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Mental healing with herbal medicine: Phytotherapeutic approaches to neurological and psychological disorders

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Abstract

Herbal medicine has been considered a promising pathway for the treatment of various neurological and psychological diseases. The broad range of use of herbal medicine is rooted in traditional ethnomedicinal knowledge, which is being reinforced by extensive modern pharmacological research. The phytotherapeutic efficacy of many important medicinal plants, such as *Withania somnifera*, *Bacopa monnieri*, *Rhodiola rosea*, *Ginkgo biloba*, and *Valeriana officinalis*, is associated with improved mental health and psychological well-being. These phytoproducts can modulate the neurotransmitter systems through serotonergic, dopaminergic, and GABAergic mechanisms, improve anti-inflammatory and antioxidative responses in the central nervous system (CNS), and can regulate the hypothalamic-pituitary-adrenal (HPA) axis, neurogenesis, and epigenetic changes. Moreover, recent works revealed the involvement of microbiome-friendly herbs in regulating the gut-brain axis. Despite favourable safety profiles and clinical significance, more research is needed to standardize optimal dosing and drug-herb interactions. Herbal neurotherapeutics are nowadays evolving with a steady shape through the recent investigations in phytochemical characterization, targeted delivery technologies, and personalized medicine applications. These consolidated methodologies made the herbal medicine more suitable to improve mental health and strengthen neurocognitive resistance.

Keywords: Antioxidant, antidepressant, herbal medicine, mental health, neurotransmitter, neuroprotective agents

Introduction

Various neurodegenerative diseases like Alzheimer's and Parkinson's disease, as well as mental health disorders like anxiety, depression, bipolar disorder, and schizophrenia, are becoming significant global health issues [1]. A combination of socioeconomic pressures, environmental changes, and lifestyle-related factors gradually increases the mental health disease cases as figured as more than 970 million affected people as reported by The World Health Organization (WHO) [2]. Side effects often accompany effective conventional pharmacological treatments due to long-term dependency and limited availability of the pharmaceutical medicines [3]. This limitation necessitated the development of a substitute bypass phytotherapy.

Application of herbal medicines for the treatment of mental disorders is considered a holistic and often individualised approach of traditional healing systems such as Ayurveda, Western herbalism, and Traditional Chinese Medicine (TCM) [4]. Research on various herbal compounds in preclinical and clinical treatment has exhibited that they can protect the brain, reduce anxiety, treat depression, and improve cognitive function. Many plant-derived chemicals isolated *Withania somnifera* (Ashwagandha), *Bacopa monnieri* (Brahmi), *Hypericum perforatum* (St. John's Wort), *Valeriana officinalis* (Valerian), and *Ginkgo biloba*, are associated with modulation of neurotransmitter activity, alleviation of oxidative stress, and stimulation of neuroplasticity [5].

This review, viewed through a phytotherapeutic lens, examines the potential healing effects of herbal medicine in recovering from the ill effects of neurological and psychological disorders. In addition to that, we have discussed the issues related to the safety, standardization of embracement herbal medicine in the treatment of modern mental healthcare practices, exploring their actual mode of regulatory action associated with

GABAergic and serotonergic pathways, suppression of neuroinflammation, and antioxidant effects. Synchronised traditional as well as modern scientific approaches revealed the use of herbal medicine as a promising tool to enhance mental well-being and increase tolerance to psychological disorders.

Understanding mental health: Neurobiological and Psychological Perspectives

Overview of key mental disorders: their symptoms and neurochemical imbalances

The unique but frequent overlapping neurochemical disruptions affect human mood, cognition, and behaviour, resulting in the occurrence of depression, anxiety, Alzheimer's disease, Parkinson's disease, bipolar disorder, and schizophrenia [6]. Reduction in serotonin, norepinephrine, brain-derived neurotrophic factor (BDNF), and dopamine levels leads to the occurrence of depression as symptomized by sadness, fatigue, and impaired cognitive function [7]. Prolonged stress results in GABA and serotonin deficiencies and elevated cortisol levels that lead to anxiety disorders, indicated by constant fear, increased tension, and interrupted sleep patterns [8]. Excessive mesolimbic pathways activation concomitant with disruption in GABA signalling and glutamate levels, due to imbalanced dopamine misregulation, resulting in symptoms of Schizophrenia, such as hallucinations, withdrawal tendency from society, and chaotic thinking. Frequent oscillations of norepinephrine, dopamine, and serotonin levels lead to alternating episodes of mania and depression, indicating bipolar disorder [9]. Some neurodegenerative diseases, like Alzheimer's and Parkinson's disorder, result from a gradual decline in acetylcholine and dopamine, respectively,

