IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

A Review On Herbal Actives For Anxiety Reduction And Sleep Enhancement: Mechanisms, Benefits, And Applications

[1]Malarkodi Velraj, [2]Abdur Raheem Noor

[1]Professor and Head, [2]Student

[1]Department of Pharmacognosy,

[1]School of Pharmaceutical Sciences, Vels Institute of Science, Technology and Advanced Studies, Chennai, Tamil Nadu, India

I. ABSTRACT

Sleep and anxiety disorders are extremely popular and co-morbid diseases that greatly deteriorate the quality of life, cognitive abilities, and health in general. The shortcomings of traditional pharmacotherapies, such as adverse effects, tolerance and dependence have resulted in the growing enthusiasm to explore herbal substitutes with superior safety profiles. The purpose of this review is to assess the therapeutic potential of the chosen herbal actives in treating anxiety and sleep disorders, their mechanisms of action, and formulation into form of convenient delivery systems. The databases used in a thorough literature search, including PubMed, Scopus, and Google Scholar, were searched in the period 2000-2025 with the priority on human clinical evidence with preclinical results. Pharmacological effects of key botanicals such as *Withania somnifera*, *Nelumbo nucifera*, *Ocimum sanctum*, *Myristica fragrans*, and *Lavandula angustifolia* were studied. These results suggest that these herbal actives have multi-targeted effects such as hypothalamic-pituitary-adrenal axis modulation, GABAergic neurotransmission, serotonergic pathway regulation, and antioxidant activity, which can lead to better sleep and less anxiety. Also, it has been shown that these actives can be incorporated into herbal oral dissolving films (HODFs), showing possible benefits in terms of bioavailability and patient compliance. To sum up, herbal actives are a promising multi-mechanistic treatment to sleep and anxiety disorders, but additional well-designed clinical trials are needed to confirm the effectiveness and standardization of multi-herbal preparations in the wider treatment options.

Keywords: Sleep Disturbance; Anxiety Disorder; Herbal Extract; Nutraceuticals; Oral Dissolving Film.

II. INTRODUCTION

Sleep disorders and anxiety disorders are major factors that lead to poor quality of life, impaired cognitive states, immune system, and cardiometabolic outcomes in the long run. The increase in consumer interest in adaptogen use (e.g., Ashwagandha, Tulsi) and calming/sedative herbs (e.g., Indian Lotus, Nutmeg,

Lavender) as a holistic sleep support, as well as the growing consumer preference toward plant-based wellness interventions and the emergence of patient-centric dosage forms, have fostered an interest in the combination of adaptogens with calming/sedative herbs.

Spectrum of Sleep Disorders

Such official systems of sleep classification divide sleep pathology into six major categories:

Insomnia Disorders -Inability to fall/sustain sleep, non-restful slumber.

Sleep Related Breathing Disorders - Obstructive sleep apnea, central apnea, hypoventilation.

Central Disorders of Hyper somnolence -Narcolepsy type1 and 2, idiopathic hypersomnia, Kleine-Levin.

Circadian Rhythm Sleep Wake Disorders- Delayed/advanced stage, shift work disorder, jet lag.

Parasomnias -Dysfunctional behaviours during sleep (sleepwalking, night terrors, Rapid Eye Movement (REM) behaviour disorder, nightmares).

Sleep Related Movement Disorders Restless legs syndrome (RLS), periodic limb movement disorder (PLMD), bruxism, leg cramps.[1]

Overlapping Causes and Factors to Sleep and Anxiety Disorders.

Sleep disruption and anxiety are bi-directionally linked [6]. Core contributors include:

Biological / Medical- Chronic pain, arthritis, neurologic disease - Endocrine deregulation (thyroid, excess/deficit adrenal cortisol)

Sleep apnea (obstruction of airways) - Hormonal changes (menopause, andropause) Psychological / Psychiatric

Generalised anxiety disease, depression, post-traumatic stress disorder (PTSD) – Acute stress, life events, grief - Maladaptive arousal conditioning (psychophysiological insomnia)

Lifestyle / Behaviour - Asomnific, work schedule- Late caffeine, stimulant or screen use (blue light) - alcohol or sedative overuse affecting the sleep architecture.

