Ilam University of Medical Sciences

Plant Biotechnology Persa

Online ISSN: 2676-7414

Homepage: https://pbp.medilam.ac.ir

Herbal Neurosoothers in Pediatric Anxiety: Insights from Preclinical Research

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Article Info

Article type:
Review Article

Article History:
Received: 27 Mar. 2026
Revised: 22 Jul. 2026
Accepted: 27 Jul. 2026
Published Online:

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A B S T R A C T

Objective: Anxiety and restlessness are childhood concerns that can shape behavioral and physical development. Growing unease, about the side-effects of pharmaceutical treatments has sparked interest in plants and herbal infusions as a gentler way to calm a child's nerves. This study set out to explore both medical sources and current scientific literature to identify herbal remedies that can soothe nervous tension and improve sleep, in children.

Methods: The review unfolded in two phases. In the phase the canonical texts of traditional medicine were examined to pinpoint plant species reported to possess calming effects, for children. The second phase involved a search and appraisal of pre-clinical, animal and clinical studies using PubMed, Scopus and the SID database covering publications from 2000 through 2025.

Results: The findings pointed to the presence of plants such, as *Foeniculum vulgare Mill. Matricaria chamomilla L., Cichorium intybus L., Achillea millefolium L., Berberis vulgaris L., Echium Fisch. & C.A.Mey. Humulus lupulus L., Valeriana officinalis L., Crocus sativus L., Cinnamomum verum J.Presl, Lavandula angustifolia Mill. Iranian traditional medicine suggests that these plants Melissa officinalis L., Salvia officinalis L., Mentha piperita L., Thymus vulgaris L., Althaea officinalis L., Syzygium aromaticum (L.) Merr. & L.M.Perry Papaver rhoeas L., Passiflora incarnata L., Rosa damascena Mill. Rubus idaeus L., Citrus aurantium L., Camellia sinensis (L.) Kuntze, Urtica dioica L., Aloysia citrodora Paláu, Elettaria L.) Maton and Zingiber officinale Roscoe* are thought to provide anxiolytic and calming benefits, for children.

Conclusion: A striking degree of overlap can be seen between the herbal repertoire and contemporary scientific findings, on plant-based calming agents for children. This convergence points toward the likelihood that many of these herbs may act as natural low-risk remedies for tackling anxiety and fostering sleep, in kids. Nonetheless carefully crafted human clinical trials remain indispensable to establish dosage parameters and to uncover any adverse effects.

Key terms: Relaxation, Nervous system, Medicinal plants, Therapy, Anxiety

➢ **How to cite this paper**
Neisari R. Herbal Neurosoothers in Pediatric Anxiety: Insights from Preclinical Research. Plant Biotechnology Persa. 2026; 8(3): 1-11.

[Downloaded from pbp.medilam.ac.ir on 2026-11-05]

[DOI: 10.66224/pbp.8.3.18]

DOI: 10.66224/pbp.8.3.18

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Publisher: Ilam University of Medical Sciences

[DOI: 10.66224/pbp.8.3.18] [Downloaded from pbp.medilam.ac.ir on 2026-11-05]

Introduction

Childhood is a formative window, for physical, psychological and behavioral growth [1]. Throughout this time youngsters undergo social and cognitive transformations that can leave them vulnerable to anxiety, restlessness, sleep disruptions and behavioral challenges [2]. Persistent sleep disorders and anxiety, in children not diminish the quality of life for them and their families they can also jeopardize long-term development, academic achievement and mental well-being [3].

Anxiety, in its essence is the mind-body's reaction to perceived threats or stressful moments often manifesting as worry, fear, tension or a vague discomfort [4]. While this alarm can be useful priming us for hazards its intensity or persistence may become disruptive spilling into life and qualifying, as an anxiety disorder [5]. Sedatives are agents that quiet the system easing both mental and physical strain and fostering a tranquil state that mitigates anxiety [6].

Although the standard drug regimens, for anxiety and sleep disturbances often work they bring along a bundle of drawbacks side-effects the risk of dependence and a tangle of drug interactions [7]. This has led parents. Health-care professionals to hunt for gentler more natural ways to soothe children [8]. In that search medicinal herbs and their infusions have taken stage buoyed by centuries of use and an expanding body of scientific evidence that supports their efficacy [9,10].

