Induced breeding of Tinfoil Barb *(Barbonymus schwanenfeldii)* (Bleeker, 1854) using Ovaprime

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Abstract

Tinfoil barb [TFB] of family Cyprinidae, is an attractive popular aquarium fish species native to Southeast Asia. There is no authentic record on its natural spawning in captivity condition in Sri Lanka. In 2015 an experiment was conducted to induce the spawning of captive reared TFB using Ovaprime, which contains sGnRHa hormone. At the initial stage, the sexually matured healthy females of 0.23 ± 0.01 kg average body weight (BW) were subjected to intra-ovarian biopsy. Later on the 18 females with migrating germinal vesicles and the males in oozed milt stage were selected for the experiment. Different dosages of Ovaprime *viz.* 0.2 ml kg^{-1}, 0.3 ml kg^{-1}, 0.4 ml kg^{-1}, 0.5 ml kg^{-1} and 0.6 ml kg^{-1} of BW were injected to the selected females while half a dosage was given to the selected males. All uninjected fish were kept as the control. The induced TFBs were kept at 100 l glass tank of preconditioned water at 1:1 male to female ration. In order to determine the ovulation time, after three hours of hormone injection, a gently pressure was given to each female vents at every half an hour to observe easy expression of eggs. The breeding performance of TFBs was determined based on the ovulation time (hrs) and the fertility rate (%). Data was analyzed with one way ANOVA and the Tukey test in SSPS software. The results indicated that minimum ovulation time was 3.20 ± 0.17 hrs at a dosage of 0.6 ml kg^{-1} of BW. The fertility rate with particular dosage was 33.33 ± 9.07 %, which was not significant compare to the least fertility rate (27.84 ± 2.36 %) obtained with 0.2 ml kg^{-1} of BW dose. However, relatively higher fertility rates i.e. 73.33 ± 4.51 % and 80.67 ± 5.13 % and minimum ovulation times (5.43 ± 0.51 hrs and 6.10 ± 0.17 hrs) were observed with 0.4 ml kg^{-1} and 0.5 ml kg^{-1} of BW dosages respectively. In three months experimental period, TFB was not observed to breed naturally. Therefore, it could conclude that maximum fertility rate and relatively lower ovulation time of TFB can be achieved with 0.4 - 0.5 ml kg^{-1} of BW Ovaprime for females and half of that for males TFB under captive conditions.

Key words: Tinfoil barb, aquarium fish, induced breeding, ovaprime, ovulation and fertility rate.

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Introduction

Production of ornamental fish is a rapidly growing branch of the aquaculture industry (Tlusty, 2001). Exotic ornamental fishes occupy a significant portion of the ornamental fishes produced in Sri Lanka.Tinfoil Barb *(Barbonymus schwanenfeldii)* TFB is an exotic fish originating in South East Asia that has a high demand in the local as well as the international ornamental fish trade. There is no authentic information related to the reproduction of this species in captivity. In the present study, attempts were made to develop the induced breeding methodology for this species within the Sri Lankan environment using the inducing hormone, "Ovaprime" which contains analogue of Salmon GnRH [Ovaprime 1 mL contains 20 µg of GnRH and 10 mg domperidon].

Materials and Methods

Sexually mature healthy TFB brooders were selected randomly based on their external features. In order to very their maturity, the females were sedated using Tricane Methane Sulphonate [TMS] 65 ppm solution and were subjected to intra-ovarian biopsies. A fine polyethylene tube was inserted into the oviduct to facilitate the removal of a few oocytes. It could see that the germinal vesicle of the oocytes was migrating to the periphery. The males selected were oozing milt when a slight pressure was applied at the vent. Eighteen pairs in the identical stage of maturity and of average body weight (BW) 0.23 ± 0.01kg were randomly collected, and conditioned. Single doses of Ovaprime were injected intramuscularly at individual of 0.2 ml kg^{-1}, 0.3 ml kg^{-1}, 0.4 ml kg^{-1}, 0.5 ml kg^{-1} and 0.6 ml kg^{-1} BW. The hormone was administered to all individuals within one hour. Males received half the dose that injected to the respective females in the each experimental group. The induced TFBs were kept at 100 l glass tank of preconditioned water at 1:1 male to female ration. Each experimental group comprised three replicates. An un-injected group was also kept under same conditions as a control. The breeding performance was determined based on the ovulation time (hrs) and fertility rate (%). In addition, post experimental mortality rate of brooders and water quality parameters in the experimental tanks were monitored. The response time was determined by applying a gently pressure that was given to each female vents at every half an hour to observe easy expression of eggs. The fertility rate was determined by the number of eggs undergoing the first cleavage stage in the embryonic development process. Data analysis was done using one way ANOVA and the tukey test.

