Shatavari - *Asparagus racemosus*

**Common Names**
- Shatavari (Sanskrit), Satavari (Hindi), wild asparagus, asparagus bush

**Part Used**
- Root

**Description**
Shatavari is a woody climber growing to 1-2 m in length. The leaves are like pine-needles, small and uniform. The inflorescence has tiny white flowers, in small spikes. The roots are finger-like and clustered. The plant, of the Liliaceae family, is common at low altitudes in shade and in tropical climates throughout India, Asia, Australia and Africa.

Shatavari is recommended in Ayurvedic texts for prevention and treatment of gastric ulcers, dyspepsia and as a galactogogue.

Shatavari means ‘who possesses a hundred husbands’. It is considered both a general tonic and a female reproductive tonic. Shatavari is the main Ayurvedic rejuvenative tonic for the female, as is Withania for the male. Shatavari is however, used for sexual debility and infertility in both sexes. It is also used for menopausal symptoms and to increase lactation. Due to its traditional usage and the fact that it contains steroidal saponins, shatavari is fast becoming a popular alternative to false unicorn root.

Shatavari is a soothing and antispasmodic diuretic (although the Western Asparagus root, *A. officinalis*, is a stronger diuretic). It is used wherever increased flow of urine is desirable, such as fluid retention and urinary infections. The diuretic and cleansing activities of the roots are of benefit in the treatment of rheumatic pain.

It is a sweet and bitter herb which is said to be particularly balancing to Pitta Dosha.

Recent research has shown it to be an immunomodulator with antioxidant, healing and adaptogenic properties.

**Constituents**
- steroidal saponins, known as shatavarins I-IV. Shatavarin I is the major glycosid
- isoflavones including 8-methoxy-5,6,4'-trihydroxyisoflavone 7-O-beta-D-glucopyranoside
- asparagamine, a polycyclic alkaloid
- racemosol, a cyclic hydrocarbon (9,10-dihydrophenanthrene)
- polysaccharides, mucilage

**Scientific studies**

**Adaptogenic Activity**
Six rasayana plants from Ayurveda, has been studied for their adaptogenic potential. The whole, aqueous, standardized extracts of selected plants (*Tinospora cordifolia*, *Asparagus racemosus*, *Emblica officinalis*, *Withania somnifera*, *Piper longum* and *Terminalia chebula*) were administered orally to experimental animals, in a dose extrapolated from the human dose, after which they were exposed to a variety of biological, physical and chemical stressors.

The plant extracts were found to protect against the stressors, as measured by markers of stress responses and objective parameters for stress manifestations.

Using a model of cisplatin induced alterations in gastrointestinal motility, the ability of the plants to exert a normalizing effect, irrespective of direction of pathological change was tested. All the plants reversed the effects of cisplatin on gastric emptying, while *Asparagus racemosus* also normalized cisplatin-induced intestinal hypermotility. All the plant drugs were found to be safe in both acute and subacute toxicity studies. Studies on the mechanisms of action of the plants revealed that they all produced immunostimulation.
A traditional Ayurvedic formulation, Siotone, a *rasayana* formulation with adaptogenic properties contains *Withania somnifera*, *Ocimum sanctum*, *Asparagus racemosus*, *Tribulus terrestris* and shilajit (a mineral-rich, composted plant exudate scraped off rocks). All ingredients are classified in Ayurveda as rasayanas which are reputed to promote physical and mental health, improve defense mechanisms of the body and enhance longevity. An in vivo study has shown that Siotone improved glucose tolerance, libido, depression, cognitive dysfunction and immunosupression caused by chronic stress.\(^9\)

**Hormonal Activity**

Pure 9,10-dihydrophenanthrene has been shown to interact with androgen receptors and may therefore inhibit androgen-dependent prostatic growth.\(^10\) Shatavarins, the steroidal saponins, may be responsible for the hormonal like effect of shatavari and explain its traditional use as a reproductive tonic.

Experimental studies have shown that shatavari may have oestrogenic effects on breast tissue and genital organs in female rats. An alcoholic extract of the shatavari rhizome was administered orally to adult pregnant female albino rats at a dose of 30 mg/100 g body weight, daily for 15 days (days 1-15 of gestation). The macroscopic findings revealed a prominence of the mammary glands, a dilated vaginal opening and a transversely situated uterine horn in the treated group of animals. The weight of the uterine horns of the treated group was found to be significantly higher (p < 0.001) but the length was shorter (p > 0.01). Microscopic examination of the treated group showed proliferation in the lumen of the duct of mammary gland. It was obliterated due to hypertrophy of ductal and glandular cells. Hyperplasia of the glandular and muscular tissue and hypertrophy of the glandular cells were observed in the genital organs. The parenchyma of the genital organs showed abundant glycogen granules with dilated blood vessels and thickening of the epithelial lining. The oviduct in the treated group showed hypertrophied muscular wall, whereas the ovary revealed no effect of the drug. The results suggest an oestrogenic effect of Shatavari on the female mammary gland and genital organs.\(^11\)

