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Effect of Different Levels of Cow Dung on Plankton Productivity in Aquaculture Tank

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ABSTRACT

A year old traditional aquaculture practice, administration of cow dung on fresh water fish culture ponds has brought out several admirable results from the past till today. The proper levels of administration and after effects of hyper administration are the challenges being faced by these aquaculture practitioners. This work aims at finding out the proper levels of cow dung to be added on to the culture systems along with the growth and multiplication of phytoplankton and there by zooplankton. The study was conducted in six glass tanks of 25l capacity, for a period of three months. Among these six tanks, the first five tanks were provided with different levels of cow dung quantities viz 100g, 200g, 300g, 400g and 500g. The sixth tank was kept as control. All the six tanks were filled with 10l water containing pure culture of Chlorella sp. (comprising 26 cells ml^{-1}) and into all these six tanks ten cells each of Daphnia sp. was introduced on the first day of study itself. The tanks were provided with proper aeration. After two weeks a few sub samples were taken from the tanks and observed. The results showed a noticeable growth performance in tank three followed by tank two. The fourth and fifth tanks were totally collapsed due to water quality deterioration. Hence for the better result on the growth of phytoplankton and zooplankton, proper quantity of cow dung as well as proper water quality should be maintained. This study will give thrust to the aquaculture sector and for optimum production.

Key words*: aquaculture, cow dung, phytoplankton, zooplankton, chlorella sps., daphnia sps.*

INTRODUCTION

The market for fish and fishery products are growing steadily in recent decades. One of the common approaches for increasing fish production in ponds is the direct application of fertilizer which enhances the production of phytoplankton, a natural food item for fishes[4]. To sustain productivity at low coast using animal wastes for pond fertilization practice are widely used in many countries[5,12]. A year old traditional aquaculture practice, administration of cow dung on fresh water fish culture ponds has brought out several admirable results from the past till today. Fertilizing the ponds with cow dung is so far the most useful technique to make up or provide the essential needed nutrients to enhance the natural productivity through production of aquatic biota, which serve either directly or indirectly as the food of fishes[11]. The proper levels of administration and after effects of hyper administration are the challenges being faced by these aquaculture practitioners.

Production of cultivated fish can be increased by introducing organic and inorganic fertilizers of different origin in fish ponds to increase the primary productivity[13]. Live feeds present in culture systems increase the survival and quality of larvae, fingerlings and fry. So using low cost manures is the most effective way to increase live feed production in ponds and thereby raising fry and fingerlings.

Now a day the success of aquaculture practices lies in the use of suitable and cost effective feeds. The present work focuses on to the production of phytoplankton and zooplankton with the help of cow dung as the source of nutrient but in the appropriate quantity.

The organic and inorganic fertilizers mainly increase the quantity of primary producers. The organic fertilizers such as dung of cattle, pig, and poultry, biomass slurry, compost, and other livestock wastes serve as a class or composite for stimulating abundant growth of zooplankton, insect larvae and other forms of fish food organisms. Therefore to maintain the required food chain equilibrium in fish ponds, combinations of various types of fertilizers is often used to ensure a balance in the amount of both plant and animal matter in the pond ecosystem. Thus the aim of the present work is to find out the proper level of cow dung to be added on to the system which could provide proper plankton growth and also which won't cause any water quality degradation. Numerous studies have been conducted on the effect of fertilizer on plankton production[1,8].

MATERIALS AND METHODS

The experiment was carried out in 6 glass tanks. The tank was of 25 litres capacity each. The study was conducted for a period of 3 months with fortnight sampling. Five different concentrations of cow dung *viz.* 100g, 200g, 300g, 400g and 500g were set for first five tanks. The sixth tank was kept as control. All the six tanks were filled with 10*l* water containing pure culture of *Chlorella* sp. (comprising 26 cells ml^{-1}) and into all these six tanks ten cells each of *Daphnia* sp. was introduced on the first day of study itself. The tanks were provided with proper aeration.

The whole set up was left undisturbed on metal racks provided with proper ventilation. The sampling was started after two weeks of lag phase. The samples collected where observed through inverted microscope (Olympus-CK40). From each sample 1 ml sub sample was transferred to the Sedgwick rafter counting cell and ten randomly selected squares of the cell enumerated. The plankton abundance in the original volume was then computed using the formula

N= A x 100 x C / V x F x L

N= number of plankton cells or unit per litre of original

A= total number of plankton counted

C= volume of final concentrate of the samples in millilitre

V= volume of a field in cubic millimetre

F= number of fields counted

L= volume of original water in litre

RESULTS AND DISCUSSION

The results are shown in figure 1 and 2. The sampling were started after two weeks from beginning of experiment. After two weeks a few sub samples were taken from the tanks and observed *via* microscope (Olympus-CK40). An average of 27 cells ml^{-1} of *Chlorella* sp. and 4 cells ml^{-1} of *daphnia* sp. was observed in tank one. The second tank showed an average of 29 cells ml^{-1} and 4 cells ml^{-1} *Chlorella* sp. and *Daphnia* sp. respectively. The third tank comprised of 30 cells ml^{-1} of *Chlorella* sp. and 7 cells ml^{-1} of *Daphnia* sp. An average of 24 cells ml^{-1} *Chlorella* sp. and 5 cells ml^{-1} of *Daphnia* sp. was observed in the fourth tank and fifth tank had only 21 cells ml^{-1} of *Chlorella* sp. and 2 cells ml^{-1} of *Daphnia* sp. in it. The control tank showed a positive growth status of 27 cells ml^{-1} of *Chlorella* sp. and 3 cells ml^{-1} of *Daphnia* sp.

