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A REVIEW ON *WITHANIA SOMNIFERA*

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INTRODUCTION

Ayurveda is made up of two Sanskrit words: "ayus" which means "life" and "ved" which means "knowledge." These two terms are combined to form the term "science of life." Ayurveda, which is a branch of the Atharva Veda or some times considered as panchamveda, is an ancient Indian medicinal system that uses herbal remedies and yogic breathing to treat a variety of ailments.[18] Ayurveda is a complementary and alternative medicine system based on ancient writings and a "natural" and systematic approach to overall health.

COMMON NAME- Ashwagandha.

Ashwagandha (*Withania somnifera*, fam. Solanaceae) is among the most important and well-known shrubs used in Ayurveda right now. The herb is known as "Sattvic Kapha Rasayana.""Indian Ginseng" or "Indian Winter Cherry" are two common names for Ashwagnadha. It's also known as an adaptogen.[18]

Ashwagandha is widely used for its plethora of health advantages. It is used as a Rasayana, which is a metallic or herbal treatment that improves physical and mental health while also increasing happiness.[18] It improves an organism's ability to resist adverse environmental factors by providing a sense of intellectual well-being.[1] It is administered to youngsters in the form of tonics, while it is given to adults and geriatric patients in the form of tablets and churanas.

For millennia, Ashwagandha has been used to treat sickness. Ashwagandha has a wide range of uses, and Native Americans and Africans have used it to alleviate inflammation, fevers, and prevent infection or disease.[5] Ashwagandha can also help to boost the immune system, improve cognitive function, and increase general well-being.[1]

SYNONYMS: Sanskrit: Ashwagandha, Turangi-gandha; English: Winter Cherry; Hindi: Punir, asgandh; Punjabi: Asgand, isgand; Bengali: Ashvagandha; Gujrati: Ghodakun, Ghoda, Asoda, Asan; Telgu: Pulivendram, Panneru-gadda, panneru; Tamil: Amukkura, amkulang, amukkuram-kilangu, aswagandhi; Karnataka: Viremaddlinagadde, Pannaeru, aswagandhi, Goa: Fatarfoda, Bombay: Asgund, asvagandha; Rajasthani: Chirpotan

ETYMOLOGY

The name "**Ashwagandha**" is comprised of the Sanskrit words ***'ashva'***, which means **horse**, and ***'gandha'***, which means **smell**, collectively it reflects that the root has a strong horse-like odor. In Latin, the term "somnifera" means "sleep-inducing."[69]

HISTORY

- The usage of Ashwagandha has a long and fascinating history. The use of Ashwagandha is documented in a number of classic Ayurvedic texts, the earliest of which is the Kasyapa-Samhita, which was written about 600 A.D. Both the English and Latin names of the plant relate to the plant's most popular uses. In Latin,'somnium' means dream, and 'fer' means to carry. The name'somnifera' means 'dream carrier,' alluding to the plant's role in fostering restful sleep.[12]
- *Withania somnifera* was originally used in the making of wine, according to Robin Lane Fox. According to Anne Van Arsdall, *Withania somnifera* was once known as apollinaris.[17]
- In their book on significant medicinal herbs of India, Thakur et al. (1987) mentioned *Withania somnifera*, and Puri (2002) provided many recipes in which ashwagndha is an important element.[12]
- Puri (2003) published RASAYANA, a monographic analysis of this adaptogenic plant. After performing

botanical study, he has presented several applications of this plant in Ayurveda, key Ayurvedic preparations, therapeutic indications, and pharmacological activities. The author has cited around a hundred sources.[12]

- Ashwagandha is a plant native to the Indian subcontinent, particularly in the arid regions of India, Sri Lanka, and Pakistan. It may be cultivated in mild conditions and can be found in several places of Africa.[17]
- It grows in desert areas of India. Punjab, Haryana, Rajasthan, Uttar Pradesh, Gujarat, Maharashtra, and Madhya Pradesh, notably Madhya Pradesh, are the states that produce the most Ashwagandha.[35]
- Ashwagandha is a blooming plant with a large edible portion. Its fruit is red-orange in colour and resembles cherry tomatoes in appearance. The fruit is edible as well, although it has a harsh flavour that not everyone can tolerate.[35]
- Roots and leaves were mostly employed for medical reasons in the past. Its leaves were used to produce tea by drying and powdering them, while the roots were employed in a variety of ways.[35]

DISTRIBUTION

The species is found in Africa, the Mediterranean, India, and Sri Lanka. It may be found in India's sub-Himalayan tracts, which reach elevations of up to 1000 metres. It may be found in Himachal Pradesh, Punjab, and other arid regions of India. This species may be found all throughout the world, from Africa to Sri Lanka. It may be found in India's sub-Himalayan tracts, which reach up to 1000 metres in elevation. Rajasthan, Punjab, Haryana, Uttar Pradesh, Gujrat, Maharastra, and Madhya Pradesh are among the drier (subtropical) portions of India where it may be found. It may be found in considerable quantities in Talacauvery, Karnataka.[35]

- The genus Withania is only found in the Old World, and it is closely linked to the gooseberry genus Physalis. Hepper identified ten species, but Hunziker later added nine additional Asian species from other Solanaceae genera.[35]
- W. somnifera is the most common and widespread species in the genus, and it may be found in the wild from the Mediterranean to South Africa, and from the Canary and Cape Verde Islands to the Middle East and Arabia, India, Sri Lanka, and southern China.[35]
- In warmer regions of Europe, it is grown in gardens, and in South Australia and New South Wales, it has become a weed. It is planted as a medical crop plant in India and worldwide, mostly for its fleshy roots.[36]
- *Withania somnifera* is found in all of South Africa's provinces, as well as Namibia, Botswana, Swaziland, and Lesotho. The western portions of the Northern and Western Cape Provinces, however, are devoid of it.[36]
- It may be found in a wide range of vegetation types from dry to wet places, including coastal vegetation, grassland (including termite mounds), karoo, savanna, scrubland, woodland, and thickets, as well as near water, such as on river banks.[36]
- It grows in both moderate shade and full sun, and is frequently found amid rocks, where the roots are kept cold. In disturbed regions, cultivated plains, and overgrazed pastures, it can unfortunately become a weed. This plant thrives at elevations of 15 to 2300 metres in southern Africa.[36]

