



Withania Somnifera Dunal (Asgand): A Comprehensive Review Of Its Therapeutic Potential And Clinical Application

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ASGANDH (*WITHANIA SOMNIFERA DUNAL*)



ABSTRACT:

Withania somnifera Dunal, commonly known as Aśgand, is a renowned medicinal plant widely utilized in the Unani systems of medicine. Often referred to as Indian ginseng or winter cherry, it holds a prominent position in traditional Indian herbal medicine, similar to the role of ginseng in Chinese medicine. Aśgand has been described in ancient texts such as Dioscorides' *Kitab-ul-Hashaish* (78 AD). The plant's therapeutic properties are attributed to its roots, which have long been used as a sedative for treating various clinical conditions, including female disorders, cough, rheumatism, dropsy, and senile debility as a sedative. The chemical composition of Aśgand reveals the presence of alkaloids, including withsomine, withaferin A, and withanolides (such as withanolide A and D), along with other constituents. Scientific studies highlight its diverse pharmacological activities, including anti-inflammatory, anti-oxidative, antimicrobial, anti-anxiety, aphrodisiac, immunomodulatory, anti-diabetic, anti-ulcer, anti-cancer, and hepatoprotective effects. In Unani medicine, Aśgand is recognized for its ability to act as a sedative (Musakkin), general tonic (Muqawwie aam), and aphrodisiac (Muqawwie Bah), among other therapeutic uses. It is classified as an adaptogen, supporting mental and physical well-being by enhancing cognitive function, boosting the immune system, reducing inflammation, and promoting overall health. Additionally, it supports bone marrow production and reproductive health, and has anti-aging properties. Its efficacy is also demonstrated in managing chronic conditions such as tuberculosis, respiratory diseases, and HIV, thanks to its potent immunostimulatory effects. Aśgand is also valuable in treating gynecological issues like anemia and irregular menstruation due to its blood-tonic properties. The plant's pharmacological benefits are attributed to its rich composition of bioactive compounds, including alkaloids, glycosides, saponins, flavonoids, terpenoids, and coumarins. This review underscores the significance of *Withania somnifera* in traditional and contemporary medical practices, highlighting its diverse therapeutic potential.

Keywords: *Withania somnifera*, Aśgand, Adaptogen, Immunomodulator, Anti-inflammatory, Cognitive disorders, Traditional medicine

INTRODUCTION:

Withania somnifera, more commonly known as Aśgand, is a prominent herb in traditional systems of medicine, particularly in Unani medicine. [1] Often referred to as "Indian Ginseng" or "Indian Winter Cherry," it is renowned for enhancing physical and mental resilience and alleviating stress [2]. The species name "somnifera," meaning "sleep-inducer" in Latin, reflects its notable anti-stress and calming properties. The Sanskrit-derived name "Ashwagandha" combines "ashwa" (horse) and "gandha" (smell), alluding to the unique earthy aroma of its roots, reminiscent of a wet horse. Its historical significance is evident from mentions in Unani texts, including Dioscorides' "Kitab-al-Hashaish" (78 A.D.), and its recognition as an official drug in the Indian Pharmacopoeia (1985).[3]

This adaptogenic herb has been valued for its extensive therapeutic benefits, including stress relief, physical endurance enhancement, rejuvenation, and cognitive support for centuries.[1] The primary medicinal properties of *Withania somnifera* reside in its roots, rich in withanolides—steroidal lactones with various

pharmacological effects. [4]Scientific studies confirm its broad spectrum of therapeutic actions, such as Mohollil-e-warm (anti-inflammatory), Musakkin (Sedative)[5],Daf-e-Iztirab(anti-stress), anti-cancer, Muqawwi-e-Aasab(neuroprotective), antioxidant, and immune-modulating properties. [7] In Unani medicine, Asgand is classified into two primary varieties: Asgand Nagori and Asgand Dakani, with Asgand Nagori being considered superior due to its higher concentration of active ingredients and superior medicinal qualities. [6]

One of the most significant aspects of *Withania somnifera* is its neuroprotective properties, particularly in neurodegenerative diseases like Alzheimer's and Parkinson's. The herb's withanolides help protect nerve cells from oxidative stress, reduce neuroinflammation, and stimulate the growth of new neurons, contributing to improved cognitive function. Several studies highlight its ability to enhance memory, learning capacity, and attention span, making it a popular choice for cognitive enhancement. [8]

Asgand is also being explored for its potential role in cancer prevention and treatment. The herb's withanolides have shown promising anti-tumor properties, with studies indicating their ability to inhibit cancer cell growth, induce apoptosis (programmed cell death), and reduce angiogenesis (the formation of new blood vessels supplying tumors). These effects make *Withania somnifera* a potential adjunct therapy for cancer, supporting conventional treatments and improving patients' overall quality of life. [9]

