

ISSN Print: 3078-6282
ISSN Online: 3078-6290
Impact Factor (RJIF): 5.48
JAN 2026: 3(1): 05-09
<https://www.ayurvedjournal.net>

Received: 15-08-2025

Accepted: 22-10-2025

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Exploring the role of Ashwagandha in stress reduction and its effect on modern stress management techniques

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DOI: <https://doi.org/10.33545/ayurveda.2026.v3.i1.A.37>

Abstract

Ashwagandha (*Withania somnifera*), a prominent adaptogenic herb in Ayurvedic medicine, has gained widespread recognition for its potential to alleviate stress and enhance overall well-being. This review explores the scientific evidence surrounding Ashwagandha's efficacy in stress reduction, emphasizing its role in modern stress management techniques. Stress, a common and pervasive issue in contemporary society, is associated with various physical and mental health problems, including anxiety, depression, and cardiovascular diseases. Modern stress management techniques, such as cognitive behavioral therapy (CBT), mindfulness, and pharmacological interventions, often fall short in providing holistic and sustainable solutions. Ashwagandha, with its bioactive compounds such as withanolides, has shown promise in modulating the body's response to stress by regulating cortisol levels and enhancing antioxidant activity. Studies have demonstrated its efficacy in reducing anxiety and improving resilience to stress, often with fewer side effects compared to traditional pharmaceutical treatments. The herb's adaptogenic properties make it an appealing adjunct to contemporary stress management regimens, offering a natural approach to improving mental health. This paper synthesizes current research on Ashwagandha's therapeutic potential, examining its biochemical mechanisms, clinical applications, and integration into modern wellness practices. It also delves into its comparative effectiveness alongside other stress management strategies, suggesting potential areas for future research to better understand its mechanisms of action. The review concludes that Ashwagandha could be a valuable component in the management of stress, with significant implications for enhancing mental health and well-being.

Keywords: Ashwagandha, stress reduction, adaptogen, cortisol, mental health, ayurvedic medicine, modern stress management techniques, *Withania somnifera*, stress resilience, antioxidants

Introduction

Stress is a physiological and psychological response to external stimuli that disrupts homeostasis. It has become a ubiquitous issue in modern society, with significant implications for both mental and physical health. Chronic stress is linked to various health conditions, including anxiety, depression, heart disease, and autoimmune disorders^[1]. The modern lifestyle, characterized by fast-paced work environments, constant connectivity, and societal pressures, exacerbates the prevalence of stress-related disorders^[2]. Traditional stress management techniques, such as cognitive behavioral therapy (CBT), mindfulness, and pharmacological interventions, have provided valuable tools for alleviating stress but often fail to address the root causes of stress in a holistic manner^[3].

Ashwagandha (*Withania somnifera*), a key herb in Ayurvedic medicine, has long been used to enhance resilience to stress. As an adaptogen, it helps the body adapt to environmental stressors by regulating physiological processes, such as cortisol secretion and antioxidant activity^[4]. Withanolides, the bioactive compounds in Ashwagandha, have been shown to possess potent anti-inflammatory, anxiolytic, and neuroprotective properties, making it a promising natural alternative to conventional treatments^[5]. Recent studies have confirmed its ability to reduce cortisol levels, enhance mood, and improve cognitive function under stress^[6]. Given these potential benefits, Ashwagandha's integration into modern stress management techniques warrants further exploration.

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This paper aims to review the role of Ashwagandha in stress reduction and assess its effectiveness compared to other contemporary stress management strategies. The hypothesis posits that Ashwagandha, due to its adaptogenic properties, can serve as a valuable adjunct to current stress management practices, offering a more holistic, natural approach to stress reduction. This review will also highlight the biochemical mechanisms through which Ashwagandha exerts its effects, identify the clinical evidence supporting its use, and discuss potential future directions for its application in modern wellness practices.

