Formulation And Evaluation of Herbal Gummies for Natural Memory Boosters or Memory Enhancers

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Abstract: Cognitive impairment, reduced concentration, and memory decline are increasingly observed due to ageing, stress, poor nutrition, and lifestyle disorders. The demand for safe, natural, and patient-friendly alternatives to synthetic nootropics has significantly increased in recent years. Herbal medicines, particularly those used in traditional systems such as Ayurveda, have shown promising neuroprotective and memory-enhancing properties with minimal adverse effects. The present study was undertaken to formulate and evaluate herbal gummies as a novel nutraceutical dosage form containing Brahmi**, walnut oil, and licorice root powder as natural memory enhancers. (Brahmi) is widely recognized for its cognitive-enhancing and neuroprotective properties. (Walnut) oil is rich in omega-3 fatty acids essential for neuronal function. (Licorice) root powder possesses antioxidant and adaptogenic properties that help reduce stress-induced cognitive decline. Gelatin was used as the gelling agent, citric acid as an acidulant, beetroot juice as a natural coloring agent, and sodium benzoate as a preservative. The prepared gummies were evaluated for physicochemical parameters such as organoleptic characteristics, pH, weight variation, texture, stability, and microbial load. The study demonstrated that herbal gummies can serve as an effective, palatable, and stable dosage form for natural memory enhancement.**

Key words: Herbal gummies, Memory support, Brahmi, Walnut, Liquorice, Herbal medicines.

I.INTRODUCTION

Memory is a complex cognitive process involving encoding, storage, and retrieval of information. It plays a crucial role in learning, problem-solving, and overall intellectual performance. Memory impairment can result from aging, oxidative stress, neurodegenerative diseases, poor dietary habits, and chronic stress. Conventional nootropic drugs, though effective, may produce side effects such as insomnia, anxiety, and dependency upon long-term use. Therefore, there is growing interest in herbal alternatives that are safer and suitable for long-term consumption. Ayurvedic literature describes several "Medhya Rasayana" herbs that improve memory and intellect. Among these, Brahmi is one of the most extensively studied herbs for cognitive enhancement. Modern research supports its ability to improve memory retention, learning capacity, and mental clarity. Gummies are a modern nutraceutical dosage form that combines therapeutic benefits with improved palatability. They are particularly advantageous for pediatric, geriatric, and non-compliant patients who have difficulty swallowing tablets or capsules. Herbal gummies offer:

- Improved patient compliance
- Better taste masking of herbal extracts
- Ease of administration
- Enhanced consumer acceptability

This study focuses on developing a standardised herbal gummy formulation containing selected memory-enhancing herbs and evaluating its quality parameters.

AIM:
To formulate and evaluate herbal gummies containing natural plant-based ingredients for enhancing memory and cognitive performance.

II.OBJECTIVES

1. To select suitable herbal ingredients with proven memory-enhancing properties.
2. To develop a stable and palatable gummy formulation.
3. To optimize the concentration of excipients for desired texture and stability.
4. To evaluate the prepared gummies for physicochemical and microbiological parameters.
5. To assess the stability of the formulation under various storage conditions.

III.PROFILE OF INGREDIENTS

1. Brahmi:

- Family: Plantaginaceae
- Common Names: Water hyssop, Jal Brahmi
- Active Constituents: Bacosides A & B, alkaloids, saponins
- Pharmacological Actions:
  - Memory enhancement
  - Neuroprotection
  - Antioxidant activity
  - Anti-anxiety effect

- Mechanism of Action:

Brahmi enhances synaptic transmission, increases dendritic branching in neurons, and reduces oxidative stress in brain tissues. Bacosides improve nerve impulse transmission and promote neuronal repair, thereby enhancing memory retention and learning capacity.

Fig 1. Brahmi

2. Walnut Oil:

- Family: Juglandaceae
- Active Constituents: Omega-3 fatty acids (alpha-linolenic acid), polyphenols, vitamin E
- Pharmacological Actions:
  - Improves cognitive performance
  - Supports brain cell membrane integrity
  - Anti-inflammatory effect

- Role in Memory Enhancement:

Omega-3 fatty acids are essential for maintaining neuronal membrane fluidity and neurotransmission. They play a significant role in improving cognitive flexibility and reducing age-related memory decline.

