



A Review On Potential Medicinal Herb Ashwagandha

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Abstract :

In recent years, there has been a significant increase in reports regarding the health promoting benefits of *withania somnifera* also known as winter cherry or Ashwagandha. Ashwagandha has a long history of use in ayurvedic medicines, and is best known as an adaptogen, a compound that can help to strengthen or boost immunity. Ashwagandha is a herbal remedy in ayurvedic medicines. Ashwagandha is known for its many types of illnesses including Parkinson's, dementia, memory loss, stress induced diseases, malignant tumours and others. Ashwagandha is used as a home remedy by Indians, and is considered the best tonic for elderly and children and as an aphrodisiac for the young people. Preclinical studies have also shown that ashwagandha has an anti-inflammatory, anti bacterial, antioxidant , antidiabetic, anti tumour , anti-ageing and neuroprotective properties. This review provides a brief overview of Ashwagandha. This review discusses about the pharmacognostic account of Ashwagandha, scientific studies on ashwagandha, effects on Parkinson's disease, effects on CNS, effects on stress induced diseases, Health Benefits Of The Various Ashwagandha Formulations. Let's briefly consider the importance of winter cherry (Ashwagandha) .

Keywords:- Ashwagandha, Parkinson's disease , *withania somnifera*, Adaptogenic, wintercherry, agglomerates.

Introduction:- Ashwagandha (*withaniasomnifera*) also known as Indian ginseng or winter berry, has been used in Ayurvedic medicines for over 3000 years.

Synonyms :- withania root, clustered wintercherry, Ashwagandha.

Biological source:- It consists of the dried roots and stem bases of *withania somnifera* Dunal, which belongs to the Solanaceae family.

Geographical source:- Withania is widely distributed from southern Europe to India and is wild in Africa.

History:- The use of Ashwagandha in Ayurvedic medicines dates back more than 3000-4000 years and traces its origins to the Attolian teachings of a revered Rishi (sage) Punarvasu. It is mentioned in Ayurvedic texts such as the Charaka and Sushruta Samhitas where it is widely prescribed as a tonic against weakness especially for people of all ages including infants and as an improver of the reproductive function in both men and women.

Cultivation and collection:- *withania somnifera* is propagated by division of cuttings or seeds. The best way to propagate them is by seed. Seeds sown on moist sand will germinate in 14-21 days at 200°C. *Withania somnifera* needs full sun to partial shade with a well-drained slightly alkaline soil mix. Plants do best when the soil pH is 7.5-8.0. A soil mix consisting of two parts sandy loam to one part sand will be better. Plants are allowed to dry thoroughly between waterings. Too much water in containers causes root rot. The plants are fertilized once a year with a balanced fertilizer.

Characteristics:- A low growing plant, often reaching only 1-2 feet but occasionally 6 feet. It is a perennial but can be grown as an annual. The plant and fruits resemble its relatives ground cherries and Chinese lantern. Young roots are straight, unbranched and conical and in pieces of various lengths. Root thickness varies with age and is usually 5-12 mm below the crown. The outer surface is yellowish-brown to yellow and longitudinally wrinkled. The taste is bitter and slimy.



Fig.No.1 Morphology of Ashwagandha

Microscopy:- A transverse section of the root shows that the cork is exfoliated or crushed; if present isodiaty and non-lignified; cork cambium of two to four diffuse rows of cells; secondary cortex about twenty layers of compact parenchymatous cells; phloem consists of sieve tubes, phloem parenchyma, companion cells, cambium shows four to five rows tangentially

