

Review Article



ISSN: 3048-572X

"ASHWAGANDHA (WITHANIA SOMNIFERA) IN STRESS AND ANXIETY: A REVIEW OF RANDOMISED CONTROLLED TRIALS AND META-ANALYSES"

Tushar Tapadiya¹**AFFILIATIONS:**

1. Research Assistant, Ira
Consultancy & Research
Organisation, Bhosari, Pune,
Maharashtra 411026

CORRESPONDENCE:

Tushar Tapadiya

EMAIL ID:

tushartapadiya11@gmail.com

FUNDING**INFORMATION:**

Not Applicable

How to cite this article:

Tapadiya T, "Ashwagandha (Withania somnifera) in stress and anxiety: a review of randomised controlled trials and meta-analyses" International Journal of Ayurvedic Medicine and Mental Health. 2026;3(3):1-5.
Sri. 2026.1004.ijamh.03.01

ABSTRACT:

Background: Ashwagandha (*Withania somnifera*) is one of the most important Rasayana and Balya herbs in Ayurveda and is now among the most widely sold herbal supplements worldwide, largely for stress and anxiety. A growing number of randomised controlled trials and meta-analyses have tested these uses. **Objective:** To review the classical basis of Ashwagandha, its pharmacology relevant to stress, and the evidence from randomised controlled trials and meta-analyses on stress, anxiety, cortisol and sleep, along with safety. **Methods:** Narrative review of classical texts and of randomised controlled trials, systematic reviews and meta-analyses identified through PubMed, Google Scholar and publisher databases. **Results:** Individual randomised trials in chronically stressed adults, healthy adults and patients with anxiety or insomnia have reported reductions in perceived stress, anxiety scores and serum cortisol with Ashwagandha root or root-and-leaf extracts at 240–600 mg per day for 6–12 weeks. A 2024 meta-analysis of nine trials (558 participants) found significant reductions in perceived stress, Hamilton Anxiety Rating Scale scores and cortisol compared with placebo. A 2025 meta-analysis confirmed cortisol reduction but did not find a significant pooled effect on perceived stress, reflecting heterogeneity. Sleep benefits are supported by a separate meta-analysis. Adverse events are usually mild, but rare liver injury and possible thyroid effects have been reported. **Conclusion:** Ashwagandha has moderate-quality evidence for reducing stress, anxiety and cortisol in the short term. Larger independent trials, longer follow-up, standardised extracts and clinical populations with diagnosed anxiety disorders are needed. **Keywords:** Ashwagandha; *Withania somnifera*; stress; anxiety; cortisol; Rasayana; adaptogen; randomised controlled trial

INTRODUCTION:

Chronic stress is associated with a wide range of mental and physical health problems, and anxiety disorders are among the most common mental disorders worldwide. Many people prefer natural products for managing stress, and Ashwagandha has become one of the most popular. It is widely marketed as an “adaptogen”, a term used for substances believed to increase resistance to stress.

In Ayurveda, Ashwagandha is classified as Balya (strength-promoting), Brimhaniya (nourishing) and Rasayana (rejuvenative), and is used for weakness, emaciation, insomnia, nervous exhaustion and ageing^[1]. The name refers to the smell of the root, said to resemble that of a horse, and also to the idea that it gives the strength of a horse. The species name somnifera means “sleep-inducing”.

Over the last 15 years, many randomised controlled trials of Ashwagandha in stress and anxiety have been published, followed by several systematic reviews and meta-analyses. This review summarises this evidence, together with the classical background, proposed mechanisms and safety.

METHODS:

Classical descriptions were drawn from Charaka Samhita and standard Ayurvedic pharmacology texts^[1]. Clinical literature was searched in PubMed, Google Scholar and publisher databases using Ashwagandha, Withania somnifera, stress, anxiety, cortisol, perceived stress, sleep, randomised controlled trial, systematic review and meta-analysis. Randomised controlled trials and meta-analyses were prioritised. This is a narrative review; individual trials were not formally assessed for risk of bias, but limitations noted by trial authors and meta-analysts are reported.

