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Development and Evaluation of a Nutraceutical Tablet From Moringa Oleifera and Phyllanthus Emblica

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Abstract

Moringa oleifera and Phyllanthus emblica (amla) are well-known medicinal plants valued for their nutritional and therapeutic properties. Moringa leaves provide protein, iron, calcium, and essential micronutrients, while amla is one of the richest natural sources of vitamin C and polyphenols. Combining both in a single dosage form may enhance antioxidant activity and improve overall nutritional value.

The present study aimed to develop and evaluate a nutraceutical tablet formulated from moringa and amla leaf powders. Tablets were prepared by direct compression using optimized ratios with suitable excipients. Standard quality control tests confirmed acceptable hardness, friability (<1%), and disintegration (<10 minutes). Nutritional analysis revealed appreciable vitamin C (20–40 mg), iron (2–4 mg), and calcium (60–90 mg) per 500 mg tablet. Antioxidant assays (DPPH/ABTS)demonstrated synergistic radical-scavenging activity in the combined formulation compared with individual plant powders. Accelerated stability testing showed minimal loss of nutrients over three months.

This study concludes that a moringa–amla tablet is a promising, low-cost nutraceutical supplement with balanced micronutrient content and enhanced antioxidant potential.

Keywords: Moringa, Amla, Antioxidant, Nutraceutical Herbal tablet.

INTRODUCTION

Herbal nutraceuticals are gaining increasing attention as safe and effective alternatives to synthetic supplements for improving nutritional status and preventing lifestyle-related disorders. Among the many botanicals explored, Moringa oleifera (commonly known as drumstick tree or “Shigru”) and Phyllanthus emblica (amla or Indian gooseberry) hold a prominent position due to their rich nutritional and medicinal value.

Moringa leaves are considered a “superfood” owing to their high content of proteins, essential amino acids, iron, calcium, potassium, vitamins A, B, and C, along with a wide range of bioactive phytochemicals such as flavonoids and polyphenols. These components contribute to moringa’s well-documented antioxidant, anti-inflammatory, and hematinic properties, making it an excellent candidate for combating malnutrition and micronutrient deficiencies.

Amla, on the other hand, is one of the richest natural sources of vitamin C, containing powerful tannins (emblicanin A and B) and polyphenols with strong antioxidant potential. Traditionally, amla has been used to boost immunity, improve digestion, delay aging, and protect against oxidative stress–related disorders.The combination of moringa and amla in a single dosage form can provide synergistic benefits: moringa contributes protein, minerals, and flavonoids, while amla enhances vitamin C intake and supports iron absorption. Developing a nutraceutical tablet from these leaf powders offers a convenient, stable, and cost-effective means to deliver balanced nutrition with strong antioxidant potential. Such a formulation can be particularly valuable in addressing nutritional gaps in populations vulnerable to anemia, vitamin C deficiency, and oxidative stress–related health issues.

Therefore, this study focuses on the formulation and evaluation of a moringa–amla health nutritional tablet, emphasizing its nutritional composition, antioxidant capacity, and pharma**.**

Objectives:

1. To formulate a natural herbal supplement Develop a safe, effective, and nutritionally rich tablet.

3. To enhance immune system function Strengthen the body’s natural defense mechanism through the synergistic antioxidant and immune modulatory effects of both herbs.

4. To promote overall health and vitality Support energy, metabolism, and general wellness using naturally derived nutrients and bioactive compounds.

5. To promote traditional and sustainable medicine Integrate Ayurvedic knowledge of moringa and amla with modern pharmaceutical technology to produce an eco-friendly health supplement.

6. To assess safety and acceptability ensure that the developed tablet is safe, palatable, and suitable for regular human consumption.

Moringa Oliefera : Moringa leaves are the edible foliage of Moringa oleifera, a fast-growing tropical tree known for its high nutritional and medicinal value. They are rich in vitamins (A, C, E, and B-complex), minerals (calcium, iron, potassium), proteins, and antioxidants.

Synonyms -Moringa Pteridosperm Garten.[older botanical name]

Chemical Constitution- Alkaloids , Flavonoids , Phenolic Compound , Vitamin , Minerals , Proteins And Amino Acid , Tannins , Saponins , Carbohydrates.

Figure1.Moringa

Phyllanthus Emblica [amla] : Amla is the dried or fresh fruit of Phyllanthus emblica L., valued for its high vitamin C content and potent antioxidant, anti-inflammatory, and immunomodulatory properties.