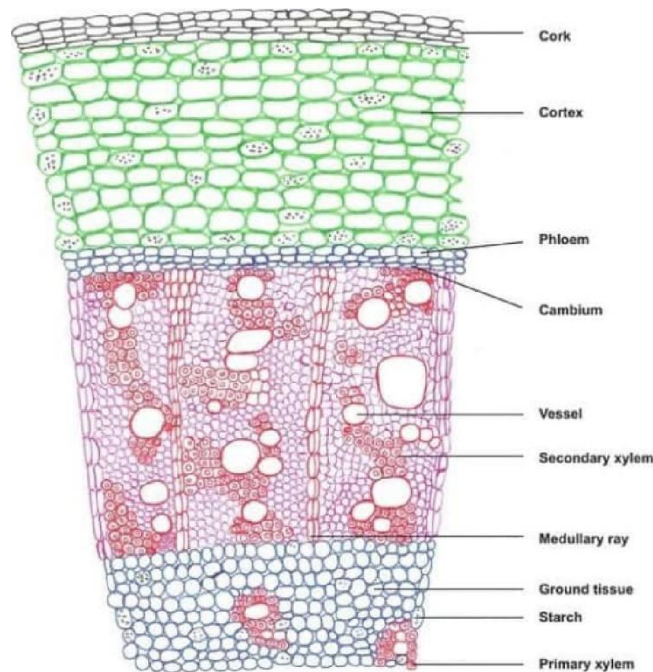


Fig.No.2 T.S. of Ashwagandha Root

elongated cells; secondary xylem hard forming a closed vascular ring separated by multiseriate medullary rays and a few xylem parenchyma.

Chemical Constituents:- The plants contain the alkaloid withanin and somniferin, pseudowithanin, tropin and pseudotropin, hygrin, isopelderin, anaferin, anahygrin and steroid lactones as main constituents. The leaves contain a steroid lactone, commonly known as withanolides.

Uses:- All parts of the plant including roots, bark, leaves, fruits and seeds are used to treat nervous disorders, intestinal infections and leprosy. Ashwagandha is one of the most widely used tranquilizers in India, where it occupies a prominent position similar to ginseng in China. It acts primarily on the reproductive and nervous systems, has a rejuvenating effect on the body, is used to improve vitality and aids recovery from chronic diseases. It is also used to treat nervous exhaustion, weakness, insomnia, wasting diseases, failure to thrive in children, impotence, infertility; multiple sclerosis, etc. It is applied externally as a poultice to ulcers, swellings and other painful places. Withania is considered an adaptogen and is therefore used for a number of ailments.

Possibly Effective for

Insomnia:- Taking Ashwagandha by mouth seems to improve overall sleep and sleep quality in some people.

Stress: Taking Ashwagandha by mouth seems to help reduce stress in some people. It can also help reduce stress-related weight gain.

There is interest in using ashwagandha for a number of other purposes, but there is not enough reliable information to say whether it might be helpful.



Marketed Products:- It is one of the ingredients of preparations known as Abana, Geriforte, Mentat, mentat syrup, Reosto, Tentex forte, anti-stress massage oil, nourishing baby oil, Nourishing Skin Cream, Anxocare, Galactin Vet, Geriforte Aqua, Geriforte Vet, Immunol, Speman forte Vet, Tentex forte Vet, Ashwagandha Tablet (Himalaya Drug Company), Balarishta (Baidyanath), Ashwagandha Tablet (BAPS AMRUT).

Scientific Studies on Ashwagandha Adaptogenic / Anti-stress effects :-

Ashwagandha compares well with *Eleutherococcus senticosus* (Siberian ginseng) and *Panax Ginseng* (Chinese Korean ginseng) in its adaptogenic properties and is therefore popularly known as Indian ginseng (Singh et al., 2010). Extensive biological animal model studies for the adaptogenic/antistress properties of Ashwagandha (Abbas and Singh, 2006; Kalsi et al., 1987; Singh et al., 1976, 1977, 1981, 1982, 1993b, 1993 2003; (Singh, 1995a, 1995b, 2006, 2008) have shown to be effective in increasing endurance (physical endurance) and preventing stress-induced gastric ulcers, hepatotoxicity and mortality induced by carbon tetrachloride (CC14). Ashwagandha has similar anti-stress activity in rats (Archana & Namasivayam, 1999). It was used an aqueous suspension of Ashwagandha root at a dose of 100 mg/kg/oral. The results indicated a significant increase in plasma corticosterone level, phagocytosis Index, and avidity index in rats subjected to cold swimming stress. In rats pretreated with the drug, these parameters were close to control values and an increase in swimming time was observed. These results indicate that *Withaniasomnifera* used in its raw form is a potent anti-stress agent. The results of the above study support the hypothesis of Ayurvedic tonics, vitalizers and rejuvenators, which suggest the clinical use of *Withaniasomnifera* in the prevention and treatment of many stress-induced diseases, such as arteriosclerosis, premature aging, arthritis, diabetes, hypertension and malignancy.

