

Shatavari (Asparagus racemosus Willd): A herbal boon to women reproductive health and an overview of current research

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Abstract

Shatavari is known as the Queen of Herbs in our medicine. The plant *Shatavari (Asparagus racemosus Willd)* is used extensively in Indian systems of medicine, i.e. AYUSH (Ayurveda, Yoga and Naturopath, Unani, Siddha and Homoeopathy). It is native to India, a woody climbing plant; both the rhizome and whole plant are useful as medicine in a wide range of diseases. It has been used in medicine for the reproductive health problems, lack of milk in lactating mothers, bleeding through urethra, epilepsy, hoarseness of voice, night blindness, scanty urination, erysipelas and cough etc since time immemorial. It is rich in alkaloids viz. steroidal Saponin (Shatavarin-1 to 6), Carboxylic acid, Isoflavones, Polycyclic hydrocarbons, Furan compound, Sterols, Kaempferol and some miscellaneous constituents. The main pharmacological activities observed in this study are Galactagogue, antioxidant, aphrodisiacs, antidepressant, hepatoprotective, antiemesis, anticonvulsant, antiulcer and anti-anxiety activity etc. Further research and investigation requires for its bioactivity, mechanism of action, pharmacotherapeutics, toxicity, standardization and safe use of this vital drug of Ayurveda. The present review incorporated a detailed account of the plant highlighting its medicinal uses, pharmacological activities on the experimental, preclinical toxicological study along current research potentials.

Keywords: *Shatavari*; *Asparagus racemosus Willd*; Galactagogue; Aphrodisiac; Hepatoprotective

1 Introduction

Shatavari (Asparagus racemosus), belongs to the family Asparagaceae, formerly known as Liliaceae (Lily) family, could be a principal healthful plant of tropical and subtropical India. The genus *Asparagus* contains approximately 300 species around the world, among those 22 species are found in India. *A. racemosus* is broadly distributed around various corners of the world [1]. Medicinal plants and herbal drugs account for a giant percent of the pharmaceutical market [2]. It is available throughout India, Asia, Australia and Africa. *Asparagus* is a popular vegetable consumed in many parts of the world. The shoot is the edible part of the plant, which are frequently used in salads, vegetable dishes and soups. Use of *A. racemosus* is indicated in ancient literature of Ayurveda [3, 4]. Its healthful utilization has been pronounced within the Indian and British formulary. It is very often known for its phytoestrogenic residences. In written material, *Asparagus racemosus* has been delineated as a *Rasayana* herb and has been used unremarkably as an adaptogen [5] to expand the non-distinctive resistance of organisms against a spread of stresses except use inside the healing of symptom and infectious disease, the plant additionally has inhibitor, immunostimulant [6, 7], antidyspepsia and medicament results. The roots are unit used in Ayurvedic medication, following a programme of processing. Recent studies suggested that the roots could provide a number of health benefits. However, more studies are needed on broad scale for more encouraging results to treat any specific condition. It is said to promote fertility and have a wide range of health benefits, particularly for the female reproductive system. The plant, *Asparagus*, is reputed to be a tonic and a

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geriatric [8]. The tubers are anti-diarrhoeatic [9], diuretic [10], anti-tumor [11], antifungal [12], anti-mutagenic [13], nutritive, tonic, aphrodisiac, appetizer and alterative. In addition, the plant is considered slightly sweet, and is useful in the diseases of blood, kidney, liver, scalding urine, rheumatism, gleet, and gonorrhoea. It is commonly used as a female internal reproductive organ tonic, as a galactagogue [14], in acidity, and as a best common wellbeing tonic [15]. Anti-oxytocin action of this plant had been recognized and immunomodulatory [16] properties are ascribed to the basis. The herb is thought to be adaptogenic, which means that it may help to regulate the body's systems and improve resistance to stress. The presence of antifungal and antimicrobial compounds in the higher plants is well established as they have delivered a source of inspiration for Nobel drug compound, as plant derived medicines have made significant contribution towards humans. The treatment of diseases as is done in cases of Unani and Ayurvedic system of medicines.

2 Botanical Description

It is a woody perennial climber; stem often spinescent, terete, green, rootstock with fascicled tuberous roots.

2.1 Distribution

Shatavari is native to tropical and subtropical India, Southeast Asia, Malaysia, Africa and Northern Australia. It is also found up to an altitude of 1500 meters in subtropical Himalayas. By nature, the plant is xerophytic and prefers the semi-arid to subtropical, cool environment.

2.2 Leaves

Linear, with a stout conical spinous spur, straight or slightly curved cladodes very slender, spinous - pointed.

