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Unlocking the Bioactive and Therapeutic Potential of Shatavari (*Asparagus racemosus*): A review of its Ancient Ayurvedic Secret for Modern Wellness

Azka Mateen[1*], Ramsha Mudassir[2], Aliya Vishal[1], M. Hussnain Muneeb Khan[1] and Mariam Ehsan[3]

1. National Institute of Food Science and Technology, University of Agriculture Faisalabad, Pakistan
2. Department of Human Nutrition and Dietetics, The Islamia University of Bahawalpur, Pakistan
3. Department of Human Nutrition and Dietetics, Government Women University Faisalabad, Pakistan

*Corresponding Author: **azkamateen211@gmail.com**

ABSTRACT

Shatavari *(Asparagus racemosus)* is a common Ayurvedic medicinal plant with widespread use for its curative and therapeutic effects on health.*A.racemosus* contains a large and diverse number of natural chemical compounds such as steroidal saponins, flavonoids, alkaloids, glycosides, and polyphenols. That combined effect of its various active compounds is responsible for its wide range of medicinal and therapeutic properties. The species are largely present all over India and other tropical countries. Traditionally, Shatavari has been used for adaptogenic, antioxidant, anti-inflammatory and immunomodulatory effects. It plays an essential role in maintaining female reproductive health, enhancing lactation and fertility and developing immune function. It is use in most modern herbal formulas and functional foods. With few reports on toxicity, it is a nontoxic and versatile plant used in medicine and nutraceutical applications. This review emphasizes its practicality as a traditional remedy by assessing its botanical properties, phytochemical content, pharmacology and future perspective in modern health care.

Keywords: Shatavari, *Asparagus racemosus*, Ayurvedic medicinal plant, Female reproductive health, Phytochemical composition, Adaptogenic herb

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Introduction

Herbal plants are now used as a vital resource for the treatment and prevention of many diseases. Every plant contains a large number of essential components that have been used in medicines and can be used to create various medications. Herbal medicine is used to cure certain diseases, preserve human wellbeing and improve personal health in many developed and developing nations [1]. Asparagus racemosus is a significant herbal plant that is considered a "rasayana". Plant medication promotes overall health by boosting cellular resilience and vitality. *Asparagus racemosus* is also popular as Satawar, Satamuli and Satavari. It is also a low-lying plant found throughout India, that is a member of *Liliaceae* family. The plant's dried roots are used as a medication that has ulcer-healing effects, mostly by improving mucosal resistance or cytoprotection. Its roots are also used to be tonic, diuretic, and galactagogue. Additionally, it is one of the most common medications used to manage AIDS symptoms. Some Ayurvedic practitioners have used *A. racemosus* to treat intestinal infections, inflammation and mental health disorders [2].

Botanical Description and Distribution

There are more than 300 species in the genus Asparagus all over the world, in which 22 of those species are found in India. Although it is mostly grown in India, A. racemosus is found throughout the world, including tropical Africa, Java, Australia, Sri Lanka, and China and India [3].

Table 1. Taxonomic Classification of *Asparagus racemosus*

Kingdom	Plantae
Order	Asparagales
Family	Asparagaceae
Genus	Asparagus
Species	*Asparagus racemosus L*

Traditional and Ayurvedic Importance

In Shatavari, the phrase "who acquires 100 husbands or sufficient to many" is used. It recommended as a general tonic and tonic for female reproductive health. The symbol "100 spouses" can also be used to represent Shatavari's ability to increase endurance and fertility. Because it promotes passion and love, this wonderful plant is known as the "Queen of Herbs" in Ayurveda. It's a main Ayurvedic medication that helps women feel more energized [4]. The plant's roots are used in modern Ayurvedic medicine as an appetizer, stomach tonic, aphrodisiac, as well as galactogogue, astringent, antidysentric agent. Moreover it exhibits laxative, anticancer, anti-inflammatory, blood purifying, antitubercular, antiepileptic properties and it is used for night blindness, kidney disorders, and sore throat issues [5].

Phytochemical Composition

Bioactive substances found in abundance in A. racemosus include alkaloids (asparagamine), polyphenols (tannins), alkaloids (asparosides), flavonoids (kaempferol, quercetin, and rutin), and steroidal saponins (Shatavarins I-VI) [6]. These substances have a wide range of pharmacological properties that include neuroprotective, estrogenic, anti-inflammatory, antioxidant, and adaptogenic effects [7].

