

Aswagandha (*Withania Somnifera*)

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Abstract: As a Rasayana, *Withania somnifera* (Ashwagandha) is a highly regarded herb in the Indian Ayurvedic medical system (tonic). It's used for a variety of ailments, but most notably as a nervine tonic. Many scientific research were conducted in light of these facts, and its adaptogenic and anti-stress properties were thoroughly investigated. It increased the stamina of rats during a swimming endurance test and avoided changes in ascorbic acid and cortisol concentration in the adrenal glands caused by swimming stress in experimental animals. Stress-induced stomach ulcers were significantly reduced after pretreatment with *Withania somnifera* (WS). On Chinese Hamster Ovary (CHO) cell cancer, WS has an anti-tumor impact. It was also reported to be helpful in animals with urethane-induced lung adenoma. Long-term treatment with WS controlled the condition in some cases of uterine fibroids and dermatosarcoma. It has a Cognition Promoting Effect and has been found to be beneficial in children with memory problems as well as elderly persons with memory loss. It's also been found to help with neurological illnesses like Parkinson's, Huntington's, and Alzheimer's. It has a GABA-mimetic action and has been demonstrated to increase dendritic development. It has an anti-anxiety impact and boosts energy and mitochondrial health. It's an anti-inflammatory and anti-arthritis medication that's been discovered to be effective in Rheumatoid and Osteoarthritis patients. To prove its clinical usefulness in stress-related diseases, neurological disorders, and malignancies, large-scale investigations are required.

Keywords: Ashwagandha (*Withania somnifera*), anti-inflammatory and immunological modulatory, anti-stress activity, therapeutic Benefit, medicinal plants

I. Introduction

Plant Description: Ashwagandha is a tiny, branching, perennial woody shrub that grows to approximately 2 feet in height and can be found in a variety of habitats, including Africa, the Mediterranean, and India. Because of its large range, there is a lot of bio-diversity in terms of local species, such as morphological and chemo-typical variances. The flowers are small and green, while the ripe fruit is a smooth, oblong, and spherical orange-red berry. It has tuberous roots that are more or less brown in color and are utilized for medicinal purposes. The seeds are scurfy and yellow (Mir Ahmad et al., 2012).

Origin and Distribution: *Withania somnifera* can be found in abundance throughout India, particularly in Madhya Pradesh, Uttar Pradesh, Punjab, and the North Western states of Gujarat and Rajasthan. *Withania somnifera*'s morphological and therapeutic qualities are determined by its source. Basically, the morphological and medicinal characteristics of plants from various sources are reported to differ. Seeds are used to propagate the plant. Propagation takes place in June and July. For the production of tiny roots, nitrogen fertilizers might be employed. Harvesting begins and will last through March. Uprooting the plant is used to collect the roots (Rao et al., 2012).

Phytochemistry: Various laboratory tests have found that the roots of *Withania somnifera* contain over 35 chemical components. The exceptional pharmacological activity of Ashwagandha is attributable to withanolides and withaferin A (Jain et al., 2012). The withanolides act as important hormone precursors that can convert into human physiologic hormone as needed. Chemical analyses on Ashwagandha show its main constituents to be alkaloids and steroidal lactones. Among the various alkaloids, withanine is the main constituent (Hossein et al., 2009). The other alkaloids i.e. somniferine, somnine, somniferinine, withananine, pseudo-withanine, tropine, pseudo-tropine, Antioxidative activity Lipids and iron are rich components of the brain and 3-a-glyoxytropine, isopelletierine, anaferine choline, cuscohygrine (Kiran et al., 2016). The total alkaloidal content of nervous system are relatively more susceptible to free radical damage than the other tissues. Indian roots have been revealed to vary between 0.13 and 0.31 percent (Srivastav et al., 2014). One biochemical analysis revealed that the leaves of the plant (Indian chemotype) consist of 12 withanolides, 5 unidentified alkaloids, many free amino acids, chlorogenic acid, glycosides, glucose, condensed tannins and flavonoids. The leaves primarily contain withaferin A, a steroidal lactone is the most important with an olide. It is thermostable and slowly inactivated at PH 7.2. The fruits contain amino acids, a proteolytic enzyme, condensed tannins, and flavonoids. They contain a high ratio of free amino acids which are proline, valine, tyrosine, alanine, glycine, hydroxyproline, aspartic acid, glutamic acid, cystine and cysteine. Shoots of *Withania somnifera* primarily contain scopoletin and also they contain protein, calcium and phosphorous. Stem and bark consist of number of condensed tannins, flavonoids and free amino acids (Uddin et al., 2012). Ashwagandha has many Nutraceutical properties. The word “Nutraceutical” is combined of two words, “Nutrition” and “Pharmaceutical” (Tewari et al., 2020).

