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Formulation, Development, and Evaluation of Polyherbal Formulation as an Energy Supplement

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Abstract

This study created a poly-herbal powder drink using traditional herbs with established nutritional benefits. Cinnamon bark, Amla leaves, and tulsi leaves were chosen for their refreshing, cooling, and energizing effects throughout the hot months. The final formulation was chosen based on taste and physicochemical attributes, following multiple experiments. The physicochemical study of the prepared drink revealed an optimal pH level, consistent with commercial guidelines. The drink received high ratings for color, taste, flavor, and texture on a nine-point hedonic scale. The created herbal drink offers consumers a cost-effective and tasty option with possible health benefits. The present drink has the potential to replace synthetic drinks on the market.

Keywords: Polyherbal powder drink, Sensory evaluation, Herbal drugs.

INTRODUCTION

India has used herbal drugs for long safe and continuous uses in alternative medicines for the treatment. Millions of people from the world wide used herbal medicine continuously and the number will double in a few years. Indian are used herbal drugs regularly as home remedies, healthy food as well as over-the-counter self-medications by Ayurveda doctors. Its definition was "any substance that may be considered food or part of a food and provides medical or health benefits, including the prevention and treatment of disease. These goods can include isolated nutrients, nutritional supplements, genetically altered foods, herbal products, and processed foods like cereals and beverages. Herbal therapy has become a popular alternative or supplement to contemporary treatments. The preparation contains poly herbs, such as Cinnamon, Amla, Tulsi, and Jaljeera powder have demonstrated pharmacological action with no side effects. Cinnamon bark is utilized for its carminative,

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stomachic, and mild astringent properties. It has been utilized for expectorant, demulcent, and antispasmodic properties. Cinnamon (*Cinnamomum zeylanicum and Cinnamon cassia*), the perpetual tree of tropical medicine, belongs to the Lauraceae family. Cinnamon includes essential oils and compounds, including cinnamaldehyde, cinnamic acid, and cinnamate. Cinnamon possesses antioxidant, anti-inflammatory, antidiabetic, antibacterial, anticancer, lipid-lowering, and cardiovascular-disease-lowering properties. It has also been shown to help with neurological disorders including Parkinson's and Alzheimer's. [1] Cinnamon bark contains procyanidins and catechins. The components of procyanidins include both procyanidin A-type and B-type linkages. These procyanidins extracted from cinnamon and berries also possess antioxidant activity[1]. Cinnamon decreased the severity of pain and nausea for women consuming cinnamon. Except for a rash and itchiness reported by 1 woman no adverse effects of cinnamon were observed[2]. The bark of cinnamon has been used as a spice and to make tea and also as an herbal remedy for the treatment of common colds, cardiovascular diseases, and chronic gastrointestinal and gynecological disorders in oriental herbal medicine. Cinnamon has likewise been used for treating sore throats, cough, indigestion, abdominal cramps, intestinal spasms, nausea, flatulence, and diarrhea. Moreover, it has been found that cinnamon slows down food spoilage and displays antifungal properties[3]. In 2018, Indonesia and China generated 70% of the global supply of cinnamon, with Indonesia accounting for roughly 40% and China for 30%.[4] Cinnamon bark, a highly prized spice, is commonly utilized. Applications include food, fragrance, and perfume industries.[5]

