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Passiflora incarnata L.: A Multifunctional Herbal Treasure with Morphology, Properties, Phytochemistry and Therapeutic Activity

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Abstract: *Passiflora incarnata L. (Passionflower) is a widely recognized medicinal plant known for its anxiolytic, sedative, neuroprotective, and antioxidant properties. Recent research (2021– 2025) has provided modern insights into its flavonoid-rich phytochemistry, especially compounds such as vitexin, isovitexin, chrysin, and apigenin, which contribute to its GABAergic and monoaminergic actions. Clinical studies demonstrate that standardized P. incarnata preparations effectively reduce anxiety, improve sleep quality, and support benzodiazepine tapering with minimal adverse effects. In addition, recent phytochemical advances have elucidated the plant's antioxidant, anti-inflammatory, and neuroprotective mechanisms, reinforcing its therapeutic prominence. This review consolidates contemporary botanical, pharmacological, and clinical findings to provide an evidence-based understanding of P. incarnata.*

Keywords: GABA, phytomedicine, neuroprotection

I. INTRODUCTION

Passiflora incarnata L. has received renewed scientific interest in recent years due to its clinically relevant effects on anxiety, sleep, and neurological function. The plant has historically been used in traditional systems worldwide, but recent studies between 2021 and 2025 have generated high-quality evidence validating many of these traditional claims. Modern phytochemical profiling confirms that P. incarnata is rich in C-glycosylated flavonoids—particularly vitexin, isovitexin, orientin, and chrysin—which play dominant roles in its anxiolytic and sedative activity through modulation of GABA_A receptors (1,2). These compounds exhibit affinity for benzodiazepine-binding sites but do not induce dependence or cognitive impairment, making the plant an attractive natural alternative to conventional anxiolytics. Recent neuropharmacological research has demonstrated that P. incarnata influences not only GABAergic pathways but also serotonergic, dopaminergic, and noradrenergic systems, contributing to broader psychotropic effects such as mood stabili zation and reduction of hyperactivity (3). Preclinical studies published in 2023–2024 have revealed significant increases in cerebellar norepinephrine and spinal dopamine following extract administration, supporting its potential in emotional and motor regulation. Alongside these CNS effects, recent antioxidant evaluations (2021–2024) indicate high phenolic content, conferring protective effects against oxidative stress and inflammation (4,5). Clinically, contemporary trials have reaffirmed the anxiolytic efficacy of P. incarnata in generalized anxiety, preoperative anxiety, and benzodiazepine withdrawal support. Notably, a 2023 clinical study reported improved benzodiazepine tapering outcomes in adults treated with standardized Passiflora extract (6). Additional trials between 2021–2022 demonstrated significant improvements in sleep quality, latency, and restfulness without next-day impairment (7). Given these modern findings, Passiflora incarnata is emerging as a scie ntifically validated herbal medicine with compelling therapeutic promise. Its safety, sustainability, and wide phytochemical spectrum justify its continued clinical and pharmacological exploration. This review synthesizes recent advancements (2021–2025) in the plant's taxonomy, morphology, phytochemistry, mechanisms of action, therapeutic applications, and safety data, providing a comprehensive update suitable for academic, clini cal, and pharmaceutical use.

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FIG NO.1. Passiflora incarnata L.

BIOLOGICAL SOURCE

Passiflora incarnata L. is a perennial climbing vine belonging to the family Passifloraceae, widely distributed across the southeastern United States and extending into Central and South America. Recent botanical surveys conducted between 2021 and 2023 reaffirm that the species thrives in warm, mildly humid regions with well-drained loamy or sandy soils, particularly in forest margins, open grasslands, and disturbed habitats such as roadside vegeta tion (8). The plant is primarily valued for its aerial parts, which include leaves, stems, and flowers, and these are the officially recognized medicinal components in contemporary pharmacopeias. According to updated regulatory monographs released in 2022, these aerial portions are harvested at peak flowering, when concentrations of flavonoids and phenolic compounds are highest and offer optimal therapeutic quality (9). Cultivation studies conducted in the last few years emphasize that P. incarnata is adaptable to varying soil conditions and requires minimal fertilization, making it suitable for sustainable medicinal cr op production, especially when propagated through stem cuttings or tissue culture to preserve genetic and phytochemical consistency (10). Morphological updates published in recent taxonomic literature confirm the distinguishing characteristics of the species, such as its axillary tendrils, deeply trilobed leaves, and large purple-white flowers with a prominent corona, all of which contribute to accurate botanical identification and separation from closely related species such as P. edulis and P. foetida.

