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Relevance of Ashwagandha (*Withania somnifera*) root extracts for good health and stamina: A review of recent advancements

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Abstract
Herbal plants have been the primary source of medicines for humans since ancient times, and traditional medical systems are used by 80 percent of the world's population. According to the World Health Organization (WHO), the international market for herbal products is worth approximately $6.2 billion and is expected to grow to $5 trillion by the year 2050, among the medicinal plants. The main objective of the study is to identify the traditional uses of ashwagandha root extracts for health and longevity, keeping focus on pharmaceutical and biochemical scientific evidence to support the validity. National and international journals have been examined for concrete evidence.

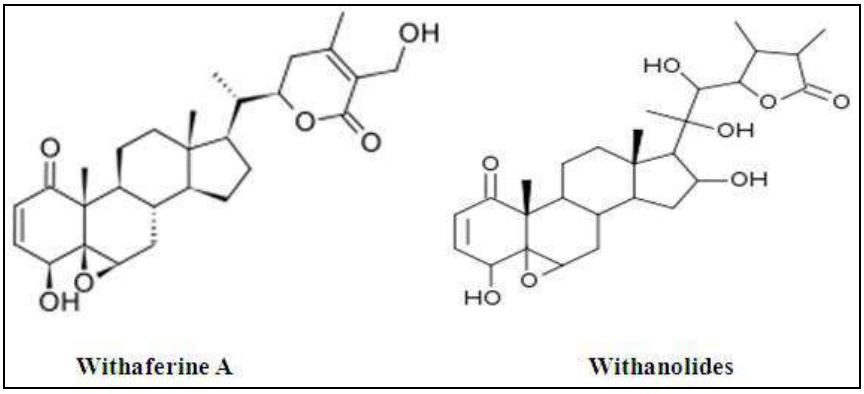
Keywords: Ashwagandha, chemotherapy use, GABA, phytochemical content, aphrodisiac

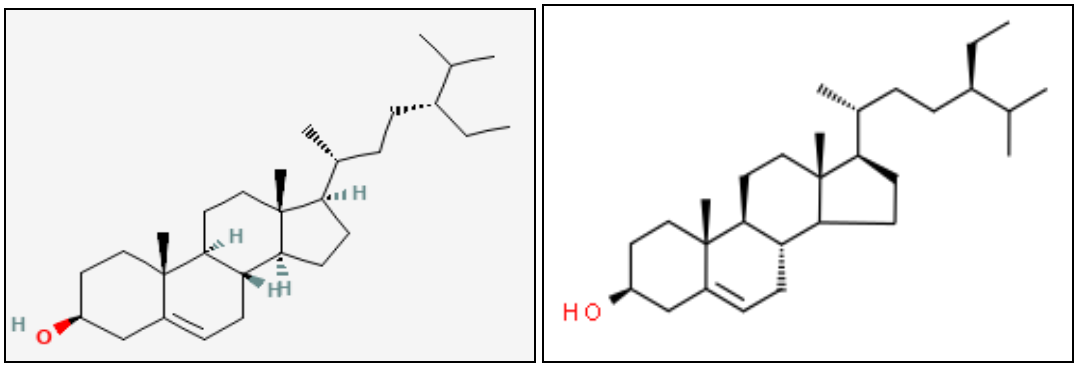
Introduction

India has become one of the world's twelve mega biodiversity hotspots, having an abundance of medicinal plants. Ashwagandha [*Withania somnifera* (L.) Dunal] is one of the key potential medicinal herbs of India, especially grown in Madhya Pradesh, Rajasthan, Gujarat, Punjab, and Uttar Pradesh (Sahu *et al*., 2014). Ashwagandha cultivation is a preferable option for places that are not ideal for food crops, and it flourishes in a dry, low-humidity environment. The plant grows abundantly in India's drier subtropical and semi-tropical climates, from the plains to 1,700 metres above sea level. The term “Ashwagandha” was derived from Sanskrit; ‘Ashwa’ means horse and ‘Gandha’ signifies fragrance to some experts and stamina to others. The earlier argues that it has a horse-like smell, while the latter says that it produces horse-like strength (Vaidya, 1984, Sharma, 2000). Its two synonyms, Vajagandha and Turangagandha, are listed in Charaka Samhita and Sushruta Samhita, and have similar meanings to Ashwagandha. Horses are represented by the words Vaji and Turanga, while Gandha is represented by the word Gandha. Ashwagandha (*Withania somnifera*) is a popular medicinal herb that can be found in India, Pakistan, Afghanistan, Spain, the Middle East, Africa, and the Canary Islands. It's also referred to as "Indian ginseng" because it's employed as an adaptogen or tonic in Ayurvedic traditional medicine (Umadevi *et al.*, 2012) [24]. It is, however, unrelated to "genuine" ginseng (*P. ginseng*, *P. quinquifolium*). Medicinally, the root is employed, but the seeds, shoots, juice, and leaves have all been used in the past (Teli *et al.*, 2014) [23].

