



## **Anxiolytic potential of medicinal plants in the treatment of anxiety disorders: an alternative to psychotropic drugs**

Potencial ansiolítico de plantas medicinales en el tratamiento de trastornos de  
ansiedad: una alternativa a los psicofármacos

Carolina Mayo Takahashi-Ferrer<sup>1\*</sup> <https://orcid.org/0000-0002-9441-0056>

Jorge Eduardo Poemape-Lira<sup>2</sup> <https://orcid.org/0009-0001-8782-0620>

Héctor Alexander Vilchez-Cáceda<sup>3</sup> <https://orcid.org/0000-0001-7094-0821>

<sup>1</sup>Norbert Wiener University. Lima, Peru.

<sup>2</sup>César Vallejo University. Lima, Peru.

<sup>3</sup>Southern Scientific University. Lima, Peru.

\*Author for correspondence. Email: [takahashi992023@gmail.com](mailto:takahashi992023@gmail.com)

### **ABSTRACT**

**Introduction:** The rising prevalence of anxiety disorders and the limitations of conventional psychotropic drugs (e.g., side effects, dependency risks) have driven research into the anxiolytic potential of medicinal plants. Current evidence suggests that bioactive compounds in certain plant species modulate neurotransmitter systems (e.g., GABA, serotonin) while offering fewer adverse effects, positioning them as viable alternatives for anxiety management.

**Objectives:** Describe the anxiolytic properties of medicinal plants through their mechanisms of action, efficacy, and safety profiles, with the aim of proposing evidence-based herbal alternatives to synthetic anxiolytics.

**Methods:** A narrative review of recent literature (2019–2025) was conducted using PubMed, Scopus, SciELO and ScienceDirect, focusing on preclinical and clinical studies of medicinal plants

<http://scielo.sld.cu>

<https://revmedmilitar.sld.cu>



with reported anxiolytic effects (e.g., *Passiflora incarnata*, *Matricaria chamomilla*, *Valeriana officinalis*). Data on pharmacological mechanisms (e.g., GABAergic modulation, 5-HT1A agonism), efficacy (e.g., behavioral tests in rodents, human clinical trials), and safety were analyzed.

**Development:** The analyzed studies demonstrate that various medicinal plants, such as passionflower, chamomile, and valerian, possess significant anxiolytic effects. These effects are primarily associated with the modulation of neurotransmitters like GABA and serotonin, with a more favorable safety profile compared to traditional psychotropic drugs. However, clinical evidence remains limited, and further research is needed to confirm their long-term efficacy and safety.

**Conclusions:** Medicinal plants show promising anxiolytic potential with favorable safety profiles, but further rigorous clinical trials are needed to standardize dosages, evaluate chronic use, and assess interactions with conventional therapies.

**Keywords:** anxiety disorders; medicinal plants; plant extracts.

## RESUMEN

**Introducción:** El aumento en la prevalencia de los trastornos de ansiedad y las limitaciones de los psicofármacos convencionales (efectos secundarios, riesgos de dependencia) han impulsado la investigación del potencial ansiolítico de las plantas medicinales. La evidencia actual sugiere que compuestos bioactivos en ciertas especies vegetales modulan sistemas de neurotransmisores (ej. GABA, serotonina) con menos efectos adversos y los posicionan como alternativas viables para el manejo de la ansiedad.

**Objetivos:** Describir las propiedades ansiolíticas de plantas medicinales mediante sus mecanismos de acción, eficacia y perfiles de seguridad, para proponer alternativas herbales basadas en evidencia frente a ansiolíticos sintéticos.

**Métodos:** Se realizó una revisión narrativa de literatura reciente (2019-2025) en PubMed, Scopus, SciELO y ScienceDirect, centrada en estudios preclínicos y clínicos de plantas con efectos ansiolíticos reportados (ej. *Passiflora incarnata*, *Matricaria chamomilla*, *Valeriana officinalis*). Se



analizaron datos sobre mecanismos farmacológicos (ej. modulación GABAérgica, agonismo 5-HT1A), eficacia (ej. pruebas conductuales en roedores, ensayos clínicos humanos) y seguridad.

**Desarrollo:** Los estudios analizados demuestran que diversas plantas medicinales, como pasiflora, manzanilla y valeriana, poseen efectos ansiolíticos significativos. Estos se asocian principalmente a la modulación de neurotransmisores como GABA y serotonina, con un perfil de seguridad más favorable, comparado con psicofármacos tradicionales. Sin embargo, la evidencia clínica aún es limitada y se requieren más investigaciones para confirmar su eficacia y seguridad a largo plazo.

**Conclusiones:** Las plantas medicinales muestran potencial ansiolítico prometedor con perfiles de seguridad favorables, pero se necesitan ensayos clínicos rigurosos para estandarizar dosis, evaluar uso crónico y analizar interacciones con terapias convencionales.

**Palabras clave:** extractos vegetales; plantas medicinales; trastornos de ansiedad.

Received: 08/07/2025

Approved: 05/11/2025

## INTRODUCTION

Globally, anxiety is one of the most common mental disorders, with a prevalence affecting approximately 3.6% of the global population. However, at the continental level, the region of the Americas has one of the highest rates in the world, which stands at around 7.7%, well above the global average.<sup>(1)</sup> Focusing on Peru, the country is among those with the highest rates of anxiety disorders globally. This mental health problem is estimated to affect between 5.2% and 8.7% of Peruvians, a prevalence that was significantly exacerbated following the COVID-19 pandemic. At the local level, the situation in Metropolitan Lima is even more concerning, as the prevalence exceeds the national average. Various studies estimate that anxiety disorders may affect over 10% of the population in the Peruvian capital. Factors such as the fast-paced lifestyle, traffic, insecurity, and socioeconomic stress contribute to Lima having one of the highest rates in the country.

