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Research Article

BIOLOGICAL ACTIVITIES OF ASHWAGANDHA (Withaniasomnifera)

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A B S T R A C T

Withaniasomnifera(Ashwagandha) is a plant used in medicine from the time of Ayurveda the in ancient system of India medicine. The dried roots of the plant are usedfor treatment of nervous and sexual disorder. From chemistry point of view the drug contains group of biological active constituents known as withanolides have been studied and they are widely distributed in family solanacae. Withaferina has shown significant anticancer activity. Majority of the anticancer drugs like vinblastine vincristine and taxol have been derived from green flora. Today there is much interest in natural product with anticancer activity. According to various surveys, the stress is the major problem for many diseases ranching form psychiatric disorders to endocrine disorder including diabetes mellitus hypothyroidism male sexual dysfunction, peptic ulcer hypertension ulcerative colitis etc. In holy Geeta, it is seen that Arjun was one of the sufferer from stress during Mahabharata war. It is similar to the modern concept of adapt genic agent which gives the protection to the human physiological system against distressed. Recent studies shows that the Ayurveda herbs having adaptogen could induces a state of non-specific increase of resistance to affect internal homeostasis. The adaptogens improve the response to stress and help the body to adapt by normalizing physiological processes in the times of increased stress.

INTRODUCTION

Withaniasomnifera known commonly as ashwagandha, Indian ginseng or winter cherry is a plant in the solanaceae or nightshade family. Several other species in the genus withaniaara morphologically similar although commonly used as a medicinal herb in Ayurveda medicine there is no high quality clinical evidence that it has any biological effect This species is a short, tender perennial shrub growing 35 -75cm (14-30 in) tall tomentose branches extend radially from a central stem, leaves are dull green, elliptic, usually up to 10 - 12cm (4to 5in) long. The flower are small, green and bell – shaped. The ripe fruit is orange–red. The species name somnifera means 'sleep inducing' in Latin. The name ashwagandha, is a combination of the word ashva, meaning horse and gandha meaning smell, reflecting that the root has a strong horse –like odor. Ayurvedic medicine uses herbs, special diets, and other natural practices as treatment for a veriety of conditions. In ayurvedic medicine, ashwagandha is considered a rasayanathat means its an herb that helps maintain youth, both mentally and physically. Historically, the roots of ashwagandha have been used to treat, arthritis, constipation insomnia, skin condition, stress, gastrointestinal issues, diabetes, nervous breakdown, fevers, snake bites, memory loss.

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Ashwagandha withaniasomnifera also known as indian ginseng and as indian winter cherry is a important ancient plant the roots of winter have been employed in indian traditional system of medicine ayurvedunani. Medical system for over 400year, the roots leaves and fruit berry possess tremendous medicinal value. A famous ayurvedic rejuventive a botanical used in many tonics and formulas aswhaganda is the best rejuventive that help maintain proper nourishment of the tissues, particularly muscle and bones, while supporting the proper function of the adrenals and reproductive system .

Botanical Name : *WithaniaSomnifera*
Family Name :Solanaceae
Common Name :Withania, Winter Cherry, Indian Winter Cherry, Indian Ginseng, Ashwagandha
Part Used : Roots, Leaves
Habitat : Cultivated throughout drier partsof IndiaProduct offered : Root

The plant grows in dry and sub tropical region and is an erect branching low laying shrub reaching a height of about 150m. It grows in dry parts in sub –tropical regions. Rajasthan, Punjab, Haryana Uttar Pradesh are the major ashwagandha producing states of the country. In Madhya pradesh along it is cultivated in more than 5000 hectare. The estimated of aswagandha roots in India is the 1500 tones and the annual requirement is about 7000 tonnes necessitating the increase in its cultivation and higher production.

