



# A Review on *Withania somnifera* (L) Dunal– A miracle in ethnomedicine.

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## Abstract

*Withania somnifera* (L) Dunal (Solanaceae) commonly known as ashwagandha, winter cherry or Indian ginseng is an evergreen shrub most frequently grown in India, Middle east and Eastern Africa. Roots, leaves, fruits and the seeds of this plant contain large number of phytochemicals, the secondary metabolites that make this plant unique. This review throws light upon the phytochemical constituents in *Withania somnifera* and their benefits in the development of modern medicine.

**Key words:** *Withania somnifera* (L) Dunal, male infertility, anti-cancer, anti- inflammatory

## Introduction

Medicinal plants contain a broad spectrum of complex chemical substances of different composition that give them the curative property, which are termed as secondary metabolites. According to the composition, the metabolites are grouped as alkaloids, glycosides, corticosteroids, essential oils etc. Medicinal plants have been crucial in sustaining the health and the well-being of mankind. It is generally recognized by our ancestors that a wide range of medicinal plants have healing powers. A plant is an immediate source of medicine, which can be extracted, titrated, and preserved. *Withania somnifera* L (Solanaceae) is an evergreen short shrubby plant that grows frequently in India, throughout Middle east and in Eastern parts of Africa. The roots, leaves, and the seeds contain a large amount of phytochemical secondary metabolites that make this plant a unique variety of medicinal use. Root is the source of ayurvedic tonic ashwagandha, that has been used as an adaptogen, diuretic and sedative. The seeds and leaves have been used as a pain reliever, to kill lice and also for making soap. In Indian traditional medicine, the roots of *Withania somnifera* (L.) are used for their anti- inflammatory, immunomodulating, neuroprotective, antistress, cardioprotective, male fertility and anticancer activities. In addition to this, it reduces

the level of oxygen free radicals, regulates apoptosis, modulates mitochondrial functions, and enhances endothelial function.

### Taxonomical classification

Kingdom- Plantae

Phylum- Tracheophyta

Class – Magnoliopsida

Order – Solanales

Family – Solanaceae

Genus – *Withania*

Species – *somnifera*

### SYNONYMS

*Physalis somnifera* L

*Withania kansuensis* Kuang & A.M.Lu

*Withania microphysalis* Suss.

### Vernacular Names

Language	Name
English	Winter cherry, Withania root
Hindi	Akri, Aswagandh
Malayalam	Amukkuram, Aswagandham
Marati	Asandha, Aswandha
Kannada	Amgura, Amugura
Gujarati	Asagandha, Asanth, Khelo akus
Telugu	Pilliamga
Bengali	Aswagandha

Sanskrit	Aswagandha
Tamil	Auchakenthi kilangu, amukirakilangu, Pivetti, Amukulangu
Urdu	Asgand

### Plant description

It is an erect greyish, slightly hairy evergreen shrub that grows to a height of 1.5 m tall with long tuberous roots and with tomentose branches extending radially from the central stem. The leaves are dull green, elliptical that have a size of 10-12 cm long. The flowers are small greenish yellow and bell shaped which can be single or in clusters. The ripe fruits are orange red in colour and are smooth, round and fleshy with many seeds.

### Bio chemical constituents

*Withania somnifera* has gained active research interest because it contains different classes of chemical compounds and a huge assortment of nutrients that possess a wide array of health benefits and multidimensional importance (Ahmad and Dar, 2017). The primary bioactive constituents that have been identified in this plant are withanolides A-Y, withaferin A, withasomniferin A, withasomnidienone, withasomnierose A-C, withanone etc. (Srivasthava et al, 2019). The alkaloids such as isopelletierine, anaferine, cuseohygrine, and anahygrine are also present in the plant extract along with the above lactones. (Singh et al, 2011). It has been reported that both root and leaf extracts of this plant contain sitoindosides, withanamides, reducing sugars, peroxidases, glycosides, starch, withanicil, benzyl alcohol, dilcitol, 2-phenyl ethanol, 3, 4, 5-trihydroxy cinnamic acid, benzoic acid, and phenyl acetic acid. (Kumar et al, 2015, Mirjalili et al, 2009, Bolleddula et al, 2012). It was reported that the plant showed the antioxidant and free radical scavenging activities due to the presence of certain withanolides such as withanoside V, withaferin A, withanolide B, withanone, and 1,2-deoxywithastramonolide (Devkar et al, 2014).