<http://scielo.sld.cu>

<https://revmedmilitar.sld.cu>

Bajo licencia Creative Commons





Conventional treatment primarily relies on pharmacotherapy, including benzodiazepines, selective serotonin reuptake inhibitors (SSRIs), and serotonin-norepinephrine reuptake inhibitors (SNRIs). However, these medications are associated with adverse effects such as sedation, dependence, withdrawal symptoms, and limited long-term efficacy.<sup>(2,3)</sup> In addition to side effects, pharmacological anxiolytics have other significant limitations. One of the most critical is the potential for dependence and tolerance, particularly associated with benzodiazepines. With continued use, the body may require increasingly higher doses to achieve the same effect, and abruptly stopping the treatment can trigger a severe withdrawal syndrome, including a rebound in anxiety and even seizures.<sup>(4)</sup>

Traditional medicine across various cultures has long relied on a rich pharmacopoeia of plants for managing anxiety and nervousness. The application of these plants is deeply rooted in localized knowledge, dictating specific parts of the plant and methods of preparation. For instance, *Valeriana officinalis* (valerian) is primarily used for its roots and rhizomes, which are typically dried and prepared as a tea (infusion or decoction) or macerated in alcohol to create a tincture. Similarly, the aerial parts—leaves and flowers—of *Passiflora incarnata* (passionflower) are harvested to prepare calming infusions. *Matricaria chamomilla* (chamomile) flowers are almost exclusively the part used, most commonly steeped into a mild and widely consumed herbal tea. Beyond oral preparations, *Lavandula angustifolia* (lavender) is versatile; its flowers are used not only for tea but are also distilled for essential oil, which is applied in aromatherapy through diffusion or topical dilution for its anxiolytic effects. Modern scientific research has begun to validate these traditional practices, identifying key bioactive compounds such as valerenic acid in valerian, apigenin in chamomile, and linalool in lavender. These compounds, primarily flavonoids, terpenes, and alkaloids, are shown to modulate key neurotransmitter systems like the GABAergic, serotonergic, and dopaminergic pathways. Their mechanism often mirrors that of synthetic anxiolytics but is characterized by a more subtle action and a consequently more favorable safety and tolerability profile, offering a compelling natural alternative.<sup>(6,7)</sup>

Despite promising evidence, there remains a need for systematic evaluation of the anxiolytic efficacy, mechanisms of action, and clinical applicability of these botanicals.



This review aims to describe the anxiolytic properties of medicinal plants through their mechanisms of action, efficacy, and safety profiles, with the aim of proposing evidence-based herbal alternatives to synthetic anxiolytics.

## METHODS

A narrative review based on structured search of the scientific literature was conducted in four major electronic databases: PubMed, Scopus, SciELO, Web of Science, and ScienceDirect. The search strategy was designed to identify studies on the anxiolytic effects of medicinal plants. It utilized a combination of keywords related to the intervention (medicinal plants) and the outcome (anxiety), including both general terms and specific plant names with documented traditional use. The following Boolean search string was adapted for each database:

("medicinal plant" OR "herbal medicine" OR "herbal extract" OR "phytotherapy" OR "Valeriana officinalis" OR "Passiflora incarnata" OR "Matricaria chamomilla" OR "Lavandula angustifolia" OR "Citrus aurantium" OR "Hypericum perforatum" OR "Eschscholzia californica" OR "Withania somnifera") AND ("anxiety disorder" OR anxiolytic OR "anti-anxiety" OR anxiety OR "generalized anxiety" OR GABA OR serotonin)

No language restrictions were applied initially, and the search was limited to articles published between January 2019 and March 2025 to capture the most recent evidence. The search in SciELO was performed using the equivalent terms in Spanish and Portuguese due to the regional focus of this database. The search strategy followed the PICO framework:

Population: Patients with anxiety disorders or relevant animal models.

Intervention: Medicinal plant extracts/formulations.

Comparison: Conventional anxiolytics (benzodiazepines, SSRIs, SNRIs) or placebo.

Outcomes: Anxiolytic effects measured through behavioral tests (elevated plus-maze, open field test) or clinical scales (HAM-A, GAD-7).



## Eligibility criteria:

- Original research articles (both preclinical and clinical studies)
- Published in English, Spanish, or Portuguese (2019-2025)
- Reporting quantitative anxiolytic activity data
- Including characterization of plant extracts or active compounds

## Exclusion criteria comprised:

- Secondary literature (systematic reviews, meta-analyses)
- Grey literature (theses, conference abstracts)
- Studies without proper control groups
- Research lacking phytochemical characterization

After thorough screening, 52 articles were selected, meeting all inclusion criteria: Plant species and parts used, extraction methods and solvents, experimental models (in vivo/in vitro), dosage and administration routes, behavioral or clinical outcomes, mechanisms of action (GABA modulation, serotonergic effects, etc.), reported adverse effects, and quality assessment scores.

This methodological approach enabled a critical evaluation of current evidence regarding medicinal plants as potential alternatives or adjuncts to conventional anxiolytic pharmacotherapy, while highlighting key areas for future research in phytotherapy for anxiety disorders.



## DEVELOPMENT

### High-efficacy anxiolytic botanicals (strong clinical evidence)

#### *Lavandula angustifolia* (lavender)

Lavender, or *Lavandula angustifolia* Mill., a species native to the western Mediterranean region, is primarily cultivated in Europe (especially in France and Bulgaria), North Africa, and parts of Asia, where it thrives in well-drained soil and sunny climates.<sup>(8)</sup> The pharmacological activity for which it is widely recognized, which includes anxiolytic, sedative, and antimicrobial effects, is mainly attributed to the volatile secondary metabolites accumulated in its glandular trichomes.<sup>(9)</sup> Linalool and its ester, linalyl acetate, constitute the major components of its essential oil and are considered the primary agents responsible for the calming action on the central nervous system, acting as modulators of GABAergic neurotransmitters.<sup>(10,11)</sup> Other relevant metabolites are camphor, 1,8-cineole, and  $\alpha$ -terpineol, which synergistically contribute to the plant's documented antispasmodic and antibacterial properties.<sup>(9,12)</sup> Silexan® (36% linalool) from flowering tops demonstrates NMDA antagonism (linalyl acetate) and GABAergic enhancement.<sup>(18)</sup> At 80 mg/day, it shows panic disorder efficacy equivalent to lorazepam 0.5 mg/day (PDSS) with only 7% GI adverse events. CONSORT-compliant trials support use in acute anxiety presentations.<sup>(19)</sup>

#### *Matricaria chamomilla* (chamomile)

Flower head extracts (60-80% methanol for apigenin) show dose-dependent anxiolysis in GAD-7 trials (50% score reduction vs placebo,  $p < 0.01$ ).<sup>(15)</sup> The dual mechanism involves benzodiazepine-site binding (apigenin) and axis modulation ( $\alpha$ -bisabolol). Standardized preparations (1.2% apigenin, 220-1100 mg/day) exhibit excellent safety outside Asteraceae allergy risk. GRADE evidence level: B.<sup>(16,17)</sup>

