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### Extraction of Mucilage as a Binder From the Petals OF Hibiscus Rosasinensis Linn and its Comparative Evaluation –*In Vitro*

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#### ABSTRACT

Hibiscus rosasinensis Linn are used in medicines in emollients and also it is used to treat burning sensations and skin disease. Mucilage of Hibiscus rosasinensis contains L-rhamnose, D-galactose, D-galactouronic acid, and D-glucuronic acid. The present article is trying to present an investigation is to extract the mucilage from the petals of flower of Hibiscus rosasinensis and use it in a paracetamol tablets as a binder. As the mucilage having granulating and binding properties so it is used in tablets, using paracetamol as a model drug. The Ph of mucilage was found to be 6.5 and all the physicochemical properties i.e. solubility and swelling index was studied. In this investigation wet granulation technique is used for the formation of granules using the above described mucilage which having the concentration of 2%, 5% and 7% w/v to use as a binder.'

**Keywords:** Hibiscus rosasinensis, Mucilage, binder, Tragacanth , Acacia

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## INTRODUCTION

Tablet binders are one of the most essential elements in the formulation of a tablet. Because they promote cohesiveness, the binders, also called adhesives, help the other ingredients in a tablet to mix together. Tablet binders are used to turn powder to granules; this is achieved through the process of granulation. During granulation, powder substances are accumulated to form larger particles called granules. <sup>[1]</sup>

When powdery particles or granules are intended for compression into a tablet, they must have two important properties:

1. Flow property – tablets should be a consistent weight and uniform strength
2. Compressibility – tablets should remain intact, compact, and stable, even when pressure is applied
3. Before undergoing the granulation process, these properties can be achieved by adding binders to the formulation. Binders should be utilized if a tablet displays poor fluidity and compressibility.

As the study of mucilage of plant get deep, it results into many interest towards pharmaceutical application such thickening agent, binders, etc. And this mucilage having eco-friendly and low paying advantage. And this mucilage also can be used in solid and liquid dosage form, due to their local accessibility. <sup>[3]</sup> In this investigation we are using the mucilage of *Hibiscus rosasinensis* as a binder for paracetamol tablet. And this binder can be used as an option for the expensive synthetic excipients. <sup>[1]</sup> In this investigation we have used conventional and microwave method for the isolation of mucilage from the flower petals. <sup>[2]</sup>

## MATERIALS AND METHOD

The flower of *hibiscus rosasinens* is was collected from the botanical garden of the institution and method used in the isolation of mucilage from the petals of the flower was conventional and microwave method.

### **Isolation of mucilage:**

The isolation processes for the mucilage from the petals are conventional and microwave method. For the isolation of mucilage by conventional method, hibiscus flower petals were accurately weighed 50g and then powdered with the help of mechanical blender for 5 minutes. And then it is soaked in distil water (1000 ml) for 24 hr in a round bottom flask. It was then boiled in water for 1 hr under reflux condenser and occasionally stirring and then kept aside for 2 hr with this mucilage will float on the water. The material was then filtered through muslin cloth, and hot distil water

was added from the sides of the marc and squeezed to remove the mucilage completely. Add equal volume of ethanol to the filtrate to precipitate it out and kept inside in refrigerator for one day for perfect settling. After a day it was filtered and dried completely in an incubator at 37<sup>0</sup>C then it is powdered and weighed finally. For the isolation of mucilage by microwave method, the very first step is similar to the above method before heating. After blending and soaking process the mixture was kept in a microwave oven at 420W intensity for 7-8 minutes. Then after this process the beaker is removed and kept aside for cooling for 2hr to release the mucilage into water. The later process was same as of above method was. <sup>[4]</sup>

#### **Phytochemical characterization of mucilage:**

The Molish's test and ruthenium red test was performed to check the presence of carbohydrates in the mucilage. Then organoleptic and physicochemical properties were observed which are explained in below Table 1. <sup>[5]</sup>

**Table 1 Physicochemical properties of mucilage of hibiscus rosasinensis**

| Sr. no. | Characteristics    | Inference              |
|---------|--------------------|------------------------|
| 1       | Color              | Brown                  |
| 2       | Taste              | Mucilaginous           |
| 3       | Odour              | Odourless              |
| 4       | Appearance         | sticky                 |
| 5       | Ash value          | Total ash 2            |
|         | (%w/v)             | 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       | Melting point      | 112 <sup>0</sup> C     |
| 10      | pH                 | 6.5                    |
| 11      | Viscosity          | 2.008 poise            |

