

**REVIEW ARTICLE****Pond Water Pollution: A Barrier to Commercial Fish Production**Ihtsham Liaqat<sup>1</sup>, Umair Bukhtiar<sup>2</sup> and Muhammad Faheem Malik<sup>3</sup><sup>1, 2, 3</sup> Department of Zoology, University of Gujrat, Hafiz Hayat Campus, Gujrat, Pakistan<sup>1</sup>**Correspondence:** ihtshamliaqat101@gmail.com**Abstract**

For every country there is vast scope for fish forming but the share of commercial fish production in total (GNP) Gross National Product is not considerable globally. Pollution is a major factor posing significant danger to hygiene issue for fish population inhabiting in pond water. Its major role is contribution to reduce the fish density and act as barrier against the commercial fish production. Different kinds of pollution like atmospheric pollution, biological pollution, eutrophication and chemical pollution such as acidic rain (acidification) effect pond fish production. Although commercial fish production is intensively managed but there are many hurdles that reduce the yield. This review covers the effect of different kinds of pollution on fish which are produced commercially in ponds.

**Keywords:** Pollution, Population, Commercial Fish Production, Fish Density. Pond Water**Introduction**

Commercial fish forming is a profitable business. It can support the economy of nation by adding its share in total gross national product (GNP). Farmers use old traditional methods for fish farming this causes the loss of assets and reduces the fish production per unit area. By using the advance technology in this sector may bring revolution and enhance its share in GNP (Winfield and Gerdeaux, 2016). Internationally much research is required for the improvement of this sector.

Pollution is any undesirable change that effect the environment. It cannot be controlled by any strategy but the only thing which could be controlled is the human behavior toward the change.

In this review we study the effects of different types of water pollution on fish production covering kinds of pollution such as biological pollution, physical pollution and chemical pollution. This review will work as a guideline and defines the core

values of fish pond. It is helpful for the businessmen who are interested in constructing fish pond by providing useful data which is required for the intensive management of farm. Methods are discussed for the proper management and control of problem that may be encountered by the farmer (Pahlow, et al, 2015). Past practices were studied critically and their conclusion is provided for help of farmers. Farmer can get benefit of this research to enhance their yield by following the directions provided. This review has its unique importance as it provide past experiences of fish farming in advance countries where modern methods are used.

**Biological Pollution**

Biological pollution found in fish pond are of different types like the presence of bacteria, algae, protozoa and fungi, which cause reduction in fish product by spreading disease. Coliform bacteria and

*E. coli* are important pathogens cause infections in fish population (Winfield and Gerdeaux, 2016).

## Fecal Coliform Bacteria

Group of bacteria causing different disease in fishes are grouped under Coliform bacteria (Gregor, 2001). Their concentration is dangerously high in those fish ponds receiving animal waste or human waste from wildlife and septic system respectively (Garcia and Beicares, 1997). Coliform bacteria may be added in small ponds by a large number of waterfowl (Burhanettin et al, 2003). Water test for fecal coliform bacteria can identify their presence and number of colonies per liter of water (Cho, 2005). Only certified laboratories are recommended for this test. The concentration in which less than ten bacteria per 100 mm of water is the optimum condition for fish farm (Annie et al, 2002).

## *E. coli*

*E. coli* is more dangerous group of bacteria than coliform bacteria (Salamon et al, 2000). *E. coli* is fatal in small quantity and the pond uses for fish production must be *E. coli* free as their presence spread serious diseases and cause death (Apha, 2005). Water tests are required for *E. coli* to identify their presence in respective ponds (Witte, 2000).

## Eutrophication

Eutrophication is defined as excessive plant growth resulting from nutrient enrichment by human activity. Some author reported that eutrophication favored the growth of fish. Recent studies conclude that the growth patterns are more complex than once thought to be with density dependence.

The uncontrolled growth of algae or cyanobacteria in fish ponds has negative effect on fish production and their habitat. Its impact is explained by Winfield J. and Gerdeaux D. (2016) in which they give an example of fish death due to eutrophication in United Kingdom and Scotland. Fish abundance and functional composition is directly related to the level of eutrophication. The contribution of some fish species in eutrophication process, researches succeeded in combating eutrophication or reoligotrophication through falling nutrient level and regaining the original level (Asim et al, 1990).

