Effect Of Mold Infested Feeds On The Growth And Survival Of *Heterobranchus longifilis* Fingerlings

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ABSTRACT

The effect of mould infested feeds on the growth and survival of *Heterobranchus longifilis* fingerlings in aquaria tanks system was studied. *Heterobranchus longifilis* fingerlings (0.90g ±0.01) were fed with three nitrogenous feeds (25.86%, 45.03% and 30.67%crude proteins). The feeds were I (mold infested feeds), II (mold non-infested feeds), and III (50% mixture of mold infested and non-infested feeds). The fish were fed to satiation at 5% body weight twice per day for 6 weeks (42 days) and the fish growth parameters measured. There was an increase in mean weight gain (MWG) of non-mold infested feeds under treatment II. The fish fed the non-mold infested feed (45.03%CP) under treatment II were observed to have the best mean final weight of 1.38g; best mean weight gain of 0.51g; best mean daily weight of 0.012g/day; best specific growth rate of 0.93% per day and best mean survival rate of 70% respectively and the best feed conversion ratio (FCR) of 5.49. There was a significant difference ($P<0.05$) in the mean weight gain and feed conversion ratio of the fish between the feeds. [Report and Opinion. 2009;1(3):9-14]. (ISSN: 1553-9873).

Key words: mold infested feeds, growth and survival, *Heterobranchus longifilis*, aquaria tanks.

INTRODUCTION

The activities of insects, microorganisms and animals as well as improper handling, physical and chemical changes due to change in temperature and humidity pose serious problem of deterioration in stored fish feeds. Although, these activities are inter-related, the effect of microbial activities in stored feeds is by far the most detrimental. Mold infestation in stored feeds reduces nutritional value owing to the loss of dietary lipids, amino acids and vitamins by enzymatic digestion (Jones, 1987;Lim et al., 2008). It may also assist in the development of lipid ketonic rancidity and non-enzymatic browning (Cockerel *et. al*, 1971). In addition, Chow (1980) reported that mold infestation also produce poorer flavour and appearance making feed lumps and less palatable (Chow, 1980)

Adventitious storage fungi grow at moisture content of about 20 percent in equilibrium with a relative humidity of 70-90 percent and are considered the principal spoilers of feed in storage. When the relative humidity falls below 65 percent, no growth occurs (Chow, 1980; Effiong, 1997). Under favourable conditions, fungi can raise the temperature in their immediate environment to 55°C with concomitant increase in moisture content of the affected feed to as much as 20%, when this occurs; secondary spoilage by bacteria takes place. The most common fungi involved in the spoilage of feeds belong to the *Aspergillus* species and *Penicillium* species. They are most destructive when temperature exceeds 25°C and relative humidity exceeds 85 percent.

The choice of *Heterobranchus longifilis* is necessary in this study because of its remarkable fast growth rate. It is highly esteemed in Nigeria and command very high commercial value in our markets due to its ability to adapt readily to poor conditions, fast growth rate, acceptability and high conversion of artificial feeds, tolerance to crowded conditions and high quality of its flesh. (Madu and Olurebi, 1987;Ofor, 2001; Ayinla *et. al*., 1994).

Having considered the above facts, this study was carried out therefore; to assess the effect of mold infested feeds on the growth and survival of *Heterobranchus longifilis* fingerlings.

MATERIALS AND METHODS

Experimental Site

The study was carried out in the Fish Processing Laboratory of the Federal College of Freshwater Fisheries Technology, New Bussa, Nigeria.

Experimental System and Fish

The feeding trial was conducted in glass aquaria ($30x30x60cm^3$). The glass aquaria tanks were properly washed and rinsed with clean water. They were filled with borehole water and aerated using air

pumps to ensure proper oxygenation and continual aeration. The experimental fish, *Heterobranchus longifilis* were procured from the genetic improvement laboratory of the National Institute for Freshwater Fisheries Research, New Bussa, Nigeria. They were acclimatized for three (3) days before the commencement of the experiment. This was done in order for the fingerlings to empty their stomach content and to force them to adjust to the new diet.

Diet Formulation and Preparation

Duckweed were harvested from the Green House of the National Institute for Freshwater Fisheries Technology, New Bussa and brought to the Federal College Freshwater Fisheries Technology feed mill where they were sun-dried for three (3) days before use and thereafter grounded into fine powder using the hammer mill. All the other feed ingredients were milled using locally fabricated hammer mill and sieved through a 595µm sieve to remove stones and dirt to ensure homogenous size profile before being analysed for proximate composition (Table 1).

Table 1: Proximate composition of feed ingredients

Feed ingredients	Crude protein (%)	Ether extract (%)	Crude fibre	Ash
Fish meal	67.70	4.10	1.31	14.80
Groundnut cake	40.60	23.90	6.00	4.52
Duckweed meal	45.50	4.00	8.00	13.40
Yellow maize meal	10.80	5.50	1.45	1.46

A 40% CP feed was formulated from yellow maize, fishmeal, groundnut cake and formulation was based on the proximate composition of the ingredients (Table 1). The diet was fortified with vitamin premix, and vegetable oil. The fishmeal was replaced by duckweed meal at 30% inclusion level. The feed was thoroughly mixed in a bowl and pelletized in an improvised Pelleting machine using 1% starch as binder.

