Ashwagandha: A Review on The Medicinal Properties and Pharmacological Uses of Ashwagandha (*Withania Somnifera*)

Akanksha Kendre[1], Dnyaneshwari Nikat[2], Bhumi Gaikwad[3], Vilasini R. Pandav[4]
[1,2,3,4]*IVM's Krishnrao Bhegde Institute of Pharmaceutical Education and Research Department: Pharmacognosy*

***Abstract*—*Withania somnifera* belongs to the family *Solanaceae* and is commonly known as Ashwagandha. Ashwagandha has a long tradition of use in Ayurvedic Medicine. Ashwagandha is a very popular medicinal herb originated mainly in India. Ashwagandha, the iconic drug of Ayurveda with a long-standing historical legacy, finds synergistic use in a long range of therapeutic applications. This review paper is presented to compile all the updated information on its phytochemical and pharmacological activities. It is the one of the ingredients in many formulations to increase energy, improve overall health. A class of phytochemicals which are utilized as a main constituent in many formulations that referred a sedative, diuretic, mitigating mainly use for boosting up energy. Ashwagandha being a natural herb possess numerous medicinal benefits for the human body. It can be easily cultivated in home lawns thereby increasing its socio-economical utility. The herb is enriched with many unidentified, unbelievable and miraculous properties**

Index Terms*—Ashwagandha, Ayurvedic, *Withania Somnifera

I. INTRODUCTION:

The raw material used in medicine is the root, and the name "Ashwagandha" is derived from the word "ashwa", meaning horse. It is believed that after consuming the root, one gains powers similar to that of a horse. The second part of the name "gandha," means fragrance and refers to the characteristic smell of the fresh root of the plant. This is evidenced by its adaptogenic effects and medicinal uses—the so-called "rasayana".

Ashwagandha is widely distributed in India, the Middle East, and some parts of Africa. It is highly valued because of its adaptogenic, rejuvenating, antioxidant, anti-inflammatory, antistress, neuroprotective, and immunomodulatory properties. Different parts of the plant, especially the roots and leaves, are used in traditional and modern medicine for treating various diseases and improving general health.

In recent years, Ashwagandha has gained global attention due to increasing scientific evidence supporting its pharmacological and therapeutic activities. Research studies have shown that the plant contains numerous biologically active compounds responsible for its medicinal properties.

Research on Ashwagandha has also shown promising results in the management of several chronic and neurodegenerative diseases, including Alzheimer's disease, Parkinson's disease, arthritis, diabetes mellitus, cardiovascular disorders, anxiety disorders, and certain types of cancer. Its neuroprotective properties have generated particular interest due to the increasing prevalence of age-related neurological disorders worldwide.

In addition to its medicinal value, Ashwagandha is widely used as a dietary supplement and health tonic to improve stamina, muscle strength, sleep quality, reproductive health, and overall quality of life. The increasing global demand for herbal medicines and natural therapeutic agents has further enhanced the importance of Ashwagandha in modern healthcare systems.

Despite its extensive traditional use and growing scientific evidence, further clinical studies and standardization of extracts are necessary to establish its long-term safety, efficacy, optimal dosage, and mechanisms of action. Therefore, Ashwagandha continues to be an important subject of

pharmacological and clinical research.

This review article aims to provide comprehensive information regarding the phytochemistry, pharmacological activities, biological effects, medicinal applications, therapeutic potential, and future prospects of Ashwagandha (Withania somnifera).

Figure 1 below shows the comprehensive health benefit of Ashwagandha.

