



Ashwagandha: A natural rejuvenator

Lalani Adil Md Rafique, Mandar Mulik

Department of Pharmacognosy, Prin. K. M. Kundnani College of Pharmacy, University of Mumbai, Mumbai, Maharashtra, India

Abstract

Ashwagandha (*Withania somnifera*), also known as ginseng, winter cherry, "Sattvic Kapha Rasayana" Herb is a member of the Solanaceae family. It has been widely used in folkloric and Ayurvedic medicines since antiquity and has wide ranging health benefits. The name "ashwagandha" is blended in Sanskrit, word 'ashva' which means horse and 'gandha' which means smell mirroring that root has a solid pony like smell. This review presents a detailed summary of the geographical distribution, scientific classification, traditional use, phytochemistry, marketed products and pharmacological activities such as cardioprotective, anti-stress, neural and physical health enhancer, antihypertensive, hypoglycemic, antiplatelet, Anti-inflammatory, etc. Classified as Rasayana (Rejuvenation) and accepted to increase longevity and vitality. The plant is highly practiced Traditionally, throughout the globe by its different vernacular names. Useful to maintain cholesterol level, optimum blood pressure, provide strength to the heart muscle, enhance cardiorespiratory endurance, and improve quality of life. In addition, it presents a detailed account of its active constituents of *W.somnifera* such as Alkaloids, Steroidal lactones, Saponin, and withanolides are considered biologically active components of ashwagandha. The drug is scientifically studied in all aspects and has proven to be a broad-spectrum remedy in a variety of experimental studies. More research is necessary; to date, promising studies into the health benefits of ashwagandha have mainly been in animals.

Keywords: Ashwagandha, withania somnifera, Rasayana, Withaferin A, Ajagandha, Amangura, Amukkirag, Asgand,, Asundha,, Indian ginseng, Kanaje Hindi, Kuthmithi, Samm al ferakh, Winter cherry, Withania, etc

Introduction

In Ayurvedic medicine, ashwagandha is considered a Rasayana. This means that it helps maintain youth, both mentally and physically [1]. *Withania somnifera* Dunal (ashwagandha, WS) is one of the important herb in Ayurvedic medicine. This is one of the world's oldest medical systems and one of India's healthcare systems. It is an annual evergreen shrub in the Solanaceae or nightshade family that grows in India, the Middle East, and parts of Africa. Several other species in the genus *Withania* are morphologically similar. Ashwagandha (*Withania somnifera*, WS), also known as Winter cherry, Ginseng Ajagandha, Kanaje Hindi and Samm Al Ferakh. It is also known in different linguistic areas in India by its local vernacular names [1, 2]. Ashwagandha improves the body's defense against disease by improving the cell-mediated immunity. It also possesses potent antioxidant properties that help protect against cellular damage caused by free radicals [3]. Traditionally the plant is highly practiced throughout the globe as cardioprotective, immunomodulator, anti-stress, neural physical health enhancer, antihypertensive, hypoglycemic, antiplatelet, anti-inflammatory effect, etc. Numerous studies suggest Ashwagandha can treat a number of diseases [4-9]. More research is necessary to date promising studies into the health benefit of ashwagandha have mainly been animals. The drug was scientifically studied in all aspects and proven to be a broad spectrum remedy in various experimental studies [10].

Taxonomy of *W. Somnifera*

Biological Source

It consists of dried root and stem bases of *Withania somnifera* (Linn) Dunal belonging to family Solanaceae and should contain not less than 0.02 percent of total withanolide A and withaferin A on their dried basis [11, 12]

Table 1

Scientific Classification.	
Kingdom	Plantae
Sub-Kingdom	Tracheobionat
Super-Division	Spermatophyta
Division	Angiosperma
Class	Dicotyledons
Clade	Tracheophytes

Clade	Eudicots
Clade	Asterids
Order	Solanaceae
Family	Solanaceae
Genus	<i>Withania</i>
Species	<i>W. Somnifera</i>

Geographical Source

This plant grows wild in all dry parts and subtropical India rising to the height of 1500 meters. It occurs in Madhya Pradesh, Uttar Pradesh, Punjab plains and North Western parts of India like Gujrat and Rajasthan. It is also found in Congo, South Africa, Egypt, Morocco, Jordan, Pakistan and Afghanistan^[13]. It is pronounced by its different vernacular name in all part of India and across the globe in Table 2^[13-19].