CLASSICAL AND PHARMACOLOGICAL

BACKGROUND:

Ayurvedic properties

Ashwagandha is described as bitter and astringent in taste (Tikta, Kashaya), hot in potency (Ushna Virya) and sweet in post-digestive effect (Madhura Vipaka), pacifying Vata and Kapha^[1]. Charaka lists it among Balya herbs and uses it in Rasayana preparations. It is traditionally given as root powder with milk or ghee, or in formulations such as Ashwagandha Churna, Ashwagandharishta and Ashwagandha Ghrita.

Phytochemistry and pharmacology

The main active constituents are steroidal lactones called withanolides, including withaferin A and withanolide A, along with alkaloids and saponins^[2]. Experimental studies suggest several mechanisms relevant to stress and anxiety^[2,3]:

- HPA axis modulation: reduction of stress-induced rises in corticosterone in animals and cortisol in humans.
- GABAergic activity: GABA-mimetic effects, which may explain anxiolytic and sleep-promoting actions.
- Anti-inflammatory and antioxidant effects: reduction of inflammatory mediators and oxidative stress.
- Neuroprotection: protection of neurons and support of synaptic function in animal models.

These mechanisms are consistent with the Ayurvedic concept of a Rasayana that builds resistance to stress and preserves Ojas.

EVIDENCE FROM RANDOMISED CONTROLLED TRIALS:

Adults with chronic stress

In a randomised, double-blind, placebo-controlled trial in 64 adults with a history of chronic stress, a high-concentration full-spectrum Ashwagandha root extract (300 mg twice daily for 60 days) significantly reduced scores on stress assessment scales and serum cortisol compared with placebo^[4].

In a randomised, double-blind, placebo-controlled trial in 60 stressed but otherwise healthy adults in Australia, an Ashwagandha extract (240 mg daily for 60 days) reduced anxiety on the Hamilton Anxiety Rating Scale more than placebo, along with reductions in morning cortisol and DHEA-S^[5]. This trial is notable because it was conducted outside India with an independent research group.

Healthy adults

In a randomised trial in healthy adults with mild stress, Ashwagandha root extract at 250 mg or 600 mg per day for eight weeks reduced perceived stress and serum cortisol compared with placebo, with greater effects at the higher dose, and also improved sleep quality^[6].

Patients with anxiety disorders

An early double-blind, placebo-controlled trial in patients with anxiety disorders at a psychiatric centre in India reported greater reduction in anxiety with an ethanolic Withania extract than with placebo over six weeks^[7]. Other trials in clinically diagnosed anxiety disorders are few, and this remains a gap.

Insomnia and sleep

In a randomised trial in 60 patients with insomnia, Ashwagandha root extract 300 mg twice daily for ten weeks improved sleep onset latency, total sleep time, sleep efficiency and anxiety scores^[8]. A meta-analysis of five trials (400 participants) found a small but significant improvement in overall sleep, larger in people with insomnia, at doses of at least 600 mg per day and with treatment of eight weeks or more^[9].

Summary of key trials

Table 1: Summary of key randomised controlled trials of Ashwagandha

Trial	Population	n	Dose and duration	Main outcomes
Chandrasekhar 2012 ^[4]	Adults with chronic stress (India)	64	600 mg/day, 60 days	Reduced stress scores and cortisol
Lopresti 2019 ^[5]	Stressed healthy adults (Australia)	60	240 mg/day, 60 days	Reduced HAM-A; reduced cortisol, DHEA-S

Trial	Population	n	Dose and duration	Main outcomes
Salve 2019 ^[6]	Healthy adults with mild stress (India)	60	250 or 600 mg/day, 8 weeks	Reduced PSS and cortisol; improved sleep
Andrade 2000 ^[7]	Anxiety disorders (India)	39	Ethanollic extract, 6 weeks	Greater anxiety reduction than placebo
Langade 2019 ^[8]	Insomnia (India)	60	600 mg/day, 10 weeks	Improved sleep parameters and anxiety

EVIDENCE FROM SYSTEMATIC REVIEWS AND META-ANALYSES:

An early systematic review identified five randomised trials of Ashwagandha for anxiety or stress and found that all reported greater improvement than placebo or comparator, while noting risk of bias and heterogeneity^[10]. A broader review of 41 human trials across many conditions concluded that stress and anxiety had the strongest evidence of benefit^[11].