Synonyms- Emblica officinalis Gaertn.(older botanical name, still commonly used in Ayurvedic texts)

Chemical constitution- Amla (Phyllanthus emblica) is rich in vitamin C, tannins (emblicanin A & B), phenolic compounds (gallic acid, ellagic acid), and flavonoids (quercetin, kaempferol). These constituents give it strong antioxidant, anti-inflammatory, and rejuvenating properties.

Figure2.Amla

ADVANTAGES OF HERBAL TABLET

1 Made from plant-based ingredients, free from synthetic chemicals.

1 Generally safe and well-tolerated by the body.
2 Enhances the body's natural defense system.
3 Helps maintain physical and mental well-being.
4 Convenient to carry, store, and consume.
5 Ensures accurate and consistent dosing.
6 Biodegradable and safe for nature.
7 Can be taken regularly without risk of addiction or toxicity.
8 Usually more affordable than synthetic medicines.
9 Treats the root cause, not just the symptoms.

Formulation Table:

Sr.No	Name of Ingredients	Role of Ingredient	Quantity taken (For 300 mg)		
			F1	F2	F3
01	Moringa powder	Antioxidant, boosts energy	120mg	105mg	90mg
02	Amla powder	Rich vitamin c , minerals	75mg	90mg	105mg
03	Ashwagandha powder	Rich in nutrient, energy booster	45mg	60mg	75mg
04	Magnesium Stearate	Lubricant, antiaderant	45mg	36mg	30mg
05	Talc	Lubricant	9mg	6mg	6mg
06	Lactose	Binding , diluent	6mg	3mg	3mg

Preparation Method of Herbal Tablet

Preparation of leaves Powder:

- Harvest fresh moringa , amla , ashwagandha leaves from a tree that is at least six months old.
- Wash the leaves thoroughly with clean water to remove any dirt or debris.
- Spread the leaves out on clean cloth or paper towel and allow them to air dry completely. This can take several days depending on the humidity levels in your area.
- Once the leaves are completely dry, remove the stem and any tough parts of the leaves Grind the leaves into a fine powder using a morter and pestle or a food processor.
- You can also use a grinder or blender, but make sure to grind the leaves in small batches to avoid overheating the machine.
- Store the moringa leaf powder in an airtight container in a cool, dry place away from direct sunlight.

Preparation method of Nutraceutical Herbal Tablet:

Dry the individual herbal powders (Moringa, Amla, and Ashwagandha) in a hot air oven at 40–45°C until moisture content is below 5%.

This ensures proper flow and compressibility

Pass each dried powder through sieve no. 40 to obtain uniform particle size and remove lumps.

Weigh powders accurately in the following proportion (example ratio):

Mix all herbal powders uniformly using a double cone blender for 10–15 minutes.Addition of Excipients:Add talc (2%), magnesium stearate (1%) , Lactose as respectively.Evaluation Check flow properties (angle of repose, bulk density, tapped density, Carr's index, Hausner ratio).Ensure the blend is free-flowing and suitable for direct compression.Direct Compression: Compress the blend using a rotary tablet press with flat or concave punches.Adjust pressure to obtain tablets of desired hardness, Weight

variation, friability, and disintegration tests should meet pharmacopoeial standard. Packaging and Store the tablets in airtight containers away from moisture and light.

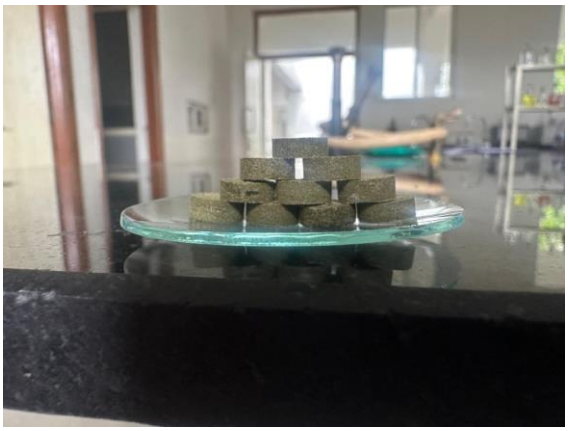

Figure.3 Herbal Tablet

Evaluation of Powder:

1. Bulk density:

By measuring the volume (V) and weight (M) of the pre-sieve blend in a graduated cylinder, the apparent bulk density (pb) of the powder blend was determined. Bulk density was calculated by using given equation:

pb=M/V

2. Tapped density:

Pouring the accurately measured amount of powder blend into the graduating cylinder and measuring the volume (V) allowed for the determination of tapped density. After that, the graduated cylinder's lid was closed, and it was tapped with a bulk density apparatus until the cylinder's volume remained constant. The tapped density was calculated by using given equation.

