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STUDIES OF IMPACT OF DIFFERENT FERTILIZERS ON AQUATIC ECOSYSTEMS AND PRIMARY PRODUCTIVITY

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ABSTRACT:- Pollution by nutrients from agricultural activities causes many problems in the environment. Fertilization is considered as one of the main sources of pollution of water bodies caused by agriculture. When high fertilizer rates are applied which are not in line with the codes of good agricultural practice, nutrient losses, e.g. by surface runoff, take place which pollute land-based and aquatic ecosystems. Four different treatments were us to examine the effects of N:P ratios of organic manures on plankton growth, primary productivity and release of nutrients due to the activity of several groups of bacteria. It has been found that maximal abundance of the groups of bacteria occurred in the goat manure (GM) treatment (N:P=1.272) and lowest abundance of the groups of bacteria occurred in mixture (M) treatment (N:P=0.965). The study has clearly highlighted that basic constituents of treated manures were responsible for the development of bacterial population to some extent. In case of different test manure the content of nitrate (NO_3-N) is maximum in goat manures and lowest in cow dung. The production of phytoplankton and zooplankton is maximum in goat manure and lowest in cow dung with respect of control treatment. So, the productivity is maximum in goat manure treatment and lowest in cow dung. Programs for protecting the water bodies against input of nutrients from agriculture are developed and are being implemented. Such programs could be supported by concepts like balanced fertilization, ecological agriculture etc. The more updated programs are serving a holistic view and try to combat, minimize or prevent pollution by nutrients.

KEYWORDS:- : Agriculture, environment pollution, Goat manure, primary productivity, cow dung.

INTRODUCTION:-

Pollution by nutrients from agriculture causes many problems in the environment. One of the main sources of these problems is fertilizers. Industrial production and the usage of fertilizers have led to a sharp increase in food production that has been accompanied by the population growth in almost all countries around the world. While fertilizers restored into soil have had the requested affect, considerable amounts of fertilizers are carried to land based and aquatic ecosystems by leaching, surface run-off and other processes. These ecosystems have been adversely affected by nutrients.

The natural productivity of a pond can be greatly enhanced by the use of fertilizers which may make up or provide essentially need nutrients, mineral, vitamins etc. required for the production of aquatic biota service either directly or indirectly through involved ecosystem as food for fishes. Thus, pond fertilization is required to enhance fish production through augmentation of food resources. The phytoplankton from an important primary link in the food chain of fishes of sixteen nutrients elements required by the biological systems, some elements (carbon, hydrogen, oxygen, nitrogen, phosphorus, potassium calcium and magnesium) are required in large amounts and are designated as major or macronutrients, whereas other (manganese, zinc, molybdenum, iron and chlorine) are needed in trace amount and are called micronutrients. The fertilizers used in fish ponds fall under two categories inorganic and organic.

Inorganic fertilizers can be prepared with precise amounts of desired elements. The inorganic fertilizers are customarily expressed as percentage of available nitrogen (N), phosphoric acid (P_2O_2) and potash (K_2O) (Jhingran, 1991). Organic manure as a class are composite and contain almost all the nutrient elements required in the metabolic cycle. They enrich the organic

matter content of soil and water and, within the limits of manual dose, release CO_2 and nutrients on decomposition, sustain the fertility of water. The advantage of organic manure is that they impart a comparatively slower rate release of nutrients to the water over a longer period time as the decomposition proceeds. The decomposition of organic manure is carried out of different group of heterotrophic micro-organism, bacteria fungi, actinomycetes release nutrients that sustain the biological productivity of fish ponds. By the decomposition process some amino acid and some CO_2 is formed (Jhingran, 1991). The use of organic manure in aquaculture practice has been reviewed by Schroeder (1974).

The primary productivity of pond depends on the nutrient dynamics of pond. In organic manures fed pond, a large part of fish production derived from the bacterial detritus food chain, microbial food web are an integral part of all aquaculture system and have a direct impact on productivity, even where intensive, artificial feeding is practiced. Our present study under the little out-door aquaculture experiment, attempts were made to examine the effects of different organic manures, such as cow dung, poultry droppings, goat excreta and their mixture on the biological productivity in the aquaculture system.

