

Effect of Herbs and Herbal Products Feed Supplements on Growth in Fishes: A Review

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Abstract

The herbs and herbal products added to the feed cure many diseases, promote growth, reduce stress, improve immunity and prevent infections in fish under culture. The addition of herbs and herbal products in fish diet is cheaper and environmental friendly with low side effect to the fish and consumers. Hence, their use as drugs in disease management in aquaculture is gaining popular. They are better than various antibiotics and vaccines used in the treatment of diseases. The present review highlights the importance of herbs and herbal products supplementation in fish feed for better fish production.

Keywords: Aquaculture, growth promoter, herb, fishes

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Introduction

Fish of commercial importance are farmed in captivity under controlled conditions to fulfill the demand of white meat for human consumption. In commercial fish farming, the production is maximized by increasing the weight of individual fish [1, 2]. An artificial feed used in the aquaculture improves fish growth with maximum weight in short time [3]. New substances are added in fish feed to improve feed conversion efficiency that result in fish growth [4]. Many studies show that inclusion of herbs in fish diet has positive effect on growth and disease free fishes.

Excess use of various antibiotics, hormones and other synthetic drugs to control diseases and improve fish growth in aquaculture is the reason behind the emergence of drug resistant bacteria and production of toxic substances harmful to the environment and human health [5] and suppress immunity in the host [6]. Thus, their use has been criticized all over the world [7]. The herbs being cheaper, eco-friendly with minimum side effects are used as alternative to antibiotics in fish health management. World Health Organization (WHO) encourages supplemented diets incorporated with medicinal herbs or plants which minimizes the use of chemicals in fish diet [8]. In this context herbs and herbal products can be used in fish diet to increase feed consumption in fish under culture

[9]. Thus, this review is an informative collection in relation to fish growth through herbal feed supplements which may be useful for aqua farmers.

Bioactive compounds present in various plants are used in animal nutrition to stimulate feed intake, improve secretion of digestive enzyme and activate immune responses. These plants are also known to possess antibacterial, antiviral and antioxidant properties [10]. In aquaculture practices many herbs and herbal products are included in the fish diet to cure diseases, promote growth, reduce stress, stimulate appetite, boost immunity and prevent infections in producing healthy fishes [11- 15].

The flavor imparted by herbs and herbal products added in fish diet changed the eating patterns, increased feed consumption and stimulated digestion by increasing the secretion of saliva, various digestive enzymes, bile, pancreatic enzymes activity and mucus in fishes [16,17].

Some herbal feed supplements used in Aquaculture

Various herbs such as *Hygrophila spinosa*, *Withania somnifera*, *Zingiber officinalis*, *Solanum trilobatum*, *Andrographis paniculata*, *Psoralea corylifolia*, *Eclipta erecta*, *Ocimum sacnctum*, *Picrorhiza kurooa*, *Phyllanthus niruri* and *Tinospora cordifolia* are used to reduce stress, increase immunity and control bacterial activities. *Penaeus monodon* in culture fed