#### **Drug-excipients compatibility study:**

The drug-excipients study is done to check whether the drug is compatible with other excipients used or not. Because drug must be compatible or stable with i.e.it should not make any chemical reaction with excipients used, which results in the production of stable, safe, attractive, effective and easy to administer product. <sup>[6]</sup>

#### **Preparation and Evaluation of Tablets:**

As it was stated above that mucilage was used in a concentration of 2%, 5% and 7% w/v for the preparation of granules. The method was used for formation of granules is by wet granulation for paracetamol tablet as a model drug. The granules were prepared and were evaluated for different physical properties like bulk density, angle of repose, hausner ratio, tapped density and Carr's

consolidation index, to check the compressibility and flow properties. The formula for preparation of paracetamol tablets are described in table 2. The granules were prepared and were pressed into a flat faced tablet of mean average weight 200 mg  $\pm$ 7.5%, diameter 8 mm  $\pm$ 0.1 mm in eight stationary 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**

| <b>Ingredients (mg/tablet)</b> | <b>HF<sub>2%</sub></b> | <b>HF<sub>5%</sub></b> | <b>HF<sub>7%</sub></b> | <b>S<sub>10%</sub></b> | <b>HFT<sub>5%</sub></b> | <b>HFA<sub>5%</sub></b> |
|--------------------------------|------------------------|------------------------|------------------------|------------------------|-------------------------|-------------------------|
| Paracetamol                    | 100                    | 100                    | 100                    | 100                    | 100                     | 100                     |
| Lactose                        | 50                     | 60                     | 70                     | 60                     | 60                      | 60                      |
| Tragacanth                     | -                      | -                      | -                      | -                      | 1%                      | -                       |
| Acacia                         | -                      | -                      | -                      | -                      | -                       | 1%                      |
| Maize starch                   | -                      | -                      | -                      | 20%                    | -                       | -                       |
| Talc                           | 9                      | 9                      | 9                      | 9                      | 9                       | 9                       |
| Magnesium stearate             | 1                      | 1                      | 1                      | 1                      | 1                       | 1                       |

HF: - granules prepared by using Hibiscus flower mucilage at 2%, 5% and 7% w/v concentration.

HFT: - granules prepared by using hibiscus flower mucilage with the help of tragacanth

HFA: - granules prepared by using hibiscus flower mucilage with the help of acacia.

**Table 3 characterization of granules prepared by different concentration of binders**

| <b>Batches</b>    | <b>Bulk density (gm/ml)</b> | <b>Tapped density (gm/ml)</b> | <b>Cars consolidation index(%)</b> | <b>Hausner ratio</b> | <b>Angle of repose</b> |
|-------------------|-----------------------------|-------------------------------|------------------------------------|----------------------|------------------------|
| HF <sub>2%</sub>  | 0.295                       | 0.390                         | 17.13                              | 1.05                 | 28.16                  |
| HF <sub>7%</sub>  | 0.290                       | 0.370                         | 14.52                              | 1.19                 | 28.05                  |
| S <sub>10%</sub>  | 0.310                       | 0.350                         | 10.62                              | 1.22                 | 29.00                  |
| HFT <sub>5%</sub> | 0.350                       | 0.295                         | 17.15                              | 1.29                 | 29.53                  |
| HFA <sub>5%</sub> | 0.320                       | 0.290                         | 12.32                              | 1.20                 | 29.12                  |

## RESULTS AND DISCUSSION

The mucilage yields for a flower petals by conventional and microwave method was found to be 4.2% and 8.33% 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 Molish's test (purple color formation) and ruthenium red test (formation of pink color) respectively. The extracted mucilage was practically insoluble in ethanol, acetone and chloroform and slightly soluble in water. It is neutral in nature as it shows the pH of 6.5 of 1% w/v of solution this neutrality suggests that Hibiscus flower mucilage is less irritating to the GIT, when used in the uncoated tablets. The interaction between drug and mucilage is checked by comparing the IR

spectra of pure drug with the combined spectra of pure drug and mucilage. All the characterization parameters for the prepared granules were found to be within acceptable limit by using different concentration of binders. Which conclude that the granules are having good flow properties and are suitable for tablet formation. The tablets are made and are evaluated by the different parameters as given in table 4. All the batches of tablets exhibited good content uniformity, weight uniformity hardness and friability values within the limits of Indian pharmacopoeia. [7] The disintegration time of tablet was found to increase with increase in the concentration of mucilage. The dissolution studies were performed by using USP type-II apparatus at 50rpm in a phosphate buffer medium. The dissolution test profile of tablets at different time intervals is described in the given table 5.

