Green Remedies for the Mind: Translation Potential of Medicinal Plants in Future Mental Healthcare

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ABSTRACT:

Stress and anxiety are becoming more common mental health issues in modern culture, owing primarily to lifestyle changes, work pressure, and social barriers. Conventional pharmaceutical therapies are effective, but they are frequently linked with side effects, dependence, and expensive costs. In this context, medicinal plants present a potential, safer, and more cost-effective option for stress and anxiety relief. Various ancient medical systems, such as Ayurveda, Unani, and ancient Chinese Medicine, have long used plant-based therapies to promote mental health. Several medicinal plants, including Withania somnifera (Ashwagandha), Bacopa monnieri (Brahmi), Ocimum sanctum (Tulsi), Valeriana officinalis, and Passiflora incarnata, have been shown to have anxiolytic and stress-relieving properties through mechanisms involving neurotransmitter modulation, antioxidant activity, and hypothalamic-pituitary-adrenal (HPA) axis regulation. This article presents an overview of medicinal plants used to treat stress and anxiety, including their active elements, pharmacological activities, and scientific data supporting their efficacy. The increased interest in green therapies demonstrates their potential to improve mental health with few side effects.

1. INTRODUCTION:

Stress is described as a disruption in a person's natural bodily and psychological equilibrium caused by exposure to situations that produce pressure and tension, which are referred to as stressors.[1]

Depression refers to a wide range of mental health issues characterized by a persistent sadness, loss of interest, and mood disruption, all of which have a negative impact on cognition and psychomotor function. [2]

According to the World Health Organization, the prevalence of depression and other mental disorders is rising globally, particularly in low-income countries, as life expectancy rises, and more people reach the age when these problems often emerge. Risk factors in these countries include poverty, unemployment, loss of a loved one, breakups, disease, mental stress, and substance addiction. Globally, 300 million individuals (about 4.4%) suffer from depression. Mental health diseases are divided into depressive and anxiety disorders. These can show with a variety of symptoms and last months or years. Recurrent episodes can have a significant impact on the patient's quality of life and function.[3]

Anxiety disorders and depression disorders are two categories of mental health conditions. These might linger for

months or years and show up with a variety of symptoms. They can be recurrent and significant impact on the patient's functioning and quality of life. Years of living with a disability are a measure of the cost of these conditions. It is predicted that 24.6 million years of impairment were attributed to anxiety disorders and 50 million years to depressive disorders globally in 2015. A total of 788,000 people died in that year.[3]

Symptoms of depressive disorders include sadness, loss of interest or pleasure, guilt or low self-worth, disturbed sleep or appetite, weariness, and impaired attention, which can lead to suicide. They are classified as major depressive disorder or depressed episode and dysthymia.

Major depressive disorder, often known as a depressive episode, is characterized by sad mood, loss of interest and enjoyment, and decreased energy. It can range from mild to severe. Dysthymia causes similar symptoms that are less severe yet linger longer. Anxiety disorders are characterized by emotions of anxiety and fear.[3]

Stress is unavoidable in life. Daily problems can cause mental, bodily, and emotional stress. The term' stress' refers to internal or external factors that disrupt an organism's homeostasis, such as infection, psychological conditions, or physical danger. According to Cota (2008), stress arises from a perceived or actual gap between a situation's demands and an organism's resources. Stressors refer to the situations or factors that cause stress. Stress is caused by stressors and experienced as a result. There are two types of stress: eustress or positive stress, which promotes longevity, productivity, and life satisfaction, such as the stress of examination, exercise.[4] Stress can cause anxiety, high blood pressure, headaches, depression, weakened immune system, high cholesterol, sleeplessness, impotence, diarrhoea, loss of appetite, cancer, respiratory disorders, accidents, liver cirrhosis, and attempted suicide.

Stress is a widespread occurrence that every person encounters. Stress is closely associated with a variety of bodily dysfunctions. It is the body's response to the various unpleasant assaults that endanger internal balance. It is known to disrupt the organism's physiological homeostasis

and cause the breakdown of integrated adaptational systems in response to a severe environmental stimulus.

In reaction to such a circumstance, the body elicits a number of autonomic, endocrinal, and visceral responses, including the production of hormones such as cortisol and adrenalin. In other words, stress is the body's response to stimuli that disrupt its homeostasis. When the balance of hormones is disrupted, the immune system suffers. A stressful experience might activate the "fight-or-flight" response, which causes hormones like adrenaline and cortisol to flow through the body. A small amount of stress, known as "acute stress," can be stimulating because it keeps us active and aware. However, long-term, or "chronic stress," can have a negative impact on health. You may not be able to control the pressures in your life, but you can change your response to them.[5]

Medications for depression include tricyclic antidepressants, monoamine oxidase inhibitors, selective serotonin reuptake inhibitors, norepinephrine and dopamine reuptake inhibitors, serotonin antagonists, and reuptake inhibitors.[6]

