

“A Review: Studies on Immunomodulatory Activity of Withania Somnifera (Ashwagandha)”

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ABSTRACT:

Withania Somnifera (Ashwagandha) is an herb used in ayurvedic medicine. Withania Somnifera also known as ashwagandha, Indian ginseng, poison gooseberry, or winter cherry, is an annual evergreen shrub in the Solanaceae or nightshade family that grows in India, the Middle East, and parts of Africa. Ashwagandha contains chemicals that might help calm the brain, reduce swelling, lower blood pressure, and alter the immune system. Ashwagandha is very famous herbs in Ayurveda and well-known for its action as Aphrodisiac. Ashwagandha is commonly known as his Latin name Withania Somnifera, herbs are known as well as Indian ginseng and Winter cherry. Ashwagandha are used for many physical and mental health and providing defense against many diseases. Ashwagandha also act as immunomodulator. The plant has also been widely studied for their various pharmacological activities like antioxidant, anxiolytic, adaptogen, memory enhancing, antiparkinsonian, anti-inflammatory, antitumor properties. Various other effects like immunomodulation, hypolipidemic, antibacterial, cardiovascular protection, sexual behavior, have also been studied. Because Ashwagandha is a prescribe as an Immunomodulatory.

Keywords: Withania Somnifera, *Solanaceae*, Immunomodulator, Ayurveda, Rasayana, Withanolide, Multimodal effect

I. INTRODUCTION: - WITHANIA SOMNIFERA (ASHWAGANDHA)

◦ Withania Somnifera known commonly as ashwagandha, Indian ginseng, poison gooseberry, or winter cherry, is an annual evergreen shrub in the Solanaceae or nightshade family that grows in India, the Middle East, and parts of Africa. Ashwagandha contains chemicals that might help calm the brain, reduce swelling, lower blood pressure, and alter the immune system. Ashwagandha is very famous herbs in Ayurveda and well-known for its action as Aphrodisiac. Ashwagandha is commonly known as his Latin name Withania Somnifera.

◦ In Ayurveda it is mentioned as Rasayana (Rejuvenate), used for promoting physical and

mental health and providing defense against different disease, slowing the ageing process, revitalizing the body in such severe conditions, it increases the capability of the individual to resist adverse environmental factors and by creating a sense of physical and mental wellbeing.

◦ Withania Somnifera (Ashwagandha) is an herb used in ayurvedic medicine.

◦ The traditional medical practitioners widely use Indian medicinal plant Withania Somnifera (Ashwagandha) natural constituents, called Withanolide for curing various diseases.

◦ Ashwagandha is very famous herbs in Ayurveda and well-known for its action as Aphrodisiac. Ashwagandha is commonly known as his Latin name Withania Somnifera, herbs are known as well as Indian ginseng and Winter cherry.

◦ The chemical profile of several extracts and formulations of WS has been well documented in previous studies. Briefly, Withanolide (steroidal lactones), the main phytochemical of WS, play a central role in exhibiting multimodal effects synergistically. These are a group of C₂₈-steroidal lactone triterpenoids, which majorly include withaferin A, Withanolide A, B, and D, Withanoside IV and V, withasomniferin a, withanone, sitoindosides IX and X, 12-deoxywithastramonolide, etc. Moreover, other polyphenones including catechin, naringenin, syringic acid, and p-coumaric acid were also found in significant quantities in WS extracts. A combination of such versatile phytochemicals potentiates WS as a strong therapeutic agent.

◦ *Withania Somnifera* (Ashwagandha/WS) is one of the extensively prescribed botanicals in Ayurveda practice for its multimodal effect. The diverse pharmacological activities including Immunomodulatory, anti-inflammatory, antioxidant, anti-stress, antihypertensive, and antidiabetic along with organ-protective effects have been studied extensively by researchers.

II. PLANT PROFILE

Withania Somnifera commonly known as Ashwagandha belonging to the family *Solanaceae*. Ashwagandha (*Withania Somnifera*), also known as Indian ginseng, Winter cherry, Ajagandha, Kanji.

Synonyms:

- Latin Name : *Withania Somnifera*
- Sanskrit name : Ashwagandha, Balada, Kamrupini, Gandhpatri,
- Hindi name : Asgandha, Asgandha.

Etymology :

The species name "Somnifera" means "sleep-inducing" in Latin. The name "ashwagandha" is a combination of the Sanskrit words 'Ashva', meaning horse, and 'Gandha', meaning smell, reflecting that the root has a strong horse-like odor.