Steeped in a millennia-long tradition Iranian traditional medicine holds a well of knowledge, about medicinal plants and how they influence children's nervous systems and psychological well-being [11]. Authoritative texts from this tradition detail the effects of herbs outline ways to brew their infusions and list age-appropriate safe dosages, children, among the groups considered [12]. Time-honored Iranian folk medicine has long turned to herbs, like chamomile lemon balm, lavender, poppy and hops as sedatives that help children drift off to sleep [13].

Recent preclinical and clinical studies have lent credence to some of these claims showing that the active blend of flavonoids essential oils and alkaloids, in these plants can tweak the nervous system tone down stress responses and raise inhibitory neurotransmitters, like GABA, which together tend to soothe anxiety and lift sleep quality [14].

Recognizing the role that mental health and quality sleep play in children's development a review of tranquil herbal infusions rooted in Iranian traditional medicine could furnish a practical guide, for parents, physicians and researchers and simultaneously lay the groundwork, for future studies that examine the safety and efficacy of these natural interventions.

Methods

This study was designed as a two-phase review to collect and analyze both traditional and scientific evidence regarding herbal infusions effective in calming children's nerves.

Phase 1: Review of Traditional Sources

In the first phase, classical and authoritative texts of Iranian traditional medicine were examined [15–21] to identify medicinal plants and herbal infusions recommended as calming agents for children. Extracted information included plant names, scientific nomenclature, parts used, and traditional methods of preparation.

Phase 2: Review of Modern Scientific Databases

In the second phase, a systematic search was conducted in PubMed, Scopus, Web of Science, and the Iranian Scientific Information Database (SID), covering the period from 2000 to 2025. Keywords included both English and Persian terms relevant to the topic, such as: "herbal tea," "child anxiety," "sleep disorders," "traditional medicine," and "phytotherapy."

Inclusion and Exclusion Criteria

Studies were included if they were clinical, preclinical, or animal model investigations

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evaluating the effects of medicinal plants or herbal infusions on anxiety or sleep disorders in children; published in English or Persian; and reported valid study designs with extractable outcomes. Excluded were studies focusing solely on pharmaceutical drugs, studies with incomplete or unusable data, review articles without empirical findings, and studies unrelated to children.

Data Extraction and Analysis

All extracted data were independently reviewed by two researchers to ensure accuracy and completeness. Discrepancies were resolved by a third reviewer. Extracted information included the plant's scientific and common names, parts used, preparation method, proposed mechanisms of action, and relevant scientific evidence regarding calming effects and sleep improvement in children.

Data Synthesis

The data were presented descriptively and comparatively, aligning traditional uses of medicinal plants with contemporary scientific evidence to provide a comprehensive synthesis of both traditional and modern findings.

Results

The findings indicate that plants such as Foeniculum vulgare Mill., Matricaria chamomilla L., Cichorium intybus L., Achillea millefolium L., Berberis vulgaris L., Echium amoenum Fisch. & C.A.Mey., Humulus lupulus L., Valeriana officinalis L., Crocus sativus L., Cinnamomum verum J.Presl, Lavandula angustifolia Mill., Melissa officinalis L., Salvia officinalis L., Mentha piperita L., Thymus vulgaris L., Althaea officinalis L., Syzygium aromaticum (L.) Merr. & L.M.Perry, Papaver rhoeas L., Passiflora incarnata L., Rosa damascena Mill., Rubus idaeus L., Citrus aurantium L., Camellia sinensis (L.) Kuntze, Urtica dioica L., Aloysia citrodora Paláu, Elettaria cardamomum (L.) Maton, and Zingiber officinale Roscoe naturally exhibit anxiolytic and calming properties for children according to Iranian traditional medicine.

Further details regarding the plants' common names in Persian and English, their botanical families, and their scientific nomenclature as recognized for their calming effects on children in Iranian traditional medicine are provided in Table 1.