2.3 Flowers

Inflorescence is Raceme, 2.5-5 cm long, slender, axillary, solitary or clustered. **Flowers** are bisexual, 5-6 mm across; **bracts** triangular; **pedicel** c. 1 mm long. **Perianth**- lobes 6, white, c. 3 x 0.5 mm, oblong, acute. **Stamens** 6, adnate to the perianth lobes; **filaments** subulate. **Ovary** 2-3 mm long, globose to slightly 3-gonous, 3-celled; **ovules** 2 per cell; **stigma** 3, recurved.

2.4 Fruits

Berry 4-6 mm diameter, globose, blackish purple on ripening.

2.5 Seeds

Seeds 2-5, c. 2 mm across, globose.

2.6 Roots

White, tuberous, radish-shaped, tapered at ends and found in clusters.

3 *Shatavari* in Ayurveda

3.1 Categorization in Ayurvedic Classics

In Vedas, *Shatavari* has been described as potent remedy for *Arsha* and *Sangrahani* and even eye disorders. In Samhitas it is used in many diseases *Jwar*, *Mutraghat*, *Kshatsheen*, *Rajaykshama*, *Raktapitta*, *Kasa*, *Arsha*, *Timir*, *Pittajatisaar*, *Vaatarakta* etc [17].

3.2 Medicinal Qualities according to Ayurveda

- **Rasa** (Taste): *Madhura* (sweet), *Tikta* (bitter)
- **Guna** (qualities): *Guru* (Heaviness), *Snigdha* (Oily, unctuous)
- **Veerya**: *Sheeta* (Cold potency)
- **Vipaka**: *Madhura* (undergoes sweet taste conversion after digestion)

3.3 Plant Parts Used:

Roots, leaves, flowers, and seeds of this plant has medicinal value. Root is especially used for treating bleeding disorders.

Ayurvedic Medicines/ Formulations of *Shatavari*: *Swarasa, Kalka, Kwatha, ksheera, ghrta, Taila. Ashokarishta, AshokaGhrta, Ashoka Ghana Vati, Kwath* (decoction).



Figure 1 Plant in Habitat

3.4 Uses of *Shatavari* in Ayurveda

Some of its uses as described in various Ayurvedic texts are:

- *Hrudya*: acts as cardiac tonic, congenial for heart
- *Medhya, Medhakara*: Improves intelligence
- *Agnivardhini*: Increases digestion strength
- *Balavardhini*: Improves strength and immunity
- *Grahanihara*: Useful in IBS, sprue, altering diarrhoea and constipation
- *Arshaghna (Arshohara)*: Useful in piles, haemorrhoids
- *Vrishya*: aphrodisiac, improves vigour
- *Sheeta*: Coolant
- *Rasayana*: anti-ageing, causes cell and tissue rejuvenation
- *Akshirogahara, nayanamayahara*: Useful in eye disorders
- *Balada*: Improves immunity and strength

3.5 Phytochemistry/Chemical Composition

Plants of *Shatavari* have a group of steroidal saponins and also contain vitamins A, B₁, B₂, C, E, Mg, P, Ca, Fe and folic acid. Its other primary chemical constituents are essential oils, asparagine, arginine, tyrosine, flavonoids (kaempferol, quercetin, and rutin), resin, and tannin steroidal glycosides (asparagosides), bitter glycosides, asparagines and flavonoids. Asparagine is a strong diuretic. In addition to these, leaves contain diosgenin and other saponins such as shatavarins I and IV [18]; roots contains Shatavarin V and Shatavarin VI-X [19, 20] and α , α -diphenyl- β -picrylhydrazyl (Racemofuran) [21], racemosol and asparagamine [22, 23]. An Isoflavones-8-methoxy-5, 6, 4-trihydroxy isoflavone-7-0-beta-D-glucopyranoside [24], Sitosterol 4,6-dihydroxy-2-O(2-hydroxy benzaldehyde [25], Kaepfrol and sarsapogenin saponin [26] were isolated from roots. While Racemoside A, B, C steroidal saponin [27] and Quercitin, rutin, hyperoside flavonoids [28] were isolated from fruits.

3.6 Biological and Pharmacological Activities:

3.6.1 Antimenorrhagic Activity

Ample formulation of *Shatavari* is, it acts as *Rasayana* and *Vaajikarana* and in *Brihatrayi*, it has been included in different groups of drug which are immuno-modulator [17]. As per Ayurveda, *Shatavari* can help to treat fertility issues in women. It contains steroidal saponins which act as an oestrogen regulator and help in blood purification and balancing of the hormones. It supports the overall reproductive health of women throughout their menstrual cycle by lowering the symptoms of PMS (Premenstrual Syndrome), reducing menstrual cramps and mood swings, and also regulating the flow of blood during periods. It also reduces the symptoms of menopause like hot flashes, irritation, vaginal dryness etc. Pandey *et al.*[29] showed that *Shatavari* may improve female reproductive health complications including hormonal imbalance, polycystic ovarian syndrome(PCOS), follicular growth and development, oocyte quality and infertility possibly by reducing oxidative stress(OS) level and increasing antioxidants level in the body.