Medications which are used to treat stress and anxiety includes as Paxil, Prozac, Effexor, Cymbalta, and Zoloft are increasingly used for stress management. However, these medications do not solve the problem. These medications cause undesirable side effects including as exhaustion, weight gain, digestive issues, sleeplessness, and sexual dysfunction. One popular anxiety treatment medication has anxiety as a side effect. Plants have been used to heal diseases for centuries due to their bioactive chemicals, which can be effective without causing adverse effects. This review suggests that plants have the capacity to treat and reduce stress. This

review examines the impact of different plant types on stress and depression. [7] In 45% of the investigations, they were decreased when herbal medications were used for the same purposes.[8]

Herbal formulations have been used for many years to improve the health of people not only in Asian countries, but all throughout the world. They claimed to improve physical endurance and cerebral abilities. Safer and less expensive herbal medications have been shown to have potential as anti-stress agents since they can alleviate stress without affecting the body's physiological functioning.[9]

Stressor Assessment: It is important to note that stress does not always affect how well or poorly the immune system functions. The ability to cope with stress is the most significant factor. The way an individual interprets a stressful experience may be more essential than the presence of the stress itself. Individuals with high stress levels and great coping skills may experience little effects on immune system performance. Individuals with poor coping abilities who experience low levels of stress may experience major changes in immunological function, increasing their susceptibility to disease. The actual level of stress does not matter when calculating its impact on the immune system. [10]

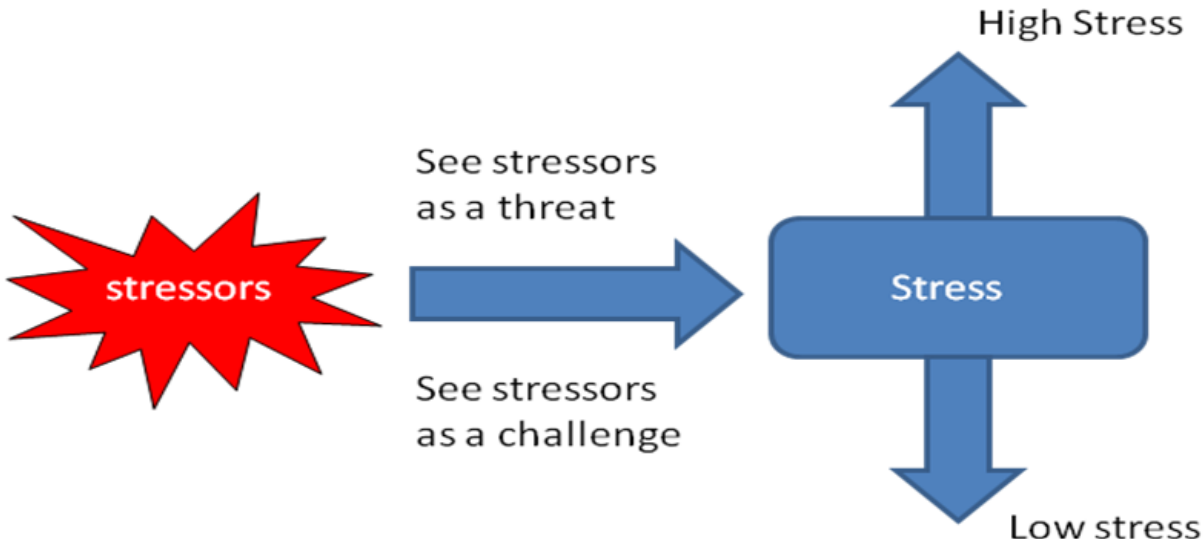

Figure1: Stressor Assessment

2. PATHOPHYSIOLOGY OF STRESS AND ANXIETY

Neurotransmitters

The most studied neurotransmitters in ADs are serotonin (5-HT), norepinephrine (NE), epinephrine (E), dopamine (DA), and gamma-aminobutyric acid (GABA).(Figure 2)[11]

