The response of *Clarias gariepinus* fingerlings (Burchell 1822) to the diet containing Housefly maggot (*Musca domestica*) (L)

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Abstract

Ten Fingerlings each of *Clarias gariepinus* were fed with five experimental diets compounded with major nutrient sources with varying percentages of protein obtained from housefly *Musca domestica* maggot meal (HFMM) at 0%, 12.5%, 50% and 100% inclusion in diets I, II, III, and IV respectively. Diet V was made up of HFMM only. The effect of the varying protein content on the growth and development of the fingerlings were studied for 8 weeks. The best feed conversion ratio was observed in diet II (25% maggot inclusion) while the least was in diet V (whole maggot). Feed utilization was highest in diet I (0% maggot). Fish fed on diet I recorded the highest growth rate (SGR) and was least in fish fed on diet V (whole maggot). Also, the highest protein efficiency ratio (PER) was recorded in fish fed on diet III and least in fish fed with diet V. Proximate analysis of fish fed on the different diets revealed that crude protein was least in fish without experimental diet (70.05%) and highest in fish fed with whole maggot (diet V) 76.31%. The ash content of fish carcass composition before and after feed trial did not follow a definite pattern. The results of the study showed that the survival and the development of fingerlings were best when maggot was used as supplement.

Keywords: Fish, maggot, and feed.

Introduction.

Insects provide a significant protein source for insectivores with values ranging from 34% in wax moth larvae to 80% of dry matter in cockroach and dragonfly (Diererdied 1993). Houseflies *Musca domestica* are known to be agents of biodegradations. The larva has the ability to utilize organic waste materials such as manure to produce animal protein (Falaye 1992). Bondari and Shepherd (1981) showed that 1-2 tonnes of maggot could be produced in a month in 20,000 hectare of poultry droppings. Little effort and money are required to harvest and process maggots, this makes it a lot cheaper than fishmeal. Lovell (1989) had earlier observed that amino acid of maggots is of high

biological value. Live maggots have also been used successfully to feed *Clarias gariepinus* fingerlings without detrimental effect on the performance and nutrient retention (Ugwumba and Abumoye, 1998; Faturoti *et al.*, 1998). This present study is therefore aimed at investigating the contribution of housefly maggot as an alternate source of protein in the diet of *Clarias gariepinus* and its effect on the growth performance and nutrient utilization.

Materials and Methods

A total of 100 *Clarias gariepinus* fingerlings used in this study were purchased from Ogun State Ministry of Agriculture and Natural Resources, Fishery Department, Odeda,

Abeokuta. Fingerlings were acclimatized in ten 40 litres plastic bowls for seven days prior to commencement of the experiment.

Ten plastic bowls of 40 litres capacity each used for the experiment, prior to stocking were washed and filled with water up to 30 litres in each bowl and placed in a well ventilated place in the Biology Laboratory of the University of Agriculture, Abeokuta.

The plastic bowls were supplied with dechlorinated tap water with pH 7.10 - 7.20 and temperature 26.7°C - 27.4°C. Fresh cow dung were collected from an Abattoir in Obantoko, Abeokuta and buried in already dug pit on a farm site at Asero, the cow dung was moistened with water to prevent drying and exposed for a day or two to allow house flies lay eggs on it

and thereafter covered with mosquito net. The medium was left for between 3-7 days to allow laid eggs metamorphose to larvae before harvesting on the 7th day. As a form of control, some of the emerging larvae were raised to adult to ensure that the maggots are of houseflies.

Harvested larvae were parboiled for about ten minutes and then rinsed several times with water to wash off dirt and later sun dried for seven days and milled. The milled harvested larvae were then added to the experimental diets.

Five experimental diets were used, four of these were compounded with major nutrient sources with varying percentage of protein source from the housefly maggots and the fifth diet was strictly made up of maggots (Table 1).