Further, a glycoside, Shatavarin I, isolated from the root of *A. racemosus* has been found to be responsible for the competitive block of oxytocin-induced contraction of rat, guinea pig and rabbit's uteri, in vitro as well as in vivo.[21]

**Antioxytocic Activity**

The saponin rich fraction was shown to have antioxytocic activity. The saponin inhibited oxytocin-induced uterine contractions in vivo.\(^12\)

**Galactogogue**

Extract of shatavari has been shown to increase both the weight of mammary lobulo-aveolar tissue and the milk yield. This effect was attributed to the action of released corticosteroids or an increase in prolactin.\(^1\) Shatavari has been found to stimulate milk production in buffaloes.\(^13\) The galactogenic effect has been confirmed by a clinical trial.\(^14\)

**Antibacterial Activity**

Different concentrations (50, 100, 150 mcg/mL) of the methanol extract of the roots of *Asparagus racemosus* showed considerable in vitro antibacterial efficacy against *Escherichia coli*, *Shigella dysenteriae*, *Shigella sonnei*, *Shigella flexneri*, *Vibrio cholerae*, *Salmonella typhi*, *Salmonella typhimurium*, *Pseudomonas putida*, *Bacillus subtilis* and *Staphylococcus aureus*. The effects produced by the methanol extract were compared with chloramphenicol.\(^15\) The antimicrobial activity may be due to 9,10-Dihydrophenanthrene.\(^16\)

**Immunological Activity**

Shatavari is an immunomodulator. Animal studies found that shatavari is capable of producing leucocytosis with neutrophilia and, furthermore, was able to prevent myelosupression by reducing cyclophosphamide-induced leucopenia.\(^17\)
Shatavari has also been shown to inhibit drug-induced mammary carcinogenesis. The hypothesis that macrophages play a pivotal role in the development of intraperitoneal adhesions and that modulation of macrophage activity, therefore, may prevent adhesions, was tested in an Indian study. The effects of shatavari was evaluated in an animal model of intraperitoneal adhesions. Shatavari reduced the severity of the adhesions and this correlated with a significant increase in the activity of the macrophages.

An in vitro study found that shatavari increased phagocytic activity of macrophages while an in vivo study found that Asparagus racemosus, Tinospora cordifolia, Withania somnifera and Picrorhiza kurrooa inhibited drug-induced suppression of chemotactic activity and production of interleukin-1 and TNF-alpha by macrophages.

Oral administration of an aqueous root extract (100 mg/kg per day for 15 days) to animals immunised with diphtheria, tetanus, pertussis (DTP) vaccine resulted in significant increase (p = 0.0052) in antibody titers to Bordetella pertussis as compared to untreated (control) animals. Immunised animals (treated and untreated) were challenged with B. pertussis and the animals were observed for 14 days. The treated animals showed a significant increase in antibody titers as compared to untreated animals after challenge (p = 0.002).

Immunoprotection against intra-cerebral challenge of live B. pertussis cells was evaluated based on degree of sickness, paralysis and subsequent death. Reduced mortality accompanied with overall improved health status was observed in treated animals after intra-cerebral challenge of B. pertussis indicating that shatavari promoted a protective immune response. This study suggest that shatavari is a potential immunomodulator which may be used to reduce morbidity associated with vaccinations.

Antioxidant Activity
Membrane damage induced by free radicals generated during gamma-radiation were examined in rat liver mitochondria. An extract of shatavari was shown in vitro to have potent antioxidant properties in mitochondrial membranes of the rat liver. Both the crude extract as well as a polysaccharide-rich fraction significantly inhibited lipid peroxidation and protein oxidation. Both fractions also partly protected against radiation-induced loss of protein thiols and inactivation of superoxide dismutase.

Cytoprotective & neuroprotective effects
Oral pretreatment with Asparagus racemosus (200 mg/kg/day) was found to protect against chemical induced gastric damage in rats. Pretreatment with shatavari has also been shown to reduce drug induced lung fibrosis. Bleomycin increases the hydroxyproline content of lung tissue causing intra-alveolar fibrosis and deranged alveolar architecture. Shatavari significantly (p<0.001) the bleomycin induced lung fibrosis. These protective effects were associated with a significant increase in alveolar macrophage activity.

Shatavari has also been shown to reduce alcohol induced damage to the gastric mucosa. Pretreatment for seven days caused a 70% reduction in the ulcer index.

