IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

To Study The Management Of Soil And Water Quality On The Production Of Pangas Catfish In Hazaribag Jharkhand

Author's name : Anita Kumari
Research Scholar
R.K.D.F. University Ranchi
Enrolment no : 008ZOO19DT001
Course name : Ph.D (Zoology)

Supervisor's name : Dr. Vijay Yadav **(It's very mandatory to mention supervisor name with my article)**
Asst. Professor
R.K.D.F University Ranchi

Abstract

Pangas catfish is generally found in two types Pangasius hypothalamus and Pangasius siluri. It is generally called Pangasius pangasius. Fish not only provides long chain omega-3 fatty acids, fat soluble vitamins, proteins, but also contains fat, inorganic substances and vitamins. Jharkhand has largest area under Pangasius culture in the country and hence it was selected for the study. Questionary method was used to select sample for the study. Two areas namely Hazaribag lake and Konar dam of district Hazaribag from Jharkhand were selected on the basis of highest area under Pangasius culture.The main aim of this study to manage the soil and water quality because both are the important determinants of the production of fish. The main role of pH is to manage the soil and water quality. Generally pH value is 1-14. Lower value of pH 7 is called acidic and above value of 7 is called alkaline. The average pH of soil should be 6.5-7.5 and water should be 7.5-8.5,which are responsible for good production of fishes. Soil is called **"Gold of Mine**" of the pond. The physical and chemical properties of soil is an image of water. The primary production and plankton production is become very well to those ponds which has good soil properties and its effects on fish production. As the health of the soil determines the nature of the pond water**.** These determinants can therefore be managed for their pH value and Liming should be always done depending upon the pH of the water and soil.

Keywords:-Pangas, soil and water management, physical and chemical properties of soil and water, average value of pH.

Introduction:-

Hazaribag, city, central Jharkhand state, northeastern India. It is situated on the Hazaribag Plateau (a section of the Chota Nagpur), about 45 miles (72 km) north of Ranchi, the state capital. Hazaribag was constituted a municipality in 1869.

Hazaribag lake

Picturesque Bada Jheel, the biggest among the four water bodies collectively known as Hazaribagh Lakes, has been turned into a fish cultivation hub, in a move that will serve multiple purposes - boost the fisheries industry, create employment and help people meet their protein requirement at affordable prices.

Several physicochemical and biological factors may impart a stress on fish growth and reproduction. The water quality, hydrology and habitat conditions reflect the impact of the urban drainage of the receiving water body. The present study was carried out to know about the major factors of cage fish farming and assess the quality of water from first study site is "Lake" located in Hazaribag. Water samples are collected and compared from Dam and lake for good production of fishes from cage fish farming. The result indicated that the many elements of water are responsible for fish production.

The fishery department will fetch fishling or small fish from Bengal and Ranchi. Then, the small fish, weighing around 3gm, will be kept in the cages and fed on a daily basis for six to twelve months. The two cages have the capacity to nurture around 50,000 fishlings. And the produces will be sold at the local market in Hazaribagh.

Konar Dam, Hazaribag

Konar dam is the second of the four multi-purpose dams included in the first phase of the Damodar Valley Corporation. It was constructed across the Konar River, a tributary of the Damodar River in Hazaribagh district in the Indian state of Jharkhand and opened in 1955.[1] The place has scenic beauty and has been developed as a recreational spot.

The district fisheries office has placed many floating cages in the Konar Dam to preserve and nurture fish. In Jamnijara village 34 cages installed in front side and 8 cages installed in the other side. Thus there are 42 cages installed in Jamnijara village. Under what is known as cage culture, fish will be stocked in 42 cages and will be fed artificially pelleted or floating feed until they reach the market size.

This dam is is in around 5 km in range. It is very suitable for cage fish farming. The fish farmers of this Jamnijara village totally depends on cage fish farming.

Good bottom soil and water quality are vital ingredient for any successful aquaculture practices. Although such problems are related to site characteristics bottom soils have undesirable properties viz acid sulphate, high organic and excessive porosity etc. Similarly, the water may have poor quality, viz highly acidic, rich in nutrient and organic matter, high in suspended solids or polluted with industrial or agricultural chemicals.