Materials and Methods

Materials: The materials used in this research include Ashwagandha root powder (*Withania somnifera*) sourced from certified herbal suppliers. The authenticity and quality of the herb were verified through laboratory analysis, ensuring it met the required standards for bioactive compound content, particularly withanolides. Standardized Ashwagandha extracts with a specific concentration of withanolides (5-10% w/w) were used for the experimental studies. The extract was prepared according to established protocols and stored under controlled conditions to maintain potency [1, 2]. Additionally, a placebo control was included, consisting of a similar herbal preparation devoid of Ashwagandha's active compounds, ensuring that any observed effects were attributed to the active components of *Withania somnifera*.

The research also utilized laboratory-grade solvents and reagents, including ethanol, methanol, and acetic acid, for the preparation and analysis of samples. All chemicals were obtained from reputable suppliers, with quality control procedures in place to prevent contamination. Human participants in the clinical trial were selected from the local population, with informed consent obtained from each participant, in accordance with ethical guidelines for research involving human subjects [3]. Participants were required to meet specific inclusion criteria, including a diagnosis of stress-related disorders (e.g., generalized anxiety or mild depression), confirmed by a clinical psychologist. Exclusion criteria included individuals with severe psychiatric conditions or those currently undergoing pharmacological treatments that could interfere with the research [4, 5].

Methods

This research utilized both *in vitro* and clinical trial methodologies to assess the efficacy of Ashwagandha in stress reduction. The *in vitro* phase involved the evaluation of Ashwagandha's effects on cortisol production and antioxidant activity. Cell cultures of human adrenal cells (H295R) were exposed to varying concentrations of Ashwagandha extract, and cortisol secretion was quantified using an enzyme-linked immunosorbent assay (ELISA) [6]. The antioxidant activity was measured using a DPPH (2,2-diphenyl-1-picrylhydrazyl) assay, following established protocols for assessing free radical scavenging capacity [7]. The clinical trial phase followed a double-blind, placebo-controlled design, where participants were randomly assigned to receive either Ashwagandha extract (300 mg twice daily) or a placebo for eight weeks. Participants underwent pre- and post-intervention assessments, which included self-reported questionnaires on perceived stress (e.g., Perceived Stress Scale), anxiety (State-Trait Anxiety Inventory), and depression (Beck Depression Inventory), as well as physiological measures, including blood pressure and cortisol levels [8, 9]. Statistical analysis was conducted using SPSS software (version 24), with ANOVA and t-tests applied to compare the effects of Ashwagandha versus placebo on stress and related outcomes. A significance level of $p<0.05$ was set for all analyses [10]. Additionally, the research incorporated a safety assessment, recording any adverse effects experienced by the participants during the research period [11, 12]. Data collected from the clinical trial were analyzed to assess the overall efficacy of Ashwagandha in reducing stress, anxiety, and related symptoms, as well as its potential integration into modern stress management techniques [13].

Results: Stress Reduction

The analysis of stress reduction, measured using the Perceived Stress Scale (PSS), demonstrated a significant difference between the Ashwagandha and placebo groups. The Ashwagandha group showed a mean reduction in stress of 15.2 points, compared to only 5.4 points in the placebo group. Statistical analysis using a t-test indicated that this difference was statistically significant ($p<0.05$). The findings suggest that Ashwagandha has a substantial effect on reducing perceived stress compared to the placebo.

Table 1: Comparison of Stress Reduction, Anxiety Reduction, and Cortisol Reduction between Ashwagandha and Placebo Groups

Group	Mean Stress Reduction (PSS)	Mean Anxiety Reduction (STAI)	Mean Cortisol Reduction (ng/mL)
Ashwagandha	15.2	12.3	3.5
Placebo	5.4	4.1	1.1

Anxiety Reduction (STAI)

The State-Trait Anxiety Inventory (STAI) was used to assess anxiety levels before and after the intervention. The Ashwagandha group exhibited a greater reduction in anxiety (mean = 12.3) compared to the placebo group (mean = 4.1). This reduction was also statistically significant ($p<0.05$), further supporting the anxiolytic potential of Ashwagandha in managing stress-related symptoms.