Taxonomical Classification:

Class	*Magnoliopsida*
Kingdom	*Plantae*
Scientific Name	*Withania somnifera*
Common Name	*Ashwagandha*
Species	*Somnifera*
Domain	*Eukaryota*
Family	*Solanaceae*
Genus	*Withania*
Order	*Solanales*
Division	*Magnoliophyta*
Subclass	*Asteridae*
Superdivision	*Spermatophyta*

II. THE MORPHOLOGY OF ASHWAGANDHA PLANT:

History: -

In recent years, there has been a growing interest in the potential health benefits of Ashwagandha, particularly in the areas of stress management, cognitive function, and physical performance. The use of Ashwagandha in Ayurvedic medicines dates back more than 3000-4000 years and traces its origins to the ancient teachings of a revered Rishi (sage) Punarvasu. It is mentioned in ayurvedic texts such as the Charaka and Sushruta Samhita's where it is widely pressed as a tonic against weakness especially for people of all ages including infants and as an improver of the reproductive function in both men and women. Studies have suggested that Ashwagandha may exhibit cardioprotective properties, be helpful in the treatment of sleep disorders, improve stress resilience, reduce anxiety, be helpful in hypothyroidism, and enhance muscle strength and recovery.

Cultivation and collection: -

Withania somnifera is propagated by division of cuttings or seeds. The best way to propagate them is by seed. Seeds sown on moist sand will germinate in 14-21 days at 200°C. *Withania somnifera* needs full sun to partial shade with a well-drained slightly alkaline soil mix. Plants do best when the soil pH is 7.5-8.0. A soil mix consisting of two parts sandy loam to one part sand will be better. Plants are allowed to dry thoroughly between waterings. Too much water in containers causes root rot. The plants are fertilized once a year with a balanced fertilizer.

Characteristics

A low growing plant, often reaching only 1-2 feet but occasionally 6 feet. It is a perennial but can be grown as an annual.

The plant and fruits resemble its relatives ground cherries and Chinese lantern. Young roots are straight, unbranched and conical and in pieces of various lengths. Root thickness varies with age and is usually 5–12 mm below the crown. The outer surface is yellowish-brown to yellow and longitudinally wrinkled. The taste is bitter and slimy.

Biological Activity

1. Ashwagandha Use in Alzheimer's Disease:

Over the course of Alzheimer's disease, an abnormal deposition of β-amyloid protein in the brain is observed. In its fibrillar form, it has a neurotoxic effect because it induces the formation of free radicals and impairs glucose transport in neurons, which leads to cell damage and death. In studies conducted on human nerve cells, Ashwagandha has been shown to neutralize the toxic effects of β-amyloid.

2. Ashwagandha Use in Parkinson's Disease:

In Parkinson's disease, the degeneration of the dopaminergic neurons of the nigrostriatal system is observed. This leads to an imbalance between dopamine's inhibitory action and acetylcholine and glutamic acid's excitatory action. It was observed that administration of Ashwagandha significantly reduced lipoperoxidation, increased glutathione concentration, increased glutathione S-transferase.

3. Anti Inflammatory/Immunomodulatory Effects

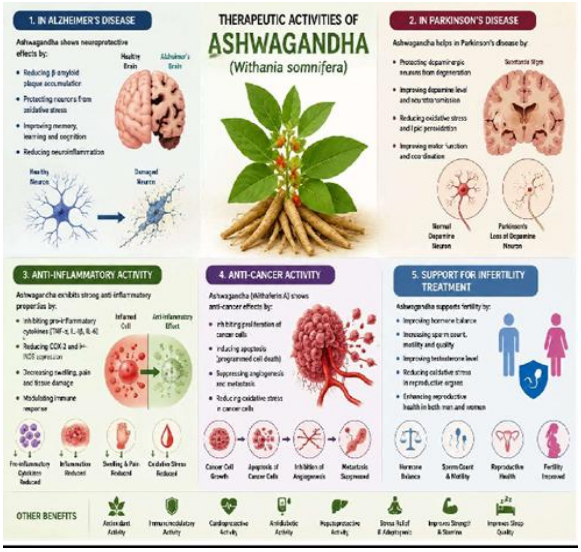
Due to its properties, *Withania somnifera* is being studied for the treatment of many diseases associated with inflammation in the body, such as cardiovascular, pulmonary, and autoimmune diseases and diabetes, cancers, and neurodegenerative diseases. It contains active compounds known as withanolides, which possess strong anti-inflammatory and antioxidant properties

4. Anticancer Activity

Research studies indicate that compounds such as Withaferin A possess anticancer properties. Ashwagandha may inhibit the growth of cancer cells, induce apoptosis (programmed cell death), and reduce tumor progression. It is being studied for potential use in breast, lung, colon, and prostate cancers.

