



# A Comprehensive Review on: Shatavari (*Asparagus racemosus*)

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## Abstract:

Natural compounds are fundamentally preferable to synthetic substances according to general people and have played an essential role in health care system for illness prevention. Herbs are thought to have a spiritual element. Ancient Ayurvedic literature refer to the medication as a Rasayan, it has a wide spectrum of therapeutic properties. The root is the most common portion used by Ayurvedic practitioners. It is described as a tonic with lactogenic properties. Several Ayurvedic practitioners have utilized Shatavari to treat nervous disorders, acid peptic ailments, infectious diseases, and as an immunomodulator. Shatavari (*Asparagus racemosus*) is one of the most essential therapeutic herbs in the human health care system. Ayurveda considers Shatavari to be a female tonic. Shatavari is an important Ayurvedic herb with numerous health benefits and is a key element in many Ayurvedic formulations. This plant's therapeutic uses have been documented in India, British Pharmacopoeia and traditional medical systems like Ayurveda, Unani, Siddha. This medicine is primarily used in the treatment of female illness, particularly as a galactagogue and in the treatment of various menstrual problems. It also helps with epilepsy, renal problems, persistent fevers, excessive heat, stomach ulcers and liver cancer, as well as increasing milk production in nursing moms. The scientific community is working on this medicine on a multifaceted level to prove that it is a powerful therapeutic drug for a variety of illness. The current review study comprises a rigorous scientific examination of *Asparagus racemosus* root extract in order to highlight future research potential for this well-known and commercially relevant medication.

**Key words:** Rasayan, Shatavari, *Asparagus racemosus*, galactagogue.

**Introduction:**

Ayurveda is the World's oldest and most refined herbal system. Plants and plant derivatives are a significant source of pharmaceuticals. Ayurvedic writings describe a number of popular herbal medications, and their popularity is growing among both Ayurvedic practitioners and common man. Shatavari (*Asparagus racemosus*) is one of the most widely used Ayurvedic medicines. It was originally botanically described in 1799. There are over 300 species of *Asparagus* in the world, with 22 species reported in India. *Asparagus racemosus* is found all over the world, including populations in tropical Africa, Java, Australia, Sri Lanka, southern China, and India, however it is primarily grown in India.

*Asparagus racemosus*, also known as Shatavari is one such herb that has been used in many forms of therapy for decades. Shatavari is a prominent medicinal plant that grows in the tropical and subtropical regions of India. Shatavari is popular name for this plant, which means “one who has hundred husbands or is pleasant to many.” It belongs to the Liliaceae family. It is a climbing plant with a tuberous, short rootstock that produces a plethora of succulent tuberous roots.

Ayurveda considers Shatavari to be a powerful Rasayana that promotes longevity, improves immunity and improves mental performance. The roots are used as a stomachic, aphrodisiac, tonic and intestinal astringent in Ayurvedic medicine. They are used to treat dysentery, tumors, blood and eye illness, inflammation, rheumatism and nervous system disorders. Unani medicine uses roots to treat liver and renal issue as well as gonorrhoea. It is a tonic for whole body as well as a female reproductive tonic. This plant is known as female rejuvenative and it is suggested by doctors in the case of repeated abortions, uterine weakening and excessive bleeding during menstruation. It's commonly used to treat male genital dysfunctions, oligospermia, spermatogenic abnormalities, and other male issues like painful micturition. It's also used in Ayurvedic formulations for dyspepsia, amoebiasis, piles, and debility. Shatavari is antidiarrhetic, antispasmodic, demulcent, diuretic, galactagogue, nutritive, mucilaginous, refrigerant, according to recent reports and experiments. It is also thought to strengthen the immune system and safeguard important organs such as the heart, brain and other body organs. The major active constituents of *Asparagus racemosus* are steroidal saponins (Shatavarins I-IV) that are present in the roots. Shatavarin IV has been reported to display significant activity as an inhibitor of core Golgi enzymes transferase in cell free assays and recently to exhibit immunomodulation activity against specific T-dependent antigens in immune compromised animals.

