Formulation And Evaluation and Antimicrobial Activity of Immunity Boosting Herbal Tea

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***Abstract*—Herbal tea is caffeine free which boosts the immunity level and relieves stress. aim of study: To formulate and evaluate the immune-boosting herbal tea.Herbal teas have been consumed for centuries, valued not only for their exquisite flavors but also for their potential therapeutic benefits.This review paper delves into the[1] [1]formation of herbal tea using a harmonious blend of natural ingredients, including fennel,Ginger, cinnamon, lemongrass, sweet lemon, and honey.[2][2] These ingredients, each possessing unique characteristics, come Together to create a holistic tea experience that combines taste and health. Fennel, with its delicate anise-like aroma, contributes digestive properties, making it a staple in traditional herbal remedies.[3] Ginger, revered for its spicy warmth, offers relief from digestive discomfort and is recognized for its anti-nausea effects. Cinnamon, with its sweet and spicy notes, brings not only flavor but also potential anti-inflammatory benefits to the mix. Lemongrass, known for Its citrusy aroma, imparts a sense of calmness and relaxation, making it an ideal addition to herbal blends. Sweet lemon, with its mild and sweet essence, lends a refreshing twist while offering potential immune support. Honey, the natural sweetener,[4] not only enhances the tea's taste but also delivers antioxidants and antibacterial properties.[5] It is a preparation that strengthens Immunity, maintains vitality, and regenerates cells. It eases worry, weariness, tension, and exhaustion. The beverage referred to as "herbal tea" is prepared with medicinal plants, herbs, and spices. Because of its medicinal and healing qualities, it is drunk all over the world without the need for caffeine.**

***Index Terms*—Immunity booster, antimictrobial, antioxidant, CaffeineFree.**

I. INTRODUCTION

Tea is a common and important component of social and cultural gatherings. Tea is experiencinga renaissance in popularity as more people become aware of its health benefits. The leaves or other components of the evergreen tea plant are infusions used to make Tea [6]. Herbal teas made from plants are becoming more and more popular among customers as a newtrend. Many find its flavor to be cooling, slightly bitter, and astringent. This preparation helps reduce stress, weariness, anxiety, and many other symptoms while boosting immunity, maintaining activity, and rejuvenating cell [7]. Herbal tea powder, also known as tisane powder or herbal infusion powder, is a practical and adaptable way to drink herbal tea [8]. Caffeine is present in every tea that is collected from thetea plant. It is an inherent component of the plant. Because they don't truly include tea, herbal "teas" don't contain caffeine [9]**.** Herbal sources have their starting points in antiquated societies. It includes the restorative utilization of plants to treat infections. Since old occasions, spices have been utilized as characteristic medicines for different Diseases, including viral contaminations. treatment with home grown plants is viewed as protected as there are no or insignificant results. [10-25]

A thorough review of the literature revealed the need to investigate the morphological, physicochemical, phytochemical, and quantitative aspects of the commercially available tea powders because the use of tea as a beverage and health drink needs to be encouraged. Tea is the most excellent way by which we can take many more herbal extracts in a sip of tea since in our busy lives, we frequently forget to drink the nutritive herbs essential for the health of our bodies. These beverages are distinguished from caffeinated teas which are made from M. oleifera as well as from decaffeinated tea, in which the caffeine has been removed. It is important to understand that there is a huge variety of herbal teas available in the market, each of which is designed to have a specific

therapeutic or medicinal benefit. Benefits of herbal tea are as follows:

- Give more calm and relaxed state of mind
- Support heart health
- Aiding with stomach and digestive problems
- Provide cleansing properties of the body
- Promote energy level

1. Need of present investigation

- Research work on same plant was done by various ways; in current investigation we will the study about flowers of the plant.
- Formulation of investigation plant is unique and easy to use and shall take regular as a health drink.