Ashwagandha Use in Parkinson's Diseases:-

Degeneration of dopaminergic neurons of the nigrostriatal system is observed in Parkinson's disease. This leads to an imbalance between the inhibitory effect of dopamine and the excitatory effect of acetylcholine and glutamic acid. Factors that cause nigrostriatal cell degeneration include: Genetic conditions; Endo- and exogenous toxic factors; neuroinfection; Oxidative stress; Reduced growth factors; The sum of the effects of several factors mentioned above. The condition is slightly more common in men than women, and although the cause is unknown, it is thought that this may be due to the protective role of estrogen.

A study was conducted on rats with 6-hydroxydopamine-induced Parkinson's disease. Before injection of 6-hydroxydopamine into the striatum, rats were orally administered *Withaniasomnifera* extract at doses of 100, 200 and 300 mg/kg body weight for 3 weeks. Ashwagandha administration was observed to significantly decrease lipoperoxidation, increase glutathione concentration, increase glutathione S-transferase, glutathione Reductase, glutathione peroxidase, superoxide dismutase and catalase activities, catecholamine and dopamine D2 receptor binding, and increased tyrosine hydroxylase expression.

Although *Withania somnifera* significantly improves biochemical parameters in Parkinson's disease, its effects depend on the administered dose. In addition, in a study conducted on fruit flies, administration of a standardized methanolic extract of Ashwagandha root counteracts the deficits associated with Parkinson's disease. In mice with Parkinson's disease, administration of Ashwagandha extract not only improved biochemical parameters but also reduced motor impairment compared to the control group. Oral administration of *Withania somnifera* extract (100 mg/kg, i.p.) to mice was observed to increase the levels of dopamine (DA), 3,4-dihydroxyphenylacetic acid (DOPAC) and homovanillic acid (HVA) and also normalize the levels of lipoperoxidation markers in the striatum of mice.

Effect on Central Nervous System - Cognition Promoting Effect:-

Ashwagandha is a well-known Ayurvedic rasayana and belongs to a subgroup of rasayanas known as medhyarasayanas. Medhya typically refers to the mind and mental/intellectual capacity. Thus, MedhyaRasayana like Ashwagandha is used to support intellect and memory. The effect of MedhyaRasayanas on supporting cognitive functions is best seen in children with memory deficits, or when memory is compromised after a head injury, or in long-term illness and old age.

Stress Reduction :- Cortisol is a hormone your body releases in response to stress and activates your fight-or-flight response. High and chronic stress levels have serious health effects over time, including reduced immunity, heart problems, and nervous system problems.

Studies show that ashwagandha lowers cortisol levels in your body, reducing stress and its symptoms, such as increased blood pressure and heart rate.

It also helps block nervous system activity associated with conditions such as generalized anxiety disorder, insomnia and clinical depression

Male Reproductive System:-

Ashwagandha:-Benefits, uses, dosage, composition and side effects of Ashwagandha, clothed in the folk names of Indian ginseng, Indian winter cherry or poison gooseberry, is a powerful means of strengthening immunity. This herb is a powerful adaptogen, meaning it is a non-toxic herb that helps normalize all body functions by acting on the HPA axis and the neuroendocrine system. Ashwagandha has the botanical name *Withaniasomnifera*. The word "somnifera" means "sleep-inducing", which means that this drug is a powerful sedative and helps treat conditions such as insomnia and other sleep disorders. The ashwagandha shrub comes mainly from India and some parts of the Mediterranean and Africa. In nature it grows to a height of 1.5 meters. The leaves are ovate, elliptic and dull greenish. The plant bears small bell-shaped yellow flowers that slowly turn into orange-red fruits as they ripen. Ashwagandha is widely mentioned in various traditional textbooks of Ayurveda, Siddha, Unani and Chinese medicine due to its wide range of health benefits. Ancient Ayurvedic texts named this plant ashwagandha, meaning "horse smell," because its roots smell like horse urine. It is also

known as Ashvakandika, Asgandh, Gandhapatri and Palashaparni. The synonyms refer to the horse as the herb is a powerful aphrodisiac and is said to give the horse stamina.

Ashwagandha Benefits

Effect On Doshas:- Ashwagandha is characterized by three different tastes, namely Tikta (bitter), Katu (pungent) and Madhura (sweet). It is blessed with Laghu (bright) and Snigdha (oily) gunas. It has UshnaVirya (hot potency) and MadhuraVipaka (pungent metabolic property). It aggravates Pitta (digestion) doshas and calms Vata (air) and Kapha (earth and water) doshas. Every part of this miracle plant is used to treat several health conditions and to promote vitality and longevity in an individual. The Holistic Science of Ayurveda uses this powerful medicine to treat many health problems including infertility, reduced immunity, arthritis, depression, insomnia, mental disorders, etc.

