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Evaluation of mangifera indica gum as tablet binder

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Abstract: The aim of the present study is to evaluate the gum of *mangifera indica* (mango) as a tablet binder employing paracetamol as a model drug. Natural gums are economic, easily available and found useful as tablet binder. To the best of our knowledge, no significant work has been reported on mango gum as a tablet binder. Paracetamol tablets were prepared by wet granulation technique using *mangifera indica* gum as a tablet binder. The prepared tablets were evaluated for physico chemical characteristics. The friability of the tablets ranges from 1.12 to 0.26 % and the disintegration time from 3 to 8 min. The binding efficacy of the *mangifera indica* gum was compared with the standard binder gum acacia at similar concentration (5% w/w). The tablets hardness prepared from *mangifera indica* gum varies from 6.3 to 6.8 kg/cm^2 which are comparable with the standard binder, gum acacia (4.8 kg/cm^2). In conclusion, MIG could be used well as a binding agent in the formulation of tablet dosage forms.
Key words: *Mangifera indica* gum, tablet binder, paracetamol.

1. Introduction

Binders are pharmaceutical excipient that are commonly employed in tablet formulation to impact cohesion on the powder mix and hence improves on the flow properties on the granules. Binders act by causing aggregation of powders thereby forming granules through the process of granulation. They modify the cohesive properties of the granules by promoting the formation of strong cohesive bonds between such particles[1].

Gum is a by product obtained as a result of metabolic mechanisms of plants. Natural gums are either water soluble or absorb water to form a viscous solution.[2] Natural gums are economic, easily available and found useful as tablet binder. Khaya gum is obtained from incised trunk of *khaya grandifolia* (Meliaceae), a typical West African tree widely available in Western Nigeria. The gum has been shown to posses binding properties and to evaluate its suitability as a binding agent in paracetamol tablet formulations.[3,4] Okra gum has been evaluated as a controlled-release agent in modified release matrices, in comparison with sodium carboxymethyl cellulose (NaCMC) and hydroxypropylmethyl cellulose (HPMC), using Paracetamol as a model drug[6]. The results indicate that okra gum matrices could be useful in the formulation of sustained release tablets for up to 6 h.

For centuries, the Mango tree (Scientific name: *mangifera indica*, Family: anacardiaceae) has been an integral part of life in India. Each and every part of the tree (bark, leaves, root, kernel, seed and fruit) serves a certain purpose, for instance as diuretic, astringent, aphthous stomatitis, diabetes, asthma, diarrhoea, urethritis, dysentery, scabies and other parasitic skin diseases[5]. To the best our knowledge, no significant work has been reported on the gum of *mangifera indica* for its use as a tablet binder.

Therefore, the aim of the present study is to evaluate the *mangifera indica* gum as a tablet binder employing paracetamol as a model drug.

2. Experimental

2.1 Materials

Paracetamol IP (piramal health, India) was used as a model because it has poor compression properties. Starch (Remidex Pharma, India) was employed as a disintegrant. *Mangifera indica* (family: Anacardiaceae) is a plant that is widely grown and widely distributed in all areas of India. The gum is a polysaccharide polymer obtained from the stem bark of the plant.

Other ingredients such as lactose, talc, magnesium stearate were LR grade.

2.2. Purification of *mangifera indica* gum[9]

The *mangifera indica* gum (MIG) was collected from the mango tree in Jaunpur, Uttar Pradesh region. The gum was dried and dissolved in distilled water. The concentrated solution was precipitated in acetone. The precipitate was separated and dried at 50°C. The dried gum was powdered and stored in tightly closed container.

2.3. Standardization of MIG

Loss on drying: The 1.0 gm gum was dried at 105°C till the constant weight of gum was obtained. The loss on drying was found to be less than < 10% w/w.

Ash value: Percentage ash content was found to be less than 8.5 % w/w.

pH: The pH of the gum (1% w/w solution in water) found to be in the range of 7.3-7.7.

2.4. Preparation and evaluation of granules [7, 8, 9]

Wet granulation method was used to prepare granules of drug. The formulation was developed by using paracetamol IP as model drug. The binder concentrations used were 2.5, 5.0 & 7.5 % w/w (Table 1).

All ingredients were dry mixed manually in mortar and water is used as granulating fluid. The wet mass was granulated by passing them manually through a number 12 mesh sieve. Granules were dried at 50°C in hot air oven and again resieved through number 16 mesh sieve[4]. The granules were evaluated for percentage of fine, particle size and angle of repose (Table 2).

2.5. Preparation and Evaluation of Tablets:

The tablets were compressed by using hydraulic press single punch with flat faced punches. The batch size prepared was of 100 tablets. The tablets were evaluated and results were shown in Table 3.

Table 1. Paracetamol formulation containing gum of mangifera indica as a binder

Ingredients (mg/tablet)	Formulations		
	F1(2.5% binder)	F2(5% binder)	F3(7.5% binder)
Paracetamol	300	300	300
Binder	15	30	45
Starch	60	60	60
Lactose	216	201	186
Magnesium stearate	6	6	6
Talc	3	3	3
Total	600	600	600

All the batches contained 0.5% w/w talc and 1%w/w magnesium stearate

Table 2. Evaluation of granules prepared from mangifera indica gum (MIG)

Formula binder weight (%w/w)	Percentage of fines	Particle size (mm)	Angle of repose
MIG 2.5	21.17(±1.60)	0.61(±0.45)	30.13°(±0.22)
MIG 5.0	18.63(±1.07)	0.66(±0.32)	32.46°(±0.34)
MIG 7.5	15.45(±1.34)	0.69± (0.28)	33.54°(±0.24)
GA 5.0	22.67(±0.80)	0.55(±0.38)	35.37°(±0.27)

Values given in parenthesis are standard deviations (n=3)

Table 3. Evaluation of tablets

Formula binder weight (%w/w)	Content uniformity (%)	Hardness (kg/cm^2)	Friability (%)	Disintegration time (min)
MIG 2.5	98.07(±0.21)	6.3(±0.36)	1.12(±0.08)	3.00(±0.49)
MIG 5.0	97.23(±0.20)	6.5(±0.28)	0.45(±0.04)	5.10(±0.47)
MIG 7.5	98.65(±0.24)	6.8(±0.25)	0.26(±0.06)	8.00(±0.35)
GA 5.0	98.55(±0.48)	4.8(±0.35)	1.85(±0.07)	3.15(±0.26)

Values given in parenthesis are standard deviations (n=3).

3. Results and Discussion

The binder gum is natural and have pH between 7.3 -7.7. The prepared granules were evaluated for percentage of fines, particle size and flow properties. It was observed when the concentration of binder was increased, the percentage of fines was reduced. The flow property of granules was determined by angle of repose and it was found that values were between 30.11 to 33.54°. All batches showed good flow property.

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 tablet hardness and disintegration time increased with increase in binder concentration. The friability values decreased with increase in binder concentration. All the evaluation parameters were found to be within the pharmacopoeial limits at binder concentrations 2.5-7.5 % w/w.

4. Conclusions

The evaluation of tablets reveals that the binding efficacy of tablets prepared using MIG is comparable with the tablets prepared using 5%w/w gum acacia as a standard binder. Therefore, it is concluded that MIG could be used well as a binding agent in the formulation of tablet dosage forms.

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