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Research Article

Evaluation of binding properties of *Moringa oleifera* gum in the formulation of paracetamol tablets

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ABSTRACT

Plant gums and mucilage are being used in Pharmaceuticals and in other various industries due to their abundance in nature, safety and low cost. Binding agents are used to impart the structural strength required during the processing, handling and packaging of tablets. In view of the importance of binders in pharmaceuticals for the manufacture of tablets and capsules, gum isolated from the stem of ***Moringa oleifera*** have been evaluated for its binding properties in the formulation of conventional Paracetamol tablet (500mg) containing 8%, 10% and 12% binding concentration. The binding property of gum was evaluated in relation to conventional binder like gelatin at different parameter like percentage of fines, tablet hardness, disintegration time, dissolution and friability. Studies showed that increase in binding concentration of *M.oleifera* gum from 8% to 12% decreases the percentage of fine, increases the hardness, increases the disintegration time, decreases the percentage of friability and decreases % cumulative release. The binder-excipients interaction study was also carried out by using FTIR i.e. by KBr pellet method which showed that***M.oleifera*** gum is compatible with drug and all excipients in the formulation. It may be concluded from the studies that increase in binding concentration decreases drug release hence this gum can be used to formulate sustained/controlled release tablet formulation, since it shows better tabletting characteristics have high potential for the substitution of expensive binder.

Keywords: *Moringa oleifera,* Binding concentration, dissolution, hardness, Paracetamol tablets

INTRODUCTION

Recent decades have seen tremendous strides in the designing of novel dosage forms. But tablets still remain an attractive option for pharmaceutical scientists and clinicians because they offer advantages of accurate unit-dosing, better patient compliance, ease of large-scale manufacturing, and Low production cost. The formulation of a tablet involves combining the active ingredient, the "drug," with pharmacologically inactive ingredients called "excipients. Binding agents are used in granulation to provide proper strength to the granules, in order to keep the tablet intact after compression. Plant gums and mucilage widely have been used in various industries like paper, textile, food, ink, cosmetics, petroleum and frequently used in pharmaceuticals as thickening, binding, emulsifying, suspending, stabilizing agents and coating materials in micro encapsulation. In view of importance of binders in pharmaceuticals for the manufacture of tablets and capsules, gum extracted from the bark of ***Moringa Oleifera*** gum was undertaken to evaluate its binding properties through assessment of various parameters essential for pharmaceutical formulation.[1, 5, 6, 7]

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MATERIALS AND METHODS

Paracetamol pure drug was obtained as a gift sample from Tablets India Ltd Chennai. *M.oleifera* gum was collected from Tamil University, Thanjavur, and the same was authenticated by G. V. S. Moorthy, Botanical Survey of India (BSI), Southern circle, Coimbatore, Tamil Nadu.

Isolation of M.oleifera gum

The gum was collected from trees (injured site). It was dried, ground, and passed through sieve no 80. Dried gum (10 g) was stirred in distilled water (250 ml) for 6-8 h at room temperature. The supernatant was obtained by centrifugation. The residue was washed with water and the washings were added to separate supernatant. The procedure was repeated four more times. Finally the supernatant was made up to 500 ml and treated with twice the volume of acetone by continuous stirring. The precipitated material was washed with distilled water and dried at 50-60° under vacuum.

Precompression parameters [3, 4]

Bulk Density, Tapped density, Angle of repose, Carr's Index was determined for Paracetamol granules prepared by using gelatin, *M.oleifera* gum at 8%,10%,12% binding concentrations.