accompanied by excitotoxicity due to induced glutamate levels, dysfunction of mitochondria, and oxidative stress, resulting in impaired memory, motor, and cognitive deficiency [10]. Deep understanding of these neurochemical profiles is crucial for developing a specific herbal treatment to improve neurological function.

Role of neurotransmitters (serotonin, dopamine, GABA, norepinephrine)

Neurotransmitters govern mental health by communicating between neurons and cognition, stimulating mood and actions. Reduction in Gamma-aminobutyric acid (GABA) activity is associated with insomnia, anxiety, and stress-related disorders, as it plays a key role as the primary inhibitory neurotransmitter and decreases neuronal excitability, increasing calmness [11]. Serotonin (5-HT) is attributed to the regulation of emotions, appetite, and sleep. Deficiency in Serotonin (5-HT) level is strongly associated with depression and anxiety disorders [12]. The body's stress response is controlled by a key component, Norepinephrine (NE) that modulates arousal, attention, and alertness. An imbalance of this neurotransmitter contributed to depression, hypervigilance, and panic disorders [13]. Schizophrenia, Parkinson's disease, and bipolar disorder result from dysregulation of Dopamine (DA) levels. The DA levels are associated with the regulation of reward processing, motor control, and motivation [14]. As a whole, these neurotransmitters make a complex neurochemical network that plays a pivotal role in maintaining mental stability. Further investigations of the modulation of this network are required, as it is a central focus of both traditional psychopharmacological therapies and evolving phytotherapeutic approaches.

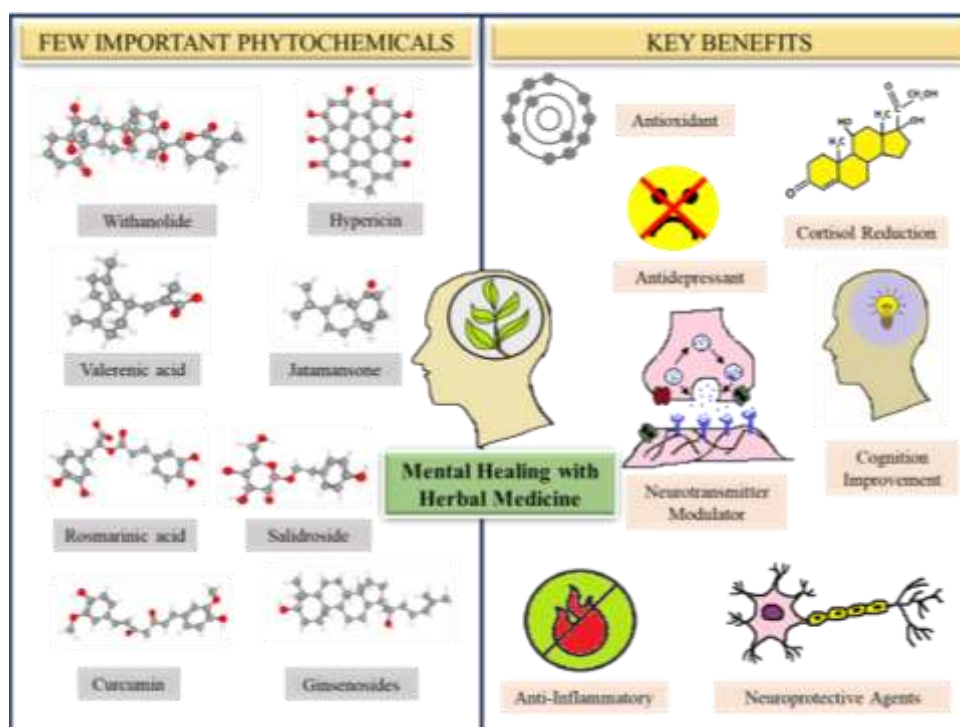


Fig 1: Some important phytochemicals (left) and their key benefit (right) in mental healing.