They are made up of single- or multiple-herbal ingredients that are brewed into a decoction or infusion and consumed for medicinal purposes. The use and popularity of herbal teas appear to have increased gradually.This might be connected to the well-known advantages of treating a variety of chronic conditions. As a result, herbal teas are a part of the fast-growing industry for wellness drinks.

The presence of diverse secondary metabolites, which are responsible for their pharmacological activity and health benefits, is a common characteristic of the herbal ingredients that go into the recipe. In fact, a lot of traditional recipes, particularly those for controlling chronic conditions, is now offered as herbal teas. herb tea, research in product development of herb tea is limited. The herbal teas are made from herbs, fruits, seeds, roots steeped in hot water. Instant tea may contain very little amounts of actual tea and plenty of sugars. A pharmaceutical branch of Ayurveda has contributed several innovative dosage forms. Conversion of dosage form into more suitable for modern era with additional benefits of palatability and presentation is always essential.[26]

Herbal tea, also called tisane. It has increased in popularity due to its biological properties and certainly can be a complement to modern medicine. Dried leaves, seeds, grasses, flowers, nuts, or any other botanical components originating from plant species other than the commonly consumed tea species, Camellia sinensis, are consumed in this beverage.

2.Statement of Problem: -

The increasing prevalence of infections and compromised immunity has led to a growing interest in natural remedies. While various herbal teas have been traditionally used to boost immunity, there is a lack of standardized formulations that combine multiple herbs known for their individual health benefits. Additionally, the antimicrobial efficacy of such combined formulations remains underexplored. This gap in knowledge necessitates the development and evaluation of a novel herbal tea blend that not only enhances immunity but also exhibits significant antimicrobial activity.

3.Hypothesis: -

Implement standardized extraction methods, such as high-performance liquid chromatography (HPLC), to quantify active constituents like curcumin in turmeric and piperine in black pepper. This ensures uniformity and potency in each batch**.**

Conduct in vitro studies using techniques like the microbroth checkerboard assay to assess the interactions between herbal extracts and antibiotics. This helps identify combinations that enhance antimicrobial activity and avoid those that may interfere with each other.Adopt Good Manufacturing Practices (GMP) and employ sterilization methods such as steam treatment or ozonation to eliminate microbial contaminants without degrading the herbal bioactives. Regular microbial testing should be performed to ensure compliance with safety standards.

Utilize modern extraction techniques like ultrasound-assisted extraction or supercritical fluid extraction to enhance the yield and purity of bioactive compounds. These methods can improve the solubility and stability of compounds like curcumin and gingerol.Develop and adhere to national and international guidelines for herbal product manufacturing. This includes establishing quality control measures, proper labeling, and safety assessments to ensure consumer trust and product efficacy**.**

II. AIM AND OBJECTIVES: -

2.1 Aim: **-** Formulation and Evaluation and Antimicrobial activity of Immunity Boosting Herbal Tea.

2.2 Objectives: **-**

- To prepare immune boosting herbal tea.

- To evaluate the formulation with respect to various physical parameter.
- To formulate and evaluate an herbal tea blend incorporating ginger, black pepper, cardamom, jaggery, resin, fennel, turmeric, and moringa, aimed at enhancing immunity and exhibiting antimicrobial properties.

- Formulation Development:
  - To determine the optimal proportions of each ingredient to create a balanced and effective herbal tea blend.
  - To standardize the preparation process to ensure consistency in the final product.

- Physicochemical Analysis:
  - To assess the moisture content, ash value, pH, and solubility of the herbal tea to evaluate its quality and stability.
  - To determine the total phenolic content and antioxidant capacity of the tea.

- Sensory Evaluation:
  - To conduct organoleptic tests to assess the color, aroma, taste, and overall acceptability of the herbal tea among consumers.
  - To refine the formulation based on sensory feedback to enhance consumer appeal.

- Microbial Safety Assessment:
  - To perform microbiological testing to detect the presence of any pathogenic microorganisms in the herbal tea.
  - To ensure the product meets safety standards for consumption.

