



Research Article

Formulation and Evaluation of Stress Relief Herbal Tea

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The present study focuses on the formulation and evaluation of a polyherbal tea blend designed to relieve stress and promote overall wellness. The formulation incorporates six medicinal ingredients—Chamomile, Ashwagandha, Peppermint, Liquorice root, Acacia gum, and Starch, with natural orange flavor for palatability. Each herb was selected based on its traditional use and scientifically validated therapeutic properties such as anxiolytic, antioxidant, anti-inflammatory, and adaptogenic effects. Three formulations (F1–F3) with varying concentrations were prepared by shade drying, powdering, blending, and sieving of plant materials. The blends were evaluated for organoleptic characteristics, ash value, moisture content, loss on drying, and flow properties, along with preliminary phytochemical screening. Results confirmed the presence of key phytochemicals such as alkaloids, flavonoids, glycosides, carbohydrates, and volatile oils, contributing to the therapeutic potential of the formulations. Among the three blends, Formulation F2 (the mid-blend) showed optimal moisture level, good flowability, and highest sensory acceptability. Thus, the developed polyherbal tea blend (F2) offers a natural, caffeine-free, and functional beverage with promising potential for stress relief and health enhancement.

Keywords: Herbal tea, Stress relief, Chamomile, Ashwagandha, Polyherbal formulation, Antioxidant, Phytochemical evaluation, Natural beverage.

INTRODUCTION

Herbal teas, also known as tisanes, are beverages prepared from the infusing or decoction of dried leaves, seeds, flowers, barks, fruits, or other botanical components derived from various medicinal plants. Unlike traditional tea obtained from *Camellia sinensis*, herbal tea are typically caffeine-free and are valued for their wide range of therapeutic and nutritional benefits. Historically, herbal teas have been used across cultures such as Ayurveda, Traditional Chinese Medicine (TCM), and European folk medicine for their curative and preventive health effects. The modern resurgence of herbal tea consumption is attributed to growing awareness about the side effects of synthetic drugs and global shift towards natural and plant-based alternatives. Herbal teas are rich in polyphenols, tannins, flavonoids, terpenoids, and other phytochemicals known to exhibit antioxidant, anti-inflammatory, antimicrobial, and immunomodulatory properties. These bioactive

compounds help in preventing oxidative stress, strengthening immunity, and managing several lifestyle related disorders. Depending on the combination of herbs used, herbal teas can serve multiple purposes – from improving digestion, relieving anxiety, and promoting relaxation to reducing cardiovascular risk and enhancing skin health. Studies have demonstrated that Polyherbal formulations, which combine more than one medicinal plant, often shows superior pharmacological activity compared to synergistic effects among phytoconstituents. Among the various medicinal plants, *Camellia sinensis*, *Moringa oleifera*, *Tulsi (Ocimum sanctum)*, *Stevia rebaudiana*, *Amla (Embelica officinalis)*, and *Zingiber officinalis* are widely used for preparing herbal teas. These herbs not only impart pleasant aroma and taste but also provide numerous health benefits such as antioxidant, hepatoprotective, cardioprotective, and anti-diabetic effects. Recent research has focused on the development of Polyherbal tea formulations that

enhances bioavailability, stability, and overall wellness benefits. Therefore, the present study aims to formulate and evaluate a Polyherbal tea blend combining selected medicinal plants based on their traditional and scientific evidence for antioxidant and therapeutic potential. The formulation is expected to serve as a natural, safe, and functional beverage that supports overall health and immunity enhancement.

MATERIALS AND METHODS:

Sample Collection:

The required ingredients were collected and pure active ingredients were obtained through the extraction process.

1. Chamomile:



Biological Source:

The biological source of chamomile is the dried flower heads of two main species: 1. *Matricaria recutita* 2. *Chamomilla recutita*. Both the species belong to the family Asteraceae, also known as the daisy or composite family.