Vernacular name of *W. somnifera*

Table 2

Language.	Local name
English	Winter cherry, Indian ginseng
Sanskrit	Ashwagandha (Horse smelling)
Urdu	Asgandha Nagori
Hindi	Asgand
Punjabi	Askan
Haryanavi	Askin
Rajasthani	Sarvagandha
Marathi	Kanchuki, Askandha
Konkani	Fatarfoda
Oriya	Asugandha
Kannada	Amangura, Sogadeberu
Malayalam	Pevetii, Amukkiram
Tamil	Amukulan-kalang, Achuvagandhi
Telgu	Penneru gaddalu
Chinese	Cui Mian Shui, Nan Fei Zui Que
French	Cerise d' hiver, coqueret somifere
German	Indischer Ginseng, Schlafbreere, Winterkirsche
Italian	Ciliegia d' inverno, Ginseng Indiano
Nepalese	Aasoganhda
Persian	Meheman
Spanish	cerezo de invierno, Ginseng Indiano, oroval

Macroscopic

Dried root is conical to cylindrical, about 25–30 cm in length and 1–2.5 cm in diameter, rough, longitudinally wrinkled, at places exhibit lenticels and wiry brittle rootlets or scars left by their removal; fracture short and starchy.

Externally buff.

Internally white.

Taste slightly sweet

Odor characteristic^[20, 21]



Withania somnifera plant.

Root of *W. somnifera*

Fig 1



Fig 2

Microscopic

Diagrammatic TS of root is circular in outline and shows a wide central xylem occupying the major area of the section, encircled by narrow parenchymatous phloem, cortex and a narrow band of peripheral cork. Detailed TS shows outermost 4–8 rows of suberized cells of the cork, occasionally at places interrupted by lenticels; followed by 15–20 layers of cortical parenchyma, loaded with simple, compound starch grains and microsphenoidal crystals of calcium oxalate; narrow parenchymatous phloem containing starch grains; uni- to multiseriate medullary rays, in continuation with xylem lies underneath this, cambium is distinct, xylem is wide consisting of isolated or rarely groups of 2–3 vessels embedded in thin-walled fibers occupying the major area of the wood, parenchyma are vesicentric and paratracheal and medullary rays are bent at places especially when run adjacent to the vessel [20, 21]

Powder

Shows abundant, simple and compound, spherical, oval or cup shaped starch grains with slit like or stellate hilum, scattered as such throughout or embedded in the parenchymatous cells of the cortex; microsphenoidal crystals of calcium oxalate embedded in the parenchymatous cells of the cortex; fragments of suberized cork in transverse and surface view; fragments of longitudinally cut and horse-shoe-shaped pitted vessels; radially cut medullary rays crossing the vessels and fibers; thin-walled xylem fibers [20, 21].