- **Importance of soil:-** The soil is the main factor in fish production. Most of the pond is built from and in the soil. Many dissolved and suspended substances are derived from contact with soil. Pond soil is the store house for many substances that accumulate in the pond ecosystem, chemical and biological processes occurring in the surface layer of pond soil influences water quality and fish production. Hence an understanding of soil properties and the reaction and process in the soil can be helpful in fish production

- **Importance of water**:-It is very important for the farmers to understand the aquatic medium of water. If the water is "bad" fishes won't grow and reproduce. Fishes stressed because of poor water quality is a prime target for pathogens and parasites. Just as people who work in offices or factories that are stuffy and have smoke or chemical fumes in the air are more apt to be sick, so it is with aquatic organisms developed in poor quality of water. Water is the medium in which fish live,and from which they derive oxygen and nutrients, So the quantity and quality of the water very much affects the prospect of fish culture. As water is the basic part of the fish culture,its specific properties as a cultural medium are naturally great in productivity of pond
- **Soil management**:-Soil is called Gold of Mine of the pond. It is considered as the chemical laboratory of the pond.The physical and chemical properties of soil is an image of water. However, suitable soil quality problem are common in fish production, and therefore, many methods are used for purpose of improving pond soils.

1. pH:- The soil may be acidic, alkaline or neutral but the ideal range for soil pH is 6.5-7.5 Acid ponds do not respond well to fertilization and liming is the only way to improve water quality with acid soil and it is the soil that must be corrected for lasting effect, rather than the pH of the water. pH measuring instruments are Soil pH Loviband Comparator, Universal indicator, and pH meter.

2. Organic Matter:- Organic matter The most important index of soil fertility is soil organic matter. The presence of organic matter increases aeration, nutrient supply, reduces seepage loss, turbidity and acts as antioxidant. The microbial activity mainly depends on the organic matter content. 57% organic carbon is found in organic matter. Organic carbon is a source of energy for microorganism and together organic matter keeps other usefull elements**.** We divide the pond in three groups by the quantity of organic carbon. The quantity of cow dung is depend on the quantity of organic matter in the fisheries pond. Its mean to say that in which pond's soil organic matter is more then the use of cow dung is become less.

ORGANIC CARBON

I	II	III
0.5%	0.5-1.5	1.5-2.0
Low production	Medium	High

DOSE OF COW DUNG

I (high organic carbon)	II (medium organic carbon)	III (low organic carbon)
5-6 ton cow dung/yr/ha	8-10 on cow dung/yr/ha	10-12 ton cow dung/yr/ha

Soil testing kit or titration method is used to measurement of organic carbon.

3. C:N Ratio:-The ratio of the elements of organic matter directly effects at the decomposition of organic matter. The soil of good quality pond's C:N ratio should be in between 10:1-15:1. Soil testing kit or Titration method is easily used to measurement of C:N ratio.

4. Redox Potential: It shows the status of oxygen. Redox potential increases the solubility of elements which which directs effects on the production of pond.

- **Management of water quality:-** Fish being aquatic being are more prone to disease and are difficult to control. The equilibrium of disease, environment and fish health are important any change in the equilibrium leads to "stressed" and becomes vulnerable to disease which have influences on growth and survival. The following qualities of water should be most necessary to the production of fish.

1. Ph:-- The quantity of hydrogen ions (H+) in water will determine if it is acidic or basic. The scale for measuring the degree of acidity is called the pH scale, which ranges from 1 to 14. A value of 7 is considered neutral, neither acidic or basic; values below 7 are considered acidic; above 7, basic. The acceptable range for fish culture is normally between pH 6.5- 9.0.

2. Alkalinity:- The alkalinity of the water in the pond can be 40-240mg/l. The alkalinity of quality pond is 80-100mg/l, which is most suitable for production. Total alkalinity is the quantity of water's total solute alkalines.

3. Dissolved oxygen : The optimum dissolved oxygen (DO) content of pond waters is in the range of 5 ppm saturation level. Aeration is a proven technique for improving DO availability. Any sort of agitation improves the DO content and among which paddle-wheel, aerators aspirators are most common.

