Comparative Studies on Zooplankton Production Using Organic Manure (Cow Dung) and Inorganic Fertilizer (N.P.K) in Ksusta Vicinity of Kebbi State

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Abstract

Comparative studies on zooplankton production using organic manure (cow dung) and synthetic fertilizer (N.P.K) was carried out in the department of forestry and Fisheries of Kebbi State University of Science and Technology Aliero, Kebbi State in September 2023 using standard methods and procedures. Three treatments consisting of organic manure, synthetic fertilizer and fertilizer-free water which served as a control treatment were placed on a Completely Randomized Experimental Design (CRED). Culture studies continued for a period of four weeks where sampling was carried out on a weekly bases. It was observed that zooplanktons with highest abundance in pond water cultured with cow dung were Metacyclops minutus ($85.66^{a} \pm 24.56$), followed by Culex restuans ($40.00^{a} \pm 4.35$) and the least in abundance was Acris crepitans with ($2.33^{b} \pm 2.33$). Zooplanktons with highest abundance in ponds water cultured with synthetic fertilizer (N.P.K) was Culex restuans ($35.33^{b} \pm 3.84$), followed by Metacyclops minutus ($23.33^{b} \pm 7.42$) and the least in abundance was Acris crepitans ($1.66^{b} \pm 1.66$). Zooplanktons with highest abundance in ponds water cultured with fertilizer-free water was Culex restuans ($30.33^{b} \pm 2.78$), followed by Metacyclops minutus ($17.33^{b} \pm 2.90$) and the least in abundance was Platyias quadriconis ($3.33^{b} \pm 1.33$). The results of the study indicated Metacyclops minutus, Culex restuans, as the most dominant zooplanktons during the study period. The least abundance zooplanktons in both the three cultured were Acris crepitans, Platyias quadriconis. In conclusion, comparison of zooplanktons produced from ponds cultured with organic manure (cow dung) and synthetic fertilizer (N.P.K) indicated that zooplanktons produced from cow dung are significantly higher than those produced from synthetic fertilizer (N.P.K). Organic manure (cow dung) is therefore recommended for use in zooplanktons production for fish farming to enhance productivity.

Keywords: *Organic fertilizer, Synthetic fertilizer, Zooplankton, Cow-dung, N. P. K.*

1.0 INTRODUCTION

Fish is an excellent source of high quality animal protein and essential fatty acids, (FAO–WHO, 2011). Live feed is essential for the growth of larval fish, they are readily ingested, digested more easily (Kinne, 1997), the first kind of live feed available to fishes generally are zooplanktons. Zooplankton are the animal components of the plankton, derive their name from the Greek word "zoon" meaning animal. Those commonly used in fish culture include rotifers, copepods, cladocerans, artemia e.t.c (Sorgeloos*etal*., 1980). Zooplankton are the initial prey item for almost all fish larvae, as they switch from their yolk sacs to external feeding. Evidence from the stomach content analysis of the fingerlings of *Clarias gariepinus* and *Clarias anguilaris*, showed that within the first few weeks of life, zooplankton was the predominant food item. The abundance of planktonic organisms in a water body influences the feeding regime of fish. In fish farm operations, lack of suitable food is believed to be the main source of mortality of early larval and fry stages of fish. Most zooplankton are secondary consumers, that is, they are herbivores that graze on phytoplankton (unicellular or colonial algae) suspended in the water column. The success of hatchery operations have been linked to the availability and supply of these natural feed, notably of zooplankton. Adeyemo *et al*, (1994),Zooplanktons are found in both freshwater and marine environments where many groups can adapt and develop in littoral zone, open or coastal water (Dumont, 1977). These planktonic organisms not only regulate aquatic productivity by their function as secondary producers but they can also indicate environmental status over a given time. This study is aimed at determining the productivity of zooplankton fauna in Kebbi State University of Science and Technology Aliero, Kebbi State Nigeria.

The readily available *Artemia nauplii* is difficult to afford by most local fish farmers due to its expense.Fish hatchlings must be fed four or five hours after hatching. This calls for researches on alternative and cheaper source of these natural feeds that will boost and enhance the rearing of fish larvae and fry.

The mortality of fish larvae and fry due to lack of live feed is a serious problem in fish farming. This is the main discouragement and problem to several fish seed producers and fish farmers. This research therefore is to bring solution and relief to fish farmers as a whole by unveiling a cheaper feed for fish larvae and fry such as zooplankton.

The main aim of this study is the Comparative studies on zooplankton Production using organic manure (cow dung) and synthetic fertilizer (N.P.K) in KSUSTA vicinity of Kebbi State.

The specific objectives are to:

- Produce zooplankton by using Organic manure.
- Produce zooplankton using synthetic fertilizer.
- Identify dominant zooplankton groups and species.

