Bioscience Research Communications
Vol. 13, No. 4, October 31, 2001
Printed in Nigeria

0795-8072/2001 $3.00 + 0.00

BRC 200068/13409

Growth performance of different sexes of *Oreochromis niloticus* fed with different feeds in Dadinkowa earthen ponds, Gombe State, Nigeria

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(Received July 5, 2000)

ABSTRACT: Growth performance of all-male, all-female and mixed population of *O. niloticus* as a member of the family Cichilidae was carried out. The weight of the stocked fingerlings ranged from 20 - 30g. Wheat bran, millet bran and rice bran were used in feeding the fish in the three groups respectively.

The best growth rates were recorded in the all-male groups. The all-male group fed wheat bran showed the highest mean growth (MGR) of 0.57g/day and food conversion ratio (FCR) of 0.33, as against the all-male fed on millet bran and rice bran with MGR of 0.47g/day, FCR of 0.44 and MGR of 0.36g/day and FCR of 0.45 respectively. There was no significant difference ($P > 0.05$) in MGR and FCR of the mixed population fed millet bran and rice bran. Also, there was no significant differences ($P > 0.05$) between the all females fed with wheat bran and millet bran, but there mean growth rate (MGR) of all-male fed with wheat bran and all-female fed on rice bran.

The results of the experiment shows that male *Oreochromis niloticus* attains the highest growth rate and best feed utilization that either the all-female or mixed population.

Key Words: Fish culture; Growth performance; Tilapia; *Oreochromis niloticus*.

Introduction

The main objective of fish culture is to get the highest fish yield of marketable size with the most economicl means possible. *Oreochromis niloticus* a Cichlid fish has a disadvantage of prolific reproduction in cultyre ponds. It attains sexual maturity in 2 - 3 months from fry stage. It can breed as often as once a month under favorable conditions. This results in the production of large numbers of small stunted and unmarketable fish which causes over-crowding in the pond. It therefore, becomes imparative to find ways of curbing or eliminating completely this unwanted reproduction.

The existing methods in use to salvage this problem include among others: Cage Culture (Coche, 1976), Irradiation (Nelson et. al. 1976). Combined stocking with piscivorous fish, (Swingle, 1960), Hybridization, (Allison and Mires, 1976) sex reversal, (Guerrero, 1975) and Monosex Culture (Bardach *et al*, 1972). Monosex Culture of Tilapia has long been recognised as one of the most satisfactory solutions to

overpopulation. (Brown and Van Someren, 1953). Many workers (Hickling, 1967; Pruginin, 1967; Shell, 1967; Bardach et. al. 1972) have observed that male Tilapia grow at a faster rate than females in culture and Frter and Iles (1972) confirmed this to be true.

Kirk (1972) in the recent review of Tilapia Culture, discussed Tilapia with special reference to those aspects of the physiology and breeding behaviour which were relevant to its culture in fresh and brackish waters. Details of husbandary techniques of Tilapia have been described in Bardach *et al*. (1972), Hust (1972) and on their Biology and Culture with particular reference to Africa by Balarin (1979).

Growth capacity and high production are the major economic characteristics for fish culture projects. This study was therefore carried out to determine the gowth responses of all-males, all-females and mixed population of *Oreochromis niloticus* using wheat bran, millet bran and rice bran, which are locally available in the study area as feeds.

Materials and Methods

Differentiation of Sexes

The distinctive features of the genitalia of male and female Tilapia as discribed by Maar *et al* (1996) was used in separating the males from the females using a fish sorting table.

Stocking of Fish Fingerings

All-male, all-females and the randomly selected mixed population of 20 - 30gm mean initial weight were stocked in 3 replicates and stocked in Dadinkowa earthen ponds of 50m² marked A1 - A3, B1 - B3, C1 - C3.

Stocking Density of 30,000 fish/ha, for all-male Tilapia, 10,000 Fish/ha, for all-female and 20,000 fish,ha for mixed population was used. Pond water quality parameters like temperature, turbidity, dissolved oxygen and pH were measured monthly following the standard methods as described in APHA (1980).

Feeding

Feeding of the stocked fish in the pond started immediately after stocking at established feeding spots. The fish were fed with wheat bran at 5% body weight once daily. Rice, wheat and millet brans were used for feeding the experimental fish. Proximate composition of the feed ingredients were determined. Weight and Length Measurement of the fish were taken forthnightly and the feed adjusted to the new body weight of the fish.

Pond Fertilization

Pond fertilization with cow dung (Organic Manure) was carried out in all the ponds at the rate of 10kg/50m² pond bi-weekly. This was done by broadcasting the fertilizer evenly on the ponds from various points of the dyke.

Mean Growth Rate

The mean growth rate (MGR) was computed using the method of Wayne and Davis (1977) as:

$$MGR = \frac{W_2 - W_1(100)}{0.5\ (W_1 + W_2)\ t} = \text{g/day.}$$

where: W_2 = Final Weight
W_1 = Initial Weight
T = Culture Period in days
0.5 = Constant.

Food Conversion ratio (FCR)

This was calculated using the formula:

$$\text{FCR} = \frac{\text{Dry Weight of Feed Fed}}{\text{Gain in Fish Weight.}}$$

Results and Discussion

Table 1 shows the growth performance of all-males, all-female and mixed - population of *O niloticus* fed on similar diets. There were significant differences ($P < 0.05$) between the mean growth rate of the all-male group, the mixed population, and the all-female. The best growth was recorded in the all-male fed on wheat bran feed with a mean growth rate (MGR) of 0.57/day followed by the all-male fed on millet bran with MGR of 0.47g/day and least MGR of 0.36g/day by the all-male fed on rice bran. This figures compares favourably with 0.75gm mean daily weight gain obtained by Okoye and Wonah (1992) under similar treatment in earthen ponds after 150 days culture period in a different ecological zone. This is also in line with an earlier result obtained by Bardach, Ryther and Mclarney, (1972) in which male Tilapia grow 2 - 3 times faster than the females.