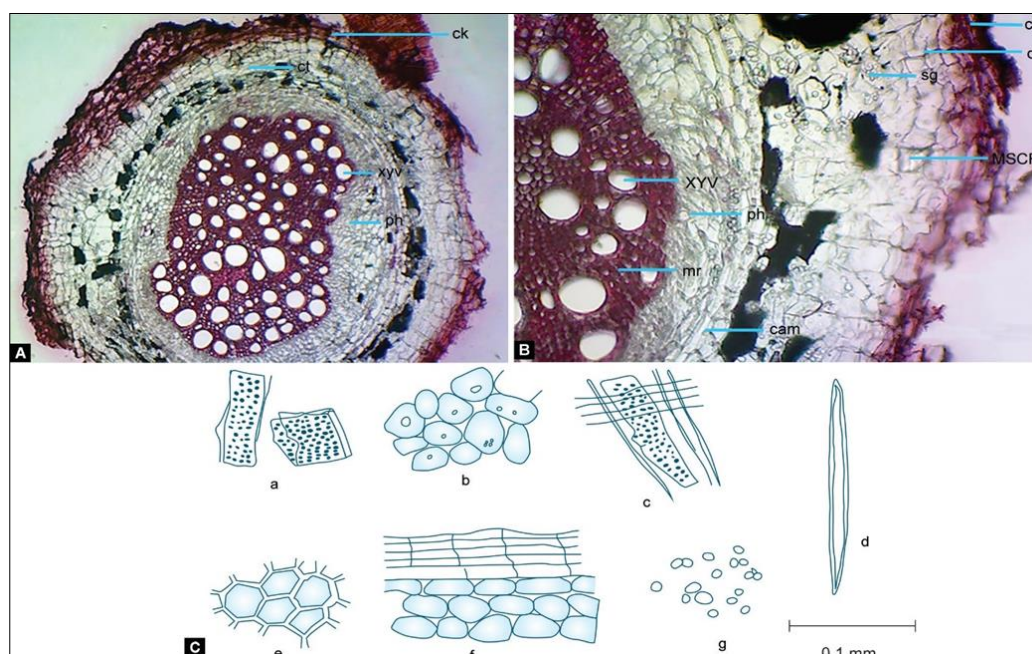


Fig 3

Chemical Constituents

The chemistry of WS has been extensively studied and over 35 chemical constituents have been identified, extracted, and isolated. The biologically active chemical constituents are alkaloids (isopelletierine, anaferrine), steroidal lactones (withanolides, withaferin), saponins containing an additional. Among the various alkaloids,

withanine is the main constituent. The other alkaloids are somniferinine, withanine, pseudo withanine, tropine, pseudo tropine, 3- α -gloxyltropine, anapherin and anahydrine. Two acyl steryl glucosides viz. Sitoindoside VII and sitoindoside VIII have been isolated from roots.

Table 3

Steroidal Alkaloids.	Steroidal Lactones.	Saponin.
▪ Withanine	▪ Withanolides A to Y	▪ Sitoindoside VII & VIII
▪ Somniferin	▪ Dehydro Withanolides R	
▪ Somnine	▪ Withasomniferin A	
▪ Withonine	▪ Withasomnidienone	
▪ Anapherin	▪ Withasomniferol A to C	
▪ Anahydrine	▪ Withaferin A	
▪ Ashwagandhine	▪ Withanone	
▪ Sitoindosides		

The leaves contain steroidal lactones, which are commonly called withanolides. The withanolides have C26 steroidal nucleus with C9 side chain, having 6 membered lactone rings. The various withanolides, withanine, withaferin are as follows