Active biochemical contents

A specific steroidal lactone called with anolides have also been observed in Ashwagandha. The presence of these alkaloids is thought to be responsible for many of Ashwagandha's pharmacological properties (Rai *et al.*, 2016) [15]. Alkaloids, 18 fatty acids, beta-sitesterol, polyphenols, and phytosterols are also found in the roots (Bruno, 2009) [4].





Beta-sitesterol Phytosterols

Fig 1: Structures of various chemicals and alkaloids present in ashwagandha roots.

Common uses

Ashwagandha had already traditionally used as an aphrodisiac. It has a long list of uses as a home remedy. It is part of the Ayurvedic, Siddha, and Unani traditions, and is listed in the Indian Materia Medica. Published research on Ashwagandha clearly shows a vast range of potentially advantageous and diverse uses for health improvement and support. A discussion of each of these potential applications follows.

1. Chemotherapy and radiation therapy

Chemotherapy and radiation therapy are frequently used to treat cancer patients. Both of these treatments have the potential to lower white blood cell (WBC) counts, and chemotherapy can cause mylosuppression, or a reduction in the capacity of the bone marrow to produce WBC. As a result, the patient may be more susceptible to other infections. When combined with chemotherapy or radiation therapy, Ashwagandha has been shown to increase WBC count in animals (Singh *et al*., 2010, Singh 2011, Ali *et al*., 2015, Rizvi *et al.*, 2016, Speer *et al.*, 2021) [20, 21, 17, 22] This herb has also been shown to reduce mylosuppression when used in conjunction with chemotherapy in other studies (Zhang *et al.*, 2018, Deshmukh *et al*., 2014) [25, 6].

Furthermore, Ashwagandha has been shown in several studies to inhibit tumor growth in test animals while boosting radiosensitivity, or the ability of radiation therapy to kill tumor cells (Palliyaguru, 2016, Kataria, 2016, Wadhwa, 2013, Verma and Bureau 2019). Even without radiation therapy, Ashwagandha was able to inhibit tumor growth in animals in one study (Rai and Bhola, 2018).

2. Immune function

Ashwagandha has been shown in studies to improve immune function in addition to its ability to treat cancer. It was demonstrated in a study in which mice given a daily dose of Ashwagandha had increased phagocytosis and intracellular macrophage activity against a pathogen. In a study on mice, ashwagandha was found to positively affect the tumor-fighting abilities of macrophages (Bruno 2009) [4].

In addition to providing immunogenic effect, ashwagandha has been used to prevent organ failure in mice treated with immunosuppressive medications, resulting in significant increases in hemoglobin level, red blood cell count, white blood cell count, platelet count, and body weight (Ziauddin, 1996) [26].

Ultimately, mice's immune systems were suppressed using a various approach before being subjected to infectious organisms in a series of studies. Mice pretreated with one of six herbs, including Ashwagandha, fared much better than control mice in each experiment. Mice given the herbs recovered faster, had less illness, and died less often. Artificially produced neutropenia (a lack of neutrophils, a type of white blood cell) was reduced by these herbs, but leucocytosis was increased (an increase of white blood cells). Antibiotics and these herbs were used together in therapies that had a much better healing impact than either treatment alone. Stress-related damage was also minimized by the herbs (Rehman *et al.*, 2017) [16]

3. Antioxidant activity

Ashwagandha seems to be have significant antioxidant activity, which is also one of its signaling pathways. In one study, Ashwagandha substantially reduced free radical oxidation in the liver of mice while strengthening antioxidant enzyme activity such as superoxide dismutase (SOD) and catalase (Birla *et al*., 2017). In other studies, Ashwagandha was found to suppress free radical activity in stress-induced mice (Cereste, 2011) [5]. From another study, Ashwagandha, given once daily for 21 days, boosted SOD, catalase, and glutathione peroxidase levels in rats in a dose-dependent manner (Alam *et al.*, 2012). From one investigation, Ashwagandha enhanced SOD activity in the pancreas of diabetic rats when used as an aspect of an Ayurvedic herbal formulation (Maher, 2016).

