



Review Article	Volume 15 Issue 07	July 2026
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ASHWAGANDHA (WITHANIA SOMNIFERA): AN EVIDENCE-BASED REVIEW OF A PROMISING RASAYANA DRAVYA

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Abstract

Background: *Ashwagandha* (*Withania somnifera* (L.) Dunal), popularly known as Indian Ginseng or Winter Cherry, is one of the most important medicinal plants described in Ayurveda. It has been extensively mentioned in classical texts as a potent Rasayana Dravya that promotes longevity, strength, vitality, immunity, reproductive health, and healthy ageing. Traditionally, it has been prescribed for disorders associated with Vata Dosha, debility, stress, insomnia, infertility, neurological diseases, and tissue depletion. During the last three decades, extensive experimental and clinical research has demonstrated that Ashwagandha possesses adaptogenic, antioxidant, anti-inflammatory, immunomodulatory, neuroprotective, cardioprotective, antidiabetic, anticancer, and endocrine-regulating properties. These findings strongly support many of its traditional therapeutic indications and establish Ashwagandha as one of the most scientifically validated medicinal plants in integrative medicine.¹

Materials and Methods: This review was prepared using information collected from classical Ayurvedic texts, pharmacognosy books, peer-reviewed journals, PubMed, Scopus, Google Scholar, ScienceDirect, and AYUSH publications. Experimental studies, randomized controlled trials, systematic reviews, and review articles published in English were critically analyzed.

Results: Classical literature recognizes Ashwagandha as an important Rasayana, Balya, Brimhana, Medhya, and Vajikarana Dravya. Modern evidence demonstrates significant adaptogenic, antioxidant, neuroprotective, anti-inflammatory, endocrine-regulating, and immunomodulatory activities with proven clinical benefits in stress, anxiety, cognitive dysfunction, muscle weakness, infertility, and metabolic disorders.³

Discussion: Modern biomedical findings closely correlate with the classical Ayurvedic principles of Rasayana Chikitsa. Scientific evidence supports the traditional use of Ashwagandha as a safe rejuvenating medicinal plant.⁴

Conclusion: Ashwagandha remains one of the most evidence-based medicinal plants in Ayurveda. Integration of classical knowledge with contemporary scientific evidence highlights its important role in preventive, promotive, and integrative healthcare.⁵

Keywords: Ashwagandha, Rasayana, Withania somnifera, Adaptogen, Evidence-Based Medicine, Ayurveda

INTRODUCTION

Medicinal plants have served as the foundation of healthcare systems since ancient civilization. Among thousands of medicinal plants described in Ayurveda, Ashwagandha occupies a unique position because of its remarkable rejuvenating, nourishing, and restorative properties. It has been classified as an important Rasayana Dravya, capable of improving longevity, immunity, physical strength, mental health, reproductive function, and resistance against disease. The concept of Rasayana extends beyond disease treatment and primarily aims to maintain health, delay ageing, improve tissue nutrition, and enhance quality of life. Because of these unique properties, Ashwagandha has remained one of the most frequently prescribed medicinal plants in traditional Ayurvedic practice for several centuries.⁶

Botanically, Ashwagandha (*Withania somnifera* (L.) Dunal) belongs to the family Solanaceae and is commonly known as Indian Ginseng or Winter Cherry. Although often compared with *Panax ginseng* because of its adaptogenic activity, both plants differ considerably in phytochemistry and pharmacological actions. The medicinal value of Ashwagandha is mainly attributed to its roots, although leaves, fruits, and seeds also possess therapeutic importance. Modern phytochemical investigations have identified numerous biologically active constituents, including withanolides, withaferin A, sitoindosides, alkaloids, flavonoids, steroidal lactones, glycowithanolides, tannins, and phenolic compounds. These phytochemicals collectively contribute to its diverse pharmacological activities.⁷

In recent decades, global interest in herbal medicine has increased substantially because of the growing burden of chronic diseases and the search for safer therapeutic alternatives. Consequently, Ashwagandha has become one of the most extensively investigated medicinal plants worldwide. Numerous experimental studies, randomized controlled clinical trials, and systematic reviews have demonstrated beneficial effects in stress management, anxiety disorders, cognitive dysfunction, sleep disturbances, sarcopenia, infertility, diabetes mellitus, metabolic syndrome, neurodegenerative disorders, inflammatory diseases, and healthy ageing. These findings strongly support many traditional Ayurvedic claims and establish Ashwagandha as an important bridge between classical medicine and modern evidence-based healthcare.⁸