Table 1: Medicinal Plants with Calming Effects in Children According to Iranian Traditional Medicine

Botanical Family	Persian Name	English Name	Scientific Name
Apiaceae	Razianeh	Fennel	*Foeniculum vulgare* Mill.
Asteraceae	Babouneh	Chamomile	*Matricaria chamomilla* L.
Asteraceae	Kasni	Chicory	*Cichorium intybus* L.
Asteraceae	Boumadaran	Yarrow	*Achillea millefolium* L.
Berberidaceae	Zereshk	Barberry	*Berberis vulgaris* L.
Boraginaceae	Gavzaban	Borage	*Echium amoenum* Fisch. & C.A.Mey.

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Cannabaceae	Razak	Hops	*Humulus lupulus* L.
Caprifoliaceae	Sonboloteib	Valerian	*Valeriana officinalis* L.
Iridaceae	Zafaran	Saffron	*Crocus sativus* L.
Lauraceae	Darchin	Cinnamon	*Cinnamomum verum* J.Presl
Lamiaceae	Ostokhodous	Lavender	*Lavandula angustifolia* Mill.
Lamiaceae	Badranjbouyeh	Lemon balm	*Melissa officinalis* L.
Lamiaceae	Maryamgoli	Sage	*Salvia officinalis* L.
Lamiaceae	Naena	Mint	*Mentha piperita* L.
Lamiaceae	Avishan	Thyme	*Thymus vulgaris* L.
Malvaceae	Khatmi	Marshmallow	*Althaea officinalis* L.
Myrtaceae	Mikhak	Clove	*Syzygium aromaticum* (L.) Merr. & L.M.Perry
Papaveraceae	Shaqayeq	Poppy	*Papaver rhoeas* L.
Passifloraceae	Gole saati	Passion flower	*Passiflora incarnata* L.
Rosaceae	Golesorkh	Damask rose	*Rosa damascena* Mill.
Rosaceae	Tameshkghermez	Red raspberry	*Rubus idaeus* L.
Rutaceae	Baharnaranj	Bitter orange	*Citrus aurantium* L.
Theaceae	Chayesabz	Green tea	*Camellia sinensis* (L.) Kuntze
Urticaceae	Gazaneh	Nettle	*Urtica dioica* L.
Verbenaceae	Behlimou	Lemon verbena	*Aloysia citrodora* Paláu
Zingiberaceae	Hel	Cardamom	*Elettaria cardamomum* (L.) Maton
Zingiberaceae	Zanjabil	Ginger	*Zingiber officinale* Roscoe

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The plant parts used and the traditional methods of preparation for medicinal plants employed to calm children's nerves in Iranian traditional medicine are presented in Table 2.

Table 2: Plant Parts Used and Traditional Methods of Preparation of Medicinal Plants for Calming Children's Nerves in Iranian Traditional Medicine

Scientific Name	Plant Part Used	Traditional Method of Use	Proposed Mechanism of Action on Nervous System Relaxation
Foeniculum vulgare Mill.	Fruit (seed)	Infusion	Reduces anxiety through calming effects on the central nervous system
Matricaria chamomilla L.	Flowers	Infusion and decoction	Enhances GABA receptor activity and reduces neuronal excitability
Cichorium intybus L.	Leaves and root	Decoction	Mild sedative and anti-inflammatory effects that help reduce stress
Achillea millefolium L.	Flowers and leaves	Infusion	Reduces anxiety by modulating the sympathetic nervous system
Berberis vulgaris L.	Stem bark and root	Syrup or extract	Neurotonic and mild calming effects via reduction of excitatory neurotransmitters
Echium amoenum Fisch. & C.A.Mey.	Flowers	Infusion	Increases serotonin levels, reducing anxiety and excitability
Humulus lupulus L.	Female inflorescence (cone)	Infusion	Stimulates GABA receptors, inducing sleep and relaxation
Valeriana officinalis L.	Root	Extract or infusion	Enhances GABA neurotransmission, inducing sedative and hypnotic effects
Crocus sativus L.	Stigma	Infusion	Anxiolytic effect via serotonin reuptake inhibition and antioxidant activity
Cinnamomum verum J.Presl	Stem bark	Added to milk or infusion	Reduces stress through antioxidant effects and central nervous system support
Lavandula angustifolia Mill.	Flowers	Inhalation or infusion	Reduces anxiety and excitability through neurological and olfactory calming effects
Melissa officinalis L.	Leaves	Infusion	MAO inhibition, increased serotonin levels, and anxiety reduction

