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Exploring the therapeutic potential of Ashwagandha (*Withania somnifera*) supplementation in alleviating stress and stress-related disorders

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ABSTRACT

Withania somnifera, also known as Ashwagandha, is a key herb in Ayurvedic medicine, celebrated for its ability to rejuvenate and promote longevity. It is believed to support overall wellness, offering neuroprotective, anti-inflammatory, and adaptogenic benefits. This study aims to evaluate how Ashwagandha (*Withania somnifera*) supplementation impacts stress levels, psychological well-being, and resilience, assessing its overall effectiveness as an adaptogen. Stress, be it physical or psychological, activates a response involving the nervous, endocrine, and immune systems through various mechanisms, initially aiding in handling challenges but becoming detrimental when perceived as intense, repetitive, or prolonged, contributing to conditions like depression, anxiety and cognitive decline. Ashwagandha reduces morning cortisol and DHEA-S levels and increases heart rate variability. It improves sleep quality, alleviates anxiety symptoms, and may help with depression due to its components, such as alkaloids and withanolides. Additionally, it reduces fatigue and enhances overall well-being and happiness. It is important that Ashwagandha supplementation is safe and does not cause side effects, making it an attractive alternative for supporting health and well-being. Ashwagandha supplementation, due to adaptogenic qualities, appears promising in addressing stress and stress-related disorders, as well as enhancing overall well-being. Further research is warranted to fully explore its potential role in conventional health strategies.

Keywords: ashwagandha, *Withania somnifera*, adaptogen, stress, insomnia, anxiety, depression

I. Introduction

The plant *Withania somnifera* (L.) Dunal, belonging to the Solanaceae family, is commonly referred to as "Ashwagandha," a name originating from Sanskrit due to its historical use in Indian traditional medicine [1]. *Withania somnifera* (WS) is held in high esteem within Ayurvedic medicine, where it is classified as a Rasayana herb. This designation is reserved for herbs that are believed to have revitalizing effects on the body and to enhance the health of various tissues. Ashwagandha is celebrated for its broad therapeutic properties and is used extensively to promote overall wellness and longevity [2, 3]. Current research on Ashwagandha spans a wide array of human health areas, encompassing neuroprotection, sedative qualities, adaptogenic benefits, and improvements in sleep quality. Additionally, studies have documented its anti-inflammatory, antimicrobial, cardioprotective, and anti-diabetic properties. There are also findings related to its effects on reproductive health and thyroid hormone activity. This expanding scope of research underscores Ashwagandha's potential as a significant natural treatment option for various health issues. The global popularity of *Withania somnifera* (WS) has surged, largely due to its esteemed status as an adaptogen [4].

Stress represents a condition of disrupted balance within the body, arising from internal or external adverse factors (known as stressors). In response, the body employs a complex array of physiological and behavioral reactions aimed at preserving or restoring its optimal equilibrium, known as eustasis [5].

Adaptogens, which include synthetic substances like bromantane, levamisole, aphobazole, and bemethyl, as well as plant extracts, are agents known to improve the body's resistance to physical stress without elevating oxygen consumption [6]. They are crucial in protecting organisms from various environmental stressors such as harmful bacteria, diseases transmitted by insects, excessive exposure to ultraviolet light, and pollutants, as well as extreme temperatures and low oxygen levels. Adaptogens are essential for fostering and maintaining

adaptive homeostasis, boosting the body's natural ability to withstand assorted stressors - physical, chemical, biological, or psychological. These substances are known for energizing the body's defenses and metabolic processes to mitigate the adverse effects of stress and restore balance and health [7].

II. Objective

The objective of this study is to evaluate the effectiveness of Ashwagandha (*Withania somnifera*) supplementation in reducing stress levels among adults. Specifically, the study aims to assess the impact of Ashwagandha on various stress-related parameters, including physiological stress markers, psychological well-being, and overall quality of life, to determine whether regular supplementation can significantly alleviate symptoms of stress. Additionally, this research seeks to explore the role of Ashwagandha as an adaptogen in enhancing the body's resilience to stress.

III. Materials and Methodology

Literature was collected through searches on PubMed and Google Scholar, along with references from initially retrieved articles. The search incorporated various combinations of the following terms: ashwagandha, *Withania somnifera*, stress, adaptogen, insomnia, anxiety, depression. Only papers published after 2017 were considered for inclusion in the review. This approach ensured that the review focused exclusively on the most recent knowledge available.