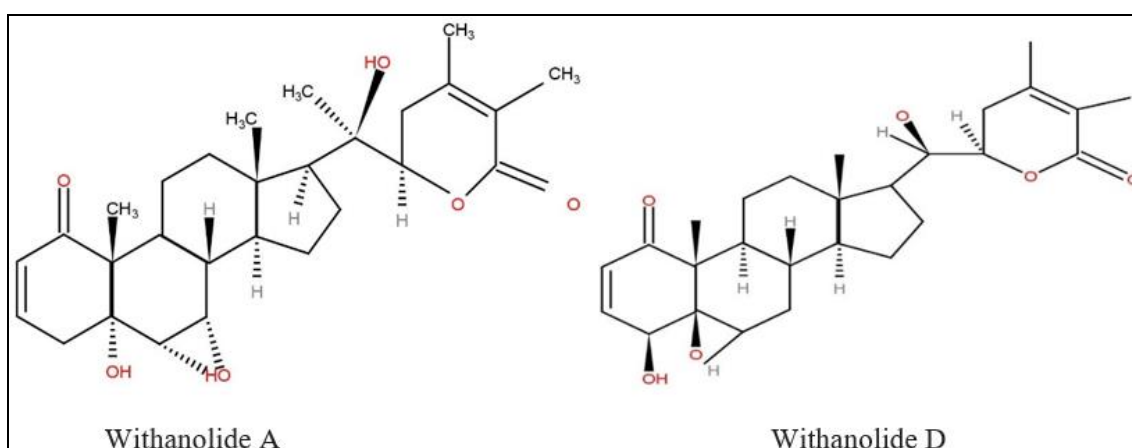


Fig 4

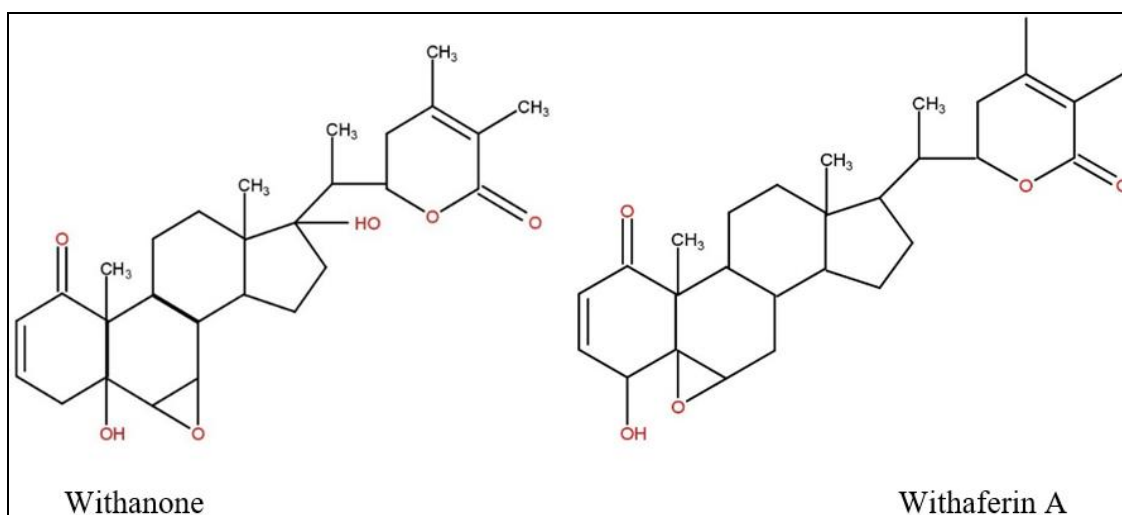


Fig 5

These compounds have been obtained from *w. Somnifera* chemotype I. Another series of steroidal lactones viz. Withanolide E to M has been obtained from chemotype III. The drug also contains two monohydric alcohols called somnitol and somnirol; withanic acid; a phytosterol and ipuranol; mixture of fatty acid containing cerotic acid, oleic acid, palmitic acid and stearic acid ^[22].

Standard of Quality

- Foreign organic matter: Not more than 2 %
- Total Ash: Not more than 7%
- Acid insoluble ash: Not more than 1.2 %

- Alcoholic soluble matter: Not less than 16%

Vata Pitta Kapha

Ashwagandha root is unique in its ability to both vitalize the nervous system while simultaneously soothing & calming the mind.

Relieves agitation and daily stress while rejuvenating the nervous and reproductive system.

Increase longevity and vital force.

Table 4

<ul style="list-style-type: none"> Dosha ⇒ Decreases vata and kapha, neutral to pitta. <ul style="list-style-type: none"> Rasa (taste) ⇒ Bitter astringent, sweet. <ul style="list-style-type: none"> Virya (energy) ⇒ Heating. Vipaka (post digestive effect) ⇒ Sweet. <ul style="list-style-type: none"> Guna (quality) ⇒ Light. Dhatu (tissue) ⇒ Blood, muscle, fat, bone, nerve, reproductive. <ul style="list-style-type: none"> Srotas(channel) ⇒ Reproductive, nervous, respiratory

Most Important Marketed Dosage Forms

Some of the most important marketed dosage forms of *w. Somnifera* as follows ²³

Table 5

Product	Manufacturer	Product type (Ashwagandha content)	Stated health benefits
Ashwagandharishta	Baidyanath	Polyherbal (1.7-g/30ml)	Nervine tonic, memory and cognition improvement, better power of concentration, natural sleep induction
Himalaya Ashwagandha	Himalaya drug company	Mono Herbal extract (250mg /250mg capsule)	Stress management
Himalaya massage oil	Himalaya drug company	Polyherbal (165mg/ml)	Body Relaxation, stress relief, relief from insomnia,backache
Vigomax	Charak Pharmaceuticals Ltd.	Polyherbal plus bhasma (extract from 300 mg w.s/capsule)	Vigor and vitality enhancement
Brento	Zandu Pharmaceutical Works Ltd	Polyherbal (extract from 100mg w.s/ capsule)	Nervine tonic

