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Study of Disintegrant Property of Moringa Oleifera Gum and its Comparison with other Superdisintegrants

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Abstract: Plant products serve as an alternative to synthetic products because of local accessibility, eco-friendly nature and lower price compared to imported synthetic products. Natural gums and mucilage have been widely explored as pharmaceutical excipients. Tablet disintegration has received considerable attention as an essential step in obtaining fast drug release. The present study was undertaken to separate or isolate gum from raw gum of Moringa Oleifera Linn. and explored its use as disintegrant by formulating tablets of Aceclofenac. The study of binder, suspending agent and film forming agent property of seeds and gum powder of Moringa Oleifera has already being studied. Hardness of the tablets was found to be in the range of 3.5 – 4.1 kg/cm^2 for all formulations. The wetting time decreased with the increase in concentration of gum in formulation.The disintegration time of tablet formulation prepared from gum (2% w/w, 3%w/w, 4%w/w) was found lesser as compared to tablet formulation prepared from synthetic disintegrant like Starch Sodium Glycolate (SSG) and Crosscarmellose Sodium (CCS). The *in-vitro* dissolution profile exhibited maximum drug release from all the formulations. The results of weight variation, hardness, friability and dissolution profile of the formulations prepared with isolated gum from Moringa Oleifera are similar to that of those formulations prepared using other superdisintegrants. The result of disintegration shows that the isolated gum can be effectively used as disintegrant in tablet formulation.
Keywords: *Moringa Oleifera* Gum, Disintegrant, Aceclofenac.

INTRODUCTION:

As a natural defence mechanism to prevent infection or dehydration many trees and shrubs are known to produce an aqueous thick exudation when the plants bark is injured. Eventually the solution dries up in contract with sunlight and air and a hard transparent brown-tint glass mass formed. This solid mass is known as Natural gum.[1] Excipients play an important role in dosage forms such as tablet, capsule, lotions, suspensions, syrups and ointments. Plant products serve as an alternative to synthetic products because of its local accessibility, environment friendly nature and low prices compared to imported synthetic products.[2-3] *Plantago ovata* mucilage has been evaluated in fast disintegrating tablet[2,7]. *Ocimum americanum* Linn. Mucilage has been evaluated in disintegrating tablet[3] .Almond gum also used as binder in Diclofenac Sodium tablet [4]. Moringa gum is obtained from the tree Moringa Oleifera which is a water soluble gum extrudes from the bark on Moringa trees. In present study, an attempt was made to prove Moringa gum as disintegrant.

MATERIALS AND METHODS:

Materials: Aceclofenac was obtained as gift sample from Arene Life Science and Moringa Oleifera Gum was obtained from local nursery. Aerosil were purchased from Waker Silicon and Cross Carmellose Sodium was purchased from Prachin chemicals, Ahmedabad.

Methods:

Isolation of Moringa Oleifera gum:

The gum was collected from trees (Injured site). It was dried, ground and passed through sieve no 80. Dried gum (10g) was stirred in distilled water (250ml) for 6-8 hours at room temperature. The supernatant was obtained by centrifugation. The residue was washed with water and the washings were added to supernatant. The procedure was repeated four times. Finally the supernatant was made up to 500 ml and the treated with twice the volume of acetone by continuous stirring. The precipitated material was washed with distilled water and dried at 50-60ºC under vacuum[5]

Formulation of Tablet:

The tablets of Aceclofenac were prepared by wet granulation method using *Moringa Oleifera* gum, CCS and SSG as disintegrants, MCCP as diluent, Starch as binder, Purified talc and Mg Stearate as lubricant and Aerosil as glidant shown in table 1. The drug and other ingredients with half quantity of disintegrant were mixed together, sufficient quantity of starch paste was added to form coherent mass. The wet mass was granulated using sieve No. 40 and the granules formed were dried in Hot Air oven at 40ºC for 20 minutes and regranulated using sieve no 20. The granules were blended with remaining quantity of the disintegrant (extra granular disintegrant), purified talc, Aerosil and compressed into 10mm round concave punch in a rotator tablet machine[6] (Cadmach, 8 Station D-Tooling Compression Machine, Ahmedabad, India).