Results and Discussion

The effect of different dosages on the breeding performance of TFB is shown in Table 1. Ovaprime has successfully induced the spawning of TFB. Five different Ovaprime dosages were found to have support the spawning activity and breeding performance of TFB and it was favored by middle inclusion levels of Ovaprimee dosages in the experiment.

Ovaprimee has been used successfully in several fish families (Hill *et al.*, 2005). The present study showed that all fish in the experimental groups respond to the striping trials except for those in the control. The least response time was recorded at a dosage of 0.6 ml kg^{-1} of BW Ovaprimee at a time lapse of 3.20 ± 0.17 hrs. The maximum response time was observed at 0.2 ml kg^{-1} of BW at a lapse of 11 ± 0.51hrs. According to the literature surveyed, 0.5 ml kg^{-1} of body weight is the standard Ovaprime dose for inducing ovulation in fish (Hill *et al.* 2005). In the case of TFB, the dosage of 0.6ml kg^{-1} of BW Ovaprime showed the minimum response time. However, the respective fertility rate was not different significantly to the lowest fertility rate, which was at the dosage of 0.2 ml kg^{-1} of BW. Although, the best dosage with the minimum response time is 0.4ml kg^{-1} of BW, but this is not significantly different from that of the group receiving 0.5ml kg^{-1} dose.

Table 1. Breeding performance of TFB induced with Ovaprimee.

Dosage/ml kg^{-1} of BW	0.20	0.30	0.40	0.50	0.60	P value
Ovulation time/ hrs	11.00 ± 0.51^{a}	9.20 ± 0.17^{b}	5.43 ± 0.51^{c}	6.10 ± 0.17^{c}	3.20 ± 0.17^{d}	0.000
Fertility rate %	27.84 ± 2.36^{a}	50.5 ± 7.09^{b}	73.33 ± 4.51^{c}	80.67 ± 5.13^{c}	33.33 ± 9.07^{a}	0.000

Values are presented as means ± S.D., means in each raw with different superscripts are significantly different from each other.

The maximum fertility rate was observed in the fish group receiving 0.5ml kg^{-1} of BW of Ovaprime. Thus the range between 0.4ml kg^{-1} - 0.5ml kg^{-1} of BW could be considered as the best to achieve a higher fertility rate. These values were not significantly different from each other. During the latency period temperature ranged from 27.4 ^{0}C – 27.8 °C and pH was measured as 7.3. Therefore, further studies should be carried out to identify the best dosage which falls 0.4 ml kg^{-1} - 0.5 ml kg^{-1} of BW dosage of Ovaprimee. Spawning was not observed in the tanks in which the control fish group was kept for a three months period. This indicates although they did have viable ova, their spawning could not be complete without the support of inducing hormones in Sri Lankan captive environment conditions.

The survival rate of brooders was 100% after the administration of Ovaprimee and the post spawning period. According to observations, the range of hormone dosages used for the present study is not harmful and there was no any sign of negative effect on the TFB. Achionye and Obaroh (2012) have found that procedure of injection, quality of the hormone and degradation of water quality during holding and handling of fish affect the post inducing mortality of brooders. Proper conditioning and domesticating the fish before injecting, maintaining appropriate water quality, supplying a nutritious feed, using a good quality hormone and reduced handling of fish due to administration of single dose may be attributed for the zero mortality in brood fish. The similar condition has been observed by More *et al.* 2010). There was no any significant difference ($P > 0.05$) in some water quality parameters such as water temperature, dissolved Oxygen and pH in six different treatment tanks.

Although, successful results could be obtained in this study, future studies which facilitate incubation using hatchery jars with water jets, increase the hatchability as eggs are semi buoyant and are need to be carried out. However, the developed induced breeding technology can be introduced to local commercial fish breeders for mass scale production of TFB.

Conclusion

Higher fertility rates and a relatively short ovulation time of TFB can be achieved by injecting dosage of 0.4 ml kg^{-1} -0.5 ml kg^{-1} of BW Ovaprime to females and half that dosage to the

males at the same time in spawning the TFB in captivity. It is less time consuming and fruitful method for commercial scale fish breeding in Sri Lanka.

References

Achionye, C. G. and Obaroh, I. 2012. Ovaprim doses effects on eggs of African mudfish *Clarias gariepinus*. *International Journal of Life Science and Pharma Research*. **2(2):** 1-9.

Hill, J. E, Baldwin, J.D, Graves, J.S, Leonard, R, Powell, J. F. F. and Watson, C. A. 2005. Preliminary observations of topical gill application of reproductive hormones for induced spawning of a tropical ornamental fish. *North American Journal of Aquaculture*. **67**:7–9.

More, P. R. 2010. Comparative study of synthetic hormones Ovaprim and carp pituitary extract used in induced breeding of Indian major carps. *Libyan Agriculture Research Center Journal International*. **1(5):** 288-295.

Tlusty, M. 2002. The benefits and risks of aquacultural production for the aquarium trade. *Aquaculture*.**205.** 203– 219.