Phytochemical Constituents:- Ashwagandha as a whole contains countless active substances that are used to improve various bodily functions. The roots are packed with essential volatile oils, amino acids and alkaloids, while the fruits and leaves are rich in tannins and flavonoids that help ward off free radical damage and also reduce oxidative stress.

Benefits Of The Various Parts Of The Plant:

Leaves::The analgesic and antioxidant properties of ashwagandha leaves are used to treat viral infections, cough and cold symptoms, fever, and chronic pain.

Flowers and Seeds:- Ashwagandha flowers have powerful diuretic and aphrodisiac properties that are used to improve fertility and treat kidney problems such as kidney stones.

The seeds, on the other hand, have anthelmintic properties and are used to prevent and treat infectious diseases and parasitic infestations.

Roots:- The roots are the most important part of the plant and are mostly used in various formulations, The root has strong aphrodisiac, diuretic, anthelmintic, antioxidant, anti-depressant, anti-diabetic properties and is therefore used to treat nervous problems, diabetes, constipation, infertility, skin disorders etc. Although While in ancient times Ayurvedic healers used to prepare Ashwagandha preparations themselves, today the markets are flooded with these preparations and it can be easily used and used for its wide range of health benefits.

Health Benefits Of The Various Ashwagandha Formulations :

1. Ashwagandha Churna :-

Ashwagandha churna is a powdered formulation of the ashwagandha plant (mainly the roots) used to increase male libido and treat various infertility problems.

Ingredients:-

1 part Ashwagandha

Dividing Vidhara (ieArgyreia speciose)

Method :-

Herbs are washed and dried in direct sunlight. Once there is no moisture, they are crushed separately and passed through a No. 100 sieve to obtain a fine powder. The powders are then mixed together to form a homogeneous mixture and sieved again to remove any impurities or hard particles. Store in airtight containers for future use.

Advantage:**Male Reproductive System:-**

The formulation is usually indicated to improve male health. Churna has powerful spermatogenic properties which are extremely beneficial for treating oligospermia (i.e. low sperm count), hypospermia (low sperm volume), asthenozoospermia (i.e. sperm motility), teratospermia (i.e. abnormal sperm shape) and increases spermatogenesis (i.e. sperm production). . As a natural antioxidant, Churna improves the production of male hormones such as testosterone and luteinizing hormone. It also treats conditions such as erectile dysfunction and premature ejaculation,

Female Reproductive System:-

In addition to improving male fertility, it also helps in the treatment of endometriosis (inflammation of the endometrium) and is a powerful uterine tonic. It maintains hormone levels in the blood, strengthens the female reproductive organs and supports the maturation of eggs into follicles. Regular use of this product or consumption of fertility enhancing foods can be very helpful when an individual is trying to conceive.

Increases Libido: Being a natural aphrodisiac, it helps reduce mental stress and anxiety and stimulates libido-enhancing hormones. It also increases virility and stamina in men.



Fig.No.3 Ashwagandha Churna

Dosage:-

.The dosage should be according to the health condition, age and as recommended by the Ayurvedic doctor or practitioner. It is usually taken as 3 grams, 2 to 3 times a day for adults. It can be consumed with warm milk and should be taken on an empty stomach in the morning or at night before going to bed. It does not show any side effects after proper consultation.

2.Ashwagandha Arishtam:-

This health tonic is a liquid preparation of the herb ashwagandha for general weakness and immunity improvement. Apart from being used to improve reproductive health for both men and women, it is also used for nervous problems like depression, dementia, etc.

The goodness of various herbal ingredients along with ashwagandha like mushali, manjistha, haldi, haritaki, mulethi, arjuna, rasna, daruhaldi, trivrit, chitraka, mustak, vacha, chandan, sariva And several other dravyas or ingredients which make it a potent medicine for a number of ailments. The decoction is prepared by boiling various kashayadravyas or specific decoction herbs and reducing the water content to $\frac{1}{4}$ of the original content. The decoction is strained and stored in a container. Jaggery and dried prakshepakadravyas like dhataki, ginger, black pepper, dalchini, ela, tejpata, nagkeshar and priyangu are added one by one and mixed. The container is covered with a lid, set aside and allowed to ferment for about a month. After fermentation is complete, it is filtered to remove the herb skins and stored in an airtight glass container for future use.

