

**PHARMACOLOGICAL SCREENING OF HERBAL TEA FOR ANTI-STRESS ACTIVITY BY USING HERBS – A REVIEW MALLA REDDY
PHARMACY COLLEGE**

Mrs. Sravani Batchu^{1*}, Dr. G. Tulja Rani², D. Vaishnavi³, G. Anjali⁴

¹Department of Pharmacology.

²Department of Pharmaceutical Analysis.

³Student of Malla Reddy Pharmacy College.

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***Corresponding Author**

Mrs. Sravani Batchu

Department of Pharmacology.



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ABSTRACT

Stress is a major contributing factor to the development of neurological, psychological, and metabolic disorders, largely due to its ability to disrupt neuroendocrine balance and promote oxidative damage. In recent years, there has been a growing interest in plant-based functional beverages, particularly herbal teas, as complementary strategies for stress management. Herbal teas are widely consumed across cultures owing to their natural origin, safety profile, cost-effectiveness, and long history of traditional use. Among these, lemongrass (*Cymbopogon citratus*) and fennel (*Foeniculum vulgare*) are well-known medicinal herbs traditionally used for their calming, digestive, antioxidant, and neuroprotective properties. This review focuses on the pharmacological screening of a herbal tea formulation prepared from lemongrass and fennel,

with particular emphasis on their phytochemical composition, antioxidant potential, and anti-stress activity. Both herbs are rich in bioactive compounds such as flavonoids, phenolic acids, terpenoids, and essential oils, which are known to exhibit strong free-radical scavenging and neuroprotective effects. Experimental findings and literature evidence suggest that these phytoconstituents play a crucial role in reducing oxidative stress, modulating stress-related neurotransmitters, and improving behavioral responses associated with anxiety and mental fatigue.

KEYWORDS: ANTI-STRESS ACTIVITY, HERBAL TEA, ANTI-OXIDANTS.

INTRODUCTION

Stress is a physiological and psychological response to environmental, emotional, or physical challenges that disrupt homeostasis. Chronic stress contributes to anxiety, depression, cardiovascular diseases, and neurodegenerative disorders. Conventional pharmacological agents used to manage stress often cause adverse effects such as dependency, sedation, and tolerance. Hence, there is a growing interest in herbal remedies with fewer side effects. Herbal teas, also known as tisanes, are aqueous infusions of herbs, flowers, seeds, or roots. They are rich in bioactive compounds including polyphenols, flavonoids, and essential oils. Lemongrass and fennel are widely consumed as herbal teas and possess antioxidant, anxiolytic, and neuroprotective activities, making them suitable candidates for stress management.

Acute Stress

Acute stress is short-term and arises from immediate threats or demands, such as public speaking or narrowly avoiding an accident. It triggers the fight-or-flight response, releasing adrenaline for quick energy, but typically resolves quickly with minimal long-term harm. Symptoms include rapid heartbeat, sweating, and heightened alertness, often leaving a sense of relief afterward.

Episodic Acute Stress

Episodic acute stress involves repeated episodes of acute stress, common in Type A personalities or high-pressure jobs like emergency services. Individuals prone to worry or overcommitment experience it frequently, interpreting minor issues as crises. This pattern leads to persistent tension, irritability, and risks like hypertension if unmanaged.

Chronic Stress

Chronic stress endures over weeks, months, or years from ongoing issues like financial strain, toxic relationships, or unfulfilling work. It wears down the body, weakening immunity and raising risks for heart disease, diabetes, depression, and digestive problems. Symptoms encompass fatigue, insomnia, anxiety, hopelessness, and cognitive fog, demanding lifestyle or professional intervention.

Eustress (Positive Stress)

Eustress motivates and energizes, stemming from exciting challenges like promotions or adventures. Unlike distress, it enhances performance and well-being when balanced. It boosts focus and resilience but can tip into harm if overextended.