4. Brain chemistry

Ashwagandha has been utilized in the treatment of psychological and emotional well-being, because it can alter brain chemistry in a good way. In animal experiments, for instance, it has been designed to boost memory and cognitive function either increasing acetylcholine activity in the brain or binding to cholinergic receptor sites (Houghton and howes 2005). This plant also exhibits GABA-mimetic action, which means it can imitate some of the relaxing neurotransmitter GABA's effects (Mehta, 1991) [13]. Ashwagandha has been demonstrated in clinical trials to relieve a reactive type of depression without sedating the user. It nevertheless improves mental and psychomotor function by reducing mental stress.

5. Aphrodisiac

In a clinical experiment of ashwagandha on the ageing process, 71.4 percent of the males reported an increase in their sexual performance capacity. The herb's conventional use as such an antidepressant shows up to be confirmed by these findings (Krutika, 2016) [11]

6. Anti-inflammatory & antiarthritic activity

Ashwagandha is shown to have powerful anti-inflammatory properties. For instance, their anti-inflammatory activity was shown to be fairly similar to that of a 5 mg/kg dosage of hydrocortisone in one research (Kalra and Kaushik, 2017). Five plants were examined for their anti-inflammatory properties in another investigation. The findings revealed that while each of the plants had various levels of anti-inflammatory action, Ashwagandha had the most (Sikandan *et al.,* 2018) [19]

7. Anti-stress and anabolic activity

A comparison of Ginseng (*Panax ginseng*) and Ashwagandha (*Withania somnifera*) was conducted due to their functional similarities (*Withania somnifera*). Each herb was examined in mice using water solutions of the powdered root: (1) for anti-stress action (by the swimming endurance test); and (2) for anabolic activity (by the weight measurement of body weight and levator ani muscle). When compared to the control group in the swimming endurance test, Ashwagandha and Ginseng both showed anti-stress activity, while Ginseng's activity was higher. Although both herbs had considerable anabolic activity, the mice given with Ashwagandha gained more body weight than those treated with Ginseng in the anabolic research (Kitts, 2000).

8. Morphine dependance

Since Ashwagandha has only been tested in mice, it also has the potential to treat those who are habitual to morphine. In what seems like a 10 days research, Ashwagandha prevented the development of morphine tolerance. This is critical since developing a tolerance for a substance frequently leads to higher doses and abuse. Ashwagandha also reduced morphine withdrawal leaps, which are an indication of morphine dependence (Gohari *et al.,* 2008) [7].

9. Glandular support

Even if most of the above benefits wasn't enough, Ashwagandha also aids the thyroid, liver, and pancreas work efficiently. Mice had a rise in both T3 and T4 thyroid hormones after being given T3 and T4 thyroid hormones on a daily basis for 20 days. Ashwagandha also reduced free radical activity in the liver in the same research (Honda 2018). In another study, a combination of Ashwagandha and other herbs (*Tinospora cordifolia*, *Eclipta alba*, *Ocimum sanctum*, *Picrorrhiza kurroa*, and shilajit) given once daily for 28 days reduced blood sugar levels and free radical activity in diabetic rats' pancreas. Because the reduction in blood sugar may be related to pancreatic free radical scavenging activity, which protects the cells that make sugar, this activity in the pancreas is critical (Mehta *et al.,* 2020).

10. Safety

A 90-day oral treatment of three doses of Ashwagandha in rats was used to detect any potential harm. The researchers looked at food consumption, body weight, haematological, biochemical, and histopathological markers. On gross examination and histopathologically, the brain, heart, lung, liver, spleen, kidneys, stomach, testis, and ovaries were all normal. In rats, subacute toxicity trials revealed no harm (Mellado-Garcia, 2016) [14]. Ashwagandha appears to be a safe herb. Despite this, one study suggests that Ashwagandha should be avoided during pregnancy (Edward *et al.,* 2015).

Conclusion

A review is an effective approach for accurately and reliably summarising evidence about the effectiveness of health-care interventions. The Ashwagandha proves to be a promising naturally occurring substance of an effective and reasonably safe radiosensitizer/chemotherapeutic agent, as per initial study. *Withania somnifera* (Ashwagandha) is an Indian plant that was employed in medicine since the time of Ayurveda. Ashwagandha was used to treat bronchitis, asthma, ulcers, emaciation, sleeplessness, and senile dementia as well as an aphrodisiac, liver tonic, anti-inflammatory agent, and astringent. The use of ashwaganda for anxiety, cognitive and neurological diseases, inflammation, and Parkinson's disease is verified by clinical trials and animal research.

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