Asparagus racemosus – Monograph

By Talal Al Hamad , May – 2016

Latin name:

Asparagus racemosus - which translates to wild asparagus.

Classical & Common names:

- *Sanskrit:* Sahasravirya, Shataavari, Shatmooli, Atirasa, Bahusutaa, Shatpadi, Shatviryaa, Bhiry, Indivari, Vari. Satawar, Shimai-shadavari, Ammaikodi. Challagadda, Pilligadalu, Majjige-gedde, Shatawarmul,
- *Bengali:* Satamuli
- *Gujarathi:* Ekalakanto
- *Kahnada:* Aheru balli
- *Telgu:* Kilwari
- *Tamil:* Kilwari
- *Nepali*: Satamule
- *Chinese*: T'ien-men Dong
- *Unani*: Satawar
- *Siddha*: Seemaithannervittan
- *English*: Indian Asparagus, Wild Asparagus.

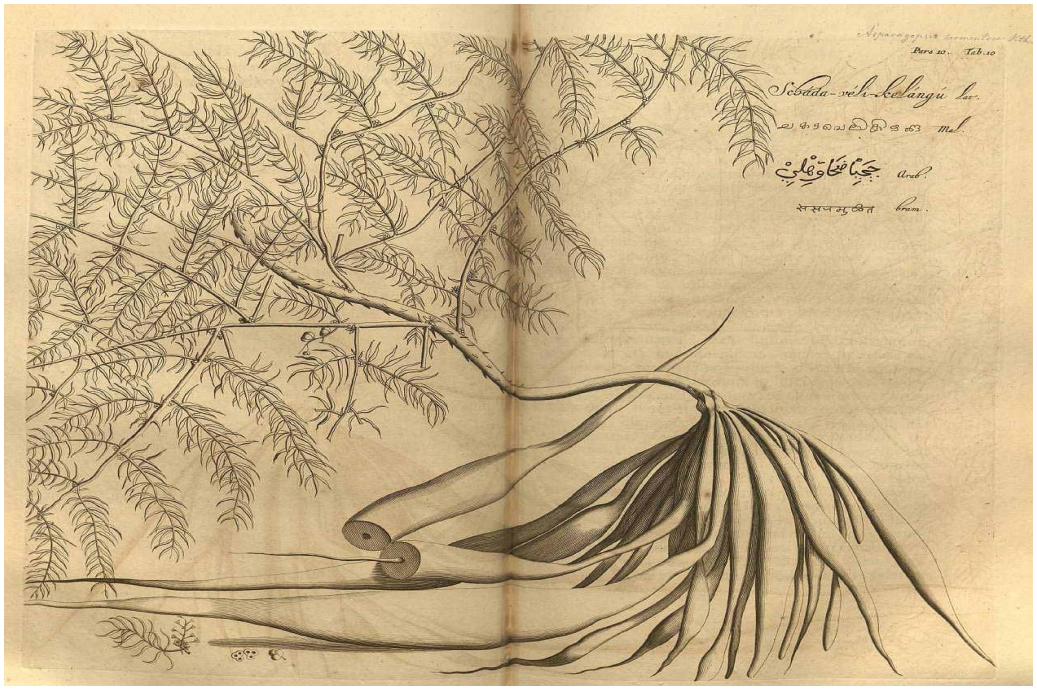
Plant Family:

Shatvari belongs to the Asparagaceae family. In earlier classification systems, it was classified as part of the Liliaceae family.

Botanical description , Habitat and Range:

Shatvari is a climbing plant that grows all over India. It can be found in low forest and tropical areas, but it is particularly abundant in northern India, in the Himalayas, at an altitude of 1300-1400 meters. The plant grows 1-2 meters in length and is known as an “armed climber”. It has shiny, small, green leaves that are uniform and much resemble pine needles. The flowers are small and white, and have a stamen with white filaments with tiny red anthers. The finger like roots tend be clustered beneath the surface. They are tuberous and grow anywhere between 30 cm to over 60 cm in length, tapering at both ends. The fruits are tiny berries that are purple/black when ripe. Shatvari flowers in July and fruits in September. Below are some images to help illustrate, including botanical drawings. The Western edible variety Asparagus officinale shares some properties but it is more diuretic.