It is seen that ashwagandha's anti-stess anabolic activity was similar to panax ginseng in an animal model of chronic stress. Withaniasomnifer & panax ginseng, extracts decrease the number & severity of stress induced ulcers, reversed stress induced inhibition of male sexual behavior & inhibited the adverse effects of stress on retention of learned tasks. Both reversed stress induced immune suppression, only withania increased peritoneal macrophage activitybut withania average over panax ginseng abuse syndrome a condition characterized by high blood pressure, water retention, muscle tension & insomnia stress.

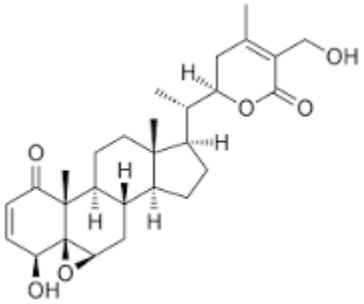
Climatic conditions for growth

The crop required a relatively dry season during its growing period. It can tolerate a temperature range, of 20 to 38^{o}C and as low a temperature range of 20 to 38^{o}C and as low a temperature as 10^{o}C.the plant grows from see level to an altitude of 1500 meters.

Chemical Composition

Laboratory analysis has revealed over 35 chemical constituents contained in the roots of *Withaniasomnifera*. The biologically active chemical constituents are alkaloids(isopellertierine, anferine), steroidal lactones (withanolides, withaferins), saponins containing anadditional acyl group (sitoindoside VII and VIII), and withanoloides with a glucose at carbon 27(sitonidoside XI and X). *Withaniasomnifera* is also rich in iron.

The roots of *Withaniasomnifera* consist primarily of compounds known as withanolides, whichare believed to account for its extraordinary medicinal properties. Withanolides are steroidal and bear a resemblance, both in their action and appearance, to the active constituents of Asian ginseng (Panax ginseng) known as ginsenosides. Ashwagandha'swithanolides have been researched in a variety of animal studies examining their effect on numerous conditions, including immune function and even cancer. Chemical analysis of Ashwagandha show its main constituents to be alkaloids and steroidal lactones. Among the various alkaloids, withanine is the main constituent. The other alkaloids are somniferine, somnine, somniferinine, withananine, pseudo-withanine, tropine, pseudo-tropine, 3-a-gloyloxytropane, choline, cuscohygrine, isopelletierine, anaferineandanahydrine. Two acyl sterylglucoside viz. sitoindoside VII and sitoindoside VIII have been isolated from root. The leaves contain steroidal lactones, which are commonly called withanolides. The withanolides have C28 steroidal nucleus with C9 side chain, with a six membered lactone ring. Twelve alkaloids, 35 withanolides, and several sitoindosides from *Withaniasomnifera* have been isolated and studied. A sitoindoside is a withanolide containing a glucose molecule at carbon 27. Much of Ashwaganda's pharmacological activity has been attributed to two main withanolides, withaferin A and withanolide D. Further chemical analysis has shown the presence of the following. Anaferine(Alkaloid), Anahygrine (Alkaloid), Beta-Sisterol, Chlorogenic acid (in leaf only), Cysteine (in fruit), Cuscohygrine (Alkaloid), Iron, Pseudotropine (Alkaloid), Scopoletin, Somniferinine (Alkaloid), Somniferiene (Alkaloid), Tropanol (Alkaloid), Withanine (Alkaloid), Withananine (Alkaloid) and Withanolides A-Y(Steroidal lactones.



Pharmacological Activity

Centuries of Ayurvedic medical experience using *Withaniasomnifera* have revealed it to have pharmacological value as an adaptogen, antibiotic, aboritifacient, aphrosidiac, astringent, antiinflammatory, deobstruent, diuretic, narcotic, sedative, and tonic. Ashwagandha has been found to: Provide potent antioxidant protection. Stimulate the activation of immune system cells, such as lymphocytes and phagocytes. Counteract the effects of stress and generally promote wellness.