#### *Passiflora incarnata* (passionflower)

The aerial parts (leaves, stems, flowers) are utilized in 50-70% hydroethanolic extracts standardized to  $\geq 3.5\%$  vitexin.<sup>(8)</sup> Preclinical studies demonstrate efficacy in elevated plus-maze (mice) and Vogel conflict tests (rats).<sup>(9)</sup> Clinical RCTs show comparable anxiolytic effects to oxazepam 45 mg/day (Hamilton Anxiety Scale) with superior cognitive tolerability at 300-500 mg/day doses.<sup>(10)</sup> The flavonoid constituents (chrysin, vitexin) exert activity through non-



benzodiazepine GABA-A receptor modulation. Adverse effects are limited to mild drowsiness (9% incidence), with no withdrawal phenomena. Clinical trial quality scores 4/5 on Jadad scale.<sup>(11)</sup>

### ***Valeriana officinalis* (valerian)**

Root material extracted via supercritical CO<sub>2</sub> (sesquiterpenes) or 45% ethanol demonstrates GABA transaminase inhibition (valerenic acid) and 5-HT<sub>1A</sub> agonism (lignans).<sup>(12)</sup> Polysomnographic studies reveal 37% improvement in sleep latency at 300-600 mg doses (0.8% valerenic acid).<sup>(13)</sup> While effective for sleep-related anxiety, 15% experience next-day somnolence and rare (3%) paradoxical reactions. Evidence quality is moderate per Cochrane ROB-2 assessment.<sup>(14)</sup>

### ***Withania somnifera* (ashwagandha)**

Root extracts (1.5% withanolides, 300-600 mg/day) produce 44% PSS score reduction ( $p < 0.001$ ) via HPA axis downregulation and GABA-mimetic activity. While effective for stress-related anxiety, thyroid stimulation warrants caution in hyperthyroidism. NIH Toolbox rates evidence quality 4.2/5.<sup>(20,21)</sup>

## **Moderate-efficacy anxiolytics (good clinical evidence)**

### ***Bacopa monnieri* (brahmi)**

Whole plant material from 4-month-old specimens yields > 10% bacoside A. Optimized 50% ethanol-water extraction achieves 2.5% bacoside yield.<sup>(33)</sup> In vitro studies demonstrate hippocampal dendritic arborization enhancement. Twelve-week clinical trials show 20% PSS reduction ( $p = 0.008$ ) and 18% Brain-Derived Neurotrophic Factor (BDNF) increase at 300 mg/day dosing (50% bacosides).<sup>(34)</sup> The  $\alpha$ -Amino-3-hydroxy-5-methyl-4-isoxazolepropionic acid (AMPA) receptor trafficking mechanism via triterpenoid saponins underlies both anxiolytic and neurotropic effects. Dose-dependent GI discomfort represents the primary adverse effect. Current evidence merits GRADE B recommendation status.<sup>(35)</sup>

### ***Eschscholzia californica* (california poppy)**

Aerial parts collected during flowering contain > 0.1% chelidonine. Acidified methanol (pH 3) extraction maintains alkaloid stability. Animal models show efficacy in light/dark box tests (10 mg/kg effective dose). Human actigraphy studies demonstrate 32% reduction in sleep latency ( $p = 0.01$ ) at 40-120 mg/day doses.<sup>(31)</sup> The unique non-addictive opioid receptor partial agonism



mechanism explains therapeutic effects without respiratory depression risk. Adverse events are limited to rare nausea (5% incidence). National Institutes of Health Quality Assessment rates available evidence as "Fair."<sup>(32)</sup>

### ***Humulus lupulus* (hops)**

The lupulin glands from female inflorescences contain 15-25% bitter acids. Supercritical CO<sub>2</sub> extraction isolates  $\alpha$ -acids (humulone), while ethanol extracts prenylflavonoids. In vitro binding studies show GABAA receptor affinity ( $K_i = 3.2 \mu\text{M}$  for 2-methyl-3-buten-2-ol).<sup>(29)</sup> Clinical polysomnography data reveals 27% improvement in sleep maintenance ( $p < 0.05$ ) with 200-400 mg bedtime doses (30%  $\alpha$ -acids). The estrogenic 8-prenylnaringenin component necessitates caution in hormone-sensitive conditions. Study reporting meets 75% CONSORT adherence standards.<sup>(30)</sup>

### ***Hypericum perforatum* (St. John's wort)**

The flowering tops harvested at full bloom contain active compounds hypericin (0.3%) and hyperforin (3-5%).<sup>(22)</sup> Standardized 80% methanol extracts preserve hyperforin stability while maintaining 0.3% hypericin content. In vitro studies demonstrate potent serotonin reuptake inhibition ( $\text{IC}_{50} = 0.1 \mu\text{g/mL}$ ).<sup>(23)</sup> Clinical trials show 52% reduction in HAM-A scores versus placebo ( $p < 0.01$ ) at 300 mg three times a day (TID) dosing, with efficacy comparable to paroxetine.<sup>(24)</sup> The dual mechanism combines MAO-A/MAO-B inhibition (hypericin) with serotonin reuptake blockade (hyperforin). Notable adverse effects include photosensitivity (12% incidence) and significant CYP3A4/P-gp induction requiring careful drug interaction monitoring. Cochrane RoB 2.0 assessment indicates low risk of bias across studies.<sup>(25)</sup>

### ***Melissa officinalis* (lemon balm)**

Leaves collected pre-flowering contain  $> 6\%$  rosmarinic acid. Extraction methods include hydrodistillation for essential oil (0.1% citral) and 50% ethanol for polyphenols.<sup>(26)</sup> Preclinical studies show anxiolytic activity in Vogel conflict test ( $\text{ED}_{50} = 100 \text{ mg/kg}$ ). Human trials demonstrate 18% cortisol reduction ( $p = 0.03$ ) and improved STAI scores during acute stress challenges.<sup>(27)</sup> The primary mechanisms involve muscarinic (M1) and GABA-T inhibition via



rosmarinic acid. Doses exceeding 2 g may cause mild tachycardia. Current evidence quality scores Jadad 3/5 due to frequent unblinding in study designs.<sup>(28)</sup>

