Volume 8 Number 2, April, 2010 pp . 43- 48 ISSN 1597 - 1074

EFFECT OF ORGANIC FERTILIZERS ON ZOOPLANKTON PRODUCTION

R.C. A. Orji and K. Chibugwu
[1]Department of Fisheries and Aquatic
Resources Management,
[2]Michael Okpara University of Agriculture,
Umudike, Abia State, Nigeria

ABSTRACT
Comparative study of zooplankton production, using poultry droppings, pig dung and cow dung was carried out for five weeks using seven glass aquaria (60×30×36) cm³. The aquaria were thoroughly washed, filled with 20litres of bore-hole water, fertilized with the respective organic manures after 4 days fermentation and inoculated with zooplankton samples collected from an earthen fish pond. The highest mean zooplankton population was recorded in the aquarium tanks fertilized with poultry droppings (3989cells/L), followed by pig dung (2783cells/L) cow dung (2030cells/L) and lastly the control aquarium (1140cells/L). Poultry droppings culture had the highest population peak in the second week (8175), pig and cow dung in the third week (5650,4225) and the control in the fourth week (2350). Poultry droppings is therefore recommended for quick and high production of zooplankton which invariably reduces the high cost of imported expensive pelleted feed for fish fry.
***KEY WORDS**: Organic fertilizers, Zooplankton, Production.*

INTRODUCTION
The use of organic manure as a fertilizing agent in fish culture is a common practice among fish pond aquaculturists (Mortimer, 1954, Hepher, 1962 and Reppapport *et. al.*, 1977). Such organic manure is applied to pond water to stimulate and generate the growth of phytoplankton which is food for zooplankton –the preferred food for young fish. By increasing phytoplankton and zooplankton production, fish yield could be considerably increased. However, while the use of organic manure in fish pond is a common place, there is no consensus as to the quantity and frequency of application because of the variation in the nutrient components of the various organic manures.

The variation coupled with the low nutrient of organic manure as compared to inorganic fertilizer has resulted not only in wild ranges but also large quantities usually recommended for use in fish culture system. While some authors have recommended certain application rates (Dupree & Hunner, 1979, Orji & Agunwa, 2003; Orji & Udonwu, 2006), others have hesitated to be specific, maintaining that the rate of application should depend on the prevailing fertility of the culture system (Boyd, 1979).

Zooplanktons are microscopic organisms that are suspended in water which serve as excellent food for fish such as fry and fingerlings in ponds and tanks. They usually occur in low quantities in water bodies, sufficient quantities can however be raised in water enclosures. According to

Alans *et. al.,* (1989), zooplankton plays a vital role in the food chain of fish and other animal food which supply amino acids, vitamins and mineral salts. As such, their role is significantly and extensively used in the rearing of larvae and fry of commercially important fishes. As the application of organic and inorganic fertilizers enhances good water quality, fertilization establishes a bloom of plant and animal plankton. Organic manure such as cow dung, chicken dropping, pig manure etc, is used to generate algal bloom which is a basic food for zooplankton.

In some cases, there may be need to inoculate the culture water with extraneous algae and zooplankton, if it is observed that the production water has no initial aquatic concentration of the plankton. This is important if the culture tank is being used for the first time and bore-hole is the water source, (Ovie 2002). The source of water available determines the quantity of phytoplankton, zooplankton, fry, fingerlings and fishes which can be produced. Fish species have preferred optimum ranges for the various parameters of water quality such as temperature, dissolved oxygen, pH, and conductivity and ideally, the fish or zooplankton culture should operate at the optimum levels of these parameters to achieve fast growth and efficient performance.

This work is aimed at identifying which of the three common organic manures-poultry droppings, pig dung, and cow dung-generates more zooplanktons as well as make appropriate recommendation to aquaculturists on how to utilize organic manure for zooplankton production.

MATERIALS AND METHODS

The study was carried out at the Department of Fisheries and Aquatic Resource Management Laboratory of Michael Okpara University of Agriculture, Umudike, Abia State. Seven glass aquaria, each measuring (60×30×36)cm³ were used, labeled A1, A2, B1, B2, C1, C2, and D. Aquaria A1 and A2 contained poultry droppings manure culture, B1 and B2 contained pig manure, C1 and C2 for cow dung while D had no application of manure but was inoculated with zooplankton to serve as control experiment.

