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COMPLETE STUDY FORMULATION OF EFFERVESCENT TABLET FROM CARICA PAPAYA, MORINGA AND AJWAIN IN DIABETIC

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ABSTRACT

Objectives: *Studies show that papaya and bay leaf have significant medicinal properties, including the ability to help with degenerative diseases like diabetes. However, no herbal tablets combining these two plants have been made before. This research aimed to develop tablets using extracts from papaya and bay leaf, combined with different concentrations (1%, 2%, and 3%) of the binder polyvinylpyrrolidone (PVP) K30, prepared through the wet granulation method.*

Methods: *The tablets were evaluated for their physical properties, such as weight variation, friability (resistance to breaking), hardness, disintegration time, and appearance, using standard pharmaceutical methods. The total flavonoid content in the extracts was measured using a spectrophotometer.*

Results: *The tablets were light brown with flat surfaces, a specific smell, and a bitter taste. Their physical properties met pharmaceutical standards. The flavonoid content in papaya and bay leaf extracts was 1.562% and 2.240%, respectively.*

Conclusions: *PVP K-30 can effectively be used as a binder to produce high-quality, ready-to-use tablets from papaya and bay leaf extracts.*

KEYWORDS: *Papaya extract, Bay leaf extract, Tablets, Polyvinylpyrrolidone K30, Flavonoid.*

INTRODUCTION

Medicinal plants play a crucial role in healthcare, with about 80% of the global population relying on traditional medicine, which is mostly plant-based. Traditional medicine encompasses various natural healthcare systems like Ayurveda, Siddha, Unani, and tribal or folk practices. These practices, which date back to ancient times, are primarily based on practical experience rather than modern scientific principles.

In India, around 7,500 plants are used in traditional health practices, especially in rural and tribal areas. However, the medicinal properties of over 4,000 of these plants remain either unknown or poorly understood by the general population.

Classical systems like Ayurveda, Siddha, Unani, and Tibetan medicine utilize about 1,200 plants. Among these, plant-based treatments for liver diseases have been widely used in India and have gained global attention through pharmaceutical advancements. Despite this, many plant-based medicines, including those for liver diseases, are not widely accepted as mainstream treatments.

The process of combining multiple herbs in specific proportions to create tablets is known as herbal tablet formulation (HTF). This approach, rooted in ancient medical systems like Ayurveda, is based on the idea that combining herbs in the right ratio can effectively treat various diseases, including diabetes.

COUNTRY NAME	2000	2030
India	31.7	79.4
China	20.8	52.8
Europe	28.3	37.4
Australia	0.9	1.7
United States canada	19.7	33.9

Prevalence of diabetic: Estimated number of people region wise for the year 2000-2030

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MATERIAL AND METHOD

This experimental study measured blood glucose levels in male rats before and after treatment to evaluate the antidiabetic effects of Moringa leaves and papaya seeds.

The chemical compounds from Moringa leaves and papaya seeds were extracted using maceration with 96% ethanol as the solvent.

Antidiabetic activity was tested by monitoring the blood glucose levels of male rats induced with 10% glucose. The rats were divided into six groups: negative control, positive control, glibenclamide (5 mg), and groups treated with single or combined extracts.

Preparation of Moringa Leaf Extract

Fresh Moringa leaves (M. Oleifera) were sorted, washed, and weighed (2 kg wet weight). The leaves were dried, blended into powder, and sieved with a 40-mesh sieve. A powdered leaves were soaked (macerated) in 96% ethanol in a 1:5 ratio for three days with occasional stirring.

The mixture was then filtered, and the residue was soaked again with fresh ethanol. This process was repeated three times. The collected extract was filtered and concentrated using a rotary evaporator at 40°C. The final thick extract was collected, weighed, and stored.

Preparation of Papaya Seed Extract

Fresh papaya seeds (C. Papaya L.) were sorted, washed, and weighed (2 kg wet weight). After drying, They were ground into powder using a blender and sieved through a 100-mesh sieve. A powdered seeds were macerated in 96% ethanol in a 1:3 ratio for three days with occasional stirring.

The mixture was filtered, and the residue was re-soaked with fresh ethanol. This process was repeated three times.

The extract was then filtered and concentrated using a rotary evaporator at 50°C. The final thick extract was collected, weighed, and stored.

CARICA PAPAYA

MORINGA

EXTRACTION OF MCERATION PROCESS

Preparation of Plant Extracts

1. Carica papaya Leaves:

The leaves were washed under running tap water for 5 minutes and dried naturally. A total of 25 g of dried leaf powder was soaked in 250 ml of 75% ethanol for 72 hours.

The mixture was then filtered using Whatman No. 41 filter paper, and the filtrate was concentrated using a rotary evaporator at 45°C under reduced pressure.