5. Support for Infertility Treatment

The definition of infertility given by the World Health Organisation (WHO) states that it is the inability to achieve pregnancy within 1 year. The administration of Ashwagandha in the form of powdered root also significantly improved semen parameters. There was an increase in sperm count, improvement in sperm morphology, an increase in sperm volume, which also increased the possibility of pregnancy in women.



Dietary and Ayurvedic Uses of Ashwagandha

In Ayurveda, Ashwagandha is not only used as a medicinal herb but also as a nutritional health supplement to improve strength, vitality, and overall wellness. Traditionally, the powdered root of Ashwagandha is mixed with foods and beverages to enhance its therapeutic effects and absorption in the body.

Ashwagandha is commonly consumed with:
Warm milk
Honey
Ghee (clarified butter)
Herbal teas
Chyawanprash

Ayurvedic tonics:

According to Ayurvedic practice, combining Ashwagandha with milk and ghee helps nourish body tissues, improve energy levels, and support the nervous system. It is traditionally used as a rejuvenating dietary supplement for children, elderly individuals, recovering patients, and people suffering from weakness or fatigue.

Traditional Dietary Preparations:

Ashwagandha Milk: Ashwagandha powder mixed with warm milk to improve sleep, strength, and immunity.

Ashwagandha Churna:

Powdered root consumed with honey or ghee.

Herbal Formulations:

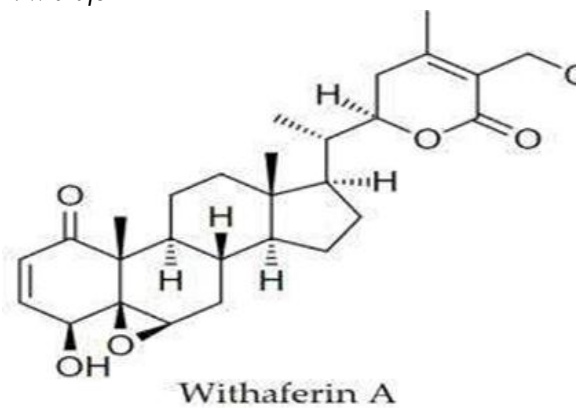
Used in Ayurvedic preparations such as Ashwagandha rishta and medicated foods.

Dietary use of Ashwagandha is believed to:
Increase stamina and vitality, improve digestion and metabolism, promote healthy sleep, reduce stress and anxiety, Support reproductive health, enhance immunity and longevity Ayurveda considers Ashwagandha a "Rasayana" herb, meaning it helps rejuvenate the body and maintain overall health when included regularly in a balanced diet and lifestyle.

Active Compounds
Ashwagandha is characterized by a rich phytochemical composition. Depending on the location of the raw material, it exhibits a diverse composition of chemical compounds. Its active substances that play a crucial role in pharmacological action are witanolides and alkaloids.

1. Withanolides:
Withanolides are steroidal lactones considered the most important active compounds in Ashwagandha. They are responsible for many pharmacological effects such as anti-inflammatory, antistress, antitumor, antioxidant, radiosensitizing, hepatoprotective, anticonvulsant, immunomodulatory, antiproliferative, cardioprotective, thyroid stimulating, hypoglycemic, diuretic, and hypercholesterolemic properties. It includes, witanopherin A, witanolides A-Y, witanone, witadomniferin A, and witasomniferols A.

