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Phytomedicine: Ashwagandha

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Abstract- The effectiveness of ashwagandha in a variety of rheumatologic conditions may be due in part to its anti-inflammatory properties, which have been studied by several authors. *Withania somnifera* (Ashawagandha) is very revered herb of the Indian Ayurvedic system of medicine as a Rasayana (tonic). It is used for various kinds of disease processes and specially as a nervine tonic. Considering these facts many scientific studies were carried out and its adaptogenic / anti-stress activities were studied in detail. It has anxiolytic effect and improves energy levels and mitochondrial health. It is an anti-inflammatory and anti-arthritis agent and was found useful in clinical cases of Rheumatoid and Osteoarthritis. Large scale studies are needed to prove its clinical efficacy in stress related disorders.

Keywords- Ahwagandha: Introduction, Taxonomical classification, Synonyms, Biological source, Geographical source, Chemical constituents, Chemical use, Anti-inflammatory properties, Immunomodulatory property.

Introduction- *Withania somnifera* (WS), also known as ashwagandha, Indian ginseng, and winter cherry, it has been an important herb in the Ayurvedic and indigenous medical systems for over 3000 years. The roots of the plant are categorised as rasayanas, which are reputed to promote health and longevity by augmenting defence against disease, arresting the ageing process, revitalising the body in debilitated conditions, increasing the capability of the individual to resist adverse environmental factors and by creating a sense of mental wellbeing¹. *Withania somnifera* Dunal (ashwagandha, WS) is widely used in Ayurvedic medicine, the traditional medical system of India. It is an ingredient in many formulations prescribed for a variety of musculoskeletal conditions (e.g., arthritis, rheumatism), and as a general tonic to increase energy, improve overall health and longevity, and prevent disease in athletes, the elderly, and during pregnancy. Many pharmacological studies have been conducted to investigate the properties of ashwagandha in an attempt to authenticate its use as a multi-purpose medicinal agent. For example, anti-inflammatory properties have been investigated to validate somnifera, dunal, withaferin, sitoindoside, solanaceae, Indian ginseng, and winter cherry. Results of these searches were reviewed to identify relevant articles²⁻³. It is in use for a very long time for all age groups and both sexes and even during

pregnancy without any side effects. Historically, the plant has been used as an antioxidant, adaptogen, aphrodisiac, liver tonic, antiinflammatory agent, astringent and more recently to treat ulcers, bacterial infection, venom toxins and senile dementia⁴.



Fig- *Withania somnifera* (Ashwagandha)

Clinical trials and animal research support the use of WS for anxiety, cognitive and neurological disorders, inflammation, hyperlipidemia and Parkinson's disease. WS chemopreventive properties make it a potentially useful adjunct for patients undergoing radiation and chemotherapy. Recently WS is also used to inhibit the development of tolerance and dependence on chronic use of various psychotropic drugs.

Taxonomical Classification-

Kingdom: Plantae, Plants;

Subkingdom: Tracheobionta, Vascular plants;

Super division: Spermatophyta, Seeds plants;

Division: Angiosperma

Class: Dicotyledons

Order: Tubiflorae

Family: Solanaceae

Genus: Withania

Species: somnifera Dunal

Synonyms:

Sanskrit: Ashwagandha, Turangi-gandha;

English: Winter Cherry;

Hindi: Punir, asgandh;

Bengali: Ashvagandha;

Gujrati: Ghodakun, Ghoda, Asoda, Asan;

Telugu: Pulivendram, Panneru-gadda, panneru;

Tamil: Amukkura, amkulang, amukkuram-kilangu, aswagandhi,

Karnataka: Viremaddlinagadde, Pannaeru, aswagandhi, Kiremallingadde;

Goa: Fatarfoda;

Punjabi: Asgand;

Bombay: Asgund, asvagandha;

Rajasthani: Chirpotan

Biological Source- It consists of dried roots and stem base of *Withania somnifera* Dunal, belonging to family Solanaceae and should contain not less than 0.02 percent of total withanolide A and withaferin A on dried basis.

Geographical source- This plant Grows widely in all dry parts and subtropical India. It occurs in Madhya Pradesh, Uttar Pradesh, Punjab, plains and north western parts of India like Gujarat and Rajasthan, it is also found in Congo, South Africa, Egypt, Morocco, Jordan, Pakistan and Afghanistan.

Chemical constituents-

The biologically active chemical constituents of *Withania somnifera* (WS) include alkaloids (isopelletierine, anaferrine, cuseohygrine, anahygrine, etc.), steroidal lactones (withanolides, withaferins) and saponins. Saponins and acylsterylglucosides in Ashwagandha are anti-stress agents. Active principles of Ashwagandha, for instance the saponins VII-X and Withaferin-A, have been shown to have significant anti-stress activity against acute models of experimental stress. Research reveals ashwagandha possesses anti-inflammatory, antitumor, antistress, antioxidant, immunomodulatory, hemopoetic, and rejuvenating properties. Ashwagandha also appears to benefit the endocrine, cardiopulmonary, and central nervous systems. Few articles were discovered on the mechanism of action for these effects. Several preliminary studies have been conducted on animals. A summary of the findings of these studies is presented below⁵.

