Nwanna, L. C.; Ajani, E. K.; Omitoyin, B. O.; Magawata, I. Ayoola, S. O.; Orisasona, O.; Kareem, O. K and Abubakar, M. Y. (Eds.) (2004) ***Proceedings of the Fifth Conference of Association of Nigerian Fisheries Scientists.*** **"SUSTAINABLE FISHERIES AND AQUACULTURE PRODUCTION FOR ENHANCING LIVELIHOOD IN NIGERIAN ECONOMIC DEVELOPMENT"** 9TH – 11TH JULY, 2024 In the University of Lagos, Lagos, Nigeria

Growth Performance and Survival Rate of *Clarias gariepinus* Hatchlings Fed Different Starter Feeds

***Adelodun, O. B.[1], Rafiu, R. A.[2] and Olawumi, L. Y.[3]**

[123]Department of Fisheries Technology

Oyo State College of Agriculture and Technology, Igboora, Nigeria

*Corresponding Author: adelodunoluwatobi@yahoo.com

ABSTRACT

The study was conducted to determine the growth response and survival rate of *Clarias gariepinus* hatchlings fed different starter feed. Fish seeds were artificially propagated. Commercial starter feeds; Coppens (0.2-0.5mm), Alleraqua(0.2-0.5mm), Imported fish meal and Oven dried maggot meal were used. The hatchlings were randomly allocated into troughs at the rate of thirty (30) hatchlings per trough. The troughs were labelled diet I(Fish meal), diet II(Coppens), diet III(Aller Aqua) and diet IV(maggot meal), representing each treatment fed. The fish were fed to satiation, four (4) times daily. The feeding trial lasted for five (5) weeks. The growth was measured weekly and mortalities were noted. The results showed that diet II (Coppens fry feed) gave the best growth performance in terms of weight gain (2.14±0.25) and specific growth rate (2.24±0.10). it can be said that Diet II had the best starter feed performance, which was closely followed by Diet II

Keywords:

growth reponse, maggot meal, starter feed, hatchlings

Introduction

The importance of aquaculture in improving the diet of the people, generating employment in rural areas and in conserving foreign exchange; through import substitution, has increased in recent years. For aquaculture industry to thrive, apart from development of adequate manpower, there is need to research and develop various inputs of production, such as feed. The need for feed development is becoming increasingly urgent. Furthermore, fish nutritionists agree that important gaps still exist in the knowledge of how to administer feed to Clarias larvae, in order to obtain optimal growth and high survival rate.

Seed production still poses a challenge to commercialization of African catfish (*Clarias gariepinus*) industry in Nigeria. Although many factors affect the growth of fish larvae, weaning is one of the key factors that define the survival and good growth of larval fish. The process is regularly referred to as a changeover of the feed from live feed to dry feed. Introducing a new correct starter compound feed type to the larval fish at a particular larvae developmental stage is a key challenge in intensive fish culture (Ostaszewska, Wegner and Wegiel, 2003) and it is only possible at a developmental stage when the digestive system is able to assimilate and digest the compound feed (Navarro and Sarasquete, 1998). Although the fish may have basic developmental phases, complexity of development of the digestive

tract and timing may defer as the larvae matures, characterizing varying nutritional requirements at different stages and periods in different fish species (Jian, 2008). First feeding when the fish begins taking feeds is the most critical period as delays or early feeding may affect larval growth and survival (Chepkwemoi *et al.,* 2013). The high rate of cannibalism and mortality experienced after the 1st week of hatching in artificial propagation of *Clarias spp* can be attributed to unavailability of suitable exogenous food items (Faruk et al., 2019). After 3 days, when the yolk sac has been absorbed, the larvae swims around in search of food items, failure of which the larvae becomes weakened to death or feed on other larvae to survive. The success of fish larvae rearing mainly depends on the availability of suitable diets that are readily consumed, efficiently digested and composed of required nutrient for good growth and health (Girri et al., 2002).

In some cultured species, dry feeds have been successfully introduced as starter feeds at first feeding without using live feeds (Adewolu, Akintola and Akinwunmi., 2009). Additionally, the type of weaner feed given will influence the growth and the survival of the larvae differently because of different nutritional content in the different diet formulations. This study is aimed to assess the growth performance and survival rate of *Clarias gariepinus* hatchlings fed different starter feed.