with diet containing these herbs improved growth [12]. Similarly, garlic, onion, marjoram, caraway, basil, anise, fennel, licorice, black seed and fenugreek are known to promote growth [13], feed conversion [15], improve protein digestibility and retain energy [18, 19] in aquatic animals. Promising results were achieved when Harada (1990) used garlic as stimulatory effect on olfaction instead of chemotherapeutics on Oriental weather loach (*Misgurnus anguillicaudatus*) and Japanese amberjack (*Seriolaquin queradiata*) [20]. This is similar with what was reported by Lee and Gao (2012) on *Pelodiscus sinensis*, *Ctenopharyngodon idellus*, *Cyprinus carpio*, *Carassius auratus* and *Oreochromis niloticus* [16]. Allicin is an active compound of garlic which induces increase in feed intake. Zeng (1996) also reported that adding 50 mg kg⁻¹ of synthesized allicin to tilapia diet increased more than 2-3% of its weight gain after 45 days of culture [21]. The use of other culinary herbs such as red clover (*Trifolium pratense*), caraway (*Carum carvi*) and basil (*Ocimum basilium*) have shown positive results as growth promoting agents in *Oreochromis niloticus* [22]. Methanol extract of green tea (*Camellia sinensis*) enhanced the growth, survival rate, feed utilization and protein content in black rockfish (*Sebastes chlegeli*) [23]. Garlic supplemented diet improved weight gain (WG) and specific growth rate (SGR) in *Oreochromis niloticus* [24]. Feed containing 3% garlic powder improved WG, feed efficiency (FE), and SGR in *Oreochromis niloticus* [25]. In the same species high growth rate was observed in feeding diet with 2.5% garlic [26]. Garlic supplemented diet increased weight and SGR in tilapia [27]. Diet containing 3.2% garlic powder showed best growth in *Oreochromis niloticus* [28]. Rainbow trout fed with 1.0% garlic diet increased growth and improved feed utilization [29]. Similarly, *Oreochromis niloticus* fed with garlic supplemented diets showed significant improvement in weight gain, feed conversion and protein efficiency [30]. *Labeo rohita* fed with herbal supplemented diet improved feed consumption resulting in better growth due to high protein synthesis [31].

Leaves of *Sesbania grandiflora*, *Moringa oleifera*, *Coleus aromaticus*, *Ocimum basilium* and *Solanum verbascifolium* have been found to promote growth in *Oreochromis mossambicus* [32]. *O. mossambicus* fed with diet containing *Moringa oleifera* showed maximum increased weight and specific growth rate. The maximum increase in length was observed in the fishes fed with *Ocimum basilicum* supplemented diet. Thus, plant ingredients are included in fish diet for their better growth. Red clover (*Trifolium pratense*) mixed with diet promoted growth in *Oreochromis aureus* [33]. Juvenile pike perch (*Sander lucioperca*) fed on diets supplemented with medicinal plants grew faster than those fed with the control diet [34]. In common carp *Cyprinus carpio*, guppy *Poecilia reticulata*, cichlid *Cryptoheros nigrofasciatus*, and red sea bream *Pagrus major* diet supplemented with medicinal plants improved growth. The use of Ginseng herb (Ginsana G115) in diet enhanced the growth in *Oreochromis niloticus* fingerlings [35-39]. The use of antibiotics can be replaced by optimized dose of Garlic to enhance growth performance and meat quality [40]. Metwally (2009) recommended supplementation of Garlic in fish feed to promote growth and increase survival rate [29]. The use of *Phyllanthus emblica* in any doses to feed of fish results in maximum growth [41]. John et al., (2007) used four different plants such as *Echinacea purpurea*, *Allium sativum*, *Nigella sativa*, and *Origanum marjorana* as feed additives which enhanced growth and improved survival of *Oreochromis niloticus* [42].

Various commercial herbal additives have been introduced in aquaculture for fish growth. Sangrovit® (commercial product containing isoquinoline alkaloid sanguinarine) at low levels (25-100 mg kg⁻¹) in diet promoted growth in tilapia [43]. Tilapia fed with Sangrovit® supplemented diets consumed more feed as compared to control and showed improved growth. In *Catla catla*, 5% inclusion of *Cynodon dactylon* in diet improved the growth, feed efficiency, body composition, digestive enzyme and anti-protease activity [44]. The significant