Table 1: Proximate and Percentage Composition of Experimental Diets

Ingredient	0%	12.5%	25%	50%	100%
Maize	34.00	34.00	34.00	34.00	-
Brewers waste	10.00	10.00	10.00	10.00	-
Vitamin premix	2.00	2.00	2.00	2.00	-
Bone meal	4.00	4.00	4.00	4.00	-
Fish meal	10.50	7.93	5.20	-	-
Soya bean meal	39.50	29.57	19.80	-	-
Maggot	-	12.50	25.00	50.00	100.00
Total	100.00	100.00	100.00	100.00	100.00
Determined Proximate Components.					
Moisture (%)	12.37	10.99	11.89	9.52	10.45
Crude Protein	46.70	40.75	43.40	42.82	39.97
Ash (%)	12.85	13.05	12.60	13.00	13.10

The major sources of protein in ration for diets I-IV constituted 50%. The housefly maggots meal (HFMM) was used at 12.50% 50% and 0% inclusion in diet I, II, III and IV respectively. Diet V was made up of HFMM only. A total number of ten fingerlings were stocked in each bowl. The fingerlings were fed with equal weight of the different experimental diets and were fed twice daily-morning and evening. The feeding trial for each diet was replicated. Debris was removed from the experimental bowls daily by gently removing the fish with the aid of a ten litre plastic bowl, the fish is then quickly transferred into another plastic bowl containing fresh water. The water containing the debris is then carefully drained off the bowl, washed and filled with fresh water. Water temperature was obtained daily using an ordinary mercury thermometer dipped in each of the bowls for about 3 minutes before it is quickly read off. Mean pH was determined by the use of a pH meter (model 3015).

The length of individual fingerlings was measured quickly in centimeters using a meter rule; the average length for each bowl is then calculated. Weights of the fish in each bowl were measured in grammes with the use of a sensitive scale (Mettler Model AE 240). Average weight for each bowl was also determined. The length and weight measurement were taken weekly for 8 weeks, mean weight gain (MWG), food intake (FI), feed conversion ratio (FCR), specific growth rate (SGR), and protein efficiency ratio (PER) were also determined. Mortality was monitored daily and dead fish removed. The feeding trial lasted 56 days.

Proximate analysis was carried out for crude protein, moisture content and Ash content on the experimental fish after the completion of the experiments.

The data obtained from the trials were analyzed statistically using Analysis of variance (ANOVA). Level of significance was determined for all growth and nutrient parameters.

Results

The mean weekly length gain of the fingerlings on the various diet formulations is presented in Fig.1. The total increase in mean length was highest in fingerlings fed on diet I with average length increase of 2.82 ± 0.11 cm and lowest in fingerlings fed on diet V with average length of 0.94 ± 0.08 cm. The weekly weight gain was highest in fish fed on diets I and III with mean weight gain of 3.90 ± 0.28 g and 2.66 ± 0.12 g respectively. The lowest mean weight was recorded in diet V with 1.33 ± 0.05 g (Fig.2). Analysis of the data showed that there was no significant difference among the mean length recorded for the different diets ($P > 0.05$). However, there was a significant difference between mean weight recorded for the diets ($P < 0.05$).

Figure 1: Weekly mean length gain of *C. gariepinus* fingerlings fed on experimental diets

Figure 2: Weekly mean weight gain of *C. gariepinus* fingerlings fed on experimental diets

indicates that 1.12 ± 0.06 of it, was utilized to give a product fish weight of 1g. The worst FCR was observed in fish fed diet V with FCR 3.37 ± 0.16 . The mean specific growth rate is shown on Table 2. The highest specific growth rate was recorded in fish fed diet I (1.65 ± 0.09) followed by diets IV, III and II with specific growth rate 1.12 ± 0.08 , 0.96 ± 0.06 , and 0.77 ± 0.04 , respectively. The lowest was obtained in diet V with SGR value of 0.64 ± 0.02 . In all, there was no significant difference between the specific growth rates recorded for the diets ($P > 0.05$). The highest protein efficiency ratio (PER) was observed in fish fed on diet III with mean value of 2.05 ± 0.19 and the lowest in diet V with 0.98 ± 0.07 , (Table 2).

