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**ORIGINAL ARTICLE**

# Effect of Water Quality and Food Conditions upon Growth and Survival of *Clarias batrachus* (Linn.)

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## ABSTRACT

*There was a significant different (P<0.05) in weight gain and total length increase for treatments with the control condition. The result of this study has show variation in water parameters, but diet I contained the richest nutrients gave rise to the best growth and size increment. Fish mortality was nil for diet I, 30.0% for diet II and 60% for diet III. Diet I was the cheapest, hence its usage may be encouraged.*

***Key words:*** *Zooplankton, Maggot, Growth, Survival, Water quality*

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## INTRODUCTION

Fish is most widely accepted food source and provides vitamins, calcium and unsaturated fats to human population. Enriched nutrient supply in aquaculture enables the growth and survival of fishes (Dutta Munshi, *et al.*, 1990). The low supply of fish protein in the country increased malnutrition especially among low income groups. Fish like other animals require essential nutrients to larval stages for maximum production. The nutrient could be supplied from plankton (Adigun, 2005), worm's maggot or supplementary diet for culture success. The planktons in the food composition of predatory fishes could reduce the high cost associated with artificial diet. Survival and increased availability of fries and fingerlings were better supported in combination with plankton, than the result with artificial di*et al*one in the hatchery (Ovie, 1996)

High cost of fish feed has been a major problem to fish farmers in India. Artificial feed is usually expensive because the feed ingredients compete for its consumption by human and livestock. There is need to identify, explore and utilize cheaper natural feeds which are easily available with less competition. The maggot grown on poultry waste was reported to possess large potential for fish production (Giri, et. *al*., 2002). Fishes have used protein efficiently as energy source, hence they convert protein to energy better and faster than livestock. The present study will determine the value of zooplankton as natural feed with low cost, easy availability, less compatible and most easily reproducible source for the growth and survival of *Clarias batrachus*. We also studied variation in water parameters for various diets under experimental period which also affects upon biology of fishes.

## MATERIALS AND METHOD

Four weeks old fingerlings of *Clarias batrachus* were obtained from the breeding stock of Kushinagar (U.P.) hatchery plant and conveyed in plastic bucket to tanks of 5.60 $m^2$ the

acclimatization was done in tank and food supplied after 24 hours of starvation. Ten specimens each were selected randomly from the pool and stocked into tanks with different dietary components. The experimental diet analysis was as: 40% maggot in diet I, 41% coppens with artificial food in diet II and only common ingredients (22% maize, 32.50% soybean, 3.60% blood meal and .50% premix vitamins) in diet III.

The proximate analysis of first diet, maggot grown from poultry waste contained 44.5% of crude protein, 10% of ash and 24% of lipid. The cultured zooplankton contained 60.8 crude protein, 9.05% ash and 13.4% lipid, while coppens contained 45.00% of crude protein, 9.05% of ash and 12% of lipid. Each treatment was applied in duplicate. Diet I contained maggot meal fortified with zooplankton, Diet II composed of coppens alone Diet III contained only zooplankton as control condition. The zooplanktons were cultured as described by Ovie (1996) and screened through mosquito netting to remove wastes.

The fingerlings were fed twice daily for 5 days at 9 h and 15 h and food quantity adjusted in accordance with their body weight. Batch measurement of body weight was taken with the aid of an electronic balance and recorded at weekly intervals, while total length measurements recorded with the aid of a measuring board each week. Water temperature, dissolved oxygen, nitrate and chlorophyll were observed routinely (APHA, 1989). Growth and survival of fingerlings were monitored for each treatment.

Data were subjected to one way analysis of variance (ANOVA) at 5% level of significance. Duncan Multiple Range Test was used to determine the difference among means.

