

## Comparison of two hormone preparations on the reproductive performance of air breathing catfish *Clarias batrachus* (Lin.)

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### Abstract

Two hormone preparations *viz.* Human Chorionic Gonadotropin (HCG) and pituitary gland (PG) suspension were compared for their comparative efficacy on the breeding performance of a air breathing catfish *Clarias batrachus*. It was found that HCG induced fish gave better ovulation response than PG. Both fertilization and hatching of eggs were significantly ( $p < 0.01$ ) higher in HCG treated fish than PG. On all consideration, HCG was found more suitable for induced breeding of *C. batrachus* over PG.

Key words: HCG, PG, *Clarias batrachus*, Breeding

### Introduction

Among the indigenous cat fishes *Clarias batrachus* is an important fish species in Bangladesh. The fish is highly esteemed for its high market value and delicate taste. The population of this catfish is currently declining due to various man made and natural reasons. Availability of fry and fingerlings is the basic requirement of fish culture, but it is very difficult to collect the fry and fingerlings of this fish from natural sources. Therefore, artificial breeding with hormone manipulation is the only way to mass produce the fry of this species for culture.

Hormones are widely used for artificial breeding of fish, however, hormones are scarce in Bangladesh. Therefore, appropriate methods should be developed to make optimum use of hormones. To control life cycle of fish species some steps have to be followed, these include maintenance of brood stock for the production of eggs and sperm, rearing of larvae and raising of fish to marketable size (Richter *et al.* 1985). However, brood stock kept in captivity seldom reproduce spontaneously thus artificially induced breeding with the help of hormones is common practice in aquaculture. Different hormone preparations are used for this purpose including fish pituitary gland (PG) and Human Chorionic Gonadotropin (HCG). Ahmed *et al.* (1981 and 1985), Khan *et al.* (1975), Rahmatulla *et al.* (1983), Thakur *et al.* (1985) provided basic information on induced breeding of *C. batrachus* with a view to mass production of seeds. During the

past decades, successful breeding of fish had been attained with HCG either alone or with PG. The synchronization of egg production by brood stock fish can be achieved by hormone manipulation, this greatly facilitates planned breeding and culture programmes in fish farms. In the present study two hormone preparations HCG and PG were compared for their comparative efficacy on the breeding performance of *C. hatrachus*.

### Materials and methods

The study was carried out in a commercial fish breeding farm, Madina Fisheries and Hatchery Complex located at Dohar, Dhaka, Bangladesh. Thirty matured female catfish *Clarias batrachus* were collected from hatchery's own brood ponds. Twenty fish were selected for the experiment. The surplus 10 fish was kept as a backup in case of mortalities and escapes. Furthermore, 10 males were used from the fish farm's own brood stock to provide milt for fertilization. After proper acclimatization, the fishes were divided into two groups having 10 females in each groups and designated as T1 and T2. The two hormone preparations were collected from local market. The dry PG (pituitary gland of carp) in vial is available in market and generally used for carp breeding in Bangladesh. The HCG was produced by a commercial pharmaceutical company (Sumach: Infar, India) and HCG solution was prepared according to the prescriptions of brochure supplied by the manufacturing company (Table 1). Dry HCG powder (30 i.u./mg) was dissolved in distilled water. After homogenizing, the solution was centrifuged for 5 minutes at 4,000 rpm. The clear upper fluid was decanted in a sterile 30 ml flask and used immediately. HCG was diluted in such a way that 1 ml solution corresponds to 1000 i.u. The PG solution was prepared by homogenizing the dry PG in a tissue homogenizer and centrifuged in a centrifuge machine at 4,000 rpm. The upper clear fluid is used for injection purpose. Ten fully matured male brood fish were used for sperm collection. The fish were dissected and the sperm collected from the testes by squeezing out the milt. On mid June 2000, all experimental female fish were arranged into two groups of 10 females with a mean body weight of  $119 \pm 5$  g and  $118 \pm 5$  g, respectively. Each experimental female was injected with one of the two hormone preparations. The suspension was injected into dorsal musculature just below the dorsal fin. One group (T1) was injected with 400 i.u. HCG/100 g body weight and the other group (T2) was injected with 15 mg PG/ 100 g body weight.