Chemical Constituents:

Chamomile (*Matricaria Chamomilla*) contains several active constituents that contribute to its stress relieving properties. The primary compounds responsible for its calming and anxiolytic effects include:

1. Apigenin: A flavonoid that binds to benzodiazepine receptors in the brain, promoting relaxation and reducing anxiety. It has mild

sedative effects, helping to calm the nervous system.

- 2. Chamazulene:** A volatile oil with anti-inflammatory and anti-oxidant properties, which may directly support stress relief by reducing inflammation related tension in the body.
- 3. Bisabolol:** An essential oil with anti-inflammatory and also soothing effects on brain, contributing to calming properties by reducing mental stress.
- 4. Luteolin:** Another flavonoid with anxiolytic and anti-inflammatory effects which may help modulate stress responses in the brain.
- 5. Matricin:** A precursor to chamazulene, it supports the herb's anti-inflammatory and calming effects.

Medicinal Uses: It has anti-inflammatory and Calming effects on CNS.

2. Ashwagandha:



- **Biological source:** It consists of dried roots and stem base of *Withania somnifera* Dunal, belonging to family **Solanaceae**.
- **Chemical constituents:** Ashwagandha (*Withania somnifera*) contains withanolides as its active constituents leading to stress relieving properties.

1. Withanolides: They exhibit anti-inflammatory and anti-stress properties.

Examples: Withaferin A, Withanolide A, Withanolide

2. Alkaloids: Compounds like isopelletierine, anaferine, somniferine act as ashwagandha's calming effects.

3. Sioindosides: These are glycosylated derivatives of withanolides.

4. Other compounds: Saponins and Flavonoids.

- **Medicinal Uses:** Ashwagandha is used in traditional medicine to manage stress and anxiety, boost immunity and improve cognitive function.

3. Peppermint:



- **Biological Source:** The biological source of peppermint is the perennial herb *Mentha Piperita*, a hybrid of watermint (*Mentha aquatica*) and spearmint (*Mentha spicata*). It belongs to **Lamiaceae** family.
- **Chemical constituents:** Monoterpenoid menthol, Ketone menthol, flavonoids and Rosmarinic acid.
- **Medicinal uses:** It is mainly used to relieve tension and headaches.

4. Liquorice Root:



- **Biological Source:** The biological source of liquorice root is the perennial herb *Glycyrrhizaglabra*.

- **Chemical constituents:** glycyrrhetic acid, flavonoids, saponins, isoliquiritin, glycyrrhizin and glabridin

- **Medicinal uses:** It has anti-oxidant and anti-inflammatory properties.

5. Acacia:



- **Biological source:** The biological source of acacia is from the stem and branches of *Acacia Senegal*. It belongs to the family of **Fabaceae**.
- **Chemical constituents:** Gums, Tannins, flavonoids and Terpenes.
- **Medicinal uses:** To provide stability, emulsifying agent.

6. Starch:



- **Biological source:** Starch is founds in plants as a polysaccharide, located in seeds, roots, tubers and stems.

- **Chemical constituents:** It consists of Polysaccharide, Monomer and Polymer such as Amylose and amylopectin.
- **Medicinal uses:** Mainly used to increase flowability of powder.

7. Orange Flavour Powder:



- **Chemical constituents:** Hydrocarbon limonene, Octanol and various esters and alcohol.
- **Uses:** Used as a Flavouring agent.

Preparation of plant material, solvent selection and extraction methods:

1. Chamomile:

- **Preparation of plant material:**
 - Collect and purchase dried chamomile flowers, as they contain higher concentration of apigenin (primarily in the form of apigenin-7-glucoside).
 - Grind the dried flowers into a fine powder using a mortar and pestle or a mechanical grinder to increase surface area for extraction.
- **Solvent selection :**
 - Use a polar solvent like ethanol (70-80% aqueous solution) or methanol, as apigenin is moderately polar. Ethanol is preferred for its safety and effectiveness.
 - Alternatively, water can be used for hot water extraction, but it may yield lower apigenin concentration due to its polarity.
- **Extraction method:**

- **Maceration-** soaks the powdered chamomile (e.g., 100g) in 500-1000ml of 70% ethanol for 24-48 hours at room temperature with occasional stirring. This simple method is used for small scale extraction.

