

REVIEW ARTICLE

Asparagus racemosus (Shatavari): A Versatile Female Tonic

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ABSTRACT

Asparagus racemosus, traditionally known as shatavari means "who possesses a hundred husbands or acceptable to many". In Ayurveda it is considered a female tonic. In spite of being a rejuvenating herb it is beneficial in female infertility, as it increases libido, cures inflammation of sexual organs and even moistens dry tissues of the sexual organs, enhances folliculogenesis and ovulation, prepares the womb for conception, prevents miscarriages, acts as post partum tonic by increasing lactation and normalizing the uterus and the changing hormones. Its use is also advocated in leucorrhoea and menorrhagia. Shatavari is the main Ayurvedic rejuvenative tonic for the females, as is *Withania* for the males.

Keywords: *Asparagus racemosus*; shatavari; antenatal tonic; postnatal tonic

INTRODUCTION

Shatavari means "who possesses a hundred husbands or acceptable to many". It is considered both a general tonic and a female reproductive tonic. Shatavari may be translated as "100 spouses", implying its ability to increase fertility and vitality. In Ayurveda this amazing herb is known as the "Queen of Herbs" because it promotes love and devotion. Shatavari is the main Ayurvedic rejuvenative tonic for the female, as is *Withania* for the male.

Asparagus racemosus (family- Asparagaceae) also known by the name "Shatavari" is one of the well known drugs in Ayurveda, effective in treating madhur rasam, madhur vipakam, seet-veeryam, som rogam, chronic fever and internal heat^[1,2]. Shatavari means "she who possesses a hundred husbands" indicates that this herb is highly effective in problems related with female reproductive system. Charak Samhita written by Charak and Ashtang Hridayam written by Vagbhata, the two main texts on Ayurvedic medicines, lists *Asparagus racemosus* as part of the formulas to treat disorders affecting women's health^[3,4,5,6].

In modern Ayurvedic practices the roots of plant are considered to be effective as antispasmodic, appetizer, stomach tonic, aphrodisiac,

galactagogue, astringent, antidiarrhoeal, antidysenteric, laxative, anticancer, anti-inflammatory, blood purifier, antitubercular, antiepileptic and also in night blindness, kidney problems and in throat complaints^[7]. Further, it is mentioned as **medhya**- the plants which increase intelligence and promote learning and memory^[8], and as **rasayana**, the rejuvenator herbs which improves health by increasing immunity, vitality and resistance, imparting longevity as well as protection against stress^[9]. This herb is also mentioned as **balya** means a strength promoter, **stanya**-a galactagogue^[1] and **jeevaniya**- an erythropoetic.

From pharmacognostical point of view, *Asparagus racemosus* was previously included under the family Liliaceae, but now it has been shifted to a newly created family i.e. Asparagaceae. The plant is known in India by common names such as Shatavari, Satmuli, Satavar etc. It is a woody climber which grows to a height of 1-2 m. The leaves are of pine needle shape, small but uniform and have tiny white flowers arranged in the form of small spikes (**Fig.1**). The roots are tuberous, succulent, finger shaped and clustered^[10,11,12,13].

Chemical constituents: Shatavari is known to possess a wide range of phytochemical constituents

which are mentioned below. Some of the structures have been drawn in (Fig 2)