Fermentation of Organic Manures

The required dosage of organic manure for each treatment and its replicate was 56mg/L of culture water (Kibria *et. al.*, 1997). The three organic manures were weighed and soaked with 5litres of water with three plastic bowls. They were left to ferment for four days in the plastic bowls with occasional stirring twice daily. At the end of the fourth day, the fermented organic manures were filtered through a clean white nylon cloth into clean new bowels and then introduced into the culture glass aquaria.

Inoculation of zooplankton

The zooplankton for inoculation was collected from earthen pond of the University fish farm with a 10mm mesh size net with zooplankton cup and introduced into the respective aquaria for inoculation. A measuring cylinder of 10ml was used to measure out 2ml of sample for counting and identification of zooplankton. Quantitative analysis of zooplankton concentration, were

carried out at twice weekly intervals according to APHA (1985). Identification of zooplankton was based on external morphology while counting chamber of 25×16×1mm dimension displayed under an inverted microscope was employed for counting the number. Each of the aquaria was inoculated with 10ml of mixed zooplankton population with the use of clean uncontaminated measuring cylinder.

Physico-Chemical Parameters Analysis

The physico-chemical parameters of the water monitored were pH, dissolved oxygen and temperature. Dissolved oxygen was measured insitu, with Hanna instrument portable oxygen meter H19142. pH and temperature were also measured insitu with Hanna instrument-portable micro-processor printing and logging pH/ORP meter 98240 respectively.

Statistical Analysis

Data collections from zooplankton collection were analysed using two way analysis of variance (ANOVA) to test significant variation between the treatment means.

RESULT

Physico-chemical water parameters

The result of physico-chemical water parameters of the culture media obtained at the completion of the culture are presented in Table 1. During the 38 days of culture, water temperature fluctuated slightly within the range of 26.1 – 28.6°C, dissolved oxygen range from 4mg/1-7mg/l and pH from 6.50-7.90. These fell within optimal conditions.

Zooplankton production

The result of zooplankton densities obtained is presented in Table 2. The table shows the mean population density of zooplankton in the four different culture vessels tagged A1, A2, B1, B2, C1, C2, and D, respectively. The highest zooplankton population was recorded in the aquaria fertilized with poultry droppings (3989cells/L), followed by pig dung (2783cells/L), cow dung (2030cells/L) and control (1140cells/L.)

While pig dung and cow dung had their peak growth on the third week with 5650 and 4225cells/L, poultry droppings had the peak growth on the second week with 8175 and the control had its peak growth on the fourth week with 2350cells/L.

The dominant zooplankton groups identified were: Copepoda, Cladocera, and Insecta. The copepods include *Mesocyclope* leuckarti, *Mesocyclope lyolimus*. Cladocera include: *Daphnia pulex* and *Simocephale acutirostratus,* Insecta include dragon fly and mosquitoe larvae.

DISCUSSION

Based on the above results, the physico-chemical water parameters remained within favorable ranges as recommended by Jingran, (1991). The pH range of 6.5-7.9 probably contributed to maintaining buffering effect on the culture samples and consequently improved biological production and so agreed with the observation of Wade and Sterling (1999). Furthermore the

range of dissolved oxygen of 4mg/L-7mg/L falls within the recommended range of 4-8mg/L of Dupree and Hunner (1984).The temperature range of 26-29°C also falls within the recommended value of 25-32°C, (Dupree & Hunner, 1984).

The dominant zooplankton groups identified in this work-Copepoda, Cladocera and Insecta is in line with that of Kemdrim (2000) in Kangimi Reservoir, Kaduna State, which identified Copepods, Cladcera and Rotifers, with Copepoda and Cladocera being more adundant. Similarly Cheikyula *et. al.*, (2001) produced the highest concentration of Copepoda and Cladocera (moina) with poultry droppings at a fertilization concentration of1.25gm/L. However, Aguigwo (1998), recorded Daphnia species outnumbering other species in Nnamdi Azikiwe University Awka stream.