The poor response to growth by the females could be attributed to the fact that they attained sexual maturity as pointed out by (Hickling, 1967). The all-male fed on wheat bran also shows the highest feed utilization.

The mixed - population showed the same pattern of growth except for those fed on millet bran where the all-female grew faster than the mixed population. The food conversion ratio (FCR) was also best in the all-male fed on wheat bran than those fed on millet bran and rice bran, but ironically, the FCR of the all-females were better than those of the mixed population. Though, that of mixed population fed on wheat bran was still better than those fed with either wheat bran or rice bran.

The faster growth of the all-male with higher feed utilization and low mortality as against those of the all-females is in line with the results obtained by Van Someran and White head (1959), in which they observed that male *O niloticus* grows faster than the females. The male growth superiority is considered to have a genetic basis (Fryer and Iles, 1972) due to sex chromosomes and their interaction with autosomes.

The fact that about 580 fry/fingerlings were recovered from the all-male amd all-females ponds at harvest shows some degrees of human error in the manual sexing. This was due to undifferentiated papillae of *O niloticus* fingerlings which were difficult to distinguish at a stocking size of 20 - 30gm.

Table II shows the summary of Physico-chemical parameters and they fall within the range reported by Huet (1975), Boyd (1976) as good for pond culture.

The data on phytoplankton and zooplankton abundance is presented in Table III. The Phytoplankton found in the ponds include various algae and diatoms. The Zooplankton found in the pond were dominated mainly by Copepods of the genus Diaptomus, Cyclops and Cladocerans of the genus Daphnia and Bosmina. Rotifers were also found to be present in the pond water. These result conform with the three major taxonomic groups of zooplankton that are commonly found in Nigerian waters (Ovie, *et al*. (1992).

It has been clearly shown from this experiment that all-males *O. niloticus* grew much bigger than the females given the same conditions. It is therefore advisable that for purposes of hetting table-sized fish within the shortest possible time, the culture of all-males *O niloticus* by fish farmers be encouraged. The disadvantages of this method of fish culture however include:- Stress caused to the fingerlings during sorting, labour intensiveness of the sorting exercise, wastage of female fish and 100% separation of sexes may not be achieved due to human error.

Works in this direction had also been reported by Okoye and Wonah 1992 and 1993 respectively, further - investigations should be continued along this line using high quality protein feed with the evaluation of the cost benefit analysis.

Table 1: Growth performance of all-males, all-females and mixed population of *Oreochromis niloticus* fed on similar diets.

Feed Type	Pond No.	Sex	Mean initial weight	Mean final weight	Mean weight gain (g)	Mean growth rate (g/day)	% Survival	Total feed given (kg)	Feed Conversion Ratio	Culture Period (days)
Wheat bran	A1	Male	24.0	230.0	206.0	0.57	94	70	0.33	360
	A2	Mixed	23.0	170.0	147.0	0.40	94	65	0.44	360
	A3	Female	25.0	150.0	125.0	0.34	77.5	45	0.36	360
Millet bran	B1	Male	28.6	198.6	170.0	0.47	98	75	0.44	360
	B2	Mixed	25.5	157.5	132.0	0.36	90	68	0.52	360
	B3	Female	27.0	162.0	135.0	0.38	77.5	50	0.37	360
Rice bran	C1	Male	25.5	157.5	132.0	0.36	74	50	0.45	360
	C2	Mixed	23.8	151.8	128.0	0.35	98	70	0.54	360
	C3	Female	23.0	123.0	100.0	0.27	70	40	0.40	360

Table 2: Mean values of physical and chemical characteristics of Dadinkowa pond water.

Pond No.	Mean Temp (^{O}C)	Range	Mean Transpa-rency	Range	Mean pH	Range	Mean D. O. (mg/l)	Range	Mean Pond Depth (m)	Range
A1	25.0	16 - 33	0.35	0.30 - 0.38	6.5	6.2 - 6.8	3.7	2.8 - 3.8	1.2	1.1 - 1.3
A2	27.0	16 - 34	0.32	0.31 - 0.41	6.7	6.4 - 6.7	3.9	3.0 - 4.0	1.4	1.3 - 1.4
A3	25.5	15 - 32	0.40	0.35 - 0.40	6.6	6.5 - 7.0	3.6	2.8 - 7.0	1.3	1.2 - 1.3
B1	26.0	16 - 33	0.30	0.28 - 0.38	6.8	6.8 - 7.2	4.0	2.9 - 4.0	1.3	1.0 - 1.2
B2	26.0	16 - 34	0.35	0.30 - 0.40	6.4	6.6 - 7.0	3.9	3.5 - 4.0	1.2	1.1 - 1.5
B3	26.0	15 - 32	0.38	0.31 - 0.38	6.6	6.5 - 7.2	3.4	3.0 - 3.5	1.3	1.1 - 1.6
C1	27.0	17 - 31	0.40	0.29 - 0.38	6.3	6.4 - 6.8	3.5	2.7 - 3.6	1.5	1.2 - 1.4
C2	24.0	16 - 32	0.32	0.30 - 0.37	6.8	6.0 - 8.0	3.8	2.9 - 4.2	1.2	1.3 - 1.5
C3	28.0	18 - 30	0.37	0.32 - 0.35	6.5	6.8 - 7.5	3.6	2.8 - 3.8	1.3	1.0 - 1.3

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