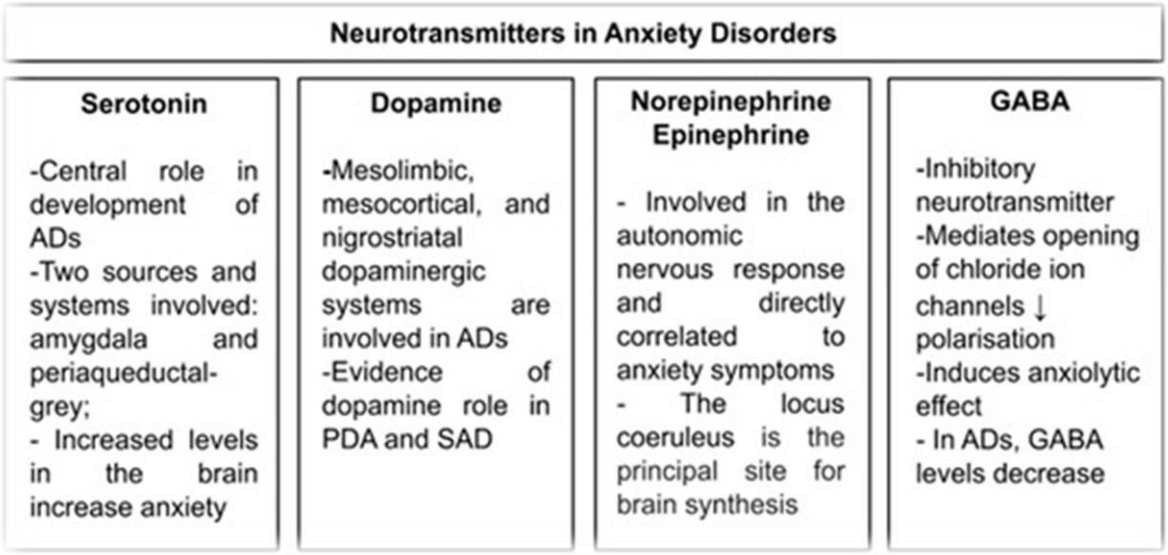

Figure 2. Neurotransmitters in Anxiety Disorders.

This article investigates neurotransmitters related in anxiety disorders. Note: ADs (anxiety disorders), GABA (gamma-aminobutyric acid), PDA (panic disorders with or without agoraphobia), and SAD (social anxiety disorder). [11]

Role of Hypothalamic-pituitary-adrenal axis

The HPA axis is the body's central stress response system. Under stress, the hypothalamus produces corticotropin-releasing hormone (CRH), which stimulates the anterior pituitary gland to secrete adrenocorticotropic hormone (ACTH), resulting in cortisol release from the adrenal cortex. While acute activation is beneficial, chronic stress causes sustained HPA axis activity and glucocorticoid resistance, which harms brain areas like the hippocampus and prefrontal cortex.

Elevated cortisol levels are a defining finding in many persons with MDD and are associated with reduced hippocampus volume and neurogenesis. impaired feedback inhibition of the HPA axis. Anxiety and difficulty sleeping have increased. Notably, glucocorticoid-induced reduction of BDNF causes morphological and functional abnormalities in the brain.[12]

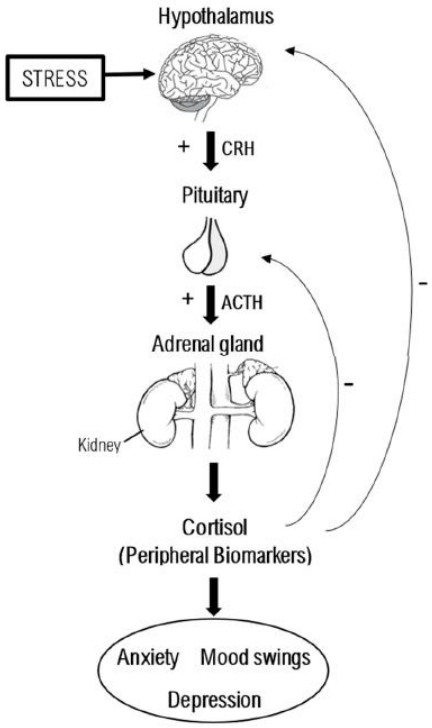

Figure 3. Illustration of the hypothalamic–pituitary–adrenal axis and related peripheral biomarkers.

The hypothalamic–pituitary–adrenal (HPA) axis is an endocrine system based on feedback interactions among the hypothalamus, the anterior pituitary gland, and the adrenal glands. The neuroendocrine cells of the hypothalamus produce CRH (corticotropin-releasing hormone), which is then released into the adenohypophysis where it induces the synthesis of ACTH (adrenocorticotropic hormone). Finally, the adrenal cortex produces glucocorticoids (mainly cortisol) in response to ACTH

stimulation. The stress-related dysregulation of the HPA axis in mood and anxiety disorders can be assessed by measuring the peripheral biomarkers, such as plasma, urinary, hair, and salivary cortisol, or the releasing factors (CRH and ACTH) and neurotransmitters (epinephrine and norepinephrine).

Stress Hormones and their effects on body system

Adrenaline accelerates the heart rate, raises blood pressure, and provides more energy. Cortisol, the primary stress hormone, raises blood sugar, also known as glucose, which improves the brain's usage of glucose and increases the availability of chemicals that repair tissues.[13]

3. CONVENTIONAL TREATMENT

3.1 Pharmacological Therapy

Numerous neurotransmitters play a role in both normal and pathological anxiety states. Each of these systems is a possible target for pharmacological intervention, but only a few types of medicines are used in clinical practice to treat anxiety. These medication classifications will be briefly explored next.

3.1.1 Selective serotonin Reuptake Inhibitors

SSRIs, which are typically prescribed for depression, are considered the first line of treatment for anxiety

disorders. This medicine family contains fluoxetine (Prozac, Eli Lilly), sertraline (Zoloft, Pfizer), citalopram (Celexa, Forest), escitalopram (Lexapro, Forest), fluvoxamine (Luvox, Solvay), paroxetine (Paxil, GlaxoSmithKline), and vilazodone.72 The main feature of these drugs is that they inhibit the serotonin transporter and appear to produce desensitization of postsynaptic serotonin receptors, hence restoring the activity of serotonergic pathways.