SYNONYMS AND COMMON NAMES

Recent ethnobotanical reports indicate that Passiflora incarnata continues to be recognized globally under several vernacular names, reflecting its widespread traditional use and cultural importance. In contemporary North American herbal practice, it is widely known as passionflower or maypop, particularly in regions where the plant grows in the wild. In South American contexts, especially in Brazil and Paraguay, recent surveys from 2021 to 2024 document names such as maracujá-roxo and granadilla silvestre, demonstrating its integration into local medicinal systems (11). In India, where renewed interest in the plant has emerged within integrative medicine, it is often referred to as Krishna Kamal, a name documented in several recent agricultural and ethnobotanical studies (12). Although the species is relatively stable taxonomically, some modern botanical databases still list historical variants such as P. incarnata var. mexicana and P. incarnata var. typica, though these are now primarily of academic rather than practical relevance. The plurality of names underscores the plant’s enduring therapeutic prominence across cultures and its continued acceptance in modern natural medicine.

TAXONOMY

Updated phylogenetic analyses conducted between 2021 and 2023 have reaffirmed the taxonomic placement of Passiflora incarnata within the order Malpighiales and the family Passifloraceae, a group comprising over 600 species distributed predominantly in tropical and subtropical regions (13). Recent molecular studies using chloroplast genome sequencing have strengthened the understanding of species relationships within the Passiflora genus and have confirmed the distinctiveness of P. incarnata from other sympatric species widely used in food and medicine, such as P. edulis (14). Botanically, P. incarnata is characterized as a herbaceous-to-woody vine with alternate, trilobed leaves, axillary tendrils, and large, ornate flowers featuring five petals, five sepals, and a strikingly organized corona of filaments. These floral structures support specialized pollinators, a feature highlighted in recent ecological reviews. The reproductive morphology, including the well-defined androg ynophore and ovoid berries containing gelatinous seeds, remains central to its taxonomic diagnosis and continues to appear as distinguishing criteria in updated identification keys used by botanists and pharmacognosists alike. Together, these modern taxonomic insights ens ure precise classification, which is essential for quality control in herbal pharmacology and research.

Table 1: Taxonomy of Passiflora incarnata L.

Taxonomic Rank	Classification
Kingdom	Plantae
Clade	Angiosperms
Clade	Eudicots
Clade	Rosids
Order	Malpighiales
Family	Passifloraceae
Genus	Passiflora
Species	Passiflora incarnata L.

PHYTOCHEMISTRY

Recent research between 2021 and 2025 has substantially strengthened the phytochemical understanding of Passiflora incarnata, revealing a diverse array of bioactive constituents that contribute to its pharmacological profile. Modern chromatographic and spectrometric analyses consistently show that the aerial parts of the plant contain abundant C-glycosylated flavonoids, particularly vitexin, isovitexin, orientin, isoorientin, and other related derivatives, which are regarded as the primary contributors to the plant's anxiolytic, sedative, and neuroprotective effects (15). These flavonoids exert strong antioxidant activity and modulate neurotransmission, especially through interactions with GABAergic pathways. In addition to flavonoids, P. incarnata contains β-carboline alkaloids, including harman and harmine, which offer mild monoamine oxidase inhibitory activity and further enhance the plant's psychotropic properties, although their concentrations remain low compared to flavonoids. Advanced phytochemical profiling studies conducted in 2023 and 2024 have also identified significant levels of phenolic acids such as caffeic, chlorogenic, and ferulic acids, all of which contribute substantially to the plant's antioxidant and anti-inflammatory potential (16). Recent comparative analyses across Passiflora species indicate that P. incarnata possesses one of the highest total flavonoid concentrations, a finding that supports the contemporary preference for this species over others for clinical and therapeutic applications. Furthermore, seasonal and environmental influences have been shown to affect the quantitative yield of its phytochemicals, with peak bioactive levels observed during full flowering, reaffirming the importance of harvesting time for standardized medicinal preparations (17). Together, these recent findings highlight a robust and complex phytochemical architecture that underlies the plant's therapeutic versatility.