Anti-inflammatory Activity

Withaferin A exhibits fairly potent anti-arthritic and anti-inflammatory activities. Anti-inflammatory activity has been attributed to biologically active steroids, of which Withaferin A is a major component. It is as effective as hydrocortisone sodium succinate dose for dose. It was found to suppress effectively arthritic syndrome without any toxic effect. Unlike hydrocortisone-treated animals which lost weight, the animals treated with Withaferin A showed gain in weight in arthritic syndrome. It is interesting that Withaferin A seems to be more potent than hydrocortisone in adjuvant-induced arthritis in rats, a close experimental approximation to human rheumatoid arthritis. In its oedema inhibiting activity, the compound gave a good doseresponse in the dose range of 12-25 mg/kg body weight of Albino rats intraperitoneally and a single dose had a good duration of action, as it could effectively suppress the inflammation after 4 hours of its administration. Asgand (*Withaniasomnifera*) has been shown to possess anti-inflammatory property in many animal models of inflammations like carrageenan-induced inflammation, cotton pellet granuloma and adjuvant-induced arthritis Detailed studies were carried out to investigate the release of serum β-1 globulin during inflammation by two models of inflammations viz. primary phase of adjuvant induced arthritis and

formaldehyde-induced arthritis. The experiments showed interesting results as most of the APR wereinfleeced in a very short duration and also suppressed the degree of inflammation.

Anti-stress

A study conducted by the Institute of Basic Medical Sciences at Calcutta University examined the effects of Ashwagandha on chronic stress in rodents. For a period of 21 days, the animals received a mild electric shock to their feet. The resulting stress on the animals produced hyperglycemia, glucose intolerance, increase in plasma corticosterone levels, gastric ulcerations, male sexual dysfunction, cognitive deficits, immunosuppression and mental depression. Researchers using *Withaniasomnifera* discovered the animals given the herb an hour before the foot shock experienced a significantly reduced level of stress. This research confirms the theory that Ashwagandha has a significant anti-stress adaptogenic effect. Research conducted at the Department of Pharmacology, University of Texas Health Science Center indicated that extracts of Ashwagandha produce GABA-like activity, which may account for the herb's anti-anxiety effects. GABA (Gamma Amino-butyric acid) is an inhibitory neurotransmitter in the brain. Its function is to decrease neuron activity and inhibit nerve cells from over firing. This action produces a calming effect. Excessive neuronal activity can lead to restlessness and insomnia, but GABA inhibits the number of nerve cells that fire in the brain, and helps to induce sleep, uplift mood, and reduce anxiety. Ashwagandha has traditionally been used to stabilize mood in patients with behavioral disturbances. Research has revealed that the herb produces an anti-depressant and anti-anxiety effect in rodents comparable to the anti-depressant drug imipramine and the anti-anxiety drug lorazepam (Ativan). In fact, Ashwagandha is one of the most widespread tranquillizers used in India, where it holds a position of importance similar to ginseng in China. It acts mainly on the reproductive and nervous systems, having a rejuvenative effect on the body, and is used to improve vitality and aid recovery after chronic illness. Chronic stress can cause conditions such as cognitive deficit, immunosuppression, sexual dysfunction, gastric ulceration, irregularities in glucose homeostasis, and changes in plasma corticosterone levels. In a rat model of chronic stress syndrome, *Withaniasomnifera* and Panax ginseng extracts were compared and contrasted for their abilities to relieve some some of the adverse effects of chronic stress. Research results showed that both Ashwagandha and Panax ginseng decreased the frequency and severity of stress-induced ulcers, reversed stress-induced inhibition of male sexual behavior, and inhibited the effects of chronic stress on retention of learned tasks. Both botanicals also reversed stress-induced immunosuppression, but only the Withania extract increased peritoneal macrophage activity. The activity of the Withania extract was about the same as the activity of the ginseng extract. *Withaniasomnifera*, however, has an advantage over Panax ginseng in that it does not appear to result in .ginseng-abuse syndrome., a condition characterized by high blood pressure, water retention, muscle tension, and insomnia.