The method by which this reduces anxiety symptoms is unclear. Vilazodone, the most recently approved medicine in this family (despite being prescribed for severe depressive disorder), works as a partial agonist of the serotonin-1a receptor, which may contribute to anxiolysis.73 Buspirone (BuSpar, Bristol-Myers Squibb), while not a serotonin reuptake inhibitor (SRI), is a 5-HT1a agonist that is commonly used as a standalone treatment or in conjunction with SSRI therapy.[14]

3.1.2 Serotonin Norepinephrine Reuptake Inhibitor

Venlafaxine, desvenlafaxine (Pristiq, Pfizer), and duloxetine are examples of serotonin and norepinephrine transporter inhibitors (SNRIs).75 Milnacipran (Savella, Cypress/Forest) is rarely, if ever, used to alleviate anxiety because its only FDA-approved application is fibromyalgia.76 SNRIs are often utilized when an SSRI fails or does not respond well. They are used as augmentation to SSRIs because the combination of these two medication types can create serotonin syndrome.

Patient responses to SNRIs can vary greatly; some patients may report a worsening of anxiety-related physiological symptoms as a result of enhanced norepinephrine-mediated signaling caused by norepinephrine transporter blockage. Patients who do not experience this effect, enhanced noradrenergic tonus may contribute to the anxiolytic efficacy of these drugs.[15]

3.1.3 Benzodiazepines

Benzodiazepines were once commonly used to treat anxiety disorders, but they are no longer regarded first-line therapy due to the hazards associated with their long-term usage.75 They are particularly efficient in relieving acute anxiety, but are associated with significant side effects when used for a long time in high dosages, including:

- Physiological and psychological dependence.
- Potential fatalities during withdrawal.
- Cognitive function and coordination are impaired.
- When combined with alcohol or narcotics, they can cause a potentially fatal overdose.
- Inhibition of memory encoding, which can impair the effectiveness of concurrent treatment.

Because of these factors, benzodiazepines are frequently only used to treat acute anxiety in the short term or to treat refractory anxiety following the failure of multiple other medication attempts. Notably, certain patient subgroups respond well to modest benzodiazepine dosages and can safely taper off of high doses, particularly when cognitive-behavioral treatment (CBT) is included.[16]

3.1.4 Tricyclic Antidepressants

All tricyclic antidepressants (TCAs) are norepinephrine reuptake inhibitors, and several also inhibit serotonin reuptake. Although several drugs in this therapeutic class are as effective as SSRIs or SNRIs for anxiety disorders,

TCAs have a higher number of side effects and are potentially fatal in an overdose. Because of this, TCAs are rarely used to treat anxiety disorders. One prominent exception is clomipramine (Anafranil, Malinckrodt), which may be more effective than SSRIs or SNRIs in patients with OCD.[17]

3.2 Non-Pharmacological therapy

Mind-body medicine has been found to alleviate stress and improve overall well-being. These mind-body approaches assist people shift their way of thinking about the situation, giving them more control over how they respond to stress. Individuals can manage and even minimize their stress by asserting control over their stress-related reactions and behaviors. Furthermore, when people recognize they can manage their behaviors and, more crucially, their attitudes, they have more influence over their total stress levels. It is critical for individuals to learn how to control their thoughts, attitudes, and behaviors when confronted with stressful situations. The following are some natural stress-reduction techniques. [18]

Relaxation Techniques:

- Exercise
- Breathing
- Yoga
- Medication
- Division of labor
- Assertiveness
- Alcohol and drugs
- Caffeine

4. MEDICINAL PLANTS IN STRESS AND ANXIETY MANAGEMENT

4.1 Ashwagandha

Figure 4: Ashwagandha

Ashwagandha, scientifically known as Withania somnifera, is a popular herb used in traditional Ayurvedic medicine. It is considered an adaptogen, meaning it helps the body adapt and cope with stress. Ashwagandha has been used for centuries to support overall well-being and promote relaxation. ashwagandha is its ability to help reduce cortisol levels, the primary stress hormone in the body. By regulating cortisol levels, ashwagandha can help mitigate the negative effects of chronic stress on the body and mind. This herb has also been found to have anxiolytic properties, helping to alleviate anxiety and promote a sense of calmness.