MATERIALS AND METHODS

The present review was designed as a conceptual narrative review based on both classical and modern literature. Information regarding Ashwagandha was collected from classical Ayurvedic texts including Charaka Samhita, Sushruta Samhita, Ashtanga Hridaya, Bhavaprakasha Nighantu, Dhanvantari Nighantu, and Kaiyadeva Nighantu. Modern scientific literature was retrieved

through electronic databases such as PubMed, Scopus, Google Scholar, ScienceDirect, SpringerLink, and AYUSH Research Portal using keywords including “*Withania somnifera*”, “Ashwagandha”, “Rasayana”, “adaptogen”, “clinical trial”, and “systematic review.” Relevant experimental studies, randomized controlled trials, review articles, and meta-analyses published in English were critically analyzed to summarize available evidence regarding pharmacological activities, mechanisms of action, therapeutic applications, and clinical efficacy.⁹

CONCEPTUAL STUDY

Ashwagandha has occupied an important position in Ayurvedic therapeutics since the classical period. Ancient scholars described it as one of the best Rasayana Dravyas because of its ability to restore vitality, nourish body tissues, enhance physical endurance, improve fertility, and promote healthy ageing. The term “Ashwagandha” literally means “having the smell of a horse,” referring both to the characteristic odour of its fresh roots and its reputed ability to impart the strength and stamina of a horse. Classical physicians recommended the drug for individuals suffering from chronic illness, weakness, emaciation, ageing, infertility, and neurological disorders.¹⁰

Unlike many medicinal plants that possess organ-specific therapeutic actions, Ashwagandha acts systemically by improving tissue nutrition and restoring physiological balance. Classical Ayurvedic scholars considered it an ideal rejuvenating medicine because it enhances Ojas, improves Dhatu Poshana, and increases the body's natural resistance against disease. These concepts closely resemble the modern understanding of immune modulation, cellular protection, and healthy ageing. Consequently, Ashwagandha has remained one of the most respected medicinal plants in traditional medicine as well as modern integrative healthcare.¹¹

Botanical Identity

Parameter	Description
Botanical Name	<i>Withania somnifera</i> (L.) Dunal
Family	Solanaceae
English Name	Indian Ginseng, Winter Cherry
Hindi	Ashwagandha
Sanskrit Name	Ashwagandha, Vajigandha, Balada, Varahakarni
Parts Used	Root (main), Leaves, Seeds, Fruits

Synonyms (Paryaya)

Classical Ayurvedic Nighantus describe several synonyms of Ashwagandha, each representing a particular therapeutic property or botanical characteristic. Commonly mentioned names include Ashwagandha, Vajigandha, Balada, Varahakarni, Turangi, Hayagandha, Kamaroopini, and Pushtida. These names collectively indicate its ability to enhance physical strength, improve nourishment, promote reproductive health, and restore vitality in debilitated individuals.¹²

Position in Classical Ayurvedic Literature

Ashwagandha has been described in several classical Ayurvedic treatises and Nighantus. Although the extent of description varies among texts, all major authorities recognize its importance as a rejuvenating medicinal plant.

Major Classical References

- Charaka Samhita
- Sushruta Samhita
- Ashtanga Hridaya
- Bhavaprakasha Nighantu
- Kaiyadeva Nighantu
- Dhanvantari Nighantu
- Raja Nighantu

Rasa Panchaka

Property	Description
Rasa	Tikta, Kashaya, Madhura
Guna	Laghu, Snigdha
Veerya	Ushna
Vipaka	Madhura
Prabhava	Rasayana, Balya, Vajikarana

Therapeutic Properties (Karma)

Classical Ayurvedic literature describes Ashwagandha as a multidimensional medicinal plant possessing several therapeutic actions that contribute to the maintenance of health and treatment of disease. Unlike many drugs that act only on a single organ system, Ashwagandha improves systemic physiological functions by promoting nourishment, restoring tissue integrity, enhancing vitality, and increasing resistance against disease. These actions are primarily attributed to its Rasayana, Balya, Brimhana, and Vajikarana properties. The combined effect of these properties enables the drug to improve strength, delay ageing, support recovery from chronic illness, and enhance both physical and mental performance.¹⁶