Beyond brain health and stress management, *Withania somnifera* is known for its ability to improve physical stamina and overall vitality. [6] Its support of the endocrine system, particularly the thyroid and adrenal glands, makes it beneficial for individuals dealing with chronic fatigue, adrenal insufficiency, or hormonal imbalances. Its ability to increase energy levels, combat fatigue, and enhance endurance has made it popular among athletes and individuals seeking improved physical performance. Additionally, its anti-inflammatory and analgesic effects make it useful in treating arthritis, joint pain, and inflammation. [6]

Clinical studies have highlighted its efficacy in improving metabolic health, enhancing immunity, and managing chronic conditions such as diabetes and cardiovascular diseases. Notably, its favorable safety profile, characterized by minimal side effects when used appropriately, underscores its suitability for long-term use across various populations, including pregnant women. [3]

In addition to its roots, other parts of *Withania somnifera* hold therapeutic value. The leaves are used to treat fever and reduce swelling, the flowers exhibit astringent and diuretic properties, (basu)the fruits are employed in managing skin ulcers and tumors, and the seeds have been found to enhance sperm count and promote testicular growth.[6]Traditional Unani texts describe Asgandh as beneficial for uterine pain, leucorrhoea, and respiratory issues like bronchial asthma, fever, and cough.[10,11]

Several studies have explored its various pharmacological properties. The ethanolic extract of the fruit has shown antifungal activity against *Aspergillus niger* and *Penicillium citrinum*. It has also exhibited significant larvicidal effects against *Aedes aegypti*. Additionally, ethanolic extracts of the leaves and stem have demonstrated antibacterial properties against various pathogens. These findings, supported by research from Rizki et al. (1989) and Qureshi et al. (1956), reinforce *Withania somnifera*'s diverse therapeutic potential.[12] *Withania somnifera* is also subject to agricultural research. The variety "WS 20" was released through selection by Lal Nehru Krishi Vishva Vidyalaya, Mandsaur, Madhya Pradesh, and has achieved a 30%

increase in dry root yield over local varieties. Genetic studies indicate that additive and non-additive genes contribute to traits like plant height, flowering time, root yield, and branching patterns. Cultivation practices in Madhya Pradesh have optimized its yield, with early August sowing significantly increasing root production. Additionally, seed germination rates can be improved with plant growth regulators like indole acetic acid and gibberellic acid. [12]

Despite its resilience, *Withania somnifera* is susceptible to diseases such as damping-off, leaf blight, and pest infestations. Preventive measures, including the application of Dithane M-45, Malathion, and Kelthane, have effectively managed these issues. Gamma-ray irradiation has also been explored as a method to decontaminate the plant while preserving its phytochemical properties. [12]

Withania somnifera remains a cornerstone of both traditional and modern medicine due to its extensive therapeutic potential. Its adaptogenic, neuroprotective, anti-inflammatory, and immune-modulating properties make it a valuable remedy for numerous health conditions. As research continues to validate its efficacy and safety, its role in integrative medicine will likely expand, offering a holistic approach to wellness and disease management.



Taxonomical classification **Vernacular names:**^{[1,10,13],5,13}

Kingdom: <i>Plantae</i>	English: <i>Winter cherry</i>
Sub-kingdom: <i>Tracheobionta</i>	Gujrati: <i>Asganda, Asundha, Asana, Ghodakun</i>
Super-Division: <i>Spermatophyta</i>	Hindi: <i>Asgand</i>
Division: <i>Magnoliophyta</i>	Punjabi: <i>Kodyali, sankhpushpi</i>
Class: <i>Magnoliopsida</i>	Sanskrit: <i>Ashvagandha, Ashvakandika, Balada,</i>
Subclass: <i>Asteridae</i>	Tamil: <i>Amukkaram, Kizargu Amukkuran</i>
Order: <i>Solanales</i>	Bombay: <i>Sagun,</i>
Family: <i>Solanaceae</i>	<i>Asvagandha.</i>
Genus: <i>Withania</i>	Urdu: <i>Asgand, Asgand Nagori</i>
Species: <i>somnifera</i>	Marathi: <i>Asganda, Askagandha, Askandhatilli</i>

BOTANICAL DESCRIPTION:

Withania somnifera, commonly known as **Ashwagandha or Asgand**, is a member of the **Solanaceae** family. The name "Ashwagandha" is derived from the Sanskrit words "Ashwa," meaning horse, and "Gandha," meaning smell, referring to the characteristic scent of its fresh roots, which are said to resemble that of a horse.[12]

The primary medicinal part of **Withania somnifera** is its dried root. The roots are typically found in small pieces that measure 10.0–17.5 cm in length and 6–12 mm in diameter and are used commercially in pharmaceutical preparations. The root pieces have a dark brown exterior with a creamy interior. When dried, the roots are cylindrical, straight, and unbranched, tapering slightly towards the tip. The primary roots also bear minor roots that resemble fibers, with longitudinal creases and an exterior color ranging from buff to grey-yellow. These roots are straight, conical, and unbranched, with some featuring crowns and several bud scars at the root crown.