Ashwagandha is known to support the nervous system by enhancing neurotransmitter function and modulating the activity of gamma-aminobutyric acid (GABA) receptors, which are involved in regulating anxiety and stress responses. By doing so, it can help reduce feelings of restlessness, irritability, and fatigue associated with stress. ashwagandha has been studied for its potential benefits on overall mental health. It may improve cognitive function, memory, and attention span, which can be affected by chronic stress. Ashwagandha is available in various forms, including capsules, powders, and tinctures. It is generally well-tolerated, but it's important to note that individual responses may vary. It is advisable to consult with a healthcare professional before starting any supplementation, especially if you have any underlying health conditions or are taking medications.[19]

4.2 Lavandula:

Figure 5: Lavandula

Lavandula, also known as lavender, is a fragrant herb widely renowned for its calming and relaxing effects. It has been utilized for ages in traditional medicine for its diverse medicinal properties. Lavender includes various bioactive chemicals, such as linalool and linalyl acetate, which contribute to its calming properties. These chemicals have been proven to interact with the neurological system, inducing relaxation and lowering anxiety. Lavender's uses include its ability to relieve stress and anxiety. Its scent has been shown to have anxiolytic qualities, which aid to relieve stress and promote tranquility. Inhaling lavender essential oil or utilizing it in aromatherapy has been proved to relax both the mind and body.

4.3 Ginseng

Figure 6: Ginseng

Ginseng refers to many plant species belonging to the *Panax genus*, including *Panax quinquefolium* (American ginseng) and *Panax ginseng* (Asian ginseng). Ginseng has a long history of usage in traditional Chinese medicine. It is known for its adaptogenic characteristics. Ginseng includes active chemicals known as ginsenosides, which are thought to be responsible for its medicinal properties. These chemicals have been demonstrated to interact with a variety of organ systems, including the neurological and immunological systems. Ginseng's principal applications are to boost energy and counteract weariness. It is said to help the body's stress response by boosting resilience and general Vigor. Ginseng is frequently us Ginseng is also renowned for its cognitive-enhancing properties. It is thought to promote mental clarity, concentration, and memory. Regular ingestion of ginseng may increase cognitive function and general mental performance to treat physical and mental tiredness, and it may help boost endurance and stamina.[20]

4.4 Linden (Tilia spp.)

Figure 7: Linden

Linden is Known as *Tilia spp*., this tree genus has a number of species that are frequently found in Asia, North America, and Europe. Because of their possible health benefits, linden tree flowers, leaves, and bark have been utilized in traditional medicine for generations. Linden is renowned for its ability to promote relaxation and calmness. It has long been used as a natural treatment to ease nervous tension, lower anxiety, and promote relaxation. To produce a calming and pleasant effect, the fragrant blooms of the linden tree are frequently utilized

in herbal remedies or made into teas. Linden is used because it may help reduce the symptoms of stress. It is thought to have mild sedative qualities that might reduce emotional strain and encourage relaxation.

4.5 Hawthorn

Figure 8: Hawthorn

Hawthorn, or *Crataegus spp*., is a shrub or small tree in the Rosaceae family. It has a lengthy history of usage in traditional medicine due to its possible cardiovascular advantages. Hawthorn is highly valued for its ability to promote heart health and blood circulation. Hawthorn includes a variety of bioactive chemicals, including flavonoids, oligomeric proanthocyanidins (OPCs), and triterpene acids, which are thought to contribute to its medicinal properties. These chemicals are known to have antioxidant and anti-inflammatory characteristics, which could benefit cardiovascular health.[21]

4.6 Gotu kola

Figure 9: G. Kola

Centella asiatica, the scientific name for gotu kola, is a tiny herbaceous plant that is indigenous to Asia and is primarily found in China, India, and Southeast Asia. Because of its possible health benefits, it has been extensively employed in traditional medical systems including Ayurveda and Traditional Chinese Medicine. Gotu kola is well known for its adaptogenic qualities, which support general health and assist the body in adjusting to stress. It is

thought to improve resilience and assist the body's stress response mechanism. Gotu Kola has the ability to improve memory and cognitive function. It is frequently used to increase concentration, focus, and mental clarity. It is thought that gotu kola supports cognitive functions and general brain health by positively influencing neurotransmitters in the brain.[22]

4.7 Valerian

Figure 10: Valerian

Valeriana officinalis L. (Valerianaceae),

Valerian roots contain hypnotic and tranquilizing properties and are typically used as a sedative, calming, and sleep-promoting agent. Additionally, it is used as an anticonvulsive for epilepsy, a narcotic for sleeplessness, and a medication for a number of mental illnesses, including as hysteria, depression, and nervous unrest. In addition to treating mental illnesses, it also possesses antispasmodic and anti-HIV properties. It is also used to treat digestive issues, hypochondriasis, cardiac arrhythmias, and urinary tract infections. There are hundreds of active phytochemicals in the plant, including monoterpenes, sesquiterpenes, triterpenes, lignans, alkaloids, flavonoids, and valepotriates. The main molecule behind valerenic acid's efficacy in treating mental illnesses, including calming effects, is its established interaction with glutamergic and GABA receptors. Furthermore, the anxiolytic effect is enhanced in plants by the presence of borneol, didrovaltrate, isovaleric acid, and a little amount of lignans.[23]