**Habitat:**

Shatavari is a plant that grows wild in India, Nepal, Sri Lanka, Australia, Africa, and Eastern Europe. This woody climbing plant, first reported in 1799, grows to a height of one to two metres and loves to establish root in gravelly, rocky soils at elevations of 1300 to 1400 metres. The demand for Shatavari is always increasing because to the multiple health advantages it has been linked to, yet supply is inconsistent and inadequate. Deforestation

and indiscriminate, destructive harvesting have exacerbated the situation. The plant is currently classified as 'endangered' in its native environment, necessitating immediate conservation efforts.

**Cultivation:** (*Rakesh k Joshi et al, 2016*)

### 1. Climate and soil:

Shatavari is a plant endemic to the Indian subcontinent that grows in a wide range of habitats, from the humid tropical rainforests of Sri Lanka to the Himalayan mountains. The plant is a climber, with thin branches and feathery leaves that break out of shrubs and trees to sustain its development and seek light. Although it prefers to grow in wet rainforests, Shatavari may also survive in drier environments. Its ability to catch and store water in dry soils reflects its ability to replace fluids in the human body and restore equilibrium to a stressed system.

### 2. Harvesting:

The months of May and June are ideal for planting. Shatavari crops are often resistant to pests and illness. Harvesting begins 1.5-2 years after transplantation and lasts for 10-15 years.

## Morphology:

### 1. Plant profile: (*P. S. Bhokardankar et al, 2019*)

<b>Kingdom</b>	Plantae
<b>Clade</b>	Angiosperms
<b>Order</b>	Asparagales
<b>Family</b>	Asparagaceae (Liliaceae)
<b>Sub-family</b>	Asparagoideae
<b>Genus</b>	Asparagus
<b>Species</b>	Asparagus racemosus L
<b>Latin Name</b>	Asparagus racemosus

2. **Synonyms:** (P. S. Bhokardankar et al, 2019)

Shatavari is known by several different names like,

Indeevari, Sukshmapatra, Bahusuta, Shatmooli, Narayani, Bhiru, Virya, Madabhanjani, Shatpadi, Shatvirya, etc.

3. **Vernacular Names:** (Vikas Jaitik et al, 2014)

- **Sanskrit:** Shatavari
- **Hindi:** Satavari, Shatawar or Satmuli
- **Bengali:** Shatamuli
- **Marathi:** Shatavari or Shatmuli
- **Gujarati:** Satawari
- **Rajasthan:** Norkanto or Satawar
- **Telugu:** Toala-gaddalu
- **Tamil:** Shimaishadavari or Inlichedi
- **Malayalam:** Chatavali
- **Kannada:** Majjigegadde or Aheruballi
- **Madhya Pradesh:** Narbodh or atmooli

4. **Plant description:** (Suraj T. Jadhav et al, 2018)

Asparagus racemosus is a woody climber that can reach a height of 1-2 metres.

**Leaves:** small and uniform, like pine needles

**Flowers:** white with short spikes

**Roots:** tuberous, 10-30 cm long and a thickness of 0.1-0.5 cm, sweetish in taste, ash coloured on the outside and white on the inside.

**Fruits:** a berry with a diameter of 0.4-0.6 cm, pea-like appearance, contains seeds.



**Fig: Asparagus racemosus plant and its tuberous roots.**

### 5. Microscopy: (IP 2007 Vol. III)

The inner parenchymatous zone of cortex is composed of 18-24 layers in upper and 42-47 layers in the middle tuberous portion of the roots.

The cells are thin-walled cellulosic, with circular to oval outlines and distinct inter cellular spaces. In some roots 3-4 layers of cortex immediately adjacent to the endodermis are modified into a sheath of stone cells round the endodermis. The number of vascular bundles is 30-35 in the upper levels and 35-45 in the middle tuberous portions of the roots.

