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PRELIMINARY EVALUATION OF *BAUHINIA RACEMOSA LAM CAESALPINACEAE* SEED MUCILAGE AS TABLET BINDER

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ABSTRACT

The objective of present investigation was to evaluate *Bauhinia racemosa Lam*. Caesalpinaceae seed mucilage as a binder for pharmaceutical dosage forms. Natural mucilages are economic, easily available and found useful as tablet binder. No work has been reported on it as a tablet binder. Granules were prepared with its varying concentrations and evaluated for tablet characteristics. Wet granulation technique was used for the preparation of amoxicillin trihydrate granules. The binder concentrations used in the formulation were 2, 4, 6 & 8 % w/w. The evaluation of granules showed 0.52 to 0.72 mm granule size, 28 to 31 º angles of repose and 20.53 to 11.81 % fines. The evaluation of tablets showed 3.52-0.89% w/w friability, 4 to 12 min disintegration time and more than 90% dissolution in 60 min. Tablets at 8% w/w binder concentration showed more optimum results as tablet binder. The mucilage was found to be useful for the preparation of uncoated tablet dosage form.

Keywords: Bauhinia racemosa seed, Binder, amoxicillin trihydrate and Dissolution

INTRODUCTION

Since ancient times *Bauhinia racemosa Lam.* family: Caesalpinaceae has been an integral part of life in India. Leaves of *Bauhinia racemosa* are traditionally used on occasion of Dashera festival as symbol of gold in India. It occurs frequently in India, Ceylon, China and Timor. The stem bark of the plant is an astringent and is used in the treatment of headache, fever, skin diseases, tumors, blood diseases, dysentery, and diarrhea [1], extracts of leaves showed antibacterial activity[2] and seeds showed cytotoxic, hypotensive and hypothermic activity[3]. Mucilages are generally physiological products of metabolism, formed within the cell (intracellular formation) and/or are produced without injury to the plant. Biodegradable, biocompatible and non-toxic, low cost, environmental-friendly processing and edible properties makes natural mucilages advantageous over synthetic polymers[4]. Mucilages forms slimy masses, often found in different parts of plants, on hydrolysis yield a mixture of sugars and uronic acids. Mucilages contain hydrophilic molecules, which can combine with water to form viscous solutions or gels[5, 6] . No significant work has been reported on Bauhinia racemosa for its use as a tablet binder.

MATERIALS AND METHODS

Microcrystalline cellulose (Loba chemie), Amoxicillin trihydrate were obtained as gift sample from Sandoz Pharma Ltd. Mumbai, India, seeds *of Bauhinia racemosa* , all other materials used in this study were of A.R.grade. Plant parts were authenticated through letter No BSI/WRC/Tech/2011/V.No. ABGBAR2 and specimens were stored at Botanical Survey of India, Western Regional Centre, Pune, Maharashtra, India.

***Isolation of mucilage from Bahunia racemosa (BR) seed*:** Seeds were boiled for 3 hours in distilled water and allowed to soak in water for overnight. Seeds were swelled. The outer coverings were removed by pressing the seed. The obtained sticky material was stirred in distilled water for overnight at 100 rpm.

The material was filtered through muslin cloth. Obtained filtrate was precipitated in double quantity of acetone. It was washed three times with acetone. The obtained substance was dried in oven at 40°C for 6 hours. It was reduced to fine powder and stored in closed container.

***Identification of mucilage*:** Mucilage was identified by treating the test sample with ruthenium red solution. If color changes to pink indicates presence of mucilage[7].

***Preparation and evaluation of granules*:** Wet granulation method was used to prepare granules of drug. The formulation was developed by using Amoxycillin trihydrate as model drug. The tablet formulations were developed for 300 mg tablet weight is shown in table 1. Binder solution of BR seed mucilage was prepared by dissolving it in distilled water. The binder concentrations used were 2, 4, 6, 8 % w/w in solution. Binder level was adjusted by lowering the level of MCC in the formula.

All ingredients were dry mixed manually in mortar. Binder solution was slowly added into mixture. The wet mass was granulated by passing them manually through a number 12 mesh sieve. Granules were dried at 50 ºC in oven and again sieved through number 16 mesh sieve. The granules were evaluated for percentage of fines, particle size, bulk density, tapped density and Carr's compressibility index. Granules were mixed with 3% talc and evaluated for flow property[8, 9]. Results of granule characteristics are shown in table 2.

***Preparation and Evaluation of Tablets*:** The tablets were compressed by using Cadmach single punch tablet machine fitted with flat faced 8 mm punches. Tablets were prepared and stored in closed container for 15 days. No evidence of physical changes were observed. The tablets were evaluated for content uniformity, hardness, friability, disintegration time and dissolution study[10, 11, 12, 13]. Results are shown in table 3.

***Tablet dissolution study*:** Dissolution study was carried out in 900ml distilled water medium using paddle type dissolution test apparatus (Electrolab). The dissolution was carried out at 37 $\pm$ 0.5 °C at 100 rpm .5 ml samples were withdrawn at 10 min intervals. 5 ml dissolution medium was added into dissolution chamber as a replacement for sampling after each interval. Absorbance was measured at 272 nm using UV spectrometer (Chemito 2600)[14]. % cumulative drug release was plotted against time in min to obtain dissolution curve shown in figure 1.

