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Effect of Oral Treatment of Mibolerone on Sex Reversal of *Oreochromis mossambicus*

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Abstract - Sexually undifferentiated fry of *Oreochromis mossambicus* were fed diets containing 0, 1.25, 1.5, 1.75 and 2 ppm of mibolerone, a synthetic male hormone, for three weeks in net cages in a concrete tank. Control and hormone-treated fish were further reared for 108 days in net cages in an earthen pond to determine growth, survival and sex reversal. Results of the fry treatment showed that the hormone-treated fry had lower growth and survival than those of the controls. Subsequent growth and survival of the treated fish reared in net cages were better than those of the control. The high percentages of males in the hormone-treated fish indicated that sex reversal was achieved.

The sex reversal technique is applied in commercial hatcheries in the Philippines and other countries for the production of high percentages of males in the populations of tilapias which are prolific breeding fishes (Guerrero and Guerrero 1988). The technique involves the oral treatment of a synthetic male hormone to sexually undifferentiated fry for a period of three weeks to produce sex-reversed females (genetic females that have male phenotype). Tilapia populations with high percentages of males grow faster than populations with normal sex ratios (50:50) because of reduced breeding and the superior growth rate of males (Guerrero 1982).

The common synthetic male hormone used for sex reversal of tilapia is methyltestosterone at levels of 25 to 60 ppm in the diet.

Mibolerone, a new synthetic male hormone, has been found to be more potent than methyltestosterone for sex reversal of *Oreochromis aureus* (Torrans et al. 1989) and *O. niloticus* (Guerrero and Guerrero, in press).

Effective use of mibolerone for sex reversal of *O. mossambicus* and the common carp (*Cyprinus carpio*) has been reported by Nandeesha et al. (1990) and Das et al. (1990), respectively.

This study was done to determine the effectiveness of mibolerone for sex reversal of *O. mossambicus* with oral administration of the hormone.

Alcohol (90% ethanol) — hormone solutions containing 1.25, 1.5, 1.75 and 2 ppm of mibolerone (Cheque Drops, Upjohn Inc.) were prepared. Each solution was mixed thoroughly with the standard fry diet (35% crude protein) to prepare the experimental diets which were then air-dried to evaporate the alcohol prior to feeding. A control diet with only alcohol was prepared in the same manner.

Five batches of swim-up fry of *O. mossambicus* produced in an earthen breeding pond were stocked separately in fine-mesh net cages (0.5 x 0.5 x 0.4 m) in a concrete tank (5 x 1 x 0.4 m) with water depth of 0.3 m. The spacing between hapas was approximately 1 m. There were 800 fry in each batch. The fry were treated with each of the diets containing 0, 1.25, 1.5, 1.75 and 2 ppm of mibolerone (M). The feeding rates applied were 30% of fry biomass per day for the first week, 25% for the second week and 20% for the third week of treatment with four feedings per day. The high feeding rates were used to ensure consumption of the feed by the fry in the presence of natural food (e.g., algae) in the hapas. Excess feed (retained by the fine mesh) and natural food were siphoned out of the hapas every other day.

Following treatment, the different batches of fingerlings were stocked separately in 5 x 2 x 1 m net cages (5-mm mesh size) in a 200-m^2 earthen pond with water depth of 0.6 m. There were 250 fingerlings stocked in each cage. The fish were fed with a standard diet (70% fine rice bran and 30% fish meal) at 5% of body weight per day in two feedings. Fish growth, survival and percentage of males (determined by examination of the urogenital papilla and gonad) of the fish in each cage were measured after a rearing period of 108 days.

The results of fry treatment (Table 1) showed that the growth and survival of the controls were higher than those of the

Table 1. Growth and survival of control and mibolerone (M)-treated *O. mossambicus* fry[a] after 21 days in net cages.

Treatment	Mean Wt. (g)	% Survival
Control	0.21	81
M - 1.25	0.10	80
M - 1.5	0.13	71
M - 1.75	0.16	73
M - 2	0.12	67

[a]Initial mean weight = 0.009g

hormone-treated fry. The growth inhibition and mortality of *O. aureus* fry were noted with increasing levels of mibolerone in the water (Meriwether and Torrans 1986; Torrans et al. 1989).

The hormone-treated fish except for the ones treated with M-1.25 had better growth and survival than the controls after the rearing period in cages (Table 2). Fish treated with mibolerone at 1.25 ppm in the diet had a low survival because of predation. All the hormone-treated fish had higher percentages of males compared with that of the control indicating that sex reversal of genetic females was achieved. The slow growth of *O. mossambicus* in the cages could be attributed to inbreeding depression (Wohlfarth and Hulata 1983).

While mibolerone is more effective than methyltestosterone at a lower dose for induced sex reversal of tilapia, its availability and cost may be constraints for its wider use. Mibolerone is commercially available only in the United States in the form of a veterinary product manufactured by Upjohn, Inc.

Table 2. Growth, survival and percentage males of control and mibolerone (M)-treated *O. mossambicus* fingerlings after 108 days in net cages.

Treatment	Mean Wt. (g)	% Survival	% Male
Control	4.0	90	53
M - 1.25	4.2	50[a]	84
M -1.5	4.6	100	84
M - 1.75	4.6	100	88
M - 2	4.6	100	94

[a]A juvenile *Channa striata* was found in the cage.

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