CHEMICAL CONSTITUENTS

Modern chemical investigations of Passiflora incarnata have revealed a rich spectrum of more than 200 identified compounds distributed among flavonoids, alkaloids, phenolics, volatile compounds, and amino acids, many of which play synergistic roles in the plant's pharmacological activity. Recent LC-MS and HPLC studies conducted between 2022 and 2024 confirm that flavonoids remain the dominant group, with vitexin and isovitexin consistently emerging as the main biomarkers used for quality control in regulated herbal formulations (18). These flavonoids possess benzodiazepine-like binding characteristics at the GABA_A receptor and are largely responsible for the calming and anxiolytic effects of the plant. In parallel, updated chemical profiling has reaffirmed the presence of β-carboline alkaloids, which contribute to mood regulation and stress modulation through interactions with monoaminergic pathways, although present in modest concentrations that do not reach toxicological significance. Phenolic acids such

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as chlorogenic and coumaric acid have been highlighted in several 2023 and 2024 studies for their strong antioxidant and anti-inf lammatory actions, reinforcing the plant's neuroprotective benefits (19). Additionally, recent GC-MS evaluations have reported the presence of volatile constituents, including linalool, farnesol, and β-caryophyllene, which contribute mild sedative and aromatic properties to the plant. Importantly, updated biochemical analyses confirm that the plant contains physiologica lly relevant amounts of gamma-aminobutyric acid (GABA), supporting its well-documented calming effects and offering biochemical justification for its long-standing traditional use as a sleep and anxiety remedy (20). The synergy between these multiple chemical groups has been highlighted in recent pharmacological studies, which demonstrate that the combined actions of flavonoids, phenolics, alkaloids, and plant-derived amino acids yield stronger therapeutic effects than any isolated constituent alone (21). Overall, the current phytochemical and chemical evidence from 2021–2025 establishes P. incarnata as a complex, bioactive plant with considerable therapeutic potential grounded in its rich molecular composition.

Table.2 Chemical Constituents of Passiflora incarnata

Class of Compound	Major Constituents	Pharmacological Significance	References
C-glycosylated Flavonoids	Vitexin, Isovitexin, Orientin, Isoorientin	Primary anxiolytic and sedative flavonoids; modulate GABA_A receptors; antioxidant activity	[15], [18], [21]
Flavones & Flavonols	Chrysin, Apigenin, Luteolin derivatives	GABAergic modulation; anxiolytic and sedative actions	[22], [23]
β-Carboline Alkaloids	Harman, Harmine	Mild MAO inhibition; mood regulation; antispasmodic effects	[20], [25]
Phenolic Acids	Caffeic acid, Chlorogenic acid, Coumaric acid, Ferulic acid		[16], [19], [26]
Volatile Compounds	Linalool, Farnesol, β-Caryophyllene	Mild sedative aroma; contributes to calming effects	[19], [21]
Amino Acids & GABA	Endogenous GABA	Supports calming and sedative activity	[20]
Other Minor Constituents	Cyanogenic glycosides (trace), polysaccharides	Supportive metabolic and antioxidant effects	[16], [19]

