Biospectra : ISSN: 0973-7057, Vol. 15(1), March, 2020, pp.129-132
An International Biannual Refereed Journal of Life Sciences

Animal Science

ISSN : 0973-7057

Int. Database Index: 663 www.mjl.clarivate.com

Effect of nitrates & nitrites on pond water ecology of Madhepura, Bihar

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Received : 16th December, 2019 ; Revised : 04th February, 2020

Abstract: Pond ecology must be stabilizing so that a dynamic equilibrium is maintained. Often, this equilibrium is a resultant of specific quantities of organic & inorganic elements. But whenever these quantities increase abruptly, the ecology of the ponds goes off balance, usually leading to collapse of a near to ideal ecosystem. Through necessary, nitrates if in excess quantity, has adverse affects on the pond water ecology. Excessive of nitrates in a pond usually denotes contamination by anthropological activities. To maintain water health, it is necessary to understand the effects of these inorganic elements.

Key words: Pond ecology, nitrates, nitrites, dynamic equilibrium

INTRODUCTION

Nitrates are derivatives of Nitrogen & are the forms of N_2 which is usually taken up by plants for their metabolic needs. Nitrogen is essential for all living things as it is a component of protein.[1] Increase in nitrates level is usually covered by overstocking & over feeding fishes, or more generally due to surface runoff of agricultural products Nitrogen is highly leachable, like fertilizers that contain high amounts of inorganic N_2.[2]

Fish waste usually produces Ammonia, which further is oxidized to form nitrates. Untreated human sewage can contribute to nitrate levels in surface & ground leaking or poor functioning septic systems are source of such nitrates. Presence of nitrates stimulates algal growth.[3,4] Whenever this algal growth is high, it reduces the O_2 levels in water causing fish death.

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Nitrates are undetectable without testing as it is colorless, odorless & tasteless. A low cost test can be done using dip tests.[5-7] Milky colour of pea soup is usually an indication of high concentration of algae. Excessive nitrogen, in either form (nitrate or nitrite) leads to massive death of fish, shrimps & eutrophication. Nitrite (NO_2^-) is toxic to aquatic organism due to the damage to hemoglobin. While nitrification couples the conversion of NH_4^+ -N to nitrate, de-nitrification reduces to nitrogen, further releasing nitrogen into the atmosphere.[8]

About 75% of nitrogen in feed ends up in water through ammonification of uneaten feed & excretion.All aquatic organisms excrete wastes and aquatic plants and organisms eventually die. These activities create ammonia. Some bacteria in the water change this ammonia to produce nitrite which is then converted by other bacteria to nitrate. Nitrates (NO_3^-) are an oxidized form of nitrogen and are formed by combining oxygen and nitrogen.[9]

The transformation capacity of de-nitrification done by de-nitrifiers, which require high carbon content for their growth, is limited due to high nitrate/nitrogen concentration. Freshwater ponds provide abundant food resources to humans, supplying tons of fishery production every year. Recently, high density and intensive farming models with superfluous feeding and fertilization have been used to achieve higher economic efficiency, resulting in nitrogen accumulation owing to excessive residual feed and excrement.

MATERIALS & METHODS

Site Description

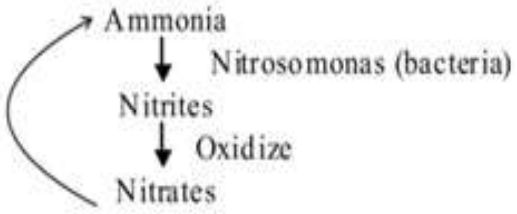
Random sample of pond water were collected from two shallow (<3 m) vernal ponds located on outskirts of Madhepura during the research work. Ponds are surrounded by growth woods, which act as a natural buffer strip on all sides. Ponds at these sites form within shallow depressions. They are replenished via irrigation ditches with water sourced from agricultural fields. All ponds at those sites are often filled in the late spring when irrigation water is abundant, but a lack of rain water later leads to gradual evaporation throughout the summer. Though some ponds may completely dry up at the end of the summer, others retain water, though at much lower levels.