2.0 Materials and Method

2.1 Study Area

The experiment will be conducted at Kebbi State University of Science And Technology, Aliero (KSUSTA) Faculty of Agriculture, Aliero Local Government Area In Kebbi State Nigeria. It is bordered in the North-East by Gwandu Local Government Area, in South-West by Jega Local Government and in the North-West by Binin Kebbi Local Government and in the East by Tambuwal Local Government of Sokoto State. The University latitude 12˚16'42"N and longitude 4˚27'6"E of the equator. The annual temperature varies considerably but usually ranges between 26˚C to38˚C. There are two distinct season in the regime the rainy season which starts usually around May and lasts till around September and dry season from October to April. The annual rainfall is frequently erratic and varied distributed from 500mm to 1300mm per annum (Smanr, 1998).

2.2 Source of organic manure and synthetic fertilizer

The sample of organic manure (Cow Dung) was collected at forestry seedling unit, department of forestry and fisheries, Kebbi state university of science and technology Aliero and synthetic fertilizer (N.P.K) was purchased at Aliero Town.

2.3 Experimental design

Nine (9) ponds each of dimension $0.5m^2$ were filled with water. Treatment 1 representing Organic manure was replicated three times and tagged TRT 1 and RP 1, RP 2 and RP 3, where three (3kg) of cow dung was applied to each replicate. Treatment 2 representing Synthetic fertilizer was replicated three times and tagged TRT 2 and RP 1, RP 2 and RP 3, were two (2kg) of synthetic fertilizer was applied to each replicate. Then treatment 3 representing control treatment (consist of only ordinary water) was also replicated three times and tagged TRT 3 and RP 1, RP 2 and RP 3.

2.4 Zooplankton Harvesting and Identification

Zooplanktons were harvested weekly by the horizontal trawl method, using micro-filament plankton net of 50µm mesh size after collection in a 35ml plastic bottle. The samples collected were viewed under microscope. Identification of zooplanktons was carried out with the aid of a key prepared by Emi and Cartin, (2007).

Fig 1 zooplankton harvesting

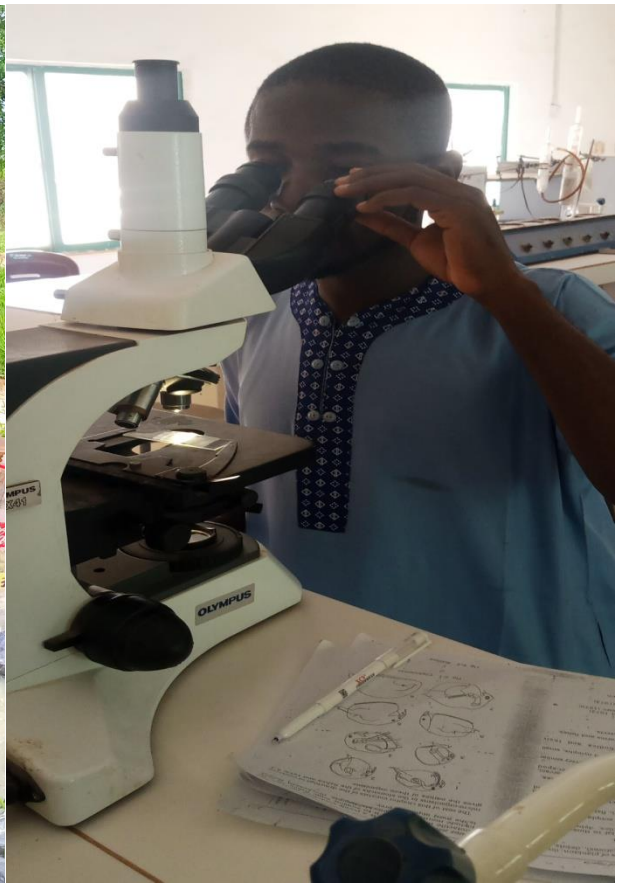

Fig 2 zooplankton Identification

2.5 Statistical Analysis

The data collected from the different treatments and their replicates were analyzed using One way analysis of variance, SPSS (Statistical Package for the Social Sciences). Treatments mean differences were separated using Duncan's multiple range test

3.0: RESULTS

Table 3.1: shows comparative result on zooplanktons produced using organic manure (cow dung) and synthetic fertilizer (N.P.K).

Keys: T1 Organic manure (cow dung), T2 Synthetic fertilizer (N.P.K) and T3 Control (ordinary water).