RESULTS AND DISCUSSION

Isolated substance was identified as mucilage using ruthenium red test. The prepared granules were evaluated for percentage of fines, particle size, bulk density, tapped density, Carr's compressibility index and flow properties. The results are shown in table 2. It was observed that the percentage of fines was reduced and granule size increased as the concentration of binder was increased. It means as concentration of mucilage increases it produces large aggregate through granulation mechanisms.

The flow property of granules was determined by angle of repose and it was found in between 28-31°. As percentage of fines decreases, reduces particle interlocking and friction, thus decreasing angle of repose. All batches showed excellent to good flow property. Granule size distributed between 0.52- 0.72 mm. Bulk densities of prepared granules was decreased from 0.69 ± 0.03 to 0.59 ± 0.02 gm/ml as concentration of mucilage increases. Carr's Compressibility Index (CCI) was also decreased from 14.85 ± 0.27 to 6.45 ± 0.18 as Concentration of mucilage increases. Decreased bulk density and CCI with increase in mucilage concentration suggests improved binding of particles and flow property respectively.

The prepared tablets were evaluated for content uniformity, hardness, friability and Disintegration time. The results are indicated in table 3. All batches of tablets exhibited a good uniformity in content. The hardness of tablet increased with increase in percentage of binding agent.

The friability values decreased with increase in binder concentration. The disintegration time also increased with increase in binder concentration. All the evaluation parameters were found to be within the pharmacopoeial limits at binder concentrations 8 % w/w. Increase in binder concentration therefore resulted in a corresponding decrease in friability and increase in disintegration time.

In vitro dissolution profile is given in Figure No. 1. Dissolution study showed that the drug released from the tablets containing 2-8 %w/w binder was more than 90 % in 60 min. The drug release from tablets decreased with increase in concentration of BR seed mucilage.

CONCLUSION

BR seed mucilage was produced optimum results at 8% w/w concentration among the developed formulations. It was found useful as tablet binder and granulating agent for wet granulation method.

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Table 1: Formulation containing 6% w/w BR seed mucilage

Ingredients	Quantity % w/w
Amoxicillin Trihydrate*	83
Microcrystalline Cellulose	8
Binder (Mucilage)	6
Talc	3

** 250 mg of Amoxicillin trihydrate*

Table 2: Evaluation of granules

Characteristic	BR seed mucilage Concentration (% w/w)			
	2	4	6	8
% Fines	20.53	17.34	13.65	11.81
Granule Size mm	0.52 ± 0.06	0.59 ± 0.07	0.65 ± 0.09	0.72 ± 0.11
Angle of repose	31°	29°	29°	28°
Bulk Density g/ml	0.69 ± 0.03	0.65 ± 0.03	0.62 ± 0.02	0.59 ± 0.02
Tapped density g/ml	0.81 ± 0.02	0.73 ± 0.04	0.68 ± 0.02	0.63 ± 0.01
% CCI	14.85 ± 0.27	11.47 ± 0.34	8.92 ± 0.23	6.45 ± 0.18

Average ± Std. Deviation obtained from 5 observations.

Table 3: Evaluation of amoxicillin trihydrate tablets

Characteristic	Mucilage Concentration (% w/w)			
	2	4	6	8
Tablet thickness mm	3.98± 0.023	3.97± 0.084	3.98± 0.017	3.97± 0.072
Hardness kg/cm^2	3.02 ± 0.38	3.88 ± 0.34	4.61 ± 0.41	5.72 ± 0.32
Content uniformity %	99.71 ± 1.38	98.94 ± 1.07	99.22 ± 1.16	99.11 ± 1.74
Friability (%)	3.52 ± 0.34	1.76 ± 0.13	1.13 ± 0.25	0.89 ± 0.86
Disintegration time Sec.	4.74 ± 1.15	6.27 ± 1.41	9.58 ± 1.27	12.02 ± 1.33
Average weight (mg)	301 ± 1.63	299 ± 2.03	299 ± 1.93	300 ± 2.33

Average ± Std. Deviation obtained from 5 observations.

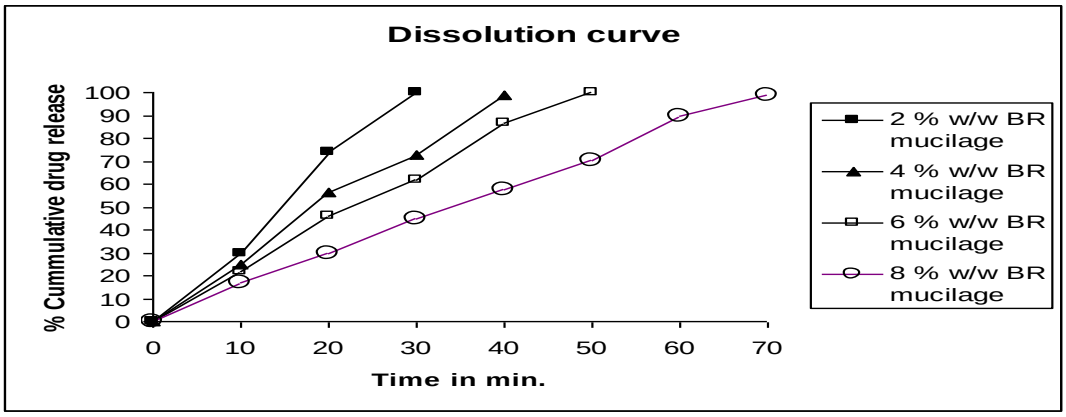

Figure 1: Dissolution curve for amoxicillin trihydrate tablets

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