DESCRIPTION

Withania somnifera is a small shrub to 2m high and to 1m across. Almost the whole plant is covered with short, fine, silver- grey, branched hairs. The stems are brownish and prostrate to erect, sometimes leafless below. The leaves are alternate (opposite or flowering shoots), simple, margins entire to slightly wavy, broadly ovate, obovate or oblong, 30-80mm long and 20-25 mm broad, narrowed into the 5-20mm long petioles, almost hairless and green above, densely hairy below.[46]

The 1-7 inconspicuous bisexual flowers appear at the leaf nodes on 2-5mm long stalks. The 5 lobed calyx is +/- 5mm long; in fruits it is +/- 20mm long, spherical or urn-shaped, membranous and 5-10- ribbed. The corolla is 5- robbed, narrowly campnualte, 5-8mm long and light yellow to yellow-green. The 5 stamens are yellow-orange and somewhat exserted.[49]

The fruit is a hairless spherical berry, 5-8mm across, orange-red to red when ripe and enclosed by the enlarged calyx. The neumerous seeds are very pale brown, 2.5mm across,+/- kidney-shaped and compressed with a rough, nettled surface.[47]

The southern Africa the flowering time is mostly from October to June, while the fruiting time is mostly from October to July.[47]

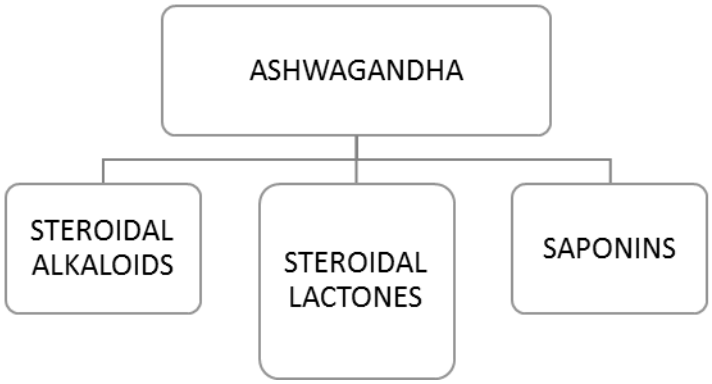
WITHIANIA SOMNIFER

can be recognized by the red fruit covered by the brownish, papery, inflated calyx. Collectors have described it as a bad-smelling bush with particularly strong-smelling roots and have also commented on the leaves that have a strong smell of greenish tomamtoes.[50]


[48]

PHYTOCHEMISTRY

More than 50 chemical compounds have been identified in various sections of the Ashwagandha plant (extraction is primarily done from the roots and leaves), with steroidal alkaloids, steroidal lactones, and saponins being the most important.[1]



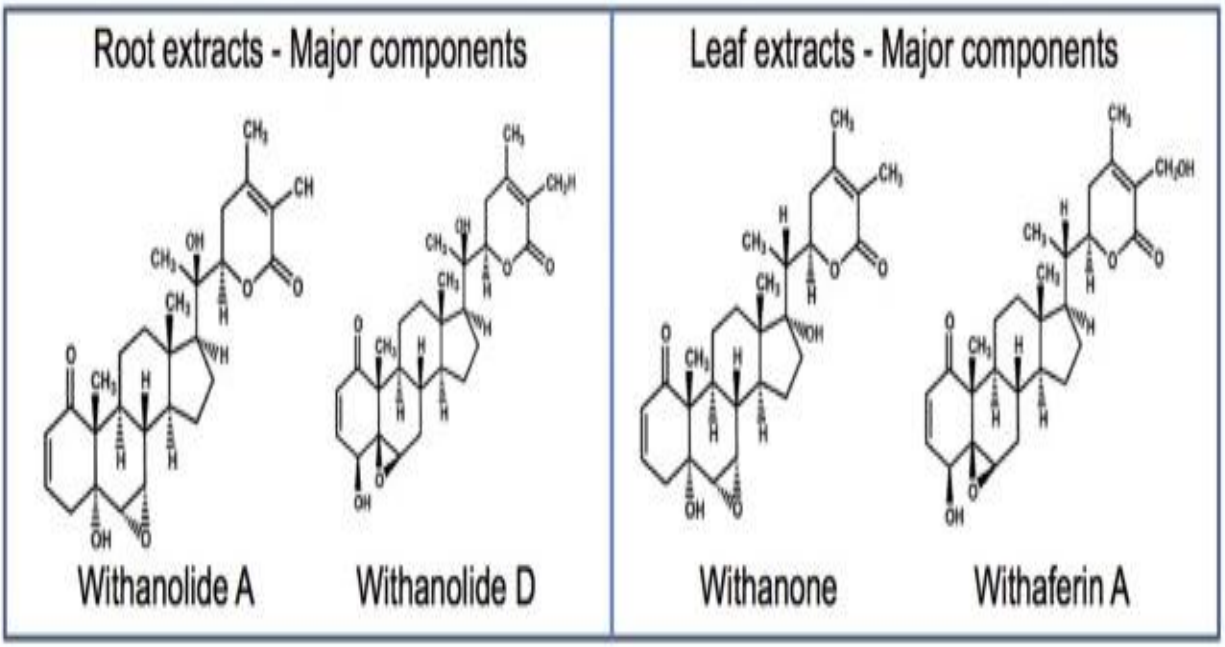
STEROIDAL ALKALOIDS	STEROIDAL LACTONES	SAPONINS
• WITHSONIFERINANIN E • SOMNIFERINE • SOMNINE • WITHANANINE • ISOPELLETIERINE • ANAFERINE • ANAHYDRINE • ASHWAGANDHIN--E • SITOINDOSIDES	• WHITANOLIDE (AtoY) • DEHYDRO-WITHANALIDE R • WITHASOMNIFERIN A • WITHASOMIDINONE • WITHASOMNIFEROLS (A to C) • WITHAFERIN A • WITHANONE	• SITOINDOSIDE VII &VIII