Botanical drawings of Asparagus racemosus showcasing its tuberous root, which is the part used medicinally.(See below)


Pers 10.. Tab 10
Sévâda-veli-kelangú Tam.
Arab.
Sans.

Shatvari flowers: Take note of the beautiful red anthers.

Shatvari Plant in the wild

Shatvari tubers, ready for use.

Dried Shatvari tuber .

Parts used:

The tuber is the main part used medicinally, however the leaf has also been used as well.

Collection and harvesting considerations:

The tubers are usually harvested in the Autumn. Although usually wild crafted, Shatvari has also been successfully cultivated. Shatvari roots mature in approximately 12-14 months after planting. The time generally depends upon various conditions such as soil PH and climatic conditions. A one hectare grow area can yield 12,000-14,000 kg of fresh roots , which equates to 1000-1200 kg of dried roots. A single plant yields approximately 500-600 grams of fresh root. A healthy Shatvari plant can be harvested for 10-15 years.

Actions:

anabolic, aphrodisiac, anticancer, antiviral, alterative, adaptogen, antispetic, antidysenteric, antidiarrhoeal, antidepressant, antiamaeobic, anticoagulant, breast tonifier, cardiac tonic, demulcent, diuretic, estrogenic ,enzymatic, febrifuge, galactagogue, gastric sedative, gastro protective, hormonal tonic, immune tonic, lung tonic, nutritive , ovarian tonic, refrigerant, rejuvenative, strengthens the body and mind (Rasayana), stomachic,

Historical Use & Ethnobotany :

Shatvari is known in ayurvedic medicine as the queen of herbs. The word Shatvari literally translates to “she who possesses a hundred husbands”. It has been used for millennia to enhance the fertility of men and women , and as a sexual tonic. By the 16^{th} century, the herb emerged as a highly effective female tonic and galactagogue. It has since been a part of most aphrodisiac formulas.

Asparagues racemosus was first mentioned in the *Atharvaveda* and the *Rig Veda*, where it was noted as a powerful Rasayana that enhances memory , youth, strength and intelligence. Rasayanas, are plant medicines that promote well being by increasing cellular vitality and resistance.

Historically, the tubers have been used for: immune function, to increase milk flow, ulcers and spasms. They has also been used to treat nervous disorders, liver diseases, inflammation and infectious disease. The root infused oil was used topically to treat skin diseases, and the leaves as well were infused in ghee and applied to boils and sores.

Charaka Samhita and Sushruta Samhita spoke of Shatvari as a: styptic and ulcer healing agent in internal hemorrhage, healer of female genitourinary disorders and an intestinal astringent and disinfectant (for diarrhea). It also mentions its use as a nervine tonic in the treatment of epilepsy and migraines. Ayurveda believes that Shatvari works as a blood purifier for skin diseases, suggesting an alterative like action. Sushruta also mentions the use of the drug in : internal abscesses, oedema, consumption, respiratory troubles, urethral discharges, and seminal disorders. For urinary calculi a decoction was boiled with ghee and prescribed internally.

In TCM, the herb is believed to have a positive effect on the energy of the heart. It is known as “Tian Men Dong” which translates to heavenly spirit herb. It is revered by Buddhists, yogis and monks for its ability to open the heart. Another name for Shatvari is the “flying herb” as it allows a person to fly through the universe and achieve amazing dreams. It allows ones consciousness to drift into space when asleep. It is believed this herb lifts your mind and vision while giving you dreams of flying. Shatvari is also considered a rejuvenating herb that nourishes inward kidney Qi. It is stated to be specific for : dryness (including vaginal dryness), sexual debility, infertility and longevity.

Character :

Taste: Bitter & Sweet

Energy: Cooling

Planet: Shatvari is definitely a moon herb. Moon herbs are demulcent and tonic, and have an affinity for breasts and the female reproductive system. One of the negative traits “moodiness” points to a hormonal theme, which Shatvari undoubtedly addresses.

Vipaka (Post digestive effect): Sweet

Other qualities: Heavy, unctuous . Thus Pacifies Pitta and Vata but increases Kapha dosha.

Affinity: all seven dhatus (tissues)

Systems: circulatory, reproductive, respiratory, digestive.