## RESULTS AND DISCUSSIONS

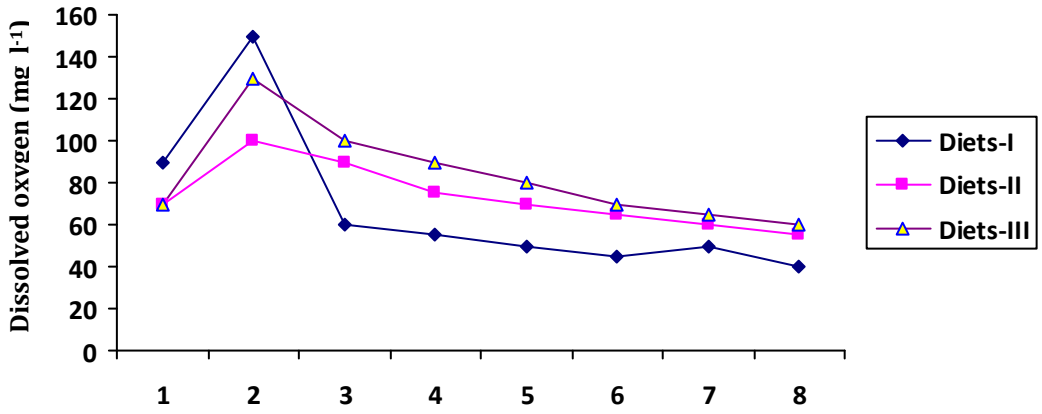


**Fig. 1:** Fluctuation of dissolved oxygen(mg $l^{-1}$) in the larvae tanks

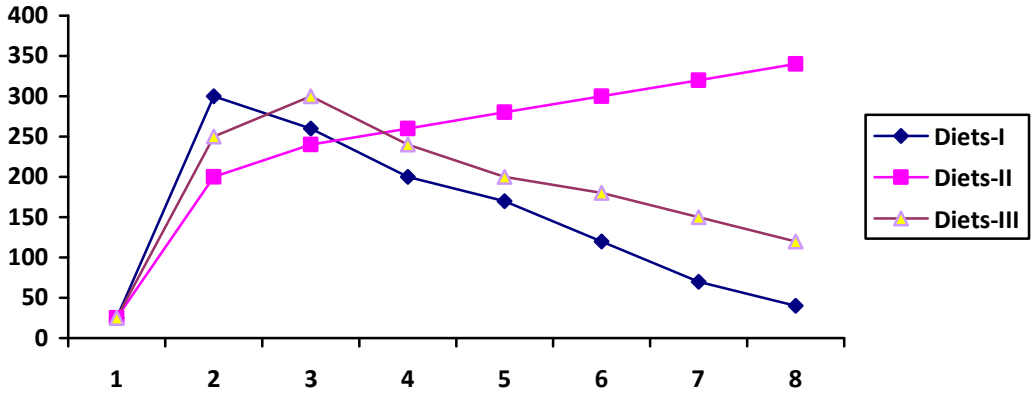


**Fig. 2:** Fluctuation of nitrate ( g $l^{-1}$) of larvae tanks

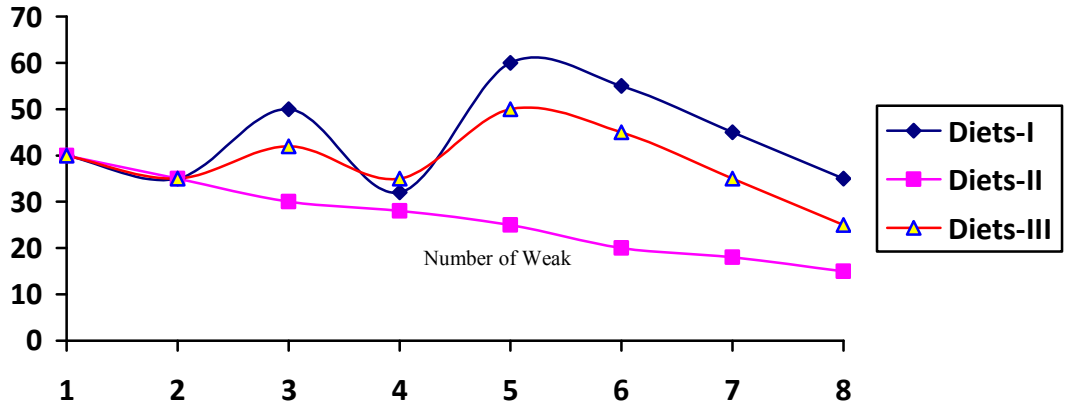


**Fig. 3:** Fluctuation of Chlorophyll (g $l^{-1}$) of the larvae tanks

The water quality parameters were different for diets (Fig. 1, Fig. 2 and Fig. 3) showed varied metabolic nature of fingerlings during study period. This observation confirms influence of water quality upon fish survival and adequate growth performance (Games, *et al*., 2000).

**Table 1:** Biochemical composition of various zooplanktons (%)

| Zooplankton | MOIS | CP | CF | CHO | ASH | P | C |
|---|---|---|---|---|---|---|---|
| Daphnids | 88.3 | 68.9 | 12.09 | - | 6.47 | 1.44 | 0.18 |
| *Daphnia carinata* | 90.7 | 53.5 | 7.00 | 25.9 | 11.40 | 1.09 | 0.34 |
| *Rotifera spp.* | 89.3 | 63.9 | 14.0 | - | 9.9 | 1.00 | 0.16 |
| *Copepoda spp.* | 89.6 | 56.8 | 19.6 | 0.50 | 9.43 | - | 0.26 |
| Average Composition | 89.47 | 60.7 | 13.17 | 13.7 | 9.5 | 1.17 | 0.17 |

MOIS=Moisture, CP=Crude Protein, CF=Crude fiber, CHO=Carbohydrate, ASH=Ash, P=Phosphorus, C= Carbon