2. Moringa oleifera Leaves:

Leaves were collected from mature plants and dried at 40°C for two days. To extract bioactive compounds, 25 g of powdered

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leaves were soaked in 80% ethanol for 72 hours at room temperature with occasional stirring.

The solvent was removed using a rotary vacuum evaporator, and the extract was stored in a dark container at 4°C for further analysis.

Development and Evaluation of Herbal Tablet Formulation (HTF)

To prepare herbal tablets, extracts from three plants were used:

Carica papaya (leaves)
Moringa oleifera (leaves)
Carrissa carandus (fruit)

The extracts were analyzed to identify active compounds and underwent phytochemical screening. The herbal tablets were formulated using the wet granulation method with the following excipients:

Microcrystalline cellulose: Binder
Starch: Filler
Cros-povidone: Disintegrant
Aerosol: Flow enhancer
Vanillin: Flavoring agent
Magnesium stearate: Lubricant

This process resulted in the development of a herbal tablet containing the combined benefits of the three plant extracts.

MECHANISM OF EFFERVESCENT

Effervescent Tablets

EFFERVESCENT TABLET IN GLASS WATER

Effervescent tablets are designed to dissolve in water, releasing carbon dioxide to form a fizzy solution.

These tablets are made by compressing powdered ingredients into dense masses and are typically packaged in blister packs or hermetically sealed containers with desiccants to protect them from moisture. To use, the tablet is simply dropped into water to create a solution.

In addition to tablets, effervescent formulations are available as powders or granules. These powdered ingredients are often granulated before being compressed into tablets.

Effervescent tablets are increasingly popular in both the supplement and pharmaceutical industries due to their convenience and ease of consumption.

They dissolve quickly in liquids like water or juice, making them a preferred choice for people using them medicinally or as dietary supplements.

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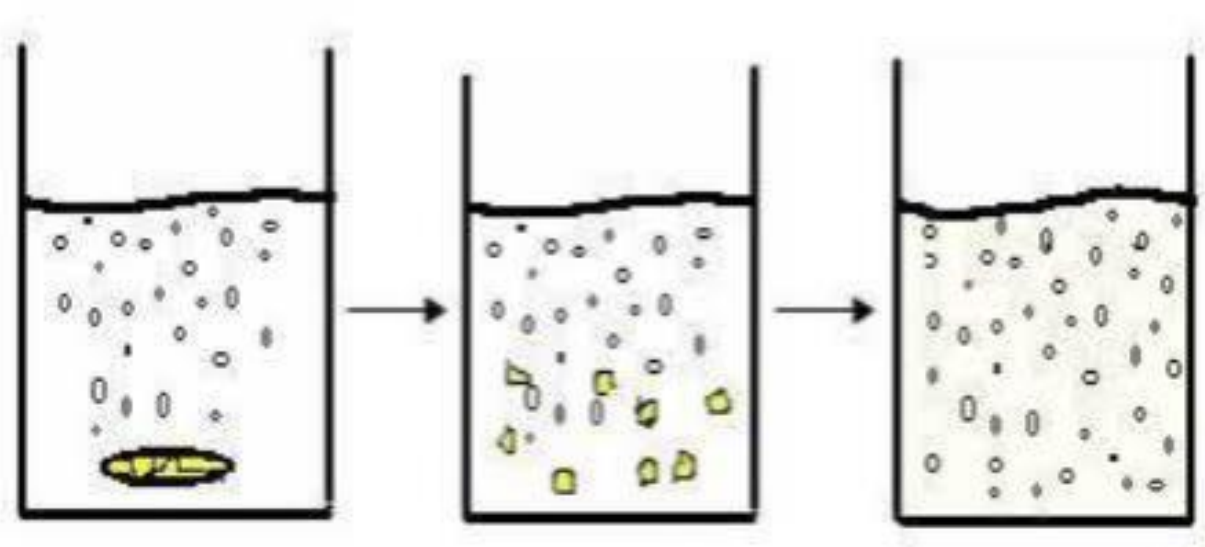

MECHANISM of Effervescent

ADVANTAGES OF EFFERVESCENT TABLET

Quick action.
No need to swallow a tablet.
Gentle on the stomach and intestines.
Easy to carry and use.
Better taste.
Stable over time.
Consistent and reliable effects.
Can include large amounts of active ingredients.
Precise dosing.
Enhanced therapeutic effects.
Useful in remote areas where injections are costly or require trained personnel.

Disadvantages of Effervescent Tablets

Some ingredients may taste unpleasant.
Tablets are large and need special packaging.
Production is expensive due to costly ingredients and facilities.
A clear solution is preferred for consumption, though fine dispersions are now acceptable.

DRY GRANULATION

Dry granulation is a process where powders are compressed without using heat or solvents. It is considered the least preferred method of granulation. The process involves two main steps: compressing the powder mixture into a compact form and then milling the compact to produce granules.