Classical Indications (Rogagnata)

The therapeutic indications of Ashwagandha described in classical Ayurvedic texts are broad because of its ability to restore physiological balance and nourish depleted tissues. It is mainly indicated in diseases characterized by degeneration, weakness, fatigue, tissue depletion, neurological dysfunction, infertility, and chronic inflammatory conditions. Ancient physicians frequently recommended Ashwagandha for patients suffering from prolonged illness, poor nutritional status, excessive physical exertion, ageing, and recurrent infections. The drug was also prescribed to improve recovery following chronic disease and to maintain health in elderly individuals.¹⁷

Major Classical Indications

- Karshya
- Kshaya
- Balakshaya

- Daurbalya
- Vata Vyadhi
- Sandhivata
- Gridhrasi
- Amavata
- Apasmara
- Unmada
- Anidra
- Shwasa
- Kasa
- Rajyakshma
- Shukra Kshaya
- Klaibya
- Vandhyatva
- Pandu
- Jirna Jwara
- Shotha

Ashwagandha as a Rasayana Dravya

The concept of Rasayana is one of the unique contributions of Ayurveda to preventive and promotive healthcare. It emphasizes maintenance of health, prevention of disease, improvement of longevity, enhancement of immunity, preservation of youthfulness, and promotion of mental well-being. Ashwagandha is regarded as one of the foremost Rasayana Dravyas because of its remarkable ability to improve tissue nourishment, strengthen physiological functions, and increase Ojas. Classical scholars believed that regular administration of Rasayana medicines enhances the quality of Rasa Dhatu, which subsequently nourishes all succeeding tissues and ultimately results in superior vitality and disease resistance.¹⁸

Ashwagandha in Vajikarana Chikitsa

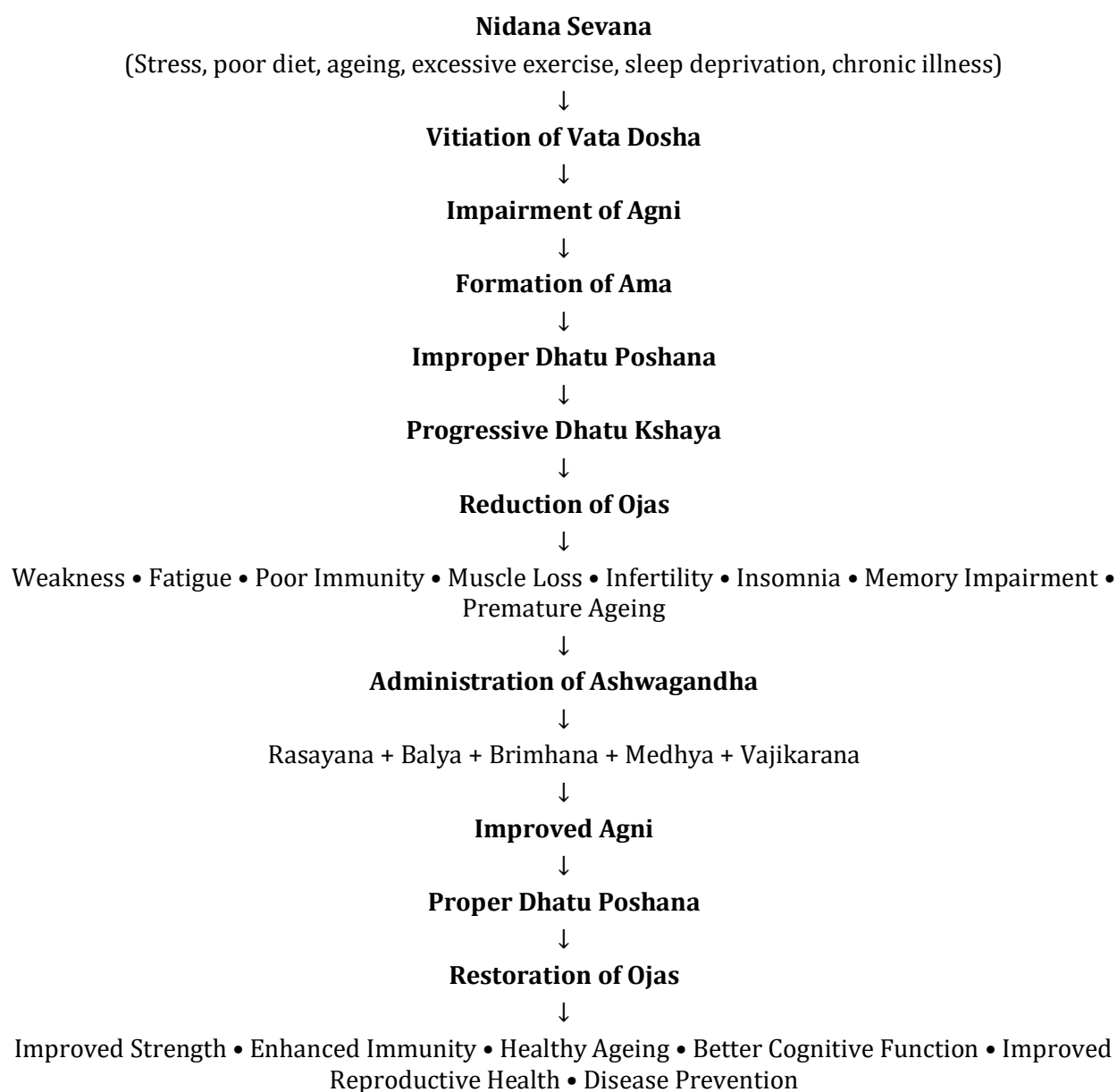
Classical texts recognize Ashwagandha as an important Vajikarana Dravya because of its ability to improve reproductive function, fertility, libido, semen quality, and overall vitality. Regular administration is believed to increase Shukra Dhatu, improve sexual performance, and support conception. It is particularly beneficial in patients with infertility associated with chronic illness, nutritional deficiency, stress, or age-related decline. The rejuvenating effect on reproductive tissues further contributes to improved physical endurance and psychological well-being.²²