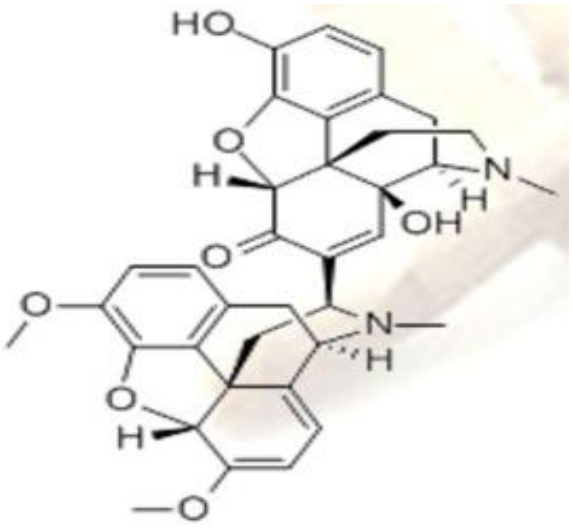
2. Withaferin A



Withaferin A

Withaferin A is one of the most studied compounds in Ashwagandha. It shows:
Strong anti-inflammatory activity, Antitumor and anticancer properties, Antioxidant effects, Ability to inhibit harmful protein aggregation in neurodegenerative diseases.
Research suggests that Withaferin A may help in diseases such as arthritis, Alzheimer's disease, Parkinson's disease, and certain cancers.

3. Alkaloids
Ashwagandha also contains alkaloids such as: Somniferine, Anaferine, Tropine, Cuscohygrine,



Somniferine

These compounds contribute to the calming, sedative, and stress-relieving effects of the plant.

4. Sitoindosides
Sitoindosides are glycowithanolides that possess antioxidant and adaptogenic properties. They help the body resist physical and mental stress and improve overall immunity.

5. Flavonoids and Antioxidants
Ashwagandha contains natural antioxidants that help neutralize free radicals and protect cells from oxidative damage. This contributes to anti-aging and protective health effects. Pharmacological Activities of Active Compounds. The active compounds of Ashwagandha exhibit several medicinal properties such as:
Antistress and adaptogenic effects Antioxidant activity Immunomodulatory effects Anticancer activity Neuroprotective action Antidiabetic, Antidiabetic effects

III. CONCLUSION:

Ashwagandha (Withania somnifera) is a highly valuable medicinal herb with a wide range of pharmacological and therapeutic properties. The plant contains numerous bioactive compounds, especially withanolides, which contribute to its antioxidant, anti-inflammatory, neuroprotective, antistress, and immunomodulatory activities.

Although many beneficial effects have been reported, further clinical research and standardization are necessary to establish safe dosage guidelines and therapeutic efficacy. Overall, Ashwagandha represents a promising natural therapeutic agent with broad-spectrum medicinal applications

1. Scientific Evidence-

Current scientific evidence supports its potential role in managing stress, anxiety, cognitive disorders, metabolic conditions, and overall well-being. However, despite promising results from preclinical and clinical studies, variations in dosage, preparation methods, and study design limit the consistency of findings. Scientific studies support its traditional uses in Ayurveda for improving physical and mental health. Ashwagandha has shown promising potential in the management of neurological disorders, stress, inflammation, diabetes, cancer, and reproductive health.

2. Future research -

Future research should focus on large-scale, well-controlled clinical trials to establish standardized dosing, long-term safety, and precise mechanisms of action. Additionally, quality control and standardization of herbal formulations remain crucial for ensuring efficacy and safety.

Research Area Importance Clinical trials

Confirm therapeutic efficacy Standardization

Ensure product quality Molecular studies Understand mechanisms Safety evaluation Determine long-term safety *in conclusion,* Ashwagandha represents a valuable natural therapeutic agent with broad-spectrum

benefits, but further scientific validation is essential to fully integrate it into modern evidence-based medicine.