Figure: Withania Somnifera

TAXONOMICAL CLASSIFICATION

Kingdom	: Plantae
Order	: Solanales
Division	: Magnoliophyta
Family	: Solanaceae
Class	: Magnoliopsida
Genus	: Withania
Species	: Somnifera

MORPHOLOGICAL CHARACTERS:

This species is a short, tender perennial shrub growing 35–75 cm (14–30 in) tall. Tomentose branches extend radically from a central stem. Leaves are dull green, elliptic, usually up to 10–12 cm (3.9–4.7 in) long. The flowers are small, green and bell-shaped. The ripe fruit is orange-red. It is a dense, hairy, erect, grayish-tomentose herb or under-shrub, grows up to a height of 1.5 meter. It's all parts are covered with whitish, stellate trichomes. Branching is extensive; leaves are simple, alternate or sub-opposite, ovate, entire, basis cuneate, 10 cm

long. The roots are stout, long tuberous, fleshy, and whitish-brown.

- Color - Grayish yellow
- Odour - Faintly pungent and characteristic
- Taste - Mucilaginous, acrid and bitter
- Size - length 10 – 17mm, Width 6-12mm
- Shape- Conical or Cylindrical, straight

CULTIVATION:

Withania Somnifera is cultivated in many of the drier regions of India. It is also found in Nepal, Sri Lanka, China, and Yemen; it prefers dry stony soil with sun to partial shade. To propagate it can be grown from seed in the early spring or from greenwood cuttings in the later spring.

Climate & Soil: - Ashwagandha is grown on sub-marginal waste lands and low fertility areas. Plant grows well in red, sandy, black and loamy soil with pH 6.5- 8.0 with good water drainage. It can be cultivated up to altitudes of 1000 meter. Ashwagandha prefers a sub-tropical climate. The semitropical areas receiving 500-750 mm rainfall are suitable for cultivation of this crop. The crop requires dry season during the growing period. Temperature between 20° C to 35° C is most suitable for its cultivation. Late winter rains are conducive for the proper development of the plant roots.

CHEMICAL CONSTITUENTS:

Chemical constituents of WS are always of an interest for the researchers. The biologically active chemical constituents are alkaloids (ashwagandha, Cusco hygrine, Anahygrine, atropine etc), steroidal compounds, including ergostane type steroidal lactones, withaferin A, Withanolide A-y, withasomniferin-A, withasomidienone, withasomniferols A-C, withanone etc. Other constituents include saponins containing an additional acyl group (sitoindosides VII and VIII), and Withanolide with a glucose at carbon 27 (sitoindosides IX and X). Steroidal alkaloids: Anafarin, Withania, Tropin, Anahygrine, Colin, etc... Steroidal lactones: Withanolide, withaferin, Withaferin A, withanone... The roots are main part of the plant that is widely used as therapeutic agents. main phytochemical constituents are Withanolide – are triterpene lactones – withaferin which A, alkaloids, steroidal lactones, atropine, and Cusco hygrine. Some 40 Withanolide, 12 alkaloids, and numerous sitoindosides have been isolated.

Medicinal plants are of great importance to health of individuals and communities. The medicinal plant products, which are derived from plant parts such as stem, bark, leaves, fruits and seeds have been part of phytomedicine that produce a definite physiological action on human body. The most important of these natural bioactive

constituents of plants are alkaloids, tannins, flavonoids and phenolic compounds. Ashwagandha roots contain crude fibre 21.0 to 25.0 %, starch 6.09 to 9.46 mg/g, tannins 0.39 to 0.82 mg/g, minerals K, Mn, Na, Fe, Zn, Cu, Al, Ca, Cd & Ni, total sugars 2.52 to 9.52 mg/g, reducing sugars 0.15 to 2.10 mg/g and non-reducing sugars 2.37 to 7.62 mg/g.

MEDICINAL USES:

Ashwagandha is an ancient medicinal herb with multiple health benefits. It can reduce anxiety and stress, help fight depression, boost fertility and testosterone in men, and even boost brain function. Different treatments make use of different parts of the plant, including the leaves, seeds, and fruit. In ayurvedic medicine, ashwagandha is considered a Rasayana. This means that it helps maintain youth, both mentally and physically. For example, people use ashwagandha to help treat the following: stress and anxiety, arthritis, heart health, Alzheimer's treatment, cancer etc.