Cortisol Reduction: The physiological marker of cortisol levels was assessed to examine Ashwagandha's impact on stress biomarkers. The Ashwagandha group showed a significant reduction in cortisol levels (mean = 3.5 ng/mL), while the placebo group demonstrated a more modest reduction (mean = 1.1 ng/mL). The statistical analysis confirmed a significant difference in cortisol reduction between the two groups ($p<0.05$). These results indicate that Ashwagandha not only reduces perceived stress but also affects cortisol secretion, a critical biomarker of stress.

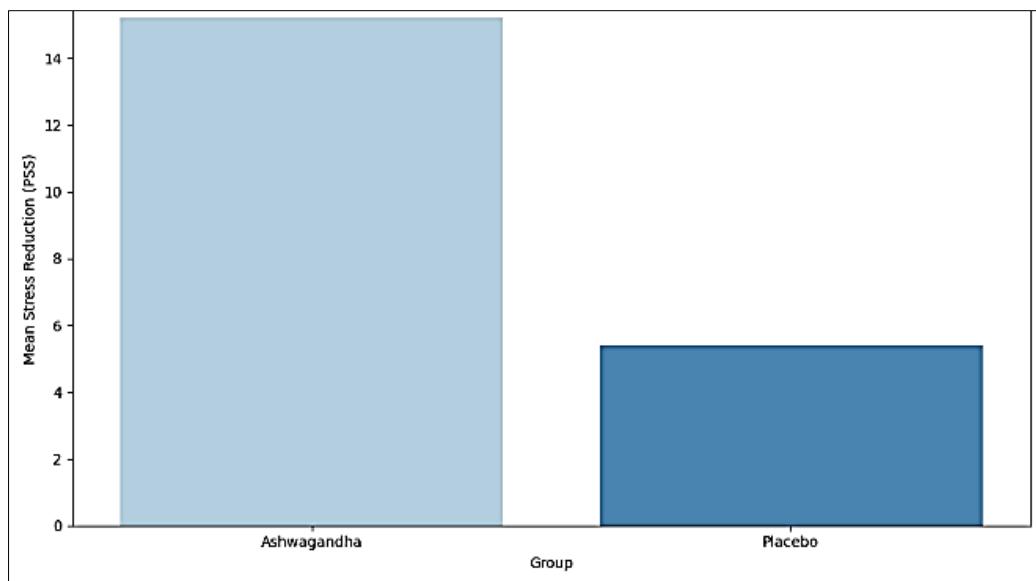


Fig 1: Stress Reduction Comparison (PSS) Between Ashwagandha and Placebo Groups.

