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Comparative evaluation of different hormones on the reproductive performance of pearl spot (*Etroplus suratensis*)

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Abstract

Pearl spot, *Etroplus suratensis* were induced to spawn in captivity to assess the efficiency of two dissimilar synthetic hormones Viz., HCG and WOFAFH under captive condition. The experiment was designed with 2 treatments and one control. The treatment brooders were injected with single dose of 0.5 ml kg⁻¹ body weight WOFA FH and 1500 IU HCG and normal saline (0.9%) for control. For each of the hormone administered treatment, results were recorded. Spawning was observed within 24-48 h after injection. Hatching of eggs were observed after 72 h of incubation at 27-29° C. The mean fertilization rate was 77 ±1.45 for HCG, 72 ± 1.45 for WOFAFH treated fish and 64 ±2.08 for control. The mean hatching rate was 86.66 ± 0.88 with HCG, 86.00^b ± 0.57 with WOFA FH and 82.33 ±1.20 with control. HCG gave 77 ±1.45 higher fertilization rate as well as 86.66^b ± 0.88 more hatching rate of eggs respectively as compared to WOFAFH. HCG and WOFA FH were found to be more effective in induced breeding of *E. suratensis*.

Keywords: HCG, *Etroplus suratensis*, WOFA FH, pearl spot

Introduction

Fisheries is a sunrise sector with wide-ranging resources and potential. Currently, India is the second major fish producing and second leading aquaculture nation in the world. It is marked from the progress of fish production, which is about 106 million tons (FAO, 2017) [7]. The involvement in fish consumption has enhanced people's diets around the world through speckled and nutritious food. In 2013, fish accounted for around 17% of the world-wide population's consumption of animal protein and 6.7% of all protein consumed (FAO, 2016) [6]. Riding on a robust demand, aquaculture needs to be outspread. In India, brackish water farming is synonym with the culture of only shrimp. Therefore, Diversification of cultivable species is a crucial for this hour for sustainable brackish water aquaculture development. A number of potential fish species have been priorities to diversify the aquaculture production in India. As a high value species, the pearl spot, *Etroplus suratensis* is deliberated as one of the supreme appropriate candidates to expand the coastal aquaculture in south Asia.

Pearl spot is a brackish water cichlid fish typically found in peninsular India and Srilanka (Hora and Pillay, 1962; Rishi and Singh, 1982) [11, 20]. It is a euryhaline species, feeds habitually on filamentous algae, copepods, cladocerans, insects and worms (Jingran and Natarajan, 1969) [12]. Its maturity starts from its first year, however the Sexual dimorphism is perceptible only in the period of breeding season (Padmakumar *et al.* 2004a, b) [16, 17]. During one spawning its fecundity is around 500 to 7550 numbers (Bindu, 2006) [3]. Though it is a brackish water fish, it is also found in freshwater reservoirs, lakes and river. (Chandrasekar *et al.* 2014) [4]. In India, however it is found in the southern states, the fish is valued and used as a delightful food solitary in Kerala (Joseph and Ignatius, 2016) [13]. Even then, most of the fishes existing in the market are from the wild catch. Wild catch is also declining due serious depletion in their natural habitat owing to uncontrolled exploitation owing to boom of tourism in backwaters and lakes (Padmakumar *et al.* 2002) [15]. So, to recompense the demand, and to sustain the interest of the farmer, induced spawning is thought to be the only alternative method for quality seed supply and production (Sharma *et al.* 2010) [22].

Induced breeding in *Etroplus suratensis* using HCG+LHRH combination has showed an enhanced performance (Das *et al.* 2010) [5].

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Equally administration of HCG alone through subcutaneous injection in pearl spot also produced improved performance in comparison to the dietary administration in inducing spawning (Felix *et al.* 2017) [8]. However, only few hormones have been tried out in induced breeding of *Etroplus suratensis*. Despite the fact that the fish can grow well its breeding is limited due to intricate breeding behaviour and parental care (Padmakumar *et al.* 2009; Natarajan, 2013) [18, 13]. So, the current study was intended to compare the enactment of different hormones, in inducing breeding in pearl spot.

Materials and Methods

Experimental site

Experiment was conducted at Pulicat research field facility (PRFF), Fisheries College and Research Institute, Ponneri, TNFU, Tamil nadu, India.