Table 2 shows the mean population densities of zooplankton populations for A,B,C and D containers, respectively as well as the production peaks of 8175, 5650, 4225, and 2350 individual zooplanktons per liter. Production could be obtained from poultry droppings on the second week. Pig dung and cow dung had their peak production during the third week while control had its highest production peak on the fourth week. Based on the above, for easy production and supply of zooplankton to feed fish fry, chicken droppings are therefore highly recommended. This is because the peak production could be obtained within two weeks to meet up with the demand. Production of natural food (zooplankton) for fish fry reduces cost of buying expensive, imported pelleted feed.

REFERENCES

Aguigwo, J.N (1998) Studies on physico-chemical parameters and plankton of a Productive stream, J. Aquatic Sc. 13:9-13.

Alans, M.J. Habib, M.A.B. and Beyum, M. (1989), Effect of Water Properties and Dominance of phytoplankton on the abundance of zooplankton, Aquacult, 109:37-49

APHA (American Public Health Association) (1995) standard method of assessment of Waste water, Washington DC USA 1268pp.

Boyd, C.E. (1979) Water quality in warm water fish ponds, Auburn University, Auburn, Alabama. Res and Dev. Series No. 22, 30pp.

Cheikyula, J.T., Ofojekwe, P.C., Amali, E.I. (2001) Influence of varying manure Concentration on production of moina, J. Aquatic Sc. 16(2):76-78.

Dupree, K.H and Hunner, J.V. (1981)Tthe status of warm water fish farming research US Fish and Wild life Services, Washington DC, USA, pp 85-92.

Hepher, B (1962) Primary production in fish pond and application for fertilization experiments, Liml. And Oceanography, 7:131-136.

Jingran, V.G (1991),Fish and fisheries of India, Hindustan Publishing Corporation, Delhi, 727p.

Kemdrim, E.C. (2000) Diel rhythm of plankton production, J. Aquatic Sc. 15:35-39.

Kibria, G., Nugegoda, D., Fairclough, R. and Brandly, A. (1997) Zooplankton, its biochemistry and significance in aquaculture, NAGA, the ICLARM Quarterly. April-June 1997, 8-14pp.

Mortimer, C.H. (1954) Fertilizer in fish ponds, Her Majesty Stationery Office, Fish Pond, London 155pp.

Orji, R.C.A. and Agunwa, A.C. (2005) Growth response, feed utilization and survival of *H. Longifilis fingerlings*, reared in concrete tanks, Proceedings of 20th Annual Conference of Fisheries Society of Nigeria (FISON) 271-820

Orji, R.C.A. and Udonwu, E.U., (2006) The effect of cow dung and poultry dropping on Plankton Abundance. Animal Production Research 2 (4): 197-201.

Ovie, S.I., (2002) Fish larval rearing: the effect of pure/mixed zooplankton and artificial diet on the growth and survival of C. angullaris, J. Aquatic Sc. 21:67-73.

Reppaport, U.S., Sarig, T. and Bojorano, Y. (1977) Observations on the use of organic fertilizer in intensive fish farming. Bangladesh 29:57-70.

Wade, W. and Stirling, H.P. (1999) Fertilization of earthen ponds 1: effects on physico-Chemical characteristics and eutrophication of pond water and soil. J.Aquatic Sc.14:5-11.

Table 1: Mean Physical – Chemical parameters Observed In The Culture Vessels

Water Parameters	A	B	C	D
Dissolved oxygen (mg/L)	5.68	6.01	5.85	6.98
pH	7.51	7.46	7.38	7.35
Temperature(°C)	27.6	27.6	27.3	27.3

A=Poultry dropping

B=Pig dung

C=Cow dung

D=Control

Table 2: Mean Population of Zooplankton (NO./lit) Observed in the culture Vessela

Weekly Mean Values	A	B	C	D
Week One	150	150	150	150
Week Two	8175	2315	1675	250
Week Three	6100	5650	4225	1450
Week Four	3450	3550	2350	2350
Week Five	2070	2250	1750	1500
Total	19945	13915	10150	5700
Mean	3989±0.01	2789±0.91	2030±0.56	1140±031