Materials and Method

Study Site

The experiment was carried out at the Oyo State College of Agriculture and Technology Fish Farm, Hatchery Section, Igboora.

Experimental fish

Fish seeds were artificially propagated using a potent male and gravid female of average weight of 1.05±0.03kg each. The female fish was injected with pituitary gland from a donor fish. The eggs were stripped out after 11hours (latency period) and the testes of the male was collected. The eggs were fertilized by piercing and squeezing out the milt from the male testes to the eggs, stirred for homogenous mixture. The fertilized eggs were incubated for 28 – 32 hours in the hatching trough. The hatchlings were allowed to absorb their yolk before the commencement of feeding trials.

Experimental diet

1kg of commercial starter feeds such as Coppens fry feed (0.2-0.5mm), Aller aqua fry feed (0.2mm-0.5mm) and Fish meal (imported) were purchased at a fish feed store in Abeokuta, Ogun State. The maggot meal was processed by oven drying the harvested maggot at the end of the culture period, and grinded to powdery form.

Experimental procedure

Three hundred and sixty (360) hatchlings were randomly selected and fed with shell free artemia for four days after absorption of their yolk. The hatchlings were randomly allocated into troughs at the rate of thirty (30) hatchlings per trough. The troughs were labelled DI, DII, DIII and DIV representing diet I, diet II, diet III and diet IV respectively. Each of the diets were triplicated to give 12 troughs in total. Hatchlings in DI were fed Fish meal (Control), DII were fed Coppens fry feed, DIII were fed Aller Aqua fish powder and DIV were fed processed maggot meal. The fish were fed to satiation, four (4) times daily.

Feeding

The feeding trial lasted for five (5) weeks. The growth was measured weekly using highly sensitive electronic scale and recorded. The mortalities were also noted

Data collection

Fish growth performance in the experiment was measured weekly and at the end of the experiment. The following parameters were measured;

- **Average Weight Gained** = Final weight – Initial weight
- **Percentage Weight Gained =** $\frac{\text{Weight gain}}{\text{Total weight}} \times 100$
- **Specific growth rate (SGR) =** $\frac{^{Log}\text{Final Weight} - {}^{Log}\text{Initial Weight}}{\text{Duration of the Experiment (Days)}} \times 100$
- **Survival rate =** $\frac{\text{Total number of live fish}}{\text{Total number of stocked fish}} \times 100$

Data analysis

Data collected was subjected to descriptive and inferential analysis (analysis of variance) using SPSS version 20.0.

Results and Discussion

Table 1: Nutrient composition of test diets

Parameters	Fish meal (DI)	Coppens (DII)	Aller Aqua (DIII)	Maggot meal (DIV)
Crude Protein	60.10±1.57	51.30±0.33	64.00±1.17	40.81±1.75
Crude Fat	7.67±0.72	12.01±0.17	10.02±1.08	3.69±0.15
Crude Fibre	6.00±0.25	1.90±0.07	1.00±0.04	0.71±0.03
Ash	4.70±0.05	12.10±0.50	9.50±0.17	7.51±0.51
Phosphorus	2.32±0.02	1.20±0.04	1.50±0.01	0.60±0.02
Calcium	0.41±0.01	1.70±0.02	1.40±0.02	1.33±0.05
Sodium	0.51±0.02	0.40±0.01	0.50±0.01	0.36±0.01

Table 1 shows the nutrient composition of the experimental diets. Aller Aqua fry powder had the highest Crude protein (64.00±1.17), followed by Fish meal (60.1±1.57), Coppens fry feed (51.30±0.33) and Maggot meal (40.81±1.75) respectively. Coppens fry feed (DII) had the highest Crude fat (12.01±0.17) and Ash content (12.10±0.50), while the highest Crude fibre content (6.00±0.25) was found in fish meal. Phosphorus was most abundant in Fish meal (2.32±0.02) while Calcium was most abundant in Coppens (1.70±0.02).

The proximate composition of the experimental diet as revealed in table 1 were within the range recommended for fish seed growth and survival (Tibbetts and Lall, 2013).