In addition to the roots, the stem bases are also used medicinally. These stems are green, cylindrical, and thickened in various ways, with longitudinal wrinkles. The powdered form of the root is greyish, has a harsh taste, and emits a strong odor. The pharmacological activity of Ashwagandha is attributed to the presence of several alkaloids within the root. Although the plant's fruits, seeds, leaves, and roots are all therapeutically valuable, it is primarily the dried root that is used for its medicinal properties, owing to its high concentration of bioactive compounds. [12]

Morphology of the Root

Macroscopic Features

The commercial root samples vary in size, measuring 3-10 cm in length and 3-12 mm in diameter. The external surface is generally smooth, with few lenticels and scars or remnants of daughter roots. The color ranges from slightly brownish, white, to buff, and the fracture is short and starchy, revealing a white interior. The root has a bitter and acrid taste, with no characteristic odour.

Microscopic Features

The young root exhibits a single-layered epidermis, followed by a parenchymatous cortex of 4-5 cell layers. The endodermis is marked by Casparian dots, with some cells showing secondary wall formation. Beneath the endodermis, a single-layered pericycle encloses a diarch stele. As secondary growth progresses, the cork cambium arises in the outermost cortex layer, and the endodermis persists. In mature rootlets, the cork consists of 3-5 cell layers, while the phelloderm comprises 6-8 layers of slightly thick-walled, tangentially elongated cells.[13]

HABITAT AND DISTRIBUTION:

Asgand is a late-rainy-season **kharif crop**. It may be grown as a rain-fed crop in semitropical locations with 500 to 800 mm of rainfall. It naturally occurs in Madhya Pradesh's forests, the Indian western Himalayas, the foothills of Punjab, Himachal Pradesh, and Uttar Pradesh. ^[15]

Propagation and cultivation: by seed

Shelf life: 2-3yrs

Period of occurrence

The seeds are sown in the nursery just before the beginning of the rainy season. The plants flower and fruit in August -December [16]. Harvesting starts in January and continues till March. The roots are collected during January and collection continues up to March.[5]

UNANI DESCRIPTION OF WITHANIA SOMNIFERA (ASGAND)

Attribute	Description
Mizaj (Temperament)	Hot and Dry (3) ⁰ ^[11] , Hot (1 ⁰) and Dry (2 ⁰) degrees ^[11]
Maza (Taste)	Mucilaginous, bitter, and acrid ^[17]
Boo (Smell)	Pungent odor, the smell of horse's urine. ^[17]
Nafa-e-Khas (Specific Benefit)	Muqawwi-e-Bah (Aphrodisiac) ^[17]
Part Used	Dried roots ^[1-4]
Muzir (Adverse Effect)	- Irritates the throat - Unsuitable for individuals with a hot temperament ^[11,12,13]
Musleh (Corrective)	- Gargle with <i>Joshanda Shehtoot Shereen</i> for throat - Use <i>Kateera</i> and <i>Roghan</i> for hot temperament ^[12,13,4]
Badal (Substitute)	Bahman Safed ^[9-10] Suranjan, (<i>Colchicum luteum</i> Linn) Behman Safaid5
Miqdare Khuraak (Dose)	3-5 gram ^[11] Dosage: 3-5 grams ^[4]
Murakkabat (Compound Formulations)	- Majoon Muqawwie Reham - Majoon Zanjabeel - Habbe Asgand - Majoon Suhaga - Majoon Salab - Majoon Samag - Kushta Godanti ^[11-13] - Halwa Gheekwar. Pharmacopia of india Habbe Asgand ^[5] Majoon Asgandh