Data Collection

Field campaigns were conducted to investigate pond nutrient limitation. We followed up on observed field patterns by collecting water samples from both previously surveyed ponds. During the study surface water samples were collected in triplicate weekly from both the ponds. All surface water samples were analyzed for total dissolved organic carbon (TDOC).

For ponds equally spaced samples were taken around the circumference.

RESULTS



Effects

- Excess nitrate concentration spoils the living environment of aquatic animals, therefore posing an ecological concern.
- Excessive nitrogen in drinking water causes methemoglobinemia or blue baby diseases.
- Elevated nitrate cause great problems in intensive culture of commercial fish species as well as ornamental fish species.
- Freshwater fish are hyper osmotic and therefore require an active uptake of ions across their gills, usually through their duct or via certain mechanisms associated with chloride cells of gills. Nitrite has affinities for these chloride cell uptake mechanisms & have tendency to accumulate in the cell.
- Nitrite accumulates in tissues such as gills, liver, brain & muscle.
- Blood appears as a primary target for nitrite. From blood plasma, nitrite diffuses into RBC, where it oxidizes Hb into methaemoglobin or ferri haemoglobin. This form of Hb, loses its capacity to bind to O_2 & changes the blood colour from red to brownish.
- When a fish with methaemo globinaemia is frightened or otherwise found to become active, it may die of Anoxia.
- Physiological disturbances are induced by nitrite.

CONCLUSION

Increasing use of pesticides or fertilizers with high N_2 concentrations, are highly leachable. This leaching process usually pollutes nearby water bodies. Increase in nitrate causes wild growth of algae leading to decrease in water's oxygen content (hypoxia). While increase in nitrate, is usually related with toxicity & anoxic condition.

ACKNOWLEDGEMENT

The author is very much thankful to the University Department of zoology for its encouragement for completing the research work. The author is also thankful to the medical department and the patient for their great support and co-operation.

REFERENCES

1. **Pathak, S. and Shastree N.K. 1993.** Physicochemical status of the lentic hydrosphere of Rukmini and Visar Sarovar of Gaya, Bihar. *Environ. Ecol.* **11(1):** 57-66.
2. **Rani, R., Gupta, B.K. & Srivastava, K.B.L. 2004.** Studies on water quality assessment in Satna city (M.P): *Seasonal parametric variations, Nature environment and pollution technology*, **3(4):**563-565.
3. **Sreenivasan, A. 1964a.** Limnological studies and fish yield in three upland lakes of Madras State, India. *Limnol. Oceanogr*. **9:** 564-575.
4. **Singh H, Yadav S, Singh BK, Dubey B, Tripathi K, Srivastava V, Shukla DN 2013.** Assessment of Geochemical Environment from Study of River Sediments in the Middle Stretch of River Ganga at Ghazipur, Buxar and Ballia area' *Proc. Natl. Acad. Sci., India, Sect. B Biol. Sci.* **83(3):**371–384
5. **Sulabha, V. and Prakasam.V.R. 2006.** Limnological features of Thirumullavaram temple pond of Kollam municipality, Kerala. *Journal of Environmental Biology*. **27(2):** 449-451.
6. **WHO 1996.** Guidelines for Drinking Water, V. 2, Recommendations World Health, Organization, Genev Assessment of seasonal variations in surface water quality of the River Kosi, a major tributary of the river Ganga in Northern India 201
7. **Singh, M., & Singh, A. K. 2007.** Bibliography of environmental studies in natural characteristics and anthropogenic influences on the Ganga River. *Environmental Monitoring and Assessment*, **129:**421–432.
8. **Narayana, J.,Puttaiah E.T. and Basavaraja,D. 2008.** Water quality characteristics of anjanapura reservoir near Shikaripur, District Shimoga, Karnataka. *J. Aqua. Biol.,* **23(1):** 59-63.
9. **Sharma, Rajesh Kumar and Madhulika Agarwal, 2005.** Biological effects of heavy metals: An overview. *J. Environ. Biol.,* **26:** 301-313.

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