Table 1. Source and method of hormone (HCG and PG) administration

Name of hormone	HCG	PG
Producer	Infar Pharmaceutical Company Ltd.	Anonymous
Dosages	400 i.u. / 100 g body weight.	15 mg /100 g body weight
No. of injection	Two	Two
Interval between injections	6 hour after 1st injection	6 hour after 1st injection
Route of administration	Intramuscularly	Intramuscularly

In each case total dose of hormone was divided into two injections and given at 6 hour interval. After injection, the females were individually housed in 200-l trays. A latency period of approximately 18 hours (Table 1) was allowed after which the fish were stripped for egg. The eggs from each individual female was collected in plastic bowl and fertilized with milt. Approximately 100 eggs from each female was incubated in 20-l plastic bowl fitted with inlet and outlet for constant water supply. In all 20 plastic bowls was used for egg incubation. Water temperature was maintained at  $27 \pm 1^\circ\text{C}$ . After about 26 hours of incubation all egg samples were thoroughly checked, dead eggs were counted per plastic bowl and removed, leaving the hatched larvae behind. The percent ovulation was calculated by the formula: Percent ovulation = No. of fish ovulated x 100 / Total no. of fish injected. The fertilization rate was calculated by following formula: Percent fertilization = No. of fertilized eggs x 100 / Total no. of eggs (fertilized + unfertilized). The hatching percentage was calculated after hatching. The hatching percentage was calculated as [(Number's of eggs in sample - Dead eggs) / Number of eggs in sample x 100. Data were analyzed by using the computer based SPSS program.

## Results and discussion

The result presented in Table 2 shows that both experimental groups of fish did not differ significantly in body weight at the start of the experiment, thus it was possible to compare the groups without restrictions. The ovulation response showed (Fig. 1) a significant difference between the PG and HCG treated groups. A higher percentage of fish (100%) was induced by HCG in comparison to PG (80%). The eggs of the HCG treated group were brownish in color and the PG treated groups were yellowish brown in color and contained some white dead eggs. The fertilization rate of HCG treated group was  $80.07 \pm 2.58\%$  and that of PG treated group was  $70.01 \pm 1.43\%$  (Table 2). In respect of hatching rate, HCG treated group resulted in  $70.45 \pm 3.60\%$  hatching, while it was only  $60.10 \pm 3.21\%$  in PG treated group. It appears from the result that HCG worked better in all respect than PG for artificial breeding of cat fish.

Table 2. Comparison of two groups of *Clarias batrachus* injected with two hormone preparation

Treat-ments	Replications	Fish wt. (g)	Doses	Ovulation responses (%)	Fertilization rate (%)	Hatching rate (%)
T <sub>1</sub>	R <sub>1</sub>	120	HCG 400	+	78.50	71.44
	R <sub>2</sub>	115	i.u/100g	+	81.25	69.22
	R <sub>3</sub>	125		+	76.25	63.25
	R <sub>4</sub>	122		+	82.12	74.26
	R <sub>5</sub>	115		+	80.10	71.26
	R <sub>6</sub>	110		+	79.50	75.23
	R <sub>7</sub>	125		+	82.50	67.12
	R <sub>8</sub>	114		+	84.15	68.23
	R <sub>9</sub>	112		+	80.15	71.25
	R <sub>10</sub>	123		+	76.25	73.26
Mean		118.10	400	100	80.07	70.45

Treat-ments	Replications	Fish wt. (g)	Doses	Ovulation responses (%)	Fertilization rate (%)	Hatching rate (%)
T <sub>1</sub>	R <sub>1</sub>	110	PG 15 mg/100g	+	70.50	63.21
	R <sub>2</sub>	125		+	69.25	60.15
	R <sub>3</sub>	114		+	71.30	54.26
	R <sub>4</sub>	120		+	68.35	59.21
	R <sub>5</sub>	112		-	-	-
	R <sub>6</sub>	123		+	69.55	61.23
	R <sub>7</sub>	120		+	68.80	64.27
	R <sub>8</sub>	120		+	72.35	57.29
	R <sub>9</sub>	125		+	70.70	61.23
	R <sub>10</sub>	125		-	-	-
Mean		119.4	15	80	70.01	60.10

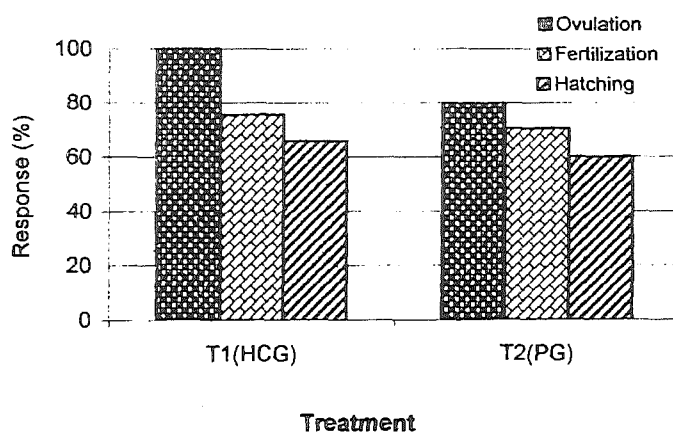


Fig. 1. Comparative performance of HCG and PG on ovulation response, fertilization and hatching of eggs of *Clarias batrachus*.