**Table 4 Evaluation parameters of tablets**

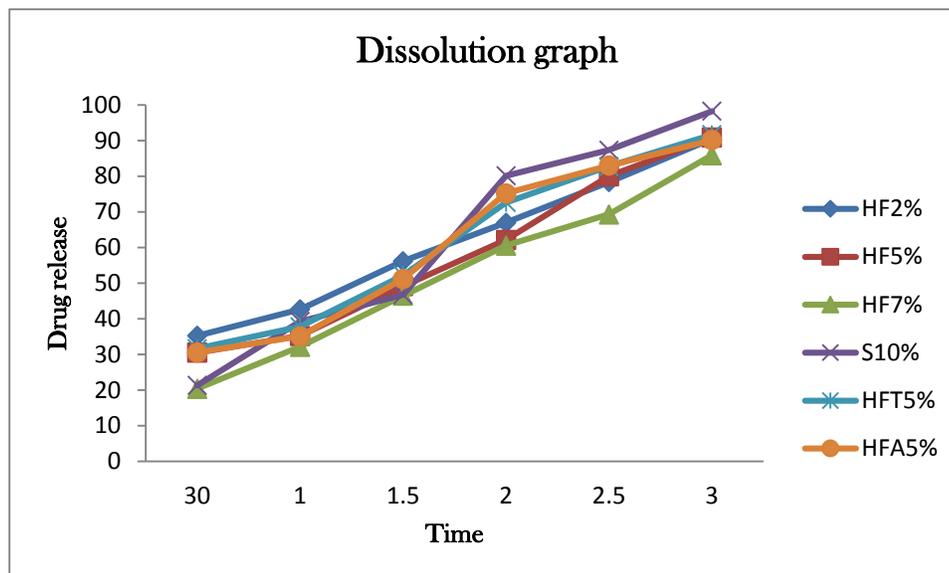
| Batches           | Weight variation (mg) | Disintegration time (min) | Hardness (kg/cm <sup>2</sup> ) | Friability (%) | Uniformity of content (%) |
|-------------------|-----------------------|---------------------------|--------------------------------|----------------|---------------------------|
| HF <sub>2%</sub>  | 187.04                | 2.10                      | 3.00                           | 0.425          | 98.20                     |
| HF <sub>7%</sub>  | 188.75                | 2.25                      | 3.60                           | 0.445          | 98.56                     |
| HF <sub>10%</sub> | 192.10                | 2.60                      | 3.82                           | 0.465          | 98.61                     |
| HFT <sub>5%</sub> | 198.26                | 3.30                      | 4.02                           | 0.556          | 99.26                     |
| HFA <sub>5%</sub> | 198.60                | 4.45                      | 4.20                           | 0.589          | 99.68                     |

HFT: - tablets prepared by using tragacanth HFA: - tablets prepared by using acacia

**Table 5 Dissolution profile for tablets at different tie interval**

| Batches           | D10   | D20   | D30   | D40   | D50   | D60   |
|-------------------|-------|-------|-------|-------|-------|-------|
| HF <sub>2%</sub>  | 35.26 | 42.68 | 56.18 | 67.0  | 78.34 | 90.45 |
| HF <sub>5%</sub>  | 30.51 | 35.23 | 49.18 | 62.17 | 80.01 | 90.86 |
| HF <sub>7%</sub>  | 20.41 | 32.18 | 46.52 | 60.56 | 69.3  | 85.90 |
| S <sub>10%</sub>  | 21.33 | 39.26 | 46.76 | 80.13 | 87.33 | 98.25 |
| HFT <sub>5%</sub> | 31.66 | 37.82 | 52.23 | 72.66 | 82.80 | 91.66 |
| HFA <sub>5%</sub> | 30.56 | 35.13 | 51.20 | 75.18 | 83.0  | 90.15 |

D: Dissolution time interval in minutes



**Figure 1** 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 binder and with acacia, tragacanth it gives up to 100% drug release within time limit. As compared to the other concentration used the S<sub>10%</sub>, HFT<sub>5%</sub> and HFA<sub>5%</sub> gives 98.25%, 91.66% and 90.15% respectively more sustained release.

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