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"FISH DISEASES AND THEIR MANAGEMENT OF INDIA : A REVIEW"

Dr. Pushpa Singh[1] and Urmila Patel[2]
[1]Assistant Professor , Department of Zoology, Govt. P.G. College Satna (M.P.).
[2]Research Scholar, Department of Zoology , Govt. P.G. College Satna (M.P.).

ABSTRACT:

Most of disease outbreak is observed during fluctuation of temperature or changes in the environment. The common factors of diseases are Changes in water quality such as, Temperature, Dissolved Oxygen, CO_2, pH, Transparency, Turbidity etc. Waste products make water polluted so that gills, skin, and mouth cavity become infected. Excess use of organic matters and food produce harmful gases such as H_2S, Ammonia, Methane, CO_2, which are responsible for fish disease. Mixing of polluted water from sewage, factory, town or city makes pollution in water. Runoff water from agricultural field, flooded area and other ponds make polluted water. Fluctuation in temperature and high stocking density may cause stress in fishes. Over feeding may cause water pollution.

KEYWORDS: *Antibiotics, Aquaculture, Fish and Health Management.*

INTRODUCTION

The aquaculture sector in Asia has shown continuous growth and has contributed significantly to global aquaculture production. It is the fastest growing food production sector with an average annual growth rate of around 7.5%. The fisheries sector supplies 17% of animal protein and supports the livelihood of 12% of world's population. The global aquaculture production during 2014 was estimated to be 74 million tonnes. In India, with constant population growth, there has been rising demand for cheap source of animal protein for billions, emphasis has been given on up-scaling of aquaculture with species diversification and culture of fast growing fish species. The fact that production from open water resources like rives, wetlands, lakes and marine sector has shown declining trend, emphasis has now been given on aquaculture. Thus, aquaculture sector has expanded rapidly to become a major global industry. While, Asia contributes more than 90% to the world's aquaculture production, India now takes the second position with regard to annual fisheries and aquaculture production, only after China and the country contributes to about 7.3% of the global aquaculture production. India harbours more than 10% of global fish biodiversity and there has been significant development in species diversification with intensification of culture methods. In India, more than 14.5 million people are directly or indirectly dependant on fisheries for their livelihood security and it has been a major driver of socio-economic development of rural poor, specifically in coastal communities. Transformation of the Indian fisheries sector from traditional to commercial scale has led to an increase in fish production from 7.5 lakh tonne in 1950-51 to 107.95 lakh tonne during

2015-16. Fisheries sector contributes over 1% of the total national Gross Domestic Product (GDP) and 5.3% of agricultural (GDP). The sector has shown significant annual growth at the rate of over 10%, which is one of the major contributors to foreign exchange. The export earnings from the sector has registered at 30,420.83 crore Indian Rupees (INR) during 2015-16. It has been predicted that fish consumption in developing countries will increase by 57 percent, from 62.7 million metric tons in 1997 to 98.6 million in 2020.

With the introduction of exotic Specific Pathogen Free (SPF) pacific white shrimp, *Penaeus vannamei* in the year 2009 in India, there has been remarkable growth in shrimp production during last few years, touching all time high of 433448 metric tonnes during 2014-15, with export revenues of over US$ 5.0 billion. The country has plans to increase the fish production and productivity by 8 per cent annual growth rate and to reach 15 million tonnes mark by 2020. Despite phenomenal growth of aquaculture sector both in fish and shrimp production during last few years, the progress of aquaculture has caused some unwarranted activities both for the species and environment. The consequence has been increasing array of emerging and reemerging diseases in aquaculture, adversely affecting growth of the sector. The total loss to aquaculture sector world-wide has been estimated to be more than US$ 6.0 billion per annum. In India, the loss due to disease outbreaks during 2006-08 in shrimp farms located in nine coastal districts was estimated to be 1000 crores Indian Rupees (INR). This review examines present status of fisheries and associated problems relating to occurrence of emerging and reemerging diseases in fish and shellfish culture with future scope of aquaculture development in India.

Discussion :

Symptoms of Disease :

Common symptoms of disease are following: Isolation from group, differences in behavior and swimming. Abnormal position, stop feeding or reject food intake. Changes in body physique, shape, colour i.e., discoloration of body. Edges of fins become whitish, reddish, removal of scales. Accumulation of water or reddish fluid in the body and roots of fins. Stomach swollen, necrosis of gills, secretion more mucous. Body swelling followed by spots, abrasions, furunculous, ulcer or wound with fungal infection. Sudden movement and jumping off the water, rubbing the body against rough surface, pond dykes, aquatic plants etc., improper respiration and movement. Movement on own axis, backward or forward, tail down or head down, oblong, vertical or horizontal, imbalanced body. Exopthalmous or endopthalmous with swelling or bulging eyes, improper vision.

