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REVIEW ARTICLE

Botany and Ethnopharmacological Potential of Ashwagandha

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ABSTRACT

Ashwagandha [*Withania somnifera* (L.) Dunal] roots have been used for Indian traditional medicine applications including for the control of fever, asthma, arthritis, rheumatism, inflammation, tuberculosis, mental diseases, and male sexual disorders. The multipurpose use of Ashwagandha has numerous other beneficial health effects that are relevant in light of pharmaceutical perspectives. This review aims to provide comprehensive evaluation of the botanical description and ethnobotanical uses of ashwagandha. An online survey was accompanied for traditional applications of ashwagandha extracts. Appropriate data were obtained from several electronic scientific databases and additional information was also obtained from other relevant sources like textbooks and local prints and scripts. This review investigates and presents the relevant information on ashwagandha, and its botany, ethnopharmacological uses. Future online survey studies are needs to understand the bioactive mechanism of alkaloids, and steroidal lactones compounds, and their effects upon their or consumption through which we can facilitate the protection of human health from several diseases.

Keywords: Ashwagandha; Botany; Ethnopharmacology; Traditional medicine

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INTRODUCTION

Withania somnifera (L.) Dunal commonly known as Ashwagandha, belongs to family Solanaceae, is an important Ayurvedic medicinal plant, its pharmacological, chemical composition and therapeutic effectiveness has been recognized.Ashwagandha is commonly known as Indian winter cherry and Indian ginseng, in India it's called by different vernacular names like Amukkira (Tamil), Asgandh (Hindi), Tilli (Marathi) and Akshan (Pujabi). For centuries, parts of the plant have been used for treating several diseases by different medical systems, depending on ethnic groups. In traditional Indian medicines, this plant has grouped as Rasayana (lengthening lifespan) in Ayurveda. Daily consumption of powdered root of this plant is assumed to delay the senescence, rejuvenate the muscle and reproductive organs and increase the fertility (Durg et al., 2018). In folk medicine, it's used to treat cough, stress, nervous exhaustion, memory loss and muscular weakness (Sharma and Dash, 1998).

The root extracts of the plant exposed to be efficiently improved cerebral health, brain ageing and locomotive syndrome (Singh et al., 2008). It's also used to cure weakness, epilepsy, memory loss, and neurodegenerative diseases such as spinal cord injury, Alzheimer's, and Parkinson's disease(Kulkarni and Dhir, 2008; Rajasankar et al., 2009). Additionally, ashwagandha root extracts areused or consumed as a dietary supplement across developing the world as well as developed nation like the United States (Rajasankar et al., 2009). Based on the above potential health benefits, ashwagandha had great attention in traditional medicine. Therefore, the aim of this review is to highlight the main phytochemicals and its beneficial effects of ashwagandha root powder and extracts for human wellness.

Botanical description

Ashwagandha (*Withania somnifera* L. Dunal) belongs to the Solanaceae family. The plant grows well in dry and arid soils of subtropical countries of Asia and Africa continents (Atal and Schwarting, 1961).In India, ashwagandha prolifically grows in dry tracts of Uttar Pradesh, Madhya Pradesh, Rajasthan, Punjab plains and Gujarat (Tripathi et al., 1998).This plant has ploidy level variations and predominance with tetraploid, chromosome number is 2n = 48 (Iqbal and Dutta, 2007). It is a small erect, evergreen shrub, grown about 30-75 cm in height and covered with wooly pubescence. Roots are tuberous, 20-30 cm long, cylindrical, 1-2 cm diameter and whitish brown colour skin. The leaves are simple, opposite, ovate, and glabrous, 4-10 cm length and 2-7 cm broad and arranged in alternate fashion. Flowers are bisexual, axillary umbellate cymes, five petals, and five sepals, bicarpellary ovary, single style, and bilobed stigma with dehiscing anthers (Atal and Schwarting, 1961; Kaul et al., 2005). The pollen load is huge on the stigma, and stiff pollen which favours self-pollination (Mir et al., 2012). Petals are united, stamens attached with corolla tube. The matured fruit is berry, orange-red in colour and is enclosed with persistent calyx. Seeds are tiny, reniform shape and yellow in colour (Bharti et al., 2016). Typical photographs of various botanical features of ashwagandha are presented in Figure 1.

Ethnopharmacological potential of ashwagandha

Ashwagandha roots have been used over 3000 years in traditional medicine for treating various health problems in Asia (Singh et al., 2010). This plant roots serves as ingredient for about 200 formulations in India folk medicine and is used as an aphrodisiac and for the treatment of asthma, inflammation, insomnia, anxiety, psoriasis, constipation, fatigue, weakness, impotence, premature ageing, ulcers, and mental stress. Ashwagandha leaves used for the treatment of tumors in Ayurvedic and Unani system of medicine (Singh et al., 2010). The plant root extracts and active molecule withanolides have potent therapeutic properties like antioxidant, immunomodulation, anti-ageing, adaptogenic, neuroprotective, and antitumor activities (Ziauddin et al., 1996; Rasool and Varalakshmi, 2006; Gupta et al., 2011; Dhuley, 2001; Mishra et al., 2000; Prakash et al., 2013 & 2014).