Pharmacological and therapeutic properties

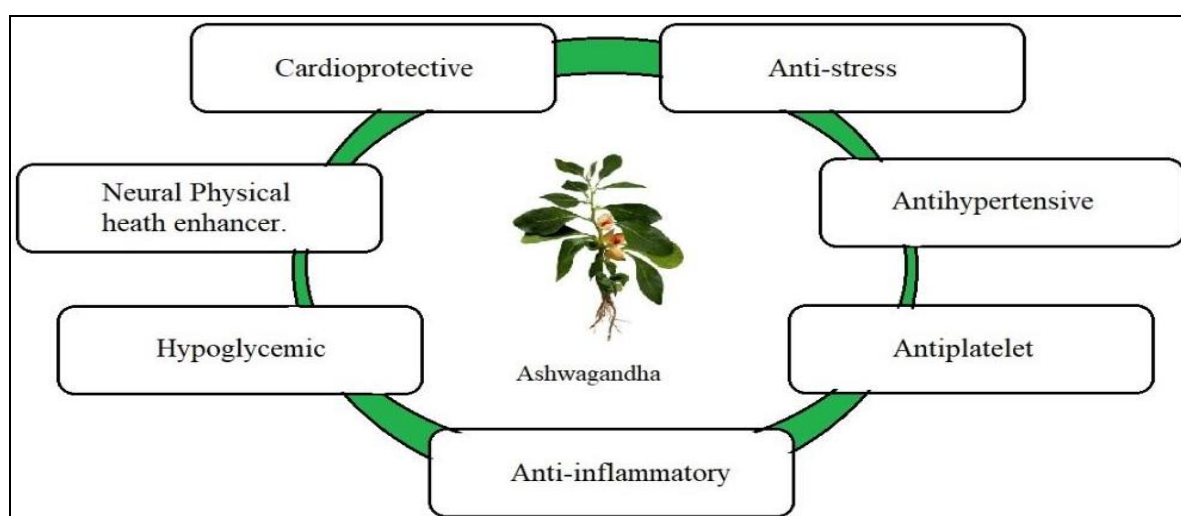


Fig 6

A. Cardioprotective

In ayurveda, Abnormal heart rhythm falls under the category of Hridroga (heart disease). Abnormal heart beat is the condition when the heart is not able to pump blood efficiently which results in the following.

- Abnormal heart rhythm.

- Shortness in breath.
- Chest pain.
- Irregular pulse.
- Heart palpitation.
- Sweating.

These symptoms are associated with these problems, it may lead to serious health complications like stroke, heart failure, Alzheimer's disease, etc.

According to Ayurveda 3 main energies Vata, Pitta, and Kapha maintain good health. Imbalance in any three energies results in health complications. Abnormal heart rhythm is due to all three energies.

- Imbalance in Vata ⇒ Irregular heartbeat.
- Aggravated pitta ⇒ Increases in a heartbeat.
- Imbalance in Kapha ⇒ Slow heartbeat.

An increase in catecholamine content in the heart and aortic tissues and their decrease in adrenal glands are unfavorable effects of high doses of ashwagandha. On the basis of these observations, it was concluded that ashwagandha possesses adaptogenic, cardiotropic, cardioprotective, and anticoagulant properties [24] WS is known to possess cardioprotective and cardiotropic properties in animal models when administered at 30, 60, and 90mg/kg/day as a polyherbal combination containing 50mg/capsule of WS tuber for 60 days (orally) [25] Polyherbal formulations which contained WS (50, 75, and 100mg/ml, *in vitro*) also provides cardio-protection (doxorubicin-induced) in animals [26] by activating a transcription factor known as nuclear factor-erythroid-2(Nrf)-2, which stimulates phase-II detoxification enzymes, thereby evading apoptosis in an Nrf-2-dependent manner in HL-1 cardiomyocytes [27, 28]. Treatment with WS (50mg/kg b.w. for 30 days) in wistar rats significantly restored the balance between myocardial oxidant and antioxidant, anti-apoptotic and pro-apoptotic effects, and further reduced histopathologic deterioration of myocardium and triphosphate nick-end labeling (TUNEL) positivity (apoptosis) in rat models [29, 30]. Furthermore, standardized WS extracts (1.5% withanolides) at a dose of 300 mg/kg prevented cardiotoxicity induced by doxorubicin and restored several biochemical changes like reduction in elevated malondialdehyde level, catalase, superoxide dismutase activity, calcium content, Bcl-2 protein levels [31]

