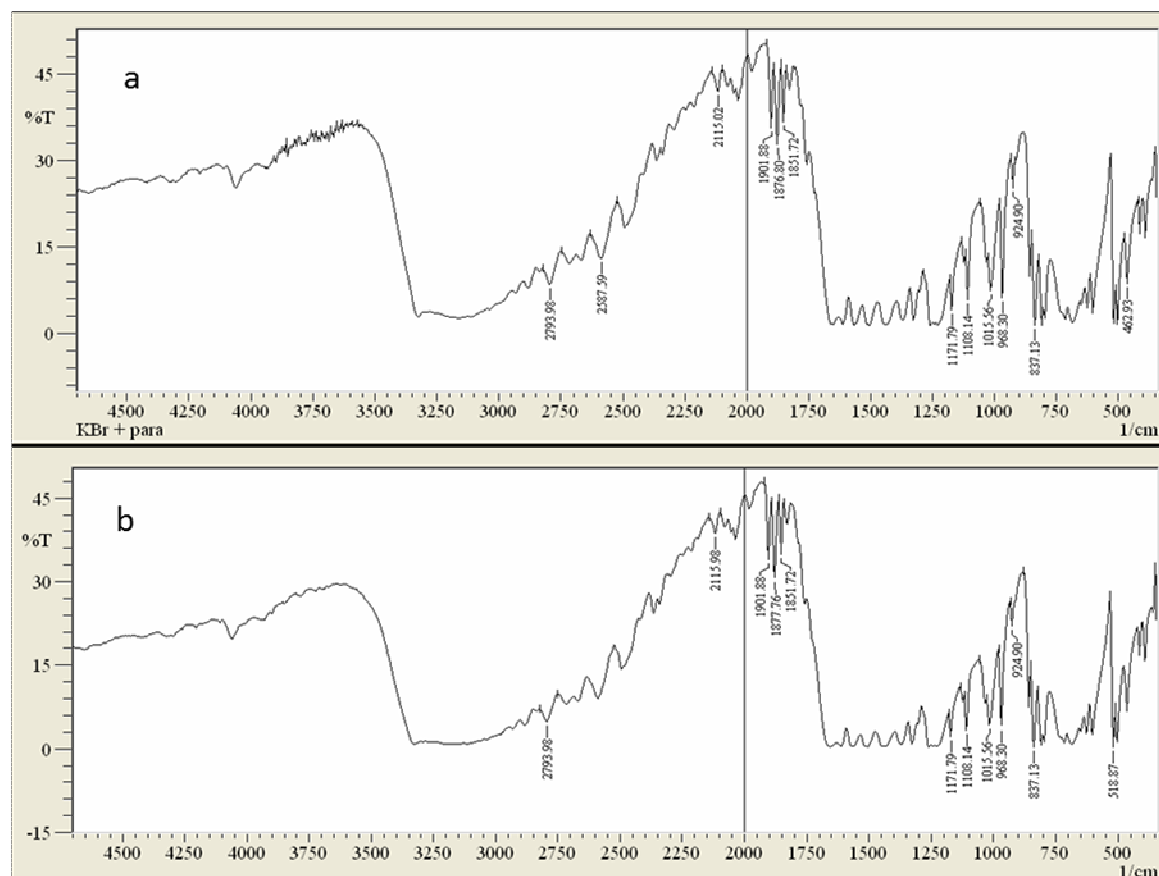


Fig. 1. IR spectra for drug excipient compatibility study: a) IR spectra of Paracetamol;
b) IR spectra of Paracetamol and mucilage of *Hibiscus* flower

All the characterization parameters for the prepared granules using different concentration of binders were found to be within the acceptable limit. This reveals that the granules are having good flow properties and suitable for tableting. The prepared granules were then compressed to form tablets and these tablets were evaluated by the different parameters as given in Table 4. All the batches of tablets exhibited good content uniformity. The disintegration time of tablet was found to increase with increase in the concentration of mucilage. All the batches of tablets exhibited weight uniformity, hardness and friability values within the limits of Indian pharmacopoeia.⁷ The dissolution studies were performed by using USP type-II apparatus at 50 rpm in a phosphate buffer medium of pH 5.8 at $37 \pm 0.5^\circ\text{C}$ at the predetermined interval of time. The dissolution test profile of tablets at different time intervals is given in Table 5. The graph of drug release profile of dissolution test at different concentrations of mucilage is shown in Fig 2. The graph reveals that the drug release decreases with increase in a concentration of mucilage. The drug release rate at 5% w/v concentration of mucilage was found to be 90.45 %, which is closer to the drug release rate shown by using standard binder (starch). Thus, the overall evaluation parameter of the tablets reveals that the tablets prepared with a 5% w/v concentration of flower mucilage (binder) is an optimum concentration for the preparation of tablets.