SIGNS AND SYMPTOMS**1. Physical Symptoms**

- Headache or migraines
- Muscle tension, neck or back pain
- Fatigue or low energy
- Sleep problems (insomnia or oversleeping)
- Upset stomach, nausea, acidity
- Rapid heartbeat, sweating
- Frequent illnesses (low immunity)

2. Emotional Symptoms

- Anxiety, nervousness
- Irritability or mood swings
- Feeling overwhelmed or helpless
- Sadness or low motivation
- Difficulty relaxing
- Loss of interest or enjoyment

3. Cognitive (Mental) Symptoms

- Poor concentration
- Forgetfulness
- Racing or negative thoughts
- Constant worrying
- Difficulty making decisions

4. Behavioral Symptoms

- Changes in eating habits (overeating or loss of appetite)
- Social withdrawal
- Increased use of caffeine, alcohol, or tobacco
- Procrastination or reduced productivity

- Nail biting, pacing, restlessness

CAUSES

1. Personal Causes

- Poor time management
- High expectations or perfectionism
- Negative thinking or overthinking
- Lack of self-confidence
- Health problems

2. Academic / Work-Related Causes

- Exams, assignments, deadlines
- Heavy workload or pressure to perform
- Job insecurity or long working hours
- Lack of recognition or support
- Competition and fear of failure

3. Social Causes

- Family conflicts
- Relationship problems
- Social pressure or peer comparison
- Lack of social support
- Isolation or loneliness

4. Financial Causes

- Low income or unemployment
- Debt or loans
- Rising living expenses
- Unexpected financial emergencies

5. Environmental Causes

- Noise, pollution, overcrowding
- Poor living or working conditions
- Natural disasters or climate issues
- Unsafe surroundings

6. Lifestyle Causes

- Lack of sleep
- Poor diet
- Lack of physical activity
- Excessive screen time
- Substance abuse (alcohol, caffeine, smoking).

TREATMENT

1. Lifestyle Changes

- Regular **exercise** (walking, yoga, stretching) reduces stress hormones
- **Balanced diet** and adequate **sleep** improve stress tolerance
- Limit **caffeine, alcohol, and screen time.**

2. Relaxation Techniques

- **Deep breathing** and **meditation** calm the nervous system
- **Yoga, progressive muscle relaxation, and mindfulness** help mental balance
- Listening to **music** or engaging in hobbies reduces tension.

3. Psychological Therapy

- **Counseling** or **talk therapy** helps manage emotional stress
- **Cognitive Behavioral Therapy (CBT)** helps change negative thought patterns
- Stress-management training improves coping skills.

4. Social Support

- Sharing problems with **family or friends**
- Participating in **support groups** or community activities.

5. Medical Treatment (If Severe)

- **Doctors may prescribe medications** for anxiety or depression when required
- Regular **medical check-ups** for stress-related conditions.

6. Time Management & Self-Care

- Prioritize tasks and avoid overworking
- Take **breaks**, practice **self-care**, and maintain work–life balance.

COMMON DRUGS USED

1. Anti-Anxiety Drugs (Anxiolytics): Benzodiazepine, Alprazolam, Buspirone

2. Antidepressants:

- **SSRIs (Selective Serotonin Reuptake Inhibitors):** Fluoxetine, Sertraline, Escitalopram, Paroxetine
- **SNRIs:** Venlafaxine, Duloxetine.

3. Beta-Blockers: Propranolol

4. Sleep Aids (if stress causes insomnia): Zolpidem, Melatonin supplements

5. Herbal / Natural Options (Mild stress): Ashwagandha, Brahmi, Valerian root, Chamomile.

ANTIOXIDANTS

Antioxidants are substances that protect the body from damage caused by **free radicals**, which are unstable molecules produced during metabolism, stress, pollution, and disease. Free radicals cause **oxidative stress**, leading to cell damage, aging, and various disorders. Antioxidants neutralize these free radicals and help maintain cellular health.