	Safuf Jaryan Khas ^[4]
Afa'al (Action)	- Muqawwi-e-Munaqi-e-Rahe(Uterine tonic) - Muqawwie Aam (General tonic) - Muhallile Waram (Anti-inflammatory) - Muffatehe Sudad (Deobstruent) - Musakkin (Relaxant) - Munawwim (Sedative) - Moaddile Akhlat (Normalizes humors) - Mufattite Hisaat (Lithotriptic) - Moallide Labn (Galactagogue) - Musaffie Khoon (Blood purifier) - Moallide and Mughlliz-e-Mani (Semen producer)^[8,9,12] - Musammun-e-Badan (Nutritive) - Musakkina-e-Aasab(Nerve Calmative) - Mudir(Diuretic)^[17]
Therapeutic Uses (Iste'malat)	Zaght ud dam Qawi(Hypertension), Junoon(Insanity) ,Duwar (vertigo), Sahar(Insomnia), Ikhtenaq ur rahm (Hysteria), Sara (Epilepsy),Melancholia (Schizophrenia)and other neurodegenerative diseases. Ishaal(Diarrhea),Zaheer (Dysentery),and Suda (Headaches)like Shaqiqa (Migraines)^[8,9,12]Sailan-ur-Rahem(Leucorrhoea),Riqqat-e-Mani(Hypospermia), Waj-ul-Mafasil(Arthritis), Zof-e-bah (Sexual Debility) [13]Jiryan(Spermatorrhea), ehtelaam(Nocturnal Emission), Zof-e-Aam(General Debility), Zof-e-Asab (Nervous Debility), Nisyaan(Dementia) and wajaul Qutun (Lumbago)^[17]

CHEMICAL CONSTITUENTS:^[1]

Withania somnifera (Ashwagandha) is a pharmacologically significant medicinal plant known for its diverse bioactive constituents. Its therapeutic potential is attributed to a complex profile of alkaloids, withanolides, flavonoids, saponins, steroidal lactones, and other secondary metabolites.

1. Alkaloids

The alkaloid fraction of *W. somnifera* contributes to its neuroprotective, sedative, and hypotensive effects. The total alkaloid content in Indian roots varies from 0.13% to 0.31%, depending on geographical and environmental factors. Chromatographic analyses have identified 13 Dragendorff-positive alkaloids, including:

- Cuscohygrine
- Anhydride
- Tropine
- Pseudo-tropine
- Anaferine
- Somniferin
- Withanine
- Withananine
- Pseudo-withanine
- Somnine
- Somniferine
- Somniferinine
- Withsomine (isolated from roots cultivated in West Germany)[1]

2. Withanolides (Steroidal Lactones)

Withanolides are the most significant bioactive constituents of *W. somnifera*. These naturally occurring steroidal lactones exhibit anti-inflammatory, antioxidant, antitumor, and immunomodulatory properties. Key withanolides include:

- **Withaferin A** – Anti-inflammatory, anti-arthritic, hepatoprotective, and anticancer activity
- **Withanolide A** – Neuroprotective, anxiolytic, and anti-stress properties
- **Withanolide D** – Immunomodulatory and anti-tumor effects
- **Withanolide G** – Antioxidant and anti-aging potential
- **Sitoindosides** – Adaptogenic and stress-relieving effects

3. Flavonoids and Saponins

- Flavonoids present in *W. somnifera* contribute to its antioxidant and cardiovascular benefits.
- Steroidal saponins enhance its adaptogenic, anti-inflammatory, and immunomodulatory properties.

4. Amino Acids and Other Secondary Metabolites

The roots of *W. somnifera* contain free amino acids essential for neurotransmitter function and cellular repair, including:

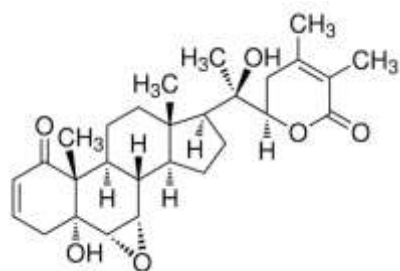
- Aspartic acid
- Glycine
- Tyrosine
- Alanine
- Proline
- Tryptophan
- Glutamic acid
- Cystine

Other secondary metabolites include:

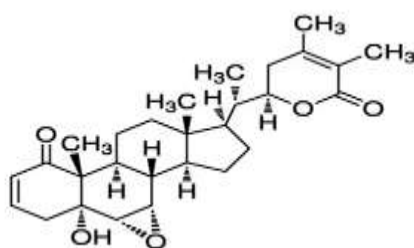
- **Polysaccharides (starch and resin)** – Support immune function and enhance bioavailability.
- **Lipid-based compounds (linoleic acid, essential fatty acids)** – Cardioprotective and anti-inflammatory effects.
- **Inorganic compounds (potassium nitrate, iron)** – Contribute to metabolic and hematological health.(1)
- **GABA mimetic compounds** – Anxiolytic and sedative properties beneficial for stress and neurological disorders.(18)

The diverse chemical composition of *Withania somnifera* underlies its broad therapeutic applications in traditional and modern medicine. The synergistic effects of its bioactive compounds contribute to its

adaptogenic, neuroprotective, immunomodulatory, and anti-inflammatory properties, making it a valuable medicinal herb for integrative healthcare practices.