Precautions and Treatment :

Precautions and Treatments to prevent fish from disease are based upon mode of application of practices, chemicals, medicines etc. as per requirement:

i. **Disinfection of ponds and tanks:** Pond management is based on the application of 50-100kg bleaching powder per hectare during pond preparation. Quick lime is used 400-600kg / h in new ponds and 500-800kg/ h in old ponds to eradicate microbes and pathogens. Fish stock can be treated with 5ppm formalin or 0.5-2.0% salt solution prior to stocking in the pond. 5kg $KMnO_4$ and 5-liter formalin can be used in new ponds. 10kg $KMnO_4$, 10kg $CuSO_4$ and 10liter formalin can be used in old ponds.
ii. **Disinfection of instruments:** The instruments related to fish culture should be disinfected with 5-25ppm formalin or 250 ppm $KMnO_4$ after proper washing and complete sun drying before using in the pond. Never use instruments from others pond.
iii. **Proper diet:** Fresh and healthy feed having 24% protein and sufficient fat, lipids, vitamins and minerals should be used 2-3 times in a day. Poor quality food may cause slow growth and weaken the fish.
iv. **Grading of fish:** Fish should be stocked in separate ponds according to the size, species and stages to prevent the mortality due to competition of food and space. There should be separate tanks and ponds for brooders, fries, fingerlings, yearlings and juveniles.

v. **Eradication of diseased and dead fishes:** diseased fish can be eradicated and treated till healthy condition. Dead fishes should be taken out from the pond and buried away from ponds and hatchery.
vi. **Primary treatment:** This treatment is done with the help of KMnO4, common salt solution, formalin and CuSO4. Generally, 2-3% salt solution is used as bath treatment for 1-2 minutes. KMnO4 is 100- 250ppm for 2-3 minutes as bath treatment. KMnO4 is applied 2.5kg/h in each month. Slacked lime is used 100-200kg/h every month. Netting is required twice a month or after 20 days. Water exchanges up to 30cm should be done per month. In severe infection different medicine or chemicals could be used according to the diagnosis of disease. Oxytetracyclin antibiotic antibiotics can be mixed with fish feed 50-60mg /100kg fish up to 15 days. Also, an injection of streptomycin 25mg and Penicillin 20,000IU can be given to valuable and costly fish more than 1kg body weight.

Aquatic Resources in India:

Aquatic resources in India are vast and diversified. The country is bestowed with varied potential resources in the form of rivers and canals (1.95 lakh km), floodplain lakes (7.98 lakh hectare), ponds and tanks (24.33 lakh hectare), reservoirs (29.26 lakh hectare) and brackish water (11.55 lakh hectare). The marine fisheries resources are estimated at 4.41 million metric tonnes and its activities spread along the country's long coastline of 8118 km with 2.02 million square km Exclusive Economic Zone (EEZ). In India, the aquatic resources are categorized as i) Freshwater aquaculture ii) Brackishwater aquaculture iii) Open water aquaculture (Wetlands, estuaries, Reservoirs, canals etc.) iv) Marine aquaculture/Mariculture. Cage culture is practised in open water resources especially in reservoirs and lakes.

Potential of fish production from open-water resources:

India is endowed with a vast expanse of open inland waters in the form of rivers, canals, estuaries, lagoons, reservoirs, lakes etc. In recent years traditional aquaculture has turned into a science based economic and commercial activity involving heavy inputs. Locally known as tal, jheel, maun, chaur, beel and pat in different states in India, floodplain wetland occupies an estimated area of over 354213 ha. Although the vast and varied inland fishery resources of India have a rich production potential, this potential has not yet been utilized at optimum level. The reservoirs have been classified into three categories as small (<1000 ha), medium (1,000 to 5,000 ha) and large (>5000 ha) for the purpose of fisheries management. The Madhya Pradesh has 172,575 small reservoirs, 149,259 medium and 138,550 large reservoirs, with a total water reservoirs 460,384. Vass and Sugunan.