Environment - Noise, exposure to light during the night, temperature, travelling across different time zones (jet lag)

Medication / Substance - Selective Serotonin reuptake inhibitors (SSRI), steroids, decongestants, stimulants, certain antihypertensive, -Recreational drugs that influence, Rapid Eye Movement/ Non-Rapid Eye Movement (REM/NREM) cycles Similar to other scientific fields, sleep studies encounter challenges and weaknesses when developing their explanations of the sleep cycle. Like all other scientific disciplines, sleep research is not devoid of issues and shortcomings in forming its explanations of the sleep cycle.

Age-specific Recommended Sleep Duration.

Consensus guidelines [1][4] suggest the following typical nightly sleep ranges for healthy individuals. Individual variation exists.

Table 1: Age-specific recommended sleep duration

Age Group	Recommended Sleep (hrs./24h)	Notes
Newborns (0–3 months)	14–17	Frequent cycles; wide range normal
Infants (4–11 mo)	12–15	Includes naps
Toddlers (1–2 y)	11–14	Includes naps
Preschool (3–5 y)	10–13	Often 1 nap
School age (6–12 y)	9–12	Critical for learning, growth
Teens (13–18 y)	8–10	Often sleep-restricted by schedule
Adults (18–64 y)	≥7 (most 7–9)	AASM minimum threshold 7 h for health
Older Adults (65+)	7–8	Sleep fragmentation common

After effects of Chronic Sleep Deprivation

Deficiency or inadequate and poor sleep is associated with extensive health risk factors [4]:

Neurocognitive: Poor attention, slower response, memory impairment, poor decisions, more likely to have accidents (as bad as alcohol impairment in extreme deprivation).

Emotional / Psychiatric: Increased stress responsiveness, mood changes, anxiety, depression, irritability, in the extreme, hallucinations.

Metabolic & Endocrine: Insulin resistance, increased blood glucose, imbalance of the appetite hormones with the increased ghrelin, decreased leptin (predisposes to weight gain/obesity).

Immune: Diminished immune competence, a single night of total deprivation is sufficient to initiate inflammatory immune changes.

Growth & Repair: Reduced growth hormone release (children/teens), impaired tissue repair.

III. METHODS

To find relevant studies published between (2000-2025), the comprehensive literature search was carried out using electronic databases such as PubMed, Scopus, and Google Scholar. Keywords used in the search included: sleep disorder, anxiety, herbal medicine, adaptogens and oral dissolving films. Included studies in this review entailed human clinical trials, randomized controlled trials, and pertinent review articles, which investigated the effects of the chosen herbal actives on sleep and anxiety. Also, preclinical and mechanistic studies were taken into account in order to justify pharmacological actions. The studies that only involved toxicity, non-scientific related conditions, and insignificant studies were eliminated. Herbal actives were chosen on the basis of traditional use, the presence of scientific evidence and applicability to modulating stress and promoting sleep.

Ashwagandha (*Withania somnifera*)

Key Constituents: Withanolides (withaferin A, withanolide D), sitoindosides.

Kingdom: Plantae

Family: Solanaceae

Species: *Withania somnifera* (L.) Dunal

Parts Used: Roots and aerial parts.

Mechanisms: Hypothalamic–Pituitary–Adrenal (HPA)-axis modulation (decrease cortisol), possible GABA mimetic effects, chronomodulatory influence on circadian genes [7], anti-inflammatory & antioxidant.

Evidence: Systematic review & meta-analysis of 5 Randomized Controlled Trials (RCTs) was associated with moderate and significant differences in sleep parameters especially at doses of 600 mg/day or greater over 8 weeks.Randomized Controlled Trial (RCT) in non-restorative sleep (healthy adults) -Substantiated increase in sleep quality (72% versus 29% placebo), sleep efficiency, latency and quality of life (6 weeks).Press review of links to stress/anxiety/insomnia. Compiles finding cortisol decrease, GABAergic role in animal models of sleep, Non-Rapid Eye Movement (NREM) and total sleep increased in sleep-disturbed rats [8][9]. Multiple RCTs and meta-analyses confirm that *Withania somnifera* (Ashwagandha) significantly improves sleep and reduces stress[7].

Advantages: Stress relievers adaptogens can improve sleep at night because they are calming. Stress reduction during the day could be an enhancement in night sleep

Safety: Generally safe, mild GI/upset, contraindicated in pregnancy, hyperthyroidism.

Indian Lotus (*Nelumbo nucifera*)

Plant Parts: Seeds, stamens, flowers, traditional sedative and meditative aid.

