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EFFECTS OF *ARTEMIA NAUPLII* AND FORMULATED DIET ON GROWTH AND SURVIVAL OF LARVAE AND POST LARVAE OF *CLARIAS GARIEPINUS*(L).

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ABSTRACT

The growth and survival of larvae and post larvae of *Clarias gariepinus* fed Artemia nauplii and formulated diet were investigated for a period of 50 days. A total of 2000 *Clarias gariepinus* larvae (mean weight 0.001 g) were randomly stocked into four tanks, with replicates, and fed on the 4th to 25th day after hatching with *A. nauplii.* They were fed 0.25% and 0.5% of their body weight with *A.nauplii.* Post larvae of *C.gariepinus* were fed from the 26th to the 50th day with 0.25% and 0.5% of formulated diet. The specific growth rate, survival, condition factor and mortality were calculated. Results indicated that there was increase in body weight; the mean was 0.042g for larvae fed 0.25 % and 0.057g for larvae fed with 0.5% of body weight respectively. Survival rate was high (95%). The specific growth rate was 6.41 % ± 1.59 for post larvae fed 0.25% and 9.35% ± 0.049 for post larval stage fed 0.5% of formulated diet. Specific growth rate was higher in larvae than post larvae. *A.nauplii* was a good starter live food for the larvae of *C.gariepinus.* By gradual replacement of *A.nauplii, C.gariepinus larvae* can be successfully weaned to formulated diet.

Key words: Live food, specific growth rate, mortality and cost.

INTRODUCTION

Culture fishery is in the increase in Nigeria, but the industry is faced with the challenge of sufficient fry production. Most of the fish farmers are not conversant with the technique of artificial spawning and larvae rearing until they become fingerling. The major challenge is the feed of the larvae after the yolk is exhausted. Some researchers have investigated the effects of some live feed on some fish species notable among them are: (Mohler JW et al,2000, Oyero JO et al, 2009, Okunsebor SA and Ayuma V, 2011).

Food and Agriculture Organization reported that fish supplies have dropped from about 17kilogram per capita in the 1970s to less than seven kilogram per capita in 2006 for most African countries (Mkoka C, 2011) .This indicates that the protein intake is low in Africa since supply of fish which is the major source of protein is on the decline. There is need to boost supply through culture fisheries, but fingerling should be readily available for stocking of the various culture systems. The fish that is widely cultured in Nigeria is *Clarias* species and is acceptable among consumers.

Clarias gariepinus belongs to the group of fishes that their larval stage is referred to as altricial .These are larvae when the yolk sac is exhausted, remain in a relatively underdeveloped state. The digestive system is rudimentary, lacking a stomach and much of the protein digestion takes place in hindgut epithelial cells (Govoni JJ et al, 1986).Such a digestive system seem (at this point) to be incapable of processing

formulated diet in a manner that allows survival and growth.

However, growth and survival of fry were enhanced when they were fed with live feed. Some of the advantages of using live feed are that they are able to swim in the water column and are thus constantly available to the larvae. In addition the movement of the live feed in the water is likely to stimulate larval feeding responses (Stattrup JG and McEvoy L ,2003) .

Some of the researcher that have investigated the effects of live feed on the growth of fry include: first feeding fry reared at 18.5fish/L and offered supplemental *A. nauplii* were similar in size to those reared at the same density which received a normal ration after 26days (Mohler JW et al, 2000).

Moina micrara was used as a starter feed for *Hetroclarias* sp. hatchlings and it was observed that the hatchling survived with Moina as a starter feed (Okunsebor SA and Ayuma V,2011). In larval Zebra fish fed live feed two to three weeks after hatching the result indicated that live feed performed better than processed diet(Goalish EM et al,2011). Fish larvae lack feeding appendages, any food must pass into the mouth whole. Feed that will ensure survival of larvae after utilizing the yolk in the egg is needed. In Nigeria high mortality is being recorded after successful artificial spawning because of little or no information on a suitable diet that will ensure larval survival and reduce wastage of resources expended during artificial spawning.

Furthermore, formulated diets tend to aggregate on the water surface, and sink to the bottom, and are less available to the larvae than the live feed. Formulated diet is capable of moving only in a downward direction towards the bottom. It is pertinent that formulated diet is introduced at a stage during development when it would be consumed by the young larvae.

The process of gradually introducing formulated feed to the post larvae of *C. gariepinus* before they attain fingerling size were also investigated. A total of 5000 *Acipenser persicus* larvae mean weight 0.406 ±0.047g were fed with formulated diets in form of paste, pellet paste, and *Chironomid* larvae, and control feed comprising Daphnia, and *Chironomid* larvae, and there was significant difference with feed (Shakourian M et al, 2011). Highest body weight of 2.51g was gained with paste, and *Chironomid* larvae, they gradually replaced live food of Persian sturgeon larvae with formulated diet(Shakourian M et al, 2011). *Artemia* was enriched with fatty acids, and vitamin C, and fed to fish and results showed that it improved growth in fish (Noori F et al,2011) .