Antibiotic Activity

The antibiotic activity of the roots as well as leaves has recently been shown experimentally. Withaferin A in concentration of 10µg/ml inhibited the growth of various Gram-positive bacteria, acid-fast and aerobic bacilli, and pathogenic fungi. It was active against Micrococcus pyogenesvaraureus and partially inhibited the activity of Bacillus subtilis glucose-6-phosphatedehydrogenase. Withaferin A inhibited Ranikhet virus. The shrub's extract is active against Vaccinia virus and Entamoebahistolytica. Asgand showed the protective action against systemic Aspergillus infection. This protective activity was probably related to the activation of the 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 due to the presence of the unsaturated lactone-ring. The lactone showed strong therapeutic activity in experimentally induced abscesses in rabbits, the being somewhat stronger than that of Penicillin. It substantiates the reputation of the leaves as a cure for ulcers and carbuncles in the indigenous system of medicine.

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. Free radical damage of nervous tissue may be involved in normal aging and neurodegenerative diseases, e.g., epilepsy, schizophrenia, Parkinson's, Alzheimer's, and other diseases. The active principles of WS, sitoindosides VII-X and withaferin A (glycowithanolides), have been tested for antioxidant activity using the major free-radical scavenging enzymes, superoxide dismutase (SOD), catalase (CAT), and glutathione peroxidase (GPX) levels in the rat brain frontal cortex and striatum. Decreased activity of these enzymes leads to accumulation of toxic oxidative free radicals and resulting degenerative effects. An increase in these enzymes would represent increased antioxidant activity and a protective effect on neuronal tissue. Active glycowithanolides of WS were given once daily for 21 days, dose-related increased in all enzymes were observed; the increases comparable to those seen with deprenyl (a known antioxidant) administration. This implies that WS does have an antioxidant effect in the brain, which may be responsible for its diverse pharmacological properties. In another study, an aqueous suspension of WS root extract was evaluated for its effect on stress-induced lipid peroxidation (LPO) in mice and rabbits. LPO blood levels were increased by lipopolysaccharides (LPS) from Klebsiellapneumoniae and peptidoglycans (PGN) from Staphylococcus aureus. Simultaneous oral administration of WS extract prevented an increase in LPO. Apart from hepatic lipid peroxidation (LPO), the serum enzymes, alanine aminotransferase, aspartate aminotransferase and lactate dehydrogenase, were assessed as indices of hepatotoxicity. Silymarin (20 mg/kg, p.o.) was used for comparison. Iron overload induced marked increase in hepatic LPO and serum levels of the enzymes, which was attenuated by glycowithanolides (WSG) in a dose-related manner, and by silymarin.

Anti-aging activity

Ashwagandha was tested for its anti-aging properties 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. The subjects experienced significant improvement in hemoglobin, red blood cell count, hair melanin, and seated stature. Serum cholesterol decreased and

nail calcium was preserved.Seventy percent of the research subjects reported improvement in sexual performance.

Anticonvulsant Activity

Administration of Asgand root extract was found to reduce jerks and clonus in 70% and 10% animals respectively with dose of 100mg/kg and reduction in the severity of pentylenetetrazole (PTZ)-induced convulsions was evident from EEG wave pattern. Asgand root extract showed reduction in severity of motor seizures induced by electrical stimulation in right basilateralamygdaloid nuclear complex through bipolar electrodes. The protective effect of Asgand extract in convulsions has been reported to involve GABAergic mediation.