Types of Antioxidants

1. Enzymatic Antioxidants

These are naturally produced in the body and form the first line of defense against oxidative stress. Examples include superoxide dismutase (SOD), catalase, and glutathione peroxidase. They convert harmful free radicals into harmless molecules like water and oxygen.

2. Non-Enzymatic Antioxidants

These are obtained mainly from the diet and help support the body's antioxidant system. They are further classified as

- **Natural antioxidants:** Vitamin C, vitamin E, beta-carotene, flavonoids, and polyphenols found in fruits, vegetables, and herbs.
- **Synthetic antioxidants:** Butylated hydroxyanisole (BHA) and butylated hydroxytoluene (BHT), mainly used in food preservation.

3. Water-Soluble Antioxidants

These antioxidants work in the watery parts of cells and blood. Vitamin C and polyphenols are common examples, protecting cells from oxidative damage.

4. Fat-Soluble Antioxidants

These protect cell membranes from lipid peroxidation. Examples include vitamin E, vitamin A, and carotenoids.

5. Plant-Based Antioxidants (Phytochemicals)

These include flavonoids, tannins, phenolic acids, and terpenoids commonly found in medicinal plants and herbal teas. They possess antioxidant, anti-inflammatory, and anti-stress properties.

Overall, antioxidants play a vital role in preventing oxidative damage, supporting immune function, reducing stress, and maintaining overall health.

ANTIOXIDANTS IN HERBAL TEA

Herbal tea is a rich source of natural antioxidants that play an important role in reducing oxidative stress and promoting overall health, particularly in stress management. It contains bioactive compounds such as polyphenols, flavonoids, phenolic acids, tannins, and essential oils derived from medicinal plants like lemongrass, fennel, chamomile, and green herbs. These antioxidants help neutralize reactive oxygen species produced during physical and psychological stress, thereby protecting cells and tissues from oxidative damage. Flavonoids and phenolic compounds support brain function by protecting neurons, regulating stress hormones, and improving mood stability. Essential oils present in herbal teas also exhibit calming and neuroprotective effects, contributing to relaxation and mental well-being. Regular consumption of antioxidant-rich herbal tea helps reduce anxiety, improve sleep quality, enhance immune defense, and support the body's natural stress-coping mechanisms, making it an effective and safe functional beverage for stress relief.



LEMONGRASS (*Cymbopogon citratus*) Fig. no.1: Lemongrass – *Cymbopogon citratus*.

PLANT INFORMATION

- **Common name:** Lemongrass, Citronella grass
- **Botanical name:** *Cymbopogon citratus*
- **Kingdom:** Plantae
- **Division:** Magnoliophyta
- **Class:** Liliopsida
- **Order:** Poales
- **Family:** Poaceae
- **Genus:** *Cymbopogon*
- **Species:** *Cymbopogon citratus*

Vernacular names

- **English** – Lemongrass
- **Hindi** – Gandhatrina
- **Telugu** – Nimma Gaddi
- **Tamil** – Elumichai Pul

Botanical Description

- **Type:** Perennial aromatic grass
- **Height:** 1–1.5 meters
- **Leaves:** Long, narrow, linear, green with sharp margins and lemon fragrance
- **Stem:** Solid, jointed
- **Flowers:** Rarely flowers under cultivation

Growing Conditions

- **Sunlight:** Full sunlight
- **Soil:** Well-drained sandy or loamy soil
- **Watering:** Moderate watering
- **Climate:** Tropical and subtropical regions

Propagation

- **By slips:** Clumps are divided and replanted
- **By seeds:** Rarely used

Chemical Constituents

- **Essential oils:** Citral (geranial + neral), myrcene
- **Flavonoids:** Luteolin, quercetin
- **Phenolic compounds:** Caffeic acid, chlorogenic acid
- **Terpenes:** Geraniol, citronellol
- **Tannins**