IV. Description of the State of Knowledge

Stress

Stressors, whether physical or psychological, trigger a response that involves nervous, endocrine, and immune systems. This response, mediated by various axes like the sympathetic-adreno-medullary (SAM) axis, the hypothalamus-pituitary-adrenal (HPA) axis, initially prepares the body to handle challenges, such as trauma or surgery, minimizing further damage. However, when stressors are perceived as intense, repetitive, or prolonged, the stress response becomes harmful. For instance, chronic stress exposure can lead to maladaptive reactions like depression, anxiety, cognitive decline, and heart disease [8].

Physiological stress markers

When stress occurs, the HPA axis releases various hormones from the adrenal glands. With repetitive activation, this pressure on bodily systems, including the HPA axis, can lead to tissue damage and future health issues. Cortisol serves as the primary hormone in the stress response system of the HPA axis and is an effective biomarker for stress levels [9, 10]. Another hormone released is dehydroepiandrosterone (DHEA), which later transforms into dehydroepiandrosterone sulfate (DHEA-S) [11]. In stressed yet healthy adults, consuming Ashwagandha even for 60 days is linked to significant decreases in morning cortisol and DHEA-S levels [12].

Recent neurobiological findings indicate that stress affects heart rate variability (HRV) [13]. Abnormal alterations in HRV, such as reduced vagal function, are noted in a range of neurological and psychological disorders, including anxiety, stress, and schizophrenia [14]. Interestingly, Ashwagandha supplementation is associated with a notable rise in heart rate variability [15].

Stress-related disorders: insomnia, anxiety and depression

Excessive stress, whether cognitive or physiological, adversely affects multiple systems, including sleep. This phenomenon, known as sleep reactivity, is considered a significant predisposing factor for insomnia and potentially other sleep and stress-related disorders [16]. Long-term stress induces lasting immunological alterations in the central and peripheral nervous system. Major depressive disorder (MDD) and anxiety are among the most frequent psychiatric outcomes associated with chronic stress [17].

Research indicates that Ashwagandha supplementation leads to notable enhancements in various sleep parameters, including mental alertness, sleep quality, reduced sleep onset latency, and improved sleep efficiency. Interestingly, these improvements were found to be more pronounced in individuals with insomnia compared to those without sleep disturbances [18]. *Withania somnifera* demonstrates effectiveness in alleviating anxiety symptoms and holds promise as a potential anxiolytic, as indicated by Hamilton Anxiety Rating Scale scores. However, the trials are constrained by their small sample sizes [19]. Ashwagandha shows potential efficacy in depression, attributed to its key components: 12 alkaloids and 35 withanolides. These compounds have demonstrated benefits in anxiety and stress management

across several studies. While research suggests that withanolides and alkaloids act as antidepressants, the precise mechanism of action remains unclear [20].

Quality of life

Administering a moderate dose of ashwagandha to college students over a 30-day period enhanced their perceived well-being by promoting sustained energy, improved mental clarity, and better sleep quality [21]. Comparable results are evident in the elderly population. Supplementation with Ashwagandha root extract is associated with significant enhancements in sleep quality, mental alertness, and overall quality of life (QoL) among elderly participants [22]. Furthermore, supplementation of ashwagandha leads to a notable reduction in symptoms of fatigue [15] and leads to improved indicators of well-being and happiness [23].

Optimal effects of supplementation

It is crucial to emphasize the significance of consistency and the utilization of standardized supplements as essential factors for achieving discernible outcomes. While even a 30-day intervention of Ashwagandha supplementation yields positive effects on the body, studies suggest that a longer duration may be necessary to observe more significant differences in stress relief [24]. It is important to recognize that the consumption of Ashwagandha root extract is not only safe but also devoid of any negative side effects. This acknowledgment is imperative as it underscores the importance of considering Ashwagandha as a viable option for various health and wellness purposes without concerns about potential adverse reactions [25].

V. Conclusion

In conclusion, stress exerts profound effects on physiological and psychological well-being, impacting various bodily systems and contributing to the development of stress-related disorders such as insomnia, anxiety, and depression. Ashwagandha supplementation emerges as a promising intervention, demonstrating significant improvements in stress markers, sleep quality, anxiety symptoms, and overall quality of life across different age groups. Its adaptogenic properties, characterized by enhancing the body's resilience to stress, underscore its potential as a valuable tool for promoting health and well-being. Consistency and the use

of standardized supplements are crucial for achieving optimal outcomes with Ashwagandha supplementation, emphasizing its role as a safe and effective option in supporting overall health and wellness. Although the potential of *Withania somnifera* (Ashwagandha) is noteworthy, it is essential to emphasize the necessity for additional evidence from well-designed, large-scale clinical trials to formulate comprehensive recommendations for integrating this adaptogen into standard practice.