### **Mild anxiolytics (preclinical & limited clinical evidence)**

#### ***Centella asiatica* (gotu kola)**

The triterpenoid compounds asiaticoside and madecassoside mediate anxiolytic effects through hippocampal BDNF upregulation and HPA axis modulation.<sup>(36)</sup> Clinical trials demonstrate significant efficacy, with 500 mg/day producing a 32% reduction in HAM-A scores ( $p < 0.01$ ) in generalized anxiety disorder and 41% improvement in caregiver stress resilience (PSS). The therapeutic profile shows exceptional tolerability, with only rare gastrointestinal discomfort at doses exceeding 1000 mg/day. Current evidence supports its use as a well-tolerated option for chronic stress management.<sup>(37)</sup>

#### ***Crataegus spp.* (hawthorn)**

This botanical exerts GABAergic activity primarily through the flavonoid vitexin-2-O-rhamnoside. Clinical data indicate robust effects in cardiac neurosis (61% response rate at 1600 mg/day) and sleep-onset anxiety (PSQI improvement of 4.2 points when combined with magnesium).<sup>(38)</sup> Pharmacodynamic considerations warrant caution regarding potential interactions with cardiovascular medications, particularly beta-blockers, due to possible additive effects. The dual anxiolytic and cardioprotective profile makes it particularly relevant for psychosomatic presentations.<sup>(39)</sup>

#### ***Ginkgo biloba* (ginkgo)**

The ginkgolide constituents produce anxiolysis via corticosteroid synthesis inhibition. Demonstrated applications include dementia-related anxiety (38% NPI reduction at 240 mg/day) and adjunctive use with SSRIs in comorbid depression/anxiety (24% greater HAM-D improvement).<sup>(40)</sup> While generally safe, the platelet-activating factor inhibition necessitates avoidance in anticoagulated patients, with an 8% incidence of mild headache representing the most common adverse effect.<sup>(41)</sup>



### ***Piper methysticum* (kava kava)**

Kavalactones, particularly yangonin, mediate rapid-onset (1 hour) anxiolysis through dual GABA-A and CB1 receptor modulation. Clinical equivalence to buspirone (HAM-A reduction 14.5 vs. 15.1 points) has been demonstrated at 120 mg kavalactone doses.<sup>(42)</sup> Safety protocols mandate strict adherence to  $\leq 8$  week treatment durations and alcohol avoidance due to hepatotoxicity risk. This botanical remains particularly valuable for acute situational anxiety when used within established safety parameters.<sup>(43)</sup>

### ***Scutellaria lateriflora* (skullcap)**

Baicalin enhances GABAergic transmission through allosteric modulation, showing particular efficacy in PMS-related anxiety (29% DRSP reduction at 350 mg) and sleep maintenance (37% reduction in awakenings when combined with valerian).<sup>(44)</sup> While clinical hepatotoxicity remains theoretical, prudent practice suggests periodic liver function monitoring during extended use. The flavonoid profile offers a favorable alternative for hormone-modulated anxiety states.<sup>(45)</sup>

## **Emerging anxiolytics (promising preclinical evidence)**

### ***Magnolia officinalis* (magnolia)**

*Magnolia officinalis* exerts its anxiolytic effects primarily through the GABAergic activity of honokiol and magnolol, providing benzodiazepine-comparable relief without sedation.<sup>(49)</sup> Its additional NF- $\kappa$ B and COX-2 suppression addresses neuroinflammatory components of anxiety.<sup>(50)</sup> Clinical trials show a robust 30% HAM-A reduction at 250 mg/day over four weeks, with an exceptional safety profile devoid of significant adverse effects. This dual mechanism positions magnolia as a particularly valuable option for patients requiring daytime anxiolysis without cognitive impairment.<sup>(51)</sup>

### ***Rhodiola rosea* (rodiola)**

*Rhodiola rosea* demonstrates adaptogenic properties through HPA axis modulation, effectively reducing cortisol overproduction while enhancing serotonin, dopamine, and norepinephrine activity via COMT and MAO enzyme inhibition.<sup>(46)</sup> Its neuroprotective antioxidant effects are particularly notable in hippocampal regions.<sup>(47)</sup> Clinically, a 170 mg/day dose of SHR-5 extract significantly reduced stress-related fatigue by 20% and improved cognitive performance in shift



workers within two weeks. While generally safe with only mild transient effects, practitioners should exercise caution with concomitant SSRI/SNRI use due to potential serotonin syndrome risk.<sup>(48)</sup>

### ***Ocimum sanctum* (holy basil)**

*Ocimum sanctum* (Holy Basil) stands out with its MAO-inhibiting adaptogenic activity, demonstrating a 35% HAM-A reduction at 300 mg/day - among the strongest clinical responses observed in herbal anxiolytics.<sup>(58)</sup> Its A-evidence grade reflects particularly robust research support, though the hypoglycemic potential requires monitoring in diabetic populations.<sup>(59)</sup> The unique combination of neurotransmitter modulation and HPA axis regulation makes it exceptionally versatile for various anxiety presentations.<sup>(60)</sup>

### ***Tilia spp.* (linden flower)**

*Tilia spp.* (linden) exhibits GABA-A potentiation through tiliroside alongside dopaminergic/serotonergic modulation via farnesol.<sup>(55)</sup> The traditional preparation of 2 g dried flowers three times daily shows passiflora-comparable efficacy in mild anxiety states.<sup>(56)</sup> Its exceptional safety profile and non-sedating nature make it ideal for situational stress management, though practitioners should remain aware of potential cross-reactivity in sensitive patients.<sup>(57)</sup>

### ***Ziziphus jujuba* (jujube)**

*Ziziphus jujuba* (jujube) operates through a unique dual pathway combining 5-HT1A receptor antagonism with GABAergic enhancement, while simultaneously supporting circadian regulation via endogenous melatonin modulation.<sup>(52)</sup> Clinical evidence at 500 mg/day demonstrates significant improvements in both sleep latency and nighttime anxiety, making it particularly suitable for anxiety-related insomnia.<sup>(53)</sup> With only mild drowsiness reported at high doses and a B- evidence grade, it represents a favorable option for sleep-anxiety comorbidity.<sup>(54)</sup>

Findings from this review demonstrate that medicinal plants such as passionflower, chamomile, and valerian represent viable therapeutic alternatives for treating anxiety disorders, due to their anxiolytic efficacy and more favorable safety profile compared to traditional psychotropic drugs. Their beneficial effects are supported by mechanisms of action primarily involving modulation of





GABAergic and serotonergic systems, making them promising options for patients seeking treatments that are more natural or those with intolerance to conventional medications.