Table 2: Percentage Composition (%) of the experimental feed

Ingredients	Percentage Composition (%)
Yellow maize	13.8
Fish meal	18.9
Duckweed meal	8.1
Groundnut cake	54.2
Vegetable oil	2.0
Vitamin premix	2.0
Starch	1.0
Total	**100.0**

Experimental Procedure

For the purpose of this study the formulated diet was divided into two portions designated feed 1 & 2. Feed I was kept until visible signs of moldiness while Feed II had no moldiness. The six aquaria tanks of 3 replicates were used as follows for the experiment. Feed 1: mold-infested feed, Feed II: non- mold infested feed and Feed III: 50% mixture of the mold infested and non-mold infested diets.

The fish, *Heterobranchus longifilis* fingerlings were randomly distributed at a stocking density of 20 fish per aquarium tank. They were fed at 5% body weight twice daily morning and afternoon at equal ration. Sampling was done weekly using a sensitive electronic balance (OHAS-LS-400g model) to determine the average weight of the fish and adjust the feed accordingly.

The experiment was run for 42 days all analyses for proximate composition were determined according to the methods of AOAC. (2000). Water temperature, dissolved oxygen and pH were monitored daily with a standardized mercury thermometer while dissolved oxygen concentration was determined using Jenway Automatic pH meter (Jenway 3015).

Measurement of growth parameters

The growth parameters were measured according to the methods described by Oleva- Novoa *et al.*, (1990). Mean weight gain (MWG) was calculated as the difference between the initial and final weight divided by the number of the surviving fish at the end of the culture period.

MWG = Final body weight – Initial body weight x 100

Number of surviving fish

Specific growth rate (SGR) (%/day): This is the relationship of the difference in the weight of the fish within the experimental period.

SGR = (In Wf – In Wo) x 100

Time

Feed conversion ratio (FCR) was determined by dividing the total weight of the food given by the total increase in weight gained by the fish over a period of time while feed intake (FI) was calculated as the addition of daily mean feed intake of the fish during the period. Average daily growth (ADG) was calculated as the difference between the final weight and the initial weight divided by the number of days i.e. the experimental period **ADG** = Final weight – Initial weight

Number of days

Statistical analysis

Data were subjected to analysis of variance (ANOVA) and Duncan's multiple range tests was used to compare differences among individual means (Duncan, 1955).

RESULTS AND DISCUSSION

Growth pattern of *Heterobranchus longifilis* fingerlings fed the experimental feeds for 42 days is presented in Table 1. During the period ~~of study, experimental fish accepted all the~~ feeds readily and appeared healthy. Fish survival was not very high in all the dietary treatment. It ranged from 30 to 70% (Table 3) and there were observable adverse effects of mold-infested feeds on the fish and water quality in the aquaria tanks. Fish mortality due to mold-infested treatment was high (Feed I). This could be attributed to the effect of the infestation on the nutrient content of the feed as well as the poor water quality, which was not within the recommended limits for Catfishes. (Boyd and Tucker (1998).

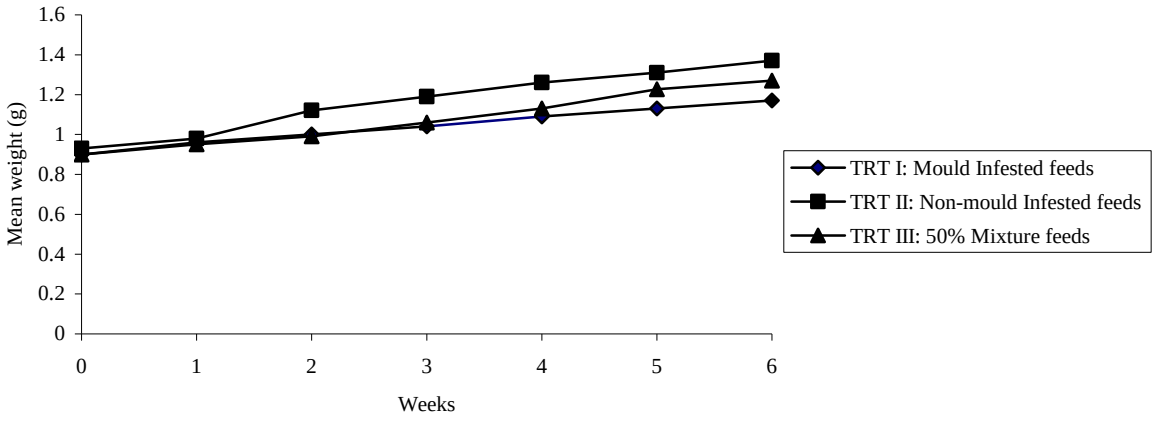

Figure 1: Growth pattern of *Heterobranchus longifilis* fingerlings fed the experimental feeds for 42 days

Russo and Yanong (2002) stated that species of *Aspergillus flavus* and *A. parasiticus* produced aflatoxins in feeds containing oilseed components such as soybean meal, groundnut cake, peanut meal and cottonseed oil. Such feeds when fed to fish usually results in poor growth performance high mortality rates.