Table 1:Formulations

F1	Paracetamol formulation with 8% *M. oleifera* gum.
F2	Paracetamol formulation with 8% Gelatin gum.
F3	Paracetamol formulation with 10% *M. oleifera* gum.
F4	Paracetamol formulation with 10% Gelatin.
F5	Paracetamol formulation with 12 % *M. oleifera*
F6	Paracetamol formulation with 12% Gelatin

Table-2.Precompression parameters data for Paracetamol granules

parameters	8%		10%		12%	
Formulation	F1	F2	F3	F4	F5	F6
Bulk Density (g/cc)	0.42	0.43	0.46	0.46	0.48	0.46
Tapped Density (g/cc)	0.48	0.50	0.52	0.53	0.53	0.52
Angle of Repose (?)	22.7	24.0	22.5	23.2	24.0	27.1
Carr's Index	12.5	14.0	11.53	13.2	9.43	11.53

Table-3.Post formulation study of Paracetamol formulations

Parameters	F1	F2	F3	F4	F5	F6
% of Fines	5.12	5.22	4.02	4.32	4.21	4.0
Hardness (kg/cm2)	8.03	7.98	8.6	8.3	8.8	9.0
Friability %	0.52	0.56	0.32	0.44	0.25	0.21
Weight variation(mg)	604±3.89	607±4.76	608±3.10	607±2.67	605±3.56	607±3.99
Thickness (mm)	4.2	4.3	4.1	4.2	4.4	4.2
Disintegrations (min.)	10.18	11.20	12.15	12.05	12.66	12.98

Method of formulation[8,9]

Conventional Paracetamol tablets (500mg) were prepared by wet granulation method, by using Gelatin, *Moringa oleifera* as binding agents. The Compression process was performed by using twelth station rotary tablet punching machine (punch size 12/32). Various formulations are mentioned in **Table 1.**

Post formulation study of Paracetamol formulations[2, 3, 4, 10 ,11]

The formulated tablets were evaluated for the following parameter such as % fines, hardness test, friability, weight variation, thickness, disintegration, and dissolution studies and results were recorded

Characterization of Paracetamol formulation by Fourier transfer Infrared spectroscopy (FTIR)

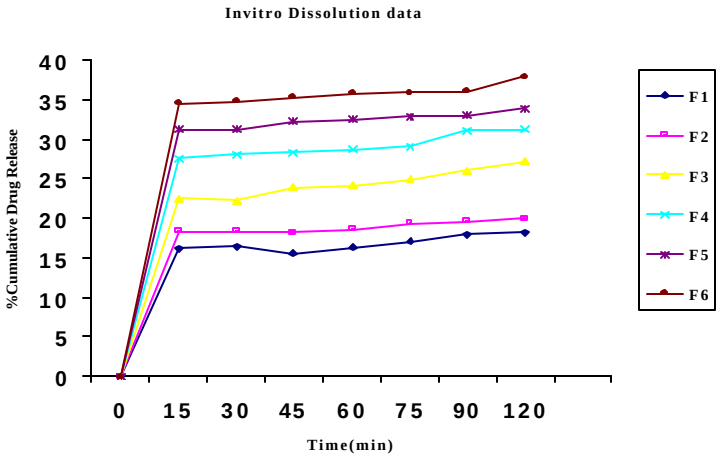
Fourier transform IR spectra were recorded on FT/IR-4100 type A for Paracetamol, Paracetamol formulation with*M.oleifera* gum and results were recorded.

RESULTS AND DISCUSSION

Conventional Paracetamol tablets were prepared by using 8%-10% binding concentration of *M.oleifera* gum and gelatin by wet granulation method. The precompression parameters like Bulk density, Tapped density, Angle of repose and Carr's index were determined for prepared granules and results were recorded in the **Table 2**

1.Fig. .*Invitro* dissolution studies

Dissolution studies were carried out for 2 hours in pH 7.4 buffer and the samples were analyzed using UV spectrophotometer and the results are shown below.



Characterization of Paracetamol, *Moringa oleifera* gum, Paracetamol formulation with M.oleifera gum by Fourier transfer Infrared spectroscopy (FTIR)