Modern Uses:

Shatavari is considered the main female rejuvenative herb. Its most popular modern application is as a sexual, reproductive and pregnancy tonic. As such it is regularly seen in formulas that treat any of these above noted conditions. The information on Shatvari is vast and overwhelming. As such I have compiled an effective shortlist of how the herb is viewed/used in today's modern world by herbalists, ayurvedic practitioners and phytotherapists alike.

- Shatvari is a potent aphrodisiac for women. It is considered the female “Ashwagandha”. It is used regularly to address low libido and is a fantastic adaptogen.
- It is is of great value for those who have had a historectomy or are in menopause.
- It greatly increases the flow and quality of milk by mother. It also increases the flow of semen.
- Externally as a medicated oil, it is an excellent emollient and is used for stiff joints and muscle spasms.

- It is rich in phyto estrogens and as such has been used with good success for menstrual migraines and hot flashes.
- An excellent menstrual and ovulation regulator that is also effective in the treatment of morning sickness.
- It is used as a hormonal balancer. Some herbalists believe that Shatvari could prove to be a possible substitute for the endangered Chamaelirium luteum.
- Its demulcent properties make it efficient in the treatment of stomach problems, diarrhea, dry/irritated lungs and inflamed kidneys. It is used in India as an antacid.

- Shatvari is known to be an excellent anti spasmodic and is highly beneficial in amenorrhea, dysmenorrhea, leucorrhea, endometetriosis and other pelvic inflammatory diseases.
- A paste of the leaves is used in burning sensation on the skin, specifically in smallpox and bullae.
- It increases appetite and stimulates the liver due to its slightly bitter taste. This effect is mild however.
- Is useful in cases of uterine hypoplasia in young girls.
- Due to its Vata lowering and demulcent properties it also finds its use in rectal bleeding.
- Shatvari has beneficial effects on the heart and is used in edema of cardiac origin.
- Its diuretic properties give it a place in the treatment of stones and dysurea.

Pharmacology – Constituents

Steroidal saponins (Shatvarin I , II II IV), alkaloids, proteins, tannins, bioflavinoids, B vitamins, calcium , zinc, quercetin, rutin, hyperoside, sitosterol saponins A4, A5, A6, A7 and A8 , Shatavaroside C , diphenylpentendiol shatavarol , racemoside A, beta-sitosterol, stimasterol, ursolic acid.
Some structures of Saponin A4 were renamed as sarsasapogenin, due to it having one molecule of glucose and two of rhamnose

Pharmacy – Forms and Dosage

-Powder : Traditionally 3-6 grams is taken per dose. However one teaspoon , 1-3 x a day is also sufficient for most patients.

-Fresh juice: 10-20 ml

-Fluid extract: 1:1 2-8 ml daily

-Standardized extract : 10:1 (> 20 percent saponins) 200-800 mg daily.

-Tincture: 1 : 5 @ 50 % 2-5 ml t.i.d

Clinical studies:

Again with the vast amount of information available, I have sifted through and provided a general summarisation of the findings:

- Whole aqueous standardized extract of Asparagus racemosus offers protection against physical and chemical stressors. The studies also indicate that the extract stimulate the immune system.
- Shatvari has been shown to help normalize the body in particular after chemotherapy. The herb reversed the effects of the chemotherapy drug cisplatin . It also normalized cisplatin-induced intestinal hypermotility.
- Pregnant female animals showed an enhancement of estrogen after Shatvari extract was given.