Uses of Lemongrass

1. Health Benefits

- Improves digestion and relieves bloating
- Reduces anxiety and stress
- Acts as a natural pain reliever
- Supports immune system

Medicinal Uses

1. Lemongrass as anti-stress activity

Lemongrass (*Cymbopogon citratus*) is widely used in traditional and modern medicine for its anti-stress properties. It acts as a natural calming agent that helps reduce anxiety, mental fatigue, and nervous tension by exerting a soothing effect on the central nervous system. The essential oil of lemongrass, rich in citral and other bioactive compounds, exhibits mild sedative and anxiolytic activity, which helps promote relaxation and emotional balance. Lemongrass is commonly consumed as a herbal tea to relieve stress-related symptoms such as headache, insomnia, irritability, and restlessness. Its antioxidant and anti-inflammatory properties protect nerve cells from stress-induced oxidative damage, thereby supporting cognitive function and mood stability. In aromatherapy, lemongrass oil is used to relieve mental exhaustion, improve concentration, and uplift mood. Additionally, lemongrass helps regulate stress-related digestive disturbances such as gastric discomfort and spasms, indirectly reducing psychological stress. Overall, lemongrass serves as an effective natural remedy for managing stress and promoting mental well-being.

2. Lemongrass as antioxidant

Lemongrass (*Cymbopogon citratus*) possesses significant antioxidant properties that contribute to its anti-stress activity. It is rich in bioactive compounds such as citral, flavonoids (luteolin and quercetin), phenolic acids (caffeic acid and chlorogenic acid), terpenoids, and tannins, which collectively help neutralize reactive oxygen species generated

during stress. Psychological and physiological stress increase oxidative stress in the body, leading to neuronal damage and altered neurotransmitter balance. The antioxidants present in lemongrass protect brain cells from oxidative damage, reduce inflammation, and support neurochemical stability. Citral and myrcene exhibit calming and anxiolytic effects, while flavonoids and phenolic compounds enhance the body's antioxidant defense system and regulate cortisol-induced stress responses. Consumption of lemongrass tea provides these antioxidants in a bioavailable form, promoting relaxation, reducing anxiety, improving sleep quality, and enhancing overall mental well-being. Thus, the antioxidant constituents of lemongrass play a crucial role in its effectiveness as a natural anti-stress agent.

Traditional Uses

- Lemongrass tea is consumed for stress relief
- Used in Ayurveda for fever and digestive disorders
- Essential oil used in aromatherapy.

FENNEL (*Foeniculum vulgare*)



Fig. no.2: Fennel – *Foeniculum vulgare*.

PLANT INFORMATION

- **Common name:** Fennel, Sweet fennel
- **Botanical name:** *Foeniculum vulgare*
- **Kingdom:** Plantae
- **Division:** Magnoliophyta
- **Class:** Magnoliopsida
- **Order:** Apiales

- **Family:** Apiaceae
- **Genus:** *Foeniculum*
- **Species:** *Foeniculum vulgare*

Vernacular names

- **English** – Fennel
- **Hindi** – Saunf
- **Telugu** – Sopu
- **Tamil** – Sombu

Botanical Description

- **Type:** Perennial aromatic herb
- **Height:** 1–2 meters
- **Leaves:** Finely dissected, feathery
- **Flowers:** Small yellow flowers in umbels
- **Fruits:** Small greenish-brown seeds (commonly used)

Growing Conditions

- **Sunlight:** Full sun
- **Soil:** Well-drained fertile soil
- **Watering:** Moderate
- **Climate:** Temperate and subtropical climates

Propagation

- **Seeds:** Primary method of cultivation

Chemical Constituents

- **Essential oils:** Anethole, fenchone, estragole
- **Flavonoids:** Quercetin, kaempferol
- **Phenolic compounds:** Rosmarinic acid
- **Fatty acids:** Oleic acid, linoleic acid
- **Coumarins**

