



J. Chem. Pharm. Res., 2010, 2(4):722-726

ISSN No: 0975-7384
CODEN(USA): JCPRC5

Isolation and Comparative Evaluation of *Cordia dichotoma* Forst. Mucilage as a Binding Agent with Standard Binder

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ABSTRACT

Cordia dichotoma Forst. found wild in the forest region, drupe usually single seeded containing mucilage. To isolate mucilage pulp is removed and the seed were macerated with water then filter. Acetone precipitation method is used to isolate mucilage from filtrate and dried in vacuum dryer at 40° C. The physicochemical characteristic of mucilage has performed such as swelling index, solubility, loss on drying. This study was carried out to compare the binding effects of isolated mucilage with starch. Granule properties such as angle of repose, moisture content, bulk and tapped densities, Hausner's ratio, Carr's index and tablet properties which included weight uniformity, friability, disintegration times, and dissolution rates using standard methods. Mucilages of varying concentrations of 8, 10 and 12%w/w were used to produce aceclofenac granules by wet granulation method and compressed into tablets at arbitrary pressure load unit of 6 tons. An increase in binder concentration led to decrease in friability and increase in disintegration time of the tablets. The results indicate that mucilage obtained from *Cordia dichotoma* Forst. fruit possesses comparable binding properties.

Keywords: *Cordia rothii*, Binder, Aceclofenac, Mucilage.

INTRODUCTION

In preparation of a tablet, from a drug as a dosage form, Pharmaceutical ingredients are required. Some Pharmaceutical ingredients require a binder for tablet dosage form. This provides the cohesiveness necessary for bonding ingredient together. For a successful formulation binder concentration must reached to form a tablet and finally disintegrate with in specified time period. [1].

Binding agents are used to impart the structural strength required during the processing, handling and packaging of tablets. A number of plant gums have been used as binding agents in tablet formulations viz. acacia, guar gum, tragacanth etc. [2].

Cordia dichotoma Forst. Fruits are 1.3- 2.5 cm long globose or ovoid glossy, yellowish brown, pinkish or nearly black when ripe, usually single seed surrounded by a transparent, sticky, sweet edible pulp.[3] In previous study *Cordia* species fruit mucilage pharmaceutically use as a anti capping agent with different binder.[4]

Hence, in this study we have investigated the binder effects of *Cordia* gum mucilage on the mechanical properties of tablets and to compare the prepared tablets with standard tablets prepared using starch as binding agent.

Collection of Plant Material: *Cordia dichotoma* Forst. Fruit in is collected from wild source of the Satpura regions of the district Jalgaon from Maharashtra and identified by Dr. Kshirsagar, Botanist Department of Botany S.S.V.P.S. College, Dhule.

Extraction of mucilage using water:

Fruits of *Cordia dichotoma* Forst. washed and outer covering is removed pulp and the seed (1000g) were macerated with 50 times of their weight of water and allow standing for 24h. The extract was then pressed through muslin cloth. The filtrate containing mucilage is used further for used for isolation.

Isolation of mucilage using acetone:

To the filtrate, acetone was added in 1:2 proportions to precipitate out mucilage. The mucilage (15% w/w) so obtained was then subjected to air drying for sufficient period of time and further dried in vacuum dryer at 40°C.

Purification of the isolated gum:

The well dried mucilage was powdered with the help of mortar and pestle and passed through sieve number 60 then the powdered gum was solubilized in distilled water. The concentrated solution was precipitated by acetone. The precipitate was separated and dried at 60°C. The dried gum was powdered and stored in tightly closed container.

Physicochemical Characteristics of Mucilage

The physicochemical characteristics of mucilage such as swelling index [5] solubility [6], loss on drying were determined as per British Pharmacopoeial Procedures [7] and pH was determined using digital pH meter.

Preparation of binder solution:

The binder solution was prepared by dissolving the mucilage of *Cordia dichotoma* in water. Standard binder (starch) was prepared by dispersing a 10 g sample of the starch powder in 20 ml of distilled water and adding boiled water whilst stirring with a glass rod to make up to 100 ml. The mucilage was allowed to cool and was used for binding.

Preparation of the granules**Preparation and Evaluation of Granules**

The granules were prepared by wet granulation method. Aceclofenac was used as a model drug to formulate granules. Starch was used as disintegrant; lactose used as diluents and talc as lubricant respectively. The drug, lactose, and SSG were mixed thoroughly and a sufficient volume of 8, 10 and 12 % w/w of mucilage of *Cordia dichotoma* Forst. was added slowly to the powder blend and cohesive wet mass was prepared. For standard used 10%w/w of starch as a binder. The batch size was 100 g. The wet mass was then sieved through sieve number. 10 and dried at not more than 60 °C in hot air oven up to LOD NMT 3%. The dried granules were re-sieved through sieve number 20. The prepared granules were then evaluated for percentage of fines, particle size and flow properties (by measuring angle of repose) [8, 9]. The bulk and tapped densities were determined using bulk density apparatus. Compressibility index of the granules was determined by Carr's compressibility index [10, 11].