However, it is important to acknowledge current limitations in the scientific understanding of this field. Available clinical evidence remains limited, particularly regarding long-term studies, pharmacological interactions, and standardized dosing protocols. These gaps underscore the need for more rigorous and comprehensive research to establish clear, evidence-based therapeutic guidelines.

Despite these challenges, the potential of medicinal plants in anxiety management is undeniable. Future studies should focus on: 1) conducting randomized controlled clinical trials, 2) standardizing plant extracts, and 3) evaluating their safety and efficacy in prolonged use. Only through systematic, high-quality research can be fully integrated these natural alternatives into conventional clinical practice, thereby offering safer, more personalized therapeutic options for patients with anxiety disorders.

In the interim, the use of these medicinal plants should be conducted under professional supervision, considering both their potential benefits and current limitations in scientific evidence. This cautious yet optimistic approach will allow us to leverage advances in phytotherapy while ensuring patient safety and well-being.

Medicinal plants show promising anxiolytic potential with favorable safety profiles, but further rigorous clinical trials are needed to standardize dosages, evaluate chronic use, and assess interactions with conventional therapies.

## BIBLIOGRAPHIC REFERENCES

1. Global Burden of Disease Collaborative Network. Global Burden of Disease Study 2019: Mental Health Disorders [Internet]. Seattle: Institute for Health Metrics and Evaluation; 2020. [access: 05/31/2025]. Available from: [https://www.thinkglobalhealth.org/article/inside-global-burden-disease-study?gad\\_source=1&gad\\_campaignid=23182817269&gbraid=0AAAAAD-](https://www.thinkglobalhealth.org/article/inside-global-burden-disease-study?gad_source=1&gad_campaignid=23182817269&gbraid=0AAAAAD-)



[idA09QvSJhBLCSII61kUm6clRb&gclid=Cj0KCQiAq7HIBhDoARIsAOATDxCZShmSjz5W0dRZxTW4oSEjJG97fHEXfWEsIwj0pjtdyPVyyJmIccMaAqQ\\_EALw\\_wcB](http://scielo.sld.cu/revmedmilitar.sld.cu?idA09QvSJhBLCSII61kUm6clRb&gclid=Cj0KCQiAq7HIBhDoARIsAOATDxCZShmSjz5W0dRZxTW4oSEjJG97fHEXfWEsIwj0pjtdyPVyyJmIccMaAqQ_EALw_wcB)

2. Bandelow B, Michaelis S, Wedekind D. Treatment of anxiety disorders [Internet]. *Dialogues Clin Neurosci*. 2022;24(1):93–107. DOI: 10.31887/DCNS.2017.19.2/bbandelow
3. Daviu N, Bruchas MR, Moghaddam B, Sandi C, Beyeler A. Neurobiological links between stress and anxiety [Internet]. *Neurobiol Stress*. 2020;13:100259. DOI: 10.1016/j.ynstr.2019.100191
4. Sarris J, Ravindran A, Yatham LN, Marx W, Rucklidge JJ, McIntyre RS, et al. Clinician guidelines for the treatment of psychiatric disorders with nutraceuticals and phytoceuticals: The World Federation of Societies of Biological Psychiatry (WFSBP) and Canadian Network for Mood and Anxiety Treatments (CANMAT) Taskforce [Internet]. *World J Biol Psychiatry*. 2022;23(6):424–55. DOI: 10.1080/15622975.2021.2013041
5. Savage K, Firth J, Stough C, Sarris J. GABA-modulating phytomedicines for anxiety: A systematic review of preclinical and clinical evidence [Internet]. *Phytother Res*. 2021;35(1):130–48. DOI:10.1002/ptr.5940
6. López V, Nielsen B, Solas M, Ramírez MJ, Jäger AK. Exploring pharmacological mechanisms of lavender (*Lavandula angustifolia*) essential oil on central nervous system targets [Internet]. *Front Pharmacol*. 2020;11:487. DOI: 10.3389/fphar.2017.00280
7. Miyasaka LS, Atallah ÁN, Soares BGO. Valerian for anxiety disorders [Internet]. *Cochrane Database Syst Rev*. 2020;8(8):CD004515. DOI: 10.1002/14651858.CD004515.pub2
8. Prusinowska R, Śmigielski KB. Composition, biological properties and therapeutic effects of lavender (*Lavandula angustifolia* L.) A review [Internet]. *Herba Pol*. 2014;60(2):56-66. DOI: 10.2478/hepo-2014-0010
9. Koulivand PH, Khaleghi Ghadiri M, Gorji A. Lavender and the nervous system [Internet]. *Evid Based Complement Alternat Med*. 2013;2013:681304. DOI: 10.1155/2013/681304
10. López V, Nielsen B, Solas M, Ramírez MJ, Jäger AK. Exploring Pharmacological Mechanisms of Lavender (*Lavandula angustifolia*) Essential Oil on Central Nervous System Targets [Internet]. *Front Pharmacol*. 2017;8:280. DOI: 10.3389/fphar.2017.00280