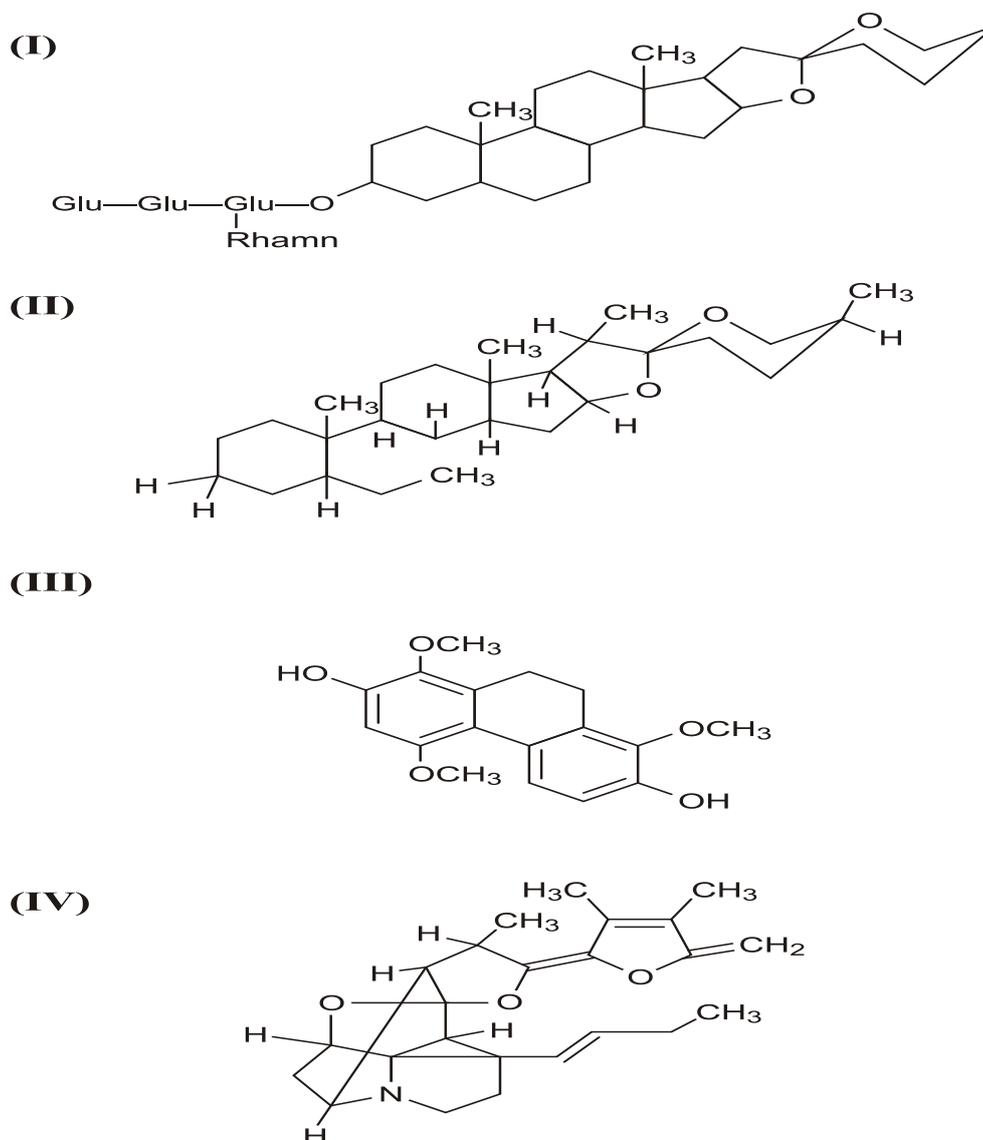
1. Steroidal saponins, known as shatvarins. Shatvarin I to VI are present. Shatvarin I is the major glycoside with 3-glucose and rhamnose

moieties attached to sarsapogenin^[14,15,16,17]. Recently, Shatvarin V, Asparinins, Asparosides, Curillins, Curillosides have also been reported^[17].