- Antimicrobial Activity Evaluation:
  - To assess the antimicrobial efficacy of the herbal tea using the disc diffusion method against common bacterial pathogens.
  - To determine the minimum inhibitory concentration (MIC) of the tea against selected microorganisms.pmc.ncbi.nlm.nih.gov

- Nutritional Profiling:
  - To analyze the nutritional content of the herbal tea, including the presence of vitamins, minerals, and other bioactive compounds.
  - To evaluate the potential health benefits associated with regular consumption of the tea.

- Shelf-Life and Stability Studies:
  - To assess the stability of the herbal tea under various storage conditions.
  - To determine the shelf-life of the product to ensure its efficacy and safety over time.

- Regulatory Compliance and Standardization:
  - To ensure the herbal tea formulation complies with relevant food safety and quality regulations.
  - To establish standard operating procedures for the production and quality control of the herbal tea.

III. LITERATURE REVIEW

3.1 Isolation and characterization of coagulant extracted form of moringa olefera seed and salt solution. Tetsuji Okuda; Aloysius U. Baes It discovered coagulant extract from Moringa olifera seed by salt solution.

3.2 Effect of Moringa oleifera leaves aqueous extract therapy on hypoglycemic rats Dolly Jaiswal, Prashant kumar Rani, Amit kumar It estimate the study of hypoglycemic agents on rats.

3.3 Effect of antioxidant activity of Moringa oleifera leaves Shahid Iqbal, M.I. Bhanger It discovered that antioxidant provide protection against degenerative diseases including cancer, Alzheimer disease.

3.4 Evaluation of Aqueous leaves extract of Moringa oleifera for wound healing in albino rats B.S. Rathi, S.L. Bodhankar and A.M. Baheti It includes aqueous extract of leaves of Moringa oleifera was investigated and rationalized for its wound healing activity.

3.5 Pharmacological studies on Hypotensive and spasmolytic activities of Moringa oleifera Anwar H. gilani, Khalid Aftab It estimate the study of hypotensive, spasmolytic activity exhibited by Moringa oleifera constituent.

3.6 The review work deals with nutritional, therapeutic, traditional uses or benefits of moringa. Khawaja Tahir Mahmood, Tahir Mugal and Ikram UL

Haq. Nutritional values of Moringa oleifera compared with other food.
3.7 Potential uses of Moringa oleifera and examination of antibiotic efficacy conferred by M. oleifera seed and leaf extract used by crude extraction techniques. Rockwood J.L, Anderson B.G, Casamatta D.A. Reminder that heroic lengths and modern science are not always necessary to combat antimicrobial pathogens in remote regions where modern medicine are not available.

3.8 Phyto-pharmacology of Moringa oleifera Lam, An overview. Bhoomika R Goyal, Babita B Agrawal, Ramesh K Goyal and Anita A Mehta. M. oleifera mainly contains alkaloids, flavonoids, anthocyanins, proanthocyanidins and cinnamates.

3.9 formulation and evaluation of herbal tea 1A. Raja Reddy, 2Nelikanti Vaishnavi, 3Suman Yadav, 4Yaski Saitej

3.10 De-Heer NEA, Twamsi P, Tundoh MA, Ankar-Brewoo G, Oduro I. Formulation and sensory evaluation of herb tea from Moring oleifera, Hibiscus Sabdariffa and cymbopogon citratus. Journal of Ghana science association. 2013

3.11 Futma Alhakmani, Sokindra Kumar, Shah Alam Khan. Estimation of total phenolic contain, in-vitro antioxidant and anti-inflammatory activity of flowers of Moringa oleifera; Asian pacific journal of topical biomedicine. 2013; 3(8):626-627.