Alkaloids (ashwagandhine, cuscohygrine, anahygrine, tropine, etc.), steroidal compounds (including ergostane type steroidallactones), withaferin A, withanolides A-y, withasomniferin-A, withasomidienone, withasomniferols A-C, withanone, etc.) are among the biologically active chemical ingredients.[1]

Saponins with an extra acyl group (sitoindoside VII and VIII) and withanolides with a glucose at carbon 27 (sitoindoside IX and X) are further ingredients (3, 4).[3] Aside from these components, the plant also contains withaniol, acylsteryl glucosides, starch, reducing sugar, hantreacotane, ducitol, a variety of amino acids such as aspartic acid, proline, tyrosine, alanine, glycine, glutamic acid, cystine, tryptophan, and a significant level of iron. One of the main withanolidal active principles identified from the plant is withaferin A, which is chemically described as 4b,27- dihydroxy-5b-6b-epoxy-1-oxowitha-2, 24-dienolide.[6]

One of the primary withanolidal active principles extracted from the plant is withaferin A, also known as 4b, 27- dihydroxy-5b-6b-epoxy-1-oxowitha-2, 24-dienolide. WS showed chemogenetic variation and so far three chemotype I, II and III had been reported.[6] These are chemically similar, but their chemical contents differ, particularly in terms of withanolide content. In Indian variety thirteen Dragendroff positive alkaloids have been obtained.

- Ashwagandha contains anti-stress compounds such as acylsterylglucosides and Sitoindosides.[11]
- Active components of Ashwagandha, such as the sitoindosides VII-X and Withaferin-A, have been demonstrated to exhibit considerable anti-stress actions in acute stress models.[11]
- Many of its constituents support immunomodulatory actions.[13]



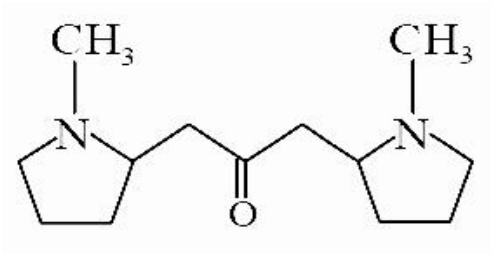
- withasomniferin-A and 5-dehydroxy withanolide-R were isolated from the aerial parts of *Withania somnifera*.[14] [16] [19]

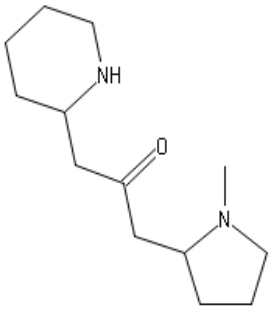
STRUCTURES

A.)E.gAloids such as (1.Cuscohygrine,2.Anahygrine,3.Tropine etc.)[19][23]

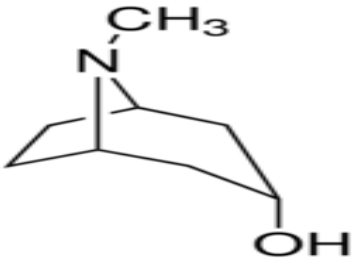
1.) Cuscohygrine

2.) Anahygrine



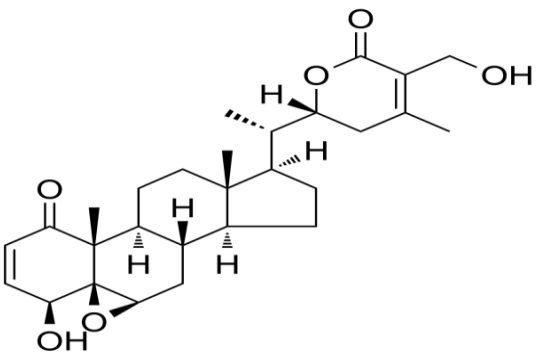


3.) Tropine

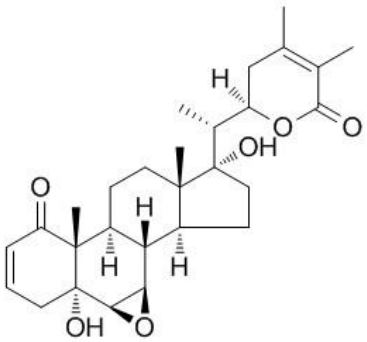


B.) Steroidal compounds:-such as (1.withaferin A,2.Withanolides A-y,3.withanone, etc.) are among the biologically active chemical ingredients.[19][23]

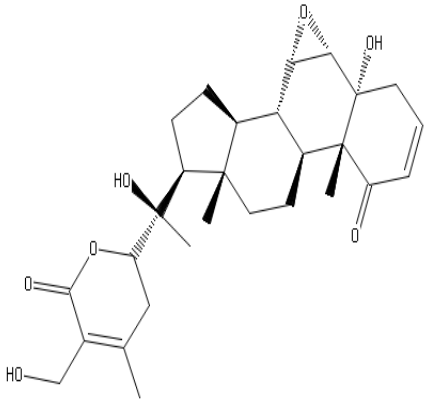
1.)Withaferin A

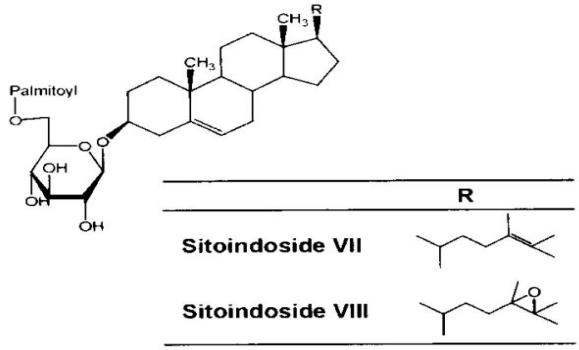


2.) Withanone



3.) Withasominiferols





C.) Saponins:-such as, SitoindisideVll and Vlll[19][23]