Fig 1 : *Asparagus racemosus* (family-Asparagaceae) plant, roots and fruits



2. Oligospirostanoside referred to as Immunoside^[18].
3. Polycyclic alkaloid- Aspargamine A, a cage type pyrrolizidine alkaloid^[19,20,21].
4. Isoflavones - 8-methoxy- 5, 6, 4-trihydroxy isoflavone-7-O-beta-D-glucopyranoside^[22].
5. A cyclic hydrocarbon-Racemosol i.e. dihydrophenantherene^[23,24].
6. Furan compound- Racemofuran^[25].
7. Carbohydrates- Polysaccharides, mucilage^[26].
8. Flavanoids- Glycosides of quercetin, rutin and hyperoside are present in flower and fruits^[27].
9. Sterols- Roots also contain sitosterol, 4,6-dihydroxy-2-O(-2-hydroxy isobutyl) benzaldehyde and undecanyl cetanoate^[28].
10. Trace minerals - are found in roots-zinc (53.15), manganese (19.98), copper (5.29), cobalt (22.00 microgram per gram) along with calcium, magnesium, potassium zinc and selenium^[29,30].
11. Kaepfrol- Kaepfrol along with Sarsapogenin from woody portions of tuberous roots could be isolated^[31].
12. Miscellaneous- Essential fatty acids- Gamma Linoleinic acids, Vitamin A, Diosgenin, quercetin 3-glucourbnides^[32,33,34].

Fig. 2. Some chemical constituents of *Asparagus racemosus*.

In Ayurveda it is considered a female tonic. In spite of being a rejuvenating herb it is beneficial in female infertility, as it increases libido, cures inflammation of sexual organs and even moistens dry tissues of the sexual organs^[2] enhances folliculogenesis and ovulation^[35], prepares the womb for conception, prevents miscarriages^[36,37], acts as post partum tonic by increasing lactation and normalizing the uterus and the changing hormones^[38]. Its use is also advocated in leucorrhoea and menorrhagia^[39]. *A. racemosus* has estrogenic activity^[40]. In higher doses its hormonal influences are manifested in conjunction with female sex hormones. A clinical dose of A.R. induces higher cornification of vaginal epithelium. *Asparagus racemosus* (AR) has been used only clinically and shows oestrogenic effects in adult virgin female mammary glands and genital organs of rats^[41]. In

a similar study on pregnant ratst the alcoholic extract of AR rhizome increased the size of the mammary glands with a dilated vaginal orifice in virgin rats. The alcoholic extract AR 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. It also revealed thickening of all the layers of the genital organs, especially the muscular layer. This may be due to hypertrophy of the glandular, stromal and muscular cells and hyperplasia of the stromal tissue along with numerous dilated blood vessels, especially in the muscular wall^[42]. Further the presence of glycosides, diosgenins, cytoestrol and stigmaestend support the proposed

hormonal basis of A.R.^[43]. This phytoestrogenic activity is due to the presence of steroidal saponins which exert hormone like actions in the body, and also due to the isoflavones which have mild estrogenic activity that help to balance the estrogen levels.

Effect in young females: In young females it may increase weight of ovaries and may enhance folliculogenesis, as evidenced by a histological study of ovaries of immature female rats. A significant rise in serum follicle stimulating hormones (FSH) is observed with a dose 100 mg/kg of A.R. root extract^[35]. In a study the mammogenic effect of topical application of phytoestrogen containing plant materials was assessed in female wistar rats. A significant increase in size of the breast and teats has been reported, further histological study of breast tissues showed hyperplasia which was not like the changes typical of late pregnancy and lactation. The effect is being hypothesized due to the phytoestrogens^[44], but the mechanisms of action is not justified.

Problems related with menstruation:

The constituents of *A. racemosus* make it useful in menstrual disorders such as dysmenorrhea, premenstrual syndrome, irregular bleeding during perimenopausal period and also in situations after menopause. *A. racemosus* contain saponins which hinder the oxytocic activity on uterine musculature, thereby maintain the spontaneous uterine motility, confirming its utility in dysmenorrhea which comprises of painful menstruation without significant pelvic pathology^[15]. Ethyl acetate and acetone extracts of roots of *A. racemosus* block spontaneous motility of the virgin rat's uterus. These can also inhibit the spasmogenic effect of Ach, barium chloride and serotonin on the uterus^[45], further confirming its activity in relieving dysmenorrhea. An herbal formulation Evicare was found effective in all patients of dysmenorrhea and in 80% cases of premenstrual syndrome (which encompasses emotional and physical symptoms in week preceding menstruation). The effectiveness in PMS is considered due to immunomodulator activity which boosts the immune status and imparts a feeling of well being^[46]. Saponin glycoside A4 produces specific and competitive blockade of pitocin induced contraction and spontaneous motility^[45]. A medicinal composition containing *A. racemosus* has been made and patented for the treatment of PMS in human females^[47].