During the final sampling the *chlorella* sp. Was at a range of 29 cells/ml, 31 cells/ml, 35 cells/ml, 22 cells/ml, 18 cells/ml and 25 cells/ml for 1^{st}, 2^{nd}, 3^{rd} ,4^{th}, 5^{th} and control tank respectively. The *daphnia* sp. for the 1^{st} tank was 6 cells/ml, 2^{nd} tank 11 cells/ml, 3^{rd} tank 16 cells/ml, 4^{th} tank 8 cells/ml in the 5^{th} tank no cells was there. For the control tank it was 3 cells/ml in number. The detailed result of cells in number per millilitre are shown in graphs (Fig. 1 and 2).

The number of phytoplankton in fertilized pond may be found more than ten times higher than in unfertilized pond[3]. The present findings are in accordance with the studies conducted by several scientists[6,7], Rappoport *et al*,[14], Javed *et al*,[10]. The present result indicates that cow dung may get decomposed for the release of inorganic nutrients. Boyd[2] also explained the use of cow dung as direct fed

for fishes and also to get decomposed to release inorganic nutrients. The proper level of dosage of cow dung was observed to be 300g in 10 litres of water, which is 30g per litre. 20g per litre also showed satisfactory results. But for the present study the approximate quantity of cow dung to produce maximum production was found out to be 30g/*l* Proper usage of manures is important. Hyper use of manure wills deplete its water quality, which may be the reason for decrease in number of cells in the fourth and fifth tanks respectively.

Fig.1 Number of *chlorella sp. /ml* of culture sample

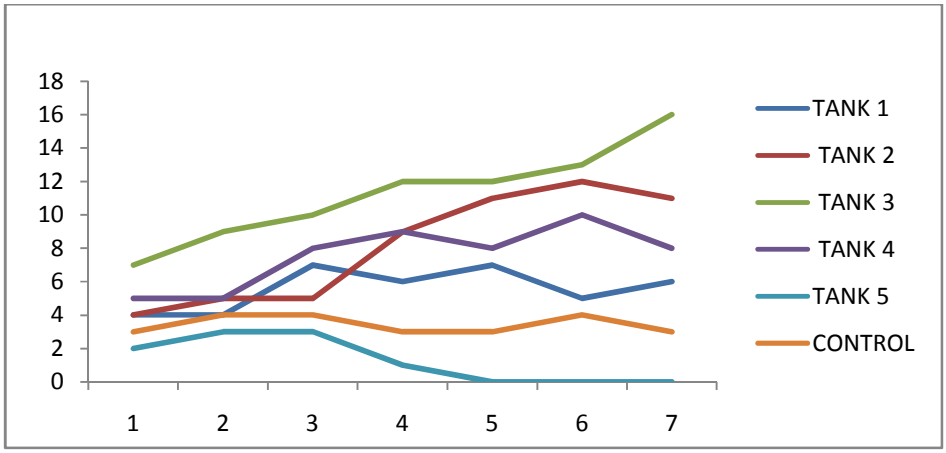
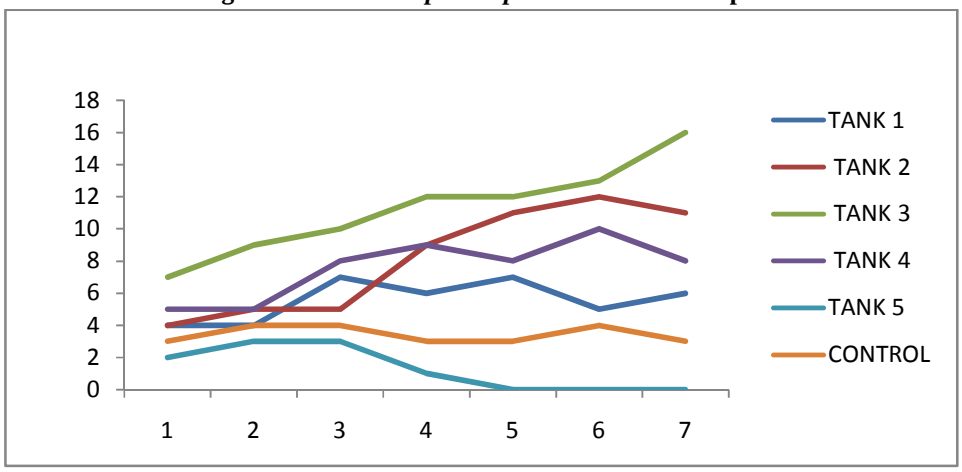


Fig.2 Number of *Daphnia sp. /ml* of culture sample



CONCLUSION

For the proper plankton production at low cost, cow dung turned out to be a big break through from very olden days as a traditional practice. But the proper level of cow dung to be used in a system was the question to be solved. Through this work a mild attempt to know the proper dosage of cow dung which could promote plankton growth and which couldn't deplete water quality. In a culture system with fishes in it, this dosage could be increased as the fishes directly could also feed on the cow dung. Thus for cost effective aquaculture practices and high yield it is suggestible to use cow dung, which could maintain biological productivity.

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