THE FLOKLORE

- Ashwagandha is considered to provide a stallion's power, stamina, and character in fokelore. This herb's nature is somewhat contradictory, as it is both relaxing and helpful to develop a balanced reaction to stress. It is traditionally used to enhance energy and vigour.[55]
- Sacred Ayurvedic scriptures dating back 3,000 to 4,000 years indicate the usage of Ashwagandha. It was classified as a rasayana plant, meaning it was traditionally used as a revitalising tonic. Many cultures have benefited from this plant. Alexander the Great and his army are reported to have made wine using Ashwagandha, which they drank to boost their vitality and strength. There is also a tradition

that Apollo discovered this plant and gave it to his son Asclepius, an ancient Greek hero of health and well-being.[56][57]

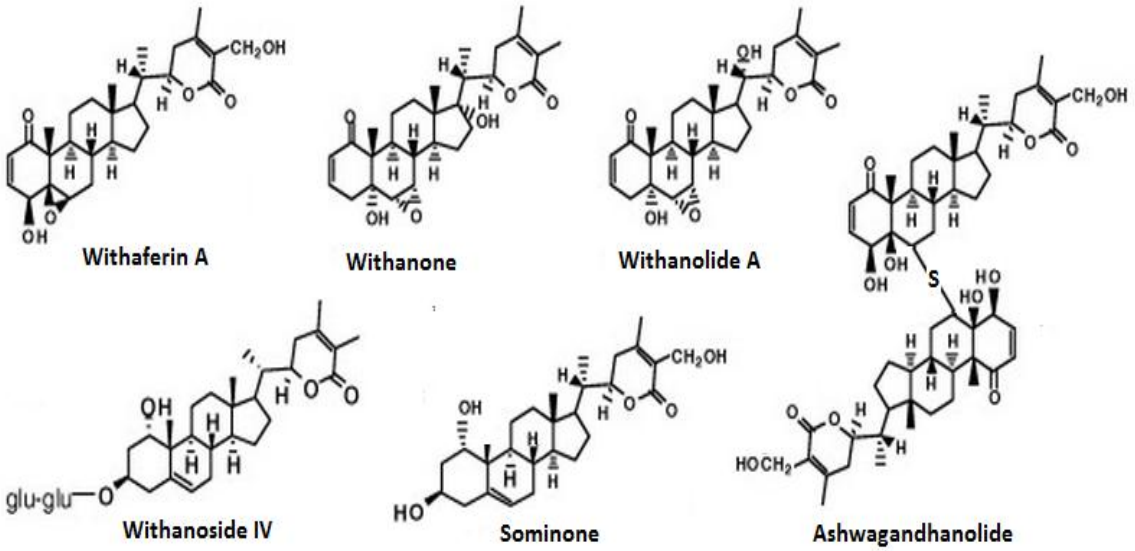
ETHNOPHARACOLOGICAL USES

- Fever, asthma, arthritis, rheumatism, inflammation, TB, mental ailments, and male sexual abnormalities have all been treated with Ashwagandha (*WITHANIA SOMNIFERA*) Roots in Indian traditional medicine.[53]
- The versatile usage of Ashwagandha offers a slew of other health benefits that are pertinent from a pharmacological standpoint.The goal of this analysis is to offer a detailed assessment of ashwagandha's botanical description and ethnobotanical usage. For traditional uses of ashwagandha extracts, an online poll was conducted. Appropriate data was acquired from a number of computerised scientific databases, as well as extra material on ashwagandha and its botany and ethnopharmacological applications.[58]
- Future online research is needed to better understand the bioactive processes of alkaloids and steroidal lactones chemicals, as well as their impacts on their dietary ingestion, so that we may improve human health protection against a variety of illnesses.[68]
- Ashwagandha roots have been used in Asian traditional medicine for over 3000 years to treat a variety of ailments.[60]
- This plant root is used as an aphrodisiac and for the treatment of asthma, inflammation, insomnia, anxiety, psoriasis, constipation, exhaustion, weakness, impotence, premature ageing, ulcers, and mental stress in around 200 formulations in Indian traditional medicine.[64]
- In the Ayurvedic and Unani systems of medicine, ashwagandha leaves are used to cure malignancies. The active molecule containing anolides in plant root extracts has powerful therapeutic effects such as antioxidant, immunomodulation, anti-ageing, adaptogenic, neuroprotective, and anticancer capabilities.[55]
- In Indian traditional medicine, doctors and healers thought that boiling ashwagandha root powder with milk would cure female infertility (Kirtikar and Basu, 1999). This plant's roots were traditionally used to boost youthful vigour and strength, as well as promote critical fluid production, blood muscle fat, semen, and cells.[59]
- Ashwagandha fruits are used as a bitter tonic for dyspepsia and newborn development, and they include a strong sedative, blood purifier, and diuretic agent. Ashwagandha leaves, according to Patwardhan, are used to treat painful swelling, fever, and opthalmitis. Additionally, this plant exhibited antiserotogenic and anabolic qualities, as well as helpful effects in the treatment of geriatrics, stress, and arthritis .Ashwagandha roots have also been utilised in Indian traditional medicine to help relax the mind and improve memory and vision.[65][69][63]