Evaluation of the tablets

Drug-Excipient interaction studies

The pure drug sample, isolated gum powder of Moringa Oleifera, and the physical mixture of drug to excipient in the ratio 1:1 were subjected to I.R spectral studies using FTIR spectrophotometer (FTIR-4100, Shimadzu, JAPAN).

Hardness

The crushing strength of the tablets was measured using a Monsanto hardness tester. Six tablets from each formulation batch were tested randomly and the average reading noted.

Friability test

Friability of the tablet was determined using Friability Tester made by Electro lab rotated at 25rpm for 4 min. Percentage friability was determined by following equation,[9]

$$\text{Percentage friability} = \frac{\text{Initial weight} - \text{Final weight}}{\text{Initial weight}} \times 100$$

Weight Variation

Randomly twenty tablets were selected after compression and the mean weight was determined. The sample tablets were weighed individually and the deviation from the mean weight was calculated (USP XXX).

Wetting time

A piece of tissue paper folded twice was placed in a Petri dish containing 6 ml of water. A tablet was placed on the paper and the time taken for complete wetting of tablet was noted. Three tablets from each formulation were randomly selected and the average wetting time was noted.[7]

Drug content

Twenty tablets were weighed and powdered. An amount of the powder equivalent to 100mg of Aceclofenac was dissolved in 100ml of pH 7.5 phosphate buffer, filtered, diluted suitably and estimated for the drug content at 275 nm using UV-Visible spectrophotometer (UV 1800-Shimadzu, Japan).

***In- vitro* disintegration time**

In vitro disintegration time was measured by placing a tablet in 100ml water maintained at 25°C. The time taken for the tablet to disintegrate completely was noted.[8]

Dissolution studies

In- vitro drug release studies of all the formulations were carried out using tablet dissolution test apparatus (USP TDT 06T, Electrolab, Mumbai) at 50rpm. Phosphate buffer pH 7.5 was used as the dissolution media with temperature maintained at 37±2ºC. Samples were withdrawn at different time intervals, diluted suitably and analyzed at 275nm for percentage drug release using Shimadzu UV-Visible spectrophotometer. The sample after each withdrawal was replaced with same volume of fresh media and the test was conducted in triplicate.[6]

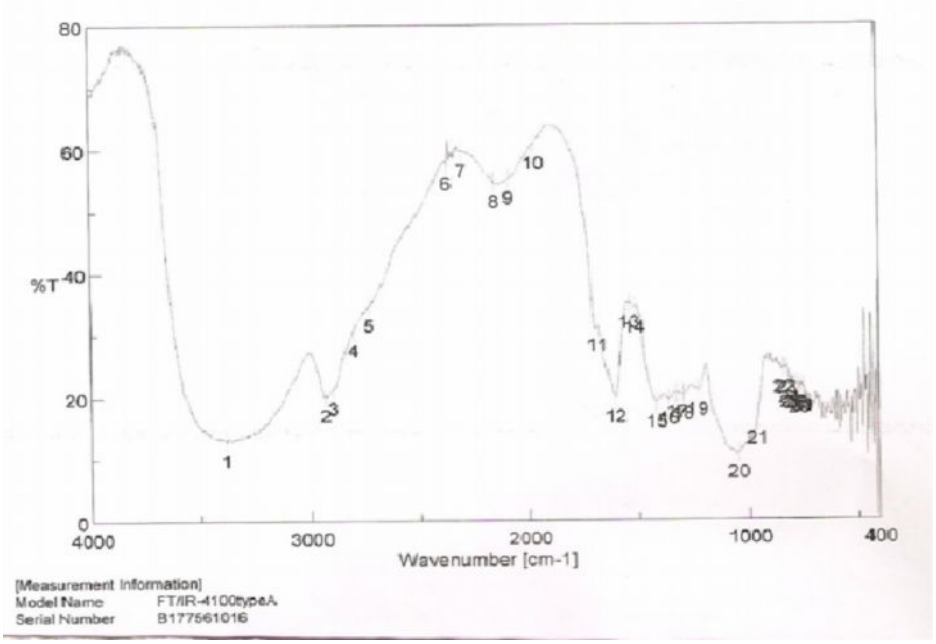

Figure 1 (A) FTIR of isolated Moringa Oleifera gum.