Nootropic effect

Effects of sitoindosides VII-X and withaferin isolated from aqueous methanol extract of roots of cultivated varieties of WS were studied on brain cholinergic, glutamatergic and GABAergic receptors in rats. The compounds slightly enhanced acetyl cholinesterase (AChE) activity in the lateral septum and Globuspallid us, and decreased AChE activity in the vertical diagonal band. These changes were accompanied by enhanced M1-muscarinic-cholinergic receptor binding in lateral and medial septum as well as in frontal cortices, whereas the M2- muscarinic receptor-binding sites were increased in a number of cortical regions including cingulate, frontal, parietal, and retro spinal cortex. The data suggest the compounds preferentially affect events in the cortical and basal forebrain cholinergic-signal transduction cascade. The drug-induced increase in cortical muscarinic acetylcholine receptor capacity might partly explain the cognition enhancing and memory-improving effects of WS extracts in animals and in humans. In a study by Zhao *et al* Withanoside IV (a constituent of WS; the root of WS) induced neuritis outgrowth in cultured rat cortical neurons. Oral administration of withanoside IV significantly improved memory deficits in Abeta-injected mice and prevented loss of axons, dendrites, and synapses. Sominone, an aglycone of withanoside IV, was identified as the main metabolite after oral administration of withanoside IV. Sominone induced axonal and dendritic regeneration and synaptic reconstruction significantly in cultured rat cortical neurons damaged by Abeta. Withanoside IV may ameliorate neuronal dysfunction in Alzheimer's disease and that the active principle after metabolism is sominone. In another study reserpine treated animals also showed poor retention of memory in the elevated plus maze task paradigm. Chronic WS administration significantly reversed reserpine-induced retention deficits. In different study with WS root extract improved retention of a passive avoidance task in a step-down paradigm in mice. WS also reversed the scopolamine-induced disruption of acquisition and retention and attenuated the amnesia produced by acute treatment with electroconvulsive shock (ECS), immediately after training. Chronic treatment with ECS, for 6 successive days at 24 h intervals, disrupted memory consolidation on day 7. Daily administration of WS for 6 days significantly improved memory consolidation in mice receiving chronic ECS treatment. WS, administered on day 7, also attenuated the disruption of memory consolidation produced by chronic treatment with ECS. On the elevated plus-maze, WS reversed the scopolamine-induced delay in transfer latency on day 1. On the basis of these findings, it is suggested that WS exhibits a nootropic-like effect in naïve and amnesic mice.

Antiparkinsonian properties

Parkinson's disease is a neurodegenerative disease characterized by the selective loss of dopamine (DA) neurons of the substantianigra pars compacta. The events, which trigger and/or mediate the loss of nigral DA neurons, however, remain unclear. Neuroleptic-induced catalepsy has long been used as an animal model for screening drugs for Parkinsonism. Administration of haloperidol or reserpine significantly induced catalepsy in mice. WS significantly inhibited haloperidol or reserpine-induced catalepsy and provide hope for treatment of Parkinson's disease. In another study, 6-Hydroxydopamine (6-OHDA) is one of the most widely used rat models for Parkinson's disease. There is ample evidence in the literature that 6-OHDA elicits its toxic manifestations through oxidant stress. Antiparkinsonian effects of WS extract has been reported due to potent antioxidant, antiperoxidative and free radical quenching properties in various diseased conditions. Rats were pretreated with the WS extract orally for 3 weeks. On day 21, 6-OHDA was infused into the right striatum while sham operated group received the vehicle. Three weeks after 6-OHDA injections, rats were tested for neurobehavioral activity and were killed 5 weeks after lesioning for the estimation of lipid peroxidation, reduced glutathione content, activities of glutathione-S-transferees, glutathione reeducates, GPX, SOD and CAT, catecholamine content, dopaminergic D2 receptor binding and tyrosine hydroxylase expression. WS extract reversed all the parameters significantly in a dose-dependent manner. Tardive dyskinesia is one of the major side effects of long-term neuroleptic treatment. The pathophysiology of this disabling and commonly irreversible movement disorder is still obscure. Vacuous chewing movements in rats are widely accepted as an animal model of tardive dyskinesia. Oxidative stress and products of lipid peroxidation are implicated in the pathophysiology of tardive dyskinesia. Repeated treatment with reserpine on alternate days for a period of 5 days significantly induced vacuous chewing movements and tongue protrusions in rats. Chronic treatment with WS root extract for a period of 4 weeks to reserpine treated animals significantly and dose dependently reduced the reserpine induced vacuous chewing movements and tongue protrusions. Oxidative stress might play an important role in the pathophysiology of reserpine-induced abnormal oral movements. In another study, WS glycowithanolides (WSG) administered concomitantly with haloperidol for 28 days, inhibited the induction of the neuroleptic TD. Haloperidol-induced TD was also attenuated by the antioxidant, vitamin E, but remained unaffected by the GABA mimetic antiepileptic agent, sodium valproate, both agents being administered for 28 days like WSG. Antioxidant effect of WSG, rather than its GABA-mimetic action reported for the prevention of haloperidol-induced TD. WS 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