Key Compounds: Nuciferine, neferine, flavonoids, endogenous GABA content in seed extracts.

Kingdom: Plantae

Family: Nelumbonaceae

Species: *Nelumbo nucifera* Gaertn

Parts Used: Flower

Mechanisms: Gamma-Aminobutyric Acid receptor binding; increased serotonergic signalling; promotes Non-Rapid Eye Movement (NREM) sleep in rodent Electroencephalogram (EEG) models; reduces wakefulness in caffeine arousal model.[11]

Evidence: Lotus seed water extract (up to 160 mg/kg) increased Non-Rapid Eye Movement (NREM) sleep time, reduced wakefulness; dose-related up regulation of GABA_A/B & 5 HT receptor transcripts [11].

Application: This is used as a mild tranquilizer; it can be used with the adaptogens to achieve calming with a balance.

Safety: Generally, food safe (edible seeds that are quite common in being eaten); high dosage can reduce BP; scanty paediatric information-low dose should be used in children.

Tulsi / Holy Basil (*Ocimum sanctum / Ocimum tenuiflorum*)

Key Constituents: Eugenol, ursolic acid, rosmarinic acid, ocimumosides A & B.

Kingdom: Plantae

Family: Lamiaceae

Species: *Ocimum sanctum*

Parts Used: Leaves, Roots and Seed

Mechanisms: There are a number of possible ones; from adaptogenic, which buffers HPA and SAM activation to reduced cortisol levels, reductions in peripheral oxidative stress mediators to reduction in an "I'm stressed out" score.

Evidence: RCT in stressed adults resulted in significant PSS and Athens Insomnia Scale (AIS) reductions as compared to placebo, with trend toward improved sleep efficiency [12] - Clinical data summarised in Tulsi review: reduced stress, anxiety, depression; improved sleep complaints in 6-week DBPC study [13].

Advantages: Daytime stress buffer that indirectly supports sleep and immune supportive.

Safety: Good at traditional doses; monitor blood sugar in diabetics and high doses long term — theoretical fertility caution (animal data).

Nutmeg (*Myristica fragrans*)

Key Actives: Myristicin, elemicin, safrole, eugenol.

Kingdom: Plantae

Family: Myristicaceae

Species: *Myristica fragrans* Houtt

Parts Used: Seed

Mechanisms: CNS depressant; Myristicin metabolites associated with sedative & mood effects; decreased locomotor in murine models; hypothetical GABA/monoamine modulation.

Evidence: The inhalation of nutmeg essential oil led to a decrease of locomotor activity in mice; Myristicin was detected as the most important sedative constituent. Classic use in Ayurvedic preparations supports night relaxation; there is little human-controlled data.

Advantages: In small quantities, it induces mild sedation [14] and makes a beautiful match with the warm sensation of honey.

Safety: Psychoactive/toxic in high doses (>5 g powder/dose). 50-100-mg/day adult nutraceutical dose and paediatric micro dosing only.

Lavender (*Lavandula angustifolia*)

Key Constituents: Linalool, linalyl acetate, terpinenes.

Kingdom: Plantae

Family: Lamiaceae

Species: *Lavandula angustifolia* Mill

Parts Used: Flower

Mechanisms: Ca^{2+} voltage-dependent channels inhibition, 5-Hydroxytryptamine 1A (5HT1A) receptors interaction, translational modulation of N-Methyl-D-Aspartate (NMDA)/glutamate system, mild effects upon Gamma-Aminobutyric Acid type A receptor (GABAA); autonomic calming (Decreased Heart Rate and Blood Pressure); Aroma therapeutic limbic modulation.

Evidence: SR/MA of lavender aromatherapy RCTs found however significant anxiolytic effect (Hedges' g −0.65) and lowered salivary cortisol [17]. - Clinical Randomized Controlled Trial in postmenopausal women with insomnia: oral lavender essential oil group trends of sleep efficiency improvement as well as lower sleep onset latency. -Reviews (topic: narrative and mechanistic) confirm Ca2+ channel&5HT1A involvement; broad CNS sedation [17].

Double Function: Provides anxiety relief effects in combination with being a natural product to mask the bad taste of herbs included in Oral Dissolving Films (ODFs) is an enjoyable way to take and gives it good flavour and scent.

Safety: Topical/Oral in studied dose, usually safe; rare GI or dermal irritation.