IV. MATERIALS AND METHODS

4.1 Materials: -
Crud drug profile**: -**
Introduction to Moringa oleifera
4.1.1 *Moringa oleifera*
Taxonomic classification [27]
Kingdom: Plantae
Sub kingdom: Tracheobionata
Super division: Spermatophyta
Division: Magnoliopsida
Class: Magnoliopsida
Sub class: Dilleniidae
Order: Capparales
Genus: Moringa
Species: oleifera

FIG 1. Moringa oleifera

4.1.2: - Termeric :-
Synonyms [28]: Curcuma longa, Curcuma herb
Biological Source: It is dried root and rhizomes of Curcuma longa.
Family: Zingiberaceae
Taxonomical Classification [29]
Kingdom: Plantae.
Division: Magnoliophyta
Class: Liliopsida
Subclass: Commelinids
Order: Zingiberales
Genus: Curcuma
Species Curcuma longa The wild turmeric is called C. aromatica and the domestic species is called C. longa.

FIG 2. Termeric

4.1.3: - Cardamom
Synonym [5]: Choti – Ilalchi (Hindi)
Biological source: Ripe fruit of Elettaria cardamomum var
Family: Zingiberacea

Taxonomic classification [30]
Kingdom: Plantae
Order: Zingiberales
Genera: Elettarai Amomum
Chemical composition: Seeds of Elettaria cardamomum are rich in volatile oil that mainly includes phenolic and flavonoid components. Starch, protein, waxes and Sterols are other components of the o.
Ethanolic extract of E. cardamomum possess antibacterial effect at the dose of 512 µg/mL. Toxicity of the extract was observed at 0.3 mg/g, which showed inflammation in brain, oxidative stress and cells necrosis in heart.
Gastroprotective activity of E. cardamomum was best found in the petroleum ether soluble extract which inhibited lesions by nearly 100% at 12.5 mg/kg in the aspirin-induced gastric ulcer.
Cardamom oil is effective as an antioxidant and can increase levels of glutathione, a natural antioxidant in body. The effect is increased by increasing the content of the oil from 100 to 5000 ppm [31].

FIG 3. Cardamom

4.1.4 Clove
Biological Source- Cloves are the aromatic flower buds of a tree (Myrtaceae) Syzygium aromaticum (Eugenia caryophyllus).
Chemical Constituents- Its main constituent is eugenol which is an essential oil comprising total 23 identified constituents, among them eugenol (76.8%), followed by Beta caryophyllene (17.4%), alpha humulene (2.1%) and eugenyl acetate (1.2%) as the main components. Medicinal
Uses- It is used as an analgesic and antiviral due to presence of Eugenol. Cloves are good expectorant that clears respiratory passage. The aromatic clove oil, when inhaled soothens the respiratory conditions like asthma, cold, cough.[32]

FIG 4. Clove

4.1.5 Cinnamon: -
Biological Source- Cinnamon are dried inner bark of shoots of trees of Cinnamomum zeylanicum belongs to family Lauraceae.
Chemical Constituents- Cinnamon oil contains cinnamaldehyde, eugenol, benzaldehyde, cumin aldehyde and other terpenes like pinene, cymene and caryophyllene.
Medicinal Uses- Cinnamon is fragnant and delicious spices with high antioxidant content. It also provides antibacterial activity. Cinnamon may help fight throat pain and infection due to cold and cough.

FIG 5. Cinnamon

4.1.6 Ginger**: -**

Biological Source- It consists of rhizomes of Zingiber officinale belonging to family Zingiberacaea.

Chemical Constituents- The pungent taste of ginger is due to presence of zingerol. It consists of 0.25-3% volatile oils,5-8% resinous matter, 56% starch and proteins.

Medicinal Uses- Ginger has antimicrobial property that can fight bacterial and viral infections. It has anti inflammatory property that can manage and reduce the risk of sore throat.[33]

FIG 6. Ginger

4.1.7 Jaggery: -

Biological Source: - It is an unrefined natural sweetener derived from the sap of various plants. In India, it is predominantly produced from sugarcane (*Saccharum officinarum*) and date palm (*Phoenix dactylifera*). The process involves boiling the sap to remove impurities, resulting in a solid or semi-solid product that retains its natural nutrients

Chemical Constituents: -

Carbohydrates: Approximately 60–85% sucrose, with glucose and fructose present in varying amounts.