4. Turbidity : Several factors like suspended soil particle, planktonic organisms and organic matter contributes to turbidity. Measured using Secchi disc the optimum visibility range from 40-60 cm. it can be controlled by application of organic manure at 500-1000 kg/ha, gypsum @ 250-500 kg/ha or alum @25-50 kg/ha.

5. Ammonia : Fish are very sensitive to unionized ammonia (NH3) and optimum range is 0.02-0.05 ppm in the pond water. The same is reduced in the case of high DO and high CO2. Aeration, healthy phytoplankton population removes ammonia from water. Addition of salt @ 1200-1800 kg/ha reduces toxicity. Formalin are also use in certain cases. Biological filter may be use to treat water for converting ammonia to nitrate and then to harmless nitrate through nitrification process.

6. Hydrogen sulphide : Fresh water fish pond should be free from hydrogen sulphide because at concentration of 0.01 ppm fish lose their equilibrium. Frequent exchange and increase of pH through liming can reduces its toxicity.

7. Total hardness : It should be greater than 40 ppm because it helps to protect fish against harmful effect of pH and metal ions. Low hardness can be treated with lime.

8. Temperature : Temperature sets the pace for metabolism and biochemical reaction rates. The optimum temperature range for carp fishes and pangas catfishes are 28-32 degree celsius respectively. Temperature can be adjusted to optimum level in controlled condition like hatcheries but difficult to adjust in large water bodies. Operation of aerator helps in breaking thermal stratification while planting of trees gives shades. Therefore the production of fish is more where the temperature is high.

Materials and methods:-

Jharkhand has largest area under Pangasius culture in the country and hence it was selected for the study. Multistage stratified random sampling was used to select sample for the study. Two districts namely Ranchi and Hazaribag from Jharkhand were selected on the basis of highest area under Pangasius culture. The farmers uses many methods to manage the pond productivity such are:-

- **Nutrient removal :** It is possible to precipitate phosphorus from pond water by applying sources of iron, aluminium or calcium ions. Alum (aluminium sulphate) or ferric chloride are commercially available of which the former is cheap and widely used. Alum @ 20-30 ppm is more suitable in alkaline water (>500 ppm) and gypsum (calcium sulphate) @ 100-200 ppm is better in low alkaline water.
- **Plankton removal :** Copper sulpahte @ 1/100 of the total alkalinity is recommended for reducing phytoplankton abundance and blue-green algae in particular.

- **Chlorination :** It is possible to disinfect bottom of empty pond and waters in newly filled and unstocked ponds by applying chlorine products @ 1ppm or more of free chlorine residual. The residuals will detoxify naturally in a few days so that ponds can be stock safely.
- **Liming :** Liming should be always done depending upon the pH of the water and the soil. As the health of the soil determines the nature of the pond water, pH of the water can be taken as reference to determine appropriate dose of application.

The farmers also used pH paper, Universal indicator, pH meter, Loviband Comparator etc to measurement of pH.

Why Lime:-Several factors contribute to lowering the pH in ponds. Rain is acidic, usually with a pH of 5.2 to 5.6, and industrial pollution can lower it to 2.5. In areas with coniferous forests, rain percolates through the pine needles, making it even more acidic. Over time, this leaches all the minerals out of the soil. Also, the clay bottom necessary to keep a pond from leaking is acidic, and decaying plants can release additional acids. Agricultural lime is crushed limestone (calcium carbonate), which will neutralize these acids and act as a buffer to keep the pH from changing rapidly. Fish can live in water with a wide range of pH, from about 4 to 10. However, rapid changes in pH can kill fish, even within this range. While fish can adjust their body chemistry to different environmental pH values, this takes energy which could otherwise be used for growth and reproduction. Maintaining a constant internal pH in an extreme environment causes fish stress, making them susceptible to disease and parasites. In a limed pond, the fertilizer element phosphorus is in the soluble, orthophosphate form that is available to plankton; otherwise, it will be mostly tied up in bottom sediments. Finally, liming can increase the amount of carbon dioxide in water, which is used in photosynthesis. For these reasons, liming ponds has been shown to double bluegill production in ponds, without adding any fertilizer.

pH of water	Quantity of lime
4.0-5.0	1000 kg/ha
5.1-6.0	600 kg/ha
6.1-6.5	400 kg /ha
6.6-7.5	200 kg /ha
7.6-8.5	100 kg/ha

Conclusion:-

Monitoring water quality.