Withanolide A



Withanolide B

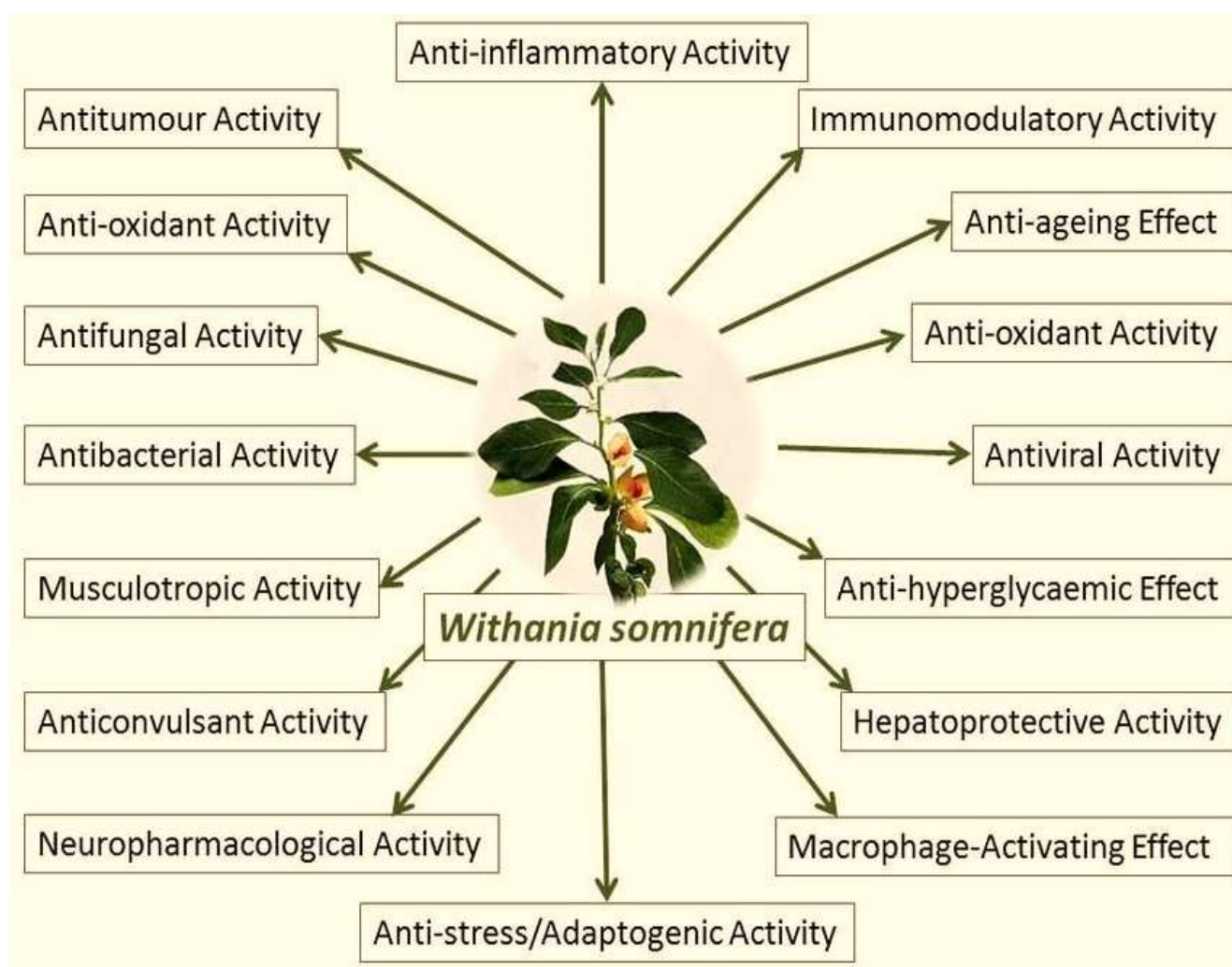


Fig: Various pharmacological activities

PHARMACOLOGICAL AND CLINICAL STUDIES :

➤ **Cardioprotective and Anti-Hypertensive Activity:**

Ashwagandha has shown significant cardioprotective and anti-hypertensive effects. In animal studies, its alkaloids demonstrated prolonged hypotensive, bradycardia, and respiratory-stimulating effects by activating brainstem centers and blocking autonomic ganglion activity. [18] In rat models of isoprenaline-induced myonecrosis, Ashwagandha improved antioxidant levels, restored hemodynamic parameters, and protected the heart from damage. It has been recommended to prevent coronary heart disease, hypertension, and atherosclerosis by reducing sympathetic stimulation and supporting heart function. Human studies indicated that Ashwagandha notably lowered diastolic blood pressure without significantly affecting systolic pressure, highlighting its effectiveness in managing blood pressure^[14]