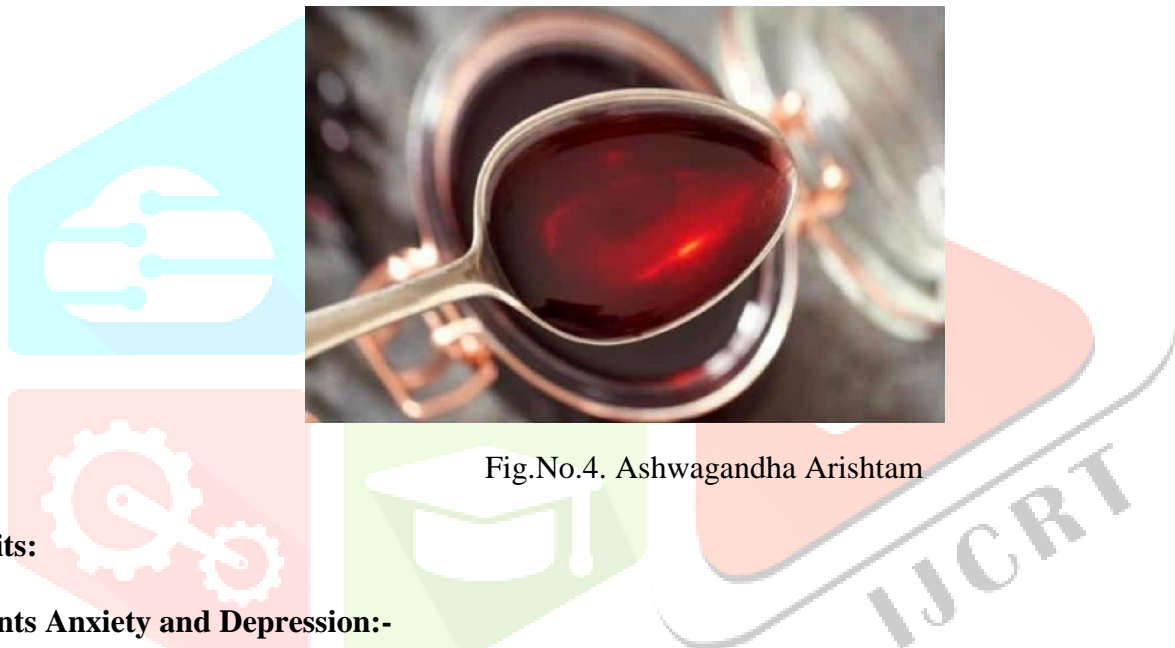


Fig.No.4. Ashwagandha Arishtam

Benefits:

Prevents Anxiety and Depression:-

Ashwagandha arishtam is extremely useful in treating various types of psychotic problems like depression, dementia etc. It normalizes vata and pitta doshas in the body which in turn keeps serotonin levels under control and helps reduce various symptoms of anxiety including restlessness, cold hands and feet etc. The strong anti-depressant properties of the decoction help to relax the mind, reduce irritability and improve energy and stamina.

Treats insomnia:-

Ashwagandha's anti-stress and anxiolytic properties help calm the mind and body. It helps the mind get rid of agitated thoughts, reduces mental fatigue and improves sleep patterns.

Improves immunity:-

This powerful formulation is of great value in improving the body's overall endurance and energy levels. The active ingredients of Ashwagandha and other herbs used in this formulation reduce weakness and fatigue and improve the body's vitality. It also improves adrenal function, which in turn helps reduce stress levels.

Strengthens bone health:-

The tonic is highly beneficial for improving bone health and reducing joint pain and inflammation. It supports bone health, reduces the risk of fractures, maintains overall body balance and provides the body with a strong and perfect skeleton. It also increases bone and muscle mass and treats conditions such as osteoarthritis, osteoporosis and fibromyalgia.

Dosage:-

The general dose of ashwagandhaarishtam is 20 ml, i.e. 4 teaspoons twice a day with the same amount of water or as recommended by the doctor.

Adverse effects: Overdosage of the product without consulting a doctor may cause some contraindications such as acidity, heartburn, GERD, acidity in the mouth, gastritis, ulcer, etc.