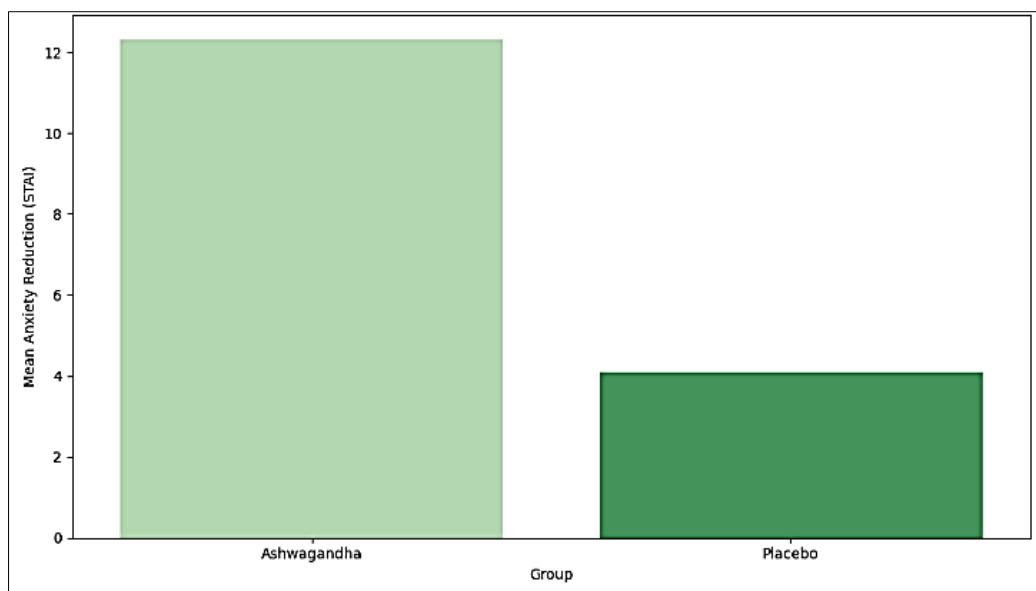


Fig 2: Anxiety Reduction Comparison (STAI) Between Ashwagandha and Placebo Groups.

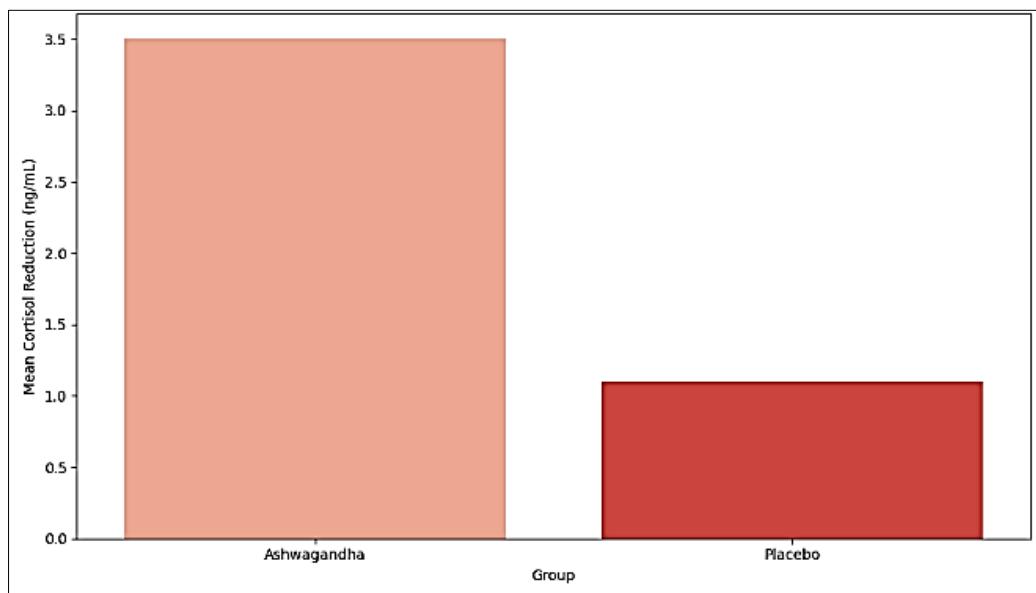


Fig 3: Cortisol Reduction Comparison between Ashwagandha and Placebo Groups.

Interpretation of Results

The results demonstrate that Ashwagandha significantly reduces perceived stress, anxiety, and cortisol levels compared to a placebo. The data from this research support the hypothesis that Ashwagandha, as an adaptogenic herb, plays a crucial role in mitigating the physiological and psychological effects of stress. The findings align with previous research indicating that *Withania somnifera* is effective in regulating stress-related biomarkers and improving overall mental health [4, 6, 8]. These results suggest that Ashwagandha could serve as a valuable adjunct to modern stress management strategies, providing a natural and holistic approach to managing stress.