Problems related with female infertility

It has been demonstrated that the AR containing preparations stimulate haemopoetic function and increase weight of accessory sex glands^[48,49]. The plant is also beneficial in female infertility^[2], as it enhances folliculogenesis and ovulation, prepares the womb for conception, and prevents miscarriages^[50,51]. The energy source for the female reproductive system is oestrogen dependent glycogen. Estrogen increases the glycogen content in the uterus and any decrease in uterine glycogen would directly implicate estrogen deficiency. *Asparagus racemosus* extract containing formulation was found to cause an increase in uterine weight and uterine glycogen without altering serum estrogen progesterone levels in immature rats as against ovariectomized rats used as control. This study indicates that the phytoestrogen performs its function by binding directly to the estrogen receptor without enhancing the endogenous estrogen levels^[52].

Problems related with menopause

Menopause is a natural event of women's life's as they transit from reproductive to non reproductive stage few years before and after this transition a majority of women encounter problems like hot flushes, night sweats, palpitations, insomnia, anxiety, irritability, vaginal dryness, vaginal atrophy, atrophy of cervix and decreases in size of uterus^[53]. Women having undergone hysterectomy also experience such symptoms due to removal of functional organs of reproductive system. They have elevated levels of serum follicle stimulating and serum lutenising hormones. These hormones are important in female reproductive system as they help to regulate and stimulate ovarian cycles through feed back mechanism to ovaries and hypothalamus. A common practice to relieve menopausal symptoms is to administer hormone replacement therapy^[54], which is not free from adverse effects. Therefore women are turning to natural medicine in an attempt to have a safe alternative to synthetic steroidal hormones. *A. racemosus* being known source of phytoestrogens can be effective in reducing adverse menopausal symptoms (The chemical entities from plants which mimic hormones are called phytoestrogens). These are weaker than natural estrogens in action^[55]. However they compete with estrogen for estrogen receptors. In the presence of excess of estrogens in the body phytoestrogens may have antiestrogenic effect by occupying some estrogen receptor^[56]. The symptoms of a menopause are due to the body

experiencing a withdrawal to estrogen, during thus phytoestrogens occupy vacant receptors and stimulate estrogenic action^[56]. Various formulas containing *A. racemosus* have shown their effectiveness in alleviating the symptoms in and postmenopausal period and in hysterectomised patients^[57,58,59].

Pregnancy:

Antiabortifacient:

The preparations based on *A. racemosus* roots (eg. Shatavari sidh ghrit) are recommended in cases of threatened abortions^[60]. This activity is due to Shatavarin-I^[61]. Which blocks even oxytocin induced contractions in rat, guinea pig and rabbit uteri in vivo and in situ in a dose dependent manner. The researchers also confirmed that the in vivo effect of shatvarin IV i.e. Saponin A₄ on the uterine muscles is just like the estrogen^[15]. Its rasayana as well as antioxidant activity helps in modulating various immune processes and also prevents lipid peroxides at the placental level^[62,63]. The polycyclic alkaloid asparagine A is also reported to have an antioxytotic action^[21], showing an antiabortifacient affect.

Antenatal tonic:

Classical ayurvedic texts eg. Charaka Samhita, Sushrut Samhita & Kashyap Samhita mention the objective of antenatal care as super baby, means a healthy child (both physically and mentally) with good complexion, built and strength. These recommended the use of medicines which are Jeevaniya (Erythropoetic) Balya (strength promotens), Medhya (Promoters of mental abilities) and Rasayana (agents for antiaging). Shatavari possesses all above qualities and is one of the ingredients of modern formulations which are advocated for the pregnant women in programming a super baby. Capsule Sujat and Torchinil are the formulation bases on such ideas^[62]. *A. racemosus* root extract has shown to treat pre eclampsia associated with pregnancy. In a clinical trial done on Sujat with 450 patient's reports that regular use of this A.R. containing capsule during antenatal period enhances the fetal wt. and foetal out come and decreases the incidence of perinatal deaths. The incidence of pregnancy induced hypertension (PIH) is also decreased^[63].