SPECIES	T1 MEAN ± SE	T2 MEAN ± SE	T3 MEAN ± SE
Pleuroxus laevis	22.00^{a} ± 6.08	7.33^{b}± 1.85	6.33^{b}± 1.20
Chydorus barroisi	21.66^{a} ± 4.09	8.66^{b}± 2.90	5.33^{b}± 1.76
Ceriodaphnia comuta	27.00^{a}± 3.21	9.66^{b}± 4.17	4.00^{b}± 1.15
Macrothrixtri serialis	11.66^{a} ± 2.84	4.33^{b}± 0.88	5.66^{ab} ± 1.20
Graptoleberistestudanaria	12.00^{a}± 3.05	4.33^{b}± 0.66	3.66^{b} ± 1.20
Alonaguttata	27.00^{a} ± 11.50	12.66^{b}± 2.66	11.33^{b}± 1.76
Metacyclops minuta	85.66^{a} ± 24.56	23.33^{b}± 7.42	17.33^{b}± 2.90
Cyptocyclops bicolor	23.33^{a}± 5.20	14.66^{b}± 2.66	12.00^{b}± 2.00
Encyclops serruletus	16.33^{a}± 2.96	11.33^{ab}± 3.33	7.00^{b}± 0.57
Eudiaptonu sgracilis	14.00^{a}± 2.08	5.33^{b}± 1.76	5.00^{b}± 1.15
Dipleuchlamis propalata	10.00^{b}± 3.51	15.33^{a}± 3.71	5.00^{b}± 1.45
Macrochaetus collinsi	9.33^{a}± 2.40	6.66^{b}± 1.76	6.66^{b}± 1.76
Branchionus calyciflorus	12.66^{a}±5.20	5.33^{b}± 0.66	4.66^{b}± 0.66
Brachionus quadridentatus	18.00^{a}± 8.32	7.00^{b}± 3.60	5.33^{a}± 1.33
Platyias quadriconis	6.66^{b}± 1.33	7.66^{a}± 3.17	3.33^{b}± 1.33
Lepadella petalla	17.66^{b}± 3.17	18.33^{a}± 4.17	10.00^{b}± 1.15
Culex restuans	40.00^{a}± 4.35	35.33^{b}± 3.84	30.33^{b}± 2.78
Acris crepitans	2.33^{b}± 2.33	1.66^{b}± 1.66	3.66^{a}± 3.66

3.2: shows appearance of zooplankton specimens based on taxonomic orders such as Cladocera, copepod, Rotifers, Dipteria, and Anura.

Fig. 1 Cladocera

Fig. 2 Copepoda

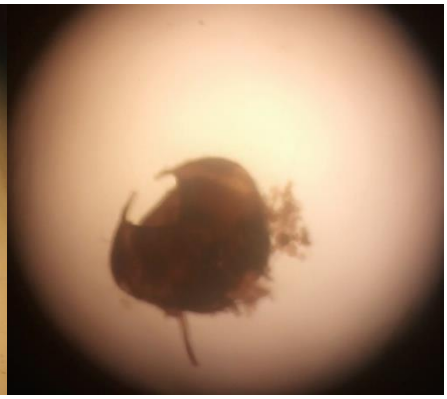

Fig. 3 Rotifera

Fig. 4 Dipteria

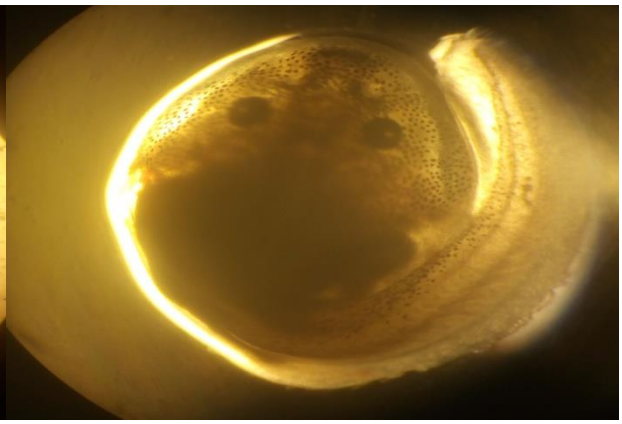

Fig. 5 Anura

Discussion Conclusion

The result of the study revealed that the two culture media favored the production of different zooplankton species. Copecods, Rotifers and Cladocera. This abundance could be attributed to the availability of elements such as potassium, nitrogen, phosphorus, carbon, etc. in the ponds cultured with cow dung and synthetic fertilizer (N.P.K). This findings concurred well with the findings of Jhingran,(1991) who reported that organic manure results in higher zooplankton densities in the ponds. Hence, it can be concluded that zooplankton population is improved with the application of the manure maintaining the water quality favorable for fish production. Zooplanktons production were found to be high in pond cultured with cow dung than synthetic fertilizer (N.P.K) This might be attributed to the facts that cow dung has more nutrients than (N.P.K) which has only

three types. It was noticed that zooplankton drastically reduced during the fourth week of the research. This might be as results of depletion of dissolved oxygen which was more abundant during the first and second week, probably related to setting in of decomposition of cow dung remnants, a process that exhausts oxygen. This agreed with the findings of Catton et al., (2007) who reported dissolved oxygen problem after fertilization of pond with organic manure.

CONCLUSION

This Study therefore revealed high production of zooplanktons for fish production with both organic manure (cow dung) and synthetic fertilizer (N.P.K). However, higher production was achieved with organic manure compared to synthetic fertilizer.

RECOMMENDATION(S)

1. Fish farmers should be educated on the importance of producing zooplanktons for fish farming using organic and Inorganic fertilizer so as to minimize cost.

2. Researches should be conducted with different organic manures to compare the effectiveness of each for zooplanktons production for use in aquaculture.

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