Table 2. Bioactive compounds present in *Asparagus racemosus* and their health benefits

Bioactive Compounds	Phytochemical Class	Health Benefits
Shatavarins I–VI	Steroidal Saponins	Estrogenic action promotes the reproductive health of women.
Asparagamine	Alkaloid	Helpful for neuroprotection, adaptability, and cognitive function
Kaempferol, Quercetin, Rutin	Flavonoids	Anti-inflammatory, antioxidant, and overall health support
Sarsasapogenin	Sapogenin	Anti-inflammatory, anti-cancer, and saponin precursor
Racemosol	Polycyclic Alkaloid	Antiviral action (HIV-1)
Asparosides	Glycosides	The immune-modulatory and adaptogenic
Methy11,12-octadecadienoate	Fatty Acid Ester	A possible antioxidant was found via GC-MS analysis.
Tannins	Polyphenols	Anti-inflammatory, antimicrobial, and antioxidant
Fructo-oligosaccharides	Carbohydrates	Fructose carbohydrate Prebiotics and support for gut health

Nutritional Profile

In 100 grams of shatavari powder, there is approximately 9.5% moisture, 3.55 g ash, 2.47 g protein, 0.11 g fat, 2.5 g crude fiber, 3.39 g carbohydrates, and energy is 22 kcal are roughly present. It is also a source of vitamin C (4mg), calcium (26 mg), carotene (87.5 µg), and iron (2.17 mg) [8].

Table 3. Proximate and Nutritional Composition of *Asparagus racemosus* (per 100 g)

Nutrient / Parameter	Amount (per 100 g)
Moisture (%)	9.5
Ash (g)	3.55
Protein (g)	2.47
Fat (g)	11
Fiber (g)	2.50
Carbohydrate (g)	3.39

Energy (kcal)	22
Iron (mg)	2.17
Calcium (mg)	26
Carotene (µg)	87.5
Vitamin C (mg)	4

Biological Activities and Health Benefits of *Asparagus racemosus*

Supports Female Reproductive Health

Shatavari is crucial for postpartum care since it may increase reproductive rates and improve the quality and amount of breast milk. Shatavari's active ingredients, such as flavonoids and saponins, have the potential to improve fertility [9]. It is traditionally used to treat various women's reproductive problems, such as irregular menstruation, dysmenorrhea, menstrual bleeding, amenorrhea, sexual weakness, menopause related symptoms, and pelvic inflammatory conditions associated with sexual dysfunctions. It has been used for centuries as a uterine tonic for PMS as a result, it produces uterine prolapse and strengthens, nourishes, and cleanses the uterus. By enhancing the hormonal balance, it helps boost lactation and prevents miscarriages helps in overcoming infertility and strengthens the uterine wall for proper contraction during fetal development and growth. It improves folliculogenes, increases ovaries size, and the root extract helps stimulate serum FSH. The saponins contains A. *racemosus* help inhibit oxytocic impact on the uterine muscle, so it maintains normal uterine movement. This supports its effectiveness in relieving dysmenorrhea, which is characterized painful menstruation without severe pelvic disorders. Due to the presence of Shatavarin, the well-known Shatavari formulation Shatavri Sidh Girit is often recommended in cases of threatened abortions [4]. Shatavari root extracts are utilized to increase women's fertility, correct sexual organ issues, and balance hormone levels. It improves ovulation and folliculogenesis, supports the reproductive system for proper conception, prevents the risk of miscarriages, enhances lactation by regulating the hormones. Additionally, it has therapeutic potential to treat menorrhagia, leucorrhea, premature ovarian insufficiency (POI), and polycystic ovarian syndrome (PCOS) [10].

Enhance Immune System Function

Through T-cells, it strengthens immunity, and as a result, antibody titters significantly increased, demonstrating a notable humoral response. Shatavaroside A and B, two significant secondary metabolites found in Shatavri, are steroidal sapogenins and steroidal saponins, which may have immunomodulatory effects and improve and restored humoral and cellular immunity [11].