3.Ashwagandha Tablets:-

Solid medications can be taken orally as tablets, powders, capsules, wafers, or capsules. These Dosage forms are collectively referred to as solid unit dosage forms because each contains a specific amount of drug that is administered as a single unit. Even in the case of Long-acting Preparations, which technically include the equivalent of many standard Dosages. On the other hand, tablets and capsules currently account for more than two-thirds of the total number and cost of drugs produced worldwide.

Method of Preparation:-**Wet granulation method**

1. Pass all the ingredients through sieve no. 80.
- 2, Mix Ashwagandha, Crospovidone, Tragacanth & Magnesium stearate.
- 3.Prepare separately Lactose solution with water (Q.S).
- 4.Add the solution to the mixture to form a wet sticky mass.
- 5.Pass the agglomerates through sieve no. 12 to form granules.
- 6, Dry the granules in hot air oven at 50-600C for 1 hour .
- 7.Pass the dried granules through sieve no.16 or 18.
- 8.Add Talc and mix well.
- 9.Evaluate the preparation for preformulation studies.

Material used :-

Ingredients	Role
Ashwagandha	Rejuvenates mind and body
Lactose	Diluents, binder
Magnesium stearate	Lubricant
Tragacanth	Binder
Crospovidone	Disintegrant
Talc	Glidant

Table no.1 material used in tablets formulation



Fig.No.5. Ashwagandha Tablets

Benefits Of Ashwagandha Tablets:-

- Reduce stress.
- Improving sleep.
- Boosting athletic performance.
- Improving memory.
- Increases male fertility.
- Anti-inflammatory agent .
- Managing blood sugar level.

Summary And Conclusions: -

Ashwagandha is a plant material that has been used for centuries in traditional Medicinal systems, especially in Ayurvedic medicine. Over the years, research has been Conducted examining the various effects of Ashwagandha, and this research has shows That it has several positive effects on various body systems. Human studies have confirmed the ashwagandha's adaptogenic Potential and clinical benefits. In a number of diverse conditions. Cautions should be used when ashwagandha is taken alongside Certain medications. This review focused on the brief overview of ashwagandha. , scientific studies on ashwagandha, effects of ashwagandha on Parkinson's disease , effects on CNS, effects on stress induced diseases and various formulations of ashwagandha etc.

Although there is evidence to supporting the potential therapeutic uses of Ashwagandha, the mechanisms by which it exerts its effects are still not fully understood.

Reference: -

1. Paulina Mikulska , Marta Malinowska, Milosz Ignacyk, Pawel Szustowski, Joanna Nowak, Karolina Pesta, Monika Szelqg, Damian Szklanny, Eliza Judasz, Gabriela Kaczmarek, Ovinuchi Prince Ejiohuo, Magdalena Paczkowska-Walendowska, Anna Goćmmak, and JudytaCielecka-Piontek* Ashwagandha (Withaniasomnifera)—Current Research on the Health-Promoting Activities: A Narrative Review. Pubmed central. 2023 Apr; 15(4): 1057.

2. Singh N., Yadav S.S., Rao A.s., Nandal A., Kumar S., Ganaie S.A., Narasihman B. Review on anticancerous therapeutic potential of Withaniasomnifera (L.) Dunal. J. Ethnopharmacol. 2021 ;270: 113704. Doi: 10.1016/j.jep.2020.113704

3. R S Upendra, Mohammed Riyaz Ahmed, Healthcare prominence and Immune boosting activity of Ashwagandha against various clinical conditions and Covid 19 disease outbreak, researchgate, International journal of pharmaceutical research vol. 13.

4. Ajagandha, Amangura, Amukkirag, Asan, Asana, Asgan , Ashwagandha — Uses, Side Effects, and More, www.webmed.com.

5. Narendra Singh, Mohit Bhalla, Prashanti de Jager, and Marilena Gilca, An Overview on Ashwagandha: A Rasayana (Rejuvenator) of Ayurveda, Afr J Tradit Complement Altern Med. 2011; Suppl): 208-213. Published online 2011 Jul 3. Doi: 10.4314/ajtcam.v8i5S.9.

6. Singh N, Singh V, Abbas SS. Proc 2nd World cong Biotech Dev Herbal Med. Lucknow (India); 2003. Role of Adaptogens / Antistress agents of plant origin in health care & stress diseases of man; p. 33. [Google Scholar].