Inflammation, oxidative stress, neurodegeneration, and the gut-brain axis as contributing factors

Recent investigations also revealed that the parallel way to influence neurophysiological balance and mental disorders

critically is contributed by various neurodegenerative processes, oxidative stress, disturbances within the gut-brain axis, and chronic inflammation, along with neurotransmitter imbalances. Elevated pro-inflammatory cytokines such as

TNF- α , IL-1 β , and IL-6, leading to neuroinflammation. Synaptic dysfunction and neuronal damage occur due to neuroinflammation that results in depression, schizophrenia, and neurodegenerative diseases [15]. Impaired redox homeostasis due to a disturbed dynamic equilibrium between reactive oxygen species (ROS) and antioxidant systems causes cellular damage and stimulates neurodegeneration, particularly in Parkinson's and Alzheimer's disease [16]. Likewise, some neurodegeneration processes, such as amyloid-beta accumulation, hyperphosphorylation of tau protein, and dopaminergic neuron degeneration, contribute to progressive cognitive and emotional regression. The gut-brain axis is a dynamic bidirectional communication network that connects the brain with the gastrointestinal tract through a complex neural, immune, and endocrine pathway, and is considered a keystone modulator of mental well-being. Disruptions in this axis, particularly microbial dysbiosis, may affect mood and behaviour by altering metabolite profiles, modulating immune responses, and influencing vagal nerve signalling [17]. More elaborate studies are required to dissect the underlying interconnecting mechanism through phyto-therapeutic approaches to heal mental illness.

Traditional healing systems: Ayurveda, Traditional Chinese Medicine (TCM), Unani, and Western herbalism

The intrinsic relationship between mind, body, and spirit has long been acknowledged by traditional healing systems, including Ayurveda, Traditional Chinese Medicine (TCM), Unani, and Western herbalism. These systems use herbal medicines to restore emotional and psychological harmony [18]. In Ayurveda, mental health is governed by the balance of the three doshas (Vata, Pitta, and Kapha), with herbs like Ashwagandha, Brahmi, and Shankhpushpi used to enhance cognitive function, reduce stress, and stabilize mood [19]. TCM uses plants like ginseng, rehmannia, and schisandra to soothe the soul and feed the heart and liver. It views mental health through the lens of Qi (vital energy) flow and organ system balance [20]. Unani medicine prescribes herbs such as Saad Kufi (*Cyperus scariosus*) and Ustukhuddus (*Lavandula stoechas*) for neurological disorders and melancholy, emphasizing the balance of the four humors (blood, phlegm, yellow bile, and black bile). [21]. Western herbalism, which has its roots in Greco-Roman and European customs, makes use of herbs like Lemon Balm (*Melissa officinalis*), Valerian (*Valeriana officinalis*), and St. John's Wort (*Hypericum perforatum*) for its sedative, anxiolytic, and antidepressant properties [22]. Despite having different philosophical perspectives, these systems are similar in that they rely on plants to restore mental balance and have established the groundwork for contemporary phototherapy techniques in psychiatry.

Mechanisms of action

Neurotransmitter modulation

It has been reported that herbal decoctions have been shown to elevate various neurotransmitter systems in humans, including cognitive behaviour, stress tolerance, and mood regulation. *Rhodiola rosea*, a medicinal herb rich in salidroside and rosidarin, often inhibits monoamine oxidase (MAO) A/B, enhances receptor sensitivity, and augments the release of neurotransmitters, thereby upregulating dopaminergic, serotonergic, and noradrenergic activity.

Clinical trial on *R. rosea* proclaims that it can alleviate mild to moderate anxiety and depression over a span of 6-12 weeks in both rodents and humans [23]. A polysomnography investigation in mice has affirmed that lavender (*Lavandula angustifolia*) effectively improves sleep quality (increases NREM sleep) and reduces anxiety through activation of central amygdala GABAergic neurones. Furthermore, it also promotes GABA receptor-mediated inhibition through aromatic compounds like linalool and myrcene [24]. Additionally, lavender can also suppress serotonin transporter (SERT) and NMDA receptors, which finally result in its mood-stabilizing and neuroprotective properties [25]. Herbs like *Valeriana officinalis*, *Passiflora incarnata*, and *Melissa officinalis* upregulate GABAergic tone by modulating GABA receptors and inhibiting GABA transaminase, contributing to anxiolytic and calming effects. *Mucuna pruriens*, a source of natural L-DOPA, boosts dopamine levels in the brain [26]. Therefore, the intricate interplay of plant-based drugs and neurochemical interactions substantiates the role of plant-derived compounds in the homeostasis of neurotransmitters that finally contributes to mental well-being.