Pharmacological Activity: *Withania somnifera* (Family: Solanaceae), often known as Ashwagandha ginseng and winter cherry, is a renowned Indian medicinal herb. For almost 3000 years, it has been a significant herb in Ayurvedic and indigenous healing systems. Ashwagandha is thought to be classified as Withanolides in various medicinal uses. The effects of Ashwagandha's withanolides on immune function and even cancer have been thoroughly researched in a variety of animal experiments. Ashwagandha has been studied in a variety of forms, including dried root powder and leaf. A water or solvent derived extract, or one of its withanolide constituents, has been employed in the majority of research. Antibacterial (Owais et al., 2005), antifungal (Krishnamurthy et al., 2008), and anti-stress properties have also been identified in *Withania somnifera* (Geeta and Murugan, 2008). Many studies have found that Ashwagandha possesses antioxidant, antitumor, anti-stress, anti-inflammatory, immunomodulatory, hematopoietic, anti-aging, engineering, anti-depressant, rejuvenating, and neurotransmitter receptor effects in the central nervous system. Plant extracts were found to suppress the growth of human breast, lung, and colon cancer cell lines in recent investigations. The researchers discovered that a specific extract from the plant was more effective than the commonly used cancer treatment medication doxorubicin in inhibiting tumor growth (Sharma et al., 2011). compared it to 5 research and found that *Withania somnifera* root extracts' anti-inflammatory and immunological modulatory characteristics are likely to contribute to the chemo preventative activity.

Plant roots are classified as chemicals that are thought to promote health and longevity by increasing defense against disease, slowing the aging process, rehabilitating the body in poor conditions, surviving, increasing a person's ability to resist negative environmental factors, and creating a sense. Mental well-being has been used by all age groups and both sexes for a long time, even during pregnancy, with no negative side effects. (Kumari and Gupta 2016) investigated the nutritional content of hydrated Ashwagandha root powder (100gm) and recommended several nutritive values, as shown in table-1.

Table no 1: Composition of Ashwagandha root powder (100gm)

Nutritive values	Aswagandha root Powder	Nutritive values	Aswagandha root powder
Moisture (%)	7.45	Carbohydrate (gm)	49.9
Ash (gm)	4.41	Iron (mg)	3.3
Protein (gm)	3.9	Calcium (mg)	23
Fat (gm)	0.3	Total carotene (µgm)	75.7
Crude fibre (gm)	32.3	Vitamin C (mg)	3.7
Energy (kcal)	245		

II. History of Medicinal Plants/Herbs

Plants have been used in the Indian subcontinent since Vedic times (>10,000 years B.C.). The epic Ramayana describes the use of a herb called Sanjivani, which was brought from the Himalayas by Lord Hanuman and saved Laxman's life. The references for the usage of therapeutic plants can be found in the Atharvaveda. The

many systems of Indian medicine are thought to use around 45,000 kinds of plants. Dravya Guna Shastra is a collection of indigenous knowledge about plants and plant products that has evolved over time. Approximately 25,000 plants are medicine formulae that have arisen from such studies, according to codified traditions. Aside from that, it is estimated that over 50,000 formulas exist in folk and tribal traditions. All of these points to a strong desire to learn everything there is to know about medicinal plants that appear on the landscape from time to time. Vedas, epic poems, contain a wealth of information from the time of medicinal teachings.