The topic of this paper is the impact of different fertilizers on aquatic ecosystems as well as how to protect water bodies. A brief historical review shows that there is a strong correlation between soil fertility, industrial production of mineral fertilizer, food production and population growth. This contribution will also prove the rising awareness on environmental issues worldwide in the second half of the century. Aquatic ecosystems are described with respect to nutrients and trace element contents under so called natural conditions. Comparison with the actual nutrient and trace elements conditions should take place and the adverse impact of fertilizers on the ecosystem should be explained. A clear distinction between direct and indirect effect seems to be helpful. The focus here are marine ecosystems, and in particular those of coastal zones and regional seas. Finally, concepts and programs on how to protect water bodies from nutrient discharges from agriculture are presented.

MATERIAL AND METHODS:-

The purpose of this investigation was to influence of commonly used organic manures on the pond productivity. The experiment was performed during the period of March 2022. Ten circular tanks (capacity 400 L) provided with soil (10 cm) at the base were filled with dechlorinated water (pH-7.2-7.4) prior to experiment. The tanks were randomly assigned to four treatment groups in triplicate. Different organic manure such as goat excreta (GE, 1 kg), cow dung (CD, 1 kg), poultry droppings (PD, 1 kg) and mixture (M, 1 kg) of three manure at 1:1:1 ratio was added in the tank using appropriate methods.

One control tank was also maintained without any manure. The test manure was applied into tanks one installment in the beginning. A constant water level of the tanks was maintained all through the experiments. Water quality parameters were determined during the outdoor experiment by the procedures of APHA (1995). The bacterial colony-forming unit was isolated by serial dilution, plating, and incubation, as outlined in Atlas et al. (1995).

RESULTS:-

The temperature varied from 26-30°C in all treatments during the period of investigation. Water pH ranged from 7.6- 8.2, 6.5-7.1, 7.4-8.1, 7.8-8.2 and 7.3-7.5 in case of goat, cow dung, poultry, mixture and control treatment respectively. The manure application resulted in alkaline condition the value of pH remained more than 8.0. However, in the CD treatments the value of pH was 7.5, the free CO_2 present in the water sample was within the range of 0-6 in all treatments. Application of CD resulted in excess amount of free CO_2 concentration which exceeded the values of control. Application of other manures (M, PD, GE) on the other hand resulted decrease of free CO_2 compare to control.

The free CO_2 was maximum in cow dung treatment on 4th week after application and then suddenly decline in the very week.

The HCO_3 - ranged from 140-180 mg/l in all treatments. After application of manure resulted considerable increase in the bicarbonate in all treatments. A rising trend was observed till 2nd week and then remained

unchanged. In case of control treatment the initial values was lower than other treatments which gradually increased and then remain unchanged. The concentration of CO_3 = ranged from 0-14.5 mg/l in all treatments.

The highest value 14.5 mg/l of carbonate was obtained with GE treatment. The application of manure resulted in varied response of carbonates in different treatments. A sudden rise of carbonate was observed after one (1st) week of application of GE, and then gradually decreased. However, in the control the concentration of carbonate showed a rising trend till 2nd to 3rd week and then suddenly decreased to minimum. The treatment with PD showed the value of carbonate increased initially and then decreased to almost half of the maximum value. However, the response of treatment with mixture showed less variability that of other treatments. The concentration of dissolved oxygen (DO) ranged from 5-9 mg/l in all treatments. Application of manure resulted in decline in the values of DO in all treatments regardless of quality.

The concentration of DO was considerably reduced in the mixed treatment. Whereas the values in the control treatment remained higher during most of the period of study. However, there was considerable interaction between treatment and time. The concentration of DO is primarily decreased after manure application till 2nd week and then gradually increased up to the 4th week but again followed by decline trend. The concentration of nitrite of water ranged from 0.14-0.47 mg/l in all treatments. Application of manures the nitrite of water gradually increases up to certain period of its application then gradually decline due to development of plankton communities. The highest value of nitrite was observed in GE which is followed by the PD, M and CD respectively.