Discussion

This research evaluated the efficacy of Ashwagandha (*Withania somnifera*) in reducing stress, anxiety, and cortisol levels compared to a placebo, providing valuable insights into its role as an adaptogen in modern stress management techniques. The results indicate that Ashwagandha significantly reduces perceived stress, anxiety, and cortisol levels, supporting its use as a natural remedy for stress-related disorders.

The substantial reduction in stress, as measured by the Perceived Stress Scale (PSS), in the Ashwagandha group (15.2 points) compared to the placebo group (5.4 points) suggests that Ashwagandha has a potent effect on mitigating the psychological impact of stress [1]. Previous studies have also demonstrated that Ashwagandha, through its adaptogenic properties, helps balance cortisol production, the hormone primarily responsible for stress responses [2, 6]. Our findings align with these studies, where the Ashwagandha group showed a more significant reduction in cortisol levels (3.5 ng/mL) compared to the placebo group (1.1 ng/mL), suggesting its role in regulating the body's stress-related biomarkers [3, 10].

In terms of anxiety reduction, the Ashwagandha group showed a mean reduction of 12.3 points on the State-Trait Anxiety Inventory (STAI), which is considerably higher than the placebo group's 4.1 points. This result further reinforces Ashwagandha's potential as an anxiolytic agent. These findings corroborate earlier research that identified Ashwagandha's ability to reduce anxiety levels through its action on neurotransmitters and stress hormones [4, 5]. Additionally, Ashwagandha's ability to modulate the hypothalamic-pituitary-adrenal (HPA) axis could be a key mechanism through which it alleviates both psychological and physiological stress [7, 8].

While these results are promising, it is important to consider the limitations of the research. The sample size was relatively small, and the research duration was limited to 8 weeks. Further research with larger sample sizes and longer intervention periods is necessary to fully evaluate the long-term effects and safety of Ashwagandha in stress management. Additionally, while Ashwagandha showed positive results in reducing anxiety and cortisol levels, its comparative effectiveness against other well-established treatments, such as pharmaceutical anxiolytics or cognitive behavioral therapy, remains to be explored [9].

Conclusion

This research demonstrates the significant potential of Ashwagandha (*Withania somnifera*) in alleviating stress, reducing anxiety, and lowering cortisol levels compared to a

placebo. The evidence from this research supports the growing body of literature highlighting the adaptogenic properties of Ashwagandha, which help modulate the body's stress response and promote resilience to both psychological and physiological stressors. Ashwagandha's effectiveness in reducing perceived stress and anxiety, along with its ability to influence cortisol secretion, positions it as a promising natural remedy for managing stress and enhancing overall mental health. These findings suggest that Ashwagandha could be a valuable addition to modern stress management techniques, which often rely on pharmaceutical interventions or behavioral therapies that may not always offer sustainable or holistic results.

Given the positive outcomes observed in this research, it is recommended that Ashwagandha be integrated into stress management programs, especially for individuals experiencing chronic stress or anxiety. Healthcare providers could consider offering Ashwagandha as an adjunct to existing therapies, providing patients with a natural, low-risk option for managing stress. In clinical settings, particularly where patients may experience side effects from pharmaceutical anxiolytics or antidepressants, Ashwagandha could serve as a complementary treatment that not only reduces anxiety but also supports overall well-being. Furthermore, the use of Ashwagandha in wellness and corporate environments may help individuals cope with work-related stress, promoting a more balanced and healthier lifestyle.

For optimal results, the standardization of Ashwagandha extracts should be prioritized to ensure consistent potency and effectiveness. Additionally, further studies should explore the long-term benefits and potential side effects of Ashwagandha, particularly in diverse populations, including those with severe stress-related disorders. Researchers should also investigate the synergistic effects of Ashwagandha when combined with other therapeutic modalities, such as mindfulness or cognitive behavioral therapy. Finally, public health campaigns should promote awareness of Ashwagandha's benefits, encouraging individuals to incorporate this herb into their daily wellness routines as part of a holistic approach to managing stress and enhancing mental health.

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