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The potentiality of *Withania somnifera* for human health: A mini review

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Abstract
Withania somnifera is an important herb from the Ayurvedic medical system used for the treatment of debility, emaciation, impotence and premature ageing. Not surprisingly, it has been dubbed the 'Indian ginseng'. Its Indian name, ashwagandha, is said to refer to the 'smell and strength of a horse' and possibly alludes to its reputed aphrodisiac properties, although it could also relate to the smell of the root. Pharmacological research on *Withania* has stressed its antitumour and adaptogenic actions, reinforcing its comparison with *Panax ginseng*. However, *Withania* occupies an important place in the herbal materia medica because, while it is not as potent as *Panax*, it lacks the potential stimulating effects of the latter. In fact, it has a mild sedative action as indicated by its specific name '*somnifera*'. It is therefore ideally suited to the treatment of overactive but debilitated patients, in whom *Panax* might tend to aggravate the overstimulation. Many parts of the plant have been used in traditional medicine, including the leaves, bark and root. Except where specified in this monograph, '*Withania*' refers to use of the root.

Keywords: *withania somnifera*, ayurvedic medical system, ashwagandha

Introduction
Withania somnifera, commonly known as Ashwagandha (winter cherry), is an important medicinal plant that has been used in Ayurvedic and indigenous medicine for more than 3,000 years. Some herbalists refer to Ashwagandha as Indian ginseng. The plant extract has many bioactive compounds and thereby exerts antioxidant, anti-inflammatory, and immunomodulatory activities [15]. The plant extract and its bioactive compounds are used in the prevention and treatment of many diseases, such as arthritis, impotence, amnesia, anxiety, cancer, neurodegenerative and cardiovascular diseases, and others. This chapter describes multiple health benefits of Ashwagandha in humans and animals.
Ashwagandha contains various alkaloids, steroidal lactones and saponins, and has been used for its purported antistress/adaptogenic, antitumor, tonic, anxiolytic, anti-inflammatory and antiarthritic properties. Studies in rabbits and rodents have shown hypolipidemic and antioxidant activity in some aqueous extracts [21], and its antioxidant properties were shown to provide protection against radiation-induced hepatotoxicity in rats [24] as well as iron-induced hepatotoxicity in broiler chicks [12]. Ashwagandha does not appear to induce or inhibit major CYP450 enzyme activities (CYP3A4 and CYP2D6) in human hepatic microsomes [15].
Ashwagandha Rasayana, which contains *Withania somnifera* (Ashwagandha), is a widely acclaimed Ayurvedic drug for people of all ages. It has a revitalizing action on the nerves, bone marrow, and reproductive organs. Regular consumption is believed to retard senescence, rectify abnormalities of the sense organs and hypotrophy of muscles, rejuvenate the reproductive organs, and increase fertility. It is also useful in stress, weakness, nervous exhaustion, sexual debility, geriatric problems, memory loss, muscular weakness, insomnia, and cough. Furthermore, it is supposed to inhibit aging and catalyze the anabolic processes of the body [3].

Discussion
Preclinical studies have shown that Ashwagandha Rasayana possesses radioprotective effects, reduces radiation-induced emaciation and decrease in organ weight, and decreases the radiation-induced increase in serum alanine amino transaminase levels and lipid peroxidation [6]. Innumerable studies have shown that *Withania somnifera* increases longevity by promoting physical and mental health, and rejuvenates the body in debilitated conditions. Ashwagandha is also useful in epilepsy, stress, and neurodegenerative diseases (such as Parkinson's and Alzheimer's disorders, tardive dyskinesia, and cerebral ischemia), and contributes to general well-being [21].
Ashwagandha, scientifically known as *Withania somnifera Dunal*, is an important medicinal plant in the Ayurvedic system of medicine. The roots are highly valued, and are used either alone or in combination with other medicinal plants to treat a variety of ailments. It is also used as a general tonic to increase and to improve overall health and longevity. Regular consumption of ashwagandha is believed to prevent diseases in individuals of different ages and with various health conditions [10, 12]. Preclinical studies showed that ashwagandha was an effective immunomodulatory agent and inhibited the myelosuppression induced by diverse immunotoxins (namely, cyclophosphamide, azathioprin, and prednisolone) in mice [10]. Ashwagandha was effective in preventing myelosuppression with all three immunotoxins. The body weight, along with the levels of hemoglobin, red blood cells, white blood cells, and platelets, was restored [10].
Studies have also shown that ashwagandha was effective in

modulating cytokines of both Th1 (IFN-γ, IL-2) and Th2 (IL-4) profiles [11]. In a study to determine whether aqueous extracts of ashwagandha selectively upregulates Th1 activity, administering the extract increased the CD4+and CD8+counts as compared to both the control and cyclosporin A, with a faster recovery of CD4+T cells in immune-suppressed animals. The immunopotentiation effects were comparable to that of levamisole (a synthetic immunomodulator) under immunosuppressed conditions [11].