Brackishwater aquaculture sector in India:

India occupies fifth position amongst the major shrimp farming countries in the world. Brackishwater aquaculture includes culture of shrimp varieties mainly, the native giant tiger prawn (*Penaeus monodon*) and exotic white leg shrimp (*Penaeus vannamei*). In addition to these culture of seabass (*Lates calcarifer*) and milkfish are largely practised in brackish water aquaculture. About 90% of the shrimp farmers in India are small scale farmers which own less than 2 ha of land. Brackishwater shrimp farming sector in India has witnessed significant transformation over the last three decades. The development of hatchery technology for mass scale seed production of tiger shrimp *Penaeus monodon* along with involvement of farmers and timely intervention by agencies like Marine Products Export Development Authority (MPEDA) and ICAR Fisheries Research Institutes, paved the way for development of scientific shrimp farming in India in the 1980s.

Disease Problems in Freshwater Aquaculture:

Frequent occurrence of disease is one of the major constrains to aquaculture and may eventually become a limiting factor for aquaculture development. The increasing development of aquaculture activities and with intensification of fish culture, has led to increasing number of infectious

diseases. It has been recognized that emerging infectious diseases have been rapidly increasing in geographical range, host range with higher incidences of disease outbreaks in aquaculture, including those caused by previously recognized and unrecognized pathogens. A total loss of one billion US $ was reported due to diseases in shrimps. Fortunately, the disease problems in freshwater aquaculture in India is minimal compared to its occurrence in shrimp culture and their prevalence in neighboring Asian countries.

In pond/ Tanks Culture:

Among all fish pathogens, parasitic infestation has been the major cause of concern and causing significant setback to freshwater aquaculture in India. Fish parasites multiply rapidly under poor water quality conditions, there by affecting fishes, often leading to high morbidity. Fish parasites, mostly, the protozoan ciliates (*Ichthyophthirius* sp., *Trichodina* sp.), monogenetic trematodes (*Dactylogyrus* sp., *Gyrodactylus* sp.) and larger crustacean ectoparasites viz. *Lernae* spp., *Argulus* spp., *Ergasilus*, are the commonly reported from cases of fish diseases. The *ichthyopthirius,* cause "white spot" or "Ich" in most freshwater fishes. *Trichodina* browse over gills and skin, damaging the host tissue and consuming the resulting dead tissues. Parasites interfere with nutrition of hosts, disrupts metabolism and secretary functions of alimentary canal and damage nervous system, thereby reducing growth rate and even mortality, which result in substantial economic loss in fish culture system in India. It has been observed that in pond cultures, parasitic infestations are major cause of concern flowed by alteration in water quality. Single or multiple parasites are involved alone or along with bacterial infections causing severe damage to host tissues. Among all parasites infestation with *Argulous* is maximum followed by *Dacylogyrous* sp. affecting gills. Occurrence of *Myxobolous*, *Trichodina* and *Ergasilus* sp. are also reported but with less number of incidences.

In Open Water Aquaculture:

The cases of fish mortalities in open-water ecosystems are very infrequent in India, considering low intensity fish culture practice being followed with low anthropogenic intervention in such systems. Since some of these open water resources serve as source for public supply and human consumption, there are restrictions of external inputs into the system, which otherwise make water unsuitable for human consumption. However, fish kills are sometimes reported in some reservoirs due to sudden change in water quality parameters of the system either due to weather changes or anthropogenic activities. Again, most of the floodplain wetlands (beels, bheries, lakes, and reservoirs) have either sub-optimal water quality or ecological condition that limit their production. Due to water extraction, siltation and in many cases due to influx of sewage or industrial effluents to the system, cause changes in water quality and degradation of aquatic environment causing fish kills. Fish kills occur due to a number of reasons including abrupt change of temperatures (winter fish kills/summer fish kills), accidental spills, acid mine drainage, algal blooms (cyanobacteria, dinoflagellates), ammonia (NH_3) toxicity, hydrogen sulphide (H_2S) toxicity, hypoxia etc. There are several reports of fish kills in Indian lakes due to severe influx of domestic sewage, pesticides, tannery wastes, toxic and hazardous wastes, wastes from oil refinery, sugar mill effluents and microbial pathogens.

