



## REVIEW ON THE MOST POPULAR AYURVEDIC PLANT WITHANIA SOMNIFERA (ASHWAGANDHA)

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### ABSTRACT

Ashwagandha (*Withaniasomnifera*) has become one of the most popular Ayurvedic herbs and it is widely used herb. It belongs to the family Solanaceae Thousands year ago in the time of ayurveda ashwagandha was known as rasayana. Ashwagandha cultivated in india in large scale. It also found in Africa .America and many other countries. Its roots and orange-red fruit have been used for hundreds of years for medicinal purposes. The root of ashwagandha is used as medicine in many disease The herb is also called Indian ginseng or winter cherry This review article is presented to compile all the medicinal activity of ashwagandha. The dried root of ashwagandha contain many chemical constitute which is used for the treatment of many disease. *Withaniasomnifera* show many pharmacological activity like antioxidant, anxiolytic, adaptogen, memory enhancing, antiparkinsonian, antivenom, antiinflammatory, antitumor properties. It also show the effects like immunomodulation, hypolipidemic, antibacterial, cardiovascular protection, sexual behaviour, tolerance and dependence

**KEYWORDS** : *Withaniasomnifera*, *Withanolides*, Pharmacological activities.

### INTRODUCTION

*Withania somnifera* (WS), also known as ashwagandha and winter cherry, it is used as a ayurvedic herb and used as a medicinal plant since 3000 years. The roots of the plant are very useful, which are used in the treatment of the many disease like, arresting the ageing process, preclude the body in debilitated conditions, by creating a sense of mental wellbeing [1]. It can be used for all the group of age and it does not give any side effect. It can also be used in pregnancy [2]. The roots of WS show the medicinal activity due to the presence of withanolides, which is a steroidal lactone [3]. The leaves of WS are used in the treatment of tumors and tubercular glands [4]. A number of withanolide steroidal lactones have been isolated from the leaves of *W. somnifera* [5], and exhibit antibacterial, anti-fungal and antitumor properties [6]. Ashwagandha is used to relax the mind, relieve weakness and nervous exhaustion, increase sexual energy and promote healthy sleep. [7]. The ashwagandha is divided into two parts in unani literature 1) Ashwagandha Nagori and 2) Ashwagandha Dakani. Ashwagandha Nagori show more pharmacological action. [8].

### TAXONOMICAL CLASSIFICATION

Kingdom: Plantae  
Subkingdom: Tracheobionta  
Super division: Spermatophyta  
Division: Angiosperma  
Class: Dicotyledons  
Order: Tubiflorae  
Family: Solanaceae  
Genus: *Withania*  
Species: *somnifera* Dunal

### BOTANICAL DESCRIPTION

WS is a small, woody shrub in the Solanaceae family that grows about two feet in height. It can be found growing in Africa, the Mediterranean, and India. An erect, evergreen, tomentose shrub, 30-150 cm high, found throughout the drier parts of India in waste places and on bunds. Roots are stout fleshy, whitish brown; leaves simple ovate, glabrous, those in the floral region smaller and opposite; flowers inconspicuous, greenish or lurid-yellow, in axillary, umbellate cymes; berries small, globose, orange-red when mature, enclosed in the persistent calyx; seeds yellow, reniform. The roots are the main portions of the plant used therapeutically. The bright red fruit is harvested in the late fall and seeds are dried for planting in the following spring. Parts used: Whole plant, roots, leaves, stem, green berries, fruits, seeds, bark are used.

### CHEMICAL COMPOSITION

Laboratory analysis show that the root of *withaniasomnifera* contain 35 chemical constituents [9]. The biologically active chemical constituents are alkaloids (isopellertierine, anferine), steroidal lactones (withanolides, withaferins), saponins, and withanolides. *Withaniasomnifera* is also rich in iron. The roots of *Withaniasomnifera* consist of withanolides, which are believed to account for its extraordinary medicinal properties. Withanolides are steroidal and bear a resemblance, both in their action and appearance, same as the Asian ginseng (*Panax ginseng*) known as ginsenosides. Ashwagandha's withanolides have been researched in a variety of animal studies examining their effect on numerous conditions, including immune function and also on cancer [10]. Withanine is the main chemical constituent among all the alkaloids. Chemical analysis of Ashwagandha show its main constituents to be alkaloids and steroidal lactones. The other alkaloids are, somnine, withananine, pseudo-withanine, tropine, somniferine, somniferinine, 3-a-gloyloxytrane, choline, cuscohygrine, anafine and anahydrine. Two acyl sterylglucoside viz. sitoindoside VII and sitoindoside VIII have been isolated from root. The leaves contain steroidal lactones, which are commonly called withanolides. The withanolides contain C28 steroidal nucleus with C9 side chain, with a six membered lactone ring [11]. Twelve alkaloids, 35 withanolides, and several sitoindosides from *Withaniasomnifera* have been isolated and studied. Asitoindoside is a withanolide containing a glucose molecule at carbon 27. Most of *withaniasomnifera* pharmacological activity has been distributed to two main withanolides, withaferin A and withanolide D. The roots contain the lactone steroidal which are known as withanolides and mainly show the therapeutic activity and general health maintenance like anti-epileptic, combating infectious agents, anti-ageing, antioxidant, hypoglycemic, hypocholesterolemic activities, immunomodulation, memory enhancer, anti-cancer, and in common an effective adaptogen. [12-13]