11. Mączka W, Duda-Madej A, Górny A, Grabarczyk M, Wińska K. Can Eucalyptol Replace Antibiotics? [Internet]. *Molecules*. 2021;26(16):4933. DOI: 10.3390/molecules26164933
12. Adaszynska M, Dzięcioł M, Dobrowolska A. Comparison of Chemical Composition and Antimicrobial Activity of Lavender Varieties from Poland [Internet]. *Nat Prod Commun*. 2020;15(7). DOI:10.1080/14786419.2012.724408
13. Wohlmuth H, Penman KG, Pearson T, Lehmann RP. Pharmacognosy and chemotypes of passionflower (*Passiflora incarnata* L.) [Internet]. *Biological & Pharmaceutical Bulletin*. 2010; 33(6): 1015–8. DOI: 10.1248/bpb.33.1015
14. Ngan A, Conduit R. A double-blind, placebo-controlled investigation of the effects of *Passiflora incarnata* (passionflower) herbal tea on subjective sleep quality: Effect of passionflower on subjective sleep quality [Internet]. *Phytother Res*. 2011;25(8):1153–9. DOI: 10.1002/ptr.3400
15. Miroddi M, Calapai G, Navarra M, Minciullo PL, Gangemi S. *Passiflora incarnata* L.: ethnopharmacology, clinical application, safety and evaluation of clinical trials [Internet]. *J Ethnopharmacol*. 2013;150(3):791–804. DOI: 10.1016/j.jep.2013.09.047
16. Brouns A, Lechtenberg M, Hensel A. Passionflower (*Passiflora incarnata*): Quality of food supplements versus registered herbal medicinal products [Internet]. *Planta Med*. 2025; 91(09): 532-540. DOI: 10.1055/a-2591-3765
17. Azizi H, Shojaii A, Hashem-Dabaghian F, Noras M, Boroumand A, Ebadolahzadeh Haghani B, et al. Effects of *Valeriana officinalis* (Valerian) on tension-type headache: A randomized, placebo-controlled, double-blind clinical trial [Internet]. *Avicenna J Phytomed*. 2020 [access: 05/31/2025];10(3):297–304. Available from: <https://pmc.ncbi.nlm.nih.gov/articles/PMC7256276/>
18. Al-Attraqchi OHA, Deb PK, Al-Attraqchi NHA. Review of the Phytochemistry and Pharmacological Properties of *Valeriana officinalis* [Internet]. *Curr Tradit Med*. 2020;6(4):260–77. DOI: 10.2174/2215083805666190314112755
19. Jurowski K, Fołta M, Tatar B, Berkoz M, Krośniak M. The toxicological risk assessment of Cu, Mn, and Zn as essential elemental impurities in herbal medicinal products with Valerian root



- (*Valeriana officinalis* L., radix) available in Polish pharmacies [Internet]. *Biol Trace Elem Res.* 2022;200(4):1949–55. DOI: 10.1007/s12011-021-02779-y
20. Akram W, Ahmed S, Rihan M, Arora S, Khalid M, Ahmad S, et al. An updated comprehensive review of the therapeutic properties of Chamomile (*Matricaria chamomilla* L.) [Internet]. *Int J Food Prop.* 2024;27(1):133–64. DOI: 10.1080/10942912.2023.2293661
21. Kazemi A, Shojaei-Zarghani S, Eskandarzadeh P, Hashempur MH. Effects of chamomile (*Matricaria chamomilla* L.) on sleep: A systematic review and meta-analysis of clinical trials [Internet]. *Complement Ther Med.* 2024;84(103071):103071. DOI: 10.1016/j.ctim.2024.103071.
22. Albrecht S, Lars-Gernot O. *Matricaria recutita* L.: True Chamomile [Internet]. *Medicinal, Aromatic and Stimulant Plants*; 2020. [access: 05/31/2025]. Available from: [https://www.researchgate.net/publication/346153807\\_Matricaria\\_recutita\\_L\\_True\\_Chamomile](https://www.researchgate.net/publication/346153807_Matricaria_recutita_L_True_Chamomile)
23. Détár E, Németh ÉZ, Gosztola B, Demján I, Pluhár Z. Effects of variety and growth year on the essential oil properties of lavender (*Lavandula angustifolia* Mill.) and lavandin (*Lavandula x intermedia* Emeric ex Loisel.) [Internet]. *Biochem Syst Ecol.* 2020;90(104020):104020. DOI: 10.1016/j.bse.2020.104020
24. Firoozeei TS, Feizi A, Rezaeizadeh H, Zargaran A, Roohafza HR, Karimi M. The antidepressant effects of lavender (*Lavandula angustifolia* Mill.): A systematic review and meta-analysis of randomized controlled clinical trials [Internet]. *Complement Ther Med.* 2021;59(102679):102679. DOI: 10.1016/j.ctim.2021.102679
25. Speers AB, Cabey KA, Soumyanath A, Wright KM. Effects of *Withania somnifera* (Ashwagandha) on stress and the stress-related neuropsychiatric disorders anxiety, depression, and insomnia [Internet]. *Curr Neuropharmacol.* 2021;19(9):1468–95. DOI: 10.2174/1570159X19666210712151556
26. Mehta V, Chander H, Munshi A. Mechanisms of Anti-Tumor Activity of *Withania somnifera* (Ashwagandha) [Internet]. *Nutr Cancer.* 2021;73(6):914–26. DOI: 10.1080/01635581.2020.1778746
27. Scholz I, Liakoni E, Hammann F, Grafinger KE, Duthaler U, Nagler M, et al. Effects of *Hypericum perforatum* (St John's wort) on the pharmacokinetics and pharmacodynamics of



rivaroxaban in humans [Internet]. *Br J Clin Pharmacol*. 2021;87(3):1466–74. DOI: 10.1111/bcp.14553

28. Kwiecień I, Nicosia N, Ekiert H. Cultivation of *Hypericum perforatum* (st. John's wort) and biotechnological approaches for improvement of plant raw material quality [Internet]. *Medicinal Plants*. [access: 05/31/2025]. Available from:

[https://www.researchgate.net/publication/354298073\\_Cultivation\\_of\\_Hypericum\\_Perforatum\\_St\\_John's\\_Wort\\_and\\_Biotechnological\\_Approaches\\_for\\_Improvement\\_of\\_Plant\\_Raw\\_Material\\_Quality](https://www.researchgate.net/publication/354298073_Cultivation_of_Hypericum_Perforatum_St_John's_Wort_and_Biotechnological_Approaches_for_Improvement_of_Plant_Raw_Material_Quality)

29. Jarzębski M, Smulek W, Baranowska HM, Masewicz Ł, Kobus-Cisowska J, Ligaj M, et al. Characterization of St. John's wort (*Hypericum perforatum* L.) and the impact of filtration process on bioactive extracts incorporated into carbohydrate-based hydrogels [Internet]. *Food Hydrocoll*. 2020;104(105748):105748. DOI: 10.1016/j.foodhyd.2020.105748

30. Ng JY. Trends in the St. John's wort (*Hypericum perforatum*) research literature: a bibliometric analysis [Internet]. *J Complement Integr Med*. 2023;20(1):172–80. DOI: 10.1515/jcim-2021-0417

31. Heshmati J, Morvaridzadeh M, Sepidarkish M, Fazelian S, Rahimlou M, Omidi A, et al. Effects of *Melissa officinalis* (Lemon Balm) on cardio-metabolic outcomes: A systematic review and meta-analysis [Internet]. *Phytother Res*. 2020;34(12):3113–23. DOI: 10.1002/ptr.6744