### 6. Part used: Tuberous Roots.

### Phytochemical constituents:

Asparagus racemosus has a group of steroidal saponins that are the main bioactive ingredients. Shatavarins are steroidal saponins. Shatavarin I-IV can be found. The primary glycoside linked to sarsapogenin is Shatavarin I which contains three glucose and rhamnose moieties. Some studies have found polycyclic alkaloids such as asparagine A and disaccharide in roots are also reported in some research. 8-methoxy-5,6,4'-trihydroxyisoflavone-7-O-d-glucopyranoside a novel isoflavone, was previously identified from Shatavari. Vitamin A, B1, B2, C, E, Mg, P, Ca, Fe and folic acid are also found in this plant. Essential oils, asparagine, arginine, tyrosine, flavonoids (Kaempferol, quercetin and rutin), resin and tannin are some of the other ingredients. A new 9,10-dihydrophenanthrene derivative named racemosol and kaempferol were also isolated from ethanolic root extract of Asparagus racemosus. Zinc(53.15mg/g), copper(5.29mg/g), cobalt(22.00mg/g) and manganese(19.98mg/g) are among the trace minerals found in roots along with calcium, magnesium, potassium and selenium.

**Phytochemicals derived from different parts of the plant:**(*Lakhwinder Singh et al, 2018*)

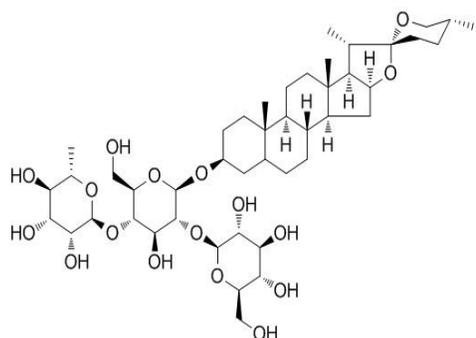
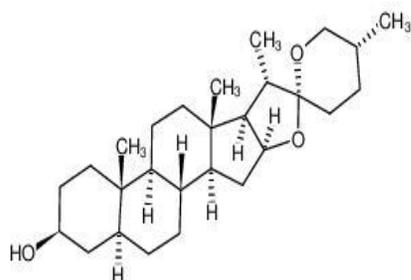
Sr no.	Part used	Phytochemicals derived from different parts of plant
1.	Roots	Rutin, Asparagamine A, 9,10-dihydro-1,5-methoxy-Quercetin-3-glucouronides, 8-methyl-2,7-phenenthrenediol, Racemofuran, Shatavarin I-IV, Immunoside, Racemosal, $\beta$ -trihydro Isoflavine 7-O-beta-D-glucopyranoside, Sterols, Alkaloid, Tannins, Carbohydrates, Flavonoids, isoflavones, Lactones, Amino acids, rutin.
2.	Shoot	Sarsasapogenin and Kaempferol Thiophenes, thiazole, aldehyde, ketone, Gamma linoleinic acids, Undecanyl cetamoate.
3.	Leaves	Vanillin, Asparagusic acid, methyl/ethyl esters.
4.	Flowers	Diosgenin, quercetin-3-glucuronide
5.	Fruits	Quercetin, Rutin, Hyperoside, Racemoside A, B, and C Sarsasapogenin, the aglycone of Racemosides A.

**Activities associated with different parts of the plant:** (*J. S. Negi et al. 2010*)

Name of the plant	Plant parts	Isolated compounds	Activity
Asparagus racemosus	Fruits	Racemoside A, Racemoside B and Racemoside C	Antioxidant
	Roots	Racemofuran, Asparagamine A and Racemosol	Anticarcinogenic, antioxidant, gastroduodenal ulcer protective activity, immunostimulant, antihepatotoxic
	Roots	8-methoxy-5,6,4'-trihydroxyisoflavone-7-O-beta-D-glucopyranoside	Antitussive, antidiarrhoeal, antiulcerogenic, antioxidant, antibacterial
	Roots	Asparagamine A, Sarsasapogenin, kaempferol, sitosterol, 4,6-dihydroxy-2-O-(2'-hydroxyisobutyl) benzaldehyde and undecanyl cetanoate.	Antioxidant, antimicrobial, immunomodulatory
	Roots	Shatavarin-IV	Anti-cancer