Table 4. Evaluation parameters of tablets

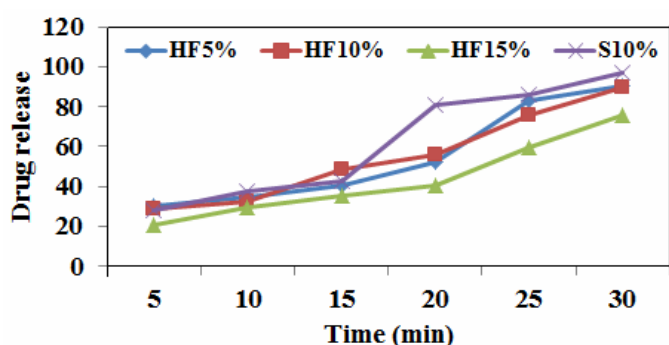
Batches	Weight (mg)	variation	Disintegration time (min)	Hardness (kg/cm^2)	Friability (%)	Uniformity of content (%)
HFT _{5%}	199.02		3.30	3.00	0.476	99.26
HFT _{10%}	198.75		4.45	3.80	0.497	99.05
HFT _{15%}	199.26		4.50	4.32	0.596	98.68
ST _{10%}	198.62		4.15	4.00	0.560	99.56

HFT- Tablet prepared by mucilage (binder); ST- Tablet prepared by starch (standard binder)

Table 5. Dissolution profile for tablets at different time interval

Batches	D5	D10	D15	D20	D25	D30
HF _{5%}	30.23	34.78	40.23	52.34	83.30	90.45
HF _{10%}	28.51	32.56	48.31	55.61	75.34	89.64
HF _{15%}	20.44	29.18	35.24	40.52	59.78	75.6
S _{10%}	27.77	37.36	42.76	80.64	85.55	97.10

D: Dissolution time interval in minutes

**Fig. 2.** Dissolution graph of tablets prepared using different concentration of *Hibiscus* flower mucilage

Conclusion

The *Hibiscus rosasinensis* mucilage from flower petals is a suitable pharmaceutical additive which could be used as a binder in tablet formulation and thus has a high potential for substitution for other more expensive binder.

Acknowledgements

The authors are thankful to the Principal, Progressive Education Society's, Modern college of Pharmacy for ladies, Moshi, Pune for providing necessary facilities to carry out this research work.

References

1. Malviya. R., Srivastava, P., Kulkarni, G. T., Applications of mucilages in drug delivery: A Review, *Advances in Biological Research*, 2011, 5 (1), 01-07.
2. Singh, K., Kumar, A., Langyan, N., Ahuja, M., Evaluation of Mimosa pudica seed mucilage as sustained-release excipient, *AAPS PharmSciTech*, 2009, 10 (4). 1121–1127
3. The Wealth of India-A Dictionary of Indian Raw Materials and Industrial Procedures, National Institute of Science and Communication, Council of scientific and Industrial Research, New Delhi, India, 1998, Vol-V (H-K), 91.
4. Shah, B. N., Seth, A. K., Microwave assisted isolation of mucilage from the fruits of abelmoschus esculentus, *Hygeia. J. D. Med*, 2011, 3 (1), 54- 57.
5. Sravani, B., Deveswaran, R., Bharath, S., Studies on Vigna Mungo mucilage as a pharmaceutical excipient, *J. Chem. Pharm. Res*, 2011, 3(2), 118-125.
6. Singh, S. K., Singh, S., Evaluation of Cassia fistula Linn. Seed mucilage in tablet formulations, *Int. J. Pharm Tech Res*, 2010, 2(3), 1839-1846.
7. Government of India, Ministry of health and family welfare, Indian Pharmacopoeia, 2010, Vol-I, 559, 560, 634, A-4.1, A-4.4.