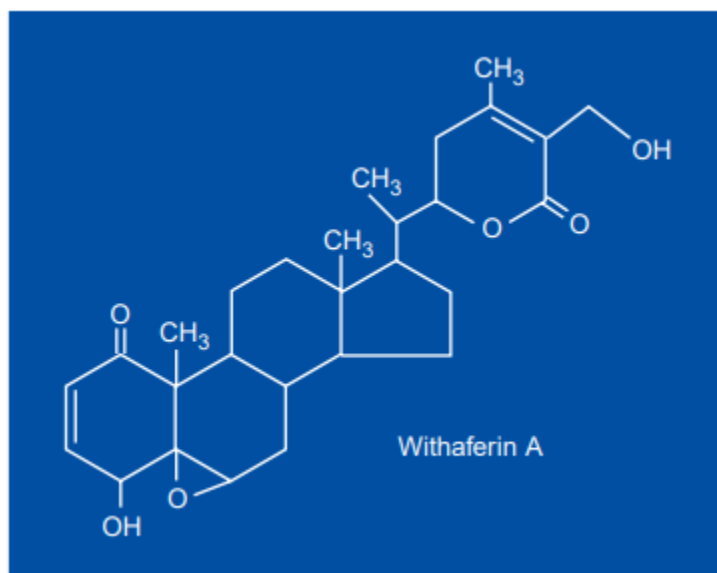


Fig- Chemical Structure of Withaferin A

Chemical uses of Ashwagandha-

For most of these 6000 years Ashwagandha has been used as a Rasayana. The root of Ashwagandha is regarded as tonic, aphrodisiac, narcotic, diuretic, anthelmintic, astringent, thermogenic and stimulant. The root smells like horse (“*ashwa*”), that is why it is called Ashwagandha (on consuming it gives the power of a horse). It is commonly used in emaciation of children (when given with milk, it is the best tonic for children), debility from old age, rheumatism, vitiated conditions of vata, leucoderma, constipation, insomnia, nervous breakdown, goiter etc⁶. The leaves are bitter and are recommended in fever, painful swellings. The flowers are astringent, depurative, diuretic and aphrodisiac. The seeds are anthelmintic and combined with astringent and rock salt remove white spots from the cornea. Ashwagandharishta prepared from it is used in hysteria, anxiety, memory loss, syncope, etc. It also acts as a stimulant and increases the sperm count⁷.

Anti-inflammatory properties-

The effectiveness of ashwagandha in a variety of rheumatologic conditions may be due in part to its anti-inflammatory properties, which have been studied by several authors. In a study by Anbalagan et al,³ powdered root of WS (1 g/kg suspended in 2% gum acacia, 50 mg/mL) was given orally one hour before the induction of inflammation by injection of Freund’s complete adjuvant rats and continued daily for three days: phenylbutazone (100mg/kg) was given as a positive control. WS was found to cause considerable reduction in inflammation. Acute phase reactants of the blood monitored by crossed immunoelectrophoresis showed changes in the concentration of many serum proteins (α 2-glycoprotein, major acute phase α 1-protein, and pre-albumin) in the WS group. The α 2-glycoprotein found only in inflamed rat serum was decreased to undetectable levels in the WS group. Phenylbutazone, on the other hand, caused a considerable increase in the α 2-glycoprotein in both arthritic and healthy rats. Another acute phase protein (peak

2, α -1 major acute phase) which increased approximately 200 percent by inflammation was brought back to normal levels by WS treatment but only to 132 percent of normal by phenylbutazone⁸.