### PHARMACOLOGICAL ACTIVITY

*Withaniasomnifera* have many pharmacological properties like antibiotic, deobstruent, adaptogen, abortifacient, antiinflammatory, diuretic, aphrodisiac, narcotic, sedative, astringent, and tonic. Ashwagandha has been found to: Provide potent antioxidant protection [14,15]. Stimulate the activation of immune system cells, such as phagocytes and lymphocytes [16,17]. Promote wellness and Counteract the effects of stress [18].

### ANTIBIOTIC ACTIVITY

The root and leaves are show the anti bacterial activity .Withaferine A was active against *Micrococcus pyogenes* and *Staphylococcus aureus*. Withaferin A inhibited the growth of various Gram-positive bacteria, acid-fast and aerobic bacilli, and pathogenic fungi. The shrub's extract is active against *Vaccinia virus* and *Entamoeba histolytica* [19]. *Asgardis* protective against systemic *Aspergillus* infection. This protective activity was probably related to the activation of the macrophage function revealed by the observed increases in phagocytosis and intracellular killing of peritoneal macrophages induced by *Ashwagandha* treatment in mice [20]. Antibiotic activity of Withaferin A is due to the presence of the unsaturated lactone ring. The lactone showed strong therapeutic activity in experimentally induced abscesses in rabbits, the being somewhat stronger than that of Penicillin. It substantiates the reputation of the leaves as a cure for ulcers and carbuncles in the indigenous system of medicine [21].

#### ANTI-AGING ACTIVITY

The anti aging activity can be determine by using clinical trial .Dose of 3 grams are given in the group of 100 males in the age category of 50-59. The subjects experienced significant improvement in hemoglobin, red blood cell count, hair melanin, and seated stature. Serum cholesterol decreased and nail calcium was preserved. it also show the increase in the sexual performance [22].

#### ANTI-DIABETIC EFFECT

Sarangi and co-workers conducted an investigation to explore the possibilities of using leaf and root extracts of *W. somnifera* against diabetes mellitus (DM) and also to examine their hypoglycaemic and hypolipidaemic effects on streptozotocin-induced diabetic rats [23]. The extract possess hypoglycaemic and hypolipidaemic properties and hence useful in diabetes mellitus. Another study show significant positive anti-diabetic activity of *W. somnifera* on diabetic rats when compared with Glibenclamide standard drug. Anti-diabetic activity may be due to increase in hepatic metabolism, increased insulin release from pancreatic  $\beta$ -cells or insulin sparing effect [24]. *W. somnifera* root (WSRET) and leaf (WSLET) extract show hypoglycaemic and hypolipidaemic effect on alloxan-induced diabetic rats [25]. Andallu and Radhika (2000), studied the hypoglycaemic, diuretic and hypocholesterolemic effect of roots of *W. somnifera* on six mild NIDDM and six mild hypercholesterolemic human subjects. Their studies indicate that the plant can be a potential source of hypoglycaemic, diuretic and hypocholesterolemic drugs. No adverse effects were observed during clinical observations [26].

#### ANTI-OXIDANT ACTIVITY

A study done by Bhattacharya et al, 1997 investigated the anti-oxidant activity of active principles of *Withaniasomnifera*, consisting of equimolar concentrations of sitosterol, stigmasterol and Withaferin A, for their effects on rat brain frontal cortex and striatal concentrations of superoxide dismutase (SOD), catalase (CAT) and glutathione peroxidase (GPX). When active glycowithanolides of *W. somnifera* (WSG) (10 and 20 mg/Kg, i.p.), were administered once daily for 21 days, there was a dose-related increase in SOD, CAT and GPX activity in frontal cortex and striatum, which was statistically significant on days 14 and 21. [27] Another study reported by Bhattacharya in 2000 investigated the antioxidant activity of *Withaniasomnifera* (WS) glycowithanolides in chronic footshock stress induced changes in rat brain frontal cortex and striatum. The stress procedure, given once daily for 21 days, induced an increase in superoxide dismutase (SOD) and lipid peroxidation (LPO) activity, with concomitant decrease in catalase (CAT) and glutathione peroxidase (GPX) activities in both the brain regions. WS glycowithanolides (WSG) administered orally 1 h prior to the stress procedure for 21 days, in the doses of 10, 20 and 50 mg/Kg, induced a dose-related reversal of the stress effects. Thus, they concluded that WSG tended to normalise the augmented SOD and LPO activities and enhanced the activities of CAT and GPX. Their results indicate that, at least part of chronic stress-induced pathology may be due to oxidative stress, which is mitigated by WSG, lending

support to the clinical use of the plant as an anti-stress agent [28].