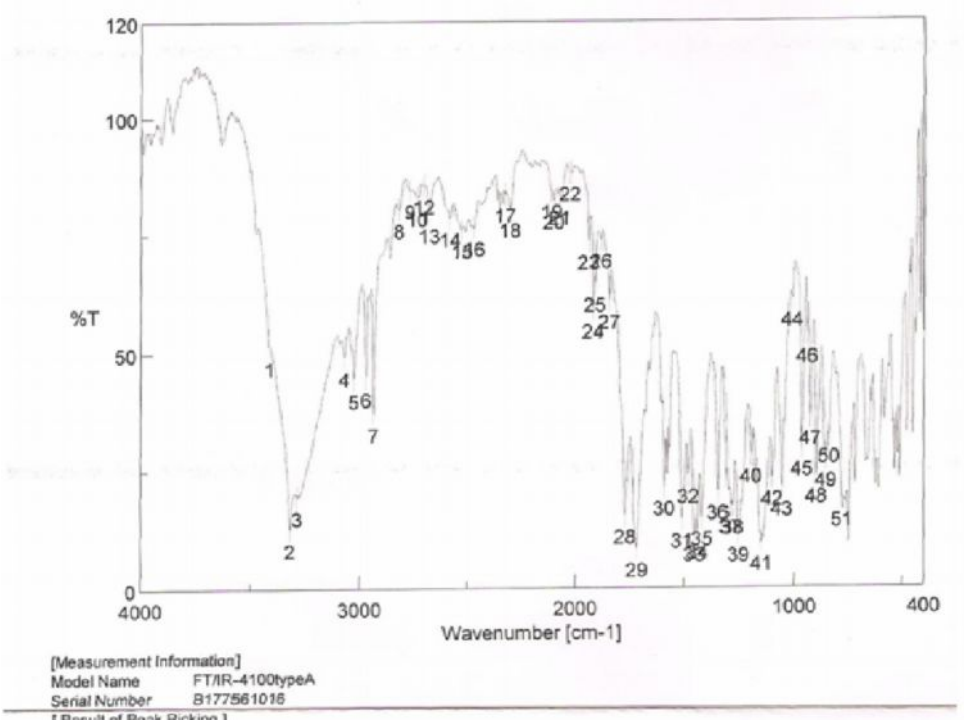

Figure 1 (B) FTIR of pure drug Aceclofenac

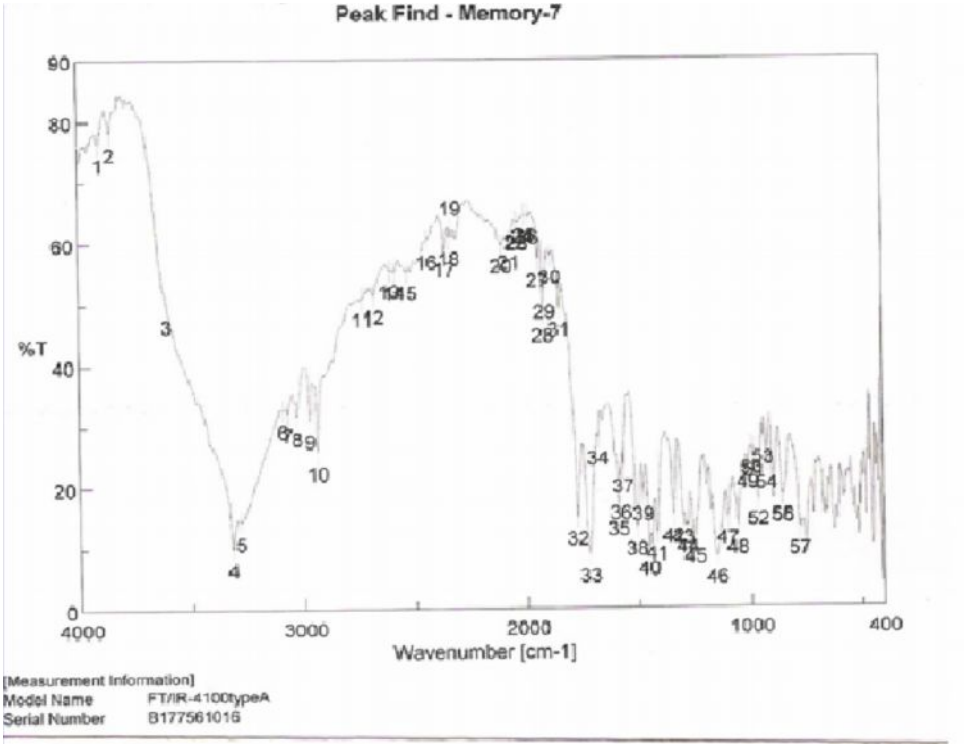

Figure 1 (C) FTIR of mixture of isolated Moringa Oleifera gum + Aceclofenac

TABLE 1: Formulation table of different batches of tablet

Ingredients	F1	F2	F3	F4	F5
Aceclofenac	100	100	100	100	100
Moringa gum	4	6	8	-	-
SSG	-	-	-	-	4
CCS	-	-	-	4	-
MCCP	70	68	66	70	70
Starch	15	15	15	15	15
Talc	4	4	4	4	4
Mg.Stearate	3	3	3	3	3
Aerosil	4	4	4	4	4

TABLE 2. Evaluation of Aceclofenac tablets

Batch no	Avg tab wt (mg)	Thickness (mm)	Hardness (kg/cm²)	Friability (%)	D.T. (min)	Wetting Time (min)	Drug Content (%)	Drug release (%)
F1	201±2	3.8-4.0	5.9-6.1	0.85	0.54	0.59	99.53	95.49
F2	201±3	3.8-4.4	5.6-5.8	0.75	0.47	0.40	99.71	97.01
F3	199±2	3.9-4.3	5.7-6.0	0.71	0.43	0.38	99.98	98.54
F4	201±2	3.3-3.5	5.9-6.1	0.78	17	16	98.57	93.96
F5	201±3	3.5-3.8	5.6-5.8	0.72	15	14	98.94	97.01

RESULT AND DISCUSSION:

The isolation of method yielded 29% of gum from the *Moringa Oleifera* raw gum. The compatibility of isolated gum with drug was found to be good with I R Spectrophotometry and it was shown in **Fig. (1A to 1C)**

The formulation were prepared using Moringa Gum mucilage (2%w/w, 3%w/w, 4%w/w), CCS and SSG as disintegrant and compressed into tablet by maintaining processing variable constant throught the study. The hardness was maintained between 3.9 – 4.2 Kg/cm^2. The friability of the tablets was found well with the approved range less than 0.5 to 1% in all the formulation and they can withstand the pressure during transportation and handling. The disintegration time for natural gum was found to be less when compared to synthetic gum tablets as shown in **table 2**. The *In – vitro* disintegration time of tablets was found to be decreased with increase in concentration of gum mucilage. The wetting time and disintegration of formulation F3 was least as increase in concentration gum. The *in-vitro* dissolution profile (**Fig.2A to 2C**) indicated a faster and maximum of drug release from all the formulations proving the disintegrant property of isolated gum of *Moringa Oleifera*. The results of evaluation test that are carried out in the formulations prepared with isolated gum are similar to that of those formulation prepared using superdisintegrants.