In Indian traditional medicine doctors and healers believed that ashwagandha root powder boiled with milk is recommended to cure sterility for females (Kirtikar and Basu, 1999). Traditionally, this plant roots used to stimulate youthful vigour and strength, improve the vital fluid production, blood muscle fat, semen and cells (Williamson, 2002). Ashwagandha fruits are used as bitter tonic for dyspepsia and promoting infants growth and possess potent agent for sedative, blood purified and diuretic (Watt, 1972). According to Patwardhan et al. (1998), ashwagandha leaves are recommended to cure the hurting swelling, fever and opthalmitis. Furthermore, this plant also exposed antiserotogenic and anabolic properties and is displayed beneficial activities for the treatment of geriatrics, stress, and arthritis (Mirjalili et al., 2009; Alam et al., 2011). Also, in Indian folk medicine ashwagandha roots have been used for relaxing the mind and enhance the memory power and eye sight (John, 2014).

Figure 1. Botanical features of ashwagandha (*Withania somnifera* L.)

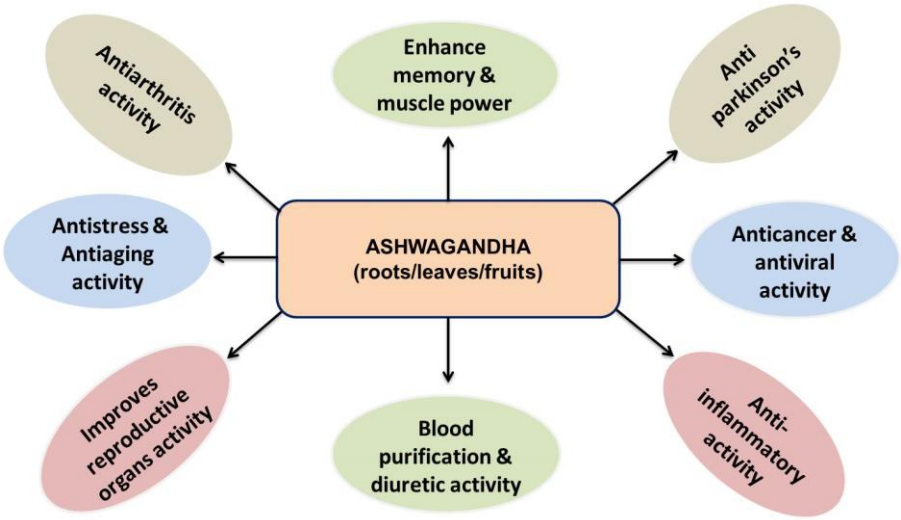

Figure 2. Ethnobotanical uses of *Withania somnifera*

Ashwagandha Rasayana is an extensively admired Ayurveda drug for peoples from the all ages. Consistent consumption of Ashwagandha is assumed to delay the senescence, correct the irregularities of sense organs, increase the growth of muscle cells, revitalize the reproductive organs and enhance the fertility. Furthermore, Ashwagandha rasayana is also useful to cure the cough, insomnia, muscular weakness, stress, memory loss, tiredness and aging problems (Sharma and Dash, 1998). Graphical representation of ethnobotanical uses of *Withania somnifera* has been shown in Figure 2.

CONCLUSIONS

Withania somnifera (L.) is an important medicinal plant and it has been used from ancient times in traditional Indian medicines (TIM). In Indian Ayurveda, this plant has grouped as Rasayana (which means lengthening lifespan).All the *W. somnifera* plant parts has been used to cure several diseases by various countries particularly in India. Among the various plant parts, roots have been widely used for treatment of some diseases like tiredness, cough, insomnia, muscular strength, stress, memory loss, aging complications, arthritis, asthma, anxiety, constipation, ulcers sterility, and impotence. Several clinical studies need to confirm the biological activity of root powder, extracts and active chemical constituents for treatment of various diseases using animal and human models.

AUTHOR CONTRIBUTIONS

A.P & K.A wrote the manuscript. S.S., K.S.V., M.K & L.H collected data and P.S editing the manuscript.

DISCLOSURE STATEMENT

No potential conflict of interest was reported by authors.

Table 1. Role of *Withania somnifera* extracts of the different parts of the plant

Parts used	Type of extract	Types of activity	Diseases	Important Findings	References
Root	Methanol	Anticancer	Colan cancer	Increased ROS by chemotherapy	Henley et al. (2017)
Root	Alcohol	Anticancer	Murine B16F1 melanoma	Apoptosis by intrinsic pathway suppression	Sudeep et al. (2018)
Entire plants	Methanol (75%)	Stem cells	bone marrow cellularity increased	Increased total WBC	Kuttan (1996)
Root	Aqueous	Anticancer	Ascites carcinoma	7.5 Gy gamma radiation	Devi et al. (1996)
Root	Water	Anticancer	Human malignant melanoma cells	Nuclear blebbing	Halder et al. (2015)
Leaves	Methanol	Antiinflammatory	Inflammatory disorders	NF-kappa inhibition by preventing TNF-induced activation	Kaileh et al. (2007)
Leaves	Methanol	Breast, liver cancer	cancer cell lines	At S phase cell cycle arrested	Alfaifi et al. (2016)
Leaves	Water	Neuroinflammation	Inactivation of microglial	cell cycle arrest at G0/G1 and G2/M phase	Gupta and Kaur (2016)
Stem	Ethanol	Anticancer	HeLa, A549, BT474, MDA-MB-231	Multidrug Resistance Targeting	Maliyakkal et al. (2015)
Fruits	Methanol	Neurological	Disorders in related to Neurology	BBB (blood-brain-barrier) permeability	Vareed et al. (2014)
Compound	withaferian A	Antimicrobial	*Pseudomonas aeruginos, Staphyloccus aureus, Bacillus subitlus, Micrococcus pyogenes*	It showed strong activity against tested organisms	Abou-Douh, (2002)
Root	Water, Methanol	Antioxidant	Chemo-preventive activity	Free radical scavenging action of the extract	Prakash et al. (2002)

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