Cardiovascular protection

WS may be useful as a general tonic, due in part to its beneficial effects on the cardiopulmonary system, as reported in the following studies. The effect of WS was studied on the

cardiovascular and respiratory systems in dogs and frogs. The alkaloids had a prolonged hypotensive, bradycardia, and respiratory stimulant action in dogs. The study found that the hypotensive effect was mainly due to autonomic ganglion blocking action and that a depressant action on the higher cerebral centers also contributed to the hypotension. The alkaloids stimulated the vasomotor and respiratory centers in the brain stem of dogs. The cardio-inhibitory action in dogs appeared to be due to ganglion blocking and direct cardio depressant actions. The alkaloids produced immediate predominant but short-lived cardio-depressant effects and a weak but prolonged cardio tonic effect in isolated normal and hypo dynamic frog hearts. In another study, Left ventricular dysfunction was seen as a decrease in heart rate, left ventricular rate of peak positive and negative pressure change and elevated left ventricular end-diastolic pressure in the control group was recorded. WS showed strong cardio protective effect in the experimental model of isoprenaline-induced my necrosis in rats. Augmentation of endogenous antioxidants, maintenance of the myocardial antioxidant status and significant restoration of most of the altered hemodynamic parameters may contribute to its cardio protective effect.

Immunomodulatory Activity

Ashwagandha showed a significant modulation of immune reactivity in animal models. Administration of Asgand was found to prevent myelo-suppression in mice treated with three immunosuppressive drugs viz. cyclophosphamide, azathioprine, and prednisolone. Treatment with Asgand was found to significantly increase Hb concentration, RBC count, platelet count, and body weight in mice. Administration of Asgand extract was found to significantly reduce leucopenia induced by cyclophosphamide (CTX) treatment. Administration of Asgand extract increased the number of β-esterase positive cells in the bone marrow of CTX treated animals, compared to the CTX alone treated group. Administration of Asgand extract was found to significantly reduce leucopenia induced by sub-lethal dose of gamma radiation. Withaferin A and Withanolide E exhibited specific immunosuppressive effect on human B and T lymphocytes and on mice thymocytes. Withanolide E had specific effect on T lymphocytes whereas Withaferin A affected both B and T lymphocytes.

Anti-hyperglycemic Effect

Asgand along with other ingredients of a composite formulation (Transina) have been reported to decrease streptozocin (STZ)-induced hyperglycemia in rats. This anti-hyperglycemic effect may be due to pancreatic islet free radical scavenging activity because the hyperglycemic activity of STZ is a consequence of decrease in pancreatic islet cell superoxide dismutase (SOD) activity leading to the accumulation of degenerative oxidative free radicals in islet-beta cells.