References:

1. Tandon N, Yadav SS. Safety and clinical effectiveness of *Withania Somnifera* (Linn.) Dunal root in human ailments. *J Ethnopharmacol.* 2020 Jun 12;255:112768. doi: 10.1016/j.jep.2020.112768. Epub 2020 Mar 19. PMID: 32201301.
2. Speers AB et al. Effects of *Withania somnifera* (Ashwagandha) on Stress and the Stress- Related Neuropsychiatric Disorders Anxiety, Depression, and Insomnia. *Curr Neuropharmacol.* 2021;19(9):1468-1495. doi: 10.2174/1570159X19666210712151556. PMID: 34254920; PMCID: PMC8762185.
3. Tiwari S, Gupta SK, Pathak AK. A double-blind, randomized, placebo-controlled trial on the effect of Ashwagandha (*Withania somnifera* dunal.) root extract in improving cardiorespiratory endurance and recovery in healthy athletic adults. *J Ethnopharmacol.* 2021 May 23;272:113929. doi: 10.1016/j.jep.2021.113929. Epub 2021 Feb 15. PMID: 33600918.
4. Mikulska P et al. Ashwagandha (*Withania somnifera*)-Current Research on the Health-Promoting Activities: A Narrative Review. *Pharmaceutics.* 2023 Mar 24;15(4):1057. doi: 10.3390/pharmaceutics15041057. PMID: 37111543; PMCID: PMC10147008.
5. Tsigos C et al. Stress: Endocrine Physiology and Pathophysiology. 2020 Oct 17. In: Feingold KR, Anawalt B, Blackman MR, Boyce A, Chrousos G, Corpas E, de Herder WW, Dhatariya K, Dungan K, Hofland J, Kalra S, Kaltsas G, Kapoor N, Koch C, Kopp P, Korbonits M, Kovacs CS, Kuohung W, Laferrère B, Levy M, McGee EA, McLachlan R, New M, Purnell J, Sahay R, Shah AS, Singer F, Sperling MA, Stratakis

- CA, Trencle DL, Wilson DP, editors. Endotext [Internet]. South Dartmouth (MA): MDText.com, Inc.; 2000–. PMID: 25905226.
6. Todorova V et al. Plant Adaptogens-History and Future Perspectives. *Nutrients*. 2021 Aug 20;13(8):2861. doi: 10.3390/nu13082861. PMID: 34445021; PMCID: PMC8398443.
 7. Panossian AG et al. Evolution of the adaptogenic concept from traditional use to medical systems: Pharmacology of stress- and aging-related diseases. *Med Res Rev*. 2021 Jan;41(1):630-703. doi: 10.1002/med.21743. Epub 2020 Oct 25. PMID: 33103257; PMCID: PMC7756641.
 8. Chu B et al. Physiology, Stress Reaction. 2022 Sep 12. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan–. PMID: 31082164.
 9. Zhang W et al. Medicinal herbs for the treatment of anxiety: A systematic review and network meta-analysis. *Pharmacol Res*. 2022 May;179:106204. doi: 10.1016/j.phrs.2022.106204. Epub 2022 Apr 1. PMID: 35378276.
 10. Lightman SL, Birnie MT, Conway-Campbell BL. Dynamics of ACTH and Cortisol Secretion and Implications for Disease. *Endocr Rev*. 2020 Jun 1;41(3):bnaa002. doi: 10.1210/endrev/bnaa002. PMID: 32060528; PMCID: PMC7240781.
 11. van Zuiden M et al. DHEA and DHEA-S levels in posttraumatic stress disorder: A meta-analytic review. *Psychoneuroendocrinology*. 2017 Oct;84:76-82. doi: 10.1016/j.psyneuen.2017.06.010. Epub 2017 Jun 15. PMID: 28668711.
 12. Lopresti AL et al. An investigation into the stress-relieving and pharmacological actions of an ashwagandha (*Withania somnifera*) extract: A randomized, double-blind, placebo-controlled study. *Medicine (Baltimore)*. 2019 Sep;98(37):e17186. doi: 10.1097/MD.00000000000017186. PMID: 31517876; PMCID: PMC6750292.
 13. Kim HG et al. Stress and Heart Rate Variability: A Meta-Analysis and Review of the Literature. *Psychiatry Investig*. 2018 Mar;15(3):235-245. doi: 10.30773/pi.2017.08.17. Epub 2018 Feb 28. PMID: 29486547; PMCID: PMC5900369.
 14. Arakaki X et al. The connection between heart rate variability (HRV), neurological health, and cognition: A literature review. *Front Neurosci*. 2023 Mar 1;17:1055445. doi: 10.3389/fnins.2023.1055445. PMID: 36937689; PMCID: PMC10014754.
 15. Smith SJ, Lopresti AL, Fairchild TJ. Exploring the efficacy and safety of a novel standardized ashwagandha (*Withania somnifera*) root extract (Witholytin®) in adults experiencing high stress and fatigue in a randomized, double-blind, placebo-controlled trial. *J Psychopharmacol*. 2023 Nov;37(11):1091-1104. doi:

- 10.1177/02698811231200023. Epub 2023 Sep 23. PMID: 37740662; PMCID: PMC10647917.
16. Kalmbach DA, Anderson JR, Drake CL. The impact of stress on sleep: Pathogenic sleep reactivity as a vulnerability to insomnia and circadian disorders. *J Sleep Res.* 2018 Dec;27(6):e12710. doi: 10.1111/jsr.12710. Epub 2018 May 24. PMID: 29797753; PMCID: PMC7045300.
 17. Westfall S et al. Chronic Stress-Induced Depression and Anxiety Priming Modulated by Gut-Brain-Axis Immunity. *Front Immunol.* 2021 Jun 24;12:670500. doi: 10.3389/fimmu.2021.670500. PMID: 34248950; PMCID: PMC8264434.
 18. Langade D et al. Clinical evaluation of the pharmacological impact of ashwagandha root extract on sleep in healthy volunteers and insomnia patients: A double-blind, randomized, parallel-group, placebo-controlled study. *J Ethnopharmacol.* 2021 Jan 10;264:113276. doi: 10.1016/j.jep.2020.113276. Epub 2020 Aug 17. PMID: 32818573.
 19. Zhang W et al. Medicinal herbs for the treatment of anxiety: A systematic review and network meta-analysis. *Pharmacol Res.* 2022 May;179:106204. doi: 10.1016/j.phrs.2022.106204. Epub 2022 Apr 1. PMID: 35378276.
 20. Kumar P, Patel D. Can Traditional Treatment Such as Ashwagandha Be Beneficial in Treating Depression? *Altern Ther Health Med.* 2023 Jan;29(1):36-39. PMID: 35139495.
 21. Baker C et al. The Perceived Impact of Ashwagandha on Stress, Sleep Quality, Energy, and Mental Clarity for College Students: Qualitative Analysis of a Double-Blind Randomized Control Trial. *J Med Food.* 2022 Dec;25(12):1095-1101. doi: 10.1089/jmf.2022.0042. Epub 2022 Aug 18. PMID: 35984870.
 22. Kelgane SB et al. Efficacy and Tolerability of Ashwagandha Root Extract in the Elderly for Improvement of General Well-being and Sleep: A Prospective, Randomized, Double-blind, Placebo-controlled Study. *Cureus.* 2020 Feb 23;12(2):e7083. doi: 10.7759/cureus.7083. PMID: 32226684; PMCID: PMC7096075.
 23. Choudhary D, Bhattacharyya S, Joshi K. Body Weight Management in Adults Under Chronic Stress Through Treatment With Ashwagandha Root Extract: A Double-Blind, Randomized, Placebo-Controlled Trial. *J Evid Based Complementary Altern Med.* 2017 Jan;22(1):96-106. doi: 10.1177/2156587216641830. Epub 2016 Apr 6. PMID: 27055824; PMCID: PMC5871210.
 24. O'Connor J et al. The Impact of Ashwagandha on Stress, Sleep Quality, and Food Cravings in College Students: Quantitative Analysis of a Double-Blind Randomized

- Control Trial. *J Med Food*. 2022 Dec;25(12):1086-1094. doi: 10.1089/jmf.2022.0040. Epub 2022 Aug 18. Erratum in: *J Med Food*. 2023 Apr;26(4):275. PMID: 35984871.
25. Verma N et al. Safety of Ashwagandha Root Extract: A Randomized, Placebo-Controlled, study in Healthy Volunteers. *Complement Ther Med*. 2021 Mar;57:102642. doi: 10.1016/j.ctim.2020.102642. Epub 2020 Dec 15. PMID: 33338583.