3. Liquorice Root Powder:

- Family: Fabaceae
- Active Constituents: Glycyrrhizin, flavonoids, saponins
- Pharmacological Actions:
  - Adaptogenic
  - Antioxidant
  - Anti-inflammatory
  - Neuroprotective

- Role in Cognitive Support:
- Liquorice reduces stress-induced hormonal imbalance and oxidative damage, indirectly supporting memory and cognitive performance.

Fig 2. Liquorice

4. Gelatin:

- Acts as a gelling agent to provide structure and chewable consistency.

5.Citric Acid:

- Provides acidic taste and maintains pH for stability.

6.Beetroot Juice:

- Natural coloring agent and antioxidant source.

7.Sodium Benzoate:

- Preservative used to prevent microbial growth.

IV.FORMULATION DEVELOPMENT

Rationale for Excipients:

- Gelatin: Provides elasticity and chewable consistency.
- Citric Acid: Enhances taste and maintains acidic pH for preservation.
- Beetroot Juice: Natural colorant and antioxidant.
- Sodium Benzoate: Prevents microbial growth.
- Purified Water: Solvent and dispersion medium.

FORMULATION TABLE (Per 100 g Batch)

Ingredient	Quantity	Role
Brahmi Extract	2 g	Memory enhancer
Walnut Oil	1 g	Cognitive support
Licorice Root Powder	1 g	Adaptogen
Gelatin	10 g	Gelling agent
Citric Acid	0.5 g	Acidulant
Beetroot Juice	5 ml	Colorant
Sodium Benzoate	0.1 g	Preservative
Purified Water	q.s.	Vehicle

V.METHOD OF PREPARATION

Step 1: Preparation of Gelatin Base:

Gelatin was soaked in purified water for 15 minutes for blooming. The swollen gelatin was heated in a water bath at 60–70°C until a clear solution was obtained.

Step 2: Preparation of Herbal Phase:

Brahmi extract and licorice root powder were dissolved/dispersed in warm purified water. Walnut oil was slowly incorporated with constant stirring to ensure uniform distribution.

Step 3: Addition of Additives:

Citric acid and sodium benzoate were added to the gelatin solution with continuous stirring. Beetroot juice was added to impart natural color.

Step 4: Mixing:

The herbal mixture was incorporated into the gelatin base under constant stirring to obtain a homogeneous viscous mass.

Step 5: Molding:

The prepared mass was poured into pre-lubricated silicone molds and allowed to cool at room temperature.

Step 6: Drying:

The gummies were dried at 25–30°C for 24 hours to achieve desired consistency.

Step 7: Packaging:

The dried gummies were removed and packed in airtight containers to prevent moisture absorption

EVALUATION OF HERBAL GUMMIES:

1. Organoleptic Evaluation:

- Color: Reddish (due to beetroot juice)
- Taste: Sweet-sour with mild herbal aftertaste
- Odor: Characteristic herbal
- Texture: Elastic and chewy

2. pH Determination:

The pH was measured using a digital pH meter. Acceptable range: 4–6.

3. Weight Variation Test:

Ten gummies were weighed individually and compared with average weight.

4. Texture Analysis:

Hardness and elasticity were evaluated manually or using a texture analyzer.

5. Moisture Content

Determined using a moisture analyzer to ensure stability.

6. Microbial Limit Test:

Total bacterial and fungal count were evaluated to ensure safety.

7. Stability Studies:

Conducted under:

- Room temperature (25°C ± 2°C)
- Accelerated condition (40°C ± 2°C, 75% RH)

Observed for changes in color, texture, odor, and microbial growth over 1–3 months.

VI.RESULTS AND DISCUSSION

The formulated herbal gummies showed satisfactory organoleptic properties with uniform color and acceptable taste. Gelatin concentration was optimized to provide proper chewability without stickiness. The pH was within acceptable limits, ensuring product stability.

No significant weight variation was observed. Microbial analysis confirmed the effectiveness of sodium benzoate as a preservative. Stability studies indicated no major changes in texture, appearance, or odor under recommended storage conditions.

The synergistic effect of Brahmi, walnut oil, and licorice root powder suggests potential cognitive enhancement with antioxidant and neuroprotective benefits.

VII.CONCLUSION

The present study successfully formulated and evaluated herbal gummies containing natural memory-enhancing herbs. The formulation demonstrated satisfactory physicochemical properties, stability, and patient acceptability.

Herbal gummies represent a promising nutraceutical dosage form for cognitive support and memory enhancement. Further clinical studies are recommended to establish efficacy in human subjects.

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