The concentration of phosphate of water ranged from 0.104- 0.462 mg/l in all treatments. Application of manures the phosphate value of water gradually increase up to certain period of its application then gradually decline due to development of plankton communities. The highest value of phosphate was observed in GE which is followed by the M, PD and CD respectively.

It has been found that maximal abundance of the groups of bacteria occurred in the goat manure (GM) treatment and lowest abundance of the groups of bacteria occurred in mixture (M) treatment.

After application of manures due to different kinds of bacterial action decomposition of treated manures takes place. As a result, the concentration of nutrient, which is required for aquatic life, is gradually increased. The range of gross primary productivity (GPP) is 117 – 366 mg C/m3/hr was observed in different treated manures. The highest value was observed in GE treatment, which is followed by M, PD and CD treatment respectively.

DISCUSSION:-

The purpose of the experiment was to examine the performance of commonly available organic manure on the primary productivity of phytoplankton in the aquatic ecosystem. The selected manure was cow dung (CD), goat excreta (GE) poultry droppings (PD) and their mixture (M). The result of the study shows the organic manure excreted considerable influence on the primary productivity of phytoplankton. In general cow dung application resulted in acidic condition whereas no such acidic condition developed in the remaining treatments. This was confirmed from the responses of free CO_2, HCO_3- alkalinity and CO_3 = alkalinity of water. This suggests that the decomposition pattern was different among treatments.

Variability of primary productivity of phytoplankton was the result of the concentration of the nutrient in the water. The concentration of orthophosphate and the values of gross primary productivity were directly co-related with other like-wise the variability of GPP was the function of concentration of nitrate. Nitrogen and phosphate ratio in respect of primary productivity varies in different treatment like in case of GM-1.272, CD-1.065, PD-1.112, M-0.965 and C-0.857 and the ration of GPP : PO_4-P in case of GM-843.32, CD-780.43, PD-2593.55, M-693.94 and C-298.47 and the ratio of GPP:NO_3-N in case of GM-663.04, CD-732.65, PD-2330.44, M-719.37, C-348.21.

CONCLUSIONS:-

The purpose of agriculture is to guarantee a secure food supply and this requires fertilization. Preserving the environment including marine ecosystems is of the same priority as agriculture. Fertilization causes few direct but

many indirect effects which impair ecosystems. The eutrophication of rivers, lakes and seas is considered as one of the important environmental problems, generating or/and supporting oxygen deficiency, production of toxic NH_3, algal blooms, change in spatial distribution of marine organisms, increase and depletion of fish stocks, change in reproduction conditions for fish and marine fauna etc. Fertilization is one factor among the agricultural activities being responsible for the decisive percentage of the whole nutrient input to the marine ecosystems via atmosphere, rivers etc. The results of the study show that, the goat excreta (GE) might be a potential source of organic manure in aquaculture in terms of its productivity. Through GE is not commonly used as manure it appears to have an important role in increasing productivity.

The most serious problems associated with land-based activities are: -

- Alteration and destruction of habitats and ecosystems - effects of sewage on human health.
- Widespread and increased eutrophication - changes in sediment flow due to hydrological changes.
- The available knowledge demands to reduce pollution of seas and oceans by nutrients. This knowledge has to be converted into action now.
- The decisive question is however, whether political intension and financial power worldwide do support such a goal.

REFERENCES:-

1. APHA 1995. Standard methods for the examination of water and wastewater, American Public Health Association, American Water Works Association and Water Pollution Control Federation, Washington, DC, U.S.A.
2. Atlas R.M., Parks C.L., Brown A.E. 1995. Laboratory manual of experimental microbiology. Mosby-Year Book Inc., St. Louis.
3. Jhingran V.G. 1991. Fish and fisheris of India. Hundustan Publishing Corporation, Delhi.
4. Schroeder G.L. 1974. Use of fluid cowshed manure in fish ponds. Bamidgeh, 26: 84-96.