A study has compared the antiulcer and antisecretory activity of shatavari and withania root extracts with a standard drug, ranitidine, in various models of gastric ulcer in rats. Ulcers were induced by the indomethacin (NSAID) and swim (restraint) stress treatment. Results demonstrated that shatavari as well as withania methanolic extract (100 mg/kg per day) given orally for 15 days significantly 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. Study also suggest that the herbs increase the antioxidant defence, as indicated by increases in the antioxidant enzymes superoxide dismutase, catalase and ascorbic acid, with a concomitant and significant decrease in lipid peroxidation. Shatavari was more effective in reducing gastric ulcer in...
indomethacin-treated gastric ulcerative rats, whereas withania was effective in stress-induced gastric ulcer. Results obtained for both herbal drugs were comparable to those of the standard drug ranitidine.²⁵

Excitotoxicity and oxidative stress are the major mechanisms of neuronal cell death in neurodegenerative disorders that occurs in both Alzheimer's and Parkinson's diseases. Reactive oxygen species (ROS) that are generated extracellularly and intracellularly by various mechanisms are among the major risk factors that initiate and promote neurodegeneration. Shatavari has been shown in experimental designs to be protective against kainic acid-induced hippocampal and striatal neuronal damage. The impairment of hippocampus and striatal regions of brain was marked by an increase in lipid peroxidation and protein carbonyl content and decline in glutathione peroxidase activity and reduced glutathione content. Shatavari supplementation improved the glutathione peroxidase activity and glutathione content and reduced the membrane lipid peroxidation and protein carbonyl.²⁶

Anti-lithic effect
Shatavari has been shown to reduce urinary stone formation in rats. An ethanol extract of shatavari was evaluated for its inhibitory potential on lithiasis (stone formation), induced by oral administration of 0.7 5% ethylene glycolated water to adult male albino Wistar rats for 28 days. The ionic chemistry of urine was altered by ethylene glycol, which elevated the urinary concentration of calcium, oxalate and phosphate ions, thereby leading to renal stone formation. The ethanol extract, however, significantly (p < 0.05) reduced the elevated level of these ions in urine. Furthermore, shatavari elevated the urinary concentration of magnesium, which is considered to be one of the inhibitors of crystallization. The high serum creatinine level observed in the ethylene glycol-treated rats was also reduced, following treatment with the shatavari extract. The histopathological findings also showed signs of improvement after treatment with the extract.²⁷

Diuretic Activity
Shatavari has been shown to inhibit antidiuretic hormone (ADH).¹²

Antitussive Activity
The methanol extract of *Asparagus racemosus* root (200 and 400 mg/kg, p.o.) showed significant antitussive activity on sulfur dioxide-induced cough in mice, the cough inhibition (40.0 and 58.5%, respectively) being comparable to that of 10-20 mg/kg of codeine phosphate (36.0 and 55.4%, respectively).²⁸

Digestive and Anti-diarrhoeal Activity
Shatavari is used in Ayurveda for dyspepsia (amalapitta) and it has been shown to improve digestion by increasing the levels of amylase and lipase.²⁹ An Indian study with eight healthy male volunteers compared shatavari with the drug metoclopramide, which is used in dyspepsia to reduce gastric emptying time. Metoclopramide and shatavari did not differ significantly in their effects. It was found that shatavari reduced gastric emptying time by 37% (p<0.001).³⁰

Shatavari has been used traditionally in Ayurveda for the treatment of diarrhoea and dysentery. Experimental animal studies have shown that both water and ethanol extracts of shatavari (200 mg/kg) may significantly (p< 0.05) inhibit castor oil induced diarrhoea and PGE² induced enteropooling (excessive secretion of water and electrolytes). Both extracts also showed significant (p < 0.001) reduction in gastrointestinal motility in a charcoal meal test in rats. These tests suggest that shatavari may be an effective remedy for diarrhoea.³¹

Toxicity
The LD50 is >1g/kg. No toxic effects or mortality were observed with doses ranging from 50mg/kg to 1g/kg for four weeks. Acute and subacute (15-30 days administration) toxicity studies did not detect any changes in vital organ function tests.
Actions

Adaptogen, antitussive, antioxidant, antibacterial, immunomodulator, digestive, cytoprotective, galactogogue, anti-oxytocic, antispasmodic, antidiarrhoeal, antiulcerogenic, oestrogen modulator.

Indications

- Stress, fatigue, general weakness
- Chronic disease, prevention of adhesions, cancer
- Cough
- Fluid retention
- Inflammatory conditions of the gastrointestinal and urinary tracts including cystitis, gastritis, diarrhoea and gastrointestinal ulceration.
- Prevention of urinary stones
- Sexual debility and infertility; insufficient lactation, menopausal symptoms.
- Threatened miscarriage.
- As an alternative to False Unicorn Root.
- General antioxidant, neuroprotection

Contraindications

Use with caution in pregnancy.

Dosage

1:2 root extract in 25% alcohol: 30-60 mL per week

References

2. Thakur RS, Puri HS Husain A. Major Medicinal Plants of India. 78-81. 89. Lucknow, Central Institute of Medicinal and Aromatic Plants.