A 2024 systematic review and meta-analysis of nine randomised controlled trials including 558 participants found that Ashwagandha significantly reduced perceived stress (mean difference about 4.7 points on the Perceived Stress Scale), Hamilton anxiety scores (mean difference about 2.2 points) and serum cortisol compared with placebo^[12]. Four of the included

studies reported mild to moderate adverse events.

A 2025 meta-analysis focusing on cortisol and perceived stress, including seven trials on cortisol and six on perceived stress with 488 participants, found a significant reduction in cortisol but no significant pooled effect on perceived stress scores^[13]. The author noted moderate heterogeneity and called for longer and more diverse trials. These differences between meta-analyses reflect differences in inclusion criteria, extracts, doses and outcome measures, and show that the size of the effect on subjective stress remains uncertain.

A conference abstract presented in 2025 reported a pooled analysis of 15 trials with reductions in cortisol, perceived stress and anxiety^[14]; as an abstract, it should be interpreted cautiously until a full peer-reviewed paper is available.

Table 2: Summary of systematic reviews and meta-analyses

Review	Trials (participants)	Stress	Anxiety	Cortisol
Pratte 2014 ^[10]	5 RCTs	Improved in all	Improved in all	Not pooled
Vijayakumar 2024 ^[12]	9 RCTs (558)	Significant reduction	Significant reduction	Significant reduction
Albalawi 2025 ^[13]	7 and 6 RCTs (488)	No significant pooled effect	Not assessed	Significant reduction

SAFETY:

Ashwagandha is generally well tolerated in clinical trials, with adverse events usually mild, such as drowsiness, gastrointestinal upset and headache^[9,12]. However, several safety issues deserve attention.

Liver injury. A case series from Iceland and the United States described cholestatic or mixed liver injury attributed to Ashwagandha supplements, with recovery after stopping the product^[15]. The frequency appears low, but clinicians should advise patients to stop the product and seek care if jaundice, itching or dark urine develop.

Thyroid function. In a randomised trial in patients with subclinical hypothyroidism, Ashwagandha root extract increased thyroid hormone levels and reduced TSH compared with placebo^[16]. This may be beneficial in hypothyroidism but could be problematic in people with hyperthyroidism or those taking thyroid medicines.

Pregnancy and other cautions. Classical and modern sources advise caution in pregnancy. Ashwagandha may add to the effects of sedatives, and may interact with immunosuppressants and drugs for diabetes and hypertension. Product quality varies, and extracts differ in their withanolide content and in whether they use root only or root and leaf.

PRACTICAL CONSIDERATIONS:

Classical preparations and Anupana

In Ayurvedic practice, Ashwagandha is rarely given alone as a standardised extract. It is usually taken as root powder (Churna) in doses of a few grams, mixed with warm milk, ghee or honey depending on the patient's condition, or as part of compound formulations^[1]. The vehicle (Anupana) is considered important: milk and ghee are thought to enhance its nourishing and calming effects and to make it suitable for Vata-dominant, depleted patients, while honey or warm water may be preferred where Kapha or Ama is present. It is generally recommended in the evening when sleep is the main target.

Modern trials, by contrast, use concentrated extracts in capsule form at fixed doses of 240 to 600 mg per day. These extracts concentrate withanolides and are more convenient, but they differ from classical preparations in composition. It is not known whether the results of extract trials apply to traditional root powder, or vice versa. This is an important question for practitioners and for public health guidance.