State - country - place	Plant parts	Local names	Ethnomedicinal use against/ as	Method of preparation	Route of administration/ dose
Andhra Pradesh - India - East Godavari	Root	Penneru	Combat anemia; increasing sperm count	Root powder with equal sugar; with sugar and ghee	Oral (twice few days); oral (daily once for 40 days)
Andhra Pradesh - India - East Godavari	Root	Pannerugadda	Astringent, aphrodisiac, nervine sedative, narcotic, diuretic, tonic, alterative, aphrodisiac, rheumatic swelling	–	Oral
Andhra Pradesh - India - Yavatmal	Whole plant	Ashwagandha	Arthritis, anxiety, insomnia, tumors, tuberculosis, asthma and chronic liver disease	–	Oral
Assam - India - Barpeta	Root	Aswagandha	Female infertility	Powder with tablet (Dron, Sidhelota, and Slilax) and Rangajoba juice	Oral
Assam - India - Morigaon	Leaves and roots	Achagandha	Leprosy	Paste	Topical
Bihar - India - Buxur	Root	Aswagandha	Diuretic	Seed decoction	Oral
Chhattisgarh - India	Root, leaf	Aswagandha	Sexual and general weakness, headache, pregnancy care, rheumatism, debility, aging, gonorrhea, ringworm, bed sores, hemorrhoids, abscesses and smallpox	Root powder, decoction, leaf paste, ash	Oral, topical
Chhattisgarh - India - Raigarh	Root	Aswagandha	Male sterility	Powdered root with milk	Oral, for 7 days
Chhattisgarh - India	Root	Aswagandha	Anti-snake venom	Aqueous	–
Haryana - India - Rohtak, Jhajjar, Bhiwani, Rewari, Faridabad, Sonipat, Mahendergarh	Stem bark	Asgand	Menstrual disorder	Powder with misri and water	Oral
Haryana - India - Jhajjar		Askin	Cough	–	–
Haryana - India - Mahendergarh	Seeds and leaves	Asgand	Hardness of mammary	–	–
Haryana - India - Jind	Leaf, root and fruit	Bambhol	Vagina related pain; painful swelling, boils and rheumatic pains	Root powder with sugar and milk; warm leaf	Oral; topical
Haryana - India -Jhajjar	Stem bark, root	Guga	Fever, cough asthma, migraine	Powder or paste	Oral, twice daily for 7 days Twice daily until cure
Himachal Pradesh - India - Solan	Leaves	Aswagandha	Weight loss	Raw leaves	Oral, chewed every alternate day for a month
Himachal Pradesh - India - Hamirpur	Seeds	Ashwagandha	Physical and mental weakness	Seed powder	Oral, with hot water for 10 days, twice a day
Himachal Pradesh - India - Hamirpur	Leaves and Roots	Ashvagandha	Diabetes	Leaf infusion and root powder	Oral
Himachal Pradesh - India - Keylong and surroundings	Roots	Ashvagandha, Asgandh	Tonic, hypnotic, diuretic, narcotic, sedative, abortifacient, rheumatism, cough, delay aging, graying of hairs, provide physical and mental strength	Powder	Oral, 200–500 mg of root powder with one glass of warm milk before sleep for 15 days
Jharkhand - India - Latehar	Roots	Ashvagandha	Venomous snake bite	Powder, with other plants	Oral, 1 mg of the powder is given to the victim 7 times at 3 min gap
Jammu and Kashmir - India - Udhampur	Leaves	Asgandh	Memory enhancer, obesity	Fresh leaves	Oral, chewing on an empty stomach
Jammu and Kashmir - India - Kathua	Leaves	Asgandh	Memory enhancer, obesity	Fresh leaves	Oral
Jammu and Kashmir - India - Udhampur	Stem	Asgandh	Leucorrhea	Dried finally chopped	Oral, 1 teaspoon stem with water on an empty stomach
Karnataka - India - Shimoga	Root	Ashvagandha	Diabetes	Powder	Oral, with water for 15 days
Karnataka - India - Chikmagalur	Root	Ashvagandha	Cardio vascular problems	Decoction	Oral, with root decoction of *F. microcarpa*
Karnataka - India - Chikmagalur	Root	Ashwagandha	Asthma	Decoction	Oral, with garlic and cow's milk, two to four times a day
Karnataka - India - Gulbarga	Root, leaves	Ashwagandhi	Aphrodisiac, ulcers, swellings	Root powder; leaf paste	Oral, with root powder of *E. echinatus*, mustard and

Karnataka - India - Gadaga	Leaves	Ashwagandha	Cough with sputum	Decoction, young leaves of the plants are crushed and boiled in water	Oral, twice a day for 3–5 weeks
Karnataka - India - Talacauvery and Kudremukh,	Root	Ashvagandha	General weakness	5 g of the powder in warm milk or water with sugar	Oral, twice daily for 2 weeks
Karnataka - India - Bellary	Root	Ashvagandha	Diabetes mellitus	100 g root with 50 g of fresh root bark of *Gymnema sylvestre* boiled in 500 ml of goat milk, dried in shade and dried	Oral, 3–4 gm of powder with cold water
Kerala - India - 14 districts	Seed	Amukkuram	Oligomenorrhoea	Pounded and cooked with rice as a form of porridge	Oral, at night time
Madhya Pradesh - India - Jhabua	Root, whole plant	Asgandh	Fever and weakness	Whole plant used as a tonic, root extract in milk	Oral, daily in the morning
Madhya Pradesh - India - East Nimar region	Root	Ashwagandha, Asgandh	Joint pain	Stem juice	Oral, mixed with warm water
Madhya Pradesh - India - West Nimar region	Root	Ashwagandha	Antibacterial, rheumatism, tuberculosis	–	Oral
Madhya Pradesh - India - Jhabua	Root, whole plant	Asgandh	Fever, weakness due to fever	Whole plant used as a tonic, root extract in milk	Oral, daily in the morning
Madhya Pradesh - India - Balaghat	Root	Ashwagandha	Male sterility, leucorrhoea, miscarriage	Decoction of root	Oral
Madhya Pradesh - India - Sidhi	Root	Ashwagandha	Leucorrhoea	5 g root powder with 250 g milk	Oral, once a day
Madhya Pradesh -	Leaves	Ashwagandha	Asthma	A teaspoonful of leaf paste	Oral, once daily in the
Madhya Pradesh - India - Jhabua	Root, whole plant	Asgandh	Fever, weakness due to fever	Whole plant used as a tonic, root extract in milk	Oral, daily in the morning
Madhya Pradesh - India - Balaghat	Root	Ashwagandha	Male sterility, leucorrhoea, miscarriage	Decoction of root	Oral
Madhya Pradesh - India - Sidhi	Root	Ashwagandha	Leucorrhoea	5 g root powder with 250 g milk	Oral, once a day
Madhya Pradesh - India - Anuppur	Leaves	Ashwagandha	Asthma	A teaspoonful of leaf paste mixed with a cup of cow's milk	Oral, once daily in the morning before breakfast for 21 days
Madhya Pradesh - India - Satna	Root	Ashwagandha	Anti-tumor, arthritis, asthma, cold and cough, conjunctivitis, diabetes, diuretic, epilepsy, insomnia, intestinal infections, leprosy, nervous disorders, tubercular glands, tumors, ulcer	–	Oral
Madhya Pradesh - India - Badwani	Root	Ashwagandha	Impotency	Sweet balls with dried leaves of *P. betle*	Oral, one ball daily at night
Maharashtra - India - Buldhana	Root	Ashwagandha, Askand	A nocturnal emission, weakness	2 spoonfuls of root powder with a cup of cow milk	Oral, in the morning for 21 days
Maharashtra - India - Buldhana	Root	Askand, Ashwagandha	Paralysis	Paste of root powder, milk, white of an egg and some edible oil	Topical, twice daily for body massage