Ashwagandha in Medhya Chikitsa

The Medhya action of Ashwagandha has been recognized since ancient times. It improves memory, concentration, intellectual performance, learning ability, emotional stability, and mental endurance. By nourishing Majja Dhatu and supporting Manovaha Srotas, Ashwagandha enhances higher neurological functions and helps manage anxiety, insomnia, stress, mental

fatigue, and age-related cognitive decline. This classical description closely corresponds with modern evidence demonstrating neuroprotective and cognitive-enhancing activities.²³

Samprapti Flow Chart



Phytochemical Constituents

Modern phytochemical investigations have established that Ashwagandha is a rich source of biologically active secondary metabolites responsible for its diverse pharmacological properties. More than 80 bioactive constituents have been isolated from different parts of the plant, particularly the roots and leaves. These compounds belong to various chemical classes including steroidal lactones, alkaloids, flavonoids, saponins, amino acids, phenolic compounds, tannins, glycowithanolides, and steroidal saponins. Among these constituents, withanolides are considered the principal pharmacologically active molecules because they exhibit antioxidant, adaptogenic, anti-inflammatory, neuroprotective, anticancer, immunomodulatory, and endocrine-regulating activities. These phytochemicals act synergistically to produce the broad therapeutic spectrum of Ashwagandha and contribute to its effectiveness as a rejuvenating medicinal plant.

Major Phytochemical Constituents

- Withanolide A
- Withanolide D
- Withaferin A
- Withanone
- Sitoindosides VII–X
- Glycowithanolides
- Somniferine
- Anaferine
- Cuscohygrine
- Tropine
- Isopelletierine
- Withanine
- Flavonoids
- Steroidal lactones
- Saponins
- Polyphenols
- Amino acids
- Iron

Pharmacokinetics

Following oral administration, the active constituents of Ashwagandha are absorbed through the gastrointestinal tract and undergo hepatic metabolism. Experimental studies indicate that withanolides are distributed to several organs including the brain, liver, kidneys, skeletal muscles, endocrine glands, and reproductive tissues. Their metabolites continue to exhibit biological activity and contribute to prolonged pharmacological effects. Although detailed human pharmacokinetic studies remain limited, available evidence suggests acceptable oral bioavailability, good tissue distribution, and a favorable safety profile when administered at recommended therapeutic doses.