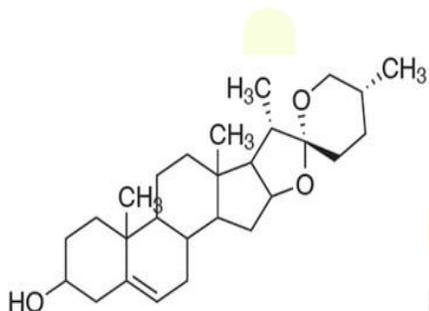
	Fruits	Sitosterol, stigmasterol, Sarsasapogenin, sitosterol-beta-D-glucoside, stigmasterol-beta-D-glucoside.	Antioxidant, antiulcer, antimicrobial, immunomodulatory, tyrosinase inhibitor.
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**Fig. Sarsasapogenin**

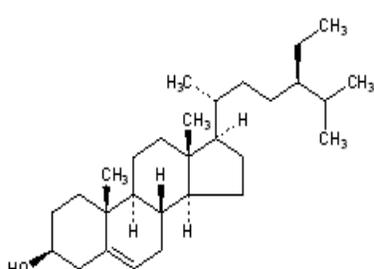


**Fig. shatavarin-IV**

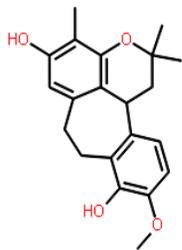
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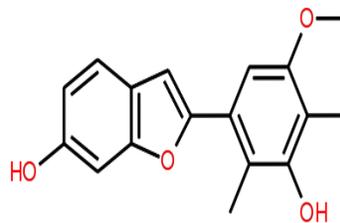
**Fig. Diosgenin**



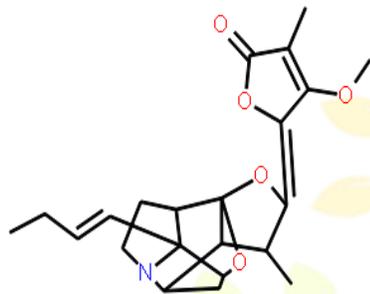
**Fig. Sitosterol**



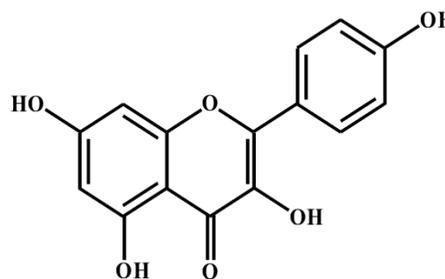
**Fig. Racemosol**



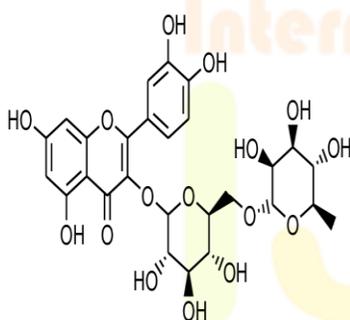
**Fig. Racemofuran**



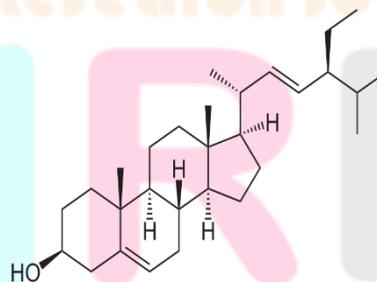
**Fig. Asparagamine A**



**Fig. Kaempferol**



**Fig. Rutin**



**Fig. Stigmasterol**

**Medicinal activities associated with plant parts:** (Lakhwinder Singh et al, 2018)

**Roots:** Galactagogue, Estrogenic, Immunomodulators, Antidyspepsia, Antiallergic, Anticancer, Anti-inflammatory, Antidiabetic, Antioxidant, Antitussive, Hepatoprotective, Antibacterial, Antiulcer, Anti-diarrhoeal, Antilithiatic.