Acts as Natural Adaptogen

As an adaptogenic herb, shatavari helps the body in managing stress levels and maintain equilibrium in challenging circumstances. According to recent research, the root of *Asparagus racemosus* has the ability to control the hypothalamic-pituitary-adrenal (HPA) axis, which plays a key role in managing the body's stress response. Shatavari is a potential herb for treating anxiety, depression, and stress-related diseases because of its adaptogenic qualities. Shatavari extract significantly decreased adrenal gland damage caused by stress and enhanced the overall physiological stress response [12].

Improve Digestion and Gut Health

Shatavari has been shown to enhance the production of gastric mucus, which acts as a barrier against stomach acid and helps prevent ulcer and gastritis issues [12]. *Asparagus racemosus* improves the digestive system and helps prevent several disorders associated with the gut. It is one of the important sitavirya drugs that has been used to treat peptic ulcer disorders [13].

Exhibits Antioxidant Activity

Recent studies highlight the potential antioxidant properties of shatavari. According to several studies, the antioxidant properties of Shatavari is attributed to the presence of flavonoids, saponins, and other polyphenolic components. These bioactive compounds protect the body by mitigating oxidative stress and damage to cells by neutralizing or scavenging free radicals. Oxidative stress plays a significant role in age and other chronic conditions, including diabetes, heart disease, and neurological disorders. Shatavari has gained popularity and use as supportive therapy in the prevention and management of these conditions [12].

Anti-inflammatory and Immunomodulatory Properties

Recent research has demonstrated that shatavari possesses strong anti-inflammatory effects and immunomodulatory properties. Studies have shown that *Asparagus racemosus* root extract can suppress pro-inflammatory cytokines such as TNF-α, IL-1β, and IL-6, which play a crucial role in inflammation and immunological responses. These effects suggest that it may be used to treat inflammatory conditions like arthritis and autoimmune responses. Findings published in the *Journal of Ethnopharmacology* also reported that Shatavari extract may enhance immune function by promoting the formation of white blood cells. Hence, it is serves as useful herbal remedy for boosting immunity, particularly in individuals with weakened immune systems [12].

Modern Research and Applications

When shatavari root powder is added to pasta and noodles, it enhances their nutritional value and visual quality by providing a high fiber, calcium, and energy-dense functional food option. This approach aligns with increasing consumer demand for natural and health-promoting ingredients in processed food items [14]. The current work aims to develop a functional formulation by incorporating shatavari *(Asparagus racemosus Willd)*, a significant medicinal herb in India into bread. Experimental trials were carried out by using the central composite rotatable design (CCRD) trials were conducted with yeast and shatavari powder as variables [15].

Shatavari in Herbal Formulations

Shatavari is increasingly incorporated in blends of herbs. It is commonly combined with other adaptogenic herbs such as ashwagandha *(Withania somnifera)*, to enhance its capacity to lower stress and enhance overall health. With the progress of Ayurveda and modern herbal medicinal therapy, *Shatavari* has become more widely available and is now consumed in various forms that include tinctures, teas, capsules, and powders packs [12].

Potential Side Effects

Shatavari has been used widely in the ayurvedic medicinal system for many years and is considered generally safe as no known toxicity or negative side effects. Studies indicate that even high dosages of Shatavari do not cause any genotoxic effects, behavioral, neurological, or mortality abnormalities in experimental test animals. However, after receiving 100 mg/kg body weight/day of shatavari root extract for 60 days prolong, experimental rats displayed both certain teratogenic effects and a marked reduction in body weight in rat models [10].

Conclusion

The well-known herbal plant, shatavari, or *Asparagus racemosus*, has been widely used for traditional and Ayurvedic medical uses. It exhibits several pharmacological properties, particularly in the areas of immune system function, stress levels reduction, gastrointestinal support, and enhancing female reproductive health and wellbeing. It also have rich phytochemical profile which includes saponins, flavonoids, alkaloids and polyphenols. Its uses in functional foods and herbal formulations indicate increased customer interest in natural health-promoting therapies and its recent research proves its effectiveness as an antioxidant, anti-inflammatory, and immunomodulatory agent. Shatavari is a safe, useful and adaptable herb with potential uses in clinical, nutraceutical, and functional food areas. Its therapeutic potential can be further validated and its application in modern healthcare expanded through continued research and development in the coming years.

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