7. Manasvi Jain PUBLISHED: 15 JUL 2023, 15:00 PM 1ST Boost immunity in monsoon: Know the benefits of ashwagandha and tulsi.
8. Karin Elgar Ashwagandha: A Review of Clinical Use and Efficacy, nutritional medicine journal.
9. Ambiyee, V. R. et al. (2013) Clinical evaluation of the Spermatogenic activity of the root extract of ashwagandha (*Withaniasomnifera*) in oligospermic males: a pilot study. *Evid. Based Complement. Alternat. Med.*, 2013, 571-420.
10. Pandey A., Bani S., Dutt P., Satti N.K., Suri K.A., Qazi G.N. Multifunctional neuroprotective effect of Withanone, a compound from *Withaniasomnifera* roots in alleviating cognitive dysfunction. *Cytokine*. 2018; 102:211—221. Doi: 10.1016/j.cyt.2017.10.019. [PubMed] [CrossRef] [Google Scholar].
11. Das R., Rauf A., Akhter S., Islam M.N., Emran T.B., Mitra S., Khan I.N., Mubarak M.S. Role of Withaferin A and Its Derivatives In the Management of Alzheimer's Disease: Recent Trends and Future Perspectives. *Molecules*. 2021;26:3696. Doi: 10.3390/molecules26123696. [PMC free article] [PubMed] [CrossRef] [Google Scholar]
12. Sehgal N., Gupta A., Valli R.K., Joshi S.D., Mills J.T., Hamel E., Khanna P., Jain S.C., Thakur S.S., Ravmdranath V. *Withaniasomnifera* reverses Alzheimer's disease pathology by enhancing low-density lipoprotein receptor-related protein in liver. *Proc. Natl. Acad. Sci. USA*. Doi: 10.1073/pnas.1112209109. [PMC free article] [PubMed] [CrossRef] [Google Scholar]
13. Zlokovic B.V., Deane R., Sagare A.P., Bell R.D., Winkler E.A. Low-density lipoprotein receptor-related protein-1: A serial clearance homeostatic mechanism controlling Alzheimer's amyloid β -peptide elimination from the brain. *J. Neurochem* [PubMed] [CrossRef] [Google Scholar]
14. Rabhi C., Arcile G., Le Goff G., Da Costa Noble C., Ouazzani J. Neuroprotective effect of CR-777, a glutathione derivative of Withaferin A, obtained through the bioconversion of *Withaniasomnifera* (L.) Dunal extract by the fungus *Beauveria bassiana*. *Molecules*. Doi: 10.3390/molecules24244599. [PMC free article] [PubMed] [CrossRef] [Google Scholar]
15. Singh Ms, Ramassamy C. In vitro screening of neuroprotective activity of Indian medicinal plant *Withaniasomnifera*. *J. Nutr. Sci.* 2017;6:e54. Doi: 10.1017/jns.2017.48. [PMC free article] [PubMed] [CrossRef] [Google Scholar]
16. Wongtrakul J., Thongtan T., Kumrapich B., Saisawang C., Ketterman A.J. Neuroprotective effects of *Withaniasomnifera* in the SH-SY5Y Parkinson cell model.

Heliyon. Doi: 10.1016/j.heliyon.2021.e08172. [PMC free article] [PubMed] [Crossref] [Google Scholar]

17. Rasool M., Varalakshmi P. Immunomodulatory role of *Withaniasomnifera* root powder on experimental induced inflammation: An in vivo and in vitro study. *Vascul. Pharmacol.* Doi: 10.1016/j.vph.2006.01.015. [PubMed] [Crossref] [Google Scholar].

18. Alam N., Hossain M., Mottalib M.A., Sulaiman S.A., Gan s^m., Khalil M.I. Methanolic extracts of *Withaniasomnifera* leaves, fruits and roots possess antioxidant properties and antibacterial activities. *BMC Complement. Altern. Med.* 2012; 12:1—8.

Doi: 10.1186/1472-6882-12-175. [PMC free article] [PubMed] [Crossref] [Google Scholar]

19. Sengupta P., Agarwal A., Pogrebetskaya M., Roychoudhury S., Durairajanayagam D., Henkel R. Role of *Withaniasomnifera* (*Ashwagandha*) in the management of male infertility. *Reprod. Biomed. Online.* Doi: 10.1016/j.rbmo.2017.11.007.