Mechanism of Action

Unlike synthetic drugs that generally target a single molecular pathway, Ashwagandha acts through multiple complementary mechanisms. Its pharmacological effects result from simultaneous regulation of oxidative stress, inflammation, endocrine function, mitochondrial activity, immune responses, neurotransmission, and cellular metabolism. This multitarget mechanism explains its effectiveness in diverse chronic disorders.

Major Mechanisms of Action

- Regulation of the hypothalamic-pituitary-adrenal (HPA) axis
- Reduction of serum cortisol levels

- Enhancement of endogenous antioxidant enzymes
- Suppression of oxidative stress
- Inhibition of NF- κ B inflammatory pathway
- Reduction of TNF- α , IL-1 β , and IL-6
- Modulation of GABAergic neurotransmission
- Improvement of mitochondrial function
- Promotion of neuronal regeneration
- Enhancement of synaptic plasticity
- Regulation of apoptosis
- Immunomodulation
- Improvement of endocrine homeostasis
- Stimulation of anabolic pathways in skeletal muscle

PHARMACOLOGICAL ACTIVITIES

Adaptogenic Activity

The adaptogenic activity of Ashwagandha is one of its most extensively investigated pharmacological properties. Adaptogens increase the body's ability to resist physical, psychological, and environmental stress while maintaining physiological homeostasis. Experimental and clinical studies have consistently demonstrated that Ashwagandha reduces stress-induced elevations in serum cortisol, improves resilience to chronic stress, decreases fatigue, and enhances physical endurance. Supplementation with standardized root extract has also been shown to improve overall quality of life and occupational performance in individuals experiencing chronic psychological stress.

Antioxidant Activity

Oxidative stress contributes significantly to ageing and chronic degenerative diseases. Ashwagandha possesses potent antioxidant activity by enhancing endogenous antioxidant defense mechanisms. It increases the activity of superoxide dismutase (SOD), catalase (CAT), glutathione peroxidase (GPx), and reduced glutathione (GSH), while simultaneously reducing lipid peroxidation and reactive oxygen species. Through these actions, the plant protects cellular membranes, proteins, DNA, and mitochondria from oxidative injury, thereby slowing cellular ageing and reducing tissue damage.

Anti-inflammatory Activity

Inflammation plays a central role in numerous chronic diseases including arthritis, cardiovascular disease, diabetes, neurodegeneration, and autoimmune disorders. Withanolides, especially Withaferin A, inhibit inflammatory mediators by suppressing cyclooxygenase, lipoxygenase, and nuclear factor-kappa B signaling pathways. Consequently, production of pro-inflammatory cytokines decreases, leading to reduced tissue inflammation, pain, edema, and cellular injury. These actions explain the traditional use of Ashwagandha in inflammatory musculoskeletal disorders.

Immunomodulatory Activity

Rather than simply stimulating immune responses, Ashwagandha maintains immune homeostasis by regulating both innate and adaptive immunity. Experimental studies demonstrate increased macrophage activity, improved natural killer cell function, enhanced antibody production, and balanced cytokine responses. These actions improve resistance against infections while preventing excessive inflammatory reactions, making Ashwagandha useful in conditions associated with immune dysfunction.

Neuroprotective Activity

The neuroprotective effects of Ashwagandha have attracted considerable scientific interest because neurodegenerative diseases are increasing globally. Experimental studies indicate that Ashwagandha reduces neuronal oxidative stress, promotes neurite outgrowth, enhances synaptic plasticity, improves mitochondrial function, inhibits β -amyloid aggregation, and reduces neuronal apoptosis. These mechanisms may contribute to improved cognitive performance and slower progression of Alzheimer's disease, Parkinson's disease, and other neurodegenerative disorders.

Anxiolytic Activity

Clinical studies consistently demonstrate that Ashwagandha reduces symptoms of generalized anxiety, emotional stress, irritability, and psychological fatigue. These beneficial effects are attributed to regulation of the hypothalamic-pituitary-adrenal axis, reduction of cortisol secretion, enhancement of GABA receptor activity, and modulation of neurotransmitter balance. Improved sleep quality further contributes to reduced anxiety and enhanced psychological well-being.