4.8 Ginko Biloba

Figure 11: G.Biloba

Ginkgo biloba has been used to treat various illnesses, including cognitive problems, dementia, dizziness/vertigo, low mood, cerebral insufficiency (lack of attention, anxiety, confusion), and Alzheimer's disease . The plant extract has been shown to provide neuroprotection against neurodegenerative illnesses by scavenging free radicals and reactive oxygen species (ROS) and reducing oxidative stress. Numerous experimental research have validated the effects of pharmacologically active biomolecules such as flavonoids and terpenoids.[24]

4.9 Hypericum perforatum

Figure 12: H. perforatum

Hypericum Perforatum L. (Hypericaceae), sometimes known as St. John's Wort or Balsana. Hypericin, a psychoactive chemical, is a good cure for nervous issues like anxiety, depression, sleeplessness, and tension. It can also be used as a natural antidepressant . Obstructing reuptake leads to higher levels of serotonin, dopamine, and norepinephrine. St. John's Wort has been shown to enhance the number and affinity of receptors, including dopaminergic, GABAergic, and serotonergic . Additionally, the herb contains astringent, expectorant, diuretic, and powerful antibacterial and antiviral properties.It suggest that St. John's Wort oil, made by infusing fresh flowers in olive oil, can treat sunburn, wounds, ulcers, and sores.[25]

4.10 Ocimum sanctum

Figure 13: O.sanctum

Basil, also known as *Ocimum sanctum*, is a plant in the Labiatae family.It has a volatile oil that includes caryophyllene, methyl eugenol, and over 70% eugenol. It also contains ursolic acid, rosmarinic acid, alkaloids, saponins, flavonoids (such as apigenin and luteolin glycosides), phenylpropane glucosides, and tannins. Ocimum sanctum has several pharmacological actions, including immunomodulation, anti-stress, hepatoprotection, chemoprevention, and anti-inflammatory properties. Ocimum sanctum lowers stress, improves endurance, eases inflammation, lowers cholesterol, gets rid of toxins, shields the body from radiation, and stomach ulcers, reduces fevers, enhances digestion, and offers a wealth of minerals and antioxidants. Ocimum sanctum is categorized as a "adaptogen," meaning that it improves the body's ability to react physiologically to stressors. Consequently, the negative consequences of long-term stress, like anxiety, insomnia, and digestive issues, can be reduced. Additionally, it increases resistance to several stressors, including exposure to hepatotoxins, produced stomach ulcers, and behavioral despair.[26]

4.11 Piper methysticum

Figure 14: P. Methysticum

The shrub *Piper methysticum*, sometimes known as kava and belonging to the Piperaceae family, is found on numerous islands in the South Pacific, including Hawaii. It includes an active principle in psychotherapy. Kava lactones, the main ingredients in the roots, have both sedative and intoxicating effects. Up to 15% of the root mass of this plant includes kavalactones, which promote feelings of wellbeing and physical and mental relaxation without producing negative side effects or addiction. They are also referred to as kavapyrones and possess analgesic, anticonvulsant, muscle relaxant, anxiolytic, and local anesthetic qualities. Because it is known to promote relaxation while maintaining mental acuity, this active principle is prescribed for those with diagnosed anxiety and is also effective in reducing the daily stress and strain of a fast-paced lifestyle. It is especially helpful in managing anxiety during the day. Additionally, piper methysticum helps relax skeletal muscles and encourages regular, comfortable sleep. The kava extract has demonstrated "long-term efficacy as a treatment alternative to tricyclic antidepressants and benzodiazepines in anxiety disorders."[27]

4.12 Turmuric (*Curcumin longa*)

Figure 15: Turmuric

Turmuric, also known as *Curcuma longa*, is a flowering plant that belongs to the Zingiberaceae family of ginger. Curcumin, the primary component of turmeric. Because of its hybrid chemical structure, curcumin, the main curcuminoid of C. longa (turmeric), possesses properties of both terpenoids and polyphenols. Because of its strong anti-inflammatory and antioxidant qualities, which are closely related to the pathophysiology of depression, it has been extensively researched. Curcumin attenuates neuroinflammation by mechanistically suppressing pro-inflammatory mediators such as NF-κB, IL-6, and TNF-α. By promoting neurogenesis and upregulating BDNF expression, it also improves hippocampus neuroplasticity. By blocking monoamine oxidase-A (MAO-A), curcumin regulates monoamine levels and raises serotonin and dopamine levels in important brain areas. Curcumin increases the activity of endogenous antioxidant enzymes and scavenges reactive oxygen radicals, According to human studies, curcumin with SSRIs can considerably lessen depression symptoms, particularly in people with elevated oxidative stress or inflammatory markers. [28]