REFERENCES

[1] Kirtikar KR, Basu BD. *Indian Medicinal Plants*. Dehradun: International Book Distributors.

[2] Ministry of Health and Family Welfare, Government of India. *The Ayurvedic Pharmacopoeia of India*.

[3] Singh N, Bhalla M, de Jager P, Gilca M. An overview on Ashwagandha: A Rasayana (rejuvenator) of Ayurveda. *Afr J Tradit Complement Altern Med*. 2011.

[4] Mishra LC, Singh BB, Dagenais S. Scientific basis for the therapeutic use of *Withania somnifera* (Ashwagandha): A review. *Altern Med Rev*. 2000.

[5] Kulkarni SK, Dhir A. *Withania somnifera*: An Indian ginseng. *Prog Neuropsychopharmacol Biol Psychiatry*. 2008.

[6] Mirjalili MH, Moyano E, Bonfill M, Cusido RM, Palazon J. Steroidal lactones from *Withania somnifera*, an ancient plant for novel medicine. *Molecules*. 2009.

[7] Dar PA, et al. Pharmacologic overview of *Withania somnifera*, the Indian ginseng. *Cell Mol Life Sci*. 2015.

[8] Gupta GL, Rana AC. *Withania somnifera* (Ashwagandha): A review. *Pharmacogn Rev*. 2007.

[9] World Health Organization. *WHO Guidelines on Traditional Herbal Medicines and Medicinal Plants*.

[10] Bone K, Mills' S. *Principles and Practice of Phytotherapy: Modern Herbal Medicine*. Churchill Livingstone Publishers.

[11] Indian Council of Medical Research. *Medicinal Plants of India*.

[12] Sharma R, Martins N, Kuca K, et al. Therapeutic perspectives of *Withania somnifera*: A review. *J Herb Med*. 2021.

[13] Tandon N, Yadav SS. Safety and clinical effectiveness of Ashwagandha: A review. *J Ethnopharmacol*. 2020.

[14] Chandrasekhar K, Kapoor J, Anishetty S. A prospective study of safety and efficacy of Ashwagandha root extract in reducing stress and anxiety. *Indian J Psychol Med*. 2012.

[15] Bhattacharya SK, Satyan KS, Ghosal S. Antioxidant activity of glycowithanolides from Ashwagandha. *Indian J Exp Biol*. 1997.

[16] Panda S, Kar A. Evidence for free radical scavenging activity of Ashwagandha in experimental studies. *J Pharm Pharmacol*. 1997.
[17] Singh G, Sharma PK, Dudhe R, Singh S. Biological activities of *Withania somnifera*. *Ann Biol Res*. 2010.
[18] Upton R. *Ashwagandha Root Monograph*. American Herbal Pharmacopoeia; 2000.
[19] National Center for Complementary and Integrative Health. Information on Ashwagandha and herbal medicine research.
[20] Kulkarni RR, Patki PS, Jog VP, Gandage SG, Patwardhan B. Treatment of osteoarthritis with a herbomineral formulation containing Ashwagandha. *J Ethnopharmacol*. 1991.
[21] Widodo N, Takagi Y, Shrestha BG, et al. Selective killing of cancer cells by leaf extract of Ashwagandha. *Cancer Sci*. 2007.
[22] Sehgal N, Gupta A, Valli RK, et al. *Withania somnifera* reverses Alzheimer's disease pathology in experimental models. *Proc Natl Acad Sci USA*. 2012.
[23] Ahmad MK, Mahdi AA, Shukla KK, et al. *Withania somnifera* improves semen quality in infertile men. *Fertil Steril*. 2010.
[24] Davis L, Kuttan G. Immunomodulatory activity of *Withania somnifera*. *J Ethnopharmacol*. 2000.
[25] World Health Organization. *WHO Monographs on Selected Medicinal Plants*. Vol. 4.