Quality and standardisation

Commercial Ashwagandha products vary widely. Some use only root, as classical texts recommend, while others use root and leaf. Withanolide content differs between extracts and between

batches. Products may be adulterated or contaminated. For research, the extract used should be described fully: plant part, extraction solvent, marker compound content, batch number and manufacturer. For clinical use, practitioners should prefer products from manufacturers that follow good manufacturing practice and provide certificates of analysis.

Who may benefit

Based on current evidence, Ashwagandha may be considered for adults with:

- Perceived stress or burnout without a severe psychiatric disorder.
- Mild to moderate anxiety symptoms, as an adjunct to lifestyle and psychological measures.
- Stress-related sleep problems or mild insomnia.

From an Ayurvedic viewpoint, it is especially suited to people with Vata-dominant presentations, such as restlessness, fatigue, poor sleep, weight loss and depletion.

Who should use it with caution or avoid it

Ashwagandha should be used with caution or avoided in pregnancy, in people with liver disease or a history of drug-induced liver injury, in hyperthyroidism, in people taking thyroid hormones or sedatives without medical review, and before surgery. In Ayurvedic terms, it is also used cautiously where there is marked Ama, high Pitta with heat symptoms, or congestion.

People with severe anxiety, panic disorder, depression with suicidal thoughts, or psychosis need psychiatric assessment. Ashwagandha should not be used as a substitute for effective treatment in these cases.

Interpreting the size of the effect

Statistically significant effects are not always clinically important. The pooled reduction of about 2.2 points on the Hamilton Anxiety Rating Scale in one meta-analysis^[12] is modest. For an individual with mild stress, such an effect may be meaningful, especially if combined with other measures. For a person with a severe anxiety disorder, it is unlikely to be sufficient on its own. Clinicians should set realistic expectations and monitor progress with standard scales.

DISCUSSION:

The evidence for Ashwagandha in stress and anxiety is stronger than for most herbal products used in mental health. Several randomised, placebo-controlled trials, including at least one from an independent group outside India, report reductions in subjective stress, anxiety and cortisol. Meta-analyses confirm a reduction in cortisol, while estimates of the effect on perceived stress vary.

Several limitations should be noted. Most trials are small (around 60 participants) and short (6–12 weeks). Many were conducted in India and some were funded by manufacturers of the extracts studied. Different extracts with different withanolide contents and plant parts were used, making comparison difficult. Few trials enrolled patients with diagnosed anxiety disorders, and none compared Ashwagandha with first-line treatments such as SSRIs or cognitive behavioural therapy. Long-term safety and efficacy beyond three months are not known.

From an Ayurvedic perspective, these trials test Ashwagandha as a single standardised extract rather than as part of an individualised Rasayana regimen with diet, conduct and

preparation. They therefore test only part of the classical approach. Future research could compare standardised extracts with classical preparations (such as root powder with milk), and test Ashwagandha within a broader Ayurvedic programme.

Priorities for future trials include: larger, multicentre, independently funded trials; enrolment of patients with diagnosed generalised anxiety disorder; comparison with or addition to standard treatment; follow-up of at least six months; systematic monitoring of liver and thyroid function; and full reporting according to CONSORT and its extension for herbal interventions.

CONCLUSION:

Ashwagandha, a classical Rasayana and Balya herb, has moderate evidence from randomised trials and meta-analyses for reducing stress, anxiety and cortisol in adults over short periods, and for improving sleep, particularly in people with insomnia. It is generally well tolerated, but rare liver injury and thyroid effects require attention. Larger, longer and independent trials in clinical populations are needed to define its place in the management of stress-related and anxiety disorders.