4.13 Berberis vulgaris

Figure 16: vulgaris

Berberis vulgaris, commonly known as common barberry,European barberry, or simply barberry, is a shrub of the Berberis genus native to the Old World. The principal constituent of berberine Vulgaris is Berberine. In a number of preclinical models, berberine, an isoquinoline alkaloid obtained from plants like Hydrastis canadensis, Coptis chinensis, and B. vulgaris, has demonstrated potent antidepressant properties. It works primarily by

inhibiting monoamine oxidase A (MAO-A), which raises serotonin, dopamine, and norepinephrine levels in the brain, enhancing mood and affective balance. Furthermore, berberine facilitates neurogenesis and synaptic remodeling in the hippocampus by increasing the expression of brain-derived neurotrophic factor (BDNF). Its capacity to inhibit microglial activation and downregulate important inflammatory mediators like IL-6, TNF-α, and NF-κB is proof of its anti-inflammatory qualities. Crucially, berberine also has an effect on the gut microbiota, reestablishing microbial equilibrium and lessening depressed symptoms brought on by endotoxemia. Berberine dramatically corrects behavioral and neurochemical deficits in models of depression caused by lipopolysaccharide (LPS) and chronic unpredictable mild stress (CUMS).[29]

4.14 Humulus lupulus

Figure 17: H. lupulus

Humulus lupulus L. (Moraceae), Hops: A perennial climber with significant commercial and therapeutic value, hops are widely used in the beer industry as a flavoring, bittering, and/or preservation ingredient. According to Chevallier , Strobilus, the female inflorescences of hops, is a source of drugs for sedatives, sleeplessness, excitability, restlessness, and anxiety. Humulones and lupulones are the main components responsible for the sedative and antidepressant effects. Gamma-aminobutyric acid is known to influence neurotransmission in the latter . Additionally, it has been observed that certain bioactive compounds of hops interact with melatonin and serotonin receptors, which in turn affect a number of central nervous system processes .[30]

4.15 Rhodiola rosea

Figure 18: R. rosea

Rhodiola rosea, often known as Golden Root or Roseroot, is a medicinal plant of the Crassulaceae family that flourishes in cold climates. It contains potent substances such as rosavins (rosavin, rosin, and rosarin), salidroside, flavonoids, terpenes, and phenolic acids, all of which contribute to its antioxidant and adaptogen characteristics. These substances increase mood, alleviate sadness, and boost both mental and physical performance. R. rosea has been shown to reduce fatigue and stress by altering serotonin and dopamine levels and regulating beta-endorphins. It has long been used in Siberia to encourage fertility, in Middle Asia as a tea to cure colds and flu, and in Tibetan medicine to eliminate lung heat, purify the body, and heal injuries. Its adaptogenic properties provide advantages like immunological support, anticancer effects, and enhanced cognitive function in addition to being beneficial against a variety of chemical, biological, and physical stressors.[31]

TABLE 4.1: Herbal Medicine Use for Stress

S. No	Herbal Medicine	Family	Chemical Constituents	Growing Area	Physiological Uses	MOA
1.	Ashwagandha	Solanaceae	Withanolides, Alkaloids, Sitoindosides	India, Pakistan, Sri Lanka	Adaptogen stress adaptation, vitality	Adaptogen; regulates HPA axis, ↓ cortisol, enhances GABA activity.
2.	Lavender	Lamiaceae	Valerenic acid, Valerenal, Isovaleric acid	Europe, Asia	Relaxation, anxiety relief sleep promotion	Enhances GABA neurotransmission, Produces

						sedative &anxiolytic effects.
3.	Ginseng	Araliaceae	Ginsenosides	East Asia	Adaptogenic, energy boost, stress management	Adaptogenic action ; balances stress hormones & neurotransmitter.
4.	Linden (*Tiliaspp.*)	Malvaceae	Flavonoids	Native to Europe and North America	Relieves anxiety and tension, promotes relaxation.	Mild CNS depressant action due to flavonoids; reduces anxiety.
5.	Hawthorn	Rosaceae	Flavonoids, Proanthocyadins	Europe, North America	Calming, cardiovascular support stress reduction	Calm cardiovascular system; reduces stress-induces palpitation.
6.	Valerian	Caprifoliaceae	Valerenic acid Valerenal, Isovaleric acid	Europe, Asia	Sedative, sleep aid, anxiety reduction	Increases GABA levels; produces sedative & anxiolytic effects.
7.	Gotu Kola *(Centella Asiatica)*	Apiaceae	Triterpenoids	Native to Asia, Australia, Africa	Adaptogen, supports cognitive function, Aids in stress management	Enhances GABA & serotonin, improves cognition reduces anxiety.
8.	Rhodiola Rosea	Crassulaceae	Salidroside, rosavin	Arctic regions, Europe, Asia	Adaptogenic, stress resilience, mood enhancement	Adaptogen; modulates cortisol, improves stress resistances & mood.

.9.	Tulsi *(Holy Basil)*	Lamiaceae	Eugenol, Rosmarinic acid, Ursolic Acid	India, Southeast Asia	Adaptogenic, Stress reduction, anxiety relief	Adaptogenic; reduces stress hormones, antioxidant & anxiolytic action.
10	Kava	Piperaceae	kavalactones	Pacific Islands	Relaxation, anxiety	Adaptogenic; reduces stress hormones, antioxidant & anxiolytic action.