Asparagus can also help in the treatment of low sperm count in men. It promotes healthy sperm count and increases the chances of conception. *Shatavari*, when combined with *Ashwagandha* herb, can help treat impotency.

Women undergoing menopause often experience a decline in the quality of life due to sleep deprivation, mood swings, lack of concentration, and other factors. The drug Menosan (110mg of *A. racemosus* extract per tablet) has been studied for the treatment of post-menopausal symptoms. In a trial, significant relief from post-menopausal symptoms such as depression (90% relief), insomnia (83.33% relief), irritability (50% relief), weight gain (50% relief), bone and joint pains (40%), sweating (37.88%) and hot flashes (37.03%) was observed after the use of Mensal [30].

3.6.2 Antimicrobial Activity

Preliminary phytochemical screening as well thin layer chromatography of the EE (Ethanol Extract), CE (Chloroform Extract) and HE (Hexane Extract) revealed that the leaves of *A. racemosus* contain flavonoids which might possibly be responsible for the antimicrobial activity of the extracts [31]. A potential antimicrobial activity of *Asparagus racemosus* was also observed by Gupta *et al.*[32].

3.6.3 Anti-inflammatory Activity

Battu and Kumar [33] revealed that ethanol extract from the leaves of *Asparagus racemosus* Willd displayed marked anti-inflammatory effect at a dose of 600 mg/kg causing a maximum inhibition of about 46 % in paw oedema induced by carrageenan.

3.6.4 Anthelmintic activity

Gupta *et al.*[32] observed that extracts of all the three plants (*Asparagus racemosus*, *Andrographis paniculata* and *Discorea villosa*) at concentrations of 4, 8 and 16 mg/ml and their combination (concentration ratio 1:1:1) were used against six different bacterial strain and three fungal strain for assessment of antimicrobial activity. For anthelmintic study, the concentrations of 20 and 40mg/ml were used against *Pheretima posthuma* (Earthworms). All the plant extracts as well as their combination showed significant anthelmintic potential.

3.6.5 Antihyperglycemic and Antioxidant Activities

Antihyperlipidemic potential of ethanolic extract of *Asparagus racemosus*(EEAR) was registered when it's orally administrated 200 and 400 mg/kg/body weight for 21 days in rats [34]. It is a potential oxidant and it can be used therapeutically to capture free radicals generating in the body. The *Shatavari* root produces three antioxidants: racemofuran [21], asparagamine A, and racemosol. Antioxidants can prevent damage and disease in your body. The antioxidant activity measured using the DPPH method in terms of mean effective concentration (EC50) of the aqueous fraction was found to be 600 µg/ml as compared to 1.5 µg/ml of ascorbic acid [27, 35].

3.6.6 Anti-oxytocic property

The ethanolic extract of *A. racemosus* root had demonstrated good anti-oxytocic property [36].

3.6.7 Anticancer Activity

The Shatavarin IV isolated from ethyl acetate insoluble fraction(AR-2B) of chloroform:methanol(2:1) (AR-2) extract of *A. racemosus* roots was administered orally of (AR-2B) to tumor bearing mice at doses of 250 and 500 mg/kg body weight for 10 days, showed significant reduction in percent increase in body weight, tumor volume, packed cell volume,

viable tumor cell count, and increased non-viable cell count when compared to the untreated mice of the EAC control group. The restoration of hematological parameters towards normalcy was also observed [37]. Root extracts of *Asparagus racemosus* can cause cytotoxic effects, change the morphology and induce growth inhibition in A549 cells.

3.6.8 Antistress activity

Psychological stress disturbs reproductive health by inducing generation of reactive oxygen species (ROS) and thereby oxidative stress (OS). The increased OS may affect physiology of ovary, oocyte quality and cause female reproductive health disorders [29]. To overcome stress-mediated reproductive health disorders in women, *Shatavari* (*Asparagus racemosus*) is frequently recommended in Ayurvedic system of medicine. Antistress property of *Asparagus racemosus* in different model of stress was reported by Joshi *et al.* [38].

4 Conclusion

Shatavari is valued for its medicinal properties both in modern and traditional systems. It is especially highly acclaimed for its utility in reproductive problems and has been used for centuries. Though it has withstood the test of time, it is now important to scientifically validate its mode of action as per Ayurvedic concepts. *Shatavari* has the potential to be developed into a useful and beneficial drug for the treatment of a wide variety of reproductive as well as gynecological problems.

Compliance with ethical standards:

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Disclosure of conflict of interest

There is no conflict of interest between the authors.

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