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Research

Formulation and evaluation of herbal tablet from moringa Oleifera leaves

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Abstract

The aim of the study is formulation and evaluation of herbal tablets from moringa oleifera leaves. Moringa oleifera leaves was extracted with ethanol and formulated by using different binders which included Gelatin, Micro-crystalline Cellulose (MCC), Maize Starch produced the best tablets of ethanol extract of Moringa oleifera leaves. Numerous criteria, including strength (friability, crushing strength), and release characteristics (disintegration and dissolution durations tests), were used to characterize the formulations. The outcome demonstrated that, in comparison to tablets made with MCC or maize starch, those made with gelatin as a binder had the lowest friability and disintegration time.

Keywords: Moringa oleifera, tablet, Binder: gelatin, MCC, maize starch.

INTRODUCTION

Moringa oleifera is widely regarded as the most popular species within the Moringaceae family [1]. It includes 13 species covering India, SriLanka, Africa, and Arabia [2]. The flowers contain compounds like amino acids, sugars and alkaloids, along with flavonoids and beeswax, along with pigments like kaempherol, rhamnet, isoquercetin and kaempferitin [3]. These leaves are rich in vitamins and minerals including vitamin B6, C and A and contain other beneficial nutrients like carotene, magnesium and proteins [4]. Urinary tract infections, infections, Epstein-Barr virus (EBV), herpes simplex virus (HSV-1), HIV-AIDS, hepatitis, helminths, trypanosomes, bronchitis, external sores/ulcers, and fever are among the conditions it is used to treat. This herb long term health advantages are widely known, Indian medicine makes extensive use of bark, root bark, seeds, flowers, leaves and seeds. When young and before they darken, its leaves and fruits are tasty. Little squirrels were added to the basket in Malaysia[5].

Several phytoconstituents, including flavonoids, alkaloids, saponins and phenolic acid, are said to be present in Moringa oleifera [6]. Flavonoids will shield a lot of things from oxidative damage. Flavonoids that are analgesic and anti-inflammatory also have protecting qualities [7]. Flavonoids increase antioxidant enzymes linked to hepatoprotection and decrese glutathione ,which helps to protect hepatoma cells. According to a study by Ekundina ,400mg/kg of Moringa oleifera leaf extract could have hepatoprotective effects[8]. All of the dosage forms of Moringa oleifera are available as powder or thick, separated into hand-filled capsules,with the exception of one (from Genius Nature Herbs private) [9].

Granulation is the process of grain expansion that turns small or big particles into massive, solid agglomerates with favourable compaction, compression, and physical characteristics. There are numerous more justifications for stockpiling, including: expanding the amount of commodities; facilitating volumetric application or measurement; regulating the pace of medication release; lowering dust levels, which lowers worker exposure to drugs, boost attractiveness [10]. A more effective drug control method is provided by powder dispersion, which also enhances utilization as a mass control solution for many items (including many pharmaceuticals) and decreases the amount of dispersion created. Fairness for fewer medications [11].

Formulating a standardized quantity of Moringa oleifera leaf ethanol extract for tablets and identifying an appropriate binder for the formulation are the goals of this study. The creation of a suspension extract from M.oleifera leaves was one of the studys goals. The pharmacological characterizing the suspensions and testing the in vivo hepatoprotection activity.

MATERIALS

Moringa oleifera extract from Moringa oleifera leaves, Lactose, Starch, Talc, Magnesium stearate, propyl paraben, Maize starch, MCC, Gelatin.

METHODS

A.Extraction of Moringa oleifera Leaves

Moringa oleifera leaf extraction involves sorting and washing fresh leaves with tap water to get rid of any undesired materials, then washing them again with aquadest. After three days of drying, the leaves are ground into a powder. In a shearer, about 100 g of dry powder was combined with 1.0 litres of 70% ethanol. The mixture was then left in the shade at room temperature for three days, stirring occasionally.Sonication was used to filter and concentrate the ethanol fraction under vacuum, and the residue was then dried in a desiccator on silica. They were kept in airtight containers as powders.

Determination of average moisture content

The technique outlined was implemented with minor changes in BP 2009. A tarred petri dish was used to weigh one gramme of powdered Moringa oleifera leaves. After filling the petri dish, it was left to dry in the shade. The petri dish containing the material was then allowed to cool. Next, the weight of the sample divided by the weight of the moisture loss, represented as a percentage, was used to calculate the moisture content.

B. Preparation of granules

The formulations (F1 to F3) contain 12 mg maize starch each as disintegrant. The disintegrants were incorporated intra-granularly. In addition, maize starch was also used as binder in F1.