Studies on the Nile tilapia, (*Orechromis niloticus*) showed reduced growth rates when fed diets containing 1.8mg of aflatoxin (AFB1) per one kilogram of feed for 75 days (Tuan et al., 2002). Jantrarotai and Lovell (1990) also reported that channel catfish fed mold infested feed for 10 weeks, exhibited decreased growth rates and moderate internal lesions. Although no visible lesions were observed on the experimental fish fed mold infested feed within the period of this experiment, it is possible that the poor growth and survival could be due to reduced nutritional value in the feed sample (Jones, 1987;Chow, 1980; Russo and Yanong, 2002).

Summary of results of *Heterobranchus longifilis* fingerlings fed different experimental diets for 42 days is presented in Table 3. The mean values of all the growth parameters among the treatment were significantly different ($P<0.05$). The fish fed the non-mold infested feed (45.03%CP, table 4) in treatment II were observed to have the best mean final weight of 1.38g; best mean weight gain of 0.51g; best mean daily weight of 0.012g/day; best specific growth rate of 0.93% per day and best mean survival rate of 70%. This could be attributed to the high nutrient content of the feed, with a high protein value (about 45%) (Hillman and Cully, 1978; Falaye, 1992). The fish fed the 50% mixture of mold infested and non-mold infested feeds (30.67%CP, table 4) in treatment III had 50% mean survival rate and was the second best to treatment II in all other growth parameters while fish in treatment I: mould infested feed (25.86%CP, table 4) was least (worst). Non-mold infested feed (treatment II) undoubtedly proved to be very reliable and efficient for the experimental fish as a result of the faster growth rate (0.012g/d) observed from the feed during this experiment. This result is very promising since a mean final weight of 1.38g per fish is quite an ideal size for commercial catfish fingerling production under a 6-week culture period.

The higher crude protein content of 45.03% of the non- mold infested feed compared to the 30.67% in the 50% mixture of mold infested and non-mold infested feeds, and then the 25.86% of the mold infested feed indicates the adverse effect of mold infestation on the nutritional value of the feed which in turn affected the growth and survival of the experimental fish.

Table 3: Summary of results of *Heterobranchus longifilis* fingerlings receiving different Experimental diets for 42 days

Treatments	Average Initial weight (g)	Average Final weight (g)	Average daily wt gain (g/day)	SGR (%/day)	FCR	Survival Rate
I: Mould infested Feed	0.91 0.90 0.89	1.19 1.16 1.15	0.01 0.01 0.01	0.64 0.60 0.61	7.64 8.27 6.80	35 25 30
	0.90	**1.17**	**0.01**	**0.62**	**7.57**	**30**
II: Non-mould infested feed	0.90 1.00 0.90	1.41 1.36 1.37	0.01 0.01 0.01	1.07 0.73 1.00	4.65 6.83 4.98	70 60 80
	0.93	**1.38**	**0.01**	**0.93**	**5.49**	**70**
III: 50% mixture feed	0.90 0.91 0.91	1.24 1.29 1.28	0.01 0.01 0.01	0.76 0.83 0.81	6.41 5.81 5.92	60 50 40
	0.91	**1.27**	**0.01**	**0.80**	**6.05**	**50**

The result of the proximate composition of the experimental feed is shown in Table 4. Mold infested feed contained the lowest amount of total nitrogen while non-mold infested feeds had the highest. The 50% mixture of mold infested and non-mold infested feeds contained 30.67%CP. The protein levels of the experimental feeds 111 and I are lower than that found in feed II. Effiong and Eyo (1999) reported low crude protein content in mold infested feed samples. Their findings is similar to that of this experiment

Table 4: Proximate Composition of the Experimental feeds (Dry matter basis)

Samples	Crude protein	Ether Extract	Crude Ash	Moisture content	Crude fibre
Mold infested feeds	25.86	7.08	10.52	8.11	6.74

Non-mold infested feeds	45.03	11.06	13.29	2.00	4.90
50% mixture of mold infested and non-mold infested feeds	30.67	8.89	11.90	2.80	4.50

CONCLUSION

This study was carried out to determine the effect of mold-infested feeds on the growth and survival of *Heterobranchus longifilis* fingerlings. The study was monitored for 42 days in glass aquaria tanks. Some physico-chemical parameters such as temperature, dissolved oxygen and pH were monitored and found to be within the tolerable range. The fish fed the non-mold infested feed (45.03%CP, table 4) in treatment II gave the highest mean weight gain (MWG); best specific growth rate (SGR) and feed conversion ratio (FCR). It could be concluded from the findings of this experiment that mold infested feeds have profound adverse effect on the growth and survival of *Heterobranchus longifilis* fingerlings.

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