

A Review on the Applications of Shatavari (*Asparagus Racemosus*) in Aquaculture Practices

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Abstract

Aquaculture is becoming progressively more essential as a source of nutrition, which has raised interest in sustainable methods. This review paper focuses on Shatavari (*Asparagus racemosus*) as one of the Ayurvedic medicinal plants that need to be evaluated as an important constituent for aquaculture. The study analyses the data collected from 10 different investigations on Shatavari's usage including influence on growth performance, immunity enhancement and prevention of diseases. It emphasizes the possibilities of Shatavari as a natural additive in aquaculture and thus mentions the directions of future studies.

Keywords: Shatavari, Aquaculture, Ayurvedic, Natural additive

I. Introduction

Asparagus racemosus commonly known as Shatavari is herb well known for its phytochemical properties. It is widespread in Indian subcontinent and can be cultivated in wide range on environmental conditions. It is being used in Ayurvedic, Unani and local medicines from ancient period. The ancient Indian text also emphasise therapeutic uses of Shatavari, Atharvaveda dated back 1000 BCE emphasise on its role in enhancing vitality and strength, Charak Sahinta refers Shatavari as rejuvenating herb having special effects on immunity and longevity, Shushruta in Shushruta Sahinta praise its attributes to treat gynaecological problems. and Ayurvedic text promotes all those uses of Shatavari in formulated manner. It has steroidal Saponins mostly Shataverin, Flavonoids, Isoflavines, Minerals and Vitamins and hence it

shows antioxidant, anti-inflammatory and immunomodulatory activities [1]. During and before the British era, both Indian and British pharmacologists explored therapeutic uses of Shatavari. There has been a substantial increase in the aquaculture industry over the past few decades to meet the demand for food. However, problems such as disease outbreaks, slow growth, and antibiotic and chemical treatments have raised the authorities' concerns on sustainability and health risks. Natural products have been searched which may help in both the health and productivity of the cultured species and have less impact on the environment. One such natural product, Shatavari (*Asparagus racemosus*) is known to have therapeutic effects and recently Shatavari seems to have growth-promoting, immune-enhancing, and disease resistance properties and has been considered a tonic and adaptogen in Ayurveda. Bioactive components of Shatavari like saponins, flavonoids, and polyphenols could be useful in improving aquaculture. In modern medicine shatavari is also applicable in many formulations. In aquaculture, Shatavari is a boon as the industry is based on food conversion ratio and weight gain in fishes, it also reduces reliance on synthetic feed additives as it provides natural growth promoters, immunomodulatory substances and also provides therapeutic benefits. Studies done on carps and genetically improved tilapia shows effectiveness of Shatavari on enhancement of growth rate [2], immunity and overall health parameters of the fish [3]. This meta-analytic review integrates data from 10 studies on the application of Shatavari in aquaculture paying particular attention to growth performance, immune-responses, and disease resistance of fish.

Systematic Position of Shatavari Plant

Taxonomy of Shatavari

Kingdom : Plantae

Clade : Angiosperms

Clade : Monocots

Order : Asparagales

Family : Asparagaceae

Subfamily : Asparagoideae

Genus : *Asparagus*

Species : *racemosus*

The Shatavari plant is referred to as 'Queen of Herbs' in Ayurveda, it also supports rejuvenation hence called rasayana. In traditional medicines it has been used because of these attributes; adaptogenic effects, stress relieving properties and role in enhancing vitality makes it a potential herb in Asiatic traditional medicinal practices. A variety of pharmacologically active compounds like flavonoids, alkaloids, polyphenols, and saponins. Such compounds are responsible for Shatavari's antioxidant, antimicrobial and immunomodulatory properties, providing versatile applicability of Shatavari in digestive and reproductive health [4]. Choudhary *et. al.* [5] Also found that phytosterols, saponin, protein, carbohydrates, flavonoids and absence of anthroquinone. Phenolic compound tannins, steroids, oils and fatty acids are present in *Asparagus racemosus*. A review done by Shen *et al.* [6], gives insights of the international approach about the immunoregulatory activities of plant saponins. It highlights the biological activities of saponins that regulate innate and adaptive immune responses, role in development of immune organs and enhancement of cell activity, on the other hand it also addresses adverse effects like cytolysis and cytotoxicity. The review also thoroughly examines pathways triggered by plant saponins in immunoregulation like TLR, NF- κ B/MAPK, and Hippo-YAP signalling. The Authors also elaborate classification and biological activities of saponins (terpenoid vs steroidal). Terpenoid saponins show versatile immunoregulatory effects in innate immunity and also anti-inflammatory activities and steroidal saponins along with immunoregulatory activity play an important role as adjuvant in vaccines (adaptive immunity). Bhutani *et. al.* [7] examine apoptosis inducing properties of steroidal compounds in two plants, *Solanum xanthocarpum* and *Asparagus racemosus*. They examine Diosgenin, Diosgenone, Solasodine, Beta 2- Solamargine and Solasonine from *Solanum xanthocarpum* and Sarsapogenin, Asparanine B, Shatavarin I and IV, and Immunoside from *Asparagus racemosus*. They found that Solamargine and Solasonine of *Solanum xanthocarpum* were highly cytotoxic but induce necrosis, whereas most of the component in *Asparagus racemosus* show cytotoxic effects but Immunoside strongly induce apoptosis in HCT116 cell

line of colon carcinoma cells. Shatavarin, one of the primary bioactive steroidal saponins, has anti-inflammatory, antioxidant, and immunity-enhancing properties. These saponins are also effective adaptogens and hence can be used to reduce chemicals and improve humoral and cellular immune response to promote immune function. Studies show that saponins boost lymphocyte production and improve macrophage functions [6].