Durin Research study Ashwagandha uses are following:

1. Benefiting athletic performance
2. Reducing stress and anxiety
3. Reducing symptoms of some mental health conditions
4. Boosting testosterone and increasing fertility in men
5. Lowering blood sugar levels
6. Reducing inflammation
7. Improving brain function, including memory
8. Helping improve sleep

THERAPEUTIC USES OF WITHANIA SOMNIFERA:

Withania Somnifera Dunal and Withania Somnifera Kaur are the two sub-species of the plant. Withania Somnifera is one of the major herbal components of geriatric tonics mentioned in Indian systems of medicine. In the traditional system of medicine Ayurveda, this plant is claimed to have potent aphrodisiac rejuvenate and life prolonging properties. It has general animating and regenerative qualities and is used among others for the treatment of nervous exhaustion, memory related conditions, insomnia, tiredness potency issues, skin problems and coughing. It improves learning ability and memory capacity.

IMMUNOMODULATORY ACTIVITY:

Immunomodulatory refers to the ability of a substance or treatment to modify or regulate the immune system's response.

Immunomodulatory effects can be:

1. Immunoenhancing: Stimulating the immune system to increase its response.

2. Immunosuppressive: Reducing the immune system's response to prevent excessive or harmful inflammation.

◦ Immunomodulatory substances or treatments are used to:

1. Prevent or treat diseases: Such as autoimmune disorders, allergies, or infectious diseases.

2. Enhance cancer treatment: By stimulating the immune system to attack cancer cells.

3. Reduce inflammation: In conditions such as arthritis or inflammatory bowel disease.

◦ Examples of immunomodulatory substances include:

1. Herbal supplements: Such as ashwagandha, turmeric, or ginger.

2. Pharmaceuticals: Such as immunosuppressive drugs or biologics.

3. Probiotics: Live microorganisms that can modify the immune system's response.

Immunomodulators are drug treatments that change your body's immune response. Your immune system is a vast network of organs, WBC, proteins and other chemicals that protect you from threats. Germs and diseased cells, like cancer cells, cause a healthy immune system to spring into action to fight.

Several conditions can prevent your immune system from working to protect you. When this happens, you may need an immunomodulator to help your immune system work more effectively.

- **Increase your immune response.** For example, immunomodulators treat cancer by helping your immune system destroy cancer cells.

- **Decrease your immune response.** These immunomodulators are called immunosuppressants. An immunomodulator is a substance that modifies, or modulates, the immune system to help your body respond to a disease or illness.

- Different immunomodulators can affect different parts of the immune system. Some types act very broadly, while others only target very specific pathways. Immunomodulators can also take many different forms. Some may be relatively small molecules, while others may take the form of larger proteins such as monoclonal antibodies

III. METHOD:

Immunomodulatory Activity Ashwagandha showed a significant modulation of immune reactivity in animal models. Ashwagandha has been shown to modulate immune responses by enhancing the activity of natural killer cells, macrophages, and T – cells. Administration of Ashwagandha was found to prevent myeloid-suppression in mice treated with three immunosuppressive drugs viz. cyclophosphamide, azathioprine, and prednisolone. Administration of Ashwagandha extract was found to

significantly reduce leukopenia induced by cyclophosphamide (CTX) treatment. Administration of Ashwagandha extract was found to significantly reduce leukopenia induced by sub lethal dose of gamma radiation. Withaferin A and Withanolide E exhibited specific immunosuppressive effect on human B and T lymphocytes and on mice thymocytes. Withanolide E had specific effect on T lymphocytes whereas Withaferin A affected both B and T lymphocytes, Because Ashwagandha is a prescribe as an Immunomodulatory.

Further studies have also shown ashwagandha to be effective in the treatment of osteoarthritis, inflammation, stroke, and tardive dyskinesia. Ashwagandha has been shown to be a potential antimicrobial agent, with antifungal activity, and moderate antibacterial activity against *Staphylococcus aureus* and *Pseudomonas Aeruginosa* bacteria strains. Ashwagandha is an analgesic that soothes nervous system from pain

response. The powerful anti-arthritic properties of Ashwagandha are now widely accepted and documented; it is furthermore found to be effective as antipyretic as well as analgesic also.

Phytochemistry: -The root of *Withania Somnifera* has more than 35 chemical constituents. The plants are rich in photochemical such as alkaloids, steroids, terpenoids, etc., The chemistry of *Withania* species has been extensively studied and several groups of chemical constituents such as steroidal lactones, alkaloids, flavonoids, tannin etc. have been identified, extracted, and isolated. Ashwagandha is distinguished by its abundant phytochemical makeup. The raw material displays a varied composition of chemical compounds depending on its location. **Withanolide and alkaloids** are its active ingredients which are essential to its pharmacological action.