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Salvia officinalis L.	Leaves	Infusion	Mild sedative effect and reduction of mental stress
Mentha piperita L.	Leaves	Infusion	Mild calming and mood-enhancing effects via central nervous system modulation
Thymus vulgaris L.	Leaves and flowers	Inhalation or infusion	Mild anxiolytic and calming effects with anti-inflammatory mechanisms
Althaea officinalis L.	Root and flowers	Syrup or infusion	Mild sedative effect and nervous system soothing
Syzygium aromaticum (L.) Merr. & L.M.Perry	Dried buds	Inhalation or essential oil	Calming effects through antioxidant and anti-inflammatory actions
Papaver rhoeas L.	Petals	Infusion	Induces relaxation and mild reduction of neuronal excitability
Passiflora incarnata L.	Leaves and flowers	Infusion	Enhances GABA receptor activity and reduces anxiety
Rosa damascena Mill.	Petals	Infusion	Anxiolytic and calming effects via increased serotonin levels
Rubus idaeus L.	Leaves	Infusion	Mild sedative effect and reduction of neuronal excitability
Citrus aurantium L.	Flowers and fruit peel	Distillate or infusion	Reduces anxiety and induces calmness through olfactory and nervous system effects
Camellia sinensis (L.) Kuntze	Leaves	Infusion	Mild calming and stress-reducing effects via polyphenols
Urtica dioica L.	Young leaves	Infusion	Reduces neuronal excitability and provides mild sedative effects
Aloysia citrodora Paláu	Leaves	Infusion	Reduces anxiety and promotes relaxation via central nervous system effects
Elettaria cardamomum (L.) Maton	Seeds	Added to milk or infusion	Mild calming and stress-reducing effects via neurological and olfactory pathways

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Zingiber officinale Roscoe	Rhizome	Decoction or infusion	Reduces neuronal excitability and provides mild calming effects via anti-inflammatory actions

The medicinal plants used in Iranian traditional medicine for calming children's nerves were examined in this study to evaluate the consistency and reliability of traditional data with contemporary scientific evidence. To this end, studies conducted in animal models and preclinical research were analyzed. The findings are summarized in Table 3.

Table 3: Animal Model and Preclinical Studies of Medicinal Plants Used in Iranian Traditional Medicine for Calming Children's Nerves

Scientific Name	Summary of Animal, Preclinical, and Clinical Findings	Ref.
Foeniculum vulgare Mill.	Oral administration of fennel seeds accelerated recovery of motor and neural function following sciatic nerve injury in animal models, showing potential for nerve rehabilitation.	[22]
Matricaria chamomilla L.	Methanolic extract of chamomile exhibited dose-dependent neuroprotective effects, preventing ischemia/reperfusion brain injury by reducing lipid peroxidation and enhancing antioxidant activity.	[23]
Cichorium intybus L.	Chicory extract demonstrated anticonvulsant effects in animal models, significantly delaying seizure onset.	[24]
Achillea millefolium L.	Yarrow extract reduced oxidative stress, inflammation, and apoptosis in the spinal cord of diabetic mice, exhibiting analgesic and neuroprotective effects.	[25]
Berberis vulgaris L.	Barberry extract showed analgesic and anti-inflammatory effects partially mediated via opioid receptors.	[26]
Echium amoenum Fisch. & C.A.Mey.	Borage flower extract exhibited significant opioid receptor-mediated analgesic and anti-inflammatory effects in animal models.	[27]
Humulus lupulus L.	Hops extract induced smooth muscle relaxation in the ileum via inhibition of cholinergic pathways and showed strong spasmolytic properties.	[28]
Valeriana officinalis L.	Valerian extract improved sleep quality, increased non-REM sleep, and reduced neuropathic pain in mice.	[29]
Crocus sativus L.	Saffron combined with cerium nanoparticles accelerated peripheral nerve regeneration through antioxidant and anti-inflammatory mechanisms.	[30]

