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FORMULATION AND EVALUATION OF NATURAL BINDING AGENTS IN MORINGA OLIEFERA TABLET

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ABSTRACT

A study was carried out to investigate the efficiency of different natural binding agent such as gum of Okra fruit, gum of Hibiscus flower, gummy exudates of Moringa tree and gum of Aloe-Vera in Moringa oleifera tablet. Moringa oleifera is widely used for both nutrition and medicinal activity. The physical parameters used were weight variation, harness, friability, disintegration time and antimicrobial assay. The results of this study showed that Aloe-Vera gum produced tablet with higher hardness, disintegration time and increased antimicrobial activity. In conclusion, Aloe-Vera gum has good tablet binding properties and could be employed as a substitute for more expensive binders in fast or immediate release tablet.

Key Words: tablets, Moringa oleifera, Aloe-Vera, Okra, Hibiscus, Antimicrobial assay, binders.

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INTRODUCTION

The most commonly used dosage form for pharmaceutical preparations is currently the tablet, available in various forms and administered orally. The advantages of this dosage form are manifold: tablets are cost effective to manufacture, convenient to dispense and store, and easy for the patient to administer. Most of researchers used synthetic polymers for sustained drug delivery but they individually show specific limitations such as toxicity or expensiveness of polymer. Natural polymer such as resins, polysaccharides and gums have been extensively used for drug delivery system because they are readily available, cost effective, eco-friendly, capable of multitude of chemical modification, potentially degradable and compatible due to natural origin[1].

A sticky, colloidal carbohydrate found in certain trees and plants, which dries into an uncrystallized, brittle mass that dissolves or swells in water, is known as Gums. Moringa oleifera Lam (syn. M. ptreygosperma Gaertn.) is one of the best known and most widely distributed and naturalized species of a monogeneric family Moringaceae. Different parts of this plant contain a profile of important minerals, and are a good source of protein, vitamins, β-carotene, amino acids and various phenolics.. Number of naturally occurring polysaccharides obtained from plant (guar gum, inulin), animal (chitosan, chondrotin sulphate), algal (alginates) or microbial (dextran) origin[4]. The formulation of M. oliefera leaf into conventional tablet is to make available a simple, convenient and conventional dosage form that is elegant, easy to handle, dispense and use by the patient. It also affords other primary advantages of tablets such as

maintenance of physical and chemical stability, easy identification and low cost of production. Tablets often contain other excipients apart from the active component; one of such excipients is the binder. Binders are ingredients that impart cohesiveness to the drug materials and hold the tablets together. Some of the classical binders used in pharmaceutical manufacture include starch and acacia. The choice of a suitable binder in tablet formulation requires extensive knowledge that is gained often by empirical evaluations. As such, investigating the suitability of different binders in the formulation of herbal tablets is important[3].

MATERIALS AND METHODS

Materials

The Moringa oleifera leaf powder (drug) was collected from the Mahadeshwara Herbal at Bengaluru and excipients collected from Durga pharmaceuticals Mangalore

Isolation of gums

Four different plant gums(Moringa oleifera Gum, Hibiscus Rosasinensis, Aloe-Vera gum and Okra gum) were extracted and isolated using various techniques. After isolation the gums were stored in a deep freezer for the further use.

Preparation of Granules[2]

The drug powder and excipients were mixed and converted into a moist coherent mass and then into granules before compression into tablets. The mixed material is then sifted through a screen of suitable mesh to remove or break the lumps. The sifted material is converted into a damp mass by adding and mixing with the binder solution.The damp mass is forced through 10 mesh screens for granulation. The wet granules are dried in an oven, followed by dry screening. Finally the granules are compressed into tablets using Rotary tablet machine.

Preparation of Tablet[3]

Four (4) batches (F1, F2, F3 and F4) of basic formulations of M. oleifera leaf powder were prepared (Table-1).

Table-1 Formulation of Moringa tablets

Ingredients	Total Tablet Weight(500mg)			
	F1	F2	F3	F4
Moringa powder	375	375	375	375
Corn starch	10	10	10	10
Hibiscus	-	1%	-	-
Aloe vera	1%	-	-	-
Okra	-	-	1%	-
Moringa	-	-	-	1%
Lactose	113.25	113.25	113.25	113.25
Talc	0.125	0.125	0.125	0.125
Magnesium sterate	0.125	0.125	0.125	0.125
SLS	0.625	0.625	0.625	0.625

Evaluation of tablets [8,9,10]

Appearance

The macroscopic characteristics of tablets of each formulation including the geometric shape, appearance, color and presence of foreign material or particles was observed.

Weight variation test

20 tablets were selected randomly and average weight was determined. The individual tablets were weighted and the differences of individual weights from the average weight were determined.The percentage deviation was calculated.

Hardness

The hardness of the tablets was determined using a Monsanto hardness tester apparatus.

Friability

Twenty tablets were weighed and submitted to a friability tester machine (Roche friabilator). After 25 rpm for 4 minutes, the tablets were de-dusted and weighed again. The difference between the initial and final weights representing the friability (FR), as estimated by the percentage of powder lost was calculated.

Disintegration test

6 tablets of each batch were placed each in a tube (with a mesh at the bottom) immersed in a water bath at 37°C and the disintegration test machine was set to run. The time it took for all the tablets to disintegrate was observed and recorded for each formulation.