Anti-inflammatory and antioxidant activity in the CNS

Compounds like bacosides, derived from *Bacopa monnieri*, and curcumin from *Curcuma longa* are capable of combating oxidative stress and neuroinflammation, the key contributors to anxiety, depression, and neurodegeneration. Being able to traverse the blood-brain barrier, curcumin can suppress the astrocytes and microglia and downregulate pro-inflammatory cytokines (such as TNF α and IL 1 β). These reactions are mediated through the blocking of the NF κ B and MAPK pathways [27]. The endogenous antioxidant system is also boosted through activation of the Nrf2/ARE signalling and upregulation of enzymes like glutathione peroxidase, catalase, SOD, and HO, etc. The consequence, reduction in lipid peroxidation, cellular ROS level, and genetic damage, has been illustrated in rodent models of traumatic brain injury (TBI) and depression [28].

Bacosides lead to the activation of the Nrf2 pathway and suppression of NF- κ B, ultimately enhancing the cellular defence system by restoring antioxidant enzymes (SOD, CAT, and GPx) in cortical and hippocampus regions of the brain. In in-vivo studies with *B. monnieri* showed remarkable suppression of inflammatory markers such as MCP-1 and FAS, along with an upsurge in the cellular level of neuroprotectants (such as nerve growth factor and Bcl-2) [29]. Therefore, these herbs reinforce a dual mechanism. On one hand, they reduce neuroinflammation and, on the contrary, activate the antioxidant defence by NF κ B suppression and Nrf2-mediated gene activation thereby supporting neuronal integrity, synaptic plasticity, and mental resilience.

Modulation of HPA axis and stress response

Adaptogenic plants like *Schisandra chinensis*, *Withania somnifera* (ashwagandha), and *Rhodiola rosea* are reported to alter the cortisol level, thus modulating the Hypothalamic-Pituitary-Adrenal (HPA) axis, and thereby reducing chronic stress. In a randomized controlled trial investigation has revealed that administering a dose of 125-500 mg/day of ashwagandha extract for 8 weeks significantly decreases cortisol level and Perceived Stress Scale (PSS) scores [30]. Additionally, *R. rosea* can also

reduce the hyperactivity of the HPA axis by attenuating corticotropin-releasing hormone (CRH) signalling pathways [31]. A meta-analysis investigation with nine randomized controlled trials involving 558 individuals reported that a dose of 125-600 mg/day of *W. somnifera* administered over 30-90 days led to a sharp decline in serum cortisol level (mean difference $-2.58 \mu\text{g/dL}$; $p < 0.001$) [32]. A systematic review further affirmed the efficacy of ashwagandha in lowering morning cortisol levels across diverse human trials by modifying the hypothalamic-pituitary-adrenal (HPA) axis [33]. Taken together, these results reinforce ashwagandha's function in modulating psycho-neuroendocrine stress. These stress-relieving properties of ashwagandha are chiefly attributed to a class of steroidal lactone compounds known as withanolides [34]. Withaferin A, a steroidal lactone present in it, inhibits the release of corticotropin-releasing hormone (CRH) and adrenocorticotrophic hormone (ACTH) by modifying GABA/serotonin systems and interacting with glucocorticoid receptors [35].

Gut-brain axis influence via microbiome-friendly herbs

Medicinal herbs. Rich in prebiotics and polyphenols, for example, *Camellia sinensis* (green tea), *Panax ginseng*, *Curcuma longa* (turmeric), *Salvia rosmarinus* (rosemary), etc., promote a healthier, robust gut microflora that stabilizes cognitive behaviour and mood through the gut-brain axis [36]. There are some prebiotics and other phytochemical compounds that foster the growth of several beneficial bacteria (like *Lactobacillus* and *Bifidobacterium*), thereby increasing diversity and enhancing production of secondary metabolites such as butyrate. These changes fortify intestinal barrier integrity, suppress systemic and neuroinflammation, influence gene expression, and affect the synthesis of neurotransmitters like serotonin, GABA, and dopamine [37].