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Cinnamomum verum J.Presl	Cinnamon essential oil demonstrated muscle-relaxant properties mediated by phenolic compounds and nicotinic receptors.	[31]
Lavandula angustifolia Mill.	Lavender improved motor function, reduced neural inflammation, and increased motor neuron counts in spinal cord injury models.	[32]
Melissa officinalis L.	Lemon balm exhibited analgesic, anxiolytic, and neuroregenerative effects in the CCI model, acting via KATP, opioid, and serotonergic pathways.	[33]
Salvia officinalis L.	Sage extract reduced neuropathic inflammation and enhanced nerve regeneration with fewer side effects compared to anti-inflammatory drugs.	[34]
Mentha piperita L.	Peppermint oil decreased blood pressure and heart rate through direct vasodilation and sympathetic inhibition.	[35]
Thymus vulgaris L.	Thyme increased exploratory behavior in the EPM test, indicating anxiolytic effects without altering locomotor activity.	[36]
Althaea officinalis L.	Essential oil showed significant analgesic effects in animal tests via central and peripheral mechanisms.	[37]
Syzygium aromaticum (L.) Merr. & L.M.Perry	Clove extract exhibited anxiolytic, antidepressant, and calming effects through GABA receptor modulation.	[38]
Papaver rhoeas L.	Wild poppy extract showed strong analgesic, anti-inflammatory, and antidepressant effects in animal models.	[39]
Passiflora incarnata L.	Passionflower induced calming and anxiolytic effects via GABA pathways and increased spinal dopamine levels.	[40]
Rosa damascena Mill.	Damask rose oil induced vasorelaxation in mice via the NO–cGMP pathway.	[41]
Rubus idaeus L.	Essential oil of raspberry leaves reduced post-surgical pain via α2-adrenergic and opioid receptors.	[42]
Citrus aurantium L.	Bitter orange blossom extract exerted calming and anxiolytic effects by reducing amygdala neuron activity.	[43]
Camellia sinensis (L.) Kuntze	Green tea showed GABA(_A)-BZD-dependent anxiolytic effects similar to diazepam.	[44]
Urtica dioica L.	Nettle extract improved memory, reduced oxidative stress, and modulated monoamines in cognitive impairment models.	[45]

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Aloysia citrodora Paláu	Lemon verbena demonstrated notable antidepressant, anti-inflammatory, and antioxidant effects in chronic stress models.	[46]
Elettaria cardamomum (L.) Maton	Perinatal administration of cardamom improved learning and memory in neonatal mice via increased dopamine and serotonin.	[47]
Zingiber officinale Roscoe	Ginger reduced neuropathic pain by suppressing NF-κB signaling and inflammatory markers without affecting locomotor activity.	[48]

Industrial, Culinary, Nutritional, Ecological, and Veterinary Applications of Selected Medicinal Plants are shown in table 4.

Table 4: Industrial, Culinary, Nutritional, Ecological, and Veterinary Applications of Selected Medicinal Plants

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Scientific Name	Industrial Applications	Culinary and Flavoring Uses	Nutritional and Medicinal Applications	Ecological (Environmental) Uses	Veterinary (Livestock) Applications
Foeniculum vulgare	Extraction of essential oils for pharmaceutical and cosmetic industries	Used as a spice and flavoring in foods and beverages	Digestive aid, antispasmodic, antioxidant	Source of nectar for bees	Enhances milk production and improves digestion in livestock
Matricaria chamomilla	Pharmaceutical and cosmetic formulations	Herbal tea and flavor additive	Natural sedative, anti-inflammatory	Supports pollinators and improves soil quality	Calming additive in animal feed
Cichorium intybus	Coffee substitute and prebiotic production	Coffee additive	Rich in inulin and dietary fiber	Soil-improving and phytoremediation plant	Promotes gut health in ruminants
Achillea millefolium	Cosmetic and antiseptic formulations	Limited use as a flavoring agent	Anti-inflammatory and antioxidant	Prevents soil erosion	Used for wound healing in animals
Berberis vulgaris	Natural dye and pharmaceutical industries	Condiment in Persian cuisine	Rich in vitamin C and alkaloids	Used as a hedge plant	Antiparasitic agent in livestock
Echium amoenum	Oil extraction and herbal product manufacturing	Traditional herbal tea	Source of gamma-linolenic acid	Supports pollinators	Natural anti-inflammatory for animals
Humulus lupulus	Brewing industry	Flavoring in beverages	Potent antioxidant	Climbing plant providing natural shade	Sedative supplement in animal feed
Valeriana officinalis	Sedative and tranquilizing pharmaceuticals	Herbal infusion	Anxiolytic and relaxant	Enhances biodiversity	Reduces stress in livestock

