



RESEARCH ARTICLE

Induced Breeding of Giant Catfish, *Sperata seenghala* using Hormonal Analogues

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ABSTRACT

The study has been designed for the induced breeding of Giant Catfish, *Sperata seenghala* using hormonal analogues at Aquaculture and Fisheries Program, National Agricultural Research Center, Islamabad. The different hormonal analogues used in this study were ovaprim, HcG, LHRH and ovatide. The dose of ovaprim was 0.5 ml/kg 1b.w, ovatide 0.5 ml/kg 1b.w, LHRH 10 µg/kg 1 in double injection and HcG 10 µg/kg 1 in double injection. The best reproductive performance has been shown by the treatment of HcG i.e. % fertilization was 80±0.06, % hatchability 75±0.02 and % survival 56±0.02.

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INTRODUCTION

Artificial propagation of fish is the most promising and reliable way of ensuring availability of good quality fish seed all year round and sustainability of the aquaculture industry. It involves the use of natural (hypophysation) or synthetic hormones to induce ovulation and spawning in farmed fishes (Salami *et al.*, 2003). As promising as artificial propagation of catfish seems, one of the major constraints to fish breeders is the cost of procurement of these hormones. Ovaprim for instance cost about N5, 500 per vial, Ovatide N3, 200 while the cost of a donor Cat fish brood stock ranges between N1, 500 and N2, 500 (Olubiyi *et al.*, 2005). Other synthetic hormones in use include Human Chorionic Gonadotrophin (HCG), Decorticosterone Acetate (DOCA), and Leutenizing Hormone Releasing Hormone (Nwokoye *et al.*, 2007).

Other workers have use non-piscine pituitary hormones such as Bull frog (*Rana adspersa*) (Fagbenro *et al.*, 1995) and the Toad (*Bufo regularis*) (Sahoo *et al.*, 2008) in order to get a cheaper but equally effective hormone. Ovaprim is one of the most widely acceptable and readily available synthetic hormones because it has been found to be very effective (Nwokoye *et al.*, 2007). It

is a combination of SGnRHa and domperidone (M. Legendre *et al.*, 1995).

This study which is a pioneer study on the use of different hormones for induced breeding of *S. seenghala* is aimed at comparing the effect of use of hormones in induced breeding of *S. seenghala*.

MATERIALS AND METHODS

Experimental design

Four groups/treatments based on the administration of hormones i.e. ovaprim, HcG, LHRH and ovatide represented as treatments A, B, C and D respectively of seengharee brooders for induced spawning.

Brood stock source and management

Broodstock were stocked in a concrete tank for acclimatization for a period of 2 months and fed with artificial diets containing 45% crude protein under intensive feeding before commencement of the study. The female fish were then transferred to the experimental tanks. Eight concrete tanks were stocked with two fish per tank with two replications per treatment. The water was changed once in two weeks and the fish were weighed every two weeks. The males to be used for fertilization were stocked in a separate tank. The fish were fed twice

daily at 0900 hrs and 1700 hrs with their respective diet at 5% body weight in split doses for 56 days. After every two weeks of intensive feeding, the female broodstock fishes were carefully examined for eggs.

Reproductive performance evaluation of experimental fish

In order to analyze the reproductive performance, fertilization, hatching, survival and relative fecundity were calculated as shown below:

% Fertilization = (No. of fertilized eggs/ Total no. of eggs counted) × 100

% Hatching = (No. of eggs hatched/ Total no. of eggs in a batch) × 100

% Survival = (No. of hatchlings alive up to larval stage/ Total no. of hatchlings) × 100

Induced spawning

Readiness of gravid females selected for induced spawning was verified by measuring the diameter of eggs aspirated from the ovaries using a plastic feeding tube (O.D = 1.6 mm, I.D. = 1.2 mm, Indoplas Pty. Ltd, Sidney, Australia; or O.D. = 4 mm, I.D. = 3.5 mm). Mean egg diameter before hormone injection ranged from 1.41 to 1.50 mm and the germinal vesicle was either central or slightly off center.

Hormones

Ovaprim

Ovaprim (Syndel International Inc., Canada) is a liquid preparation containing salmon GnRH analogue (D-Arg, Pro Net-6 9 sGnRH) and domperidone, a dopamine antagonist. The manufacturer's recommended dose is 0.5 ml/kg 1b.w of spawner body weight.

Ovatide

Ovatide (sGnRH+Dopamin) was purchased from local and manufactured in India. The manufacturers recommended dose is 0.5 ml/kg 1b.w of spawner body weight.