Collection and rearing of broodstock

Matured Brood stocks (>110 weight and 17 cm length) were collected from the nearby Pulicat lake and stocked in FRP tanks at PRFF centre. The study was carried out for 2 months. At the farm site, the fishes were disinfected using KMnO₄ before stocking into the tanks. The brood stocks were reared by providing supplemented feed @ 3-5% of body weight.

Selection of Brooders

Matured brooders were selected for induced breeding experiment. Unlike other fishes sexual dimorphism is very difficult in pearl spot. For this reason the fishes were selected based on the length and weight of the brooder for breeding. The sex ratio of 1:1 was maintained throughout the experiment.

Induced Breeding

In the present study, two different inducing agents viz., HCG and WOVA FH and one control were used for evaluating the comparative spawning and reproductive performance of pearl spot. For breeding set one male and one female was used in each breeding sets. Uniform dose of inducing agent 0.5ml /Kg of body weight in case of WOVA FH and 1500IU in case of HCG was administered to the experimental fishes in respective sets by a single intraperitoneal injection at the base of pectoral fin in evening hours. The injected fishes were transferred to 300L FRP tank. The occurrence of spawning was monitored periodically by checking for the presence of eggs in the breeding tank. Fecundity; fertilization and hatching rates were calculated by random sampling and counting.

Fertilization and Hatching

The total number of eggs and fertilization percentage were determined by analysing 3 samples of 1ml aliquots. The eggs were kept in the same tank to ensure parental care. The hatchlings were reared in the same tank for three days till complete yolk absorption and then the spawn were transferred to separate tank for nursery rearing.

Physico Chemical Parameters

Water quality parameters like Temperature (mercury thermometer) pH (Hand held pH meter) dissolved oxygen, Ammonia nitrogen (NH₃-N), total alkalinity and total

hardness were measured daily according to standard methods (APHA, 2005) [2].

Data Analysis

The fertilization rate and hatching rates of different treatments were compared for the two different inducing agents using one way ANOVA and Duncan's test. Data was analysed using Statistical package for the Social Sciences (SPSS) version 16.0.

Results and Discussion

The present experiment was intended to determine the efficacy of two commercially accessible hormones in induced breeding of pearl spot and the results are precised in terms of average number of eggs per female, fertilization rate and hatching rate. The Physico-chemical parameters of water were found within the finest level for breeding and larval rearing of the species (Table 1). Complete spawning was observed within 24 – 48h after the administration of hormones. The fertilized eggs of *Etroplus suratensis* remained to be oblong shape, adhesive about 2 mm in diameter and attached at one end to the nesting object by means of a short stalk. The newly laid eggs were yellowish in colour and as the embryo developed, the yolk sac became pigmented and colour became brownish. Similarly, the authors recorded an increase in egg diameter and biochemical parameters of pearl spot administered with combination of HCG and LHRH and ovaprim, in comparison to the control (Das *et al.* 2010) [5].

The mean fecundity and mean fertilization rate obtained after induced breeding with HCG was 1920 ± 62.44 eggs per female and 86.66 ± 0.88 percentage hatching whereas it was 1630.00 ± 66.58 eggs per female and with 86.00 ± 0.57 percentage hatching for WOVA FH and 200.81 ± 19.4 eggs per female and 82.33 ± 1.20 with Control respectively. Overall, the number of eggs released during each spawning was comparatively higher compared to the spontaneous spawning in captivity (Selvaraj *et al.* 2017; Felix *et al.* 2017a) [21, 9]. The mean fertilization rate of eggs was found to be high in treatments induced with HCG and WOVA FH compared to that of Control (Table.2), however, the difference was statistically significant (p<0.05). Hatching took place at 72±2 h post-fertilization. Absorption of yolk sac was completed within the next 72 h. The mean hatching rate of eggs was found to be significantly high (p<0.05) in treatments induced with HCG and WOVA FH compared to that of control (Table 2). Correspondingly, the author also stated that doses of HCG ranging between 1500 and 2000 IU through subcutaneous injection resulted in superior performance in pearl spot (Felix *et al.* 2017) [8]. The optimistic response of *Etroplus suratensis* to HCG and WOVA FH indicated the efficacy of these hormones in induced breeding of the species.