B. Anti-stress

Sleep has a crucial role in the maintenance of the physical and mental health of the mammalian body. Sleep loss or abatement may culminate in an array of physical, metabolic, and cognitive disturbances that in turn initiate stress, anxiety, obesity, and other neurocognitive dysfunctions. Hippocampus and piriform cortex, two regions of the brain associated with memory and perception, lose their sleep-dependent functions owing to complete loss of sleep [32-34] Somnifera' means sleep-inducing and thus to validate the role of WS in averting anxiety, motor dysfunction, and cognitive deficits in sleep-deprived animals, Manchanda *et al* [35] used an aqueous extract of WS root to elucidate its sleep-inducing potential. In the study, 12hr sleep-deprived rats were found to exhibit neuromotor dysfunction and memory impairments, which could be reverted with pretreatment before sleep deprivation with WS extract for 15 days. Pre-treatment was also found to improve alertness, recognition memory, and explorative nature among rats [36]. Oral administration of WS root powder at a dose of 500mg/kg/day prevented posttraumatic stress disorder (PTSD)-induced memory impairment in single prolonged stress (SPS) rat model [37] In addition, 20 and 50mg/kg of aqueous concentrate of WS roots in inbred Charles Foster strain male rats could show its GABA-mimetic effect hence can act as a potential antidepressant [38]. WS has a remarkable quality to reduce the corticosterone levels in treated mice compared to vehicle-treated ones which were subjected to restraint stress for 30 days straight [39]. Standardized ratios of root extract powder of WS prevented stress-induced neuronal degeneration in the hippocampal Cornu Ammonis-2 (CA2) and CA3 areas compared to control or unstressed animals [40]

C. Antihypertensive

A study of Ashwagandha treatment in people with Type 2 Diabetes and/or hypercholesterolaemia reported significantly increased renal sodium excretion and urine volumes, indicating that Ashwagandha has a diuretic action, and therefore may be useful in the treatment of hypertension. WS along with Terminalia arjuna, Phyllanthus emblica (= Emblica officinalis), and Ocimum tenuiflorum (= O. sanctum) in a capsule form (Cardipro) twice daily improved the condition of coronary artery disease (CAD) patients. Following the treatment, a significant reduction of systolic and diastolic blood pressure was observed along with decreased serum cholesterol, triglycerides, and increased high-density lipoprotein (HDL) cholesterol without any marked biochemical or clinical side effects [41]. Ethanol extract of WS was found to be potential anxiolytic (against ICD-10 anxiety disorders) in A double-blind, placebo-controlled study with no adverse effects compared to the placebo group [42]. Three hundred mg twice a day standardized to 1.5% withanolides from WS root along with dietary counseling, deep breathing, relaxation techniques, and standard multivitamin significantly improved mental health, concentration, vitality, and social function leading to a better quality of life without any serious adverse effects [43]. Treatment with WS improved semen quality and sperm motility of infertile males. It reduced oxidative stress, inhibited lipid peroxidation with an increase in antioxidants [44]

D. Antiplatelet

Blood thinners are chemicals that aid in ensuring your blood flows smoothly through your circulatory system. When blood becomes backed up in your circulatory system, you may encounter problems such as strokes, heart attacks, and embolisms, each of which may prove fatal, depending on when and where they occur. Blood thinners interact with your blood and make it flow through your system with less resistance and less chance of clogging an artery or a vein. Unfortunately, they do come with their own side effects. If you're on a blood thinner and cut yourself, you'll likely bleed a lot more than regular. It's a small price to pay to ensure that your blood doesn't back up inside your system. There are two major types of blood thinner. The first is known as anticoagulants. They help by stopping your blood from clotting or turning into a clumped group of cells. It's evident that if this happens within your body, they will block off an artery or a vein, leading to a ruptured vessel. The second form of blood thinners is known as antiplatelets. Part of the clotting process within the human body sees "nets" of proteins being spread with tiny cells known as platelets filling out the empty space and stopping blood flow. Antiplatelets target this type of cell, making it impossible for clotting to occur. A "blood thinner," therefore, doesn't make your blood any thinner. It just makes it harder for your blood to clot. If you're already suffering from clotting, a blood thinner won't do anything to break up those clots, but it'll stop you from forming new ones. It'll also prevent the existing ones from getting bigger^[45, 46].