Pt=M/V

3. Angle of repose:

The fixed funnel method was utilized to calculate the angle of repose. The tip of the funnel was keeping at a specific height (h) above a graph paper that was placed on a left horizontal surface, with the funnel set perpendicular to the axis of symmetry. After pouring the powder blend down the funnel, the ideal cone height (h) of the powder blend was achieved. The diameter (2r) of the base of the powder cone was determined and the tangent of the angle of Repose was calculated by given equation:

O-tan-1 (h/r)

4. Compressibility Index [Carr's index]:

The poured and tapped density values of a material can be used to calculate the compressibility index, also known as Carr's index. It is theoretically possible to state that a material is more flowable the less compressible itis. It can be determined by substituting the values of poured density and tapped density in the equation given below:

$$C= (pt-pb)/t \times 100$$

Where, pt is tapped density and pb is untapped density.

5. Hausner's ratio:

Hausner's ratio is an index of powder flow and was measured by the ratio of tapped density to the bulk density.

$$\text{Hausner's ratio}= pt/pb$$

Where, pt is tapped density and pb is untapped density.

Evaluation Parameters:

1. Thickness: Using vernier calipers, ten tablets at random from each batch can be used to determine thickness. Every reading was made three times.

2. Hardness: Using a Monsanto Hardness Tester, ten tablets at random from each batch can be used to determine hardness. About 3-5 kg/cm2 of hardness is considered as appropriate for uncoated tablets.

3. Friability :A Roche Friabilator was used to test the sample's friability. For four minutes, ten pre-weighed tablets were rotated at 25 rpm. After dusting, the tablets were weighed again. Friability is usually defined as the weight of the tablet decreasing in the container as a result of the surface's tiny particles being removed.

4. Weight variation: Ten tablets were randomly selected from each batch, individually weight; the average weight and percentage deviation from the average were calculated. It is done in order to ensure uniformity in the weight of tablets in a batch.

5. Disintegration time: Disintegration was identified using a USP basket-style apparatus. To examine One tablet was inserted into each of the six basket tubes, covering the tablets with a plastic disk, and the rack holding the tablets was placed in a one-liter beaker of water to allow for disintegration. The water's temperature was constantly kept at 37±20 C. The oscillation was applied to tablets at a frequency of 28-32 cycles per minute. After fifteen minutes, take the basket out of the liquid and check the tablets. When every tablet dissolves after 15 minutes, the test is considered successful. If one or two of the tablets do not dissolve, try the test again with 12 more tablets. The tablets pass the test if not less than 16 of the totals of 18 tablets have disintegrated.

Table 2.Preformulation evaluation of Herbal Powder

Sr.No.	Pre formulation parameters	Results
01	Bulk density	0.5128
02	Tapped density	1.950
03	Angle of repose	Ø=3096
04	Carr's index	-280.85%
05	Hausner's ratio	0.26

Table.03 .Organoleptic characteristics of Herbal Tablets:

Sr No	Organoleptic Characteristic	Observation
01.	Colour	Greenish
02.	Odour	Characteristic
03.	Taste	Bitter
0.4	Apperance	Rough surface

Table 4. Evaluation of Herbal tablet:

Sr.No	Parameters	Results
01.	Thickness	2-4mm
	Hardness	3-6kg/cm²
03.	Friability	$\leq$ 1% wgt. Loss
04.	Weight variation	$\pm$ 5% for tablet $\leq$ 300 mg
05.	Disintegration time	Within 30 min

Result and Discussion:

The organoleptic properties of chocolate are excellent for masking unpleasant flavors associated with moringa and amla. This chocolate formulation provides a palatable means for boosting immunity. The drug extracts which are used in the dose range are safe for consumption and can be swallowed without any risk of side effects. Value addition in chocolate has been done by this effort Beneficial in general debility. Natural source of vitamin c. quickly replenish in the form of natural mineral like magnesium, phosphorus, potassium copper, iron etc.

Conclusion:

This study centered on the creation, assessment, and nutritional analysis of a health-focused herbal tablet derived from Moringa, designed as a natural supplement abundant in essential vitamins, minerals, and bioactive elements. The research showed that Moringa oleifera leaf powder can be successfully integrated into a stable tablet formulation using the direct compression method.

Phytochemical analysis revealed the presence of important bioactive compounds, such as alkaloids, flavonoids, phenolics, tannin, sapiens, and glycoside, contributing to Moringa's antioxidant, anti-inflammatory, and immunomodulatory attributes. Quantitative assessments indicated that the Moringa tablets are a rich source of essential micronutrients, including calcium, iron, potassium, vitamin A, vitamin C, and other crucial trace elements that support nutritional and metabolic balance.

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