#### ANTI-STRESS ACTIVITY

Archna et al conducted a study in 1998 for evaluating the anti-stressor properties using adult Wistar strain albino rats and cold water swimming stress test. The results indicated that the drug treated animals show better stress tolerance [29].

#### ANTI-CONVULSANT ACTIVITY

Administration of *Asgand* root extract was found to reduce jerks and clonus in 70% and 10% animals respectively with dose of 100mg/kg and reduction in the severity of pentylenetetrazole (PTZ)-induced convulsions was evident from EEG wave pattern [30]. *Asgand* root extract showed reduction in severity of motor seizures induced by electrical stimulation in right basilateral amygdaloid nuclear complex through bipolar electrodes. The protective effect of *Asgand* extract in convulsions has been reported to involve GABAergic mediation [31].

#### ANTI-INFLAMMATORY ACTIVITY

Withaferine A is the main compound which show the anti-inflammatory activity .It is mainly found in the root of the plant. It is as effective as hydrocortisone sodium succinate dose for dose [32]. It suppress the arthritic syndrome and does not give any toxic effect .Animals which are treated by hydrocortisone show the side effect like weight loss but the animals which are treated by the Withaferine A are show the gain in the weight that's why it is more useful . It is interesting that Withaferin A seems to be more potent than hydrocortisone in adjuvant-induced arthritis in rats, a close experimental approximation to human rheumatoid arthritis. In its oedema inhibiting activity, the compound gave a good dose response in the dose range of 12-25 mg/kg body weight of Albino rats intraperitoneally and a single dose had a good duration of action, as it could effectively suppress the inflammation after 4 hours of its administration [33]. *Asgand* (*Withaniasomnifera*) has been shown to possess anti-inflammatory property in many animal models of inflammations like carrageenan-induced inflammation, cotton pellet granuloma and adjuvant-induced arthritis Detailed studies were carried out to investigate the release of serum  $\beta$ -1 globulin during inflammation by two models of inflammations viz. primary phase of adjuvant induced arthritis and formaldehyde-induced arthritis. The experiments showed interesting results as most of the APR were influenced in a very short duration and also suppressed the degree of inflammation [34].

#### IMPROVE CARDIORESPIRATOR ENDURANCE

The cardiorespiratory endurance can be measure by measuring the oxygen consumption in the body by calculate the VO<sub>2</sub> max level by a 20 m shuttle run test. It is calculated by a process in which 2 group are taken .Difference in mean and change from the base line VO<sub>2</sub> max is calculated by student t test. *Ashwagandha* root extract contain many useful .The extract of the root of *Ashwagandha* is used to improving the cardiorespiratory endurance. [35]

#### CNS DISORDER

CNS disorder is become a major threat now a days. Thousands of the people are suffering from many CNS disorders .Mainly disease belongs to the CNS disorder are Parkinson Disease, Alzheimer's Disease, Epilepsy, Anxiety,, Huntington's Disease. All the disease related to the CNS disorder are due to the imbalancing of the neurons. *Withaniasomnifera* is widely used in the treatment of these disease. It work as a GABAergic amberrance. Which is responsible for many neuronal disease. The root of the *Ashwagandha* is used for balancing the GABAERGIC system and improve the acetylcholinergic system. [36]. The root extract of *W. somnifera* could induce axon and dendrite outgrowth, suggesting its potential effect on neuronal regeneration. [37,38]

#### CONCLUSION

*Withaniasomnifera* is one of the most useful medicinal plant since

the Ayurveda. It is one of the plants which show less side effect. It is very useful in the treatment of many diseases. The dried root of ashwagandha contains many chemical constituents which are used for the treatment of many diseases. Withaniasomnifera shows many pharmacological activities like antioxidant, anxiolytic, adaptogen, memory enhancing, antiparkinsonian, antivenom, anti-inflammatory, antitumor properties. It also shows effects like immunomodulation, hypolipidemic, antibacterial, cardiovascular protection, sexual behaviour, tolerance and dependence.

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