➤ **Hypolipidemic Activity**

In hypercholesterolaemic rats, Ashwagandha root powder not only reduced total lipids, cholesterol, and triglycerides but also markedly elevated plasma HDL-cholesterol levels, HMGCoA (β -Hydroxy β -methylglutaryl-CoA) reductase activity, and the amount of bile acid in the liver. Furthermore, rats treated with Ashwagandha for hypercholesterolaemic conditions showed a considerable decrease in lipid peroxidation. In hyperlipidaemic rats, the aqueous extract of Ashwagandha fruits markedly decreased high levels of lipoproteins, triglycerides, and blood cholesterol. Moreover, this medication demonstrated hypolipidemic action in hypercholesterolemia produced by triton^[26]

➤ **Hypoglycaemic and Diuretic Activity**

Ashwagandha has demonstrated hypoglycaemic and diuretic effects in human studies. A 30-day trial showed a significant reduction in blood sugar and an increase in urine volume and salt, indicating its potential to lower blood glucose levels and promote diuresis. Preclinical studies have further confirmed Ashwagandha's ability to reduce blood glucose, with Withaferin A playing a key role in managing type 1 diabetes through modulation of Nrf2/NF κ B signaling. While clinical research is limited, some studies have shown improvements in blood glucose, lipidemic profile, body weight, and blood pressure in diabetic patients.[27]

➤ **Anxiolytic and Antidepressant Effects**

Ashwagandha, particularly its Glycowithanolides (WSG) extracted from the roots, have shown significant anxiolytic and antidepressant properties in studies. It produced effects similar to imipramine and lorazepam, reducing brain tribulin, an anxiety marker. Ashwagandha effectively reduces anxiety and stress by modulating the HPA axis, lowering cortisol and DHEA levels, and offering anti-inflammatory and antioxidant benefits. It enhances cognitive function and mental well-being with minimal side effects

compared to traditional treatments like benzodiazepines, making it a promising option for managing anxiety and depression.[28]

➤ **Anti-stress Activity**

Ashwagandha (Asgand exhibits calming and stress-relieving properties similar to gamma-aminobutyric acid (GABA). A daily dose of 240 mg of white willow extract reduces anxiety and stress, as measured by the Hamilton Anxiety Rating Scale (HAM-A) and DASS-21. Ashwagandha's antioxidant activity, supported by enzymes like glutathione peroxidase (GPx), superoxide dismutase (SOD), and catalase (CAT), helps protect brain tissue from oxidative damage. Active glycowithanolides from Ashwagandha increase these enzymes' levels, suggesting its potential as an antioxidant with brain-protective effects.[14]

➤ **Neuroprotective and Anti-Neurodegenerative Effects**

Alzheimer's Disease

As populations age, Alzheimer's disease (AD) and dementia have become more prevalent— β -amyloid plaques and tau protein accumulation, which damage neurons mark AD. Ashwagandha (*Withania somnifera*) has shown the potential to counteract these effects. Its active compounds, like vitanolide and withaferin A, reduce β -amyloid aggregation, inflammation, and oxidative stress. Studies also suggest that Ashwagandha enhances the function of LDL receptor-related protein 1 (LRP1), which helps process amyloid precursor proteins. Additionally, Withanolide A has improved blood-brain barrier function and reduced brain damage in animal models. More research is needed to confirm its effectiveness for AD treatment.[3]

Parkinson's Disease

Parkinson's disease involves the degeneration of dopaminergic neurons, leading to an imbalance between dopamine and excitatory neurotransmitters. Factors such as genetics, toxins, neuroinfections, oxidative stress, and reduced growth factors contribute to this degeneration. A study on rats with Parkinson's disease showed that Ashwagandha extract (100-300 mg/kg) reduced lipoperoxidation, increased glutathione levels, and enhanced antioxidant enzyme activities, including superoxide dismutase and catalase. It also improved dopamine levels and motor function. Similar results were observed in fruit flies and mice, where Ashwagandha improved biochemical parameters and reduced motor impairments. The effects were dose-dependent.[3]

Huntington's Disease

The anti-Huntington's disease (HD) activity of *Withania somnifera* (WS) has been demonstrated in various preclinical studies, specifically focusing on its neuroprotective and antioxidant properties. HD, a progressive neurodegenerative disorder, is caused by mutations in the Huntington gene and characterized by motor and

cognitive impairments due to the degeneration of neurons in the striatum and cerebral cortex. Oxidative stress plays a major role in the progression of HD, with elevated levels of markers such as heme oxygenase, MDA, and 8-hydroxyguanosine being found in affected brain regions.