2. Ashwagandha:

- **Preparation of plant material:**

- Use dried ashwagandha roots and leaves, as they contain higher concentration of withanolides (root typically have 0.1-1.5% withanolides).
- Clean the plant material to remove dirt and impurities. Dry at 40-50°C to preserve active compound. Grind into a fine powder (40-60 mesh size) to increase surface area for extraction.

- **Solvent selection:**

- Common solvents include methanol, ethanol, or a mixture of alcohol and water (e.g., 70:30 ethanol: water). Methanol is effective for extracting withanolides due to their polarity but requires careful handling due to toxicity.
- For greener methods, supercritical CO₂ with ethanol as a co-solvent or aqueous extraction may be used.

- **Extraction method:**

- **Maceration:** Soak powdered material in methanol and ethanol (1:10 w/v ratio) for 24-48 hours with occasional shaking at room temperature. Filter the extract using Whatman filter paper or a vacuum filter.



Preparation of Herbal Tea Powder:

Formulation Table:

Sr.no.	Ingredients	F1 (Low blend)	F2 (Mild blend)	F3 (High blend)
1	Chamomile	0.4 gm	0.6 gm	0.8 gm
2	Ashwagandha	0.5 gm	0.5 gm	0.5 gm
3	Peppermint	0.2 gm	0.4 gm	0.6 gm
4	Liquorice	0.2 gm	0.2 gm	0.2 gm
5	Starch	0.1 gm	0.1 gm	0.1 gm
6	Acacia	0.05 gm	0.10 gm	0.15 gm
7	Orange Flavour	0.05 gm	0.05 gm	0.05 gm

Procedure:

1) Drying: Dried all herbal ingredients under shade to remove moisture.

2) Grinding: Each dried herb grinded separately to make fine powder.

3) Sieving: All the powders were passed through a fine sieve to obtain uniform particle size.

4) Weighing: All powders accurately weighed as per formulation'

5) Mixing: Herbal powders were mixed together in a clean, dry bowl. Gum acacia, starch, natural orange flavour were added. Mixed thoroughly to ensure uniform blending.

6) Sieving: The final blend was passed once more to remove lumps.

7) Packaging: Packed the blend in a airtight container and also filled 2g in per tea bag. Labeled properly with name, ingredients, and storage conditions.

8) Storage: Store in cool, dry place away from sunlight and moisture.

Evaluation Tests for Herbal tea blend:**A) Physiological Evaluation****1) Organoleptic Properties:**

The colour, odour, taste, and texture of the tea powder were evaluated. Two grams of each dry herbal tea sample were placed in a Petri dish, and a panel of

six assessors evaluated their colour, smell, taste, and texture.

2) Ash value:

Two grams of the herbal material were weighed into a crucible that had been preheated at $105 \pm 2^\circ\text{C}$ for 5 minutes and cooled in a desiccator. The sample was then incinerated at $525 \pm 25^\circ\text{C}$. After cooling, the crucible was weighed, reheated for 30 minutes, and weighed again. This process was repeated until a constant weight was obtained. The ash value percentage was calculated using Equation

$$\text{Ash Value (\%)} = \frac{\text{Weight of Sample Weight of Ash}}{\text{Weight of Sample}} \times 100$$

Where,

W1 = weight of crucible with ash, W2 = weight of crucible with sample, and W3 = weight of empty crucible.