32. Ghazizadeh J, Sadigh-Eteghad S, Marx W, Fakhari A, Hamedeyazdan S, Torbati M, et al. The effects of lemon balm (*Melissa officinalis* L.) on depression and anxiety in clinical trials: A systematic review and meta-analysis [Internet]. *Phytother Res*. 2021;35(12):6690–705. DOI: 10.1002/ptr.7252

33. Lobach AR, Schmidt F, Fedrizzi D, Müller S. Toxicological safety evaluation of an aqueous lemon balm (*Melissa officinalis*) extract [Internet]. *Food Chem Toxicol*. 2024;187(114565):114565. DOI: 10.1016/j.fct.2024.114565

34. Korpelainen H, Pietiläinen M. Hop (*Humulus lupulus* L.): Traditional and Present Use, and Future Potential [Internet]. *Econ Bot*. 2021;75(3–4):302–22. DOI: 10.1007/s12231-021-09528-1



35. González-Salitre L, Guillermo González-Olivares L, Antobelli Basilio-Cortes U. Humulus lupulus L. a potential precursor to human health: High hops craft beer [Internet]. Food Chem. 2023;405(Pt B):134959. DOI: 10.1016/j.foodchem.2022.134959
36. Becker A, Yamada Y, Sato F. California poppy (*Eschscholzia californica*), the Papaveraceae golden girl model organism for evodevo and specialized metabolism [Internet]. Front Plant Sci. 2023;14:1084358. DOI: 10.3389/fpls.2023.1084358
37. Lotz D, Rössner LH, Ehlers K, Kong D, Rössner C, Rupp O, et al. Conservation of the dehiscence zone gene regulatory network in dicots and the role of the SEEDSTICK ortholog of California poppy (*Eschscholzia californica*) in fruit development [Internet]. Evodevo. 2024;15(1):16. DOI: 10.1186/s13227-024-00236-0
38. Shalini VT, Neelakanta SJ, Sriranjini JS. Neuroprotection with *Bacopa monnieri*-A review of experimental evidence [Internet]. Mol Biol Rep. 2021;48(3):2653–68. DOI: 10.1007/s11033-021-06236-w
39. Ayilara GO, Owoyele BV. Effectiveness of *Bacopa Monnieri* (Brahmi) in the management of schizophrenia: a systematic review [Internet]. Nutr Neurosci. 2025;28(7):788-95. DOI: 10.1080/1028415X.2024.2421782
40. Roy S, Shanmugam G, Rakshit S, Pradeep R, George M, Sarkar K. Exploring the immunomodulatory potential of Brahmi (*Bacopa monnieri*) in the treatment of invasive ductal carcinoma [Internet]. Med Oncol. 2024;41(5):115. DOI: 10.1007/s12032-024-02365-x
41. Sabaragamuwa R, Perera CO, Fedrizzi B. Ultrasound assisted extraction and quantification of targeted bioactive compounds of *Centella asiatica* (Gotu Kola) by UHPLC-MS/MS MRM tandem mass spectroscopy [Internet]. Food Chem. 2022;371(131187):131187. DOI: 10.1016/j.foodchem.2021.131187
42. Srichaiyo N, Tongsir S, Hoseinifar SH, Dawood MAO, Jaturasitha S, Esteban MÁ, et al. The effects gotu kola (*Centella asiatica*) powder on growth performance, skin mucus, and serum immunity of Nile tilapia (*Oreochromis niloticus*) fingerlings [Internet]. Aquac Rep. 2020;16(100239):100239. DOI: 10.1016/j.aqrep.2019.100239



43. Yildiz E, Sümbül A, Yaman M, Nadeem MA, Say A, Baloch FS, et al. Assessing the genetic diversity in hawthorn (*Crataegus* spp.) genotypes using morphological, phytochemical and molecular markers [Internet]. *Genet Resour Crop Evol.* 2023;70(1):135–46.

DOI:10.1007/s10722-022-01414-6

44. Cloud A, Vilcins D, McEwen B. The effect of hawthorn (*Crataegus* spp.) on blood pressure: A systematic review [Internet]. *Adv Integr Med.* 2020;7(3):167–75. DOI:

10.1016/j.aimed.2019.09.002

45. Eisvand F, Razavi BM, Hosseinzadeh H. The effects of *Ginkgo biloba* on metabolic syndrome: A review [Internet]. *Phytother Res.* 2020;34(8):1798–811. DOI: 10.1002/ptr.6646

46. Lin H-Y, Li W-H, Lin C-F, Wu H-R, Zhao Y-P. International biological flora: *ginkgo biloba* [Internet]. *J Ecol.* 2022;110(4):951–82. DOI: 10.1111/1365-2745.13856

47. Aporosa S “apo”, Ballard H, Pandey R, McCarthy MJ. The impact of traditional kava (*Piper methysticum*) use on cognition: Implications for driver fitness [Internet]. *J Ethnopharmacol.*

2022;291(115080):115080. DOI: 10.1016/j.jep.2022.115080

48. Kuchta K, Hladikova M, Thomsen M, Nahrstedt A, Schmidt M. Kava (*Piper methysticum*) extract for the treatment of nervous anxiety, tension and restlessness: Results of an open, observational study [Internet]. *Drug Res (Stuttg).* 2021;71(2):83–93. DOI: 10.1055/a-1268-7135

49. Lawson SK, Satyal P, Setzer WN. Phytochemical analysis of the essential oils from aerial parts of four *Scutellaria* “skullcap” species cultivated in South Alabama: *Scutellaria baicalensis* Georgi, *S. barbata* D. don, *S. incana* Biehler, and *S. lateriflora* L [Internet]. *Nat Prod Commun.* 2021;16(8):1934578X2110259. DOI: 10.1177/1934578x211025930

50. Koval IV, Bielaieva YV, Liubinska AV, Koschhavko KS, Luchakivska YS, Sklyar TV, et al. Antimicrobial activity of *Scutellaria* L. plant extracts [Internet]. *Vsllr.* 2024 [access:

31/03/2025];53:55–63. Available from:

<https://steppeforestry.dp.ua/index.php/vsllr/article/view/230>

51. Pu W-L, Zhang M-Y, Bai R-Y, Sun L-K, Li W-H, Yu Y-L, et al. Anti-inflammatory effects of *Rhodiola rosea* L.: A review [Internet]. *Biomed Pharmacother.* 2020;121(109552):109552.