Antimicrobial test[5]

Disc diffusion method

Muller Hinton or nutrient agar medium was prepared. Then the medium was autoclaved along with glass wares at 15 lbs. and 121ºC for 15 min. Then allowed to cool the medium was poured to sterilised petridish and kept aside for solidification. The microorganisms were swabed over the surface of the solidified Medium (E.coli –ve) and (staphylococus +ve). Placed F1-F4 formulation and gently pressed over the medium. Kept for incubation at 37º C for 24-48 hrs. Here standard used as ciprofloxacin disc (µg).After the incubation period the zone of inhibition period was measured in mm and compared with standard used.

Optimization of Concentration of Binding Agent and Its Preparation[6]

By varying the concentration of binding agent which shows better binding efficiency and antimicrobial activity (lower, medium, high)

Stability studies[7]

The optimized batch of the tablet were monitored up to 30 day at accelerated conditions of temperature and relative humidity (40º ± 2ºC 75± 5% RH) to check the stability of the prepared tablet, by evaluating all the parameters.

RESULTS AND DISCUSSION

Appearance

Tablets were circular, smooth, shiny and green in color with some whitish spots visible on the surface. The tablets had thickness ranging from 5.02 to 5.41 mm measured using vernier calipers.

Weight Variation Test

Weight Variation Test is shown in table-2

Table-2 Determination of weight variation

Formulations	No: of tablets weighed	Mean weight (g)	No: of tablets within range	No: of tablets outside range
F1	20	0.49 ± 0.03	20	NIL
F2	20	0.48 ± 0.02	18	2
F3	20	0.5 ± 0.23	20	NIL
F4	20	0.49 ± 0.10	20	NIL

Mean±3 SD

Hardness

The hardness of the tablets was determined using a Monsanto hardness tester apparatus (Table-3).

Table-3 Determination of Hardness

Formulation	F1	F2	F3	F4
Hardness	6.1±0.002	5.5±0.001	5.3±0.003	4.7±0.002

Mean±3 SD

Friability

The F1 formulation is less friable and F2 is more friable, but all the formulations show accepted range of friability when compared with the IP standard (Table-4).

Table-4 Determination of Friability

Formulation	F1	F2	F3	F4
Friability	0.02±0.004	0.8±0.001	0.38±0.002	0.78±0.001

Mean±3 SD

Disintegration Test

Friability and hardness of a tablet is directly proportional to the disintegration time, that means as the hardness and friability increases then the disintegration time of a tablet also increases. Here the result also shows the same. Formulation F1 takes more time to disintegrate completely in 0.1N HCl (Table-5)**.**

Table-5 Determination of disintegration of tablet

Formulation	F1	F2	F3	F4
Disintegration time	10 min 5 sec	9 min 5 sec	8 min 7 sec	8 min 2 sec

Mean±3 SD

Antimicrobial Activity

Antimicrobial activities of F1 to F4 formulations were studied using Gram +ve and Gram –ve bacteria. This activity was done to check whether the antimicrobial property was retained even after compressed into tablet. All the batches showed antimicrobial activity and from the result obtained, it was clear that the Aloe-Moringa combination showed more activity when compared to other gums. For better activity the concentration of Aloe gum was optimized.

Optimization

For better activity the concentration of Aloe gum was optimized and results are shown in table-6.

Table-6 Evaluation of optimized batch

Formulation	Hardness	Friability	Disintegration test	Antimicrobial test
F_{1A}	6.1±0.003	6.2 ±0.005.2	8 MIN 20 SEC	23 mm
F_{1B}	5.2±0.0023	5.9±0.005	9 MIN 6 SEC	25.5 mm
F_{1C}	4.2±0.002	4.0±0.004.5	10 MIN 2 SEC	22 mm

Mean±3 SD

Stability Studies

The optimized batch of the tablet were monitored upto 30 day at accelerated conditions of temperature and relative humidity (40º ± 2ºC 75± 5% RH) to check the stability of the prepared tablet by evaluating all the parameters (Table-7).

Table-7 Stability studies of optimized batches

Formulation code	Hardness	Friability	Disintagration test	Antimicrobial test
F_{1A}	6.0 ± 0.005	0.01±0.004	9 MIN 20 SEC	22 mm
F_{1B}	6.1± 0.003	0.02±0.005	10 MIN 5 SEC	25 mm
F_{1C}	6.3±0.004	0.04±0.002	11 MIN 1 SEC	20 mm

Mean±3 SD

CONCLUSION

Moringa oleifera leaves are widely used for both nutritional and medicinal activity. The present study aims to formulate a conventional dosage form using Moringa Oliefera leaf powder and to evaluate the binding efficiency of natural binders. In all the evaluation parameters for binding capacity such as hardness, friability, disintegration test F1 shows better activity when compared to others. An antimicrobial assay was also carried out to assess the retaining property of leaves even after compressing it in to tablets. All formulations showed this activity and the F1 much more activity. Therefore we optimize the concentration of binding agent used and it was concluded that 1% concentration of Aloe-Vera has good capacity. By using this as binding agent we can overcome the major drawback of Moringa oleifera leave tablet ie, constipation. Because the binding agent used has laxative property.

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