PHARMACOLOGICAL USES OF *WITHANIA SOMNIFERA*

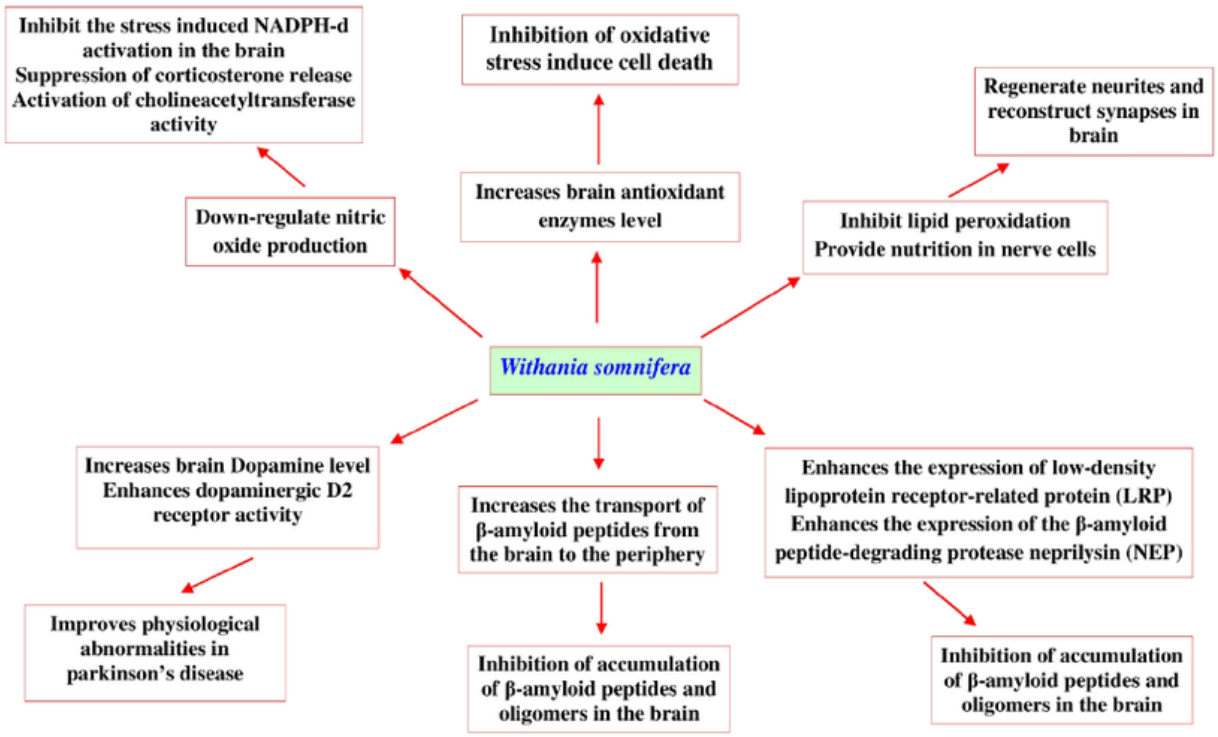


India's traditional medicinal system, Ayurveda, may be traced back to 6000 BC (Charak Samhita, 1949). For almost 6000 years, Ashwagandha has been used as a Rasayana. As a tonic, aphrodisiac, narcotic, diuretic, anthelmintic, astringent, thermogenic, stimulant, and anthelmintic, ashwagandha root is utilized.[12] The root of Ashwagandha is named for the fact that it smells like horses ("ashwa") (on consuming it gives the power of a

horse). Emaciation in children (when given with milk, it is the best tonic for children), old age debility, rheumatism, vitiated vata disorders, leucoderma, constipation, restlessness, neurological breakdown, goitre, and other diseases are all common applications.[17] To relieve inflammation, a paste produced by mashing roots with water is administered to the joints.

On a local level, it's also utilised to treat carbuncles, ulcers, and painful swellings. In combination with other treatments, the root is used to cure snake venom and scorpion stings. It also helps with leucorrhoea, boils, pimples, flatulent colic, worms, and piles. The Nagori Ashwagandha is the most powerful of all Ashwagandha varieties. You receive the best benefit from fresh Ashwagandha powder.[21]

Fevers and painful swellings are treated with the bitter leaves. Flowers have aphrodisiac, astringent, depurative, diuretic, and aphrodisiac effects. The seeds are antihelmintic, and when combined with an astringent and rock salt, they can help clear the cornea of white spots.[22] Ashwagandharishta, which is manufactured from it, is used to treat hysteria, anxiety, memory loss, syncope, and other ailments. It's also a stimulant that increases sperm production.[24]



1. Antioxidant effect

Using the fundamental free-radical scavenging enzymes, superoxide dismutase (SOD), catalase (CAT), and glutathioneperoxidase, the antioxidantactivity of the active principles of WS, sitoindosides VII-X and withaferin A (glycowithanolides), was investigated in the rat Geniusfrontal cortex and striatum (GPX). When the activity of these enzymes is diminished, damaging oxidative free radicals develop, resulting in degenerative effects.