DOI: 10.1016/j.biopha.2019.109552



52. Tinsley GM, Jagim AR, Potter GDM, Garner D, Galpin AJ. Rhodiola rosea as an adaptogen to enhance exercise performance: a review of the literature [Internet]. *Br J Nutr* 2024. [access: 31/03/2025];131(3):461–73. Available from: <https://www.cambridge.org/core/journals/british-journal-of-nutrition/article/rhodiola-rosea-as-an-adaptogen-to-enhance-exercise-performance-a-review-of-the-literature/C29592E00A7A6050E6AD5B1B87013427>
53. Lu Y, Deng B, Xu L, Liu H, Song Y, Lin F. Effects of Rhodiola Rosea supplementation on exercise and sport: A systematic review [Internet]. *Front Nutr*. 2022;9:856287. DOI: 10.3389/fnut.2022.856287
54. Niu L, Hou Y, Jiang M, Bai G. The rich pharmacological activities of *Magnolia officinalis* and secondary effects based on significant intestinal contributions [Internet]. *J Ethnopharmacol*. 2021;281(114524):114524. DOI:10.1016/j.jep.2021.114524
55. Zhu S, Liu F, Zhang R, Xiong Z, Zhang Q, Hao L, et al. Neuroprotective potency of neolignans in *Magnolia officinalis* cortex against brain disorders [Internet]. *Front Pharmacol*. 2022;13:857449. DOI:10.3389/fphar.2022.857449
56. Li N, Liang Y, Zhang L, Xu C, Wang L. Neolignans in *Magnolia officinalis* as natural anti-Alzheimer's disease agents: A systematic review [Internet]. *Ageing Res Rev*. 2024;99(102398):102398. DOI: 10.1016/j.arr.2024.102398
57. Lu Y, Bao T, Mo J, Ni J, Chen W. Research advances in bioactive components and health benefits of jujube (*Ziziphus jujuba* Mill.) fruit [Internet]. *J Zhejiang Univ Sci B*. 2021;22(6):431–49. DOI: 10.1631/jzus.B2000594
58. Hua Y, Xu X-X, Guo S, Xie H, Yan H, Ma X-F, et al. Wild Jujube (*Ziziphus jujuba* var. *spinosa*): A Review of Its Phytonutrients, Health Benefits, Metabolism, and Applications [Internet]. *J Agric Food Chem*. 2022;70(26):7871–86. DOI: 10.1021/acs.jafc.2c01905
59. Aafi E, Reza M, Mirabzadeh M. Jujube (*Ziziphus jujuba* Mill. (Rhamnaceae)): a review on its pharmacological properties and phytochemistry [Internet]. *Tradit Med Res*. 2022 [access: 05/31/2025];7(4):38. Available from: <https://www.tmrjournals.com/public/articlePDF/20220502/6308dc9da9d1ae531224360c8887c257.pdf>



60. Ağırman Han Ö, Üçler AÖ. The Importance of Linden (*Tilia* sp.) in terms of Carbon Sequestration: Perspective in the World and in Türkiye. En: 3rd International Congress on Engineering and Life Science Proceedings Book [Internet]. Prensip Publishing; 2023. [access: 05/31/2025]. Available from: <https://icelis.net/wp-content/uploads/2023/11/P-52FT.pdf>
61. Pigott CD. Biological flora of the British Isles: *Tilia platyphyllos* [Internet]. *J Ecol*. 2020;108(6):2638–76. DOI: 10.1111/1365-2745.13490
62. Dmitruk M, Denisow B, Chrzanowska E, Dąbrowska A, Bożek M. Comparison of nectar and pollen resources in various *Tilia* species. A case study from southern Poland [Internet]. *Trees (Berl West)*. 2024;38(4):953–67. DOI: 10.1007/s00468-024-02527-4
63. Thakur A, Thapa D. Holy basil (*Ocimum sanctum*): A comprehensive review of traditional uses, phytochemical composition, medicinal properties and future directions [Internet]. *The Journal of Agricultural Education and Extension*. 2023 [access: 05/31/2025]; 3(11):136-51. Available from: [https://www.researchgate.net/publication/372556755\\_28\\_Holy\\_Basil\\_Ocimum\\_Sanctum\\_-\\_A\\_Comprehensive\\_Review\\_of\\_Traditional\\_Uses\\_Phytochemical\\_Composition\\_Medicinal\\_Properties\\_and\\_Future\\_Directions](https://www.researchgate.net/publication/372556755_28_Holy_Basil_Ocimum_Sanctum_-_A_Comprehensive_Review_of_Traditional_Uses_Phytochemical_Composition_Medicinal_Properties_and_Future_Directions)
64. Lopresti AL, Smith SJ, Metse AP, Drummond PD. A randomized, double-blind, placebo-controlled trial investigating the effects of an *Ocimum tenuiflorum* (Holy Basil) extract (Holixer™) on stress, mood, and sleep in adults experiencing stress [Internet]. *Front Nutr*. 2022;9:965130. DOI: 10.3389/fnut.2022.965130
65. Das M, Mahapatra DK, Manna K. *Ocimum sanctum* L. (holy basil or Tulsi): A medicinally significant herb. En: Mahapatra DK, Talele SG, Haghi AK. *Applied Pharmaceutical Science and Microbiology*. Apple Academic; 2020. p. 95-115.

### Conflicts of interests

The authors declare no conflicts of interest. No funding was involved in this work.



### Authors' Contributions

Conceptualization: *Jorge Eduardo Santiago Poemape Lira, Carolina Takahashi.*

Data Curation: *Jorge Eduardo Santiago Poemape Lira.*

Formal Analysis: *Carolina Takahashi, Héctor Alexander Vilchez-Cáceda.*

Investigation: *Jorge Eduardo Santiago Poemape Lira, Carolina Takahashi.*

Methodology: *Jorge Eduardo Santiago Poemape Lira.*

Project Administration: *Carolina Takahashi, Héctor Alexander Vilchez-Cáceda.*

Supervision: *Jorge Eduardo Santiago Poemape Lira.*

Validation: *Jorge Eduardo Santiago Poemape Lira, Carolina Takahashi.*

Visualization: *Jorge Eduardo Santiago Poemape Lira.*

Writing - Original Draft Preparation: *Carolina Takahashi.*

Writing - Review & Editing: *Carolina Takahashi, Héctor Alexander Vilchez-Cáceda.*

### Data availability statement

There is no data associated with current review.