Tulsi (Holy Basil) often known as the "queen of herbs" (*oscimum sanctum F: labiateae*), is known for its therapeutic potential in anti-asthmatic and stimulant medications. The leaves have also been found to have anti-stress and analgesic properties. Tulsi an aromatic shrub of the *Lamiaceae* (tribe *Ocimeae*) family, is believed to have originated in north-central India and is presently found in the eastern tropical regions. Tulsi, also known as "The Incomparable One," "Mother Medicine of Nature," and "The Queen of Herbs," is venerated in Ayurveda as an "elixir of life" with unparalleled medical and spiritual virtues. Tulsi has been used in spiritual ceremonies and lifestyle practices in India for its numerous health advantages, which are currently being proven by contemporary research. Tulsi is said to be a tonic for the body, mind, and soul, supporting old Ayurvedic teachings and providing answers for various health issues. Tulsi, known for its fiery and bitter flavor, is believed to enter deep tissues, dry off secretions, and balance kapha and vata. Consuming tulsi daily can prevent disease, increase overall health and lifespan, and help manage daily stress. Tulsi is used to treat a variety of conditions, including anxiety, cough, asthma, diarrhea, fever, dysentery, arthritis, eye diseases, otalgia, indigestion, hiccups, vomiting, gastric, cardiac, and genitourinary disorders, back pain, skin diseases, ringworm, insect, snake, and scorpion bites, and malaria[6]. Tulsi can be classified into two types: Vanya (wild) and grama (homegrown). Tulsi grows naturally in the tropics and warm climates. The plant is widely disseminated and grown across India. The plant is upright, branching, fragrant, and grows to a height of 30-60 cm once mature. The aromatic leaves can be simple, opposite, elliptic, oblong, obtuse, or acute, with whole, subserrate, or dentate margins, and grow up to 5 cm long. Tulsi flowers are small and purplish, arranged in elongate racemes with tight whorls. The little fruits contain reddish-yellow seeds. The plant is bitter and caustic.[7] Tulsi has been studied extensively, with over 100 articles on its pharmacology and medicinal use in the past decade.[8] Tulsi or Vaishnavi holy basil is a sacred Ocimum medicinal and therapeutic value in Hindu belief. Hindus regard it as an earthly manifestation of the goddess Tulsi; she is regarded as a great worshipper of the god Vishnu.[9] Tulsi leaves can effectively treat ringworm and other skin problems. Tulsi has been prescribed as an antidote for dogs, scorpions, and bug bites in traditional medicine. Tulsi leaves and seeds can lower uric acid levels in the blood and urine. Tulsi leaves possess anti-fungal and anti-viral properties[10]. Tulsi contains antioxidant effects and can lower blood glucose levels. Thus, it is beneficial to diabetics. Tulsi lowers overall cholesterol levels. As a result, it is beneficial to people suffering from cardiovascular disease. Tulsi lowers blood pressure. Heat the delicate leaves of Tulsi tea and offer it to the patient. The juice separated from Tulsi leaves fills in as the best solution for cutting down fever[11]. Tulsi boosts anti-oxidant levels, including glutathione, and enzymes like superoxide dismutase and catalase. This protects cellular organelles and membranes from free radicals caused by lack of oxygen and other toxins[9]. These acts are crucial for defending against natural poisons produced by the body or by animals. Plants have a crucial role in protecting against many contaminants in modern times. Human activity produces several industrial

toxicants, including pesticides, medicines, heavy metals, and radiation.[12]

Phyllanthus emblica L. (also known as amla or Indian gooseberry) is an ephemeral tree from the *Euphorbiaceae* family. According to scientific research, polyphenols, as well as vitamin C, are important components of amla fruits and other parts. The high polyphenol and vitamin C content confers significant antioxidant activity, as well as key in vivo effects such as increased antioxidant status and endogenous antioxidant defense system function. Other potential health benefits include antihyperlipidemic and antidiabetic properties, as well as anticancer, anti-inflammatory, digestive tract, and neurological protection.[6] Amla has high levels of Vitamin C, which improves immunity, and metabolism, and protects viral and bacterial illnesses including colds and coughs. It contains polyphenols that inhibit the growth of cancer cells. Ayurveda suggests that amla juice regulates the body's functions and balances the three doshas (vata, kapha, and pitta). It has been shown to benefit obesity, diabetes, cardiovascular disease, and related disorders. The herbal formulation contains such as Tulsi, Amla, and Cinnamon which have shown pharmacological activity with no side effects. The preliminary phyto-analysis tests such as Ash value, Loss of Drying, sensory evaluation, etc. test were carried out. The Herbal Energy booster is the best choice for the replacement of Soft Energy drink usage and tackles the adverse effects. [6] According to ancient Indian mythology. It is an excellent dietary supplement with numerous medicinal effects. Emblic fruit contains high levels of phenolic compounds, making it a potential source of natural antioxidants, nutraceuticals, and therapeutic components. Consumers enjoy Emblic fruit for its distinct flavor and lovely aroma. Research has shown that amla has anti-hyperglycemic, hypoglycemic, anti-inflammatory, anti-hyperlipidemic, and antioxidant properties in both animals and humans. Amla contains antioxidants such as gallic acid, ascorbic acid, and phenolic compounds, which benefit the immune system and digestion. This review will present an overview of the nutritional composition, phytochemistry, and prospective health benefits of *P. emblica L.*, given its growing attention and potential. Amla fruits are edible and commonly found in India, Southeast Asia, China, Iran, and Pakistan.[6] It is unclear which amla components are responsible for each action, as they may be mediated through various routes. Amla's anti-inflammatory, anti-thrombotic, anti-coagulant, and anti-platelet properties make it a promising candidate for preventing many vascular illnesses. [13] Emblic fruit contains high levels of phenolic compounds, making it a potential source of natural antioxidants, nutraceuticals, and therapeutic components. Consumers enjoy Emblic fruit for its distinct flavor and lovely aroma. Amla has been shown in animal and human studies to have anti-hyperglycemic, hypoglycemic, anti-inflammatory, anti-hyperlipidemic, and antioxidant properties. Amla contains antioxidants such as gallic acid, ascorbic acid, and phenolic compounds, which benefit the immune system and digestion.[6] The plant can reach a height of 8-18m and has thin light grey bark. Its leaves are simple, light green, sub-sessile, and closely s*et along* the branchlets, resembling pinnate leaves. The flowers are greenish-yellow, and the fruits are globose, fleshy, pale yellow, with six obscure vertical furrows enclosing six trigonous seeds in two seeded three crustaceous cocci. Amla fruit is commonly used in Indian medicine to cure common colds and fevers, and as a diuretic. It can be taken alone or in conjunction with other herbs.[14] Vitamin C's high content promotes the production of nor-epinephrine, improving brain function in dementia patients. Furthermore, it is beneficial for anti-aging and is utilized in cosmetics for skin care. It promotes young and flexible skin by enhancing collagen protein synthesis and protecting against UV damage. Amla helps to prevent fat accumulation and clean out toxins. It is used as a home treatment to promote hair development. Amla fruit is used to treat neuropathy and diabetes. It balances hormones, increases fertility, and relaxes abdominal muscles through its anti-spasmatic properties. This paper aims to investigate the bioactive potential of Amla fruit, given its significant value. E. officinalis possesses medicinal and nutritional properties, including essential amino acids and vitamins.[15] having great elementary and therapeutic importance, are the gift to mankind to acquire healthy lifestyle. Emblica officinalis Gaertn. or Phyllanthus emblica Linn. (Euphorbeaceae