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Crocus sativus	Perfume and natural dye industries	Widely used spice and flavoring	Source of carotenoids and antioxidants	Drought-tolerant crop	Appetite stimulant for animals
Cinnamomum verum	Perfume, food, and pharmaceutical industries	Common culinary spice	Regulates blood glucose; antioxidant	Natural insect repellent	Antimicrobial additive in feed
Lavandula angustifolia	Aromatherapy, cosmetic, and pharmaceutical industries	Flavoring and herbal tea	Antioxidant and relaxant	Attracts pollinators	Soothing aroma reduces animal anxiety
Melissa officinalis	Pharmaceutical and cosmetic industries	Aromatic herbal tea	Mild sedative and antioxidant	Bee-attracting plant	Reduces stress in animals
Salvia officinalis	Antiseptic and cosmetic formulations	Culinary herb and seasoning	Cognitive enhancer and antimicrobial	Natural pest repellent	Exhibits antibacterial effects in livestock
Mentha piperita	Toothpaste, perfumery, and pharmaceutical industries	Culinary flavoring and tea	Antiflatulent, antiemetic	Ground cover for soil protection	Reduces intestinal gas in animals
Thymus vulgaris	Natural disinfectant and food preservative	Spice and flavoring agent	Antibacterial and antiviral	Repels pests	Enhances digestion and prevents infections in livestock
Althaea officinalis	Pharmaceutical syrups and lozenges	Natural flavoring agent	Demulcent and cough suppressant	Retains soil moisture	Soothes respiratory tracts in animals
Syzygium aromaticum	Perfume, antiseptic, and pharmaceutical industries	Common spice and seasoning	Strong antioxidant and antimicrobial	Natural pesticide	Antiparasitic for livestock
Papaver rhoeas	Natural pigment and cosmetic industries	Edible decorative petals	Source of fatty acids	Supports biodiversity	Mild natural sedative

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Passiflora incarnata	Sedative and anxiolytic pharmaceuticals	Herbal tea	Antioxidant and calming effects	Ornamental climbing plant	Reduces anxiety in animals
Rosa damascena	Perfume and cosmetic industries	Used in rosewater, jams, and syrups	Natural antioxidant	Attracts pollinators	Appetite stimulant
Rubus idaeus	Food processing and cosmetic industries	Fresh fruit, jam, and desserts	Source of vitamin C and dietary fiber	Prevents soil erosion	Natural antioxidant in animal feed
Citrus aurantium	Perfume and pharmaceutical industries	Seasoning and marmalade production	Rich in vitamin C and flavonoids	Aromatic hedge plant	Digestive tonic for animals
Camellia sinensis	Beverage and cosmetic industries	Tea leaves	Antioxidant and natural stimulant	Shade-providing plant	Enhances immunity in livestock
Urtica dioica	Textile fiber and cosmetic industries	Soup ingredient and herbal tea	High in iron and essential minerals	Improves soil fertility	Increases milk yield in livestock
Aloysia citrodora	Pharmaceutical and fragrance industries	Aromatic herbal infusion	Antioxidant and relaxant	Attracts pollinators	Reduces stress in animals
Elettaria cardamomum	Perfume and food flavoring industries	Widely used spice	Antioxidant and digestive aid	Tropical understory plant	Improves feed palatability and appetite
Zingiber officinale	Pharmaceutical and beverage industries	Common culinary spice	Anti-inflammatory and antiemetic	Enhances soil microflora	Appetite stimulant and antiflatulent

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Discussion

The findings of this study reveal a substantial overlap between data from Iranian traditional medicine sources and contemporary scientific evidence regarding the use of medicinal plants for calming children's nerves [11, 12, 14]. Many plants recommended in classical Iranian texts for reducing anxiety, improving sleep quality, and promoting relaxation in children demonstrated comparable effects in preclinical and animal model studies [22–48]. These results not only validate certain scientific aspects of traditional knowledge but also underscore the high potential of these plants for developing safe and effective natural therapies for managing anxiety disorders in children [9, 10].