**Leaves:** Cholinesterase, Antiparasitic.

**Shoots:** Anti-inflammatory, Antidiabetic and diuretic.

**Whole plant:** Antimicrobial and cytotoxic, Nephroprotective, Hepatoprotective.

**Aerial plants:** Urolithiasis, Hypolipemic, Antiasthmatic and Antifertility.

**Seeds:** Antiparasitic.

**Flower:** Diuretic.

### **Pharmacological Activity:**

#### **Immunomodulatory Activities:** (*Shashi Alok et al,2013*)

Shatavari dried root powder has a positive effect on the immune system. As a result, the inflammatory reaction is reduced. It stimulates the immune system to combat infections, tumors, and immunological weaknesses (such as AIDS). It could aid in the production of more protective antibodies against certain vaccinations, as well as a more effective cell-mediated immune response for protection against bacterial, viral and other illnesses. Several researchers have investigated the role of Shatavari root extract in enhancing humoral and cell-mediated immune responses, resulting in increased protection against infections.

#### **Antidiabetic Activity:** (*Sharma et al, 2017*)

Insulin production was stimulated by ethanolic extract and five distinct partition fractions of Shatavari roots in isolated perfused rat pancreases, isolated rat islet cells, clonal cells. Glucose-3-isobutyl-1-methylxanthine, tolbutamide, and a depolarizing potassium chloride concentration were found to boost this stimulatory effect, while diazoxide and verapamil decreased it. They also boosted intracellular calcium ion levels. In another investigation, Shatavari extract was found to increase glucose tolerance in diabetic and non-diabetic rats when given orally with glucose. The extract significantly reduced postprandial hyperglycemia following sucrose administration and reversibly raised the amount of unabsorbed sucrose in the stomach. Furthermore, the extract improved glucose transport and insulin action in 3T3-L1 adipocytes. In diabetic rats, daily injection of the extract resulted in lower serum glucose, higher pancreatic insulin, plasma insulin, liver glycogen, and a lower overall oxidant status. The antihyperglycemic activity of Shatavari is thought to be mediated in part by carbohydrate digestion and absorption inhibition, as well as an increase in insulin secretion and action in peripheral tissue.

**Antisecretory and Antiulcer activity:** (*Shashi Alok et al, 2013*)

The root powder 12 g/d in four dosages was given to 32 patients for an average of 6 weeks to assess its efficacy. In the majority of patients, Shatavari was found to alleviate the majority of their symptoms. The drug's ulcer-healing effect was linked to a direct healing impact, which was achieved through enhancing mucosal resistance, lengthening the lifespan of mucosal cells, boosting production and viscosity of mucus, and reducing H<sup>+</sup> ion back diffusion. With a considerable rise in mucosal mass, it has been proven to maintain the continuity and thickness of aspirin-treated gastric mucosa. Because Shatavari heals duodenal ulcers without limiting acid output, it might have cytoprotective properties comparable to prostaglandins and other bile salt binding.

**Galactagogue Action:** (*Shashi Alok et al, 2013*)

In humans and other animals, the impact of Shatavari on milk production and secretion has been examined. It is a galactagogue that is commonly utilized in traditional medical systems such as Ayurveda and other folk medicine. Shatavari was found to raise plasma prolactin levels in buffaloes, resulting in enhanced milk output. The galactagogue impact of two distinct preparations of Shatavari, namely milk and aqueous decoctions, was examined in rats. Both preparations resulted in a considerable increase in milk supply as well as a significant rise in pup weight growth. Shatavari has been shown to enhance plasma prolactin levels and mother and infant body weight in humans, indicating a galactagogue action.

**Antidepressant Activity:** (*Vikas Jaitak et al, 2014*)

The tail suspension test (TST) and the forced swim test were used to examine antidepressant activity in mice (FST). The methanolic extract considerably reduced immobility times in TST and FST, indicating considerable antidepressant action and highlighting the fact that the extract's efficacy was equivalent to that of study's reference medications, fluoxetine and imipramine. Methanolic extract reduced brain MAO-A and MAO-B, as well as interactions with the adrenergic, dopaminergic, serotonergic and GABAergic systems.

