Preparation and Evaluation of Cordia Fruit Gum as Tablet Binder

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Abstract

In the present work, we have formulated the oral tablets of paracetamol by using cordial fruit gum as a binder. The four different tablet formulations were prepared by wet granulation method. The binder concentrations used in the formulation were 2, 4, 6 & 8 % w/w. The evaluation of granules showed 0.643 to 0.746 mm granule size, 26.65 to 32.10 ° angles of repose and 21.8 to 13.4 % fines. Tablets were compressed to hardness at about 7.5 to 8.2 kg/cm^2. The evaluation of tablet showed 1.58 to 1.10 % friability, 12 to 22 min disintegration time and more than 90 % dissolution in 75 min. Tablets at 6 % w/w binder concentration showed more optimum results as tablet binder. The cordial fruit gum was found to be useful for the preparation of uncoated tablet dosage form.

Keywords: Cordia fruit gum, Binder, Paracetamol and Dissolution
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INTRODUCTION

The cordia fruit gums obtained from trees of *Cordia dichotoma* (Boraginaceae), it is a medium sized tree with a short, usually crooked trunk 3–4 ft. in girth (1). The fruits are globose, yellowish-brown, pink or black and pulpy. The plant grows in India, Sri Lanka and other warmer regions. The medicinal attributes of *C. dichotoma* have been known since a long time. The fruits of the plant are used as cooling, astringent, emollient, expectorant, anthelmintic, purgative and diuretic (2). A number of pharmacological properties such as analgesic, anti-inflammatory and hepatoprotective have been reported (3–5). The ripe fruits are traditionally eaten by Indian as pickle. The fruit mucilage is used as a gum for pasting sheets of paper board and as a emulsifier in the pharmaceutical excipients. The various gums were evaluated as tablet binder (6). In this present investigation cordia fruit gum has been evaluated as a binder in pharmaceutical dosage form.

MATERIALS AND METHODS

Paracetamol IP and microcrystalline cellulose were obtained as a gift sample from Kem Well House, Bangalore. All other materials used in this study were purchased from s.d fine chemicals Mumbai. Fresh white gum of *Cordia dichotoma* was collected from authenticated plant fruits in local area of Gadag district (India).

Purification of gum

The well dried cordia fruit gum was powdered in mortar and passed through sieve no. 80. Gum was solublised 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.

Standardization of gum

The cordia fruit gum was standardized for following properties. Loss on drying: 5 gm of gum was dried at 100 ± 5 °C till the constant weight is obtained. The loss on drying was found to be less than 10 % w/w. Ash value: 1gm of gum was accurately weighed and evenly distributed it in the crucible. It was dried at 105 °C for one hour and ignited in muffle furnace at 600 ± 25 °C. Percentage ash content was found to be less than 8.5% w/w. 2 to 8 % w/w gum solutions have pH 6.8 to 6.2.

Preparation and evaluation of granules

Wet granulation method was used to prepare granules of drug. The formulation was developed by using Paracetamol IP as model drug. Binder solution of gum 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 °C in oven and again received through number 16 mesh sieve. The granules were evaluated for percentage of fines and particle size. Granules were mixed with 6 % talc and evaluated for flow property (7–8). The tablet formulation was developed for 600 mg tablet weight as shown in Table 1.

Preparation and evaluation of tablets

The tablets were compressed by using Cadmach single punch tablet machine fitted with flat faced punches. The batch size prepared was of 100 tablets. The prepared tablets were stored in closed container for 30 days. No evidence of chemical change was observed. The tablets were evaluated for content uniformity, hardness, friability, disintegration time and dissolution study (9–12). Dissolution study was carried out in 900ml 0.1 N HCL medium using paddle type Dissolution Test Apparatus. The dissolution was carried out at 37 ± 10 ° C and 50 rpm paddle speed. The 10 ml samples were withdrawn at 10 min intervals. 10 ml dissolution medium was added into dissolution chamber as a replacement for sampling after each interval. Absorbance was measured at 243 nm using UV spectrometer (Simadzu).

