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Few medicinal activities of Ashwagandha (*Withania somnifera*)

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Abstract

Withania somnifera (Ashwagandha) is a plant used in medicine from the time of Ayurveda, the ancient system of Indian medicine. The whole parts of the plant are used in various treatments. The chemistry of *Withania somnifera* has been extensively studied and over 35 chemical constituents have been identified, extracted, and isolated.¹⁹The biologically active chemical constituents are alkaloids are given as a positive control. Present work is based on the research conducted crude plant extracts of leaves of *Withania somnifera* (L.) Dunal screened to investigate the biological activities i.e. antimicrobial, antioxidant, Anti-inflammatory, Anti-aging, Anti-carcinogenic, Cardio protective, Hypothyroid, Pharmacological activities. The demonstration of broad spectrum of *W. somnifera* may help to discover new chemical classes of antibiotic substances that could serve as selective agents for infectious disease chemotherapy and control.

Key-Words: *W. Somnifera*, Ayurveda, Biological activities, Chemical constituents, Antibiotic

Introduction

W. somnifera is commonly known as Ashwagandha. It is a well known as perennial herb in the Ayurveda and indigenous medical systems for 3000 years. A member of family Solanaceae, Ashwagandha is known as Indian Ginseng. Out of *Withania* genus three species are found in India namely, *W. somnifera*, *W. coagulans* and *W. Obtusifolia*, it is distributed in tropical and subtropical region like Rajasthan, Madhya Pradesh, Punjab, Himachal Pradesh, Jammu and Kashmir, Western Himalayas and Tamil Nadu. It grows as a shortly with a central stem from which branches extend radically in a star pattern covered a dense meter of woolly hairs. Leaves are alternate and ovate, up to 10 cm long and up to 5 cm wide. The flowers are small, yellow petals on the inside but with a green outer-covering layer, while the ripe fruit is orange-red and has milk-coagulating properties. Roots are long, brown, fleshy tuberous, it is used for medicinal purposes.

The main active constituents are alkaloids and steroidal lactones. These include tropin e and cuscohygrine. The leaves contain the steroidal lactones, withanolides, notably withaferin A, which was the first withanolides to be isolated from *W. somnifera*.

In Ayurveda, the berries and leaves of *W. somnifera* are locally applied to tumors, tubercular glands, carbuncles, and ulcers. The roots of *W. somnifera* are used to prepare the herbal remedy. Ashwagandha is a well known herb in the Ayurvedic and indigenous medical systems for 3000 years. The plant is being exploited for preparation of over 200 formulations used in the treatment of various physiological disorders.

The present study was designed to evaluate the activities of *Withania somnifera* (Solanaceae). *W. somnifera* is also used as a dietary supplement because it contains a variety of nutrients and photochemical.

Active constituents

All chemicals listed pertaining, the root is the part used as medicine. 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), withaferin A (steroidal lactone),

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Withanine (alkaloid), Withananine (alkaloid) and withanolides A-Y(steroidal lactones).

The main constituents of Ashwagandha are alkaloids and steroidal lactones. Among the various alkaloids, Withanine is the main constituent. The methanol, hexane and diethyl ether extracts from both leaves and roots of Ashwagandha were found. Alkaloid percentage in roots ranges from 0.13 to 0.31%. The roots of *Withania somnifera* are alterative, aphrodisiac, deobstruent, diuretic, narcotic, sedative and restorative in nature. The pharmacological activity of the root is attributed to the alkaloids and steroidal lactones. The total alkaloid content in the roots of Indian types has been reported to vary between 0.13 and 0.3, though much high yields (up to 4.3%) have been recorded elsewhere, many biochemical heterogeneous alkaloids, including chorine, tropanol, pseudo-tropanol, cuscohygrine, 3-a-glyoxytropanol, isopelletierine and several other steroidal lactones. Twelve alkaloids, 35 withanolides and several sitoindosides have been isolated from the roots of the plant have been studied.

A sitoindosides is a biologically active constituent known as withanolide containing a glucose molecule at carbon 27. Indian ginseng's pharmacological activity has been attributed to two main withanolides, withaferin A and withanolide D. Withaferin-A is therapeutically active withanolide reported to be present in leaves. In addition to alkaloids, the roots are reported to contain starch, reducing sugars, glycosides, dulcitol, withancil, an acid and a neutral compound. The amino acids reported from the roots include aspartic acid, glycine, tyrosine, alkaline, glutamic acid and Cysteine.

Medicinal Properties of Ashwagandha (*W. Somnifera*)

There are some important medicinal activities of Ashwagandha which are reported.