- Shatvari has gastric protective and anti ulcer effects. In a recent animal study, the herb showcased its ability to inhibit gastric ulcers in animals given indomethacin.
- Asparagues racemosus has recently demonstrated in multiple studies its ability to enhance systemic Th1 and Th2 immunity in animals.
- The aqueous and methanol extracts of the tuberous root were examined on swimming mice (stress induced model). The extracts showed an inhibitory effect on pro inflammatory cytokines. These include interleukin 1b, tumor necrosis factor and the production of nitric oxide in mouse macrophage cells. Corticosterone levels were then measured and the results showed that the herb maybe be of benefit in the treatment of chronic stress and inflammatory conditions.
- 1:1 fluid extract of fresh root reportedly has anti tumour properties.
- 4 tablets of 500mg root powder was given 6 times a day to patients with various digestive disorders such as: dysentery, diarrhoea and colic. It was found that the herb was a potent anti diarrhoeal and gastric sedative.
- The alcoholic extract (tincture) possesses antiamoebic effects against E. histolytic and anti viral effects against Newcastle disease.
- The extract of fresh and dried roots showed amylase and lipase like activity
- Crude alcohol extracts of the root also showed anti-oxytocic activity and weight gain in mammary glands of both post partum and estrogen primed rats. The weight gain was also seen in the uterus in estrogen primed animals.
- It increases the weight of the adrenals and reduces the quantity of ascorbic acid. This suggests ACTH release and thus a possible use into adrenal fatigue and chronic stress
- One saponin produced a blockade of oxytocin induced contractions and uterine spontaneous motility in animals.
- The root demonstrated a marked galactagogue effect in humans as well as animals. One study in

particular speaks of its success producing the galactagogue effect in buffaloes.

- Root extracts exhibit anti allergenic activity through the inhibition of passive anaphylaxis in mice and rats.
- When the whole root was fed to rats and mice the herb acted as an immuno modulator against induced sepsis and peritonitis.
- Shatvari Ghrita (Shatvari Ghee) may boost hemoglobin count.
- Shatvari Root may boost white blood count slightly.
- Crude extracts of Asparagus racemosa have shown potential to be used as an effective Eco friendly mosquito repellant.
- The leaf extract has recently been found to inhibit the growth of UOK 146, a renal cell carcinoma line. The PRCC-TFE3 fusion transcript inhibition and the BAX levels show that the extract initiates an apoptosis independent anticancer effect. This mechanism is not yet fully understood.
- In a recent study, Methanolic extract of Asparagus racemosa was studied to understand its effects on the HPA axis. The extract was given to un-manipulated animals to observe the effects. The plasma Corticosterone and norepinephrine levels showed a decrease, which indicates a direct effect on the HPA axis. All levels of monoamines in the hypothalamus increased, however the extract showed region specific changes in monoamines and their metabolites. It is clear that the herb extract is showing a physiological modulation of the stress pathways.
- Shatvari extracts have been shown to possess potent hepatoprotective properties. The root extract tested decreased in effectiveness in the following order: Ethyl acetate > Methanol > Crude hydro-alcoholic extract> n-Butanol> precipitated aqueous.
- In 2012 a study was performed to evaluate the anticancer activity of Asparagus racemosus root. The particular saponin studied was Shatvarin IV. The results showed that the constituent

exhibits significant anticancer activity in vitro and in vivo experiments.

- Shatvari was proven in a 2014 study that its root extracts are of value in anti dandruff formulations due to its anti inflammatory and antifungal properties. The root extract showed antifungal activity against M. furfur and M. globosa.
- Asparagus racemosus is a beneficial ally in the fight against leishmaniasis. The current drugs used to deal with this infection are not effective. This is partly due to suppression of the immune function during the infection. New treatment methods needed to be developed that involve the use of immunomodulatory agents. The goal was to decrease parasitic burden while enhancing adaptive immunity. Shatvari was combined with Cisplatin (an anticancer drug) and administered to Leishmania donovani infected mice. The results showed an enhanced clearing of parasites, increase Th1 response, heightened DTH response and augmented igG2a. An enhanced protective immune response was noted as well as remarkably improved liver and kidney function tests. These results were compared to mice treated only with cisplatin which suggests a future role for Shatvari in the treatment of this disease. The constituent Racemoside A, a water soluble natural steroid saponin, is considered a potent anti-leishmanial agent as it induces apoptosis. It showed potent activity against antimonial-sensitive AG83 strain and unresponsive strain GE1F8R.
- The ethanolic extract of Asparagues racemosus contains antiurolithiatic properties. Rats with urolithiasis were treated and showed significant reduced serum content of calcium, phosphorus, urea and creatinine. Histopathology of the kidneys revealed less tissue damage and were almost similar to none tested rats.
- In rats with induced diabetic nephropathy, Shatvari ethanolic extract was given daily for weeks. The efficacy was then compared with diabetic control rats. The results showed that the treatment significantly decreased plasma glucose, creatinine, urea nitrogen, total cholesterol and

triglyceride levels. Renal hypertrophy, polyuria, hyperfiltration, microalbuminuria, abnormal renal tissue and oxidative stress all greatly improved. The treatment also resulted in reduced basement membrane thickening and mesangial proliferation formation. This suggests that Shatvari may be beneficial in treating early diabetic nephropathy.