[PubMed] [Crossref] [Google Scholar]

20. Dalle-Donne I., Rossi R., Giustarini D., Milzani A., Colombo R. Protein carbonyl groups as biomarkers of oxidative stress. *Clin. Chim. Acta.* 2003;329:23—38. Doi:[PubMed] [Crossref] [Google Scholar]

21. Thakur D.A., Dey A., Chatterjee S., Kumar V. Reverse Ayurvedic Pharmacology of *Ashwagandha* as an Adaptogenic Anti-Diabetic Plant: A Pilot Study. *Curr. Tradit. Med.* Doi: 10.2174/2215083801999150527115205. [Crossref] [Google Scholar]

22. Kaushik M.K., Raul S.C., Wadhwa R., Yanagisawa Urade Y. Triethylene glycol, an active component of *Ashwagandha* (*Withaniasomnifera*) leaves, is responsible for sleep induction. *PLoS ONE.* 2017; 12:e0172508. Doi:10.1371/journal.pone.0172508. [PMC free article] [PubMed] [Crossref] [Google Scholar]

23. Deshpande A., Irani N., Balkrishnan R., Benny I.R. A randomized, double blind, placebo controlled study to evaluate the effects of *Ashwagandha* (*Withaniasomnifera*) extract on sleep quality in healthy adults. *Sleep Med.* 2020;72:28—36. Doi:10.1016/j.sleep.2020.03.012, [PubMed] [Crossref] [Google Scholar]

24. Yaribeygi H., Panahi Y., Sahraei He, Johnston T.P., Sahebkar A. The impact of stress on body function: A review. *EXCLI J.* Doi: 10.17179/excli2017480. [PMC free article] [PubMed] [Crossref] [Google Scholar]

25. Fuladi S., Emami S.A., Mohammadpour A.H., Karimani A., Manteghi A.A., Sahebkar A. Assessment of the Efficacy of *Withaniasomnifera* Root Extract in Patients with Generalized Anxiety Disorder: A Randomized Double-blind Placebo-Controlled Trial. *Curr. Rev. Clin. Exp. Pharmacol.* Doi: 10.2174/1574884715666200413120413. [PubMed] [Crossref] [Google Scholar]

26. Pratte M.A., Nanavati K.B., Young V., Morley C.P. An alternative treatment for anxiety: A systematic review of human trial results reported for the Ayurvedic herb Ashwagandha (*Withaniasomnifera*) J. Altern. Complement. Med. 2014;20:901—908.
Doi: 10.1089/acm.2014.0177. [PMC free article] [PubMed] [Crossm [Google Scholar]
27. Remenapp A., Coyle K., Orange T., Lynch T., Hooper D., Hooper S., Conway K., Hausenblas I-LA. Efficacy of *Withaniasomnifera* supplementation on adult's cognition and mood. J. Ayurveda Integr. Med. Doi: 10.1016/j.jaim.2021.08.003.
[PMC free article] [PubMed] [CrossRef] [Google Scholar]
28. Panossian A. , Wikman G. Evidence based efficacy of adaptogens in fatigue
Evidence-Based Efficacy of Adaptogens in Fatigue, and Molecular Mechanisms Related to their Stress-Protective Activity. Curr. Clin. Pharmacol. 2009;4:198—219. Doi: 10.2174/157488409789375311. [PubMed] [CrossRef] [Google Scholar]
29. Khanal P., Chikhale R., Dey Y.N., Pasha I., Chand S., Gurav N., Ayyanar M., Patil B.M., Gurav S. Withanolides from *Withaniasomnifera* as an immunity booster and their therapeutic options against COVID-19. J. Biomol. Struct. Dyn. 2022;40:5295—5308. Doi: 10.1080/07391102.2020.1869588. [PubMed] [Crossm [Google Scholar]
30. Mandlik, D. S., & Namdeo, A. G. Pharmacological evaluation of Ashwagandha highlighting its healthcare claims, safety, and toxicity aspects. J Diet Suppl 2020: 1-
31. Gupta, A. et al. (2013) Efficacy of *Withaniasomnifera* on Seminal plasma metabolites of infertile males: a proton NMR Study at 800 MHz. J. Ethnopharmacol., 149, 208-214.
32. Ashwagandha I Home I IPharmacognosy I Chapter: Pharmacognosy and Phytochemistry : Drugs Containing Alkaloids, pharmacy 180.com.
33. Sumaira Saleem, Gulzar Muhammad, Muhammad Ajaz Hussain, Muhammad Altaf, and Syed Nasir Abbas Bukhari, *Withania somnifera* L.: Insights into the phytochemical profile, therapeutic potential, clinical trials, and future prospective, pmc.