Evaluation of Binding Properties of Selected Natural Mucilages

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Received: 22 November 2001; accepted: 22 February 2002

Mucilages from Asparagus racemosus and Cassia sophera were isolated by maceration technique using water as solvent and precipitated by the addition of acetone, used as non-solvent. The percentage yields of mucilages from the selected sources were 11 and 20 per cent, respectively. Both the mucilages were evaluated for their granulating and binding properties in tablets, using paracetamol as model drug. The mucilages were used at three different concentrations, i.e., 8, 9 and 10 per cent, respectively. Wet granulation technique was used for preparation of granules. The prepared granules were evaluated for percentage of fines, particle size, and flow properties. The properties were compared with starch. The tablets were punched by using a Cadmach single punch machine and were evaluated for content uniformity, hardness, friability, disintegration time, and in vitro dissolution profiles. The tablets had good physical properties and the drug release was more than 90 per cent within 3 h. The tablets prepared using 10 per cent mucilage as binder exhibited more hardness than 8 and 9 per cent batches. Hence, 8 and 9 per cent concentrations can be considered as ideal concentrations for preparation of tablets.

Introduction

Mucilages are most commonly used adjuvants in pharmaceutical preparations. They find maximum use, particularly in the formulation of suspensions and emulsions. The usefulness of gums and mucilages as emulsifying and suspending agents has been well documented. Some of the mucilages have also been used in tablet formulations as binding agents and also to sustain the drug release. Naturally available mucilages are preferred to synthetic materials due to their non-toxicity, low cost-free availability, emollient and non-irritating nature. Hence, in the present study, two selected mucilages, Asparagus racemosus and Cassia sophera, have been evaluated for their granulating and binding properties.

Materials and Methods

The plant materials were collected from places around Ootacamund. Paracetamol was used as model drug in the study and it was purchased from Sipali Chemicals, Chennai. All the other materials and reagents used in the study were of AR grade.

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Isolation of Mucilages

Asparagus racemosus roots were used for isolation of mucilage, whereas in the case of Cassia sophera, seeds were used for isolation. The plant material was soaked in water for 24 h, boiled for 1 h and kept aside for 2 h for release of mucilage into water. The material was squeezed in a muslin bag to remove the mark from the filtrate. Then, equal volume of acetone was added to filtrate to precipitate the mucilage. The mucilage was separated, dried in oven at about 50°, powdered and passed through sieve number 80. The powder was stored in desiccator until further use (Yields: Asparagus racemosus – 11 per cent, Cassia sophera – 20 per cent).

Microbiological Properties and pH

The isolated mucilages were evaluated for microbial load after storage for 4 month. The number of colony forming units (CFU)/g of mucilage was determined by a process described in Indian Pharmacopoeia. The pH of mucilages was determined by using digital pH meter.

Preparation and Evaluation of Granules

The formulation of granules was done by using paracetamol as model drug, starch as disintegrant,
lactose as diluent, and talc as a lubricant. The formula is given in Table 1. The granulation medium was prepared by dissolving the mucilages in water at concentrations 8, 9 and 10 per cent w/v, respectively. The granules were prepared by wet granulation technique. Starch mucilage was used as standard binder for comparison. The prepared granules were evaluated for percentage of fines, particle size by sieving technique, and flow properties through measurement of angle of repose.

**Preparation and Evaluation of Tablets**

The tablets were compressed by using Cadmach single punch machine. The batch size of 200 tablets was prepared. The prepared tablets were evaluated for content uniformity, hardness, friability, disintegration time, and in vitro dissolution profile, using methods specified in Indian Pharmacopoeia.

**Results and Discussion**

The isolated mucilages were screened for microbial count and pH. Both the mucilages showed a microbial count of less than 80 CFU/g. The pH values of these mucilages were 5.7 and 6.4 for Asparagus racemosus and Cassia sophera, respectively, which indicated that these mucilages were less irritating in GIT and suitable for uncoated tablets.