- It has been reported that the herb posses significant antidepressant activity that possibly works through the monoaminergic system, serotonergic and noradrenergic system. It also has nootropic and and anti amnestic properties that may be mediated by the cholinergic system. As such, Shatvari may have potential interactions with other drugs or foods that share the same cholinergic and monoaminergic pathways
- Blood and oral swabs from oral cancer patients undergoing treatment were taken and tested against Shatvari isolates. The test results showed that it was effective at keeping secondary infections in check in treated cancer patients.
- Extracts of Asparagus racemosus have demonstrated promising anti-HIV potential and are currently being investigated.
- The extract of Shatvari showed high degree of activity against all the candida strains. The effect was comparable to the standard antibiotic used.
- Compound 10, an isolate from A. racemosus was found to be a potent inducer of apoptosis in colon carcinoma cells.
- Inclusion of Shatvari powder to the diet of hypercholesteremic rats resulted in a reduction in plasma and hepatic lipid profiles. It also increased fecal excretion of cholesterol, neutral sterol and bile acid whilst increasing hepatic HMG-CoA reductate activity and bile acid content. There was also a marked improvement in the hepatic antoxidant status. This shows potential for the herb to be used a protective agent against hyperlipidemia and hypercholesteremia.
- Aqeous extracts of Shatvari roots have shown effectiveness in preventing hepatocarcinogenesis

induced by diethylnitrosamine in rats.

- The Insulin secretory actions of A. racemosus may provide new opportunities in diabetic therapy. The extracts of the herb have wide ranging stimulatory effects on physiological insulinotopic pathways.
- Shatvari is an effective antiulcerogenic agent. Its efficacy can be compared to the standard anti ulcer drug , ranitidine hydrochloride. The test was done on NSAID plus pyloric ligation (PL) induced gastric ulcers in rats. The treatment group showed significant reduction in the ulcer index when compared with the control group. The crude extract also reduced gastric secretions and total and free acidity. An in crease in total carbohydrate and total protein of the gastric juice was also noted.
- The methanol extract of Shatvari showed significant antitussive activity on sulfur dioxide-induce cough in mice.
- The antioxidant properties of Asparagus racemosus were tested on rat livers that had damage induced by gamma radiation. The extract (P3) in addition to an active fraction of polysaccharides inhibited lipid peroxidation and protein oxidation.It also partially protected against radiation induced loss of protein thiols and inactivation of superoxide disumutase.
- Asparagus racemosus induces excess production of tumor necrosis factor (TNF) alpha.
- Shatvari has been shown to reduce gastric emptying time in normal healthy volunteers.
- Intraperitoneal adhesions may be controlled by Shatvari, a study from India shows. Macrophages appear to play a critical role in the development of adhesions and thus modulating them could help prevent this. Animals were sacrificed 15 days following surgery and their peritoneal macrophages were collected. For the group of animals receiving Shatvari, there was a significant decrease in adhesion scores.

Possible toxicity :

None noted

Contraindications:

obesity, breast or fibroid tumors, polycystic ovarian syndrome, excessive mucus,

high kapha conditions, high Ama (in a toxic state).

Shatvari may have potential interactions with other drugs or foods that share the same cholinergic and monoaminergic pathways.

Methanolic extracts of the herb showed teratological disorders in animals. This indicates that Shatvari should be used cautiously during pregnancy.

Combinations:

Shatvari is one of the primary herbs recommended for female health. It finds itself useful in a plethora of combinations. These are my personal recommendations based on my study of the herb.

- Hormonal balance, Uterine health and Fertility: combines well with Vitex, Angelica sinensis, Chamalaerium, Paeonia, Trigonella, Medicago, Trifolium.
- Aphrodisiac: works well with Epimedium, Liriosma, Damiana, Turnera
- Ulcers: combines well with Glycyrrhiza.
- Gastro protective : Ulmus, Althaea, Filipendula, Chamomilla
- Antacid: very effective when combined with Filipendula.
- Diarrhea: can be combined with gentle astringents such as Rubus, Euphrasia, Lythrum.