E. Anti-Inflammatory

Ashwagandha is considered an adaptogen, meaning it has the ability to protect that body against the harmful effects of chronic stress and restore/retain normal functioning. Studies done on animals have shown that the root offers antioxidant protection against free radicals, helping to reduce cellular stress and the inflammatory responses to that stress^[47]. One of the ways it does this is by increasing phase II liver enzymes that help get rid of byproducts (such as free radicals) that are generated by the first phase in liver metabolism of toxic substances. Conversely, ashwagandha does not offer any antioxidant protection to cancer tumor cells and in fact increases their susceptibility to oxidative damage from free radicals^[48].

F. Hypoglycemic

Hypoglycemic, diuretic, and hypocholesterolemic effects of Ashwagandha root were assessed in human subjects, in which six type 2 diabetes mellitus subjects and six mildly hypercholesterolemic subjects were treated with a powder extract for 30 days. A decrease in blood glucose comparable to that of an oral hypoglycemic drug was observed. Significant increases in urine sodium, urine volume, and decreases in serum cholesterol, triglycerides, and low-density lipoproteins were also seen^[49].

G. Neural Physical Health Enhancer

Ashwagandha is an Ayurvedic herb and medicinal plant, with a 4,000-year history addressing stress, strain and fatigue, while also promoting muscle strength, energy, sexual vitality and cognitive health. Historically, most ashwagandha use has been toward stress relief, focused on the "mind" benefits of ashwagandha. Recently, it has started to be recognized for the "body" benefits, with respect to sports and active lifestyles. This ancient herb is being actively supported by scientific studies. Researchers are exploring and confirming ashwagandha's many mind and body benefits desired by today's sophisticated wellness-focused athletes. In particular, this ancient herb has been clinically proven to increase cardio-respiratory response. This leads to reduced fatigue and improved stamina. For example, in a controlled study over 12 weeks, a group of 49 healthy, active adults were supplemented with either ashwagandha or placebo twice daily^[1]. The herbal group showed up to a 13.6 percent increase in maximum oxygen consumption. Participants also self-reported an increase in their physical and psychological health and social relationships. Yet another benefit for athletes is ashwagandha's proven ability to improve the results of their efforts: muscle strength, lean body mass, and body fat percentage. In another recent study, ashwagandha produced a marked increase in serum testosterone levels (up to and over 15 percent!), which was associated with muscle growth and increased strength. Most notably, those taking the ingredient experienced a 17.1 percent increase in arm muscle size, and a 16.1 percent reduction in average body fat^[50].

Conclusion

W. somnifera is medicinally important plant which has proven a good and healthy impact on human health. Several experiments and studies are conducted on Ashwagandha and its constituents for providing the scientific bases for the activities reported in Ayurveda. Significantly amount of investigations have been carried out on which it shows that the drug is a potentially useful. These Review gives an important view mainly on taxonomy of *w. somnifera*, botanical description, different phytochemicals and phytochemical analysis and some important marketed products and its therapeutic uses. These plant plays an important role in Pharmacological action of various cardio protective, immunomodulator, anti-stress, neural physical health enhancer, antihypertensive, hypoglycemic, antiplatelet, anti-inflammatory effect, etc. WS along with Terminalia arjuna, Phyllanthus emblica (= Emblica officinalis), and Ocimum tenuiflorum (= O. sanctum) in a capsule form (Cardipro) twice daily improved the condition of coronary artery disease (CAD) patients. It also possesses adaptogenic and cardiotropic properties. Also used for maintenance of the physical and mental health of the mammalian body. It plays a significant role in reduction of systolic and diastolic blood pressure was observed along with decreased serum cholesterol, triglycerides, and increased high-density lipoprotein (HDL) cholesterol without any marked

biochemical or clinical side effects *w. somifer* is good Source of withanolides which acts as a good source of Immunomodulator. Ashwagandha is mentioned in Vedas as herbal tonic and health food for all age groups and both sexes and even during pregnancy without any side-effects. ashwagandha produced a marked increase in serum testosterone levels (up to and over 15 percent!), which was associated with muscle growth and increased strength. Most notably, those taking the ingredient experienced a 17.1 percent increase in arm muscle size, and a 16.1 percent reduction in average body fat. However, these plant is reported without any toxic effects but still more clinical trials should also be carried in this aspects.

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