Various pathways are used to accomplish this, including immune and endocrine signalling modulation, activation of the vagus nerve. In dextran sulphate sodium salt (DSS)-induced anxiety models, for example, curcumin has been demonstrated to restore the balance of beneficial gut bacteria and reduce anxiety-like behaviours through microbial brain-gut axis pathways. Also, through modulation of gut microbiome, ginseng and rosemary extracts have been linked to decreased inflammatory markers and increased SCFA production [36, 38]. Together, these herbal remedies that target the gut-microbiome promote the production of neurotransmitters, suppress systemic and neuroinflammation, and improve gut integrity, all of which lead to better mood regulation, stress resilience, and cognitive behaviour [39].

Epigenetic modulation and neurogenesis

Herbal medicines significantly contribute to mental health by modulating epigenetic mechanisms and promoting neurogenesis, thereby influencing gene expression patterns associated with mood, cognition, and stress resilience [40]. Several phytochemicals present in medicinal herbs target DNA methylation, histone modifications, and non-coding RNAs, functioning as natural epigenetic modulators. For example, *Withania somnifera*, also known as ashwagandha, has been demonstrated to control histone acetylation and methylation in brain areas related to stress and anxiety, potentially via modifying the production of BDNF (brain-

derived neurotrophic factor), a crucial regulator of neurogenesis and neuroplasticity [41]. Similarly, the active ingredients in *Curcuma longa* and *Bacopa monnieri* control epigenetic changes, thereby promoting neurogenesis, which is essential for learning, mood control, and memory [42]. Collectively, this data demonstrates the therapeutic potential of phytochemicals in boosting brain regeneration and reestablishing epigenetic equilibrium, providing an alternative to traditional psychotropic treatments.

Future Perspectives and Conclusion

The emerging perspective on herbal therapeutics in mental well-being envisions an integrative, individualized, mechanistically enlightened approach that unites both the age-old traditional botanical wisdom with the knowledge of contemporary neurosciences. Advanced strides on detailed phytochemical analysis and standardization, nanoparticle-based targeting, and an overall multifaceted multi-omics (genomics and metabolomics) approach are collectively enhancing the bioavailability, therapeutic precision, and clinical potency of the plant-based compounds in addressing neuro-psychological disorders. With current research on gut-brain axis neuroplasticity and epigenetic attenuation, cognitive enhancers and herbal enhancers have become promising tools for neurorestorative treatments. Moreover, ethnopharmacology aided by AI and a pharmacology framework is enabling the innovation of multi-target mechanisms of plant-based bio-actives. Clinical application of those phytocompounds, however, demands addressing the challenges that include regulatory standardization, mapping herb-drug interactions, and developing evidence-based guidelines for combinatorial use of phyto-pharmaceuticals. Ultimately, in the future of mental health care, phyto-pharmaceuticals will perhaps play a pivotal role in tailored, holistic treatment paradigms that promote resilience, recovery, and the prevention of chronic neuropsychiatric diseases.

In summation, herbal medicine offers a rich and diverse set of phyto-therapeutic tools for supporting neurological and psychological health in humans. Modern phytotherapy brings together traditional wisdom and contemporary biomedical research, drawing from Western herbalism, traditional Chinese Medicine, and Ayurveda. Several plants including *W. somnifera*, *B. monnieri*, *R. rosea*, *V. officinalis*, and *Ginkgo biloba* have shown clinically evidenced benefits for mood elevation, cognitive function, stress resilience, and neuroprotection. Their effects stem from diverse mechanisms, such as modulating neurotransmitter-cortisol levels, regulating the HPA axis, reducing inflammation, enhancing antioxidant defences, and influencing epigenetic pathways.

While plant-based drugs are considered safe, their appropriate application necessitates precise dose administration, standardization, and interaction with other conventional medicinal compounds. With ongoing scientific research integration of herbal medicine into evidence-based mental healthcare supported by breakthroughs in personalized medicine, innovative formulations, and enhanced diagnostic technologies could lead to more holistic, effective, and sustainable approaches to mental and emotional wellbeing.

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