MECHANISM OF ACTION

Recent studies published between 2021 and 2025 have significantly advanced the understanding of the mechanisms underlying the pharmacological effects of Passiflora incarn ata. The most prominent mechanism involves modulation of the GABAergic system, where flavonoids such as chrysin, vitexin, and isovitexin act as positive modulators of GABA A receptors by interacting with the benzodiazepine-binding site, producing anxiolytic and sedative effects without inducing dependence or cognitive impairment (22). Contemporary electrophysiological evidence demonstrates that Passiflora extracts enhance GABA-mediated chloride currents in neuronal models, and this effect is attenuated by GABA_A antagonists, confirming a direct receptor-level interaction (23). In addition to GABAergic modulation, recent research highlights the plant's influence on monoaminergic pathways, including sero tonin, dopamine, and norepinephrine regulation. Studies conducted in 2023 and 2024 revealed increased spinal dopamine and elevated cerebellar noradrenaline after repeated extract administration, supporting its potential benefits in regulating mood, attention, and motor behavior (24). Another important mechanism involves opioid pathways, as β-carboline alkaloids in P. incarnata show affinity for kappa-opioid receptors, providing mild analgesic a nd antispasmodic properties without addictive potential (25). Antioxidant and antiinflammatory pathways also contribute significantly to the plant's therapeutic effects; modern biochemical studies confirm that its phenolic and flavonoid constituents reduce oxidative stress, suppress inflammatory cytokines, and protect neuronal cells from reactive oxygen species, thereby supporting long-term neuroprotection (26). The combined actions of these neurochemical mechanisms demonstrate that P. incarnata works through a complex and synergistic network of pathways rather than a single pharmacological target, aligning with its diverse clinical benefits.

CLINICAL AND PRECLINICAL STUDIES

Recent preclinical and clinical research conducted between 2021 and 2025 provides robust evidence for the therapeutic potential of Passiflora incarnata in anxiety, sleep disorders, benzo diazepine tapering, and neurobehavioral modulation. Preclinical investigations in rodent models have consistently shown that Passiflora extracts reduce locomotor hyperactivity, decrease anxiety-like behavior, and alter neurotransmitter levels in the cerebellum and spinal cord, confirming its actions on both emotional and motor regulation pathways (24). Behavioral studies using elevated-plus maze and open-field paradigms indicate clear anxiolytic and mild sedative effects at therapeutically relevant doses, with no impairment of coordination or memory, a key advantage over conventional benzodiazepines (27). Furthermore, antioxidant studies conducted in vivo demonstrate that Passiflora mitigates oxidative stress in neural tissues and enhances antioxidant enzyme activity, supporting its potential role in neuroprotection and stress resilience (26).

On the clinical side, modern trials continue to reaffirm Passiflora's anxiolytic efficacy. Studies published in 2021 and 2022 reported that standardized Passionflower extracts signifi cantly reduced anxiety symptoms in adults with generalized anxiety disorder and situational anxiety, performing comparably to low-dose benzodiazepines but without sedative hangover or cognitive decline (28). Notably, a 2023 clinical study evaluating Passiflora as adjunct therapy for benzodiazepine tapering demonstrated improved discontinuation success rates an d reduced withdrawal-associated anxiety, highlighting its relevance in dependency management and integrative detoxification strategies (29). Additionally, several clinical observations between 2021 and 2023 show meaningful improvements in sleep latency, overall restfulness, and nighttime calmness in individuals with mild to moderate insomnia, confirming the plant's role as a natural sleep aid with minimal side effects (30). Emerging research has also explored its potential applications in ADHD-like symptoms, pediatric anxiety, and perioperative stress, with preliminary findings suggesting promising benefits that warrant further investigation (31). Collectively, these recent studies provide compelling contemporary evidence supporting the clinical utility of Passiflora incarnata across multiple neuropsychological and behavioral conditions.

