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Formulation and Evaluation of Herbal Tea Bag Containing Moringa Oleifera and Bacopa Monnieri (Brahmi) Powder for Cognitive and Metabolic Health

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Abstract: *The increasing demand for natural health-promoting products has led to growing interest in herbal formulations that offer both therapeutic benefits and ease of use. This research focuses on the formulation and evaluation of herbal tea bag containing Moringa oleifera and Bacopa monnieri (Brahmi) powders, aimed at supporting cognitive and metabolic health. Moringa oleifera is widely recognized for its antioxidant, anti-inflammatory, and antidiabetic properties, while Bacopa monnieri is traditionally used in Ayurvedic medicine for its nootropic and neuroprotective effects. The synergistic combination of these two potent herbs in a tea bag formulation provides a convenient delivery system that may enhance bioavailability and user compliance. The research involved standardized processing of Moringa oleifera leaves and Bacopa monnieri leaves to obtain fine powders, which were then blended in various ratios to optimize efficacy and organoleptic properties. Physicochemical evaluation was performed, including moisture content, pH, bulk density and flow properties. Additionally, Extractive values were determined using both aqueous solvents to assess the solubility and potential availability of active constituents in brewed tea.*

Keywords: Moringa, Brahmi, Metabolic health, Cognitive health

I. INTRODUCTION

In recent years, there has been a significant shift in global health trends towards natural, plant-based remedies for the prevention and management of various chronic health conditions. The use of herbal teas as functional beverages has gained increasing popularity due to their perceived safety, minimal side effects, and the presence of bioactive compounds that offer therapeutic benefits. Among various herbs known for their medicinal properties, Moringa oleifera and Bacopa monnieri (commonly known as Brahmi) have garnered attention for their potent health-promoting effects, particularly in the areas of cognitive function and metabolic regulation. Moringa exhibits anti-inflammatory, antidiabetic, and neuroprotective activities, making it a valuable ingredient in managing metabolic disorders and oxidative stress-related cognitive decline. Bacopa monnieri (Brahmi) is a well-documented nootropic herb used for centuries in Ayurvedic medicine to enhance memory, learning ability, and mental clarity. It contains active constituents like bacosides, which have shown potential in supporting synaptic activity, reducing anxiety, and protecting neurons from oxidative damage. The combination of these two herbs in a tea bag formulation presents a novel approach to delivering multiple health benefits in a single, easily consumable product. The synergistic action of Moringa and Bacopa may provide enhanced cognitive performance, improved glucose metabolism, and overall wellness. This research aims to formulate and evaluate a standardized herbal tea bag containing Moringa oleifera and Bacopa monnieri powders. The study involves the selection and processing of raw materials, optimization of herbal blends, preparation of tea bags, and evaluation of various parameters including extractive value, phytochemical screening, and sensory properties. Through this work aim to create a scientifically supported, user-friendly herbal tea product that offers natural support for mental function and metabolic balance.

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Objectives:

- To develop an optimized herbal tea bag formulation using Moringa and Brahmi powders in appropriate proportions for maximum efficacy and sensory acceptability
- To analyse the presence of bioactive compounds such as Proteins, flavonoids, tannins, Alkaloids and in the formulated herbal tea powder.
- To assess the physical and chemical properties of the tea infusion, including pH, total soluble solids and infusion time.
- To assess the organoleptic properties (taste, odour, colour, and overall acceptability) of the herbal tea through sensory analysis.
- To develop functional herbal tea that can serve as a natural and health-enhancing alternative to conventional beverages.

Plant Profile:

Parameter	**Information**	
Drug Name	**Moringa oleifera**	**Bacopa monnieri**
Image		
Scientific Name	Moringa oleifera Lam.	Bacopa monnieri
Taxonomical classification	Kingdom: Plantae Division: Magnoliophyta Class: Magnoliopsida Order: Capparales Family: Moringaceae Genus: Moringa Species: Moringa oleifera	Kingdom: Plantae Division:Angiosperms Class: Eudicots Order: Lamiales Family: Plantaginaceae Genus: Bacopa Species: Bacopa monnieri
Uses	Antioxidant Properties Anti-inflammatory Blood Sugar Regulation Cholesterol Management	Cognitive Enhancement Stress and Anxiety Reduction Neuroprotective Benefits Anti-inflammatory

MATERIAL AND MATHODS:

FORMULA - Table1: Formulation of tea bags

Sr No.	**Ingredients**	**F1 Batch Moringa: Brahmi (1:1)**	**F2 Batch Moringa: Brahmi (2:3)**	**F3 Batch Moringa: Brahmi (3:2)**
	Moringa leaf powder	10 gm	8 gm	12 gm
	Brahmi leaf powder	10 gm	12 gm	8 gm
	Monk fruit Powder	2.5 gm	2.5 gm	2.5 gm

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Procedure:

Leaf Cleaning and Drying:

Begin by thoroughly washing Moringa and Brahmi leaves to eliminate dust, dirt, and any other impurities. After cleaning, dry the leaves in a shaded, well-ventilated area until they become completely crisp and brittle.