Statistical analysis showed a significant difference in respect of fertilization between HCG and PG treated group ( $t = 9.85$ ,  $df = 16$ ;  $p < 0.01$ ) (Table 3).  $t$  test performed for hatching shows a significant difference ( $t = 6.34$ ,  $df = 16$ ;  $p < 0.01$ ) between HCG and PG treated group. Thus in respect of ovulation, fertilization and hatching, the response of HCG treated fish is much higher than PG treated fish.

Table 3.  $t$ -test for fertilization and hatching of eggs of *Clarias batrachus*

Parameters	df	t	Performances
Fertilization	16	9.85	Significant
Hatching	16	6.34	Significant

Ahmed *et al.* (1985) worked with HCG and PG on reproductive performance of walking catfish opined that HCG is appropriate hormone for breeding of *C. batrachus*.

The present observation is in good agreement with the results of that study. Mustafa *et al.* (1986) studied on the efficacy of HCG and PG, and found HCG more effective with higher percentages of ovulation, fertilization and hatching than PG. This particular finding also closely agrees with the findings of the present study. Richter *et al.* (1985) found similar response in induced breeding of *C. gariepinus*. Devraj *et al.* (1972) described induced spawning using pituitary glands of marine catfish. They allowed the fishes to spawn naturally but observed that only few fishes spawned successfully. Mollah and Tan (1983) found HCG as effective agent in breeding *C. macrocephalus*. Khan and Mukhopadhyay (1975) observed successful spawning using carp pituitary extract in glass aquaria, but they observed poor rate of hatching. Ahmed *et al.* (1981) studied the spawning of *C. batrachus* in aquarium conditions and they observed repeated mating at small intervals with a few eggs released at each matings. They also noted that control fishes, which received no injection did not respond to spawning.

The present experiment clearly showed that under the given conditions the mode of action of inducing hormone to stimulate reproductive response of *C. batrachus* is in favour of HCG. Therefore, from the results of the experiment, it may be concluded that under the given condition HCG has clear advantage over PG for induced breeding of *C. batrachus*. The results showed that the use of HCG in induced breeding of *C. batrachus* could give better yield if proper induced breeding technology in the farmer level can be disseminated.

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#### References

- Ahmed, A.T.A, G. Mustafa, K.R. Islam and A. Hai, 1981. Observations on the induced spawning of *Clarias batrachus*. *Bangladesh J. Agri.*, 6(1): 1-6.
- Ahmed, K., G. Mustafa, S. Ali and M. Shajahan, 1985. Induced spawning of magur fish, *Clarias batrachus* (L.) by stripping method in a plastic bowl hatchery. *Bangladesh J. Zool.*, 13(1): 19-24.
- Devaraj, K.V., T.J. Varghese and G.P.S. Rad, 1972. Induced breeding of freshwater catfish, *Clarias batrachus* (Linn.) by using pituitary glands from marine catfish. *Curr. Sci.*, 41(25): 868-870.
- Mollah, M.F.A and E.S.P. Tan, 1983. HCG - induced spawning of the catfish (*Clarias macrocephalus*, Gunther). *Aquaculture*, 35: 239-247.
- Khan, H.A. and S.K. Mukhopadhyay, 1975. Production of stocking material of some air breathing fishes by hypophysation, *J. Inland Fish. Soc. India.*, 7: 156-161.
- Mustafa, G., K. Ahmed and M. Shajahan, 1986. Effect of H.C.G. (Human Chorionic Gonadotropin) and P.G. (Pituitary Gland) on induced spawning of the catfish, *Clarias batrachus* (Linn.). *Dhaka University Studies*, 34 (2): 159-165.

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- Rahamatulla, S.M., M.A. Islam, M.M. Hossain, M.M. Ali and A.K.M.N. Islam, 1983. Experiment on the induced breeding of *Clarias batrachus* (Linn.) by pituitary hormone injection. *Bangladesh J. Aquaculture*, 2-5.
- Richter, C.J.J. and B.C. Cattel, 1985. A new way to standardize fish breeding. *Fish Farming*, 12: 14-15.
- Thakur, N.K. and P. Das, 1985. Synopsis of biological data on magur, *Clarias batrachus* (Linnaeus, 1758). Bull. No. 41. CIFRI. Barrackpore, India. 82 pp.

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