Cognitive Enhancing Activity

Memory impairment and reduced cognitive performance frequently accompany ageing and chronic stress. Clinical studies have shown improvements in memory, attention, executive function, learning capacity, concentration, and information processing speed following supplementation with standardized Ashwagandha extracts. Experimental evidence suggests stimulation of neurogenesis and increased dendritic growth within the hippocampus, supporting its classical designation as a Medhya Rasayana.

Endocrine Regulatory Activity

Modern research demonstrates that Ashwagandha exerts beneficial effects on several endocrine glands. It has been shown to normalize cortisol secretion during chronic stress, improve thyroid hormone regulation in selected patients with subclinical hypothyroidism, enhance testosterone production in males, and improve insulin sensitivity in metabolic disorders. These endocrine-regulating effects contribute significantly to its adaptogenic and rejuvenating actions.

Antidiabetic Activity

Experimental and clinical studies indicate that Ashwagandha lowers blood glucose through multiple mechanisms including improved insulin sensitivity, enhanced peripheral glucose uptake, preservation of pancreatic β -cell function, and reduction of oxidative stress. Additional improvements in serum lipid profile and inflammatory markers further contribute to better metabolic health.

Cardioprotective Activity

Cardiovascular protection is achieved through antioxidant, anti-inflammatory, antihyperlipidemic, and endothelial-protective mechanisms. Ashwagandha reduces oxidative injury within myocardial tissue, improves vascular function, regulates lipid metabolism, and enhances endogenous antioxidant defense systems. These actions may reduce cardiovascular risk and improve overall cardiac performance.

Hepatoprotective Activity

The hepatoprotective activity of Ashwagandha results from stabilization of hepatocyte membranes, reduction of oxidative stress, suppression of inflammatory mediators, and improvement of endogenous antioxidant defenses. Experimental studies have demonstrated normalization of liver enzymes and protection against chemically induced hepatic injury.

Nephroprotective Activity

Research indicates that Ashwagandha protects renal tissue by reducing oxidative stress, preserving mitochondrial function, decreasing inflammatory cytokines, and maintaining antioxidant enzyme activity. These findings suggest possible utility in preventing drug-induced nephrotoxicity and chronic kidney damage.

Reproductive Health Benefits

One of the most extensively investigated clinical applications of Ashwagandha is improvement of reproductive health. Clinical trials have demonstrated significant increases in sperm concentration, sperm motility, semen volume, testosterone levels, libido, and fertility outcomes in men with infertility. Preliminary evidence also indicates beneficial effects on female reproductive health, sexual function, and menopausal symptoms.

Musculoskeletal Benefits

Ashwagandha enhances skeletal muscle strength, lean body mass, endurance, exercise performance, and post-exercise recovery. Clinical trials involving resistance training have shown significant improvements in maximal muscle strength, reduced muscle fatigue, and faster recovery following strenuous physical activity. These findings support its traditional Balya and Brimhana properties.

Anticancer Activity

Experimental studies have shown that Withaferin A and other withanolides inhibit proliferation of various cancer cell lines through induction of apoptosis, inhibition of angiogenesis, suppression of metastasis, modulation of inflammatory pathways, and arrest of the cell cycle. Although these findings are highly promising, additional large-scale human clinical trials are required before Ashwagandha can be routinely recommended as an adjunctive anticancer therapy.

FINDINGS

- Classical Ayurvedic literature consistently identifies Ashwagandha as one of the most important Rasayana Dravyas.

- More than 80 bioactive phytochemicals have been identified, with withanolides being the principal therapeutic constituents.
- Experimental studies confirm significant antioxidant, adaptogenic, anti-inflammatory, immunomodulatory, neuroprotective, hepatoprotective, cardioprotective, and endocrine-regulating activities.
- Randomized controlled trials demonstrate significant reductions in perceived stress and serum cortisol levels.
- Clinical evidence supports improvements in sleep quality, anxiety, memory, cognitive performance, and emotional well-being.
- Significant enhancement in muscle strength, physical endurance, and exercise recovery has been documented.
- Clinical trials demonstrate improved sperm quality, testosterone levels, and male reproductive health.
- Improvements in glycemic control, insulin sensitivity, and lipid profile have been observed in patients with metabolic disorders.
- Experimental evidence indicates promising anticancer activity through apoptosis induction and inhibition of tumor progression.
- Overall available evidence strongly validates the traditional Ayurvedic concept of Ashwagandha as a rejuvenating medicinal plant suitable for preventive, promotive, and integrative healthcare.