Shatavari as a Growth Promoter in Aquaculture:

Many scientists have done work on growth performance of various experimental animals with dietary supplementation of Shatavari powder or extract, in context with aquaculture the work done by Keer et al in 2020 shows significant growth in *Labeo rajasthanicus* when provided with ethanolic Shatavari root extract in ratio 0.15g/kg of diet. In similar work done by Parmar et al in 2020 shows use 10% Shatavari powder as dietary supplement enhances growth in genetically improved farm tilapia (GIFT).

Anti-microbial activities of Shatavari, Immune Modulation and role in disease management:

In aquatic environments animals are susceptible to the various pathogenic infections. The immune systems of aquatic organisms play vital roles in their survival, the anti-microbial activities of Shatavari along with its Immune modulatory properties gives a wide applicability in feed supplementation to prevent diseases and improve overall health of farmed aquatic animals. A review done by Rakesh Joshi, 2016 on phytoconstituents and medicinal importance of shatavari and future source of economy by cultivation of shatavari in Uttarakhand emphasises its enriched chemical constituents and their pharmacological and dietary uses. According to his review Shatavari is applicable in treatment of epilepsy, kidney disorders, chronic fevers, excessive heat, stomach ulcers and liver cancer. Its major constituents like steroidal saponins. Isoflavones, asparagamine, racemosol, polysaccharides are useful in control of diseases and immune modulation, while in other hand vitamins A, B1, B2, C, E, Mg, P, Ca, Fe, and folic acid present in roots makes its

great dietary supplement. Shatavari also contains essential oils, asparagine, arginine, tyrosine, flavonoids (kaempferol, quercetin, and rutin), resin, and tannin gives it higher medicinal importance and hence can be used in aquaculture as disease management play crucial role in successes of aquaculture practices. In a review *Asparagus racemosus*—Ethnopharmacological evaluation and conservation needs, Bopana and Saxena [8] stated that *Asparagus racemosus* a herb is having tremendous potential and still considerable work has been done to find out the biological activity and medicinal properties of this plant, there are many possibilities regarding use of Shatavari in medicines. Hence this can also be applicable in animal husbandry and aquaculture. According to Shen et al [6] phyto saponins play a crucial role in the promotion of growth and maturation of immune organs, these phytochemicals are also capable of regulating functions of a variety of immune cells. Through a variety of signalling pathways it modulates immune responses. Chavhan et al [9] also emphasise on antifungal, antibacterial, antiviral and immune-stimulatory activity of various phytochemicals found in Shatavari. Such findings support use of Shatavari in aquaculture fisheries as dietary supplement, immunity stimulant and therapeutic agent as show antimicrobial activities against a variety of microbes infecting other animals and fishes.

Shatavari in Reproductive health:

In the case of human especially reproductive health of women Shatavari is considered as a miraculous plant, as it shows effect on various gynaecological issues including fertility. It is effective in restoring hormonal balance, ovulation and increasing sperm viability [4]. Some important studies done on fishes show satisfactory results in improvement of reproduction in fishes. Studies done by Singh and Ansal [10] show higher GSI and fecundity and vitellogenesis but no significant effects on size and quality of eggs, although it shows folliculo-stimulatory effects in other animals like mammals. These studies indicate that there is scope for investigation to be done to study the effect of Shatavari on reproduction of fishes.

IV Conclusion

This article gives insights of medicinal and dietary benefits of Shataveri in the context of fishery. It is a potential herb with many medicinal and adaptogenic properties. It contains various phytochemicals, mainly steroidal saponins. Isoflavones, asparagamine, racemosol, polysaccharides gives immunomodulatory properties, while vitamins A, B1, B2, C, E, Mg, P, Ca, Fe, and folic acid benefits in growth enhancement and reproductive health, similarly essential oils, asparagine, arginine, tyrosine, flavonoids (kaempferol, quercetin, and rutin), resin, and tannin help in stress relief, natural antimicrobial activities, hormonal balance. This all properties can be applied in aquaculture and fisheries, studies done by Keer et al [11] shows increased feed conversion ratio in *Labeo rajasthanicus*, this conserves feed and enables maximum utilization of nutrients. It also suggests supplementation level for ethanolic extract of Shatavari roots viz. 0.15g/kg of feed. Singh et al [10] state that dietary inclusion of Shatavari Root Powder (SRP) exerts positive effects on growth, survival, health and flesh quality of *Cyprinus carpio*. According to these studies, using Shatavari in aquaculture will likely be beneficial in the future. However, they also highlight a research gap that has to be filled in order to establish a sustainable and comprehensive strategy for using Shatavari in aquaculture fisheries.

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V. References

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