TOXICITY AND SAFETY EVALUATION

Recent toxicological investigations conducted between 2021 and 2024 consistently demonstrate that Passiflora incarnata is a safe medicinal plant when used within standardized therapeutic doses. Acute and sub-chronic toxicity studies in rodent models have shown no mortality, no behavioral abnormalities, and no significant organ toxicity at doses commonly used in phytomedicine, indicating a wide safety margin for clinical application (32). Hi stopathological examinations reveal no structural damage to the liver, kidneys, or neural tissues, which supports the long-standing traditional use of the plant for nervous and emo tional disorders. Human clinical trials conducted since 2021 further corroborate this safety profile, reporting only mild, transient adverse effects such as slight drowsiness or gastrointestinal discomfort, with no evidence of dependence, cognitive impairment, or withdrawal symptoms—side effects frequently associated with benzodiazepines (28). Importantly, P. incarnata extracts have shown no clinically meaningful interactions with standard anxiolytics or sedatives when administered under controlled conditions, although caution is recommended when combining with CNS depressants to avoid additive sedation.

Overall, contemporary safety data affirm that P. incarnata is a well-tolerated herbal therapeutic with minimal toxicity and an excellent risk–benefit profile.

SOIL AND ECOLOGICAL BENEFITS

Recent ecological studies have emphasized the value of Passiflora incarnata as an environmentally supportive and agriculturally sustainable species. Its deep, fibrous root system contributes significantly to soil stabilization by improving aeration, decreasing erosion, and enhancing water retention capacity, making it an advantageous species for cultivation in degraded or sloped terrains (34). In addition to soil improvement, the plant's large, nectar-rich flowers attract a variety of pollinators—particularly bees, butterflies, and specialized insects—thereby reinforcing local biodiversity and contributing to ecosystem stability. Research conducted between 2022 and 2024 highlights that landscapes incorporating P. incarnata show increased pollinator activity and improved ecological re silience. Furthermore, its adaptability to nutrient-poor soils and minimal fertilizer requirements position the plant as a low-impact crop for sustainable herbal production. This ecological versatility, combined with its robust growth cycle and resistance to environmental stressors, supports its cultivation as an environmentally responsible medicinal resource.

THERAPEUTIC USES

The therapeutic applications of Passiflora incarnata have been widely supported by recent p harmacological and clinical studies. Its primary uses include:

12.1 Management of Anxiety Disorders

Passionflower exhibits clinically significant anxiolytic effects comparable to low-dose benzodiazepines, yet without cognitive impairment or psychomotor slowing. [22], [27], [28]

12.2 Treatment of Sleep Disorders and Insomnia

It improves sleep onset, increases total sleep time, and enhances overall sleep quality, without producing next-day sedation commonly associated with hypnotics. [7], [30]

12.3 Support for Benzodiazepine Withdrawal

When used as adjunct therapy during tapering, P. incarnata reduces withdrawal symptoms and increases discontinuation success rates. [29]

12.4 Neuroprotective and Antioxidant Effects

Its flavonoids and phenolic acids reduce oxidative stress, suppress inflammation, and elevate antioxidant enzyme activity, making it beneficial for long-term neural protection. [26], [19], [16]

12.5 Regulation of Hyperactivity and Attention

By modulating dopaminergic and noradrenergic activity, P. incarnata helps reduce hyperactivity and stabilizes emotional response, showing potential for ADHD-related symptoms. [24]

12.6 Analgesic and Antispasmodic Actions β-carboline alkaloids interact with kappa-opioid receptors, providing mild analgesic and muscle-relaxing effects. [25]

12.7 Mood Enhancement and Emotional Stability

The plant influences monoaminergic pathways, contributing to improved mood, decreased irritability, and better emotional regulation. [3], [21]

12.8 Stress Management

TRADITIONAL USES

13.1 Native American Medicine

Traditionally used to calm agitation, promote sleep, relieve mild pain, and reduce symptoms of nervous disturbance [11], [35]

13.2 South American Folk Medicine

Consumed as herbal infusions to address emotional imbalance, headaches, menopausal symptoms, and general restlessness. [11], [35]

13.3 European Herbal Medicine

Commonly prescribed historically for nervous restlessness, mild anxiety, sleep disturbances, and irritability, often in combination with valerian or lemon balm. [9]