Table 2: Mean growth parameters of *Clarias gariepinus* fries fed different starter feeds

Parameters	Diet 1	Diet 2	Diet 3	Diet 4
Initial Weight (g)	0.11±0.01	0.12±0.05	0.11±0.01	0.13±0.01
Final Weight (g)	1.79±0.15 [b]	2.27±0.04[a]	2.01±1.17 [a]	0.63±0.03 [c]
Av. Weight Gain (g)	1.69±0.17[b]	2.14±0.25 [a]	1.88±0.11 [a]	0.50±0.03 [c]
Specific Growth Rate	2.01±0.11 [b]	2.24±0.10 [a]	2.20±0.12 [a]	1.09±0.21 [c]
Survival Rate (%)	54.33±0.35 [b]	59.07±1.41[a]	60.67±0.78 [a]	62.14±2.14 [a]

*Mean values with different superscript along the same row are significantly different (P<0.05)

The performance of a diet on the growth of fish is largely dependent on its nutritional composition as reported by Mustapha *et al*. (2014) on the study of the comparative effect of local and foreign commercial feeds on the growth and survival of *Clarias gariepinus* fingerlings. The results in table 2 showed that diet II (Coppens fry feed) gave the best growth performance in terms of weight gain (2.14±0.25) and specific growth rate (2.24±0.10). Although, DII (Coppens fry feed) has lower crude protein (one of the crucial components in fish diet) than diet I (fish meal) and diet III (Aller aqua), the growth performance of diet II may be attributed to balanced nutrient composition when compared to other starter feeds in this study. An increase in dietary lipid level gives a protein sparing effect (Ahmad, 2008). This is similar to the findings of Faruk *et al*. (2019) on the study of growth response and survival of *Clarias gariepinus* fry fed different starter diets. Diet II had its nutrient properly utilized for growth, as it is evident in its higher specific growth rate.

The analysis of variance revealed that the growth performance (average weight gain and specific growth rate) of diet II and III were not significantly different (p>0.05). The fry fed with diet IV (maggot meal) had the lowest weight gain, specific growth rate, and significantly different from other test diets. This may be attributed to the fact that diet 4 (maggot meal) has an inferior nutritional quality compare to other test diets. The presence of chitin in insect protein also tends to lead to depression of growth performance in fish as reported by Alfiko *et al.* (2021). The performance of maggot meal in this study as starter diet for African Catfish fry contradicts the results obtained by Woke and Nweke (2022) who reported that maggot meal gave a good growth performance on African catfish fingerlings.

Meanwhile, diet IV (maggot meal) had the best survival percentage (62.14%) but not significant different (p>0.05) from diet II (Coppens) and diet III (Aller aqua). The good survival rate given by maggot meal diet in this study agrees with the findings of Kurniawan *et al*., (2018) who reported that replacing fish meal with maggot meal increases the immunity and improves survival rate in Tilapia. Studies have shown that 4.7–6.4% of fly maggot protein in feed can positively influence immunity and antioxidant capacity in other animals such as broiler chicken (Dabbou *et al*., 2018). Fly maggot protein contains bioactive substances, such as fly maggot chitosan and fly maggot peptides, which may improve immune function in animals (Macwan *et al.*, 2024). Studies have shown that 4.7–6.4% of fly maggot protein in feed can positively influence immunity and antioxidant capacity in broiler chicken.

Based on the findings of the study, hatchlings fed Diet II had the best growth performance, and the survival rate is not significantly different (p>0.05) from that of Diet IV which had the highest survival rate. Conclusively, it can be said that Diet II had the best starter feed performance, which was closely followed by Diet II

References

Adewolu MA, Akintola SL and Akinwunmi OO. (2009). Growth performance and survival of hybrid African catfish larvae (*Clariasgariepinus* x heterobranchusbidorsalis) fed on different diets. The Zoologist. 7:45-51.