5. ACTIVE PHYTOCHEMICAL

Naturally occurring bioactive substances called phytochemicals give plants their color, flavor, and pathogen resistance. Phytochemicals are important for maintaining human health and avoiding diseases including cancer, heart disease, metabolic syndromes, and neuropsychiatric conditions like depression, even though they are not considered essential nutrients like vitamins and minerals The chemical structure and metabolic origin of phytochemicals allow for their general classification. Flavonoids, alkaloids, terpenes, polyphenols, saponins, glycosides, and lignans are the main classes (Figure 5, Table 2). Common herbs, spices, fruits, vegetables, and medicinal plants all contain a number of these chemicals.

Table 5.1: Phytochemicals with examples, sources and key actions.

Class	Examples	Sources	Key Actions
Flavonoids	Quercetin, kaempferol, apigenin	Onions, apples, parsley, tea	Antioxidant, anti-inflammatory
Alkaloids	Berberine, harmine	Goldenseal, ayahuasca	Neuroprotective, MAO inhibition
Terpenoids	Limonene, ginsenosides	Citrus, ginseng	Antidepressant, adaptogenic
Phenolic Acids	Ferulic acid, caffeic acid	Berries, coffee	Neuroprotective, anti-inflammatory
Lignans	Secoisolariciresinol	Flaxseed, sesame	Antioxidant, estrogenic activity
Saponins	Bacosides, ginsenosides	Bacopa, ginseng	HPA modulation, BDNF activation

Phytochemicals' versatility stems from their capacity to alter a variety of targets linked to the pathophysiology of

depression, such as neurotransmitters, oxidative stress pathways, inflammatory mediators, and neurotrophic signaling.[32]

6. HERBAL VS SYNTHETIC DRUG (SAFETY, EFFICACY AND SIDE EFFECTS)

Table 6.1: Comparison between Herbal Medicines: Comparative Table

Aspect	Herbal Medicines	Synthetic Drugs
Origin	Derived from natural plants (e.g.,Ashwagandha, Lavender, Valerian, Passionflower)	Produced through chemical synthesis in laboratories (e.g., benzodiazepines, SSRIs).
Safety	Generally perceived as safer due to natural origin and fewer chemical constituents.	May cause significant side effects due to high potency and chemical complexity.
Efficacy	Effective in mild-to- moderate stress, anxiety, and depression; efficacy varies depending on extract quality and dose.	Highly effective in moderate-to-severe cases; standardized and evidence- based.
Side Effects	Usually mild (e.g., mild GI upset, dizziness); lower risk of dependence	Commonly cause drowsiness, weight gain, digestive issues, sexual dysfunction, and withdrawal symptoms.
Tolerance/Compliance	Better patient compliance due to fewer adverse reactions and cultural acceptance.	Poor compliance in long- term use due to undesirable side effects.

7. SYNERGISTIC EFFECTS (HERBS AS ADJUVANTS TO MODERN MEDICINE)

Herbs that are used to treat stress and anxiety, such lemon balm, chamomile, and ashwagandha, might supplement contemporary therapy. They may have synergistic effects that increase the effectiveness of traditional medications like antidepressants and lessen their negative effects. Compared to single-compound synthetic medications, this method makes use of the holistic qualities of herbal medicine, where several active compounds cooperate on different paths to offer a more thorough and gentler treatment for mental health issues.[33]

8. FUTURE PERSPECTIVE AND RESEARCH DIRECTION

Despite the widespread traditional usage of herbal remedies to treat stress and anxiety, more research trials are needed to determine their long-term safety and effectiveness. Advanced study into molecular mechanisms, standardised extracts, and synergistic herbal combinations may improve the medicinal potential of natural

products.

Integrating herbal medications with conventional therapy may provide a more holistic and patient-centered approach to treating stress-related diseases.[32]

CONCLUSION:

Thus problems that bedevil people in this stress strewn materialistic age are anxiety, confusion and depression. The affected people need to be assured that every thing is alright and they will be taken care of and given special consideration so that they feel secure and comfortable. In other words, a compassionate control needs to be exercised on them to wean them away to normalcy. However, medication causing minimum physical and mental side effects must complement this approach. Plant based potions and formulations can be relied upon for a side effect free, long term usage after appropriate efficacy evaluation studies. If depression and other related maladies are left untreated, even as much as 25 percent could become fatally affected, mainly as victims of suicide. Besides, care must be taken to ascertain the underlying cause of depression as it could also be the fallout of an underlying physical illness and through a thorough health examination to diagnose and weed out the root cause. Depression can be treated with an imaginative remedial regimen that incorporates herbal based medicines, social support and psychological intervention. After all, knowledge about the healing properties of plants and herbs has been age old and used by generations of people across the globe, while pharmacological antidepressants have only been around for a few decades. However, scientific credence is an essential prerequisite to prove the efficacy and safety of the plant based products before clearing their remedial usage in depressive tendencies.

Medicinal plants offer promising natural alternatives for alleviating stress and anxiety. Ongoing research continues to uncover new insights into their mechanisms and efficacy. Embracing green remedies can be a valuable component of holistic mental health strategies.

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