An enlarge in these enzymeswould signify expanded antioxidant pastime and a defensive impact on neuronal tissue. When active glycowithanolides of WS were administered once a day for 21 days, dose-related increases in all enzymes were detected; the increases were similar to those reported with deprenyl (a well-known antioxidant). This shows that WS has an antioxidant effect on the brain, which might explain its diverse pharmacological effects. A increase in LPO was inhibited by using WS extract in the mouth.[10] Aside from hepatic lipid peroxidation (LPO), serum enzymes including alanine aminotransferase, aspartate aminotransferase, and lactate dehydrogenase were investigated as hepatotoxicity indicators.[38]

2. Anxiety and depression

The bioactive WSG, extracted from WS roots, was tested in rats for anxiolytic and depressive effects. The effects of WSG were compared to those of the benzodiazepine lorazepam for anxiolytic activity and the tricyclic antidepressant imipramine when taken orally every day for five days. WSG had an anxiolytic effect similar to lorazepam in the extended plus-maze, social interaction, and feeding latency in an unfamiliar setting tests. WSG reduced rat brain levels of tribulin, an endocoid marker of scientific anxiety, when the dosages were elevated following treatment with the anxiogenic drug pentylenetetrazole. WSG demonstrated an antidepressant effect similar to imipramine in the forced swim-induced

'behavioural despair' and 'learned helplessness' tests. The study supported the use of WS as a temper stabiliser in Ayurvedic anxiety and depression treatment.[1][15]

3. Anti-stress effects

Aswagandha is in contrast nicely with Eleutherococcus senticosus (Siberian Ginseng) and Panax Ginseng (Chinese / Korean Ginseng) in its adaptogenic properties, and for this reason it is popularly acknowledged as Indian Ginseng.[1] Large research on organic mannequins of animals have demonstrated Ashwagandha's adaptogenic / anti-stress capabilities, revealing it to be wonderful in enhancing stamina (physical endurance) and avoiding stress. -induced gastric ulcer, hepatotoxicity caused by carbon tetrachloride (CCl4), and death. In rats, Ashwagandha has a similar anti-stress effect). An aqueous solution of Ashwagandha root was used at a dosage of 100 mg/kg/oral dose. In rats subjected to cold swimming stress, plasma corticosterone levels, phagocytic index, and avidity index all increased significantly. These metrics were approaching manipulate levels in rats pretreated with the medication, and an increase in swimming time was noted. These findings imply that *Withania somnifera*, in its natural state, is an effective stress reliever. The results of the study back up Ayurvedic theories concerning tonics, vitalizers, and rejuvenators, showing scientific usage of *Withania somnifera* in the prevention and treatment of stress-related disorders such arteriosclerosis, premature ageing, arthritis, diabetes, hypertension, and cancer.[39]

4. Anti-tumor effect on Chinese Hamster Ovary (CHO) cells carcinoma

The efficiency of CHO cell colony formation was reduced by 49% when withania roots were used. It disables ringing on the phone and prevents cell phone attachment. Based on the cell density and length of Ashwagandha exposure, it resulted in long-term growth suppression of CHO cells. This information will be useful to oncologists who plan to use Ashwagandha as a "synergizer" with regular chemotherapy or radiation therapy.[5][6]

5. Effect on Urethane induced lung-adenoma in mice and other studies

The crude form of Ashwagandha was shown to be very beneficial in experimental carcinogenesis. It inhibited urethane-induced lung adenomas in mice. A number of urethane side effects were also prevented, such as leucopoenia. Urethane, a chemical stressor, has a plethora of undesirable side effects that Withania has managed to avoid. The drug can be used to treat cancer in combination with chemotherapy or radiation. It will not only have anti-cancer properties, but it will also lessen the side effects of anti-cancer medications, which are known to affect immunity and quality of life. WS also functions as an immunomodulator, extending the lives of cancer patients whose immune systems are compromised. Our findings suggest that it be used as an anti-tumor and immune-modulator agent.[41]

6. Effect on Central Nervous System Cognition Promoting Effect

Ashwagandha is a familiar Ayurvedic Rasayana which belongs to the Medhyarasayanas, a sub-group of Rasayanas. Medhya is a Sanskrit word that means "idea" and "mental/intellectual power." As a result, Medhya Rasayana, like Ashwagandha, is used to improve memory and concentration. Medhya Rasayanas have a particularly strong memory-enhancing effect on young individuals with memory problems, or when reminiscence is impaired due to a brain injury or a long illness, as well as in people of historical age.[20]

7. Effect on neurodegenerative diseases such as Parkinson's, Huntington's and Alzheimer's diseases

According to the findings of Genius neuropathological autopsy study, neurotic atrophy and synaptic loss are the most common causes of cognitive impairment in Alzheimer's disease patients.[2] Neurite atrophy has also been recognised as a significant component of the pathogenesis in the brains of patients with various neurodegenerative diseases such as Parkinson's disease, Huntington's disease, and Creutzfeldt-Jakob disease.[20] Ashwagandha has been shown in scores of studies to reduce, halt, reverse, or abolish neuritic atrophy and synapse loss. As a result, Ashwagandha can be used to treat Huntington's disease, Parkinson's disease, Alzheimer's disease and other neurological illnesses at any stage of the disease, even before a person is diagnosed and is still experiencing slight forgetfulness, etc. In an Alzheimer's disease rat, glycowithanolides withaferin-A and sitoindosides VII–X derived from Ashwagandha roots effectively corrected the cognitive abnormalities produced by ibotenic acid.[25]

Ashwagandha is a common element in Ayurvedic tonics since it is characterised as a nervine tonic in Ayurveda. Users of Ayurvedic tonics, rejuvenators, and vitalizers tend to have improved immunity and endurance.[7]