There are two common methods for dry granulation:

1. Slugging: The powder is compressed into large tablets or "slugs," which are then broken down into granules.
2. Roller compaction: The powder is compressed between rollers to form a dense sheet, which is then milled into granules.

Methodology for Tablet Formulation

1. Preparation of Granules

All solid ingredients and excipients were sieved using sieve number 80.
Each material was weighed accurately using an electronic balance.
The active ingredient was mixed with diluents (microcrystalline cellulose and lactose) to form a dry powder, which was passed through sieve number 44.
Starch and methyl paraben were added to the mixture.
A paste of polyvinyl pyrrolidone was prepared by mixing it with isopropyl alcohol. This paste was added to the dry mixture to form a wet mass.

The wet mass was passed through sieve number 14 and dried in a tray dryer at 40°C for 30 minutes.
The dried granules were passed through sieve number 22.
Finally, the granules were lubricated with talc and magnesium stearate.

2. Compression of Tablets

The granules were evaluated and weighed to ensure a uniform weight of 500 mg per tablet.
Tablets were compressed using the RIMEK MINI PRESS-I machine and further evaluated.

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EVALUATION OF EFFERVESCENT TABLET

Pre-Compression Parameter: Angle of Repose

The angle of repose is the steepest angle formed between the surface of a powder pile and the horizontal ground. It measures the flow properties of the powder, as it reflects the friction between the particles.

The angle of repose (θ) can be calculated using the formula:

$\tan \theta = H / R$

Or

$\Theta = \tan^{-1} (H / R)$

Where:

Θ is the angle of repose

H is the height of the powder pile

R is the radius of the base of the pile

Procedure:

The powder is allowed to flow through a funnel fixed at a specific height onto a flat surface. The height (H) and radius (R) of the resulting powder heap are measured. Care is taken to ensure that the powder particles slide and roll smoothly through the funnel.

1. Angle of Repose (degrees)

20: Excellent flow

20-30: Good flow

30-34: Passable flow

40: Very poor flow

The angle of repose measures how easily a powder flows. A lower angle indicates better flow properties, while a higher angle suggests poor flow.

2. Flow Rate

Flow rate refers to how fast a mass of powder or granules flows through a funnel with a defined opening. To measure the flow rate:

1. Accurately weigh the powder.
2. Pour it into a funnel with an 8 mm opening.
3. Measure the time it takes for the powder to flow out completely using a stopwatch.

Flow Rate Formula:

Flow Rate = Weight of Granules / Time (seconds)

The flow rate indicates how easily the powder flows.

3. Bulk Density

Bulk density is the mass of the powder divided by its volume. To measure bulk density:

1. Pass 50 cm^3 of powder through a standard sieve (No. 20).
2. Fill a 100 ml graduated cylinder with the powder.
3. Drop the cylinder onto a hard surface from a height of 1 inch, three times.
4. Measure the final volume and divide the weight by this volume.

Bulk Density Formula:

Bulk Density (ρ) = Mass of Sample (M) / Final Volume (Vp)

4. Tapped Density

Tapped density is the mass of the powder divided by its tapped volume. To measure tapped density:

1. Pass 50 cm^3 of powder through a standard sieve (No. 20).
2. Fill a 100 ml graduated cylinder with the powder.
3. Drop the cylinder onto a hard surface from a height of 1 inch, 100 times.
4. Measure the final tapped volume and divide the weight by this volume.

Tapped Density Formula:

Tapped Density (Dt) = Mass of Sample (M) / Final Tapped Volume (Vt)

5. Carr's Index

method for measuring powder flow and density includes calculating the percentage of the powder's ability to settle or pack, which is important for determining the powder's suitability for processing.

Compressibility of Powder

The compressibility of a powder measures its potential to form strong and stable bridges or arches when compacted. It is often evaluated using Carr's Index, which is calculated using the following formula:

% Compressibility = (Df – Do) / Df × 100

Where:

Df is the fluff or poured (bulk) density.

Do is the tapped (consolidated) density.

Carr's Index and Powder Flow

The Carr's Index indicates how easily a powder flows, with a lower value suggesting better flow properties. Here's the classification based on Carr's Index:

5-15%: Excellent flow

12-16%: Good flow

18-21%: Fair to passable flow

23-35%: Poor flow

33-38%: Very poor flow

>40%: Extremely poor flow

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This index helps determine how the powder behaves during handling and processing

CONCLUSION

Herbal tablets were prepared using the wet granulation method with extracts from three plants:
Carica papaya (leaves)
Moringa oleifera (leaves)
Among the formulations, HTF-3 showed the best results in both pre-compression and post-compression evaluations. It was found to be suitable for oral administration and demonstrated effective pharmacological properties.

The formulations HTF-1, HTF-2, and HTF-3 showed standard values within acceptable limits. The results indicate that the developed formulations are suitable for oral administration and effective for pharmacological evaluation.

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