The best-feed conversion ratio (Table 2) was observed in diet III with FCR (1.12), which

Table 2 Mean growth response and nutrient utilization of *Clarias gariepinus* fingerlings

Dietary level of (HFMM) %	Average Wt. Gain	Average Length gain	Average Feed intake	Feed Conversion ratio	Protein efficiency ratio	Specific growth ratio	% fish mortality
0.0	$3.90^a \pm 0.28$	$2.82^a \pm 0.11$	$4.57^a \pm 0.18$	$1.17^a \pm 0.08$	$1.83^b \pm 0.18$	$1.65^a \pm 0.09$	15
12.5	$1.54^c \pm 0.06$	$1.77^a \pm 0.11$	$3.53^b \pm 0.19$	$1.19^a \pm 0.09$	$1.07^c \pm 0.09$	$0.77^a \pm 0.04$	10
25.0	$2.66^b \pm 0.12$	$2.36^a \pm 0.13$	$3.00^c \pm 0.15$	$1.12^a \pm 0.06$	$2.05^a \pm 0.19$	$0.96^a \pm 0.06$	15
50.0	$2.55^b \pm 0.09$	$1.21^a \pm 0.09$	$3.49^b \pm 0.18$	$1.38^a \pm 0.11$	$1.69^b \pm 0.16$	$1.12^a \pm 0.08$	10
100.0	$1.33^c \pm 0.15$	$0.94^a \pm 0.08$	$3.37^d \pm 0.16$	$3.37^b \pm 0.22$	$0.98^c \pm 0.07$	$0.64^b \pm 0.02$	05

*Mean values in the same column followed by the same superscripts are not significantly different at ($P > 0.05$).

Mortality was only observed during the first week and early in the second week of the experiment. The highest mortality was recorded in the fish fed with diets III and I with 3 deaths each and least in diets V with just only one. The highest moisture content (12.37%) was recorded in diet I while the least (9.52%) was in diet IV (Table 2). The crude protein was lowest (39.97%) in diet V and highest in diet I

(46.70%). The ash content was highest in diet II with values 13.05% and diets V, IV, I and III with values 13.10%, 13.00%, 12.85% and 12.60% respectively (Table 2).

Proximate analysis of fish fed on the different diets is on Table 3. The crude protein was lowest in fish with no experimental diet (70.05) and the highest recorded in fish fed on diet V (whole maggot) 76.31 (Table 3). The ash

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content of fish carcass composition before and after feed trial was observed not to follow a definite pattern. Fish fed on diets II, III, IV, I

and V recorded 3.48%, 4.15%, 5.27%, 3.16% and 5.94% respectively, while the initial fish without experimental diet recorded 5.81%.

Table 3: Proximate composition of fish carcass before and after feeding trial.

Dietary level of (HFMM)%	Moisture content %	Crude protein %	Ash content %
0.0	72.03	72.17	3.16
12.5	78.82	72.12	3.48
25.0	79.82	73.00	4.15
50.0	77.49	73.55	5.27
100.0	77.63	76.31	5.94

Discussion

Results from the present studies reveals that housefly larvae are well utilized when used as a source of protein in fish feed. This result corroborates previous observations by Lubzens *et al.*, (1984) and Alegbeleye *et al.*, (1991). Animal based feed are known to contribute significantly in digestion of food by supplying amino acids and also increase the efficiency of artificial feed when incorporated in normal proportion (Lubzens *et al.*, 1984). It is therefore remarkable to note that in this study fingerlings with higher dietary maggot inclusion (diets IV and V) converted their food better than those with lower maggot and no maggot inclusion (diets I and II).

A good nutritive value in terms of growth rate and feed conversion was not demonstrated by the experimental diets because of the absence of some basic nutrients supplying feed stuffs e.g. vitamin premix, maize, brewer's waste and bone meal. The mortality recorded at the initial stage of the experiment was not associated with feed qualities but rather as a process of acclimatization, as deaths were not recorded after the second week. This observation is in agreement with previous reports that fly larvae reduce mortality, thereby increasing survival rate of early stages of fish (Ugwumba and Abumoye, 1998).

The use of fly larvae in feeding fish appears to be a cheaper means of reducing the population of adult housefly *Musca domestica*, thereby reducing the risk of disease transmission on the

part of the insect vector. This study has demonstrated that the larvae of housefly can be used to promote the growth of fish and also utilization of maggot as a feed could serve as a means of reducing the population of adult *Musca domestica* which in turn gives rich source of dietary protein to the fish.

Acknowledgement

The authors are grateful to Mr. K. Bankole for giving the technical assistance and Dr. O. Omoniyi and Mr. W. O. Alegbeleye for support and encouragement.

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(Received 9 August 2001; Accepted 27 April 2002)