Alfiko, Y., Xie, D., Astuti, R. T., Wong, J. and Wang, L. (2021). Insects as a feed ingredient for fish culture: Status and trends. Aquaculture and Fisheries. 10.1016/j.aaf.2021.10.004

Britz, P.J. &Pienaar, A.G. 2012. Laboratory experiments on the effect of light and cover on the behaviour and growth of African catfish, Clariasgariepinus (Pisces: Clariidae). Journal of Zoology 227: 43-62.

Chepkwemoi P, Bwanika GN, Kwetegyek J, Mbahizireki G, Ndawula L and Izaara AA. (2013). Fatty Acid Profiles and Growth of African Catfish Larvae Fed on Freshwater Cyclopoid Copepods and Artemia as Live Starter Feed. International Journal of Aquaculture. 3(22):126- 132.

Dabbou, S., Gai, F., Capucchio, M.T., Biasibetti, E., Dezzutto, D., Meneguz, M., Placha, I., Gasco, L. and Schiavone, A. (2018). Black soldier fly defatted meal as a dietary protein source for broiler chickens. Journal of Animal science and Biotechnology. 9(49)

Faruk, M. H., Zarau, I. J., Bello, A. U. and Shinkafi, N. S. (2019). Growth Response and Survival of *Clariasgariepinus* Fry Fed Different Starter Diets. *International Journal of Agriculture, Forestry and Fisheries*. 7 (1): 1-4.

Girri, S.S., Saboo, S.K.,SHU,B.B, Sahu, A.K.,Mohanty,S.N., Mohanty,P.K. and Ayyapan, S., (2002). Larval survival and growth in *Wallago attu:* Effect of light, photoperiod and feeding regimes. Aquaculture, 213:157-161

Jian GQ. (2008). Larval fish Nutrition and rearing technologies: State of the Art and future. In: Stephen H. S (Eds). Aquaculture Research trends. 3:113-148.

Kurniawan, A., Kurniawan, A., Fakhrurrozi, Y., Mustikasari, D., Setiawan, J., Kartika R. N., Widhyanti, F., Sartili A. M., Arezki, T., Triswiyana, I. and Apriliazmi, I. (2018). Cempedik: Fish entity in Belitung Island. SamudraBiru Publishing. Yogyakarta. Indonesia. 237 p

Macwan, S, De Souza, S.P., Dunshea, F.R., DiGiacomo, K and Suleria, A.R.(2024). Black soldier fly larvae (Hermetica illucens) as a sustainable source of nutritive and bioactive compounds, and their consumption challenges. Animal Production Science. 64,doi:10.1071/AN23192

Mustapha, M. K., Oladokun, T. T., Salman, M. M., Adeniyi, I. A. and Ojo, D. (2014) Does light duration (photoperiod) have an effect on the mortality and welfare of cultured *Oreochromisniloticus* and *Clariasgariepinus*? *Turkish Journal of Zoology* 38: 1-5.

Navarro N and Sarasquete C. (2008). Use of freeze-dried microalgae for rearing gilthead seabream, Sparusaurata, larvae. I. Growth, histology and water quality. Aquaculture. 167:179-193.

Ostaszewska T, Wegner A and Wegiel M. (2003). Development of the digestive tract of Ide, leuciscusidus (L). During the larvae stage. Archives of polish fisheries. 11:79-92

Tibbetts S.M. and Lall S.P. (2013). Effect of dietary inclusion of Atlantic snow crab, *Chionoecetesopilio* and Northern pink shrimp (*Pandalis borealis*) processing by-products on nutrient digestibility by juvenile haddock (*Melanogrammusaeglefinus*). *Animal Feed Science & Technology*, 182 (1-4), 126-130.

Woke, G. N. and Nweke, M. N. (2022) Comparative Feeding Effects of Maggot Meal and Coppens Feed on the Growth Rate and Survival of the African Catfish (*Clariasgariepinus*). *European Journal of Biology and Medical Science Research.* 10(4): 57-66

ANIFS 2024
© 2024
***Proceedings of the Fifth Conference of Association of Nigerian Fisheries Scientists.* "SUSTAINABLE FISHERIES AND AQUACULTURE PRODUCTION FOR ENHANCING LIVELIHOOD IN NIGERIAN ECONOMIC DEVELOPMENT"**
9TH – 11TH JULY, 2024 in the University of Lagos, Lagos, Nigeria