### Effect on male infertility

Through inducing the testicular development and spermatogenesis, Ashwagandha is beneficial in treating male infertility (Abdel et al, 2001). The root extract of this plant improves the quality and count of sperm in males and reduce the effect of chemical toxins on both male's and female's gonads and enhance hormonal balance of LH, FSH and testosterone. (Rehmati et al ,2016; Gupta et al,2013; Kumar et al)

### **Anti- inflammatory and Anti-Oxidantal effects**

The root powder of *Withania somnifera* (L.) acted as an anti- inflammatory and Anti- oxidant agent in decreasing the arthritic effects in collagen induced arthritic rats. (Gupta and Singh, 2014) The anti-inflammatory properties of *Withania somnifera* L were explained after invitro and animal experiments. Hydroalcoholic extracts of Ashwagandha showed anti-inflammatory effect against denaturation of protein invitro. (Chandra et al 2012). Sankar et al (2007) reported that the biocomponent glycowithanolides present in *Withania sonifera* possesses the ability to alter the cortical and striatal anti-oxidant enzyme functions in rats. The other biologically active components include alkaloids (ashwagandha, cuscohygrine, anahygrine, topine, etc.), steroidal compounds, including ergostane type steroidal lactones, withaferin A, Withanolides A-Y withasomniferin A, withasomnidienone, withasomnierose A–C, withanone, etc. Experimental Studies in rabbits and rodents with aqueous extracts of *Withania sonifera* have showed hypolipidemic and antioxidant activity (Shukla et al., 2014; Visavadiya and Narasimhacharya, 2011), The antioxidant properties were shown to provide protection against radiation-induced hepatotoxicity in rats (Hosny et al., 2012). Invitro studies in hepatocellular carcinoma cells, Ashwagandha was found to have antioxidant and proapoptotic activity (Ahmed et al., 2018)

### **Immunomodulatory effects**

Harshith et al (2015) reported the usefulness of ashwagandha as an immunopotential agent in both normal and tumour-bearing animals, Preclinical studies showed that ashwagandha was an effective immunomodulatory agent and inhibited the myelosuppression induced by diverse immunotoxins (namely, cyclophosphamide, azathioprin, and prednisolone) in mice.

### **Neuroprotective function**

It was reported that *Withania somnifera* (L) showed beneficial role in several neurological conditions such as Alzheimer's disease, Parkinson's disease, Huntington disease, anxiety disorders, and Cerebral ischemia. (Sandhir and Sood, 2017)

### **Anti- bacterial and anti- fungal effects**

The extracts of *W. somnifera* root and leaves, show great anti-microbial potential against both gram positive and gram-negative bacteria and also against some fungal species (Singh and Kumar, 2011) Antibacterial effects of

the methanolic leaf extracts of *W. somnifera* were studied and reported (Bisht and Rawat, 2014). Antibacterial

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### Cytotoxic effect

The crude extract of *withania* showed cytotoxicity against human malignant melanoma A375 cells (Babli. et. al, 2015). The ethanol extract of Ashwagandha roots with high concentration of bioactive compounds could act as potential drug candidates against pro- inflammatory enzymes involved in development of inflammation and progression of lung cancer (Sivaraj et al 2022). The root extracts of *Withania somnifera* (L.) showed a significant cytotoxic and cytostatic potential and induces immunogenic cell death. (Eleonora. et. al 2016)

### Hepatotoxic effect

Clinical studies were conducted and concluded that the consumption of ashwagandha elevated the liver function tests such as ALT, AST, Total bilirubin and Alkaline phosphatase. The patients recovered after discontinuing the product of ashwagandha (Bjonsson et al 2020 [A].

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