Antimicrobial activity

Antimicrobial activity (denoted in terms of inhibition zone and activity index) of the plant extracts, tested against selected micro-organisms were recorded in the present study, total 21 extracts of different parts of selected plants were tested for their bioactivity. Fourteen extracts showed significant antimicrobial potential against test microbes. However 7 extracts showed no activity against any of the selected microorganisms at the tested concentration (three from *W. somnifera*). Most useable organism in the investigation was *B. Subtilis* against which, most of the plant extracts showed inhibition zone.

Anti-oxidant activity

Researchers from Banaras Hindu University in Varanasi, India, have discovered that some of the chemicals found in *W. somnifera* are powerful anti-oxidants. Studies conducted on rat's brain showed the herb produced an increase in the levels of three natural antioxidants-superoxide dismutase, catalase and glutathione peroxidase (Dhuley JN, 2007).

These findings are consistent with the therapeutic use of *Withania somnifera* as an Ayurvedic rasayana. The antioxidant effect of active principle of *Withania somnifera* root may explain the reported anti-stress, cognition-facilitating, anti-inflammatory and anti-aging effects produced by them in experimental animals, and in clinical situations (Bone K, 1996).

Anti-inflammatory activity

Researcher has explored the capacity of Ashwagandha to ease the symptoms of arthritis and other inflammatory conditions. These studies have proven that the herb acts as effective anti-inflammatory agent. Its naturally occurring steroidal content is much higher than that of hydrocortisone, a commonly-prescribed anti-inflammatory (Anbalangan K; Sadique J, 1981). The effectiveness of Ashwagandha in a variety of rheumatologic conditions may be due in part to its anti-inflammatory properties. Rats given root powder of *Withania somnifera* orally one hour before being given injection of an inflammatory agent over a three day period showed that Ashwagandha produced anti-inflammatory response comparable to that of hydrocortisone sodium succinate (Begum VH; Sadique J; 1988).

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 haemoglobin, 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 (Bone K, 1996).

Anti-carcinogenic activity

Ashwagandha is reported to have anti-carcinogenic effects. Research in animal cell cultures has shown that the herb decreases the levels of the nuclear factor kappa B, suppresses the intercellular tumor necrosis factor, and potentiates apoptotic signalling in cancerous cell lines (Ichikawa et al. 2006). One of the most exiting possible uses of Ashwagandha is its capacity to fight cancers by reducing tumor size (Prakash J; et al. 2002, Jayaprakasam B; et al. 2003). To investigate its use in

treating various forms of cancer, the anti-tumor effects of *Withania somnifera* have been studied by researchers. In one study, the herb was evaluated for its anti-tumor effects in urethane-induced lung tumors in adult male mice (Singh N Singh SP; Nath R; et al. 1986). 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.

Cardio protective activity

Ashwagandha has been evaluated in clinical studies with human subjects for its diuretic, hypoglycaemic, and hypocholesterolemic effects (Andallu B; Radhika B; 2000). Six type 2 diabetes mellitus subjects and six mildly hypocholesterolemic subjects were treated with a powder extract of the herb for 30 days. A decrease in blood glucose comparable to that which would be caused by administration of a hypoglycaemic drug was observed. Significant increase in urine sodium, urine volume, and decrease in serum cholesterol, triglycerides, and low-density lipoproteins were also seen.

Hypothyroid activity

Animal studies have shown that Ashwagandha may have effect on thyroid activity. An aqueous extract of dried *Withania somnifera* root was given to mice daily for 20 days. Significant increases in serum T4 were observed, indicating the plant has a stimulating effect at the glandular level. *Withania somnifera* may also stimulate thyroid activity indirectly, via its effects on cellular antioxidant systems. These results indicate Ashwagandha may be a useful herbal medicine in treating hypothyroidism (Panda S; Kar A; 1999, 1998).

Pharmacological activity

Centuries of Ayurvedic medical experience using *Withania somnifera* have revealed it to have pharmacological value as an adaptogen, antibiotic, abortifacient, and aphrodisiac, astringent, anti-inflammatory, deobstruent, diuretic, narcotic, sedative, and tonic. Ashwagandha has been found to provide potent antioxidant protection (Abou-Douh A M. 2002; Panda S; Kar A; 1997). Stimulate the activation of immune system cells, such as lymphocytes and phagocytes (Wagner H; et al., 1994, Singh B; et al., 2001). Counteract the effects of stress and generally promote wellness (Singh B; et al., 2003).

Conclusion

Ayurveda since time immemorial has always known to show tremendous efficiency and are used in day to day life and have tremendous medicinal values.

The studies so far indicate that *W. somnifera* could prove to be a good natural source of a potent and relatively safe radio sensitizer/chemotherapeutic agent. *W. somnifera* (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. Clinical trials and animal research support the use of Ashwagandha for anxiety, cognitive and neurological disorders, inflammation, and Parkinson's disease.

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