Powder Preparation:

Once fully dried, grind the Moringa and Brahmi leaves separately using a grinder until a fine, uniform powder is obtained. Ensure there are no coarse particles remaining.

Blending and Sweetening:

Mix the Moringa and Brahmi powders in the desired proportion. Add a natural sweetener if needed, ensuring even distribution throughout the blend.

Sieving:

Pass the blended mixture through a fine mesh sieve to achieve a consistent texture and remove any remaining coarse particles or impurities.

Evaluation:

Conduct evaluation tests on the herbal powder blend to assess its taste, odour and overall quality.

Tea Bag Filling:

Carefully fill the tea bags manually with the blended herbal powder, ensuring each bag is properly sealed without spillage or trapped air.

Fig: Herbal Tea Bag

Evalution Tests:

Phytochemical Evaluation:

Prepare an extract of the herbal tea powder using a distilled water and carry out various phytochemical evaluation tests, such as alkaloids, saponin, tannin, flavonoid, protein and others.

Organoleptic Evaluation:

The herbal tea powder was assessed for their organoleptic properties, including colour, odour, and taste.

Sr No.	Organoleptic Characters	F1 Batch	F2 Batch	F3 Batch
	Colour	Greenish brown	Greenish brown	Greenish brown
	Odour	Aromatic	Aromatic	Aromatic
	Taste	Sweet	Sweet	Sweet

Table No. 4

Organoleptic Parameters

3. Physicochemical Evaluation:

1) Total ash value:

Purpose: The total ash value determines the total amount of inorganic matter (minerals and impurities) present in the herbal tea powder.

Procedure:

1) Weigh about 2 grams of accurately measured powdered herbal tea in a pre-weighed crucible.
2) Incinerate the sample in a muffle furnace at 500–600°C for 1 hour.
3) Cool the crucible in a desiccator and weigh it again.

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4) Calculate the total ash content using the formula:

$$\text{Total Ash (\% w/w)} = \frac{\text{Weight of ash}}{\text{Weight of sample}} \times 100$$

2) Acid-Insoluble Ash:

Purpose:

Acid-insoluble ash measures the portion of the total ash that is insoluble in dilute hydrochloric acid, primarily indicating siliceous impurities like sand and soil. It is a critical test to check external contamination in herbal products.

Procedure:

1) Use the total ash obtained from the previous test.
2) Add 25 mL of dilute hydrochloric acid to the crucible containing the ash.
3) Boil gently for 5 minutes.
4) Filter the mixture through an ashless filter paper.
5) Dry the filter paper with residue and incinerate in a muffle furnace at 500–600°C.
6) Cool in a desiccator and weigh the residue.

$$\text{Total Ash (\% w/w)} = \frac{\text{Weight of residue}}{\text{Weight of sample}} \times 100$$

3) Water-Soluble Ash:

Purpose:

Water-soluble ash quantifies the part of the total ash that is soluble in water. It indicates the amount of inorganic salts present that are naturally soluble in water. Low values may indicate excessive washing or adulteration.

Procedure:

1) Take the total ash and boil it with 25 mL of distilled water for 5 minutes.
2) Filter through an ashless filter paper.
3) Collect the insoluble matter on the filter paper.
4) Incinerate the filter paper and residue in a muffle furnace.
5) Subtract the weight of the residue from the total ash

$$\text{Water-Soluble Ash (\% w/w)} = \text{Total ash} - \text{Water-insoluble ash}$$

4) Loss on Drying (LOD):

Purpose:

The purpose of determining Loss on Drying (LOD) in herbal tea powder is to measure the amount of moisture and volatile matter present in the sample. High moisture content can affect the product's shelf life, quality, and microbial stability.

Procedure:

1) Weigh 2 g of herbal tea powder into a pre-weighed moisture dish.
2) Dry in a hot air oven at 105°C for until constant weight.
3) Cool in a desiccator and reweigh.
4) Calculate LOD using:

$$\text{LOD (\%)} = \frac{\text{Initial weight} - \text{Final weight}}{\text{Initial weight}} \times 100$$

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5) pH Determination:

Purpose:

To determine the acidity or alkalinity of a solution prepared from herbal tea powder.

Procedure:

1) Dissolve 5 g of powder in 50 mL distilled water.
2) Stir, let stand, and filter.
3) Measure pH using a calibrated pH meter

6) Bulk Density:

Purpose:

To determine the mass per unit volume of the powder, including the space between particles. It's important for packaging, processing, and formulation.

Procedure:

1) Weigh a known quantity of the herbal tea powder (e.g., 10 g).
2) Transfer into a graduated cylinder (e.g., 50 mL).
3) Tap the cylinder gently to settle the powder.
4) Record the volume occupied.
5) Calculate bulk density using the formula:

$$\text{Bulk Density (g/mL)} = \frac{\text{Weight of powder (g)}}{\text{Volume occupied (mL)}}$$

7) Tapped Density:

Purpose:

Tapped density measures the maximum packing density of a powder after mechanical tapping.