## Acidification

All the scientist studying ecology are agreed that acidification due do various reasons have negative effect on water ecosystem especially freshwater ecosystem. Acid is the major contributor for the acidification of fish ponds. Massive damage to *S. trutta* population in Scotland and United Kingdom was documented. These researches inspired a large scale program to resolve this problem. After this researches, the recovery of water quality was reported and *S. trutta* populations also recovered (Asim et al, 1991).

## PH

P<sup>H</sup> is the measure of water acidity. P<sup>H</sup> value of pond water has significant importance in fish culturing (Berg and Fiksdal, 1988).

## Chemical Pollution

Chemical pollution is a similar to that of acidification. Although with in a restricted area of distribution. Industries has significant role to increase environmental chemical pollution. This chemical pollution is dangerous and cause disease in the population because the population is not developed the immunity against chemicals (Hossain, 2009). Fish production were greatly affected from the effects of this wide-spread pollution and this major environment problem received significant research attention in later half of 20<sup>th</sup> century.

Industrial revolution added significant amount of chemicals into the environment. The effect of such pollution on fish diversity was incredible and required significant attention to tackle this problem. Regarding to chemical pollution research was conducted in last decade of 20<sup>th</sup> century. Except persistent pollutant like polychlorinated biphenyls (PCBs) which are still an issue in Europe a considerable control over chemical pollution was reported (Hossain, 2009).

## Pesticides and Herbicides

Surrounded area contaminates the fish pond by pesticides and herbicides introduced to control plant growth and algae growth in the pond. (Pesticides pollution kill fishes causing waterfowl

death and animal sickness) (Schindler, 1988). Pesticides reach the fish pond when applied in field near the pond on windy day also may reach by heavy rain followed the pesticides application (Holopainen and Oikari, 1992). The use of herbicides in fish pond to control algae and plant must follow herbicides label instruction (Michael et al., 2008). Fishes are not immune to such chemicals and damage the population badly and plant injury reported on the use of water for irrigation purposes (Annett, 1998).

## Hardness and Metals

The presence of calcium and magnesium in the water cause hardness of water (Engel, 1995). Hardness of water is not dangerous for fish. Hardness of water commonly found in those ponds which are located in lime stone areas (Wilde et al, 1992). Above 50 m<sup>2</sup>/l of hardness can spoil the effect of herbicides used for controlling plants and algae in the ponds (Clarke, 1991). It reduces the efficiency of copper based pesticides (Ahmad et al, 2010). Offensive taste is developed in the animals inhabiting in aquatic environment contaminated with copper, manganese and iron (Aboul-Ezz and Abdel-Razek, 1991). The concentration of iron and manganese is high in those fish ponds located in coal mining areas (Waqar, 2006). These metals did not cause disease in fish but change the ponds aesthetic (Oguzie, 2003). The orange precipitation in pond due to high concentration of iron above 0.3 mg/l. Copper concentration above 1mg/l can cause offensive metallic taste and higher copper concentration in fish pond is due to use of copper based herbicides for plant control (Norman, 1929).

## Future Directions

As it is clear from the previous research conducted on the effect of water pollution and fish culturing, water pollution has key role in reducing and damaging the crop by causing diseases, reducing efficient metabolism for the growth of organism. Since this study assessed different types of water pollutions and its effect on commercial fish production by reviewing data which is helpful for the management of fish pond. Farmer can achieve maximum product by minimizing all the factors like eutrophication, acidification, chemical pollution and biological pollution (Rainbow, 2007). In addition to

this measure should be taken on community level to eliminate the root causes for all these types of pollutions.

## Conclusion

Fish culturing has ability to support economy of any country, by managing and manipulating the natural resources but water pollution effects fish crop badly by reducing yield. We have to take volunteer steps to reduce all these effects and improve fish production to meet global needs.

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