- Anti spasmodic: Anemone, Dioscorea, Viburnum, Paeonia, Cimicifuga
- Diuretic / renal inflammation: Solidago, Elymus, Zea, Parietaria.
- Galactagogue: Extremely beneficial on its own or if combined with: Foeniculum, Trigonella, Silybum, Galega, Medicago, Cnicus. Althaea radix
- External: Combines well in an oil with anti inflammatory herbs. These include: Chamomila, Withania, Cannabis, Prunella, Calendula, Polygonatum.

Recipes:

There are hundreds upon hundreds of recipes that include Shatvari. Below is a list of some important ones:

- Shatvari Ghrita is a rejuvenating aphrodisiac tonic mentioned in the Charaka Samhitaa. It is essentially Shatvari root infused in Ghee and is eaten freely. It is mainly used in disorders of the urinary system, breast development and for hyper acidity. Shatvari ghrita may also be used topically on the breasts.
- Phalaghrita , a classical compound, uses Shatvari for leucorrhoea, dysmenorrhea, menorrhagia and infertility. It is used for virtually all disorders of the female genitals. It is one of the best known preparations of Shatvari.
- Shataavaryaadia Churna is another important compound that Shatvari belongs to. It is used as a restorative tonic and as a cholagogue, hence its usefulness in jaundice. It is also used in menorrhagia and urinary disorders.
- To increase milk flow, give one teaspoon of Shatvari with warm milk.
- One teaspoon of Shatvari and ¼ teaspoon of rock candy with milk is used to stop esophageal burning and stomach upset.
- In hyperacidity , acid indigestion or peptic ulcer, one can take a teaspoon of Shatvari with ¼ tsp

kama dudha. Kama dudha is an ayurvedic compound used for hyperacidity amongst other things. It is composed of purified ochre and mica (minerals) and Tinospora cordifolia, a herb used to boost immunity in ayurveda.

- Another hyperacidity recipe is known as Shatavari kalka. This compound is composed of Shatvari, rock candy, ghee and milk cooked with cardamom.
- For fever, ayurvedic practitioners prescribe Shatvari with tikta, a compound of bitter herbs.
- Shatvari is a part of the famous ayurvedic anti inflammatory / pain relieving oil compound “Mahanaryana Tailam”.
- The fresh root juice with honey is given for painful tumors due to excess pitta.
- Shatvari Yog is another useful compound that works into epilepsy and hysteria.
- A recent recipe was created in India to enhance the functionality of bread by incorporating Shatvari into it at a ratio of 3.5% - 4.96%. It was found that all the phytochemicals were present in the bread with the exception of the flavinoids.

References

Frawley, D.(2000)The Astrology of Seers: A Comprehensive Guide to Vedic Astrology. Twin Lakes,WI : Lotus Press

Frawley, D & Lad, V (2010) The yoga of herbs. Twin Lakes, WI: Lotus Press.

Lad, V (2012) Textbook of ayurveda. General principles of management and treatment Volume 3. Albuquerque, NM: The Ayurvedic Press.

Bone, K & Mills, S (2013) Principles and practice of phytotherapy 2nd edition . Church Livingstone Elsevier.

Khare, C.P. (2004) Indian herbal remedies . Berlin, Heidelberg: Springer

Yance, D (2013) – Adaptogens in medical herbalism. Rochester, Vermont: Healing Arts Press.

Winston, D & Maimes, S (2007) Adaptogens: herbs for strength, stamina and stress relief. Rochester, Vermont: Healing Arts Press.