Comparative Overview: List of Herbs Used for Anxiety Vs. Sleep

Table 2: Comparative overview of herbs for anxiety and sleep

Herb	Primary Domain	Secondary Domain	Mechanism Highlights
Ashwagandha	Stress/anxiety Decrease	Sleep Increase	Hypothalamic–Pituitary–Adrenal Decrease cortisol; GABA support
Indian Lotus	Sleep Increase	Calm	GABA_A binding; 5-HT modulation
Tulsi	Stress Decrease	Sleep support	Cortisol buffering; antioxidant
Nutmeg1	Sedation	Mood warm	Myristicin sedation; monoamines
Lavender	Anxiety Decrease	Sleep quality	Ca2+ channels; 5-HT1A; aroma
Lemon Balm	Calm	Sleep onset	GABA-T inhibition
Passionflower	Sleep onset	Anxiety Decrease	GABA modulation
Magnolia	Deep sleep	Anxiety Decrease	GABA_A; cortisol Decrease

Minimum / Maximum Safe Intake Guidance (General Nutraceutical Ranges)

(Not a substitute for medical advice; ranges reflect typical supplemental use, not drug doses. Standardised extracts assumed; adjust for potency.)

Table 3: Recommended nutraceutical intake ranges

Age Group	Ashwagandha (mg/day)	Indian Lotus (mg/day)	Tulsi (mg/day)	Nutmeg (mg/day)	Lavender
<2 y	Not recommended	Not recommended	Not recommended	Not recommended	Not recommended
3–12 y	100–250	50–100	50–150	25–50	5–10 (flavor only)
13–17 y	250–400	100–200	150–250	50–100	20–40
Adults	600–1200	150–300	250–500	100–200	80–160
65+	250–600	100–200	150–300	50–150	40–80

Ashwagandha sleep meta-analysis shows ≥600 mg/day is more effective.

Lavender oral soft gel trials often use 80–160 mg/day standardised EO.

Sleep Deprivation Consequences Clinical Snapshot.

Decline in performance 20- 24 hrs. Of wake, equal effect of blood alcohol 0.10% in reaction tasks. Builds up day by day (sleep debt) resulting in cognitive impairment, mood instability. Risks cardio metabolic disease (Hypertension, diabetes) increased through hormonal changes. Immune suppression and pro-inflammatory change leads to the total loss sleep at night and result in change of the phenotype of immune cells. Paediatric effects show hyperactivity, loss of attention, learning disability. A diagnosis is made when an individual loses sleep and performs poorly on standardized tests. When a person fails to sleep and scores low in standardized tests, one is diagnosed with it.

Elaborated Mechanisms of Action (Pathway Map)

The following schematic is a text summary of some of the key pathways by which every of the prioritised herb can reduce anxiety and/or enhance sleep.

Ashwagandha → Reduced Hypothalamic-Pituitary-Adrenal axis hyperactivity (Reduces cortisol) which in turn reduces arousal; perhaps Gamma-Aminobutyric Acid Type A receptor enhancement; antioxidant Neuroprotective effect which in turn increases sleep quality.

Indian Lotus → The Gamma-Aminobutyric Acid Type A receptor binding and the endogenous Gamma-Aminobutyric Acid contribution that result in rise in Non-Rapid Eye Movement (NREM) sleep; serotonergic modulation that results in mood calm which results in better sleep continuity.

Tulsi →Modulates Hypothalamic Pituitary Adrenal axis and Sympathy-Adriano-Medullary axis (SAM) (cortisol decreases, catecholamine's decreases); antioxidant; stabilises monoamine which results in decreased stress perception leading to better sleep onset.

Nutmeg → Myristicin/elemicin Central Nervous System (CNS) non-stimulant; may be GABAergic and serotonergic tone; low locomotor activity resulting in sedation; flavour compliance aid.

Lavender → Lavender to Linalyl acetate and linalyl acetate to Linalyl acetate inhibits neuronal Ca2+ influx; 5-Hydroxytryptamine Receptor 1A (5-HT1A), N-Methyl-D-Aspartate (NMDA) and potentially Gamma-Aminobutyric Acid signalling; autonomic calming (Reduced Heart Rate /Blood Pressure); aroma therapeutic limbic calming which results in decreased anxiety, Sleep quality improvement.