Disease Problems in Cage Culture:

Management of fish disease in cage culture has been an area of concern and often responsible for catastrophic losses. Compared to pond culture, cage culture poses higher risk due to fish diseases, stress and growth limitations, vulnerability to natural disasters like storm etc. In cage culture, disease occurrence, morbidity and mortality are very high, because of high stocking density that favours disease transmission among the group. Wild fish around the cage can transmit diseases to the caged fish. The crowding in cages promotes stress and allows disease organisms to spread rapidly. Localized water quality problems, particularly low dissolved oxygen, are common in cage culture. The high fish densities, along with the high feeding rates, often reduce dissolved oxygen and increase ammonia concentration in and around the cage, especially if there is no water movement through the

cage. Overwintering problems cause stress to animals. There is usually a high mortality rate because of bacterial and fungal diseases. Different bacterial diseases like Motile *Aeromonas* septicaemia, Tail rot and Fin rot are commonly reported in cage culture. Fungal diseases like Saprolegniasis, also called "Cotton wool disease" caused by *Saprolegnia parasitica* and *Achyla* species are also commonly reported during winter months, when the cage nets are clogged with fouling agents. It has been observed that the incidences of fungal infections are maximum in cage culture systems, followed by infection with bacterial and parasitic infestations. Presence of heavy load of organic matter from unutilized and decomposed feed, excreta, decaying biofouling organisms, promote rapid growth of fungi and trigger heavy mortality in cages.

Future of Indian Aquaculture:

The future of aquaculture in India lies in the hands of the aqua culturists or fish farmers who think of fish as the source of food and nutrition but not for higher income in a short span. While fishery sector has seen not much adverse impact because of domestic consumption of the produce, shrimp aquaculture has been a risky business as the produce is totally exported with high economic gain. Hence there is an urgent need for implementation of "National Aquaculture policy" to control sustainable growth of aquaculture sector, prohibiting unwarranted activities in terms of seed, brood-stock use and application of antibiotics and chemicals in aquaculture sector. To mitigate the concern, Government of India is seriously taking steps in this regard. The Coastal Aquaculture Authority and MPEDA have been actively monitoring aquaculture activities in India. Again, to control emergence of viral pathogens in to Indian sector, the Department of Animal Husbandry, Dairying and Fisheries (DAHDF), Ministry of Agriculture has formulated "Guidelines for the Import of Ornamental Fishes into India" in consultation with National Bureau of Fish Genetic Resources (NBFGR), Central Marine Fisheries Research Institute (CMFRI) and Central Institute of Brackishwater Aquaculture (CIBA). Due emphasis has now been given to quarantine and screening of animals at airports, before allowing their entry into the country.

CONCLUSION:

In India, the emphasis need to be given on improving shrimp farming techniques to minimize their environmental impact, as well as to extend the sustainability through technology options. Now more efforts are needed to increase shrimp production with adoption of bio-secure measures for reducing production losses, as has been adopted in shrimp producing countries. The fact that there has been increased incidences of rejection of Indian shrimp consignment at International market, due to presence of residual antibiotics and pathogens of public health significance, has warned for introspection into the entire aquaculture activity. Thus, for increased export earnings, private sector participation in solving the issues of quality management, inspection, monitoring and verification procedures among shrimp manufacturers/exporters has to be strictly monitored including implementation of Hazard Analysis and Critical Control Point (HACCP) quality system, which is required for all shrimp exported to the EU and the USA. Record indicate currently, only an estimated 40% of the available resources in India, is in use for aquaculture because of technical and market access issues and there is lot of scope of development of aquaculture. As suggested by Siddick et al., the productivity of water bodies can be further improved by i) Stocking right mix of fast growing fish varieties in recommended quantities ii) Indian Major Carps (IMC) being the most demanded fish species in the region, seed production hatcheries to be made available near to the culture sites, iii) Research work need to be taken up in developing fast growing fish varieties suitable for short seasonal tanks iv) Stocking with right composition of fish seeds need to be taken up to utilize natural feed available in different levels of water column. Again, there is considerable potential for promoting scientific fish culture practices in community ponds or open-water resources including reservoirs and cage culture. Prioritizing production of fish from reservoirs holds the key for increasing inland fish production in India. The National emphasis has been to doubling the farmer's income. This could be achieved through fish production enhancement from inland open water bodies, specifically employing selective stocking and harvesting of suitable fish species. Again, cage culture is being looked upon as an

opportunity to utilize existing reservoirs with great production potential to enhance production from inland open waters and posed as an answer to increased demand for animal protein in the country.

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Dr. Pushpa Singh
Assistant Professor , Department of Zoology, Govt. P.G. College Satna (M.P.).

Urmila Patel
Research Scholar, Department of Zoology , Govt. P.G. College Satna (M.P.).