Fig. 1: Cinnamon Bark Powder

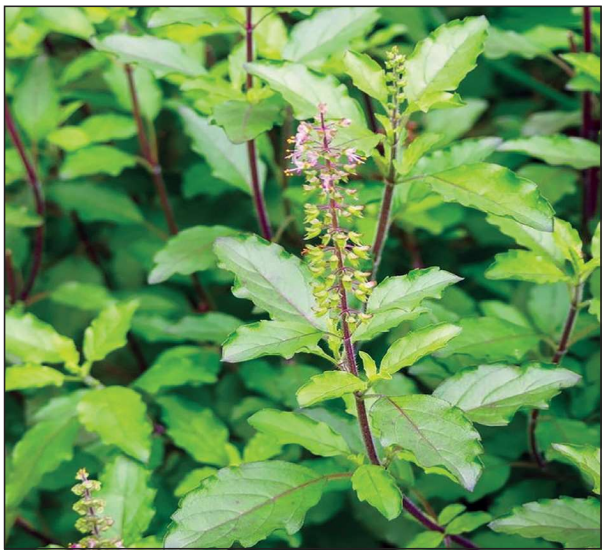

Fig. 2: Holy Basil (Tulsi) Leaves

Fig. 3: Phyllanthus Emblica Leaves

MATERIAL AND METHODS

Selection and Collection of Herbs

The ingredients (Amla, Cinnamon, Tulsi) were sourced from local markets in Neemrana Rajasthan with an emphasis on freshness and hygiene. Tulsi and amla leaves were collected and dried in the shade for 24 hours. They were reduced to a small size and sieved through No. 40.

Methods Preparation of powder formulation

The ingredients (amla, cinnamon, Tulsi) were cleaned, sliced, and sun-dried for one day before grinding and passing through sieve no. 40. Mix all powder medications according to the formula in a mortar and pestle. After mixing, the powder was dried in a hot air oven at 40°C for 1 hour before packing in an air-tight container. After preparing six formulations, three (HERB 1, HERB 2, and HERB 3) were chosen for further study. The incorporation of constituents is based on proven pharmacological efficacy.

Quality Evaluation

Evaluating the quality of herbal energy boosters is crucial for determining their efficacy and safety levels. The physicochemical and phytochemical evaluations were conducted by comparing them to standard parameters. The sensory evaluation included sight, smell, taste, touch, and hearing.

Sensory Evaluation

Consumer understanding of formulation has led to growing demand for products with positive properties beyond refreshment. A tasty preparation is essential for consumption, regardless of its nutritional value. A five-person panel conducted sensory analysis utilizing a nine-point hedonic rating scale. The evaluation criteria for Herbal Energy Booster powder drink include appearance, color, taste, flavor, consistency, and acceptability.