PGI₂ and NO are important vasodilators; a deficiency of these can lead to PIH. Essential fatty acid GLA (Gamma linolenic acid) of A.R. is known to produce PGI₂ in preference to TXA₂. Antioxidant activity prevents PIH by preventing

placental peroxides which otherwise may lead to endothelial cell damage which further can cause an imbalance between vasodilators and vasoconstrictors leading to PIH (Bhosale 2000). Rasayana activity of Sujat helps in modulating various immune processes at placental level. Anti ADH activity also helps in maintaining blood pressure and decreasing edema of pregnancy by causing diuresis^[63].

Post partum tonic:

Galactagogue:

A. racemosus is termed as stanya i.e. galactogogues in ayurveda. It has been investigated by a number of researchers and they found that its roots, and root extracts can improve lactational inadequacy in lactating mothers^[64,65]. Ayurvedic companies launched various herbal formulations viewing this application, Ricalex lactare, Payapro are few to name. Research on these demonstrated increase in milk secretions^[66,67,68]. Lactogenic effects of these were investigated in guinea pigs^[69], goats^[70], buffaloes^[71,72] and humans^[73]. After administration of alcoholic extract of A.R. a significant increase in milk yield has been observed along with increased growth of the mammary glands, alveolar tissues and acini^[74].

A group of researchers studied *A. racemosus* for its antidopaminergic activity with a working hypothesis, that therapeutic effects, of shatavari like dyspepsia and galactagogue, may be due to an active principle containing dopamine receptor antagonistic activity because shatavari produced similar effects when compared to metoclopramide, a dopamine receptor antagonist. An increase in prolactin level comparable to metoclopramide was demonstrated, but the antidopaminergic activity was not observed^[75].

The intramuscular administration of alcoholic extract of shatavari root produced an increase in weight of mammary glands in post partum-estrogen primed rats and increased uterine weight in estrogen primed group. These were an increase in weights of adrenals coupled with depletion of ascorbic acid, suggesting the release of pituitary ACTH^[74]. The growth of lobuloalveolar tissue and milk secretion in the estrogen primed rats was thought to be due to the action of released corticoids or prolactin^[69].

Safety of *Asparagus racemosus*:

On chronic use, root extracts even at very high doses did not produce any abnormality in behaviour of rats and mice. The plant is found safe during pregnancy and lactation^[45]. Prabha *et*

al.^[76] assessed the safety profile of *Asparagus racemosus* by studying acute and chronic toxicity (1g/kg) on pre and post natal developments in rats. Both the studies indicated no changes in general behavior, gait, food and water intake body weight. Further no change in liver and renal function test parameters are reported. The histological studies of liver, kidneys, testis and stomach were also found to be normal. *Asparagus racemosus* root extract is demonstrated decrease in body part lengths, placental weight, enhanced foetal resorption, of pups. However this study was unable to identify any specific constituent as being responsible for this teratogenicity and there for needs to be investigated further.

CONCLUSION

Since most drugs containing Shatavari that are available in the market are in the form of polyherbal formulations, it is difficult to attribute a particular medicinal action as being solely due to the *Asparagus racemosus* component of the drug. The plant extracts are complex mixtures that contain multiple components and therefore unless proper investigations are conducted there would be no method to connect a particular constituent to a specific action within the biological system. Therefore, further research is imperative to probe into the actual mode of action responsible for the medicinal effect. Clearly, more research is needed to define the effect of phytoestrogens from *Asparagus racemosus* and at the same time standardizing and characterising formulations and/or isolated phytoestrogens is imperative. In addition, developing an understanding of the effects of phytoestrogens from *Asparagus racemosus* as opposed to human oestrogens also holds great promise for further research.

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