Ashwagandha is also shown to selectively stimulate Th1 immunity, as evidenced by enhanced secretion of IFN-γ and IL-2 in tumor-bearing animals. Concomitantly, it increased the proliferation of CD4+/CD8+and NK cells and increased the expression of co-stimulatory molecules, namely CD40/CD40L/CD80 [12]. Additionally, administration of ashwagandha to (HL-60, human promyelocytic leukemia cells) tumor-bearing mice along with the anticancer drug camptothecin also led to enhancement in T cell activation [12]. All these observations indicate the usefulness of ashwagandha as an immunopotentiating agent in both normal and tumor-bearing animals, and validate Ayurvedic observations.

Conclusions

The roots of ashwagandha have long been used as "rasayana" drugs in Ayurvedic medicine to prevent or treat disease through the restoration of a healthy balance of life.[56] Ashwagandha is used in Ayurvedic medicine as a general restorative medicine, and to improve general health, longevity, and prevent disease. Ashwagandha is much less stimulating than ginseng, making it preferable for patients with irritability, anxiety, and insomnia, and as a gentle tonic herb for the nervous system. The species name, somnifera, indicates the plant's traditional use for sleep induction. Ashwagandha is immunomodulatory and improves energy in patients experiencing stress-induced illness or exhaustion. It is indicated in inflammatory conditions, such as arthritis or other musculoskeletal disorders, and it is combined with other herbs in the treatment of cancer. Ashwagandha is used in Ayurveda and Unani systems of medicine for thetreatment of pain, skin diseases, infection, inflammation, gastrointestinal disorders, rheumatism, and epilepsy. It is also used as a general tonic for the improvement of libido, liver health, mental state, cancer, heart disease, and the immune system. [59] In vivo studies support its use for anti-inflammatory, immunomodulatory, antioxidant, thyroid stimulating, anxiolytic, stress-reduction, memory enhancing, and antineoplastic effects. Ashwagandha is also reported to be hematopoietic, making it useful in the treatment of anemia. Ashwagandha is combined with levodopa, tropane alkaloid–containing plants, and other herbs as a therapy for Parkinsonism. Ashwagandha and other herbs may take the place of benzodiazepines and have a calming effect on the nervous system.

Overall, toxicity studies have demonstrated a high level of safety of ashwagandha and its extracts. Safety is discussed further in Plant Profiles: Ashwagandha. The American Herbal Products Association has rated it a class 2b herb (not to be used during pregnancy); however, the evidence contraindicating its use during pregnancy is limited and questionable, and Ayurvedic practitioners have used it traditionally during pregnancy. Because ashwagandha reverses cyclophosphamide-induced neutropenia, it may be prudent to avoid its use in patients with leukemia who are being treated with cyclophosphamide [13]

Future scope

W. somnifera, also known as ashwagandha in Hindi and as Indian ginseng and Winter cherry in English, is a plant of the Solanaceae family. In the Ayurvedic system of medicine, ashwagandha is considered beneficial in the treatment of many diseases. Preclinical studies have shown that the methanolic extract of the ashwagandha root (100 mg kg^{-1} body weight per day orally for 15 days) was effective in reducing the indomethacin- and swim (restraint)-induced gastric ulcerations in rats and that the effects were comparable to those of the standard drug ranitidine. The extract reduced the ulcer index, volume of gastric secretion, free acidity, and total acidity. A significant increase in the total carbohydrate and total carbohydrate/protein ratio was also observed. The extract increased the antioxidant enzymes (superoxide dismutase, catalase) and ascorbic acid, and concomitantly decreased the levels of lipid peroxidation [9].

A classic herb in Ayurvedic medicine and now regarded as one of the best adaptogenic tonics, ashwagandha has been used for over 3000 years to restore, enhance, and preserve energy, strength, memory, and vitality, counteracting the effects of stress on the mind and body, calming a turbulent mind, and promoting inner peace and clarity.[244,245]. A review article describes the findings from 58 articles found in a search of four medical databases, concluding that ashwagandha has anti-inflammatory, antitumor, antistress, antioxidant, immunomodulatory, hematopoietic, and nutritive properties, and may be of benefit also to the endocrine, cardiopulmonary, and central nervous systems; it has little or no toxicity. The review also pointed out that ashwagandha may be even more effective when given in combination with other herbs (as is usually the case in its traditional use [3, 4]. In addition to this extensive review, there are articles supporting the anxiolytic and antidepressant activities of ashwagandha, found to be comparable to that of lorazepam and imipramine; reversal of chemotherapy-induced neutropenia, anticonvulsant activity, improvement or protection of memory from known disruptors, and adaptogenic effects. Mild GI side effects may occur. It is an excellent choice in depression with anxiety and panic, a racing mind, insomnia, exhaustion, heavy bleeding, stress, and low libido. It is also used for helping memory and learning, for malnutrition and anemia, arthritis, inflammation, bronchospasm, immune enhancement, alcoholism, and reproductive system disorders; improvement in libido occurs gradually after at least a month of use. Ashwagandha may be taken in tincture, decoction, or powdered in capsules. Traditionally, the powder is prepared by boiling in milk with a small amount of sugar or honey [2, 8, 6].

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