IV. DISSCUSSION

The current review demonstrates the opportunities of the chosen herbal actives as a multi-targeted treatment of sleep and anxiety disorders. In contrast to more traditional pharmacotherapy like benzodiazepines and selective serotonin reuptake inhibitors which have limited pharmacologic activity and tend to have side effects, tolerance, and dependency, herbal agents have more widespread pharmacologic effects and a relatively favourable safety profile.

The botanicals under analysis exhibit a synergistic action of regulating Hypothalamic Pituitary Adrenal axis, promoting GABAergic neurotransmission, controlling serotonergic pathways, and antioxidant effects. The multi-mechanistic activity enables herbal combinations to address both the underlying stress response and sleep dysregulation at the same time, as opposed to specific symptoms.

Moreover, adaptogenic herbs like *Withania somnifera* and *Ocimum sanctum* can be used to decrease cortisol levels and normalize stress reactions whereas calming agents like *Nelumbo nucifera* and *Lavandula angustifolia* stimulate sleep and enhance the quality of sleep. This complementary relationship increases the effectiveness of therapy when combined to promote a holistic approach to treatment.

Moreover, the integration of these herbal actives into oral dissolving films (ODFs) provides patient-friendly delivery system with increased bioavailability, faster onset of action and increased compliance. In general, combining multi-herbal approaches with new delivery methods is an encouraging new step in the treatment of sleep and anxiety disorders.

V. CONCLUSION

Chosen herbal actives, such as Ashwagandha, Indian Lotus, and Lavender, have a scientifically supported, multi-mechanistic effect on sleep and anxiety disorders management, which has more benefits than single-target therapies that have adverse effects. These botanicals are incorporated in the oral dissolving films (ODFs) with the help of natural polymers like agar, acacia gum and fenugreek mucilage to increase bioavailability and compliance by patients. Although the results are encouraging, clinical trials need to be properly designed to confirm the effectiveness and standardization of multi-herbal ODF preparations to use in a wider range of therapeutic indications.

V. ACKNOWLEDGMENT

Conceptualization: Abdur Raheem Noor

Literature Review: Abdur Raheem Noor

Writing – Original Draft Preparation: Abdur Raheem Noor

Writing – Review & Editing: Dr. Malarkodi Velraj

Supervision: Dr. Malarkodi Velraj

REFERENCE

(Sorted by topic; all URLs accessed July 20, 2025.)

1. American Academy of Sleep Medicine. International classification of sleep disorders – third edition (ICSD-3TR). Asian J Pharm Technol. 2025;15(1):10-15.

2. Watson NF, et al. Joint consensus statement of the AASM and Sleep Research Society on recommended amount of sleep for a healthy adult. J Clin Sleep Med. 2015;11(6):591-592.

3. National Heart, Lung, and Blood Institute. Sleep deprivation and deficiency – health effects.

4. Johns Hopkins Medicine. Sleep deprivation.

5. National Sleep Foundation. Consensus sleep duration recommendations.

6. Pallesen S, et al. Consequences of sleep deprivation. Int J Occup Med Environ Health. 2010.

7. Cheah KL, et al. Effect of Ashwagandha (*Withania somnifera*) extract on sleep: systematic review and meta-analysis. PLoS One. 2021;16(9): e0257843.

8. Langade D, et al. Efficacy and safety of Ashwagandha extract in improving sleep. Cureus. 2020.

9. Khan SA, et al. Effects of *Withania somnifera* on stress-related disorders. Curr Neuropharmacol.

10. Kumar VM, Kalonia H. Effect of *Withania somnifera* on sleep-wake cycle in rats. Indian J Pharmacol.

11. Zhang X, et al. Lotus seed extract promotes NREM sleep via GABAergic receptors. J Ethnopharmacol. 2020.

12. Lopresti AL, et al. Effects of *Ocimum tenuiflorum* on stress, mood, and sleep. Front Nutr. 2022; 9:965104.

13. Cohen MM. Tulsi – *Ocimum sanctum*: an herb for all reasons. J Ayurveda Integr Med. 2014;5(4):251-259.

14. Jin Z, et al. Sedative effects of nutmeg oil in mice. Evid Based Complement Alternat Med. 2011.

15. Yim VW, et al. Lavender aromatherapy for anxiety: systematic review and meta-analysis. Complement Ther Med. 2019.

16. Woelk H, Schläfke S. Lavender oil preparation in anxiety disorders. Int J Neuropsychopharmacol.

17. Koulivand PH, et al. Lavender and anxiety disorders: review. Evid Based Complement Alternat Med.