Preparation and evaluation of tablets

The granules made from *Cordia dichotoma* Forst. gum were compressed into flat faced tablets of mean average weight 200 mg \pm 7.5%, thickness 4.1 \pm 0.3 mm, and diameter 8 mm \pm 0.1 mm in eight station D 2 link tableting machine (Karnavati Engineering. Khadi) at an arbitrary pressure load unit of 6 tons. Magnesium stearate was used to lubricate the die and punch surfaces prior to tableting to prevent sticking.

Evaluation of tablets:

The prepared Tablets were evaluated for weight uniformity, hardness, thickness, friability, disintegration time, and assay.

Weight uniformity test:

Twenty tablets from each batch were selected randomly and weighed individually using a highly sensitive electronic balance (Contech). Their mean weights, deviations, and coefficients of variation for each batch were calculated.

Tablet Hardness test: The tablets were evaluated for hardness as per B.P. procedure using Pfizer hardness tester.

Friability test: The friable mass was determined as per B.P. procedure using Friability test apparatus.

Disintegration time:

The disintegration time was determined as per B.P. procedure.

RESULTS AND DISCUSSION

The *Cordia dichotoma* fruits yield high percentage of mucilage using acetone as mucilage precipitating solvent. The isolated mucilage was characterized for various physicochemical properties as per Pharmacopoeial guidelines. The specifications were set and the results are shown in Table no. 1. The prepared granules were evaluated for percentage of fines, particle size and flow properties in comparison with maize starch granules. The results are shown in Table no. 3. Four batches of 100 tablets were prepared (as per formulae given in Table no. 2) using isolated mucilage of *Cordia dichotoma* fruits at three different concentrations 8%, 10% and 12% w/w and Starch at concentration 10% w/v. Starch (10% w/w) was used as standard binder for comparison. The prepared tablets were evaluated for weight uniformity, hardness, thickness, friability, disintegration time, and assay the results are shown in Table 4.

Table 1: Result of Physico-chemical investigation of mucilage

Sr. No	Parameters	<i>Cordia dichotoma</i>
1	Solubility	Form viscous solution in warm water, Swells in cold water, Insoluble in organic solvents like methanol, ethanol and chloroform
2	Moisture sorption study (%)	NMT 4
3	Swelling Index (ml)	NMT 5.8
4	Bulk Density (g/ml)	0.5853
5	Tapped density (g/ml)	0.8762
6	Refractive Index	1.6765
7	Optical Rotation (1% w/v) hydrolyzed solution	+1.48
8	pH of 1% w/v solution	6.0-7.2

Table 2: Formulation of tablet

Ingredients(mg/tab)	F1	F2	F3	F4
Aceclofenac (Active)	100	100	100	100
Lactose (Diluent)	64	60	56	64
SSG Disintegrant	10	10	10	10
Maize starch (Binder)	-	-	-	20
<i>Cordia dichotoma</i> Forst.mucilage (Binder)	16	20	24	-
Talc	9	9	9	9
Magnesium stearate	1	1	1	1
Total wt.	200	200	200	200

Table 3: Evaluation of granules

Sr. No.	Parameters	Binder			
		<i>Cordia dichotoma</i> Forst.mucilage (%)			Starch (%)
		8	10	12	10
1	Percentage fines	0.30	0.32	0.31	26.32
2	Mean particle size (mm)	29	28	27	0.31
3	Angle of repose	0.3862±0.045	0.3854±0.052	0.3775±0.067	28
4	Untapped density (gm/cm ³)	0.4484 ±0.014	0.4577±0.017	0.4578 ±0.018	0.3912±0.077
5	Tapped density (gm/cm ³)	13.18 ±1.167	13.20 ±1.159	13.22±1.162	0.4481 ±0.024
6	Percentage Compressibility (gm/cm ³)	0.30	0.32	0.31	12.69±1.221

Table 4: Evaluation of tablet

Formulation trial	Weight uniformity mg ($\pm 7.5\%$)	Hardness* Kg/cm ²	Thickness* (mm)	Friability (%)	DT* (sec.)	Assay (%)
F1	206	6.33 \pm 0.095	4.208 \pm 0.037	0.295 \pm 0.040	428.8 \pm 3.601	99.97
F2	202	6.73 \pm 0.082	4.128 \pm 0.081	0.253 \pm 0.037	454.3 \pm 2.422	99.98
F3	198	7.13 \pm 0.082	4.136 \pm 0.080	0.180 \pm 0.027	480.3 \pm 2.338	100.04
F4	201	6.63 \pm 0.095	4.204 \pm 0.057	0.216 \pm 0.017	469.3 \pm 1.862	100.01

CONCLUSION

The comparative result of this study has concluded that *Cordia dichotoma* Forst. mucilage seed gum (10%) may be used as a binding agent in the conventional tablet formulation. Since *Cordia dichotoma* Forst. mucilage displayed good binder characteristics, it has greater potentialities to become the new source of binder and could also be exploited for the commercial production of gums.

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