1. Weighing: 50mg of Moringa oleifera powder, 86.5mg of lactose and 12 mg of maize starch,3.2mg of talc,0.3mg of mg.sterate,3mg of propyl paraben and binders were weighed.
2. Mixing: The batches were small, mixing was done for 10 min, the extract dry powder and other excipients were mixed thoroughly.
3. Preparation of binder solution: 5% w/w of starch paste was prepared by weighing 5 g of binder maize starch powder and dispersed into 30 ml of distilled water. It was then added to a distilled water placed on a hot plate with continuous stirring until translucent paste was formed. The final 100 ml mark was made with distilled water and allowed to cool.
4. Addition of binder: Small quantity of the paste was added gradually to the powder mixture until moistened mass was formed.
5. Wet screening: The moistened mass was passed through a #10 mesh sieve.
6. Drying: The wet granules were dried in a hot air oven at 60°C and add

7. Dry screening: The granules were then passed through #14 mesh sieve and oversize granules were size reduced. Same was done for F3 but for F2, MCC was added in dry form. The granules were then characterized.

Particle size analysis of granules

Each metal was weighed with an accuracy of 0.001 g. Next, 10 g of Moringa oleifera leaf powder or granules were evenly packed onto a mesh sieve (ranging from 1000 µm to 150 µm), and the lid was secured. The flask was then shaken for 25 minutes with 5-minute shaking intervals. Afterward, the sieves were carefully separated, and the amount of material retained on each sieve was measured. The weight of the powder retained on each sieve was recorded, and the collection for each sieve was determined based on the weight difference. These values were used to calculate the percentage of the sample retained on each sieve and to determine the average particle diameter (dav) using the specified formula.

Preformulation studies

Physicochemical properties of granules

Angle of repose

The angle of repose was determined by taking the average of the three observations from the two experiments.

$\tan \theta = r/h$

where h is the heap's height and r is its circular heap's radius.

Bulk density

In order to determine the bulk density of each powder or granule sample, 10 g (M) of the sample was transferred into a 50 ml glass measuring cylinder, where the bulk volume (Vo) was noted. The following formula was used to determine the bulk density (Db):

$M/Vo = Db$

Three duplicates of the experiment were run, and the average results were reported.

Tapped density

The tapping density of every powder was measured using the Stampf Volumeter (model STAV 2003, JEF Germany). Ten grams (M) of each powder or granule sample were subjected to 250 taps after the bulk density was determined.tapped density (Dt) using the mechanically determined formula

$Dt = M / V$

The volume (V) of the powder column. Three duplicates of the results were obtained, and the averages were published (12).

Determination of Carrs Index

The bulk density and tapped density obtained from the above results were used to calculate Carr's index.

$CI = (Td-Bd)x100/Td$

Hausners ratio determination

The aforementioned findings from both tapped and bulk densities were used to calculate the Hausners ratio.

$Td/Bd = HR$

Preparation of tablets

1.The mixture is separated as equally weighing packets of 160mg.

2.The powder is fed to the tablet punching machine and are subjected to punching.These tablet represent about for 10 tablets.

Ingredients	Binders		
	Maize starch(F1)	MCC(F2)	Gelatin(F3)
Moringa extract	500mg	500mg	500mg
Lactose	865mg	865mg	897mg
Maize Starch	120mg	120mg	120mg
Binder	80mg	80mg	48mg
Talc	32mg	32mg	32mg
Magnesium stearate	3mg	3mg	3mg

Propyl paraben	3mg	3mg	3mg

RESULTS AND DISCUSSIONS

Evaluation tests: It is convenient to categorise tablet evaluation in immediate release dose forms into the following groups.

Appearance: The tablets were visually examined and were found to be free from visible defects such as capping, chipping, and lamination, indicating good physical integrity.

Tablet Hardness: The Monsanto firmness tester was used to measure the hardness of three tablets for each formulation. Between the tester's two jaws, the tablet was supported along its axis. The reading should now be 0 kg/cm2. The knob was then rotated to apply constant force until the tablet broke. At this stage, the value was expressed as kg/cm2.

Ingredients	Hardness
Maize starch	2.366
MCC	2.1
Gelatin	2.033

Percentage Friability

The strength of a tablet is measured by its friability. This test uses a plastic chamber that rotates at 25 rpm to subject several tablets to the combined effect of shock abrasion, lowering the tablets 6 inches away with each revolution. The Roche friabilator was filled with a sample of pre-weighed tablets and spun for 100 revolutions. After that, the tablets were weighed and powdered again. In general, a weight loss of less than 1% is seen as appropriate.