3) Moisture content:

Three grams of the herbal material were weighed into an evaporating dish that had been preheated at $105 \pm 2^\circ\text{C}$ for 5 minutes and cooled in a desiccator before use. The evaporating dish containing the powder was placed in an oven at $105 \pm 2^\circ\text{C}$. It was removed every 30 minutes and weighed until two consecutive readings showed no change in weight. This process was repeated three times. The moisture content percentage was then calculated using Equation 2.

$$\text{Moisture Content (\%)} = \frac{W1 - W3}{W1 - W2} \times 100$$

Where:

W₁ = weight of crucible + sample before drying

W_2 = weight of crucible + sample after drying

W_3 = weight of empty crucible

This formula gives the percentage of moisture lost from the sample during drying.

4) Flow Properties of tea powder

a) The angle of repose:

The static angle of repose (α) was measured using the fixed funnel and free-standing cone method. Fifty grams of powder were placed in a funnel with a 1 cm orifice, positioned 10 cm above a flat surface. The funnel's tip was initially closed, then released to allow the powder to flow freely onto the surface. After all the powder had drained, the height and diameter of the formed cone were measured. The procedure was repeated three times.

The angle of repose was then calculated using the formula:

$$\tan \theta^\circ = 2H/D$$

Where,

θ° = angle of repose, H = height and

D = diameter.

b) Bulk and Tapped Densities:

The volume occupied by 50 g of granules was measured using a 200 mL graduated cylinder. The tapped volume, obtained after consolidation using an automated tapping machine (Sample volumeter, STAV 2003JEF, Germany), was also recorded. Both

the bulk volume (V_0) and tapped volume (V_T) were determined. The bulk and tapped densities were calculated by dividing the weight of the granules by their bulk (V_0) and tapped (V_T) volumes, respectively, as shown in Equation 5.

Mass (g)/Volume (V_0 or V_T)

c) Compressibility Index and Hausner's Ratio:

The compressibility index (CI %) was calculated from the bulk and tapped densities using Equation 6.

The formula for the Compressibility Index (CI %) is:

$$\text{Compressibility Index} = 100 \times \left(\frac{\rho_{\text{tapped}} - \rho_{\text{bulk}}}{\rho_{\text{tapped}}} \right)$$

$$\text{Hausner Ratio} = \left(\frac{\rho_{\text{tapped}}}{\rho_{\text{bulk}}} \right)$$

5) Loss on Drying:

Loss on drying is the loss of weight expressed as % w/w resulting matter can be driven off under specified condition. weight about 2gm of the air-dried crude drug in in dried in tarred flat weighing dish. Dry in oven at 100-105% C. Cool in desiccators over phosphorus pentoxide for specific period of time. The loss in weight is recorded as moisture. Repeat the process till constant weight is obtained.

B) Preliminary Phytochemical Screening:

Sr. No.	Test	Procedure	Observation
1.	Glycoside: a. Keller kiliani test	1ml filtrate+1.5ml glacial acetic acid+1 drop of ferric chloride+conc.H ₂ SO ₄	Reddish colour appear
2.	Carbohydrates: a. Molish Test	2ml filtrate+2-3 drops of Molish reagent +1ml conc. H ₂ SO ₄	Purple or violet colour ring at the interface of two layers
3.	Alkaloids test a. Wagners Test	2 ml Filtrate+2-3 drops of wagners reagent	Reddish brown colour appear
4.	Flavonoids test: a. Alkaline reagent test	2ml filtrate+ Few drops of dil. NaOH	Yellow colour appear
5.	Volatile oil: a. Sudan red Test	2ml filtrate + alcoholic sol. Of sudan III	Red colour appear

RESULTS AND DISCUSSION:

1) Organoleptic test:

Organoleptic analysis was carried out to assess the sensory attributes such as color, odor, taste, and overall acceptability of the herbal tea blends.







Evaluations	F1	F2	F3
Colour	Light Brown	Vibrant Brown	Deep Brown
Odour	Mild	Fresh Citrus	Earthy Spicy
Taste	Mildly Sweet	Balanced Bitter	Slightly Astringent
Overall acceptability	Medium Acceptability	High Acceptability	Low acceptability

Formulation F1 exhibited a light brown color and mild aroma but lacked strong flavor intensity. F3, containing higher chamomile and peppermint content, had a deep brown color and astringent taste, making it less palatable. F2, the mild blend, displayed a vibrant brown color, balanced bitterness, and fresh citrus aroma due to an optimized ratio of flavoring herbs and chamomile constituents. Among all, F2 was found to

be the most acceptable formulation based on sensory evaluation by the panelists.