More than 1 billion people rely on herbal medications, according to the World Health Organization (WHO). The World Health Organization (WHO) has compiled a list of 21,000 plants that have been reported as having therapeutic properties around the world. A rich medicinal plant is one of India's over 2500 species; at least 150 species are utilized economically. Traditional Indian physicians have always been admired by foreign researchers.

Importance of medicinal plants/herbs: A country's medicinal plants are a valuable natural resource. They play an important role in delivering primary health care to those living in rural areas. They are used as both medicinal agents and raw materials in the production of traditional and modern medicine. Exporting medicinal plants to other countries can generate a significant amount of foreign exchange. In this approach, indigenous medicinal plants contribute significantly to a country's economy.

Therapeutic Benefit of medicinal plants/herbs: Ashwagandha root powder is also used in therapeutic diet. Therapeutic diet is a diet which is given to the patient who is suffering from any type of disease condition (Tewari, 2019). Herbal medicines are considered supplements for people in America, unlike in India, China, and other nations where they are controlled. In the United States, roughly a quarter of adults utilized herbs to treat a medical issue in the previous year, according to reports (Bent and Ko, 2004). Culinary herbs and essential oils have been utilized extensively in cuisine, fragrance, and dental and oral treatments for many years due to their many medicinal characteristics (Suppakul et al., 2003). Recent limitations and restrictions on the use of animal antibiotic growth promoters have sparked interest in plant-derived bioactive secondary metabolites as alternative performance enhancers (Greathead, 2003). Herbs and spices have long been used to deal with food safety concerns. Since ancient times, plants, their extracts, and/or essential oils have been utilized as treatments for various illnesses and as food preservatives. As a result, their applications are extremely important in terms of public health.

Ashwagandha: Ashwagandha (*Withania somnifera*) is a general tonic and antistress, according to (Bhattacharya et al., 1994). In human practice, hepatoprotective, haematonic, growth promoter, and antioxidant The use of herbal remedies or medicinal plants as feed additives can help to prevent widespread disease abuse and disrupted hormone, antibiotic, and other drug incidence in humans.

According to (Lokhande et al., 2001), *Withania somnifera*Dunal (Ashwagandha) has immunostimulatory characteristics, has a favorable impact on the endocrine, cardiovascular, and central neurological systems, and can help with memory. (Ravishanker et al., 2007) discovered that traditional systems of medicine based on medicinal plants are vital in delivering health care to a significant segment of the population, particularly in poor nations. Interest in them is growing in industrialized countries, as is the use of herbal products made from them. To understand the best approach to get the most out of these systems and how they work, you must have a fundamental understanding of their many elements. Indian Medicine is one of the most well-known traditional medical systems. According to (Nandi et al., 2011), *Withania somnifera*, often known as Ashwagandha, has long been used in ayurveda and indigenous medicine. Methicillin-resistant *Staphylococcus aureus* is the focus of current research (MRSA). It was created to test the antioxidant and antibacterial activities of extracting *Somnifera* aquatic roots. If detected by the diffusion assay well, the plant's aqueous root extract showed high antibacterial activity against MRSA in vitro. Nandi et al., (2011) calculated the plant *Withania somnifera*'s antioxidant activity to be the troke equivalent. Ounal, also known as Ashwagandha, is well-known in the ayurveda system of traditional medicine for its medicinal properties. It's been used as an antibiotic, antioxidant, aphrodisiac, liver tonic, and anti-inflammatory agent, among other things. Despite *W. W. somnifera* hasn't been linked to any bacterial activity.