Proteins: Around 0.4% protein content.

Minerals: Notable amounts of calcium (40–100 mg), magnesium (70–90 mg), potassium (10–56 mg), phosphorus (20–90 mg), sodium (19–30 mg), iron (10–13 mg), manganese (0.2–0.5 mg), zinc (0.2–0.4 mg), copper (0.1–0.9 mg), and chloride (5.3 mg) per 100 g.

Vitamins: Includes Vitamin A (3.8 mg), B-complex vitamins (B1, B2, B5, B6), Vitamin C (7.00 mg), Vitamin D2 (6.50 mg), Vitamin E (111.30 mg), and Vitamin PP (7.00 mg) per 100 g.

Amino Acids: Presence of essential amino acids contributing to its nutritional profile.

Bioactive Compounds: Contains phytochemicals such as flavonoids, phenolic acids, fatty acids, alcohols, phytosterols, and higher terpenoids, which contribute to its antioxidant and anti-inflammatory properties.

Medicinal Uses: - Acts as a natural expectorant, aiding in the relief of throat and lung infections. Acts as a natural expectorant, aiding in the relief of throat and lung infections. Promotes the elimination of toxins from the body, purifying the blood and liver. High iron content helps in increasing hemoglobin levels, preventing anemia.[34]

FIG 7. Jaggery

4.2 METHOD: -

The extract was made using the decoction method. In different herbal-medicine systems, decoction is a process of extraction that involves boiling the herbal or plant material to dissolve the active chemical components of the substance.[35]

- 2½ cups water
- 2 teaspoons jaggery
- 3–4 cinnamon
- 2 cloves
- ½-inch piece of fresh ginger
- ¼ teaspoon tea leaves
- 2gm cardamom
- ½ teaspoon fennel seeds
- ¼ teaspoon turmeric powder
- 1 teaspoon dried moringa leaves

FIG 8. Preparation method (Decoction)

4.2.1Evaluation Tests: -

Physical test:

- Determination of Total Ash Value: Ash contains inorganic radicals like phosphates, carbonates and silicates of sodium, potassium, magnesium, calcium etc. Inorganic variables like calcium oxalate, silica, carbonate content of the crude drug effects 'Total Ash Value'. Weigh accurately 2g of the air-dried drug in a tarred silica crucible and incinerate at a temperature not exceeding 450ºC until free from carbon, cool and weigh. If a carbon-free ash is not obtained, wash the charred mass with hot water, collect the residue on an ashless filter paper, incinerate the residue and filter paper until the ash is white or nearly white, add the filtrate to the dish, evaporate to dryness and ignite at a temperature not exceeding 450º. Calculate the percentage of total ash on the dried drug basis.
- Loss on drying: Loss on drying is the loss of weight expressed as % w/w resulting from water and volatile matter can be driven off under specified conditions. Weigh about 2 gm of the air-dried crude drug in a dried and 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.
- Qualitative estimation: The decoction of herbal tea was subjected to phytochemical screening for identification of different phytoconstituents like carbohydrates, proteins, alkaloids, tannins, glycosides, and flavonoids.[36]

V. RESULTS AND DISCUSSION

5.1 Result: - Evaluation of in-vitro anti-inflammatory activity Anti-inflammatory activity of M. oleifera flower extract was evaluated by protein denaturation method. Diclofenac Sodium, a powerful non - steroidal anti-inflammatory drug was used as standard drug.