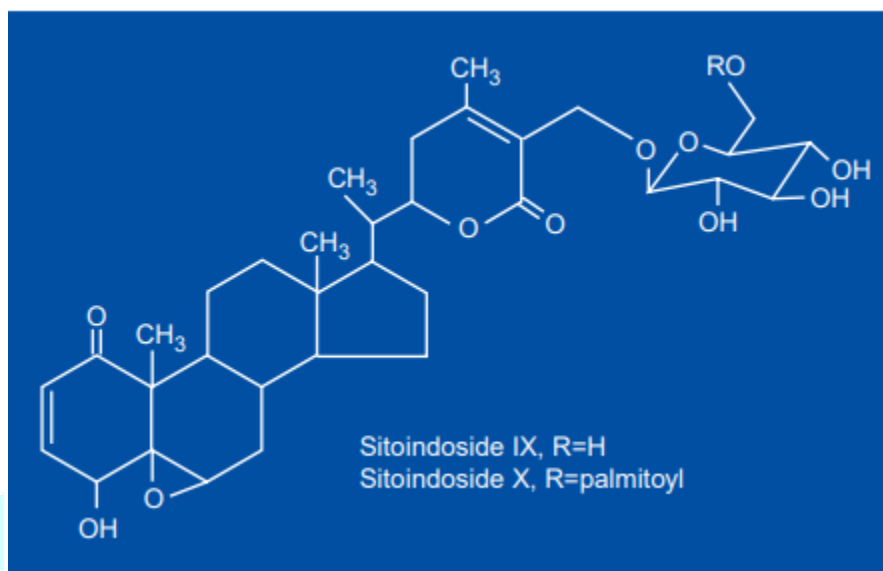


Fig. Chemical Structures of Sitoindosides IX and X.

Anti-Ulcerogenic Properties

Ashwagandha was found to be useful in the prevention of stress-induced ulcers of the gastrointestinal tract. It showed significant protection against 18 h immobilization, cold + immobilization (4h) and aspirin induced gastric ulcers and lowered the mean ulcer index in rats⁹.

Immunomodulatory Properties-

The use of WS as a general tonic to increase energy and prevent disease may be partially related to its effect on the immune system. Root extract of WS was tested for immunomodulatory effects in three myelosuppression models in mice: cyclophosphamide, azathioprin, or prednisolone¹⁰. Significant increases ($p < 0.05$) in hemoglobin concentration, red blood cell count, white blood cell count, platelet count, and body weight were observed in WS-treated mice compared to untreated control mice. The authors also reported significant increases in hemolytic antibody responses toward human erythrocytes which indicated immunostimulatory activity. The effect of WS was also studied on the functions of macrophages obtained from mice treated with the carcinogen ochratoxin A (OTA). OTA treatment of mice for 17 weeks significantly decreased the chemotactic activity of the macrophages. Interleukin-1 (IL1) and tumor necrosis factor alpha (TNF- α) production was also markedly decreased¹¹.

Hemopoetic Effect- Administration of WS extract was found to significantly reduce leukopenia induced by cyclophosphamide (CTX) treatment in Swiss albino mice. mice (687/4000 cells). The major activity of WS may be the stimulation of stem cell proliferation. These studies indicated WS reduced CTX-induced toxicity and may prove useful in cancer chemotherapy. Further studies need to be conducted to confirm the hemopoetic effect with other cytotoxic agents and to determine its usefulness as an adjuvant in cancer chemotherapy¹².

Effects on the Endocrine System- Based on the observations that WS provides protection from free radical damage in the mouse liver, studies were conducted to determine the efficacy of WS in regulating thyroid function. A combination formula of WS, *Tinospora cordifolia*, *Eclipta alba*, *Ocimum sanctum*, *Picorrhiza kurroa*, and shilajit was found to cause a dose-related decrease in streptozotocin-induced hyperglycemia. None of the herbs given individually, however, produced any effect on the hyperglycemia, indicative perhaps of why Ayurvedic medicine generally prefers combinations of herbs rather than single herbs¹³.

Antioxidant Effect- The brain and nervous system are relatively more susceptible to free radical damage than other tissues because they are rich in lipids and iron, both known to be important in generating reactive oxygen species. The brain also uses nearly 20 percent of the total oxygen supply. Further studies on other parts of the brain (e.g., cerebellum, medulla, and hypothalamus) may provide information with respect to the effects of WS on cognitive behavior and other functions of the brain, in both healthy and diseased individuals¹⁴.

Antistress properties- To evaluate the antistress effect of WS, an alcohol extract from defatted seeds of WS dissolved in normal saline was given (100 mg/ kg intraperitoneally as a single dose) to 20-25 g mice in a swimming performance test in water at 28°-30°C. The extracts approximately doubled the swimming time when compared to controls. In another study, WS prevented both a weight increase of the adrenals and a reduction in ascorbic acid content of the adrenals normally caused by this swimming test. The authors suggested that WS induced a state of nonspecific increased resistance during stress¹⁵.

Conclusion- Ashwagandha is used as a household remedy by Indians, who consider it as the best tonic for old people and children, and as aphrodisiac by young people. It is one of the best nervine tonics of Ayurveda, the most ancient system of Medical Sciences. Our clinical experience showed that besides the enumerated neurological conditions, brain strokes causing paralysis and neuronal deficit also improve in the long term treatment with Ashwagandha. The ashwagandha has been used successfully in Ayurvedic medicine for centuries, more clinical trials should be conducted to support its therapeutic use. It is also important to recognize that WS may be effective not only in isolation, but may actually have a potentiating effect when given in combination with other herbs or drugs. Thus, the above findings clearly indicate that the traditional use of Ashwagandha has a logical and scientific basis. Large scale

clinical studies are needed to prove the clinical efficacy of this herb, especially in stress related diseases, neuronal disorders and cancers.

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