Anti-stress activity: In both animal and human research, ashwagandha has been demonstrated to alleviate stress. It's a well-known herb for reducing stress. Using a cold water swimming stress test, the anti-stressor effect of ashwagandha was examined in rats. According to one clinical study, it inhibited the stress pathway in the rat brain by altering chemical transmission in the nervous system. It has been shown in several studies to successfully alleviate stress-related symptoms in persons (Verma et al., 2016). In one study, a 100mg/kg/oral dosage of an aqueous preparation of Ashwagandha root was utilized to prevent/decrease adrenal cortisol and ascorbic acid production caused by swimming stress. The adaptogenic properties of Ashwagandha have been studied (Trivedi et al., 2017). In experimental animals subjected to a variety of biological, physical, and chemical stressors,

ashwagandha was found to provide protection against these stressors when combined with other medications (Singh et al., 2011).

Anti-aging: Anti-aging properties of *Withania somnifera* were evaluated in a double blind clinical trial. A group of 101 healthy males, 50-59 years old were given the herb at a dosage of 3 grams daily for one year. Decrease in serum cholesterol was more in treated group than in placebo group. The subjects experienced significant enhancement in hemoglobin, red blood cell count, hair melanin, and seated stature. Seventy of the research subjects reported improvement in sexual performance (Singh et al., 2010).

Immunomodulator activity: In one animal study, *Ashwagandha* showed a significant modulation of immune reactivity. Administration of *Ashwagandha* was found to prevent myelo-suppression in mice treated with three immunosuppressive drugs viz. cyclophosphamide, azathioprin, and prednisolone. Treatment with *Ashwagandha* was found to significantly increase Hb concentration, RBC count, platelet count, and body weight in mice. Administration of *Ashwagandha* extract was found to significantly reduce leukopenia induced by cyclophosphamide treatment. Administration of *Ashwagandha* extract increased the number of β - esterase positive cells in the bone marrow of cyclophosphamide treated animals. Withaferin A and Withanolide E showed specific immunosuppressive effect on human B and T lymphocytes and on mice thymocytes (Ziauddin et al., 1996).

Antialzheimer's and antiparkinsonian activity: *Ashwagandha* supplements may improve brain function, memory, reaction times and the ability to perform tasks. Animal studies suggest that *Ashwagandha* may reduce memory and brain function problems caused by injury or disease. *Withania somnifera* significantly inhibited haloperidol or reserpine induced catalepsy and provide effective approach for the treatment of parkinson's disease. Anti parkinsonian effect of *Withania somnifera* extract has been reported due to potent antioxidant, anti-peroxidative and free radical scavenging properties (Kumar et al., 2016). One clinical investigation revealed that *Withania somnifera* significantly reversed the catalepsy, tardive dyskinesia and 6-hydroxydopamine elicited toxic manifestations and may offer a new therapeutic approach to the treatment of parkinson's disease (Gupta et al., 2017).

Antibiotic activity: The antibiotic activity of the roots as well as leaves has recently been shown experimentally. Withaferin A in concentration of 10 μ g/ml inhibited the growth of various gram-positive bacteria, acid-fast, aerobic bacilli, and pathogenic fungi. It was active against *Micrococcus pyrogenes* and primarily inhibited the activity of *Bacillus subtilis* glucose-6-phosphate dehydrogenase (Anonymous 1982). One experimental study reported that Withaferin A inhibited Ranikhet virus (Uddin et al., 2012). The shrub's extract is active against *Vaccinia virus* and *Entamoeba histolytica*. *Withania somnifera* showed the protective action against systemic *Aspergillus* infection. This protective activity was probably related to the activation of macrophage function revealed by the observed increases in phagocytosis and intracellular killing of peritoneal macrophages induced by *Ashwagandha* treatment in mice. Antibiotic activity of Withaferin A is attributed to the presence of the unsaturated lactone ring. It is stronger than penicillin (Meher et al., 2016).