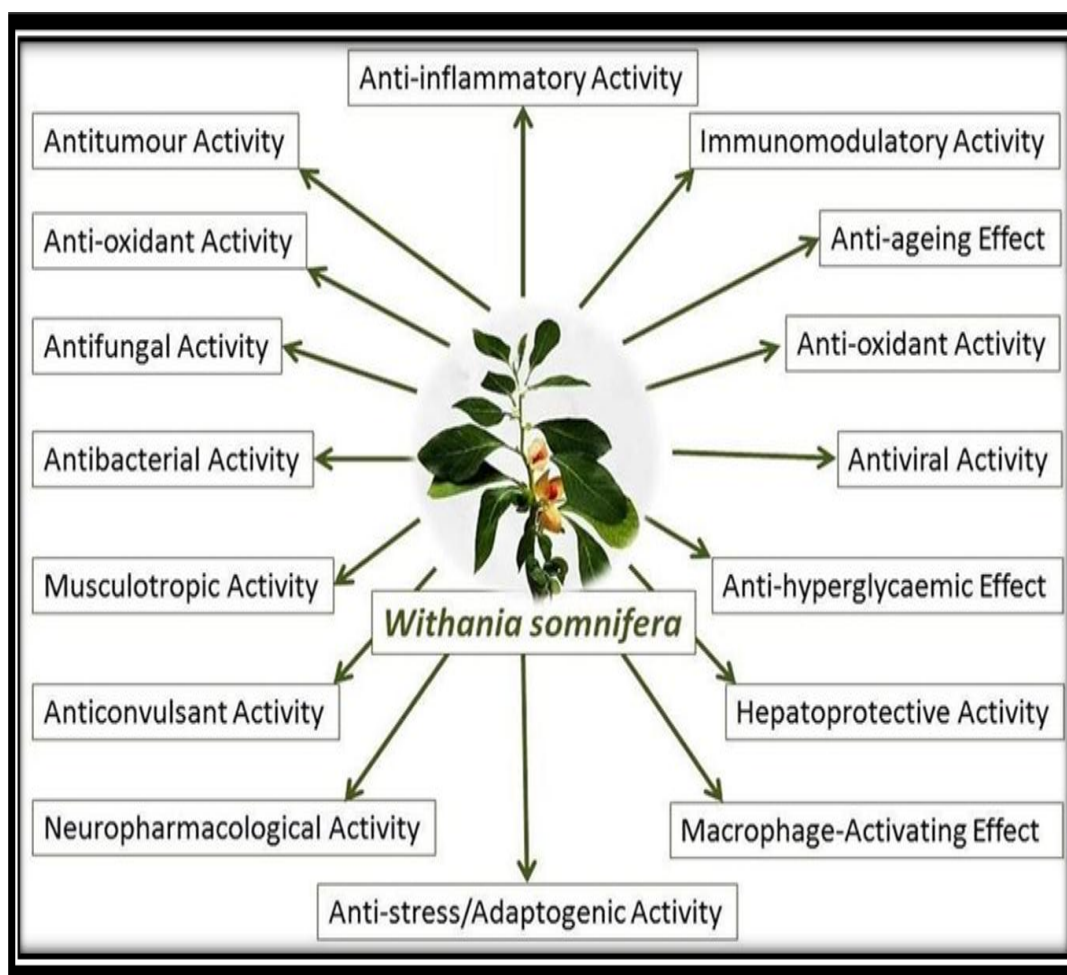


Figure: Pharmacological activities of Ashwagandha (W. Somnifera)

IV. CONCLUSION:

Ashwagandha has been shown to modulate immune responses by enhancing the activity of

natural killer cells, macrophages, and T –cells. *Withania Somnifera* (Ashwagandha) is a plant used in medicine from the time of Ayurveda, the ancient

system of Indian medicine. The plant has also been widely studied for their various pharmacological activities like antioxidant, anxiolytic, adaptogen, memory enhancing, antiparkinsonian, anti-inflammatory, antitumor properties. Various other effects like immunomodulation, hypolipidemic, antibacterial, cardiovascular protection, sexual behaviour, have also been studied. Although the results from this review are quite promising for the use of WS as a multi-purpose medicinal agent. Ashwagandha is a prescribe as an Immunomodulatory.

Somnifera L.: Insights into the phytochemical profile, therapeutic potential, clinical trials, and future prospective.

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