



## ***Ashwagandha* plant used as Rasayana Ayurvedic medicinal herb for the treatment of various human diseases**

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### **Abstract**

India is one of the 12 mega diversity countries. It is estimated around 70,000 plant species, out of them 7500 plant species are used by 7800 medicinal values. About 300 plant species are used by 7800 medicinal drug manufacturing units in India, which consumed about 2000 tons of herbs annually. There are estimated to be more than 717,330 registered practitioners of Ayurveda, Siddha, Unani and Homeopathy and Electro-homeopathy in India. In recent years the growing demand for herbal products has led to the extinction of many important plant herbs. *Ashwagandha* plant is also a rare and endangered plant. *Withania somnifera* Dunal (*Ashwagandha*) plant possesses a good anti-inflammatory, immunomodulatory, anti-tumor, antioxidant, anticancer properties. Plant has many pharmacologically and medicinally important chemicals and they protect the cells from oxidative damage and diseases. In the present manuscript we have tried to unveil the therapeutic knowledge about *Ashwagandha* plant which is used to exploit the novel medicines.

**Keywords:** *Ashwagandha*, anti-inflammatory, antioxidant, anticancer, withaferin-A. Alkaloids

### **Introduction**

*Withania somnifera* Dunal plant <sup>[1]</sup> belongs to the family-Solanaceae and commonly known as *Ashwagandha*, *ginseng* and *winter cherry*. It is a small evergreen woody herb about 30-150cm in height. Plant is found in drier part of India, Egypt, Morocco, Jordan, Pakistan, South Africa and Afghanistan. It is an important herb in Ayurvedic and indigenous medicinal system for over 3,000 years. Plant has been used as an aphrodisiac, liver tonic, anti-inflammatory agent, astringent and recently for the treatment of bronchitis, asthma, ulcers, antitumor, antistress, antiageins, antidepressive, central nervous system, emaciation and senile dementia <sup>[2]</sup>. Traditional medicines are widely used in India according to the World Health Organization (WHO). About 80% population of developing countries used traditional medicines for their primary health care needs <sup>[3]</sup>. Medicinal plants contain several phytochemicals such as Vitamins-A, C, E & K, carotenoids, terpenoids, flavonoids, polyphenols, alkaloids, tannins, saponins, enzymes, minerals, etc. These phytochemicals possess antioxidant activities, which can be used in multiple ailment treatment. *Ashwagandha* plant extract had Withaferin-A was more effective in the inhibition than the common cancer chemotherapy drug, doxorubicin used to compare it with these alkaloids <sup>[4]</sup>. Present investigation revealed that the anti-inflammatory and immunomodulatory properties of *Withania somnifera* Dunal root extract are likely to contribute to the chemo preventive action <sup>[5]</sup>. Roots of the plant are categorised as Rasayanas, which are reputed to promote the health and longevity by augmenting defence against diseases, arresting the ageing process, increasing the capabilities of the individual to resist adverse environmental factors and reacting a sense of mental well-being <sup>[6]</sup>. In the present study we have attempted to summarize briefly information available on the potency of *Ashwagandha* plant because of its immense therapeutic potential. Alkaloids of these plant is used for a long time for

all groups of human without any side effects <sup>[7]</sup>. In our earlier communications, the nature of seeds polysaccharide <sup>[8]</sup>, methylation studies <sup>[9]</sup>, periodate oxidation studies <sup>[10]</sup> and smith degradation studies <sup>[11]</sup> for the confirmation of seeds polysaccharide structure alongwith structure elucidation of oligosaccharides <sup>[12]</sup> have already been studies from *Withania somnifera* Dunal plants.

### **Materials and Methods**

*Withania somnifera* Dunal (*Ashwagandha*) plant is considered as a Rasayana herb in Ayurveda, which works on a non-specific basis to increase health and longevity. It has been used for over 2500 years to treat the all kind of human diseases <sup>[13]</sup>. This herb is also considered, as an adaptogen which is a non-toxic herb that works on a non-specific basis to normalize physiological function and neuroendocrine system. Roots and berries of plant are used in herbal medicine. In Ayurvedic system of medicine, the fresh roots are boiled in milk, prior to drying in order to leach out undesirable constituents. Berries are used as a substitute for rennet to coagulate milk in cheese making <sup>[14]</sup>.

In traditional system of medicine, the *Ashwagandha* plant was used to increase the energy, youthful vigour, strength, health, nurture the time element of body, increase vital fluids, muscle fat, blood, lymph and cell production. It was also helps to chronic fatigue, weakness, dehydration, bone weakness, premature ageing emaciation, debility and muscle tension. It helps to investigate the body by *Rasayana* (*Rejuvenating*) the reproductive organs just as a tree is investigated by feeling the roots <sup>[15]</sup>.

