PHYTOTHERAPHY APPROACH IN AQUACULTURE

Ramasamy Harikrishnan[1*], Gunapathy Devi[2], Chellam Balasundaram[3]

[1] Department of Zoology, Pachaiyappa's College for Men, Kanchipuram 631 501, Tamil Nadu, India
[2]Department of Zoology, Nehru Memorial College, Puthanampatti 621 007, Tamil Nadu, India
[3]Department of Herbal and Environmental Science, Tamil University, Thanjavur 613 005, Tamil Nadu, India

*** Corresponding author email : rhari123@yahoo.com**

Status of Phytotherapy

Phytotherapy is referred as Western Herbal Medicine. It involves use of plant-based therapies or extracts of natural origin as food and medicines typically native to Europe and North America for the improvement of health and avoidance of diseases. Of late, it is getting a lot of positive attention from both holistic and traditional practitioners over the past few years, and is often linked to traditional knowledge.

Phytotherapy includes some unique approaches to manipulating inflammatory and immunological mechanisms. Plants contain rich sources of natural bioactive compounds having various biological activities that provide medicinal value, which are known to traditional healers over several centuries. More than 80% of the world's population still follows the traditional medicines approach for their primary healthcare. About 250,000 higher level and 215,000 lower level plant species have been identified, among only about 6% of these species have benscreened for their biological properties, while only about 15% were subjected to phyto-constituents analysis. Some synthetic drugs are developed by pharmaceutical companies which originate from natural resources such as fungi, bacteria, animals, protists, and plants. Plant extracts and their derivatives have received considerable attention as therapeutic agents for preventing and treating of many human health problems.

Application of Phytotherapy

Since the 1940s, among most of the bio-molecules involved in cancer treatment, almost half are either natural products or their transformed products. The promising biological activities of these molecules warrant more research and continued exploration of these natural products to find much needed novel medicines. Understanding how herbal medicines are sourced, processed, and standardized can help providers guide patients who are trying to choose the most clinically effective and affordable treatments.

Multiple herbs are often combined and sold as proprietary blends, which can increase the risk of allergies, adverse reactions, or cross-reactivity with other pharmaceuticals and supplements. Phytotherapeutic strategies for humans include acute inflammations of muscles, joints, connective tissues and glandular and gut tissue; chronic inflammatory diseases of the digestive tract, including gastritis, Crohn's disease and ulcerative colitis; chronic inflammatory diseases of joints, and other connective tissues, including rheumatoid arthritis (RA) and ankylosing spondylitis; psoriasis, scleroderma, other chronic inflammatory skin diseases (dermatitis), including complex and autoimmune conditions such as psoriasis; long-term inflammatory processes underlying chronic conditions such as diabetes and atherosclerosis.

History of Phytotherapy for Aquaculture

Aquaculture is an important revenue sector that contributes significantly to the economy and create various jobs opportunities in almost all countries of the world. Aquaculture activities fulfill more than 30% of nutritional food demands for humans in the world. For the increasing populations, strategies for increasing aquaculture production through intensive and semi-intensive systems are often associated with higher stocking density and massive use of artificial feed, leading to the incidence of diseases including bacteria, viruses, protozoan, parasite, and fungal infections, and resulting in significant economic losses.

In India, losses due to these aspects have been estimated at several million dollars per year. To prevent and manage the infectious diseases, large quantity of antibiotics and other chemotherapeutics reused, resulting in criticism for their negative impacts, residues inenvironment, high man power requirements, financial support, etc. In addition, the use of antibiotics or chemotherapeutics in aquaculture practice usually cause changes in water quality, resulting in chances of widespread infection,through increasing stress levels which directly affects their immune system and reduces the ability of fish to fight pathogens.Further, the antibiotics or chemotherapeutants may limit the larval growth and affect immune defense of the fish larvae. In this connection, there was demand for alternative prophylactic measures of commercial synthetic drugs.

Effect of individual or mixed herbals for Aquaculture

Medicinal plant extracts are recognized as a great potential for preparing clinically useful drugs to effectively prevent and control many bacteria, viruses, protozoans, parasite, and fungal diseases in aquaculture. These are gaining importance, because herbal treatment is cost-effective, eco-friendly and has limited side effects. Traditional herbal medicines seem to have the potential immune-stimulation that contains rich sources of bioactive compounds and thus serve as important raw materials for the production of drugs that are non-biodegradable and bio-compatible. The application of phyto-therapy in aquaculture started in earlier 1990's as a preliminary study on the effect of herbal extract on hematological and biochemical changes and in vitroantimicrobial activity against infectious pathogens. A number of studies proved that herbal additives enhanced the growth of fishes and also protected from infectious diseases. Herbal extracts have important properties like controlling of infectious pathogens due to their antioxidant and antimicrobial activity.

Natural herbal products have been reported to promote various activities like anti-stress, growth promotion, appetite stimulation, tonic and immune stimulation in fish and shrimps larvae culture. The herbal products are widely accepted as immunostimulants, conferring the non-specific defense mechanisms of fish and elevating the specific immune response.Several studies confirmed that the combinations of herbal extract is better than individual herbal extract and are well known to have many properties like anti-stress, growth promoters, appetizers, tonic and immuno-stimulants. However, till date there was no herbal-resistance immunity reported by any pathogen. Mixed herbal extracts also reported enhanced innate immune response and disease resistance in goldfish against bacterial disease.

Impact of plant active compound for Aquaculture

Several plant-derived compounds had been reported that enhanced non-specific immune, and led to better performance of haematological, biochemical in fish and shrimps. Plant active compounds are also reported to enhance immune response and disease resistance in Cirrhinusmrigala against fungal disease. After supplementation of the individual or mixed herbal products in diets, it enhances hematology and biochemical parameters and innate immune response in fish against pathogens.

The herbal active compounds may inhibit or block the transcription of the virus to reduce the replication in the host cells and enhance thenon-specific immunity. Although, administration of these immune-stimulants can be done by feeding, immersion, and injection, it requiresmore studies. However, an overdose of herbals and their active principles could lead to negative effects on aquatic animals.

Conclusion

In conclusion, existing studies have clearly defined that herbal products positively enhanced growth, immunity, and disease resistance in aquaculture species. However, the information on functional and mechanisms of action of herbal products in aquaculture is still scanty. Further details on immunological and molecular studies are required to find out optimum dose, mode of administration, duration of treatment, mode of action in various fish against different pathogens before inclusion of the natural products in aquaculture practices.