2) Physiological Evaluation:

Physiochemical parameters such as moisture content, loss on drying, ash value, bulk density, tap density, angle of repose, Carr's index, and Hausner's ratio were determined to evaluate the stability, purity, and flow characteristics of the tea blend.

Parameter	F1	F2	F3	Figures
Moisture content (%)	10	11	12	
Loss on drying (%)	10.8	11.6	12.3	
Ash value (%)	0.36	0.38	0.40	
Angle of repose (°)	44	41	38	
Bulk density (g/mL)	0.46	0.48	0.50	
Tap density (g/mL)	0.65	0.67	0.69	






Carr's index (%)	29.2	28.3	27.5	-
Hausner's ratio	1.41	1.39	1.38	-
Flow character	Passable	Good	Good-Excellent	-

A gradual increase in moisture content and loss on drying from F1 to F3 was observed, which can be attributed to the increasing concentrations of chamomile and peppermint—both containing volatile components and hygroscopic oils. The ash value was within the acceptable range (<1%), confirming the purity and minimal inorganic contamination of the herbal blends. The angle of repose, Carr's index, and Hausner's ratio are indicators of powder flowability. F1 showed a passable flow (angle 44°), while F2 and F3 exhibited improved flow properties (angles 41° and 38°, respectively). The improved flow can be

linked to the presence of acacia and starch, which act as flow enhancers. Although F3 showed the best flow, its sensory characteristics were less desirable. Therefore, F2 achieved the most balanced physicochemical profile, combining good flow with favorable sensory properties.

3) Phytochemical Screening:

Phytochemical tests were performed to identify major bioactive constituents responsible for stress-relieving properties.

Phytochemical Test	Name of Test	Inference	Figures
1. Glycoside test	Keller kiliani Test	Glycoside present	
2. Carbohydrates Test	Molish Test	Carbohydrate Present	
3. Alkaloid Test	Wagners Test	Alkaloid Present	
4. Flavonoids Test	Alkaline reagent Test	Flavonoids Present	
5. Volatile Oil Test	Sudan Red Test	Volatile Oil Present	

The phytochemical screening confirmed the presence of flavonoids, glycosides, alkaloids, carbohydrates, and volatile oils. These compounds play a key role in the pharmacological efficacy of the herbal tea. Apigenin and luteolin from chamomile, withanolides from ashwagandha, and menthol from peppermint contribute synergistically to the anxiolytic and adaptogenic properties of the formulation. The presence of volatile oils and flavonoids suggests potential antioxidant and calming activity, validating the stress-relieving claim of the herbal tea. A comparative evaluation among formulations F1, F2, and F3 revealed that F2 exhibited an optimal balance of physicochemical and sensory attributes. The moderate concentrations of chamomile (0.6 g) and peppermint (0.4 g) provided a pleasant flavor profile and adequate antioxidant content without excessive bitterness or moisture retention. Improved flow parameters and stable moisture levels make F2 the ideal formulation for large-scale production and packaging.

CONCLUSION:

The formulated herbal tea blends were successfully developed using traditional stress-relieving herbs with complementary actions. All three formulations met acceptable physicochemical and phytochemical parameters, confirming their quality and purity. Among them, Formulation F2 (Mild Blend) demonstrated the best overall performance in terms of sensory acceptability, moisture stability, and flow characteristics. The presence of bioactive compounds such as flavonoids, glycosides, and volatile oils supports its potential role as a natural stress-relieving beverage. Hence, the developed F2 formulation can be recommended as a balanced, palatable, and effective herbal tea blend for managing mild stress and promoting relaxation.

CONFLICT OF INTEREST:

The authors declare no conflict of interest.

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