Hypolipidemic effect

WS root powder decreased total lipids, cholesterol and triglycerides in hypercholesteremic animals. On the other hand, significantly increased plasma HDL-cholesterol levels, HMG-CoA reductase activity and bile acid content of liver. A similar trend also reported in bile acid, cholesterol and neutral sterol excretion in the hypercholesteremic animals with WS administration. Further, a significant decrease in lipid-peroxidation occurred in WS administered hypercholesteremic animals when compared to their normal counterparts. However, WS root powder was also effective in normal subjects for decreasing lipid profiles. In another study with aqueous extract of fruits of Withaniacoagulans to high fat diet induced hyperlipidemic rats for 7 weeks, significantly reduced elevated serum cholesterol, triglycerides and lipoprotein levels. This drug also showed hypolipidemic activity in triton-induced hypercholesterolemia. The histopathological examination of liver tissues of treated hyperlipidemic rats showed comparatively lesser degenerative changes compared with hyperlipidemic controls. The hypolipidemic effect of Withaniacoagulans fruits reported to be comparable to that of an Ayurvedic product containing Commiphoramukkul. In another study, hypoglycemic, diuretic and hypocholesterolemic effects of roots of WS were assessed on human subjects. Six mild NIDDM subjects and six mild hypercholesterolemic subjects were treated with the powder of roots of WS for 30 days. Suitable parameters were studied in the blood and urine samples of the subjects along with dietary pattern before and at the end of treatment period. Decrease in blood glucose was comparable to that of an oral hypoglycemic drug. Significant increase in urine sodium, urine volume, significant decrease in serum cholesterol, triglycerides, LDL (low density lipoproteins) and VLDL (very low density lipoproteins) cholesterol were observed indicating that root of WS is a potential source of hypoglycemic, diuretic and hypocholesterolemic agents.

Sexual behavior

Methanolic root extract of WS were orally administered at dose 3000 mg/kg/day of 7 days in rats. Their sexual behaviour was evaluated 7 days prior to treatment, day 3 and 7 of treatment, and day 7, 14 and 30 post-treatment by pairing each male with a receptive female. The WS root extract induced a marked impairment in libido, sexual performance, sexual vigour, and penile erectile dysfunction. These effects were partly reversible on cessation of treatment. This antimasculine effect was not due to changes in testosterone levels but attributed to hyperprolactinemic, GABAergic, serotonergic or sedative activities of the extract. WS roots may be detrimental to male sexual competence.

Anti-carcinogenic activity

Ashwagandha is reported to have anti-carcinogenic effects. Research on animal cell cultures has shown that the herb decreases the levels of the nuclear factor kappaB, suppresses the intercellular tumor necrosis factor, and potentiates apoptotic signalling in cancerous cell lines. One of the most exciting of the possible uses of Ashwagandha is its capacity to fight cancers by reducing tumor size. To investigate its use in treating various forms of cancer, the antitumor effects of *Withaniasomnifera* have been studied by researchers. In one study, the herb was evaluated for its anti-tumor effect in urethane-induced lung tumors in adult male mice. Following administration of Ashwagandha over a period of seven months, the histological appearance of the lungs of animals which received the herb was similar to those observed in the lungs of control animals.

Other Therapeutic Benefits

Further studies have also shown ashwagandha to be effective in the treatment of osteoarthritis, inflammation, stroke, and

tardive dyskinesia. Ashwagandha has been shown to be a potential antimicrobial agent, with antifungal activity, and moderate antibacterial activity against Staphyloccusaureus and Pseudomonas Aeruginosa bacteria strains.

CONCLUSION

The studies so far indicate that *W. somnifera*could prove to be a good natural source of a potent and relatively safe radiosensitizer/chemotherapeutic agent. *Withaniasomnifera* (Ashwagandha) is a plant used in medicine from the time of Ayurveda, the ancient system of Indian medicine. Ashwagandha has been used as an aphrodisiac, liver tonic, anti-inflammatory agent, astringent,And to treat bronchitis, asthma, ulcers, emaciation, insomnia, and senile dementia.Various other effects like immunomodulation, hypolipidemic, antibacterial, cardiovascular protection, sexual behaviour, have also been studied. Clinical trialsresearch support the use of ashwaganda for anxiety, cognitive and neurological disorders, inflammation, and Parkinson's disease. Although the results from this review are quite promising for the use of WS as a multi-purpose medicinal agent, several limitations currently exist in the current literature. While WS has been used successfully in Ayurvedic medicine for centuries, more clinical trials should be conducted to support its therapeutic use.

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