Ingredients	Initial weight	Final weight
Maize starch(F1)	3.18	3.16
MCC(F2)	3.19	3.18

Gelatin(F3)	3.19	3.17

Percentage of friability: initial weight -final weight/initial weight x100

Formulations	Friability%
F1	0.62%
F2	0.62%
F3	0.31%

Weight variation

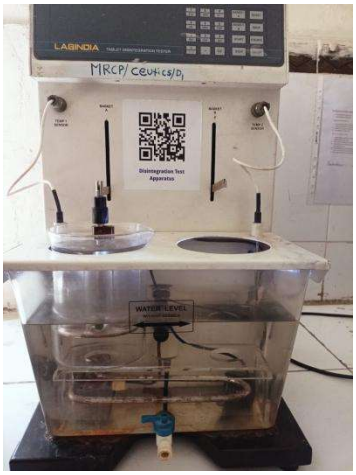
To determine the weight fluctuation Using an electronic balance, 20 tablets of each formulation were weighed separately. The average weight was then determined, and the weight of each tablet was compared to the average value to determine the weight deviation.

Weight variation % = Initial weight – Average weight /Average weight x 100

Formulation	Weight variation of the tablets
F1	0.62
F2	0.62
F3	1,26

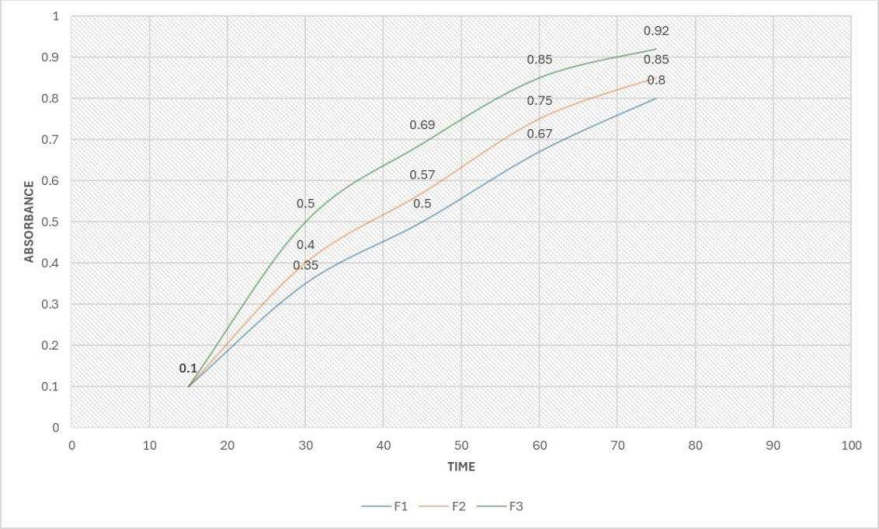
In vitro disintegration test

Using a tablet disintegration tester, the test was run on six tablets. A disintegration medium of 37±1°C distilled water was employed, and the amount of time in seconds it took for the tablet to completely dissolve and leave no palpable bulk in the device was recorded.



In vitro Dissolution test

Dissolution testing equipment was used to determine the proportion of Moringa tablets that dissolved. The solvent used was a 750 ml solution of 0.1 M HCL kept at 37 ± 0.5 °C. At 50 rpm, it turned the wing. There is a plate in each glass. Using a UV spectrophotometer, dissolved samples (10 ml) were extracted for a specified period of time (15, 30, 45, 60, and 75 minutes) and then analysed at 205.1 nm. After the sample was taken out, a volume of fresh solution was added.



F1-Gelatin, F2-Maize starch, F3-MCC

TIME	Absorbance		
	F1	F2	F2
15	0.1	0.1	0.1
30	0.35	0.4	0.5
45	0.5	0.57	0.69
60	0.67	0.75	0.85
75	0.8	0.85	0.92

Physicochemical properties of granules

Formulation	Angle of repose (°)	Bulk density (g/ml)	Tapped densitry (g/ml)	Carrs index	Hausners ratio
F1	16.00	1.10	1.33	13.5	1.16
F2	24.09	0.65	0.70	10.0	1.08
F3	23.54	0.70	0.75	6.05	1.04

CONCLUSION

An ethanol extract of Moringa oleifera leaves, a 160 mg tablet was succesfully formulated and evaluated. Thus, Moringa oleifera can be tableted with various binders and yet yield encouraging outcomes. According to investigations, gelatin is the preferred binder for making Moringa oleifera tablets because it has passed all necessary testing. It is necessary to conduct additional research on the mechanical strength and lamination characteristics of Moringa tablets.

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