DISCUSSION

Ashwagandha (*Withania somnifera*) is one of the few medicinal plants whose traditional uses described in Ayurveda have been extensively supported by modern scientific research. Classical texts describe it as an important Rasayana Dravya possessing Balya, Brimhana, Medhya, and Vajikarana properties, making it useful for improving strength, vitality, immunity, reproductive health, and longevity. The Ayurvedic concept of Rasayana emphasizes enhancement of Dhatu Poshana, promotion of Ojas, maintenance of Agni, and preservation of physiological balance. These principles closely resemble the modern concepts of immune modulation, antioxidant defense, endocrine regulation, cellular protection, and healthy ageing. The ability of Ashwagandha to restore tissue integrity and improve systemic homeostasis explains its wide therapeutic utility in chronic degenerative disorders, stress-related illnesses, and age-associated physiological decline.¹⁶

Modern phytochemical investigations have identified withanolides, withaferin A, sitoindosides, alkaloids, flavonoids, steroidal lactones, and other bioactive constituents as the major compounds responsible for the pharmacological activities of Ashwagandha. These compounds exert multitarget actions by reducing oxidative stress, suppressing inflammatory cytokines, regulating the hypothalamic-pituitary-adrenal axis, enhancing endogenous antioxidant enzymes, improving mitochondrial function, promoting neuronal regeneration, modulating immune responses, and maintaining endocrine homeostasis. Unlike many synthetic drugs that act through a single mechanism, Ashwagandha simultaneously influences several molecular pathways, resulting in comprehensive therapeutic effects. This multifaceted mechanism

explains its usefulness in stress management, anxiety disorders, neurodegenerative diseases, diabetes mellitus, metabolic syndrome, infertility, musculoskeletal weakness, inflammatory disorders, and healthy ageing.¹⁷

Evidence from randomized controlled trials, systematic reviews, and experimental studies further strengthens the therapeutic value of Ashwagandha. Clinical investigations have consistently demonstrated improvements in stress scores, serum cortisol levels, sleep quality, cognitive function, memory, muscle strength, physical performance, reproductive health, metabolic parameters, and overall quality of life. Most studies have also reported excellent safety and tolerability with standardized root extracts when administered in recommended doses. Although current evidence is highly encouraging, further multicentric randomized controlled trials with larger sample sizes, standardized formulations, longer follow-up periods, and uniform outcome measures are required to establish stronger clinical recommendations. Overall, available evidence clearly supports the integration of Ashwagandha into evidence-based preventive, promotive, and integrative healthcare systems.¹⁸

CONCLUSION

Ashwagandha (*Withania somnifera*) is one of the most important medicinal plants described in Ayurveda and is universally recognized as a potent Rasayana Dravya. Classical literature attributes to it significant Balya, Brimhana, Medhya, Vajikarana, and rejuvenating properties that promote longevity, improve tissue nourishment, strengthen immunity, enhance physical endurance, support reproductive health, and preserve cognitive function. Modern scientific research has validated many of these traditional claims by demonstrating adaptogenic, antioxidant, anti-inflammatory, neuroprotective, immunomodulatory, endocrine-regulating, cardioprotective, hepatoprotective, antidiabetic, and anticancer activities through multiple molecular mechanisms. Clinical evidence indicates that Ashwagandha is effective in reducing stress, improving sleep quality, enhancing cognitive performance, increasing muscle strength, supporting fertility, and promoting healthy ageing while maintaining an excellent safety profile. Future high-quality multicentric clinical trials using standardized formulations are required to strengthen the existing evidence and expand its therapeutic applications. Overall, Ashwagandha represents an excellent example of successful integration of classical Ayurvedic wisdom with contemporary evidence-based medicine and continues to hold immense potential in modern preventive and therapeutic healthcare.¹⁹

CONFLICT OF INTEREST - Nil.

SOURCE OF SUPPORT - None.

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