REFERENCES:

1. Sharma RK, Dash B. Agnivesa's Charaka Samhita (text with English translation), Sutra Sthana 4 and Chikitsa Sthana 1. Varanasi: Chowkhamba Sanskrit Series Office; reprint edition.
2. Mishra LC, Singh BB, Dagenais S. Scientific basis for the therapeutic use of *Withania somnifera* (ashwagandha): a review. *Altern Med Rev*. 2000;5(4):334–46.
3. Nyavanandi D, Mandati P, Vidiyala N, Parupathi P, Kolimi P, Mamidi HK. Enhancing patient-centric drug development: coupling hot melt extrusion with fused deposition modeling and pressure-assisted microsyringe additive manufacturing platforms with quality by design. *Pharmaceutics*. 2025;17(1):14.
4. Chandrasekhar K, Kapoor J, Anishetty S. A prospective, randomized double-blind, placebo-controlled study of safety and efficacy of a high-concentration full-spectrum extract of Ashwagandha root in reducing stress and anxiety in adults. *Indian J Psychol Med*. 2012;34(3):255–62.
5. Lokeshvar R, Ramaian V, Nithin V, Pavani S, Vinod Kumar T. Nanotechnology-driven therapeutics for liver cancer: clinical applications and pharmaceutical insights. *Asian J Pharm Clin Res*. 2025;18(2):8-26.
6. Salve J, Pate S, Debnath K, Langade D. Adaptogenic and anxiolytic effects of Ashwagandha root extract in healthy adults: a double-blind, randomized, placebo-controlled clinical study. *Cureus*. 2019;11(12):e6466.
7. Vidiyala N, Parupathi P, Sunkishala P, Sree C, Gujja A, Kanagala P, et al. Artificial intelligence: a new era in prostate cancer diagnosis and treatment. *Int J Pharm*. 2025;126024.
8. Langade D, Kanchi S, Salve J, Debnath K, Ambegaokar D. Efficacy and safety of Ashwagandha (*Withania somnifera*) root extract in insomnia and anxiety: a double-blind, randomized, placebo-controlled study. *Cureus*. 2019;11(9):e5797.
9. Vidiyala N, Sunkishala P, Parupathi P, Nyavanandi D. The role of artificial intelligence in drug discovery and pharmaceutical development: a paradigm shift in the history of pharmaceutical industries. *AAPS PharmSciTech*. 2025;26(5):133.
10. Pratte MA, Nanavati KB, Young V, Morley CP. An

alternative treatment for anxiety: a systematic review of human trial results reported for the Ayurvedic herb ashwagandha (*Withania somnifera*). *J Altern Complement Med*. 2014;20(12):901–8.

11. Lopresti AL, Smith SJ. Ashwagandha (*Withania somnifera*) for the treatment and enhancement of mental and physical conditions: a systematic review of human trials. *J Herb Med*. 2021;28:100434.

12. Vijayakumar V, Kuppusamy M, Arumugam V, Balakrishnan A, Bhandari RB, Boopalan D, et al. Effects of Ashwagandha (*Withania somnifera*) on stress and anxiety: a systematic review and meta-analysis. *Explore (NY)*. 2024;20(6):103062. doi:10.1016/j.explore.2024.103062

13. Naga VAUV, Vidiyala N, Sunkishala P, Vidiyala P, Kumar RKT, Elumalai S, et al. Bio-inspired green synthesis of nanoparticles for psoriasis treatment: a review of current status and future directions. *Asian J Green Chem*. 2025;9(4):373–403.

14. Bachour G, Samir A, Haddad S, Houssaini MA, El Radad M. Effects of ashwagandha supplements on cortisol, stress, and anxiety levels in adults: a systematic review and meta-analysis [conference abstract]. *BJPsych Open*. 2025;11(Suppl 1):S39. doi:10.1192/bjo.2025.10136

15. Björnsson HK, Björnsson ES, Avula B, Khan IA, Jonasson JG, Ghabril M, et al. Ashwagandha-induced liver injury: a case series from Iceland and the US Drug-Induced Liver Injury Network. *Liver Int*. 2020;40(4):825–9.

16. Sharma AK, Basu I, Singh S. Efficacy and safety of Ashwagandha root extract in subclinical hypothyroid patients: a double-blind, randomized placebo-controlled trial. *J Altern Complement Med*. 2018;24(3):243–8.