increase in SGR, feed conversion ratio (FCR) and 100% survival rate in the experimental groups were due to the presence of essential amino acids in *Cynodon dactylon* [45]. *Catla catla* fed with *Cynodon dactylon* incorporated diet showed the increased activity of digestive enzymes such as amylase and protease which enhanced digestion and absorption of nutrients essential for fish growth [44]. Inclusion of 5% *Ulva* in the diet of Nile tilapia improved the growth, feed efficiency, nutrient utilization and body composition [46]. *Oreochromis niloticus* fingerlings fed with dietary herbal powder (Superliv®) improved weight gain, FCR, protein efficiency ratio (PER) and SGR [47]. Bioflavonoids, plant chemicals with estrogenic activity, present in superliv® powder stimulated growth in common carp [48]. Sambhu and Jayaprakash (2000) recommended the use of 1% of Livol (IHF-1000) to enhance maximum growth and improve nutrient digestibility in prawn [49]. Livol (IHF-1000) is a purely herbal product containing different plant ingredients which improves digestion thereby leading to better growth in cultivable fishes [50, 51, 52]. The fish fed with different doses of ImmuPlus improved growth and inflammatory response (increase protease and amylase activity) [53]. The higher growth in treated fish is due to better utilization of feed through improved secretion of digestive enzymes and higher deposition of fats and protein in carcass [53].

Dietary administration of small quantities of vitamin C is known to improve fish growth [54, 55, 56]. Chitosan and levamisole supplementation in diet of common carp enhanced its growth [57]. Ji *et al.*, (2007) observed that the herbs promoted cellular lipid and fatty acid utilization and protein accumulation resulting in better growth performance in *Pagrus major* [38]. The dietary superliv® powder at different concentrations promoted growth of *Oreochromis niloticus* fingerlings [58]. The bioflavonoid compounds are present in superliv® powder which stimulated growth in common carp [48]. The use of fenugreek in *Labeo rohita* and *Oreochromis mossambicus* [59.

60], rosemary in *Oreochromis niloticus* [61, 62], thyme, rosemary and fenugreek in *Oreochromis mossambicus* [63] improved growth performance, disease resistance and immunity. The thyme diet improved growth and nutrient utilization in the European sea bass (*Dicentrarchus labrax*) [64]. It has been shown that herbs stimulated the secretion of pancreatic enzymes, important factors in nutrient digestion and assimilation [65]. The dietary addition of vitamin C at the rate of 400 mg kg⁻¹ increased average weight and specific growth rate of hybrid carp [66].

Vitamin C fed fishes showed higher growth rate [67]. Pandey *et al.*, (2012) showed use of Vitamin C and E as herbal drugs act as growth promoter and cure diseases of fishes and other aquatic animals [14]. Labh and Shakya (2016) studied the effect of lapsi (*Choerospondias axillaries*, Roxb.) fruit pulp in diet of Nile tilapia and common carp in the laboratory of Central Department of Zoology, Kathmandu. In the study 0.4 g ethanol lapsi fruit extract per kg is sufficient to enhance growth, survival, feed utilization and protein content of the body [68].

Importance of Herbal feed supplements in Aquaculture

Many factors such as density, water quality, feed quality and various environmental factors such as temperature, salinity and dissolved oxygen content of water play important role in increasing the meat quality and production in aquaculture. Besides the above mentioned factors disease outbreak, environmental conditions like rain, excessive temperature, floods, landslides, entry of predatory fish in the culture ponds or reservoirs, algal bloom etc. are also the cause of decreased aquaculture product. These factors cause stress and underutilization of normal feed leading to low feed conversion ratio. The antibiotics and synthetic drugs used to control diseases could damage the organs like liver and affect growth of fishes under culture leading to decreased productivity. To increase the economically viable production by solving the above problems, a

proper herbal feed supplementation is required to take care of overall health of fishes and withstand the environmental challenges without affecting the growth survivability.

Conclusion

Many studies are being carried to study the effectiveness of herbal supplementation in fish feed to manage fish diseases and produce healthy fish. The outcomes of the studies suggest the use of herbs and herbal products feed supplements for healthy fishes in culture. Conclusively, the herbal feed supplements promote growth, minimizes stress, improves immunity and prevents various infections in fishes that will help to produce healthy fishes for human consumption.

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