Pretreatment with Ashwaganda extract prevented all changes in antioxidant enzyme activities, catecholamine content, dopaminergic D2 receptor binding, and tyrosine hydroxylase expression precipitated with the help of 6-hydroxydopamine (6-OHDA) in rats (an animal mannequin for Parkinson's disease) in a dose-dependent manner. As a result of these findings, Ashwagandha might be useful in avoiding neuronal damage in Parkinson's disease patients.[40]

8. GABA-mimetic effect on neurodegeneration and neuroregenerative potential

The GABA-mimetic effect of Ashwagandha root extract has been assisted by behavioural studies. GABAergic neurodegeneration due to neuroleptic-induced excitotoxicity and oxidative stress is one of the etiopathological routes in the pathophysiology of tardive dyskinesia, and GABA agonists have been demonstrated to be useful in reducing the symptoms of tardive dyskinesia. It's probable that the impact of Ashwagandha root extract is due to its GABA mimicking properties. Ashwagandha, its components, and the metabolites of its parts stimulate nerve growth after 7 days of administration.[42]

Researchers discovered that long-term oral therapy with withanoside IV decreased axonal, dendritic, and synaptic losses, as well as memory impairments, induced by amyloid peptide A[25–35] in an intriguing study. After oral administration of withanoside IV, mice developed sominone, which resulted in considerable neurite and synaptic repair, as well as enhanced axonal and dendritic outgrowth and synaptogenesis. After the withanoside IV therapy was terminated, these effects lasted at least 7 days. These results imply that withanoside IV and its metabolite, sominone, might be useful antidementia drugs.[38]

9. Anxiolytic effect

In all three common Anxiety tests: the extended plus-maze, social interaction, and feeding latency in an unknown setting, Ashwagandha exhibited a soothing anxiolytic effect that was similar to the medication Lorazepam. Furthermore, both Ashwagandha and Lorazepam lowered rat talent tiers of tribulin, an endocoid marker of medical anxiety, when the stages of tribulin, an endocoid marker of medical anxiety, were accelerated following treatment with the anxiogenic medication pentylenetetrazole.[1]

10.Effect on Energy levels and Mitochondrial Health

The impact of Ashwagandha on glycosaminoglycan synthesis in the granulation tissue of carrageenin-induced air pouch granuloma was previously studied. Ashwagandha has been demonstrated to have a strong inhibitory impact on the integration of ribosome -35S into granulation tissue. Granulation tissue mitochondria used to have an uncoupling effect on oxidative phosphorylation (a reduction in the ADP/O ratio). In addition, Ashwagandha has been shown to affect Mg2 established ATPase recreation. Ashwagandha also reduced the activity of the succinate dehydrogenase enzyme in the mitochondria of granulation tissue.[33]

11. Anti-arthritic effect

Ashwagandha is a pain-relieving herb that calms the nervous system. Ashwagandha's anti-arthritic properties are now well-known and well-documented, and it's also been discovered to be useful as an antipyretic and analgesic.

For a rat experiencing warmness analgesia caused by the warm plate technique, ashwagandha (1000 mg/kg/oral) provided a good-sized analgesic pastime. At the second hour after administration, Ashwagandha had a height analgesic effect of 78.03 percent.[39]

12. Sexual behavior

In rats, a methanolic root extract of WS was given orally at a dosage of 3000 mg/kg/day for 7 days. By matching every man with a receptive female 7 days previous to treatment, day 3 and 7 of treatment, and day 7, 14, and 30 post-treatment, their sexual behaviour was assessed. WS root extract dramatically decreased libido, sexual performance, sexual vigour, and penile erectile dysfunction. If the medicine was stopped, these negative effects might be partially reversed. This antimasculine effect is currently linked to the extract's hyperprolactinemic, GABAergic, serotonergic, or sedative actions rather than changes in testosterone levels.[7][8]

13. Tolerance and dependence

Drug addiction, is one of the world's essential fitness problem, with massive direct fitness costs. Tolerance and withdrawal symptoms were created by chronic treatment with benzodiazepines, ethanol, or opioids. Tolerance and withdrawal caused by benzodiazepines, ethanol, and opioids have also been inhibited by a polyherbal formulation including WS as one of its ingredients. Surprisingly, repeated treatment of WS for nine days reduced the development of tolerance to morphine's analgesic effect. WS also reduced morphine withdrawal leaps, which are a symptom of increasing opiate dependency as measured by naloxone precipitation withdrawal on day 10 of the trial.[60] The studies printed that the chronic administration of the WS did now not show off any dependence-liability of its own, even upon an abrupt cessation. These findings might also have clinical implications besides producing tolerance and withdrawal consequences on long-term use.[41]

14. Antibacterial effect

When evaluated in vitro using the Agar Well Diffusion Method, both aqueous and alcoholic extracts of the plant (root and leaves) were found to have significant antibacterial activity against a range of bacteria.[5] The butanolic sub-fraction of the methanolic extract wasdemonstrated to have the strongest inhibitory effect against a number of bacteria, including Salmonella typhimurium, after it was subfractionated using a variety of solvents. Furthermore, unlike the synthetic antibiotic chloramphenicol, when these extracts were incubated with human erythrocytes, they did not produce lysis, indicating that they are safe for living cells. Salmonella

infection was efficiently eliminated in Balb/C mice after oral therapy with aqueous extracts, as demonstrated by increased survival rates and decreased bacterial load in a range of key organs. Using an agar plate disc-diffusion assay, methanol, hexane, and diethyl ether extracts from WS leaves and roots were examined for antibacterial/synergistic activity against Salmonella typhimurium and Escherichia coli.[33]

15. Heart health

Some people take ashwagandha to improve their heart health by decreasing high blood pressure, lowering cholesterol, and relieving and avoiding chest discomfort. However, there is little evidence to back up these claims. According to a human research, ashwagandha root extract may increase cardiorespiratory endurance, which may improve heart health. More research, however, is required.[21]

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