**Antihepatotoxic Activity:** (*Prashant sakharam Bhokardankar et al, 2019*)

The alcoholic extract of Shatavari root was demonstrated to dramatically lower elevated levels of alanine transaminase, aspartate transaminase, and alkaline phosphate in carbon tetra chloride (CCl<sub>4</sub>) produced liver damage in rats, demonstrating that Shatavari possesses antihepatotoxic potential.

**Antioxidant Activity:** (*Vikas Jaitak et al, 2014*)

The antioxidant effect of Shatavari crude extract and purified aqueous fraction has been proven. The extract protected against oxidative damage by preventing lipid peroxidation, protein oxidation, and depletion protein of thiols and the antioxidant enzyme superoxide dismutase. When compared to the crude extract, the purified

aqueous fraction containing polysaccharides proved to be a powerful antioxidant. The antioxidant activity of the crude extract was more efficient in suppressing protein oxidation than the purified fraction against lipid peroxidation. Radiation-induced loss of protein thiols and inactivation of superoxide dismutase were both protected by the crude and purified extracts.

**Anticancer activity:** (*Vikas Jaitak et al, 2014*)

In breast cell cancer, the root extract was found to have a protective effect. The apoptotic activity of steroidal components of Shatavari was researched, and it was concluded that they had the ability to kill tumour cells. The anticancer activities of shatavarins (including Shatavari IV) extracted from the roots of Shatavari were tested using the MTT assay with MCF-7 (human breast cancer), HT-29 (Human Colon Adenocarcinoma), and A-498 (human colon adenocarcinoma) (human kidney carcinoma). The extract (including Shatavarin IV) appeared to have substantial anti-cancer action, according to the findings of the experiments.

**Antibacterial Activity:** (*Vishnu Priya Veeraraghavan et al, 2019*)

Using the conventional cylinder technique, the antibacterial activity of Shatavari root extracts has been investigated. *Bacillus subtilis*, *Staphylococcus aureus*, *Staphylococcus wernerii*, *Pseudomonas aeruginosa*, *Proteus mirabilis*, *Klebsiella pneumoniae*, and *Pseudomonas putida* were among the bacteria tested. The extract was shown to be toxic to both gram-positive and gram-negative bacteria.

**Antiprotozoal Activity:** (*Shashi Alok et al, 2013*)

*Entamoeba histolytica* growth is inhibited by Shatavari crude alcoholic extract in vivo.

**Teratogenic Effect:** (*Lakhwinder Singh et al, 2018*)

By administering methanolic extract of Shatavari, teratogenic effects such as limb swelling, sluggish foetal body and placental growth, and an increase in foetal resorption were seen, but post-natal studies revealed a smaller litter of pups with higher mortality and delayed development.

**A Versatile Female Tonic:** (*Komal Sharma et al, 2011*)

It is regarded as a feminine tonic in Ayurveda. Despite being a rejuvenating herb, it aids female infertility by raising libido, curing inflammation of the sexual organs and even moistening dry tissues of the sexual organs, enhancing folliculogenesis and ovulation, preparing the womb for conception, preventing miscarriages, and acting as a postpartum tonic by improving breastfeeding, regulating the uterus, and modifying hormones. It's also recommended for leucorrhoea and menorrhagia.

**Anti-fungal activity:** (*Shifali Thakur et al, 2021*)

The root extract of Shatavari provides significant protection against fungal infections such as *Candida*, *Malassezia furfur* and *M. globosa*.

**Effect on uterus: (Sharma et al, 2017)**

The ethanolic extract of *A. racemosus* roots caused considerable uterine muscular relaxation in pregnant rats, but not in non-pregnant rats. Calcium-dependent and calcium-independent mechanisms were also engaged. Similarly, a polyherbal formulation including *Asparagus racemosus* reduced spasmogen-induced contractions while simultaneously increasing uterine weight. This plant has been proven to exert estrogen-like effects on the uterus. Furthermore, it has been demonstrated to be useful in treating dysmenorrhoea and irregular uterine bleeding.

