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Water monitoring in fish ponds

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Abstract
My experiences over time in observing the flow of water in fish ponds and ensuring it quality is the reason for this discussion. The paper discusses how water flow into fish ponds should be monitored daily and it quality ensured through the manipulation of parameters like: dissolved oxygen, pH, turbidity, temperature, ammonia, etc. It further discusses the indices of good quality water and the effects of poor water quality in ponds and how it should be improved upon. It concludes that ensuring sustainable good water quality is a precondition for increased productivity and vice-versa and should therefore be given first hand priority.

Keywords: Fish, Water quality, Monitoring, Ponds, Dissolved oxygen.

1. Introduction
Water monitoring in ponds is the daily observation and analysis of water parameters to ensure provisional water quality and quantity by adopting good water quality management strategies and as well ensure it supply in adequacy through the appropriate channels of flow as well it acceptability for fish culture.
Fishes are predisposed to diseases and other problems due to poor water quality in ponds, and daily water monitoring in ponds is a panacea to many pond problems. To carry out proper water monitoring, the right equipment and manpower must be in place with considerable expertise on the intricacies involved, in order to get accurate data for complete and accurate results.

1.1 Water Source and Supply
Water sources and supplies are imperative in fish culture, as it is a precursor for good water quality. There are two main sources of water to ponds:
1. Ground water: Spring and well or borehole water.
2. Surface water: Rain and run-off water, natural water course, irrigation canals and drainage canals.
Ground water supplies are reliable as they have their source from aquifers lying at different depths. However, major water supplies in most fish ponds within the country today is through boreholes and natural water course and people recourse to natural water course because it is cheap compared to the high cost of construction and pumping.

2. Water Quality
2.1 Indices of Good Quality Water for Fish Culture
- It is oxygen saturated,
- It is not super-saturated with dissolved gases (Oxygen, Nitrogen, Carbon dioxide, Hydrogen sulphide),
- It is uncontaminated,
- Posses no unwanted fish and fish eggs,
- Contain no silt loads,
- Contain no polluting chemicals,
- Harbors no fish parasites or disease causing organisms and of reliable water parameters (Oxygen, Temperature, P^H, Turbidity, Carbon dioxide, Ammonia, etc.), level and supply.

2.2 The Effects of Poor Water Quality

Water is poor in quality, when it is almost the direct opposite of the indices of good quality water for fish culture. As it may be:

- Low in dissolved oxygen and as such affects respiration.
- Super-saturated with dissolved gases and as such liable to cause gas bubble disease.
- Fish parasite accommodating, which predisposes fishes to diseases.
- Turbid, resulting to poor light penetration which in turn result to low rate of photosynthesis and oxygen production as well as the production of natural food organisms (planktons). It can also affect fish directly by clogging the gills and as well impair visibility.
- Temperature fluctuating, and below optimum levels and can affect food conversion, oxygen production and toxic ammonia production above optimum levels.
- Highly dissolved with carbon dioxide which can interfere with respiration.
- Of excessively low P^H which can result to fish death, retard the growth of natural food organisms and increase toxic ammonia at higher levels.
- Toxic un-ionize ammonia (NH_3) which above optimum levels can influence susceptibility to non-infectious diseases. The above variable and related others are associated with a water of poor quality and the direct and indirect effect is poor productivity.

2.3 How to Improve on Poor Water Quality

Ground water is considered or given a top priority as the best for fish culture because it is free of suspended materials, pollutants, and fish disease causing organisms; temperature and chemical composition are relatively constant over time. Though considered the best some will need to be treated to ensure suitability for use. Basic treatments may include:

- Aeration to increase dissolved oxygen concentration.
- Degassing to reduce total gas pressure, and to remove carbon dioxide and hydrogen sulphide.
- Temperature regulation using water heaters or mixing water of different temperatures.
- Sedimentation and filtration to remove iron and addition of calcium to waters of low hardness.

Unpolluted surface water supplies can be of enormous advantage as some of the above treatments don't need to be carried out. Surface water supplies however, suffer the major disadvantages of pollution, turbidity as well as variable quantity and availability.

2.4 Optimization of other water parameters or variables:

- **Temperature:** The optimum range for warm water aquaculture is 24 to 34 ^{0}C and 26 to 28 ^{0}C for rearing of fry and egg development. It can be regulated by the use of heaters for low temperature and cold water at higher temperature.
- **Dissolved Oxygen (DO):** it should be kept at 5ppm to saturation and should be improved upon by: continuous flow or dripping of water, the use of splash boards at inlets, desilting accumulated moulds, the use of mechanical aerators, pumps, paddle wheel aerators and biological aerators (ducks), avoid over feeding, ensure good stocking density, increase the inflow of oxygenated water etc.
- **Carbon dioxide (CO_2):** it should be kept at less than 10 ppm. Degassing should be done to optimize levels.
- **pH:** the suitable range for fish culture is 6.5 to 8.5, and is controlled by liming to neutralize pond.
- **Turbidity:** 40 to 60 cm is the optimum range for production and can be controlled by: the use of filters, Alum at 1.3 kg over 100 m^2, change of water and adequate liming and application of fertilizer.
- **Ammonia:** it should be kept at less than 0.05 ppm NH_3 (toxic un-ionized) ammonia and can be controlled by reducing stocking and feeding rates and change of water to dilute ammonia.

The above parameters are of top priority and if given serious considerations, fish safety as well increase in productivity can be assured.

3. Recommendations

1. Water should be allowed to flow through at night and kept at free board level to eliminate the problem of low dissolved Oxygen demand (BOD) as well solve the problem of low dissolved oxygen syndrome (LODOS) at night.
2. Water parameters analysis and diagnosis should be made before and after stocking if disease signs are detected.

4. Conclusion

Have you ever being at a pond site fed in your presence? If you ever did, I guess you were entertained and did appreciate the fancy display of the fishes and their competition for feed. But you forgot to appreciate something; the medium which has sustained them and aid their display 'water' not just water but of reliable quality. That is why to be committed to ensuring a sustainable water quality is a precondition for increase productivity and should be given a first hand priority.

5. References

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