13.4 Indian Ethnomedicine

Known as Krishna Kamal, it is traditionally used to reduce stress, soothe palpitations, improve digestion, and enhance mental balance. [12]

13.5 Western Herbal Practice

Frequently used in teas, tinctures, and capsules for PMS-related mood swings, nervous tension, sleep issues, and mild muscle spasms [11], [12] 13.6 Traditional Gastrointestinal Uses

Used to relieve gastric spasms and mild digestive discomfort, reflecting its antispasmodic activity recognized in modern studies. [35]

II. CONCLUSION

The growing body of research published between 2021 and 2025 has firmly established Passiflora incarnata L. as a scientifically validated medicinal plant with substantial therapeutic potential. Its rich phytochemical profile—especially its abundance of C-glycosyl flavonoids, phenolics, and β-carboline alkaloids—underpins a multifaceted pharmacological spectrum that includes anxiolytic, sedative, neuroprotective, antioxidant, and mild analgesic activities. Modern mechanistic studies confirm that the plant's primary mode of action involves the modulation of GABA A receptors, supplemented by meaningful effects on serotonergic, dopaminergic, adrenergic, and opioid pathways. Together, these mechanisms contribute to its clinical efficacy in anxiety disorders, insomnia, benzodiazepine tapering, and stress-related neurobehavioral disturbances. Clinical findings from recent years demonstrate benefits comparable to pharmaceutical anxiolytics but with superior safety, tolerability, and minimal risk of dependence or cognitive impairment. In addition to its neuropsychological effects, the plant exhibits ecological resilience and contributes positively to biodiversity through its interaction with pollinators and soil-enhancing growth patterns. The convergence of traditional knowledge and modern scientific evidence reinforces P. incarnata as a valuable phytomedicinal resource. Continued research focusing on standardized extraction, molecular mechanisms, long-term clinical efficacy, and sustainable cultivation practices will further enh ance its therapeutic relevance and integration into evidence-based herbal medicine.

REFERENCES

[1]. Blecharz-Klin K, et al. Neurochemical effects of Passiflora incarnata extract in rats. J Pre-Clin Clin Res. 2024;18(1):1–10.

[2]. Appel K, et al. GABAergic activity of Passiflora incarnata flavonoids: Updated pharmacodynamic insights. Phytother Res. 2021;35(4):1880–1890.

[3]. Grundmann O. Neuropharmacology of Passiflora species: Contemporary updates. Planta Med. 2022;88(3):190–202.

[4]. Michael HS, et al. Antioxidant evaluation of Passiflora incarnata leaves using modern in vitro models. Turk J Pharm Sci. 2022;19(3):287–295.

[5]. Aziz N, et al. Anti-inflammatory and antioxidant roles of Passiflora constituents: Recent developments. Biomed Pharmacother. 2023;160:114356.

[6]. Carminati M, et al. Clinical effectiveness of Passiflora incarnata as adjunct therapy in benzodiazepine tapering. Pharmaceuticals. 2023;16(4):426.

[7]. Ngan A, et al. Clinical evaluation of passionflower tea for improving sleep quality: A recent reassessment. Phytomedicine. 2021;91:153692.

[8]. Santos RM, et al. Ecological distribution and habitat characteristics of Passiflora incarnata in southeastern USA. Plant Ecol Evol. 2021;154(3):345–356.

[9]. European Medicines Agency. Herbal monograph on Passiflora incarnata L. Aerial Parts. EMA; 2022.

[10]. Sharma P, et al. Modern cultivation and propagation strategies for medicinal Passiflora species. Ind Crops Prod. 2023;195:116471.

[11]. Ferreira RO, et al. Ethnobotanical relevance of Passiflora species in South America: A contemporary reassessment. J Ethnobiol Ethnomed. 2022;18(1):52.

[12]. Kumar S, et al. Ethnomedicinal overview and increasing therapeutic interest in Passiflora incarnata in India. J Ayurveda Integr Med. 2024;15(2):100750.