Physicochemical and Phytochemical Evaluation

The physicochemical parameters pH, total soluble solids, and total sugars were measured. The powder drink was analyzed for carbs, proteins, glycosides, tannins, polyphenols, and flavonoids following conventional techniques.

Determination of Moisture content

The moisture content was measured using the American Association for Clinical Chemistry technique. A two-gram sample was placed in a warmed and weighed glass petriplate and dried in a hot air oven at 130°C for 2 hours or until solid. After drying, the glass Petri plate was transferred to desiccators for cooling before reweighing. Weight loss was determined as a percentage of moisture content.

Moisture content (%) = W1-W2/Weight of sample × 100

W1 = Weight (g) of Sample before drying.

W2 = Weight (g) of Sample after drying.

Determination of Ash content:

The ash content was measured according to the American Association for Clinical Chemistry technique[16]. A two-gram sample was placed in a re-weighed crucible and incinerated at 820°C for 4 hours. The crucible was then cooled in desiccators before being weighed.

Ash (%) = Weight of ash / Weight of sample × 100

Phytochemical analysis

1. **Determination of Total Phenolics:** The Folin-Ciocalteu test[17] was used to measure total phenolics. The absorbance was measured at 765 nm and reported as Gallic acid equivalents.
2. Determinat**ion of Total Flavonoids:** The total flavonoids[18] were calculated using the Aluminiun Chloride colorimetric technique. The absorbance was measured at 510 nanometers. Results were represented as Catechin equivalents.

% of Flavonoid = Final Weight – Initial weight / Weight of sample × 100

3. **Determination of Tannins:** Tannins were evaluated using the Van Buren and Robinson method, with absorbance measured at 605nm and results reported in Tannic Acid equivalents.
4. **Evaluation of Formulated Herbal Energy Booster:** Preformulation studies are a crucial stage in developing new dosage forms for drugs. The primary investigation in drug development is to gather information on the compound's characteristics and anticipated development timetable. The pre-formulation investigation may simply indicate that there are no significant hurdles to compound creation. Pre-compressional parameters included angle of repose, bulk density, tapped density, and compressibility indices.
5. **Angle of Repose:** The fixed funnel method was used to determine the angle of repose. A funnel was fastened at a specific height (h) above graph paper on a smooth horizontal surface. The blend was gently poured through the funnel until the peak of the conical pile reached the funnel tip. The radius of the base of the conical pile was measured. The angle of repose (θ) was computed using the formula:

$$\tan \theta = h/r$$

$$\theta = \tan^{-1} h/r$$

In this equation,

θ represents the angle of repose, h is the height of the cone, and r is the radius of the cone's base.

Angles of repose < 30° indicate a free-flowing material, while angles > 40° indicate a poorly flowing material. Flow qualities range from excellent (25-30), acceptable (31-35), fair (36-40), and passable (41-45).

Fig. 4: Angle of repose

6. **Bulk Density:** Add 15 g powder blend to a dry 100 ml cylinder without compacting. The powder was carefully leveled without compacting, and the apparent volume was measured. The bulk density was determined with the following formula.

$$\rho b = M / Vo$$

Where, ρb = apparent bulk density. M is the sample weight, and V is the apparent volume of powder.

7. **Tapped Density:** To measure bulk density, the sample cylinder was tapped 500 times, then 750 times, until the difference between measurements was less than 2%. The tapped volume, Vf, was then measured to the nearest graduated unit. The tapped density (gm/ml) was obtained using the formula below.

$$\rho tap = M / Vf$$

In this equation, ρtap represents the tapped density, M is the sample weight, and Vf is the tapped volume of powder. +

8. **Carr's index The Compressibility index:** Carr's index is a measure of a powder's compressibility. It is based on the bulk and tapped densities. In theory, less compressible materials are more flowable. It evaluates the importance of interparticulate interactions. In a free-flowing powder, interactions between bulk and tapped densities are less significant, resulting in closer values. Poorer moving materials tend to have more inter-particle interactions, resulting in a larger gap between bulk and tapped density. The Carr's Index reflects these differences and is calculated using the formulas below:

$$\text{Compressibility index} = [(\rho tap - \rho b) / \rho tap] / \times 100$$

Where, ρb = Bulk Density, ρtap = Tapped Density.

Table 1: Compressibility index values Carr's Index

Compressibility	Index Properties
≤10	Excellent
11 – 15	Good
16 – 20	Fair
21 – 25	Passable
26 – 31	Poor
32 – 37	Very Poor
>38	Very Very Poor

9. **Hausner's Ratio:** Hausner's ratio is an indirect measure of how easily powder flows. This is calculated using the following formula.

