
1. INTRODUCTION

Occurrence of fish in India dates back to 3 millennium BC. Cut marks obtained from the excavations of Indus valley civilization (2500 BC- 1500BC) indicate utilization of fish as food. Fish culture in India received remarkable attention with the emergence of department of fisheries. Fisheries departments were established for the improvement of aquaculture in many states during 1908-1947.

Indian fisheries and aquaculture are the vital sectors of food production. They provide nutritional security, as well as livelihood support, employment and income for about fourteen million individuals. Our country has shown continuous and sustained increase in production of fish after independence (NFDB, 2019).

With rising consumer demand, the field of aquaculture is intensifying in almost all areas of the world. To provide high productivity, intensive farming has turned out to be the exceptional option for aqua-farmers. The amplify in the productivity in fish culture has been accompanied by way of disturbing prerequisites and problems associated to fish diseases (Pavaraj *et al.*, 2011).

Aquaculture is underneath stress to reduce the usage of chemicals and antibiotics due to the threat posed to people through residual toxicity of chemicals and antibiotics. Therefore, alternatives to chemicals and antibiotics are necessary and attempts are being made to make use of natural plant products as feasible and possible preferences to chemical compounds to stimulate and enhance immunity and development of disease resistance in fishes (Chakra borty and Hancz, 2011). Therefore, natural plant based products which have the potentiality to produce disease resistance in host such as immunostimulant are used in the prevention of diseases in current years (Sakai, 1999).

Immunostimulants are valuable products used for the prevention and management of fish disease in aquaculture as these represent an alternative and supplementary product to vaccination which enhances the immune response and survival rate of the aquatic organisms under stress (Heo *et al.*, 2004).

Many substances were proved to have the immune stimulatory consequences which are microbial derivatives, plants extracts, vitamins, hormones and artificial

chemicals but plant extracts or powders have a promising and potential application as an immune stimulator in the field of aquaculture (Bairwa *et al.*, 2012).

Medicinal plants are a present of God, to cure infinite wide variety of illness in human beings and in different living organisms (Begum *et al.*, 2003). It is used in drug treatment and as immune boosters for more than thousands years ago. The herbs comprise many immunologically energetic components such as polysaccharides, natural acids, alkaloids, glycosides and oils, which can stimulate the functions of immune system (Pandey *et al.*, 2012).

It is not only used for disease management in fish culture, but also used as promoter of growth, stress resistance boosters and preventatives of infections. Herbs and flowers can additionally act as immune stimulants, conferring the non-specific protection mechanism of fishes and elevating the particular immune response (Pandey *et al.*, 2012).

Recently, the evaluation and the feasibility of natural and herbal products to treat fish disease has been initiated ,where they provide a less expensive supply for therapy with an increased accuracy than chemo therapeutic agents without inflicting toxicity (Madhuri *et al.*,2012).

The advantages of natural therapeutants over artificial or formulated ones are: a) 90% utilization executed by the cultured organism b) Provide many phyto compounds c) do not cause harm to physical system d) Supply pigments such as chlorophyll, carotenoids, xanthophylls and very complicated nutritional vitamins in the most ideal structure (Stephan *et al.*, 2006).

Recently, in the field of aquaculture, numerous medicinal plant/herbal extracts were evaluated with suitable outcomes for the management of viral and bacterial diseases. The resistance of fishes towards the pathogens by the usage of plant fortified feed can be evaluated with the aid of examining the survival rate as properly as from the hematological and immunological parameters. Thus, it has been shown that plant based immunostimulant are successful in enhancing the immunity of fishes (Rao *et al.*, 2006 and Sahu *et al.*, 2006) and with the aid of conferring early activation to the non-specific

defense mechanism (Yin *et al.*, 2008). Plant based herbal extracts can be administered as feed supplements, which is the more suitable, handy and convenient mode for the stimulation of immune system (Bairwa *et al.*, 2012). *Coleus aromaticus* is a medicinal herb, native to the areas in India and Mediterranean region. It is also called by exceptional vernacular name Karpuravalli (Tamil). It is used to treat various diseases such as malaria, disorders in alimentary canal, renal and vesicle calculi, respiratory disorders including asthma and bronchitis, convulsions in colon and neurological disorder (Chopra *et al.*, 1956; Nadkarni 1996 & Kirtikar and Basu, 2005).

Ocimum basilicum or sweet basil is native to Indo-Malayan region. It is the king of herbs and has bioactive compounds with large dietary as well as antioxidant competencies (Jayasinghe *et al.*, 2003). It has shown unique health defending property due to the presence of flavonoids and volatile oils. The flavonoids found in basil offers protection at cellular level (Nyak and Uma, 2005). Essential oil found in *Ocimum basilicum* leaves have the potentiality to inhibit a number of resistant species of pathogenic bacteria (Opalachenova and Obreshkova, 2003).

Tilapia is the third most essential fish in aquaculture. It is regarded as the FOOD FISH of twenty first century and is popularly recognized as aquatic chicken. FAO reviews indicate that global tilapia production is anticipated to reach 7.3 million tons by 2030. In many nations it has also contributed substantially to the meals security programs. Therefore it is felt that tilapia would be one of the candidate species which should be cultured to tackle the meals safety and low-priced protein requirements. MPEDA has given a fundamental thrust to tilapia farming in India (www.agritech.tnau.ac.in). So MPEDA is anticipating to elevate the yield of tilapia output in India (The Economic times, May 18, 2017).

The present work highlights on the utilization of leaf extracts (*C.aromaticus* and *O.basilicum*) supplemented feed, which are considered as much less expensive, ecofriendly, standard medicine, excessive protein enhancer for yielding most growth and excessive immunological response towards economically precious fish *Oreochromis mossambicus*. As there are no formerly archives pertaining two of these leaf extracts as feed supplements, an attempt has been made in the current study, hence it will be

beneficial for large scale hatcheries and R&D institutes for enhancement of aquaculture feed as alternatives for artificial probiotics and hormones. The present investigation was undertaken to analyze the presence of phytochemicals and the bioactive compounds in the leaf extracts of *C.aromaticus* and *O.basilicum* and to compare the efficiency of these leaf extracts supplemented feed on growth characteristics, survival rate, feed utilization efficiencies, hematological, biochemical, physiological and immunological parameters in *O.mossambicus* with following objectives.

Objectives

- To study phytochemical analysis and to characterize the bioactive compounds present in the leaf extracts of *C. aromaticus* and *O.basilicum*.
- To study growth characteristics, feed utilization efficiencies and proximate composition of *O.mossambicus* fed with the leaf extracts of *C.aromaticus* and *O.basilicum* as supplemented feed.
- To determine the hematological and biochemical parameters of *O.mossambicus* fed with leaf extracts of *C.aromaticus* and *O.basilicum* as supplemented feed.
- To study the physiological parameters and immune response of *O.mossambicus* fed with leaf extracts of *C.aromaticus* and *O.basilicum* as supplemented feed against *Aeromonas hydrophila* infection.