Water quality of konar dam is very suitable for fish farming but in rainy season the colour of water becomes yellow then farmer use the lime in this season. Water quality parameters that must be also monitored time to time in the cages are especially for pH. Dissolved oxygen, acidity, chlorine, fe, free ammonia and phosphate are also monitored at sometimes by fish farmers. Fish farmers normally maintain water parameters suitable for rearing . Feeding of fish seeds in cages, though very rarely an algal bloom may push some parameters to the point of threatening fish survival.

Water quality changes associated with cage farming

Excessive cage fish feed contents and other biological processes may contribute to lowering the quality of water. The levels of DO, pH, temperature and turbidity in two study areas was found to be in allowable limits suggesting that the nutrients input from cages did not cause a significant impact on the water quality of the Lake and dam. The fluctuation on levels of the selected parameters implied a slight impact of nutrients on water quality of the study areas. This suggests that the natural water currents of the Lake and dam probably minimized the oxygen depletion in the waters, and the pH values in all two studies fluctuated nearly neutral to alkalinity suggesting a negligible impact on water quality. Likewise, the suspended solids in the water column and water temperature in all two-study areas fluctuated slightly suggesting that cage farming did not substantially affect the water quality. In general, although nutrient contents from cages may affect the water quality parameters, there is no empirical evidence on the significant affecting of these nutrients on these selected water quality parameters hence no effect on water quality. It is also suggested that the results may have been contributed by the non-existence of small changes in weather patterns in the Lake and dam, hence no impact on water quality. However, as cage-farming activities are expected to increase, nutrient loading will increase leading to changes in DO, pH, temperature and suspended solids, hence affecting aquatic life.

Thus the soil and water both determinants can be managed for their pH value and Liming should be always done depending upon the pH of the water and soil. Fish farmers had experience of about 12 years in aquaculture and 5 years in Pangasius culture, which indicate their expertise in aquaculture practices. The years of experience in aquaculture and expertise makes Andhra Pradesh fish farmers more accomplished in taking challenges in aquaculture sector of India. Aquaculture experience for fish farmers in Jharkhand was in the range of 5 to 12 years . All these farmers are trained by training center Doranda and Shalimar Dhruva Ranchi.

References

Anita Kumari, JOURNAL-IJHESM (RKDF University,Ranchi).Determinants of pangas catfish production in Jharkhand.

Anita kumara, Journal- IJHESM (RKDF University, Ranchi). The impact of feed and seed on the production of Pangas catfish in Hazaribag, Jharkhand.

Adams, F. and Evans, C.E., 1962. A rapid method of measuring lime requirement of Red - yellow Podzolic soils. Soil Science Society of America, Procedings, 26: 355 – 357.

Black, C. A., Evans, D. D., White, J. L., Ensminger, L. E. and Clark, F. E. (Editors), 1965a. Methods of Soil Analysis. Part 1, Agronomy No. 9. American Society of Agronomy. Inc. Madison. 770 pp.

Black, C. A., Evans, D. D., White J. L., Ensminger, L. E. and Clark, F. E. (Editors), 1965b. Methods of Soil Analysis. Part 2. Agronomy No. 9. American Society of Agronomy. Inc. Madison.

Boyd, C. E., 1979. Water Quality in Warmwater Fish Ponds. Craftmaster Printers Inc., Opelika, Alabama. 359 pp.

Buckman, H. O. and Brady, N.C., 1964. The nature and Properties of Soils. The Macmillan Company, New York. 567 pp.

Coche, A. G. and Laughlin, T., 1985. Soil and Freshwater Fish Culture, FAO Training Series, Simple Methods for Aquaculture, No. 6, Food and Agricultural organisation of the United Nations, Rome 174 pp.

FAO., 1974. Guidelines for Soil Profile Description. Soil Survey and Fertility Branch, Land and Water Development Division, Food and Agriculture Organisation of United Nations, Rome, 53 pp.

Hickling, C. F., 1974. The Farming of Fish. Pergamon Press, Ox