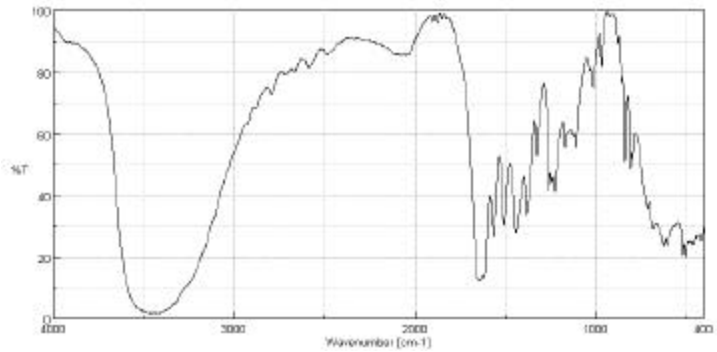


Fig.2.FTIR Spectra for Paracetamol

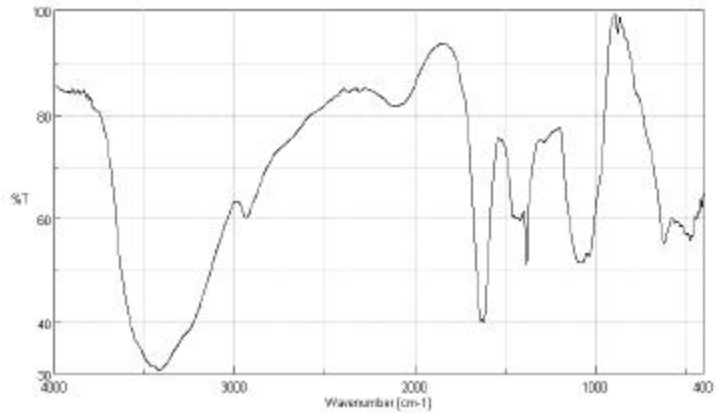


Fig.2. FTIR Spectra for *Moringa* Gum

which showed that all the formulations were well with in the official limits. Tablets prepared were evaluated for % of fines, weight variation, hardness, friability, thickness, disintegration time and the results were given in the **Table 3**.The % deviation of all the formulations for all the parameters were found to be within the prescribed

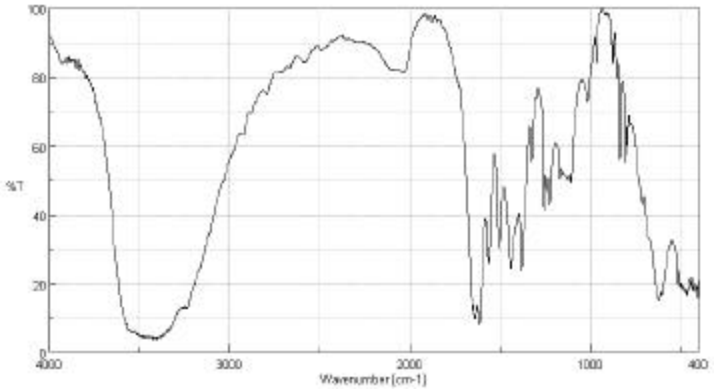


Fig.3. FTIR Spectra for Paracetamol formulation with Moringa gum

official limit. It has been observed that increase in the concentration of binders from 8% to 12% effectively changes the binding characteristic of the tablets.

Results obtained from the dissolution studies of Paracetamol tablets using *Moringa oleifera* gum, gelatin and drug release post 2 hour were shown in the **Fig 2,3&4**. It was found that increase in the binding concentration from 8% to 12% of *M.oleifera* gum in the prepared tablets decreases the drug release. Fourier transform IR spectra were recorded on FT/IR-4100 type A for Paracetamol **(Fig 2)**, *M.oleifera* gum (**Fig 3**) and Paracetamol formulation with *M.oleifera* gum (**Fig 4**). FTIR Study shows that there was no observation of extra peak which indicates there was no physical interaction of the gum with active ingredient.

SUMMARY AND CONCLUSION

From the present study it can be concluded that *Moringa oleifera* gum may be used as a binding agent in the tablet formulation when high mechanical strength is more essential. Studies shows that Paracetamol tablets prepared with 8% - 12% binding concentrations of *Moringa oleifera* gum shows delayed drug release as like gelatin. Hence this gum may be used to formulate Sustained release/Controlled release tablets by increasing the binding concentration of the same. *Moringa oleifera* gum have greater potentialities to become the new source of gums since it shows better tabletting characteristics and could also be exploited for the commercial production of gums.

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