**Table 2:** Weakly variation in body weight for all treatments (g): time in weeks

| Diets/Weak | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Diets-I | 3.56 | 5.45 | 7.70 | 8.10 | 10.20 | 11.85 | 12.48 | 14.40 |
| Diets-II | 3.33 | 3.94 | 4.95 | 5.90 | 7.00 | 8.24 | 8.90 | 9.51 |
| Diets-III | 3.13 | 3.40 | 4.50 | 5.57 | 5.78 | 6.49 | 6.69 | 7.38 |

**Table 3:** Weakly variation in total length for all treatments (mm): time in weeks

| Diets /Weak | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Diets-I | 76.5 | 82.0 | 85.5 | 95.0 | 100.0 | 106.0 | 110.0 | 118.5 |
| Diets-II | 76.6 | 79.7 | 82.5 | 85.5 | 90.5 | 91.5 | 93.5 | 101.0 |
| Diets-III | 75.5 | 78.5 | 81.0 | 81.0 | 85.0 | 86.9 | 88.0 | 90.5 |

There was a significant difference ($P<0.05$) in the body weight of the fingerlings in comparison with control condition (Table 3). However, visual observation of the treatment combination in diet I revealed that it was richer than diet II (Coppens 45.0% crude protein, 12.0% lipid and 9.5% ash). According to Gomes (2000), fingerlings are always able to convert the protein components in natural meals more efficiently than those found in artificial feed. This observation is consistent with the present study where maggot meal fortified with cultured zooplanktons, provided adequate protein, lipids, fatty acids, minerals and enzymes for the fingerlings. However, both combinations enhanced

better growth of fingerlings as well as minimized problems associated with artificial diets (Ovie, 1996). Again, the present observations were corroborated with the finding of Fasakin, *et al*. (2003) who opined that natural organisms in large quantity and high quality guaranteed good performance of fry and fingerlings in aquaculture. Lan and Pan (1993) reported that the nutritive value of natural feed promotes better growth and higher yield in fish than from artificial feeds. This may have been the reason why diet I fortified with zooplankton resulted in the best growth performance and fish survival. Although artificial feeds are specially made to meet the nutritional needs of fingerlings; their nutritional benefits were better realized in combination with zooplankton. Diet III gave rise to the highest recorded mortality probably due to the nutrient composition became insufficient could no longer sustain to satisfy the growing fingerlings. This has often been the situation over time when fishes are grown alone on natural feed. There was a significant difference ($P<0.05$) in the total length increase of the fingerlings when compared with the control treatment. According to Fasakin, *et al.* (2003), fishes reared on qualitative natural meals as diet I achieve adequate growth because they utilized the nutrient from such feeds better and faster than from artificial feed coppens, diet II. In this regard, the present study is consistence with earlier researchers (e.g., Fasakin, 2003). The methods used for collecting, processing, drying storing and administrating of feeds have been almost similar with previous researches. The slight variation may have arisen from differences in the dung used for maggot production, rate and frequency of feed application.

An overall survival of 70% was recorded at the end of this study. Fish mortality was nil in diet I, 30.0% in diet II and 60.0% in diet III. The fingerlings depend solely on zooplankton in diet III resulted in highest mortality. This event may have arisen because as the fingerlings advanced in size over time, the nutrient composition of diet III become insufficient and inadequate diet resulted in the weakness and subsequent death of the fingerlings. Again the quality and quantity of the zooplankton may have varied or become insufficient for fast growth and sustenance over time. Such observation is in agreement with the report of Wedemeyer (2001). The mortality recorded for diet II may have emanated from depleted water quality arising from the use of artificial diet. This observation is similar with opinion of Ovie (1986) reported that the use of artificial di*et al*ong provided insufficient nutrients and could induce some effects which will result to fish mortality. The high survival rate of fingerlings used for this study could be compared with 75% and 95% survival for artificial and natural feed revealed from study of SB Upadhyaya (1998). The uniformity in the results obtained in both studies may have emanated from careful handing of fingerlings which minimized the degree of stress experienced during weakly fish measurement exercises by different researchers.

The study revealed that diet I proved to be the most conductive for rearing *Clarias batrachus* juvenile in this research. It was the best alternative in comparison with diet II and III, because it gave rise to the best growth rate and size increment. It was richer in crude protein, crude fiber and lipids necessary for adequate growth and survival of fingerlings. The diet was also not compatible because low cost of production, easily accessible, easily reproducible and economically viable. In contrast, the use of coppens (artificial diet) resulted in laborious water quality monitoring, less economically viable and not easily affordable to fish farmers.

## CONCLUSION

This study has shown that diet I was the best alternative for the rearing of *Clarias batrachus* fingerlings. The diet resulted in the best growth/total length increase with highest fish survival. Thus, it may be concluded that the cost of fish production was greatly reduced, the growth rate of fish improved and survival of the fingerlings enhanced when maggot meal was fortified with cultured zooplanktons may be used as food.

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