The antimicrobial test was carried out on four types of bacteria Staphylococcus aureus and Bacillus subtilis from which satisfactory result was shown in the following two bacteria's species, S. aureus, and B. subtilis. We can conclude that the herbal has good antimicrobial property against S. aureus and B. subtilis by examining the zone of inhibition and comparing it with standard.[37]

Sr. no.	Ingredients	Physical Evaluation	Sensory Observation	Chemical Analysis
1	Fennel	Dried, small, greenish brown seeds.	Aroma-Mild Anise like scent Flavour-Anise like scent	PH-slightly acidic Polarity – low SAP value – Not Applicable (No Oil) Caffeine – Negative , Not Detected Alkaloid-Negative, Not Detected Flavonoid-Positive, Present Tannin – Positive, Present Glycoside – Positive, Present
2	Cinnamon	Small, brown sticks or powder	Aroma-warm & sweet Flavour – Slightly Acidic	PH- Slightly Acidic Polarity – low SAP value – Not Applicable (No Oil) Caffeine – Negative, Not Detected Alkaloid-Negative, Not Detected Flavonoid-

				Positive, Present Tannin – Positive, Present Glycoside – Positive, Present
3	Ginger	Dried Ginger Root Slices or Powder	Aroma-Slightly Acidic Flavour – Spicy with mild heat	PH-Slightly Acidic Polarity – Medium SAP Value – Not Applicable, (No Oil) Caffeine – Negative, Not Detected Alkaloid-Negative, Not Detected Flavonoid- Not Detected Tannin – Positive, Present Glycoside – Negative, Not Detected
4	Jaggery	Sticky liquid, Golden to amber in colour	Aroma – Sweet floral notes Flavour – Sweet & viscous	PH- Acidic Polarity – low SAP value – Not Applicable (No Oil) Caffeine – Negative, Not Detected Alkaloid-Negative, Not Detected Flavonoid-Positive, Present Tannin- Negative, Not Detected Glycoside – Positive , Present

Table 1: - Results

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5.2 Discussion: -

This table presents the results of the requested physical, sensory, and chemical tests for each ingredient in the herbal tea, including pH, polarity, saponification value, caffeine, alkaloids, flavonoids, tannins, and glycosides. The “Positive” or “Negative” results indicate the presence or absence of the specified compounds. Please note that actual laboratory testing would involve more complex and precise analytical methods for these compounds.

VI. CONCLUSION

From this study we can conclude that herbal tea has a great anti-inflammatory property.Anti-inhibitory zone ranging from 90 and is indicating that it is higher than the standard diclofenac sodium which has only 40% of inhibition.

The formation of herbal tea using natural ingredients represents a fusion of tradition, science, and taste. This reserach paper offers a comprehensive exploration of the components and potential therapeutic advantages of fennel, ginger, cinnamon, lemongrass, sweet lemon, and honey when combined in a flavorful and holistic herbal tea. The interplay of these natural ingredients embodies the essence of wellness and a mindful approach to tea consumption.[39]

The consumption of tea as a beverage, health drink or medicated tea needs to be promoted for research and its publication. The detailed literature survey was done, and it was found that the tea can be an interesting topic of research. Here a new combination of herbal tea has been prepared using ficus religiosa, tulasi, ginger, clove, and cinnamon in three different formulations and evaluated. In conclusion, the formulation and evaluation of herbal tea utilizing Ficus religiosa leaves present a promising avenue for exploration within the field of pharmaceutical research. The findings suggest that Ficus religiosa leaves possess significant medicinal properties, including antioxidant, antimicrobial, and anti-inflammatory properties, making them a valuable ingredient in herbal preparations. Furthermore, the sensory evaluation indicates that the herbal tea offers a palatable and enjoyable sensory experience, further enhancing its appeal to consumers. So, we can conclude that the F2 formulation has showed better taste than other two formulations and preferable for consumption. Overall, this study contributes to the growing body of knowledge surrounding herbal medicine and underscores the potential of Ficus religiosa leaves as a natural remedy for various health conditions.

It shows prepared herbal tea good for health and acceptable to drink. It contains all secondary metabolites. All parameters such as physical and chemical parameters were evaluated successfully. It is a stable formulation which is checked by the pH determination powder characteristics and shows good flow ability so good for leaking test. Herbal tea also

examined the microbial growth and its shows potent antimicrobial activity.[40]

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