**Biological activity of Shatavari: (Rakesh K Joshi et al, 2016)**

Bio-activity of Shatavari	Procedure of action
Dyspepsia properties	Dried root powder of Shatavari, the juice of fresh root of <i>A. racemosus</i>
Galactagogue properties	Root extracts of Shatavari 'Ricalax' tablets (Aphali Pharmaceutical Ltd. Ahmednagar) lactare(TTK Pharma,Chennai)
Antihepatotoxic potential	Alcoholic extract of roots of Shatavari.
Uterus properties	Ethyl acetate Acetone extracts of the root of Shatavari.
Cardiovascular activity	Alcoholic extract of the root of Shatavari.
Respiratory action	Higher dose of the alcoholic extract of root of Shatavari.
Immunomodulant activity	Polysaccharide fraction of Shatavari is used.
Antidepressant activity	Methanolic extract of roots of plant is used.
Adaptogen activity	Shatavari extract has been found to have excellent adaptogenic properties.
Anticarcinogen activity	Steroidal saponins of Shatavari for apoptosis inducing study.
In Neural Disorders activity	Investigated the potential of extract of Shatavari against kainic Acid(KA)- induced hippocampal and striatal neuronal damage.

**Ayurvedic formulations of Shatavari:**

- Shatavari Ghrita: Nagarjuna Herbal Care, Planet Ayurveda.
- Narayan Tail: Dabur
- Bala Tail: Spring flower herbals
- Chyawanprash: Himalaya, Dabur, Patanjali

- Shatavari granules: Himalaya, Baidyanath.
- Shatavari kalpa: Santulan Ayurveda, Dhootpapeshwar Shatavari Kalpa, Pushkaraj Shatavari Kalpa.
- Shatavari churna: Patanjali, Baidyanath
- Shatavari juice: Himalaya, Basic Ayurveda, Krishna's Herbal Ayurveda.
- Shatavari powder: plant Ayurveda, Bixa Botanical, Herbal Hills, Ultra Healthcare.

### Clinical studies:

According to one clinical investigation, Shatavari works as an outstanding stomach emptying agent. A double-blind study found that it can work as a good galactagogue agent. Shatavari has antiulcerogenic action, which means it can help people with peptic ulcers. Shatavari churna and taila are particularly beneficial in Panchkarma for Uttarbasti in Atyarvta (Menorrhoea) circumstances in females. Shatavari is highly beneficial in aschyotan of eye diseases of computer associated vision syndrome in the present day. (*Prashant Sakharam Bhokardankar et al,2019*)

In order to evaluate the efficacy of Shatavari in type 2 Diabetes mellitus, a case study was conducted. The results demonstrated a significant improvement in the patient's signs and symptoms, as well as an improvement in BMI and a decrease in blood and urine sugar levels. After analyzing the whole effect of treatment, it was revealed that Shatavari is quite useful in increasing the patient's body weight while also maintaining good blood sugar management. (*Majumder Madhumita et al,2017*)

Role of Shatavari Ksheerapaka in oligohydramnios, in this case study, Shatavari was a drug of choice and was given orally in the form of Ksheerapaka. Shatavari ksheerapaka, which contains the properties of Madhura rasa, balya, rasayana, ojaskara, and vatahara karma, is an effective treatment for nourishing the foetus, increasing amniotic fluid levels, and ensuring a healthy pregnancy. (*Samatha Honavar et al,2018*)

### Conclusion:

*Asparagus racemosus*, generally known as Shatavari in Indian Traditional system. As a component of the ancient systems of medicine like Ayurveda, Siddha and Unani, *Asparagus racemosus* is a significant medicinal plant. *Asparagus racemosus* extracts has proved to possess various pharmacological properties and a potent therapeutic agents. Although much research has been done to examine the biological activity and therapeutic uses of the plant, there are still innumerable pharmacological application options that need to be investigated. Antioxidant, diuretic, antidepressant, antiepileptic, immunostimulant, hepato-protective, antibacterial, anti-ulcerative, and neurodegenerative are just a few of the many medicinal uses for the plant.

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