One study by Kumar and Kumar used 3-nitropropionic acid (3-NP), a neurotoxin known to induce HD-like symptoms in animals, to explore the potential neuroprotective effects of WS root extract. In this study, the administration of 3-NP to male Wistar rats caused weight loss, decreased motor activity, and disrupted energy metabolism, mimicking HD symptoms. Treatment with WS root extract, which is rich in glycol withanolides like withaferin A and sitoindosides VII–X, was found to mitigate these symptoms. The extract improved weight gain, motor movement, and energy balance by acting as an antioxidant and adaptogen. Specifically, the WS root extract reduced lipid peroxidation and nitrite levels while enhancing the activity of antioxidant enzymes like superoxide dismutase (SOD) and catalase.

Furthermore, WS root extract was shown to normalize mitochondrial enzyme function, including the activities of complexes I, II, and III of the mitochondrial respiratory chain, and citric acid cycle enzymes like succinate dehydrogenase (SDH), isocitrate dehydrogenase, and α -ketoglutarate dehydrogenase, which were compromised by 3-NP treatment. These findings suggest that WS may offer potential therapeutic benefits for managing oxidative stress and mitochondrial dysfunction in HD, providing a basis for its use as an adjunct in neurodegenerative disease management.[3]

Obsessive-Compulsive Disorder (OCD):

OCD is a chronic disorder marked by intrusive, unwanted thoughts and compulsive behaviors, often linked to serotonergic dysregulation. Studies on mice using *Withania somnifera* (Ashwagandha) extracts (methanolic and aqueous) showed significant improvement in OCD-like behaviors without affecting motor activity. The effects were comparable to standard treatments like fluoxetine, highlighting Ashwagandha's potential as an adjunct therapy.[29]

Alcohol Withdrawal Syndrome (AWS):

Ashwagandha has been shown to alleviate anxiety, behavioral changes, and seizures in alcohol withdrawal models. Oral administration in rats demonstrated its protective effects during ethanol withdrawal, improving anxiety and locomotor activity, thereby supporting its role in AWS management.[29]

➤ **Antimicrobial activity**

The aqueous root extract of Asgand (*Withania somnifera*) has demonstrated notable antibacterial properties, especially against methicillin-resistant *Staphylococcus aureus* (MRSA), as confirmed through in vitro agar well diffusion assays. Active antibacterial components were identified using two-dimensional thin-layer chromatography (TLC) and contact bioautography techniques. Additionally, the extract showed significant

antioxidant potential, with a Trolox Equivalent Antioxidant Capacity (TEAC) of 9.83 mg per gram of dry extract and a reducing power of 0.11 mg per gram of dry extract, measured against ascorbic acid as a reference. These findings highlight *Asgand* as a rich source of bioactive compounds with both antibacterial and antioxidant capabilities.^[1]

➤ Immunomodulatory effect

The immunomodulatory potential of *Asgand* was evaluated in an azoxymethane-induced colon cancer model in mice. Treatment with *Asgand* extract (400 mg/kg) significantly improved immune parameters, including leukocytes, lymphocytes, neutrophils, immune complexes, and immunoglobulins (IgA, IgG, IgM). The results indicated that *Asgand* effectively controlled immune dysfunction and tumor progression, suggesting its potential role in managing colon cancer through immunomodulation.^[1]

➤ Anti-inflammatory Activity

Withaferin A, a key bioactive compound from Ashwagandha (*Withania somnifera*), shows potent anti-inflammatory and anti-arthritic effects. It reduces arthritis symptoms without toxicity and promotes weight gain in arthritic models, unlike hydrocortisone, which causes weight loss. Studies demonstrate that Withaferin A is more effective than hydrocortisone in treating adjuvant-induced arthritis. It also reduces inflammation in animal models like carrageenan-induced edema and cotton pellet granuloma. Administered at doses of 12-25 mg/kg, Withaferin A offers lasting anti-inflammatory benefits, suggesting it is a safer, more effective alternative to traditional treatments.^[9]

➤ Support for Infertility Treatment

Infertility, defined as the inability to conceive after one year of regular intercourse, affects millions of couples. Ashwagandha (*Withania somnifera*) has shown promise in treating male infertility. In men with oligospermia, Ashwagandha increased sperm count, motility, and semen volume while improving testosterone levels and reducing prolactin and FSH. Similar improvements were seen in men with normozoospermia, with enhanced sperm quality and antioxidant levels. Ashwagandha also inhibited lipid peroxidation and reduced protein carbonyl groups, suggesting a protective effect against oxidative stress. Additionally, it may serve as an alternative to pentoxifylline in infertility treatment. Studies also show Ashwagandha root extract can improve sexual function in women, enhancing arousal, lubrication, and orgasm.^[29]