Fish culturing should be encouraged in Nigeria, because fish is a good source of protein, vitamins and minerals. Fish culturing provides income and helps to alleviate poverty. There is paucity of knowledge on a good starter live food that would enhance the survival, and prevent mortality of the larvae of *C.gariepinus*. The objectives of this research are: To investigate the effects of *A.nauplii* on the growth and survival of larvae of *Clarias gariepinus;* to establish the period during growth when the post larvae could be weaned of *A. nauplii,* and fed formulated diet; to elucidate the effects of formulated diet on specific growth rate, condition factor, mortality and survival of post larvae of *C. gariepinus* in experimental tanks. It is hoped that this would fill the gap in knowledge about feeding of larvae and post larvae of *C. gariepinus* to ensure survival of larvae and post larvae considering the cost of artificial spawning.

MATERIALS AND METHODS

C. gariepinus female was injected with1ml/kg of body weight of ovaprim, after 12hours, the female was stripped. The eggs were fertilized with milt collected from male *C. gariepinus*.

The fertilized eggs were placed on kakaban in different experimental tanks containing water. And temperature was 24^0 C

Hatching

Hatching occurred 18hours after fertilization. The hatched larvae stuck to egg shell, and the fry stayed attached to the shell for 3days before they freed themselves from the yolk and started swimming about in water.

Feeding of larvae

Feeding of the hatched larvae with *A. nauplii* commenced on the fourth day after hatching.2000 larvae were placed in four tanks, with replicates and were fed 0.25% and 0.5% of *A. nauplii* for 25 days.

Water temperature, pH, dissolved oxygen content of the water were recorded.

The following growth parameters were calculated:

$$\text{Specific growth rate (SGR) \%} = \frac{\log_e W_t - \log_e W_o \times 100}{\text{Time (days)}}$$

Where W_0, is the average initial weight at the beginning of the experiment, W_t, is the average final weight at the end of the experiment, and time is the total number of days the experiment was carried out.

$$\text{Survival (S) \%} = \frac{N_1 \times 100}{N_0}$$

Where N_0 = Initial number and N_1= Final number at the end of the experiment

$$\text{Mortality (M) \%} \quad \frac{N_0 - N_1 \times 100}{N_0}$$

Where N_0 = Initial number and N_1= Final number at the end of the experiment

$$\text{Condition factor (K)} = 100w / L^3$$

Where W=weight, L= length

Feeding of post larvae

2000 post larvae of *C. gariepinus* mean weight 0.047g ±0.013 which were used in the first experiment were stocked in two experimental tanks, each with a replicate, and fed 0.25%,and 0.5% formulated diet for 25days respectively. The feed were broadcasted on water. The specific growth rate, mortality, survival, and condition factor were calculated using the formulae already stated above. The physico- chemical parameters were measured during the experiment.

RESULTS

A .nauplii served as an excellent live feed for larvae of *C. gariepinus.* The initial weight of the fish was 0.001g, and the length was 0.732cm, after 25 days of the experiment, there was increase in length, and it varied from 1.33cm to 1.54cm (mean = 1.43cm), the body weight also increased, range was 0.036 – 0.046g with the mean = 0.042g for larvae fed 0.25% of body weight. In fish that were fed 0.5% of body weight the length fluctuated from 1.73cm to 2.11cm (mean = 1.88cm), and the weight were 0.036 to 0.066g (mean = 0.057g).

The specific growth rate is shown in Table 1. Larvae that were fed 0.5% *A. nauplii* had specific growth rate of 16.9% while fry fed 0.25% *A. nauplii* had specific growth rate of 15.4%. There was no statistical significant difference ($P > 0.05$) in the growth rates of larvae in the two treatments

The condition factor observed in the two treatments were high the range was 28.2 – 33.3and the mean was 31.1 ± 2.61 at 0.25% A. *nauplii* was increased to 0. 5% and the condition factor range was 27.7 – 30.7 and the mean value was 29.5 in fry that were fed with 0.25% of *A. nauplii.*

Survival rate of the larvae was 95%, and there was little mortality recorded during the 25days that *A. nauplii* were used in feeding the larvae (Table 1).