Seeds, fruits and leaves of this plant have been traditionally used for the Ayurvedic system of medicine as aphrodisiacs, diuretic and memory loss. In Deaconess Hospital, New England has taken a patent on an *Ashwagandha* formation claimed to alleviate symptoms associated with arthritis <sup>[16]</sup>. *Ashwagandha* oil is a combination of *Ashwagandha* seed oil

with *Almond* seeds oil and rose water designed to be used as a facial toner. Acyl steryl glucoside as sitoindoside-VII and sitoindoside-VIII was isolated from *Ashwagandha* roots were screened for antistress activity using a diverse spectrum of stress induced paradigms. The new glycowithanolides as sitoindoside-IX and sitoindoside-X were isolated from *Withania somnifera* Dunal root were evaluated for their immunomodulatory effects like antistress and memory loss. It is said to have free radical scavenger activity (antioxidant) had increased superoxide activities of human liver [16].

*Ashwagandha* root extract was used for the treatment of asthma, bronchitis, leucoderma, anarania, asthenia, anemia, exhaustion, ageing, insomnia, infertility, paralysis, memory loss, multiple sclerosis, carcinoma, rheumatism and arthritis [17]. Leaves extract have been medically used internally for fever and haemorrhoids and externally for the treatment of wounds, tumours, tuberculosis glands, anthrax and aphthalmitic. Fruits and berries are used externally in the remedy of ringworm [17].

Methanolic root extract about 80% of *Ashwagandha* plant displayed significant anti-inflammatory activity on carragenan induced paw edema [18]. Root extract prevented the rise of experimentally induced LPO in rabbit and mice [19]. Alkaloids withaferin-A and sitoindoside VII-X exhibits fairly potent antiarthritic, anti-inflammatory, antioxidant and immunomodulant activities. They are also increase in the levels of SOD, CAT, GDX in brain and steroidal lactone [20]. Withaferin-A also showed significant antitumor and radiosensitizing effects in experimental tumor without any toxicity and inhibiting tumor growth inculcated survival included with Ehrlich ascites (ESC) carcinoma [21].

*Ashwagandha* Rasayana significantly reduced the lung tumor nodule formation and also reduced leucopenia induced by cyclophosphamide treated experimental animals indicating its usefulness in the cancer therapy [22]. It increased the WBC count and reduce leucopenia. They are also increased bone marrow cellularity and normalised the ratio of harmachromatic and polychromatic erythrocytes [23].

#### Chemical constituents of *Ashwagandha* plant:

*Ashwagandha* plant is chemically very complex and had about 80 known chemical compounds [24]. The biologically active chemical constituents are alkaloids such as: Ashwagandhine, cuscohygrine, anahygrine, tropine and steroidal compounds including ergostane type steroidal lactones, Withaferin-A, Withanolides A & Y, Withsomniferin-A, Withsomniferon, Withasomniferols-A&C, Withanone, etc. The chemical constituents of *Ashwagandha* roots are the steroidal alkaloids and steroidal lactones and they belongs to the withanolides class [25], with main active chemical constituents Withaferin-A is a phytosteroid [26]. Other chemical constituents are saponin containing an additional acyl group, sitoindoside-VII & VIII and withanoloides with a glucose at C [27] (sitoindoside-IX & X). Plant also contain chemical constituents like withanol, acylsteryl glucoside, starch, reducing sugar, amino acid and iron. *Ashwagandha* plant has chemogenetic variation and so far, three chemotype I, II & III had been reported [27] and 13 dragendroff positive alkaloids have been obtained. About 7 new withanolide glycosides called withanosides had been isolated and identified [28].

#### Active constituents of *Ashwagandha* plant

The major biochemical constituents of *Ashwagandha* roots

are steroidal alkaloids and steroidal lactones are called the Withanolides [29]. In present study about 12 alkaloids, 35 withanolides and several sitoindosides from this plant have been isolated and studied. A sitoindoside is a withanolide containing a glucose molecule at carbon 27. The pharmaceutical activity of *Ashwagandha* plant have been attributed to two main withanolides, withaferin-A and withanolides-D.

#### Mechanism of action of *Ashwagandha* plant

Withanolides serves as important hormone precursors that can convert into human physiologic hormones as needed. *Ashwagandha* plant is thought to be amphoteric that it can help regulate important physiologic processes. Theory is that when there is an excess of certain hormone, the plant based hormone precursor occupies cell membrane receptor sites, so the actual hormone cannot attach and exert its effect. If the hormone level is low and the plant based hormone exerts a small effect. *Ashwagandha* plant is also considered to be an adaptogen, facilitating the ability to withstand stressors and has antioxidant properties and immunostimulatory effects.

#### Results and Discussion

Medicinal plants are maintain the health and vitality of individuals and also cure all types of human diseases without causing toxicity. *Withania somnifera* Dunal (*Ashwagandha*) plant possesses good antitumor, immunomodulatory, anti-inflammatory, antioxidant and anticancer properties. Amny pharmacologically and medically important chemicals such as withaferin, sitoindosides and various alkaloids have been extracted from roots, leaves and fruits, because they protect the cells from oxidative damage and diseases. Good diet consumed rich in antioxidant plant foods such as fruits and vegetables will provide health protective effects. This manuscript provides the therapeutic knowledge, which is used by the novel all over the World. It is of significance to exploit novel medicine from *Ashwagandha* plant are quite promising for the use of this plant as a multi-purpose medicinal agent.

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