Uses of Fennel

1. Health Benefits

- Improves digestion

- Relieves gas and bloating
- Enhances appetite
- Supports respiratory health

Medicinal uses

1. Fennel as anti-stress activity

Fennel (*Foeniculum vulgare*) is traditionally used as a medicinal herb for its anti-stress and calming properties. It acts as a mild natural sedative that helps relax the nervous system and reduce anxiety, nervousness, and mental fatigue. The essential oil of fennel, rich in anethole and fenchone, exhibits anxiolytic and neuroprotective effects that help stabilize mood and promote emotional balance. Fennel is commonly consumed as a herbal tea to relieve stress-related symptoms such as headache, irritability, insomnia, and restlessness. Its antioxidant compounds protect brain cells from oxidative stress caused by prolonged psychological stress, thereby supporting cognitive function and mental clarity. Additionally, fennel helps regulate stress-induced digestive disturbances like bloating, cramps, and indigestion, which indirectly contributes to mental relaxation. In traditional systems of medicine, fennel is also used to relieve hormonal imbalance-related stress, particularly in women. Overall, fennel serves as a safe and effective natural remedy for stress management and mental well-being.

2. Fennel as Antioxidant

Fennel (*Foeniculum vulgare*) exhibits strong antioxidant properties that contribute significantly to its anti-stress activity. It contains a wide range of bioactive antioxidant compounds such as flavonoids (quercetin and kaempferol), phenolic acids (rosmarinic acid and caffeic acid), and essential oil constituents including anethole and fenchone. During psychological stress, excessive production of reactive oxygen species leads to oxidative damage of brain cells and disruption of neurotransmitter balance. The antioxidants present in fennel effectively scavenge these free radicals, thereby protecting neuronal tissues from oxidative injury. Flavonoids and phenolic compounds help reduce inflammation and modulate cortisol-induced stress responses, while anethole exhibits neuroprotective and mild calming effects. Consumption of fennel seeds or fennel tea provides these antioxidants in a bioavailable form, promoting relaxation, reducing anxiety, improving sleep quality, and enhancing mental clarity. Thus, the antioxidant activity of fennel plays a crucial role in its therapeutic potential as a natural anti-stress agent

Traditional Uses

- Chewed after meals as a digestive
- Fennel tea used for stress and digestion
- Used in Ayurveda and Unani medicine

Anti-Stress and Neuroprotective Activity

Pharmacological studies indicate that lemongrass exhibits anxiolytic and calming effects by modulating neurotransmitters such as GABA. It also reduces oxidative damage in brain tissues under stress conditions. Fennel has shown antidepressant-like and anxiolytic effects in animal models. Its antioxidant properties play a crucial role in protecting neurons from stress-induced damage.

Herbal Tea Formulation and Synergistic Effects

The combination of lemongrass and fennel in herbal tea enhances antioxidant capacity and anti-stress efficacy. Synergistic interaction between phytochemicals improves therapeutic benefits and sensory acceptability. Such formulations can be classified as functional beverages.

CONCLUSION

The pharmacological screening of herbal tea formulated using medicinal herbs demonstrates significant **anti-stress activity**, primarily due to the presence of natural antioxidants, flavonoids, phenolic compounds, and essential oils. Herbs such as lemongrass and fennel exhibit synergistic effects by reducing oxidative stress, modulating stress hormones, and exerting calming and neuroprotective actions on the central nervous system. The antioxidant constituents effectively neutralize free radicals generated during psychological stress, thereby protecting neuronal cells and improving mental balance. Regular consumption of the herbal tea offers a safe, natural, and cost-effective approach to stress management, with minimal side effects compared to synthetic drugs. Overall, the pharmacological evaluation supports the therapeutic potential of antioxidant-rich herbal tea as a functional beverage for promoting relaxation, enhancing emotional well-being, and preventing stress-related disorders.

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