Lele, B. Shatvari (Asparagus Racemosus) . Retrieved from http://www.svlele.com/herbal/shatavari.htm

Govindrajan M, Sivakumar R. Laboratory evaluation of Indian medicinal plants as repellants against malaria, dengue and filariasis vector mosquitoes. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/25399815

Singh N, Jha A, Chaudhary A, Upadhyay A. Enhancment of the functionality of bread by incorporation fo Shatavari (Asparagus racemosus). Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/25190861

Verma Sp, Tripathi VC, Das P. Asparagus racemosus leaf extract inhibits growth of UOK 146 renal cell carcinoma cell line:simultaneous oncogenic PRCCTFE3 fusion transcript inhibition and apoptosis independant cell death. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/24716915

Krishnamurthy S, Garabadu D, Reddy NR. Asparagus racemosus modulated the hypothalmic-pituitary-

adrenal axis and brain monoaminergic systems in rats. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/23485433

Acharya SR, Acharya NS, Bhangale JO, Shah SK, Pandya SS. Antioxidant and hepatoprotective action of Asparagus racemosus Wild root extracts. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/23305030

Mitra Sk, Prakash NS, Sundaram R. Shatavarins (containing Shatavarin IV) with anticancer activity from the roots of Asparagus racemosus. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/23248403

Onlom C, Khanthawong S, Waranuch N, Ingkainan K. In vitro anti-malassezia activity and potential use in anti-dandruff formulation of Asparagus racemosus. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/24117781

Sachdeva H, Sehgal R, Kaur S. Asparagus racemosus ameliorates cisplatin induced toxicities and augments its antileishmanial activity by immunomodulation in vivo. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/24103199

Jagannath N, Chikkannasetty SS, Govindadas D, Devasankaraiah G. Study of antiurolithiatic activity of Asparagus racemosus on albino rats. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/23112416

Sharma U , Kumar N, Singh B. Furostanol saponin and diphenylpentendiol from the roots of Asparagus racemosus.Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/22978214

Somania R, Singhai AK, Shivgunde P, Jain D. Asparagus racemosus Willd (Liliaceae) ameliorates early diabetic nephropathy in STZ induced diabetic rats.Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/22822526

Meena J , Ojha R, Muruganandam AV, Krishnamurthy S. Asparagus racemosus competitively inhibits in vitro the acetylcholine and monoamine metabolizing enzymes. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/21843599

Panghal M, Kaushal V, Yadav JP. In vitro antimicrobial activity of ten medicinal plants against clinical isolates of oral cancer cases. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/21599889

Bhutani KK, Paul AT, Fayad W, Linder S. Apoptosis inducing activity of steroidal constituents from Solanum xanthocarpum and Asparagus racemosus.Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/20176464

Uma B, Prabhakar K Rajendran S. Anticandidal Activity of Asparagus racemosus.Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/20490311

Kanwar AS, Bhutani KK. Effects of Chlorophytum arundinaceum, Asparagus adscendens and Asparagus racemosus on pro-inflammatory cytokine and corticosterone levels produced by stress. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/20564504

Visavadiya NP, Narasimhacharya AV. Asparagus root regulates cholesterol metabolism and improves

antioxidant status in hypercholesteremic rats.Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/18955232

Agrawal A, Sharma M, Rai SK, Singh B, Tiwari M, Chandra R. The effect of the aqueous extract of the roots of Asparagus racemosus on hepatocarcinogenesis initiated by diethylnitrosamine. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/18729252

Hannan JM, Marenah L, Ali L, Rokyea B, Flatt PR, Abdel-Wahab YH. Insulin secretory actions of extracts of Asparagus racemosus root in perfused pancreas, isolated islets and clonal pancreatic beta-cells.Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/17210753

Bhatnagar M, Sisodia SS. Antisecretory and antiulcer activity of Asparagus racemosus Willd. against indomethacin plus phyloric ligation-induced gastric ulcer in rats.Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/17135157

Goel RK, Prabha T, Kumar MM, Dorababu M, Singh G. Teratogenicity of Asparagus racemosus Willd. root, a herbal medicine. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/16872047

Mandal SC, Kumar C K A, Mohana Lakshmi S, Sinha S, Murugesan T, Saha BP, Pal M. Antitussive effect of Asparagus racemosus root against sulfur dioxide-induced cough in mice. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/11077176

Dhuley JN. Effect of some Indian herbs on macrophage functions in ochratoxin A treated mice. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/9324000

Dalvi SS, Nadkarni PM, Gupta KC. Effect of Asparagus racemosus (Shatavari) on gastric emptying time in normal healthy volunteers.Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/2097375

Rege NN, Nazareth HM, Isaac A, Karandikar SM, Dahanukar SA. Immunotherapeutic modulation of intraperitoneal adhesions by Asparagus racemosus.Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/2641519