RESULTS AND DISCUSSION

The binder gum obtained from natural origin and has pH between 6.8–6.2. The prepared granules were evaluated for percentage of fines, particle size and flow properties. The results are shown in Table 2. It was observed that the percentage of fines was reduced as the concentration of binder was increased. The flow property of granules was determined by angle of repose and it was found that values were between 26–32°. The increased percentage of fines reduces particle interlocking and friction, thus decreasing angle of repose. All batches showed good flow property. Granule size distributed between 0.64–0.74 mm. Three batches of tablets of each binder concentration were prepared. 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 6–8 % w/w. Increase in binder concentration therefore resulted in a corresponding decrease in friability and increase in disintegration time. Dissolution study showed that the drug release from the tablets containing 2–8 % w/w binder was more than 90 % in 75 min. Tablets at 6% w/w concentration shows more optimum results as tablet binder. The drug release from tablets decreased with increase in binder concentration.

Table 2: Evaluation of granules prepared from cordia fruit gum as binder

	Binder concentration (%w/w)			
Characteristic	***2***	***4***	***6***	***8***
Percentage of fines	21.8	19.5	15.8	13.4
Particle size (mm)	0.643	0.688	0.742	0.746
Angle of repose (°)	26.65	27.54	30.68	32.10

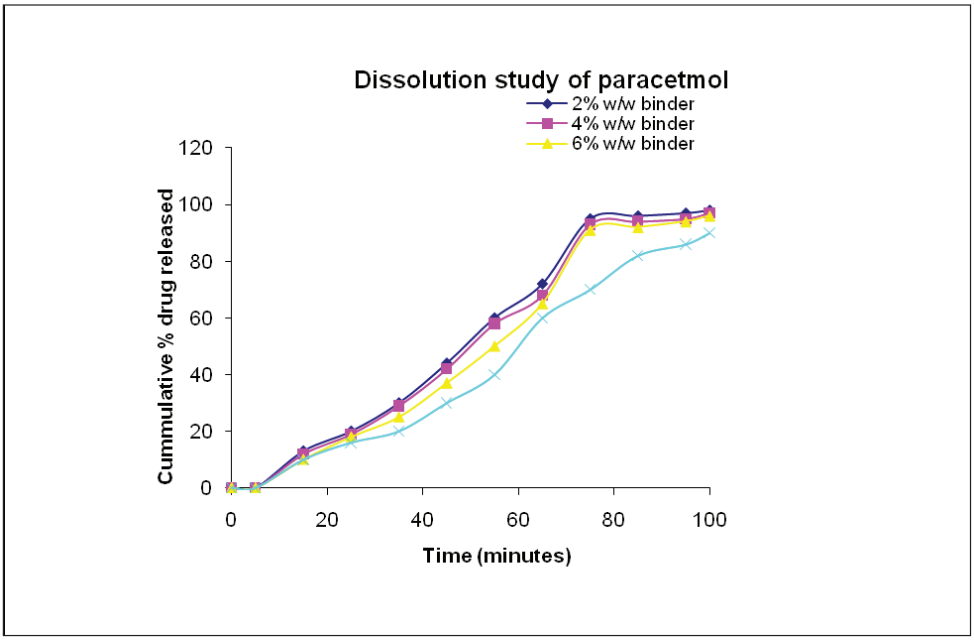
Table 1: Composition of Tablets Containing Cordia fruit Gum as Binder

	Variation of Binder Concentration by lowering the level of MCC			
Ingredients	**Batch I**	**Batch II**	**Batch III**	**Batch IV**
Paracetamol	400 mg	400 mg	400 mg	400 mg
Microcrystalline Cellulose(*MCC*)	164 mg	152 mg	140 mg	128 mg
Binder in Dist. water(*Cordia fruit gum*)	2 % w/v	4 % w/v	*6 % w/v	8 % w/v
Talc	24 mg	24 mg	24 mg	24 mg

*Indicates good concentration of binding agent.
In the formula weight of one tablet (600 mg) is mentioned, but each batch was calculated and taken for 100 tablets.

Table 3: Evaluation of tablets prepared with cordia fruit binder

	Binder concentration (%w/w)			
Characteristic	***2***	***4***	***6***	***8***
Content Uniformity (%)	95.20	98.56	98.98	98.90
Hardness kg/cm^2	7.5	7.8	8.0	8.2
Friability (%)	1.58	1.47	1.25	1.10
Disintegration time	12 min	13 min20 sec	16 min 45 sec	22 min



CONCLUSION

The cordia fruit gum exhibited good binding properties for uncoated tablets. The increased concentration of gum showed small retardation in drug release from tablet.

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