LHRH

Luteinizing Hormone-Releasing hormone analogue (Des-Gly10, [D-Ala 6] LH-RH Ethylamide) (made in China). The manufacturers recommended dose is 10 µg/kg 1 in double injection.

HCG

Human chronic gonadotropin (HCG) is a polypeptide hormone with molecular weight 36000. At present, the ready-made material available on the market in china is "Veterinary Gonadotropin". The manufacturers recommended dose is 10 µg/kg 1 in double injection

Stripping

When a female was ready for stripping, about 16-20 h post-injection, a male was sacrificed. The testes were removed, washed, and macerated in 0.9% NaCl solution. Stripped eggs were weighed and aliquot samples were obtained, weighed and counted for estimation of relative fecundity (number of eggs g⁻¹ spawn and number of eggs g⁻¹ body weight) and total number of eggs per spawn.

Fertilization

The milt was added to the eggs and mixed gently for 30-60s using a dry feather. Eggs were rinsed and incubated in improvised rectangular hatching nets each placed in a polyethylene tank with flow-through water and aeration. Fertilization rate, the ratio of eggs undergoing embryonic development to the total number of eggs sampled, was determined 6-8 h post-incubation. Fertilized eggs (120-170) were incubated further for estimation of hatching rates. The hatching rate was determined 18-22 h post-incubation at 27-30°C and it is the percentage of fertilized eggs that hatched.

Statistical analysis

The values were represented as mean±SD. The effects of the various treatments on the investigated traits were analyzed by Analysis of Variance (ANOVA) and the significant difference between the means was evaluated using the Duncan's Multiple Range Test (DMRT).

Water quality

Different parameters of water quality have been tested during the experiment such as temperature, dissolved oxygen, pH, alkalinity, hardness and electrical conductivity in all the treatments.

RESULTS

The result of induced breeding of *S. seenghla* using the four different hormones namely ovaprim, HcG, LHRH and ovatide is presented in Table 1. The weight of brooder fish in all the treatments were found to be non-significant ranging from 732-784 g. Treatment A (ovaprim) showed the highest mean weight of eggs i.e. 112 g followed by treatment D (110 g) and B (106 g), however there was no significant difference (P<0.05) in the weight of eggs released in the 4 treatments. After fertilization of the spawned eggs in the treatments, the percentage fertilization of eggs in treatment B i.e. 80% was highest among all the treatments and have significant difference (P<0.05) with all the treatments than in B and C. However, treatment C showed a significant difference (P<0.05) in percentage fertilization as compared to treatments A and B. Similarly, the values of percentage hatchability from the fertilized eggs showed that treatment C has a relatively higher value than treatments A and B, however there was no significant difference (P<0.05) in hatchability of the three treatments. The means of percentage survival of fry was also relatively higher in treatment C than in A and B but there was no significant difference (P<0.05) among the 3 treatments. The parameters tested for water quality during the experimentation were found in normal range.

DISCUSSION

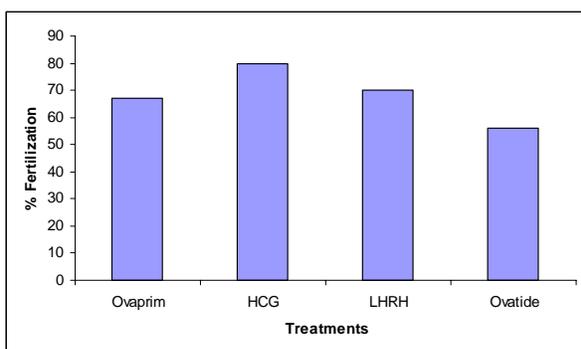
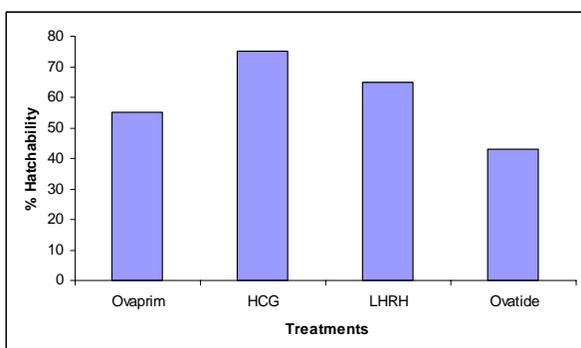
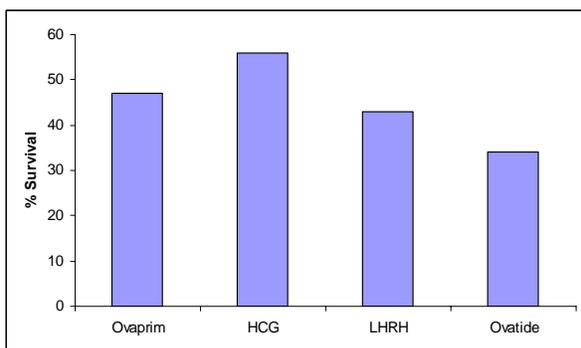
Spawning and hatching of fry were observed in fishes treated with ovaprim, HcG, LHRH and ovatide. Average weight of breeders used in this experiment ranges from 732-784 g. All the fishes responded to hormonal injection and spawned within 11-12 hrs at temperature range of 28-29°C, in accordance with the findings of Viveen *et al.*, 1985.