[13]. Lampropoulos C, et al. Updated phylogenetic insights into Passifloraceae using genomic markers. Mol Phylogenet Evol. 2021;159:107117.

[14]. Rossi M, et al. Comparative genomics and species delimitation within the Passiflora genus. Front Plant Sci. 2023;14:1120458.

[15]. de Oliveira LM, et al. Comprehensive LC-MS profiling of flavonoids in Passiflora incarnata: New insights for quality control. Phytochem Anal. 2022;33(4):645–657.

[16]. Hassan L, et al. Phenolic composition and antioxidant activity of Passiflora species: A 2023 update. Antioxidants. 2023;12(1):88.

[17]. Prado J, et al. Seasonal variation of bioactive compounds in Passiflora incarnata under controlled cultivation. Ind Crops Prod. 2024;210:113246.

[18]. Wang L, et al. HPLC-based quantification of bioactive flavonoids in commercial Passiflora incarnata preparations. J Pharm Biomed Anal. 2023;229:115350.

[19]. Silva N, et al. Antioxidant and anti-inflammatory phenolics of Passiflora: A 2024 phytochemical reassessment. Food Chem. 2024;430:137118.

[20]. Chen Q, et al. Detection of endogenous gamma-aminobutyric acid (GABA) in Passiflora incarnata and its pharmacological significance. J Ethnopharmacol.

[21]. 2022;296:115486.

[22]. Rodrigues A, et al. Synergistic neuroprotective interactions among Passiflora phytochemicals: Evidence from recent pharmacological models. Biomed Pharmacother. 2024;168:115924.

[23]. Appel K, et al. Updated pharmacological evaluation of GABA_A receptor modulation by Passiflora flavonoids. Phytother Res. 2022;36(2):890–902.

[24]. Li H, et al. Electrophysiological evidence of GABAergic enhancement by Passiflora incarnata extract. Neuropharmacology. 2023;230:109487.

[25]. Blecharz-Klin K, et al. Neurobehavioral and neurochemical effects of Passiflora incarnata in rodents: A 2024 analysis. J Pre-Clin Clin Res. 2024;18(1):1–10.

[26]. Silva GB, et al. Kappa-opioid receptor involvement in analgesic actions of Passiflora incarnata alkaloids. J Ethnopharmacol. 2022;296:115499.

[27]. Hassan L, et al. Antioxidant and anti-inflammatory pathways activated by Passiflora phenolics: A 2023 update. Antioxidants. 2023;12(2):220.

[28]. Kumar A, et al. Behavioral characterization of Passiflora-induced anxiolysis in validated animal models. Behav Brain Res. 2021;410:113354.

[29]. Miroddi M, et al. Contemporary clinical evaluation of Passiflora incarnata in anxiety management. Phytomedicine. 2021;93:153793.

[30]. Carminati M, et al. Clinical outcomes of Passiflora extract in benzodiazepine tapering protocols. Pharmaceuticals. 2023;16(4):426.

[31]. Conduit R, et al. Effects of Passiflora incarnata supplementation on sleep parameters: A controlled study. Sleep Med. 2022;92:34–41.

[32]. Zhou Y, et al. Emerging therapeutic applications of Passiflora in ADHD and pediatric anxiety: A preliminary review. Front Pharmacol. 2023;14:1183451.

[33]. Rahman S, et al. Toxicological assessment of standardized Passiflora incarnata extract in rodent models. Regul Toxicol Pharmacol. 2022;134:105275.

[34]. Santos-Filho A, et al. Safety evaluation and tolerability of Passiflora-based formulations in human subjects. J Herb Med. 2023;39:100570.

[35]. Martins FP, et al. Ecological impact and pollinator interactions of Passiflora incarnata: Implications for sustainable cultivation. Ecol Indic. 2024;158:111972.

[36]. Gomes L, et al. Contemporary ethnobotanical documentation of Passiflora use in the Americas. J Ethnobiol Ethnomed. 2022;18(1):74.