Table 1: ***Specific Growth Rate, Condition factor, Mortality and Survival of C.gariepinus larvae fed Artemia nauplii***

Growth parameters	Treatment A			Treatment B		
	Range	Mean	S.D	Range	Mean	S.D
Specific Growth Rate (SGR) %	14.8-15.9	15.4	0.59	16.1-17.3	16.9	0.74
Condition Factor K	27.7-30.7	29.5	1.63	28.2-33.3	31.1	2.63
Mortality %	5.0			5.0		
Survival %	95.0			95.0		

Number of fish in each treatment = 1000 larvae
Treatment A = Fish larvae were fed O.25% *Artemia nauplii*
Treatment B = fish larvae were fed 0.5% *Artemia nauplii*

The physico–chemical parameters were within tolerable range for the larvae, the water temperature range was 24 to 26^{o} C, pH range was 7.11-7.33 and dissolved oxygen content was 5.42- 5.84mg/L^{3}.

Post larvae fed formulated diet

The results obtained after feeding the post larvae for 25 days is shown in Table 2. The final weight range was 0.187 -0.818g, mean weight gained was 0.375g± 0.241.

The specific growth rate was 6.41 % ± 1.59 for post larvae fed 0.25% of formulated diet while the specific growth rate was 9.35% ± 0.0491 for post larval stage fed 0.5% of formulated diet(Table 2).The statistical result indicated that the growth rate fluctuated with the quantity of food ($P < 0.05$).

The condition factor was 8.48±1.91 for post larvae fed 0.25%, and 6.49± 2.21for post larvae fed 0.5% of formulated feed respectively. The statistical test for significant difference showed that larvae had higher condition factor than the post larvae. P< 0.05%.

The specific growth rate of larvae, and post larvae were compared statistically, and the result showed that the growth rate of larvae was higher than growth rate of post larvae ($P < 0 .05$) .

Mortality was observed when formulated diet was introduced about 10% died, and about 90% survived and grew to fingerling stage

Table 2: ***Specific Growth Rate, Condition factor, Mortality and Survival of C. gariepinus Post Larvae fed Formulated Diet.***

Growth parameters	Treatment A			Treatment B		
	Range	Mean	S.D	Range	Mean	S.D
Specific Growth Rate (SGR) %	3.71-7.72	6.41	1.58	8.78-9.55	9.35	0.495
Condition Factor K	6.45-11.9	8.48	1.91	4.48-8.48	6.49	2.21
Mortality %	10 .4%			10.4%		
Survival %	90.2%			89.6%		

Number of fish in each treatment = 475 fry and replicate = 950 fry
Treatment A. = 0.25% formulated feed
Treatment B. = 0.5% formulated diet

The physico–chemical parameters were within tolerable range for the post larvae, water temperature varied from 24 to 26^{o} C, pH range was 7.1-7.3, and dissolved oxygen content was 5.2- 5.6mg/L^{3} .

DISCUSSION

The results indicated that *A. nauplii* increased growth and survival of fry of *C. gariepinus* both at 0.25% and 0.5% treatments respectively. Specific growth rate was higher at 0. 5%(17.1%) and the fry also had higher condition factor value(31 .1) when the fry were fed 0.5% of *A. nauplii.* Mortality was low during the period that *A. nauplii* was used as the starter diet. The result indicates that survival rate was very high during the first 25 days of the experiment. *A. nauplii* was a good source of nutrient for the fry of *C. gariepinus*. *A. nauplii* did not pollute the water, the water remained transparent throughout the period of the experiment.This result is in line with the result of previous study (Mohler JW et al, 2000). They observed 22.8% specific growth rate in Atlantic sturgeon fed *Artemia* as starter feed. In the present work the specific growth rate of 17.1% was obtained, the difference may be due to different fish species studied. Fish larvae fed *Artemia* for 12days used *Artemia* more efficiently than artificial feed (Mohler JW,2000). In the present work similar result was obtained

The mean final weight obtained for the post larvae were 0.445g. *Acipenser persicus* larvae had a higher value body weight of 2.5g (Shakourian M et al, 2011). The difference in growth may be attributed to fish species. The specific growth rate was higher in larval stage than post larval stage. This may be as a result of change from the live feed to the formulated feed. Formulated feed sank to the bottom, and was not readily available to the post larvae. Higher mortality was recorded after the introduction of the formulated diet to the post larvae this may be as a result of the post larvae not being able to use the formulated diet efficiently. Survival was about 90% after the introduction of formulated diet.

This study corroborate the findings of the previous researchers that *A. nauplii*, enhanced the chances of survival of the larvae because it is a live feed that moves about in the water column and the larvae were attracted to the food. Another reason to consider in favour of the use of *Artemia* is the cost of fry production using artificial spawning and the cost of purchasing brooder fishes. It may be better to use live feed that will ensure survival and growth of the larvae after a lot of money has been invested in procurement of brooders. This study recommends the use of *Artemia* as the starter food for larvae of *C.. gariepinus* because survival of larvae was high. This reduced wastage of resources considering the cost of acquisition of broodstock. Secondly, by gradual replacement of life food after 25 days, post larvae of *C.gariepinus* could be cultured successfully to accept formulated diet.

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