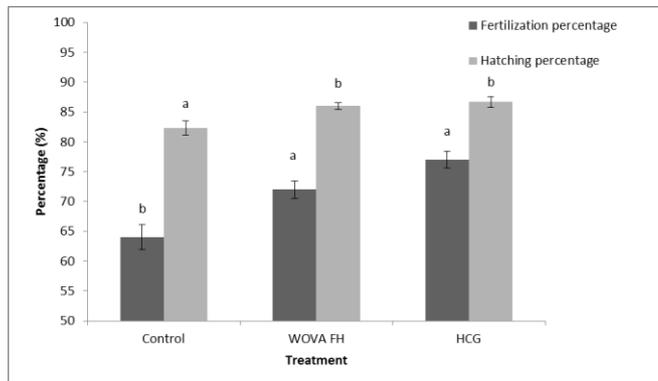
Table 1: Water quality parameters recorded in different treatment groups during the experimental period

Parameter	Breeding tanks
Temperature (°C)	27 – 29 °C
Do (ppm)	6.0 – 7.2
pH	7.6 – 7.7
Total Alkalinity (ppm)	150- 160
Hardness (ppm)	2100- 2500
Ammonia – nitrogen (ppm)	>0.05

Table 2: Fecundity, Fertilization rate and Hatching rate recorded in *Etroplus suratensis* with WOVA FH and HCG

Inducing agent	Average no. of eggs per female	Percentage fertilization	Percentage hatching
Control	200.81 ^c ±19.4	64 ^b ±2.08	82.33 ^a ±1.20
WOVA FH	1630.00 ^b ± 66.58	72 ^a ± 1.45	86.00 ^b ± 0.57
HCG	1920.00 ^a ±62.44	77 ^a ±1.45	86.66 ^b ± 0.88

Values are expressed as Mean±SE. Values in the same row with different superscripts differ significantly ($P<0.05$) for each parameter. One way ANOVA was used following Duncan multiple range test.

**Fig 1:** Fertilization and hatching rates in *Etroplus suratensis* with different inducing agents

Induced breeding technique is arguably the most vital research accomplishment in the arena of finfish aquaculture to ensure steady supply of stocking material. Several hormones have been tried for induced spawning in fishes with various levels of success (Harvey and Hoar, 1979)^[10]. Induced breeding of many Indian fishes were endeavoured by several workers (Ramaswamy and Sundaraj, 1969; Zairin *et al.* 1992; Alok *et al.* 1998)^[25, 26, 1]. However, the level of success varied based on the combination of the fish species and inducing agent. As a result, in *Etroplus suratensis* study has been attempted and found that administration of the synthetic hormone HCG+LHRH developed a success on induced spawning (Das *et al.* 2010)^[5]. On the contrary, the captive breeding of pearl spot was deliberate in a specialized raceways (70 m²) by providing artificial substrates and breeding pits, were the survival rate of eggs was around 95% survival (Padmakumar *et al.* 2009a)^[19]. In nature, the fish spawns on a range of hard object that facilitate attachment of eggs and this include stones, pieces of wood, coconut husks, water logged coconuts, mid ribs of coconut and palm leaves tiles, bamboo pieces, asbestos sheets, and any other submerged objects situated at a depth not more than 100 cm (Sultana *et al.* 1995)^[24]. Hence, in the current study flower pots were used as an artificial substrate for the adhesion of eggs. Newly, it was found that through curtailing parental care, large number of seeds can be obtained, when pearl spot broodstock maintained in plastic tanks with suitable substratum (Sukumaran *et al.* 2017a)^[23]. The present study concluded that the spawning fecundity, percentage of hatching and fertilization were fairly higher for fishes bred through induced breeding as compared to natural system.

Conclusion

The results of the present study clearly demonstrate the possibility of using synthetic preparations like HCG and WOVA FH for effective induced spawning and seed production of *E. suratensis*, which may be used for stock enhancement as well as for ranching of the species in natural water bodies. Being a species of commercial importance, the protocol for captive breeding of *Etroplus suratensis* is likely to pave way towards commercialisation of the technology, which might introduce an exciting entrepreneurial area in

aquaculture.

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