Hausner's Ratio: Tapped density (PT) / Bulk density (PB).

PT represents tapped density, while PB represents bulk density. Lower Hausner's ratio (<1.25) suggests better flow qualities, whereas 1.25-1.5 indicates moderate flow properties, and >1.5 indicates poor flow.

RESULT AND DISCUSSION

1. **Preparation of powder formulation:** The powder is prepared by mixing dried ingredients. The Herbal Energy powder drink produced variable yields, as shown in Table 2.

Table 2: Preparation of powder formulation

Content	Quantity
Amla	80%W/V
Cinnamon	15%W/V
Tulsi	0.5%W/V
Jaljira	q.s.

2. **Sensory Evaluation:** Sensory evaluation parameters for Herbal Energy Booster Powder Drink. Table 2 shows the observed metrics for the formulation, including color, taste, flavor, texture, and acceptability at room temperature. Based on matched comparison evaluations, the drink offers excellent taste, flavor, and overall acceptance. Sensory characteristics were examined during storage.

Table 3: Sensory Scores for Herbal Energy Booster

Parameters	Formulation (sugar)
Color	8
Taste	8
Flavor	7
Texture	7.5
Overall acceptability	8

1= extremely dislike, 2= strongly dislike, 3= moderate dislike, 4= slight dislike, 5= neutral,

6= slight like, 7= moderate like, 8= strongly like, 9= extremely like.

3. **Physical and Phytochemical Analysis:** To assess a formulation's nutritional adequacy, physicochemical and phytochemical parameters were measured.

Table 4: Shows the phytochemical screening of herbal medications.

Phytoconstituents	Test	Result
Carbohydrate	Benedicts test	+ve
Protein	Biuret test	-ve
Alkaloid	Dragondroffs test and Wagner's	+ve
Flavanoids	Shinoda test	+ve
Tannins and Phenolic content	Lead acetate & acetic acid	+ve
Saponins	Foam test	+ve
Fat	Filter paper test	-ve

The active ingredients of phytopharmaceuticals are not usually identified. The phytochemical examination of the herbal energy powder drink revealed the presence of alkaloids, carbohydrates, proteins, tannins, flavonoids, and phenols.

4. **Phytochemical analysis:** Phenolics and flavonoids are a broad category of chemical substances found in plants. They provide quality and nutritional value and have an important role in human fitness, including anti-inflammatory, antidiabetic, antiviral, and antioxidant properties. The total phenolic and flavonoid content of various herbal energy booster formulations was assessed (Table 4).

Table 5: Phytochemical Analysis.

Formulation	GAE equivalents (µg) GAE/ mgsample) g)	Catechin equivalents (µg CE/mg)	Tannic acid equivalents (µg TAE/m)
HERB 1	18.43	49.2	0.292
HERB 2	11.7	28.2	0.2951
HERB 3	18.3	26.8	0.2696

Crude tannins are chemicals found in plants. Tannins are polyphenols responsible for the astringent flavor of food and have anti-carcinogenic properties.

5. **Phyto-pharmaceutical test:** Moisture content and ash analysis are crucial for nutritional analysis as they impact food quality, stability, and storage. Herbal Energy Booster Powder Drink's moisture and ash content were calculated. The pH of the freshly produced Herbal Energy Booster drink was 5.5.

Table 6: Phyto-pharmaceutical test

	Ash Content	Moisture content	pH
HERB 1	4.7%	3.5%	4.5
HERB 2	4.5%	4.7%	5.2
HERB 3	5.1%	4.5%	5.4

Table 7: Physical Evaluation of Herbal Energy Boosters.

Parameters	Result
Angle of repose	30.8
Bulk density	0.50
Tap density	0.60
Carr's index	23.1
Hausner ratio	1.28

The angle of repose was 30.8, the bulk density was 0.50, the tap density was 0.60, the Carr's index was 23.1, and the Hausner's ratio was 1.28, indicating moderate flow properties. All results are presented in a table.

CONCLUSION

The formulation is good for both diabetic and non-diabetic individuals. The plant-based formulation reduces the risk of negative effects compared to soft drinks. This supplement promotes a quick recovery from illness and provides a sense of freshness. This energy-boosting powder drink is a natural alternative to manufactured drinks and offers various health benefits. The herbs employed in this preparation are inexpensive and readily available throughout the year, making the product cost-effective.

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