Table 1: Reproductive performance of females of *S. seenghala* after hormonal treatment

| Treatments | A (Ovaprim) | B (HCG) | C (LHRH) | D (Ovatide) |
|--------------------|-------------|------------|------------|-------------|
| Weight of fish (g) | 765±10.21a | 743±09.12a | 784±08.72a | 732±06.12a |
| Weight of eggs (g) | 112±1.21a | 106±1.32a | 102±0.98a | 110±0.32a |
| % Fertilization | 67±0.05b | 80±0.06a | 70±0.03b | 56±0.01c |
| % Hatchability | 55±0.02c | 75±0.01a | 65±0.04b | 43±0.02d |
| % Survival | 47±0.01b | 56±0.02a | 43±0.01b | 34±0.03c |

Table 2: Water quality parameters of all the treatments

| Treatments | A | B | C | D |
|---------------------------------|------|------|------|------|
| Temperature (^o C) | 29 | 28 | 29 | 28 |
| Alkalinity (mg/l) | 158 | 147 | 168 | 149 |
| Hardness (mg/l) | 102 | 114 | 142 | 132 |
| pH | 7.5 | 7.5 | 7.0 | 7.0 |
| Dissolved Oxygen (mg/l) | 5.24 | 4.26 | 4.85 | 4.23 |
| Electrical conductivity (µs/cm) | 542 | 551 | 526 | 532 |

**Fig. 1:** % Fertilization of Giant catfish (*Seperta seenghala*) by using different hormonal analogue**Fig. 2:** % Hatchability of Giant catfish (*Seperta seenghala*) by using different hormonal analogue**Fig. 3:** % Survival of Giant catfish (*Seperta seenghala*) by using different hormonal analogue

The higher percentage of fertilization, hatchability and survival were observed in treatment B (HCG) i.e. 67% followed by treatment A (ovaprim) and treatment C (LHRH). There is no data available for *S. seenghala* but the findings are in agreement with different studies conducted at different species of catfishes at different places i.e. a study conducted at Indoseia where *Pungasius hypothalamus* were treated with ovaprim and HCG. The group which was treated with HCG responded as well as the other group treated with ovaprim (Legendre *et al.*, 2000). Another study conducted at Ivory Coast where African catfish *Heterobranchus longifilis* Val. (Claridae) showed high percentage of fertilization and survival when treated with HcG i.e. 76% (Legendre *et al.*, 1986). Artificial spawning was induced in female African giant catfish, *Heterobranchus bidorsalis* by single intramuscular hormone injections of carp pituitary suspensions (CPS), homoplastic pituitary suspension (HPS) and human chorionic gonadotropin (HCG) in Nigeria. Hatching rates were high (>84%) and similar for all hormone-treated fish ($P>0.05$). The percentage normal larvae hatched ranged from 81.6 to 86%. During the larval rearing trials for 30 days, survival rates >82% were achieved. The four hormones tested were effective inducers (Adebayo and Fagbenro, 2004). In the present study ovaprim and LHRh did not respond as effectively when compared to HcG which is in agreement with a study conducted at Netherland in which African catfish treated with the combination of pimoziide/LHRHa as ovulation-inducing substance had been evaluated. At a dosage, given as one single injection, of 5 mg pimoziide + 0.05 mg LHRHa per kilogram body weight, 100% ovulation was achieved. In the present study LHRH was used alone without the combination of pimoziide because the availability of pimoziide was not ensured (Leeuw *et al.*, 1985). Similar to the study conducted in Netherlands, African catfish (*Clarius gariepinus*) was treated with pimoziide/LHRHa treatment and of 17 α -hydroxyprogesterone. All fish treated with pimoziide/ LHRHa or 17 α -hydroxyprogesterone showed oocyte maturation and ovulation (Richter *et al.*, 1987). Ovatide showed lowest efficiency among all the hormonal treatment. Ovaprim and ovatide are similar preparations, however better results obtained with ovaprim rather than ovatide (locally manufactured) may be due to its purity/efficiency (Zohar and Mylona, 2001).

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