**Evaluation of Granules**

The granules prepared were evaluated for percentage of fines, particle size and flow properties. The results are shown in Table 2. As the concentration of mucilages was increased, the percentage of fines was found to reduce. When compared with starch granules, all the mucilages showed little more fines. The mean particle size was found to be satisfactory for preparation of tablets. The flow property of granules was determined by angle of repose, and it was found that the values were between 26 and 30°. Hence, all the granules exhibited good flow properties.

**Evaluation of Tablets**

Six batches of tablets were prepared using two mucilages as binding agents at three different concentrations. For comparison, starch was used as a binding agent. The prepared tablets were evaluated for content uniformity, hardness, friability, disintegration time, and in vitro dissolution profile. The results are shown in Table 3. All the batches of tablets exhibited a good uniformity in content. The hardness of the tablets increased with increase in percentage of binding agent used. The tablets prepared with 10 per cent of mucilage showed more hardness when compared to tablets prepared using 8 and 9 per cent binder and starch mucilage. The friability values were decreased with increase in binder concentration. But, overall friability values were less than specified limits. The disintegration time of tablets was found to increase with increase in concentration of binder. This behavior can be attributed to the swelling property of the mucilages. But the overall disintegration time values for both mucilages were within pharmacopoeial limits.

The in vitro dissolution profile of the tablets is shown in Figure 1 and 2. This study showed that the drug release from the tablets prepared using both the

<table>
<thead>
<tr>
<th>Property</th>
<th>Asparagus racemosus, per cent</th>
<th>Cassia sophera, per cent</th>
<th>Starch, per cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage of fines</td>
<td>8  9  10</td>
<td>8  9  10</td>
<td>10</td>
</tr>
<tr>
<td>Particle size (mm)</td>
<td>0.36 0.38 0.38</td>
<td>0.38 0.39 0.40</td>
<td>0.40</td>
</tr>
<tr>
<td>Angle of repose (degrees, min)</td>
<td>27° 14' 28° 15' 28° 39'</td>
<td>27° 15' 28° 40' 27° 26° 56'</td>
<td></td>
</tr>
</tbody>
</table>
Table 3 — Evaluation of tablets prepared using *Asparagus racemosus* and *Cassia sophera* mucilages as binders

<table>
<thead>
<tr>
<th>Property</th>
<th>Asparagus racemosus, per cent</th>
<th>Cassia sophera, per cent</th>
<th>Starch, per cent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>Content uniformity (per cent) ± SD</td>
<td>96.87 ± 0.71</td>
<td>97.54 ± 0.11</td>
<td>97.46 ± 0.84</td>
</tr>
<tr>
<td>Hardness (kg/sq in) ± SD</td>
<td>4.0 ± 0.16</td>
<td>4.5 ± 0.05</td>
<td>6.0 ± 0.41</td>
</tr>
<tr>
<td>Percentage friability</td>
<td>0.4</td>
<td>0.4</td>
<td>0.3</td>
</tr>
<tr>
<td>Disintegration time</td>
<td>1 min, 4 s</td>
<td>2 min, 22 s</td>
<td>2 min, 46 s</td>
</tr>
</tbody>
</table>

mucilages at three different concentrations was more than 90 per cent in 3 h. The drug release was found to increase with increase in concentration of mucilages. A visual inspection of the tablets and dissolution medium during dissolution studies indicated that the erosion was very high from the tablets, and within 30 min, the dissolution medium was full of eroded particles. This may be the reason for increased drug release with increase in concentration of mucilages.

**Conclusions**

In conclusion, the mucilages used in the present study, viz. *Asparagus racemosus* and *Cassia sophera* have exhibited good binding properties, when tested
by using wet granulation technique. At 8 and 9 percent concentrations, these mucilages were found to be suitable binders for uncoated tablets. Both the mucilages exhibited good disintegrant properties also. Hence, these can be used in commercial scale for preparation of uncoated tablets.

References