Among the examined plants, *Melissa officinalis* L., *Valeriana officinalis* L., and *Lavandula angustifolia* Mill. have the strongest supporting scientific evidence [29, 32, 33]. Studies indicate that their bioactive compounds including flavonoids, terpenoids, and phenolic acids reduce anxiety and improve sleep quality by enhancing inhibitory neurotransmitter activity, particularly GABA, and modulating the hypothalamic-pituitary-adrenal (HPA) axis [14, 33]. These mechanisms align closely with traditional descriptions in Iranian sources, such as "modulating brain heat," "calming the spirit," and "relieving children's anxiety" [11, 12].

Plants such as *Citrus aurantium* L. and *Rosa damascena* Mill. have also demonstrated calming effects through neurotransmitter modulation and reduced neuronal excitability [41, 43]. These findings provide a scientific basis for the traditional use of these plants as herbal teas or infusions to manage mild anxiety in children [8, 9].

However, for certain plants including *Papaver rhoeas* L., *Aloysia citrodora* Paláu, and *Urtica dioica* L. scientific evidence remains limited, with most data derived from animal studies [45, 46]. Therefore, well-designed clinical studies in children are essential to establish safe dosages and evaluate potential adverse effects. This is particularly important for younger age groups, given the heightened sensitivity of the developing nervous system and age-related differences in metabolism, which may increase the risk of unintended effects.

Some plants, such as *Crocus sativus* L. and *Zingiber officinale* Roscoe, possess additional antioxidant and anti-inflammatory properties alongside their anxiolytic effects, which may support brain function and mitigate oxidative damage [30, 48]. This multifaceted activity represents a notable advantage of medicinal plants over single-target synthetic drugs.

Traditional modes of administration also merit attention. Iranian traditional medicine sources predominantly recommend herbal teas, decoctions, or hydrosols. These forms, unlike concentrated extracts or pharmaceutical drugs, generally contain lower concentrations of active compounds and are considered safer for children.

Overall, the findings suggest that Iranian traditional medicine, with its empirical and systematic approach, anticipated principles now recognized in modern pharmacology regarding the effects of plants on the nervous system. Nevertheless, translating this empirical knowledge into reliable therapeutic interventions requires controlled clinical trials, safety and dosage evaluations, standardization of extracts, and long-term toxicity assessments. The systematic documentation of traditional and ethnobotanical knowledge is essential for preserving valuable cultural heritage and identifying medicinal plants that may serve as candidates for future pharmacological research. Such information can provide a foundation for hypothesis generation, prioritization of plant species for preclinical and clinical investigations, and the development of standardized, evidence-based herbal interventions. However, traditional use should be regarded as a source of research hypotheses rather than direct evidence of efficacy or safety, particularly in children [49-52].

Conclusion

Integrating medicinal plants supported by Iranian traditional medicine, alongside behavioral and

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[DOI: 10.66224/pbp.8.3.18]

nutritional interventions, may play a significant role in managing anxiety, improving sleep quality, and enhancing mental health in children. Such applications, however, must be guided by scientific evidence and implemented under the supervision of qualified healthcare professionals to ensure safety and efficacy.

Statements and Declarations

Funding support

The authors did not receive support from any organization for the submitted work.

Competing interests

The authors have no competing interests to declare that are relevant to the content of this article.

Ethics approval

This study was performed in line with the principles of the Declaration of Helsinki.

Consent to participate

Informed consent was obtained from all individual participants included in the study.

Author contributions

AAK: Conceptualization, the original draft writing, investigation, writing including reviewing and editing and investigation and formal analysis; AS: Conceptualization, supervision, and project administration; AS and AAK Conceptualization, the original draft writing, investigation, writing including reviewing and editing.

Acknowledgments

The authors would like to express their gratitude to the Urmia University of Medical Sciences, Urmia, for supporting.

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