Anticancer activity: Animal and test tube studies have shown that it promotes the death of tumour cells and may be effective against several types of cancer. Animal studies have found that *Ashwagandha* helps induce the apoptosis or "programmed cell death" of cancer cells. It also inhibits the growth of new cancer cells in several ways. Main mechanism behind the anti-carcinogenic effect of *Ashwagandha* is generation of reactive oxygen species (ROS), which are toxic to cancer cells but not normal cells (Ahmed et al., 2014). Animal studies suggest that it may be beneficial for treating several types of cancer, including breast, lung, colon, brain and ovarian cancer (Ahmed et al., 2015). In one clinical investigation, mice with ovarian tumor treated with *Ashwagandha* alone or in combination with an anticancer drug had a 70-80% reduction in tumor growth. The most possible uses of *Ashwagandha* is its capacity to fight cancers by reducing tumour size (McKenna et al., 2015). In one study, the herb was evaluated for its antitumor effect in urethane-induced lung tumors in adult male mice. Following administration of *Ashwagandha* over a period of seven months, the histopathological appearance of the lungs of animals which received the herb was similar to those observed in the lungs of control animals (Teli et al., 2014). Withaferin A, Withanolide D and E exhibited significant antitumour activity in vitro against cell derived from human epidermoid carcinoma of nasopharynx (KB) and in vivo against Ehrlich ascites carcinoma, sarcoma 180, sarcoma black (BL) and EO771 mammary adenocarcinoma in mice in disease of 10, 12, 15 mg/kg body weight. Withaferin A has been shown to possess growth inhibitory and radio-sensitizing effects on experimental mousetumors (Yadav et al., 2010).

III. Conclusion

It's a herbal sweet curd made with ashwagandha powder. It contains fat, protein, carbohydrates, and ash, among other things. The current study found that combining Brahmi and *Ashwagandha* powder increased physico-chemical qualities such as protein, fat, glucose, TS, moisture, ash, acidity, antioxidant, and more. Rheological features such as cohesion, consistency, index of viscosity, and cost analysis, among others, are sensory attributes such as color

appearance, body and texture, and flavor test. Overall, the highest acceptability of Ashwagandha combination therapy was 5.42 percent fat, 3.80 percent protein, and 16.74 percent carbohydrate in treatment B3A3, whereas T0 treatment was 6.04 percent fat, 3.38 percent protein, and 16.42 percent carbohydrate, which differed substantially. TS (27.69) in treatment B2A3, moisture 73.39 percent in T0, ash 1.09 percent in treatment B3A3, acidity (0.72 percent in B2A1), and antioxidant (39.75) in treatment B0A3 were the highest results. Microbial examination revealed a maximum of 97.40 percent yeast and mold count in treatment B3A0, with a minimum of (86.0) in treatment T0, and rheological examination revealed a maximum of 470.16 gm in treatment T0 and a minimum of (211.26) in treatment B2A1. Treatment B0A1 has a maximum consistency of 2477.81 gm and a minimum consistency of 1690.35 gm. Treatment B2A3 has a minimum consistency of 1690.35 gm. Treatment B3A1 has a maximum viscosity index of 40.51 gm while treatment T0 has a minimum viscosity index of 16.04 gm. Herbal sweet curd of (B3A3) B3= 2.0 percent A3= 2.0 percent Ashwagandha powder prepared from whole milk with 6 percent fat and 9 percent SNF with addition of 6 percent sugar and 2.5 percent culture found to be more acceptable samples with good color flavor, aroma, taste, mouth feel, and overall acceptability according to organoleptic evaluation. The chemical characteristics of various product treatments differed significantly. The microbiological quality of the prepared herbal sweet curd was found to be satisfactory, while the microbial load of the prepared herbal sweet curd was acceptable. Because of its antispasmodic, neuroprotective, antioxidant, and anticancer properties, the varied combination of Ashwagandha and Brahmi used to produce herbal sweet curd can be included in nutritious cuisine and utilized as an Ayurvedic medical replacement. It also helps with memory and intelligence.

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