➤ Anticancer Effects

Ashwagandha contains compounds like withanolides that exhibit anti-cancer properties, effective against cancers such as breast, colon, lung, prostate, and blood cancers. Withanolides induce apoptosis and inhibit cell proliferation. Withaferin A, in particular, has shown effectiveness in treating melanoma, glioblastoma multiforme (GBM), and other cancers by triggering apoptosis and inhibiting cell migration. Research also suggests that Ashwagandha may improve the quality of life for cancer patients and protect against radiation-

induced damage. Additionally, combining Ashwagandha with treatments like cisplatin or intermittent fasting shows potential for enhanced anti-cancer effects.[29]

➤ **Treatment of Sleep Disorders**

Ashwagandha has been shown to improve sleep quality and reduce insomnia symptoms. Studies on older adults and those with insomnia showed better sleep quality and mental alertness. In animal models, Ashwagandha reduced oxidative stress and improved sleep patterns. It may also help with sleep deprivation by enhancing antioxidant enzyme levels.[29]

➤ **Adaptogenic Effect**

Ashwagandha is a powerful adaptogen, which means it helps the body cope with stress by regulating metabolic processes and reducing the harmful effects of stress. Studies have shown that Ashwagandha lowers cortisol, epinephrine, glucose, and inflammatory markers, while also supporting immune function. It has demonstrated antioxidant and immunostimulant properties, particularly in animal studies exposed to chronic stress.[29]

➤ **Treatment of Hypothyroidism**

Ashwagandha is beneficial for individuals with subclinical hypothyroidism. Unlike iodine, which stimulates thyroid hormone production, Ashwagandha normalizes thyroid function, particularly through its active compound, withaferin A. Clinical studies have shown improvements in thyroid hormone levels, making Ashwagandha a useful adjunct to conventional hypothyroidism treatments.[29]

➤ **Increase in Muscle Strength**

Ashwagandha supplementation has been linked to significant improvements in muscle strength and recovery. Research shows that it helps increase muscle mass, reduces exercise-induced muscle damage, and enhances testosterone levels. It also improves cardiorespiratory endurance, VO2 max, and overall athletic performance, allowing for faster recovery after intense physical activity.[29]

➤ **Potential Role in COVID-19 Treatment**

Ashwagandha has shown promising potential in the treatment of COVID-19. Its immune-regulating, anti-inflammatory, and antiviral properties may help mitigate symptoms and support recovery. Compounds like witanoside V and somniferin, found in Ashwagandha, may inhibit the SARS-CoV-2 virus, offering possible adjunctive therapeutic benefits. However, further research is needed to confirm these findings.[29]

CONCLUSION

Asgand (*Withania somnifera*) is a highly valued medicinal herb, deeply rooted in traditional medicine and increasingly supported by modern scientific research. Its broad-spectrum therapeutic potential spans cardiovascular, metabolic, neurological, and immune-related disorders. The herb's cardioprotective, antihypertensive, and hypolipidemic properties make it a promising natural intervention for heart health, while its hypoglycemic and diuretic effects highlight its role in managing metabolic conditions like diabetes and kidney dysfunction.

Renowned for its adaptogenic and neuroprotective effects, Asgand effectively reduces stress, anxiety, and depression by modulating the hypothalamic-pituitary-adrenal (HPA) axis. Its ability to enhance cognitive function and potentially slow neurodegenerative diseases like Alzheimer's and Parkinson's further strengthens its clinical significance. Additionally, its potent anti-inflammatory, immunomodulatory, and antimicrobial activities contribute to its efficacy in combating chronic inflammation, infections, and autoimmune conditions.

Beyond these therapeutic benefits, Asgand plays a crucial role in reproductive health by improving fertility and sexual function. It enhances muscle strength, supports post-exercise recovery, and promotes better sleep quality, making it an essential supplement for athletes and individuals seeking holistic well-being. Emerging evidence also suggests its anticancer potential, with bioactive compounds exhibiting apoptosis-inducing and tumor-inhibitory effects. Furthermore, its role in thyroid regulation and as a supportive therapy for viral infections, including COVID-19, highlights its expanding relevance in modern medicine.(30)

With a growing body of preclinical and clinical evidence supporting its diverse pharmacological actions, Asgand stands out as a vital herb in integrative healthcare. However, further rigorous clinical trials are needed to establish optimal dosage, long-term safety, and precise mechanisms of action across different populations. As research continues, Asgand has the potential to become a cornerstone of holistic health, bridging the gap between traditional wisdom and modern therapeutic advancements.

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