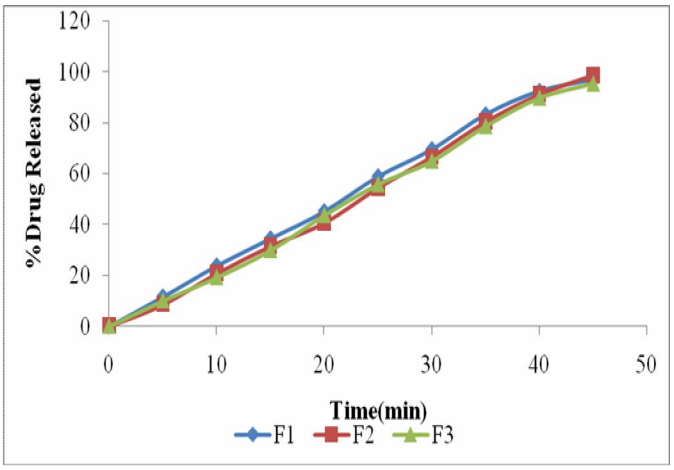

Figure: 2 (A) Dissolution profile of different batch no F1-F3

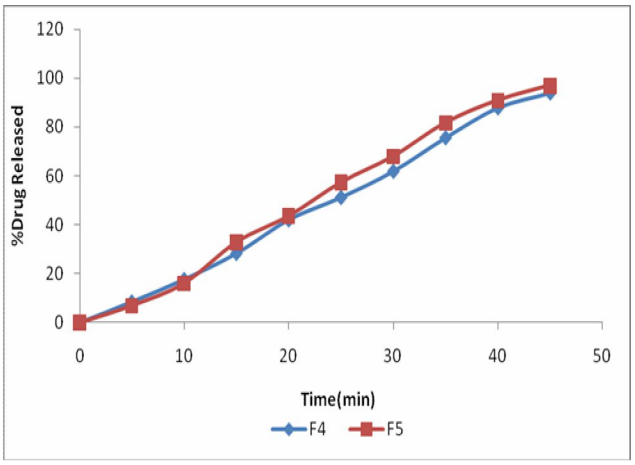

Figure: 2 (B) Dissolution profile of different batch no F4-F5

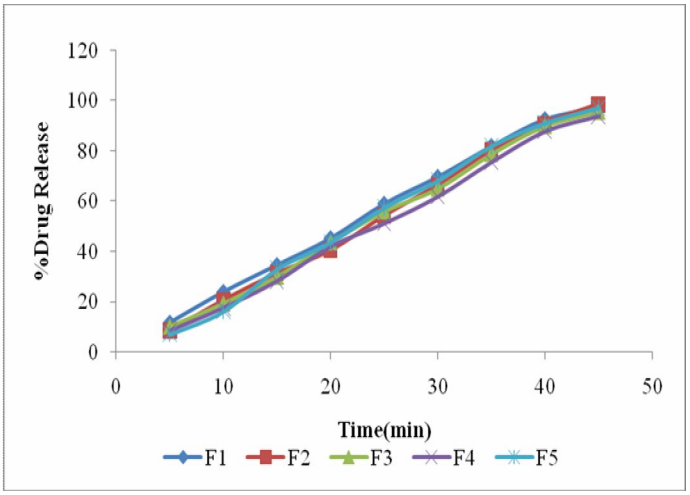

Figure: 2 (C) Comparative Dissolution profile of Batch F1-F5

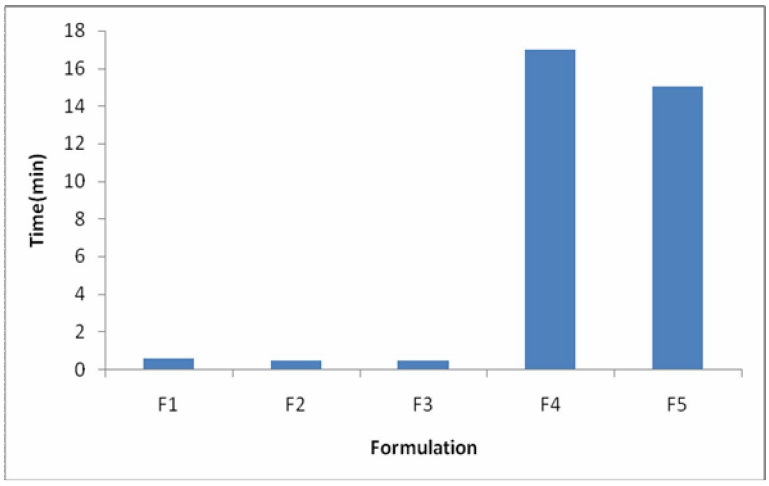

Figure: 3 Comparative disintegration profile of formulation F1-F5

CONCLUSION:

In the present study the disintegrating properties of the gum powder of Moringa Oleifera had been studied in comparison with other commercially available super disintegrants. The isolated natural disintegrant exhibits faster drug dissolution in comparison to the other super disintegrants thereby improving patient compliance. Thus the isolated gum powder can be effectively used as disintegrant.

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