Procedure:

1) Weigh a known amount of herbal tea powder (e.g., 10 g).
2) Transfer to a graduated cylinder.
3) Tap the cylinder 100 times using manually until volume no longer changes.
4) Record final volume.
5) Calculate tapped density:

$$\text{Tapped Density (g/mL)} = \frac{\text{Weight of powder (g)}}{\text{Tapped volume (mL)}}$$

8) Extractive Value: (Water-soluble)

Purpose:

To estimate the presence of water-soluble phytochemicals

Procedure:

1) Weigh 5 g of herbal tea powder.
2) Add 100 mL distilled water in a 250 mL conical flask.
3) Shake well and let it stand for 24 hours, shaking occasionally.
4) Filter the solution.
5) Evaporate 25 mL of the filtrate in a tared dish on a water bath.
6) Dry the residue to a constant weight.
7) Calculate the extractive value using:

$$\text{Extractive value (\% w/w)} = \frac{\text{Weight of sample}}{\text{Weight of residue}} \times 100$$

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9) Solubility (Herbal Tea Powder):

Purpose:

To evaluate how much of the herbal tea powder dissolves in water.

Procedure:

1) Weigh 5 g of herbal tea powder.
2) Add 100 mL of distilled water in a closed conical flask.
3) Shake well and let it stand for 24 hours, shaking occasionally.
4) Filter the mixture using dry filter paper.
5) Evaporate 25 mL of the clear filtrate in a tared evaporating dish.
6) Dry the residue at until constant weight.
7) Calculate solubility:

$$\text{Solubility (\% w/w)} = \frac{\text{Weight of sample}}{\text{Weight of residue}} \times 100$$

10) Infusion Test of Herbal Tea Bag:

Purpose:

To assess the clarity, colour, odour, and flavour of the herbal tea from a tea bag.

Procedure:

1) Boil 50 mL of distilled water.
2) Immerse one herbal tea bag in the hot water.
3) Steep for 5–10 minutes.
4) Observe the infusion: Colour, clarity, odour, taste.

Fig: Phytochemical Test Results

Fig; Ash Value Determination 1

Fig: LOD Determination

Fig: Solubility Determination

Fig: pH Determination

Fig: Density

Fig: Extractive Value Determination

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Results

Sr No.	Organoleptic Characters	F1 Batch	F2 Batch	F3 Batch
	Colour	Greenish Brown	Greenish Brown	Greenish Brown
	Odour	Aromatic	Aromatic	Aromatic
	Taste	Sweet	Sweet	Sweet

Table No. 2: Organoleptic Result

Table No. 3: Phytochemical Test Results

Sr No.	Phytochemical	Test Used	Observation	Result
	Alkaloids	Hager's Test	Yellow precipitate	Positive
	Flavonoids	Lead Acetate Test	Yellow ppt formed	Positive
	Carbohydrates	Benedict's Test	Brick-red precipitate	Positive
	Saponins	Foam Test	Persistent foam	Positive
	Alkaloids	Hager's Test	Yellow precipitate	Positive
	Phenols & Tannins	Ferric Chloride Test	Bluish Green precipitate	Positive

Table No. 4: Physicochemical Evaluation result

Sr No.	Parameter	F1 Batch	F2 Batch	F3 Batch
	Total ash value	7.2%	7.8%	6.5%
	Acid-Insoluble Ash Value	0.9%	1.1%	0.7%
	Water-Soluble Ash Value	3.8%	4.1%	3.5%
	Loss on Drying (LOD)	5.2%	6.0%	4.5%
	pH Determination	6.3	6.1	6.4
	Bulk Density	0.41 g/ml	0.39 g/ml	0.43 g/ml
	Tapped Density	0.54 g/ml	0.51 g/ml	0.56 g/ml
	Extractive Value (Water-soluble)	21%	19%	23%
	Solubility	Good	Moderate	Very good

Table No. 8: Infusion Tests Result of Herbal Tea Bag

Sr. No.	Parameters	F1 Batch Tea bags	F2 Batch Tea bags	F3 Batch Tea bags
	Clarity	Clear with slight haze, some fine sediment	Slightly hazy, more residue visible	Clear with minimal sediment
	Taste	Mild bitterness	More bitter	Smooth, less bitter
	Odour	Fresh herbal with balanced green notes	Strong herbal aroma, slightly pungent	Fresh, mild, pleasant green aroma
	Colour	Medium greenish-brown infusion	Darker greenish-brown	Light to medium greenish infusion
	Flavour	Good balance of Moringa and Brahmi flavors	Pronounced Brahmi flavour, slightly astringent	Smooth, slightly sweet with subtle vegetal notes

II. CONCLUSION

The F3 Batch (3:2 Moringa:Brahmi) emerged as the optimal herbal tea formulation, showing superior solubility, taste, and extractive value compared to F1 and F2. It offers enhanced bioavailability and therapeutic benefits, making it the most effective and suitable candidate for large-scale production. The balanced composition not only improves

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palatability but also ensures consistent quality and functionality. Overall, F3 demonstrates strong potential for commercial application, delivering improved health benefits to consumers.

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