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COMPARATIVE EFFECTS OF GnRH-BASED DRUGS ON INDUCED SPAWNING OF THE FRESHWATER CATFISH, *HETEROPNEUSTES FOSSILIS*

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ABSTRACT

Breeding experiments were conducted in *Heteropneustes fossilis* employing GnRH-based inducing agents like ovaprim, ovatide and wova-FH. The catfish responded well to ovaprim (0.40-0.55 ml/kg), ovatide (0.45-0.55 mg/kg) and wova-FH (0.50-0.60 mg/kg). Ovaprim gave better results in terms of fertilization and hatching success on low dose and latency period was also less as compared to ovatide and wova-FH. The overall performance of ovaprim was better when compared with the other two drugs. Among ovatide and wova-FH, the latter appeared to be better in spawning performance. The gonadotrophs (cynophils), distributed in the proximal pars distalis (PPD) of the pituitary gland, exhibited hyperactivity and degranulation in ovaprim, ovatide and wova-FH induced-bred *H. fossilis* suggesting release of the hormone (gonadotropin) in response to administration of the drugs.

KEY WORDS : Ovaprim, Ovatide, Wova-FH, Induced spawning, *Heteropneustes fossilis*

INTRODUCTION

Heteropneustes fossilis is a freshwater air-breathing fish distributed throughout India, Pakistan, Sri Lanka, Myanmar, Thailand and China. It is omnivorous in habit and can withstand hardy conditions of culture. *H. fossilis* commands good consumer preference because it contains high amount of protein, iron and low fat and is recommended in convalescence. The catfish possesses accessory respiratory organs and reaches market in live condition fetching good price compared to carps. The catfish can survive even in swampy and derelict water bodies with low oxygen content and can be cultured in high stocking density, hence, recommended for paddy-cum-fish as well as cage culture (Dehadrai *et al.*, 1985; Dehadrai & Kamal, 1993). In nature, this catfish breeds once in a year during spawning period from July to August (Viswanathan & Sundararaj, 1974; Nayak *et al.*, 2000a; Pandey *et al.*, 2007). The potential to obtain seed of *H. fossilis* from natural sources has become low due to the increasing use of pesticides in the paddy fields which are the main breeding grounds of this species. Nandeeshha *et al.* (1990a, b, 1991), Zairin *et al.* (1992), Alok *et al.* (1993), Lakra *et al.* (1996), Pandey *et al.* (1999, 2001, 2002a, b, c,

2009), Singh *et al.* (2000, 2002), Nayak *et al.* (2000a, b, 2001), Pandey & Koteeswaran (2004), Sahoo *et al.* (2005), Singh *et al.* (2006) and Rath *et al.* (2007) have tried induced spawning of the commercially important carps and air-breathing fishes using ovaprim, ovatide, wova-FH, HCG and other synthetic hormones. The commercial aquaculture of catfishes could not pick up in majority of the countries including India due to non-availability of seed owing to mass mortality during larval rearing period (Nayak *et al.* 2000a, 2004; Pandey & Koteeswaran, 2004). An attempt has been made to evaluate the effect of different hormonal preparations in induced spawning of a commercially important freshwater catfish, *H. fossilis*.

MATERIALS AND METHODS

Healthy mature brooders of *H. fossilis* (Bloch) collected locally from natural resources were brought to Aquaculture Research & Training Unit of NBFGR, Chinhat and kept in cement tanks. They were acclimatized under standard conditions for one week. Induced breeding experiments on the catfish were conducted using different hormonal preparations like ovaprim, ovatide and wova-FH. Ovaprim is a synthetic drug containing 20 µg

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sGnRH-a (salmon gonadotropin releasing hormone analogue) and 10 mg domperidone in 1 ml solution (Glaxo-Smith-Kline India, Mumbai). Ovatide is a synthetic peptide hormone developed for breeding of carps, catfish and mahaseer, etc. It also contains sGnRH-a (salmon gonadotropin releasing hormone analogue) and domperidone (Hemmo Pharma, Mumbai) while wova-FH is having only sGnRH-a (Wockhardt-Biostadt, Mumbai).

Broodstocks of *H. fossilis* (weight range 45-75 g) from the same maturity stage were selected for induced spawning experiments. A single dose of the drug (hormone) was injected intramuscularly into the dorso-lateral region of both the sexes. The females received ovaprim, ovatide and wova-FH @ 0.40-0.55, 0.45-0.55 and 0.50-0.60 ml/kg body weight, respectively. The males were given the injection @ 0.2 ml/kg irrespective of the hormone. The males and females were released for spawning into cement cistern (1.5 m diameter and 1 m depth) having approximately 200 l water (depth 60 cm) immediately after administering the hormone in the ratio of 2:1. Aeration was provided in the tanks and 30% surface area of the cement cistern was covered with aquatic weed, *Hydrilla*, for shelter of the catfish. During breeding operation, the cistern was covered with nylon net. Eggs were sampled and fertilization percentage was estimated. Aeration was provided during the larval rearing period. Environmental parameters like temperature (air and water), pH, DO₂, CO₂, alkalinity, nitrite and phosphate were monitored during breeding and larval rearing period (APHA, 1999).

The hatchlings were reared in the circular cement cistern in normal stocking density and kept undisturbed till the yolk sac absorbed. The spawn was fed with sieve filtered live planktonic feed. In addition to the live feed, egg custard was also provided as supplementary feed for three days. Subsequently, the supplementary diet comprising a mixture of dry fish, prawn powder and wheat flour fortified with vitamin mixture was given in semi-dried condition @ 15% of the body weight for 15 days along with plankton. Though to lesser extent *H. fossilis* exhibit cannibalism and to check it, segregation of the size group of the fry was made from time to time.

Pituitary glands from the spent and control brooders were collected and fixed immediately in freshly prepared Bouin's solution, dehydrated in ascending series of alcohol, cleared in xylene and embedded in paraffin wax at 60°C. Sagittal sections of the pituitary were cut at 5 µm and stained in alcian blue-periodic acid-Schiff-orange G (AB-PAS-OG), Herlant tetrachrome and Mallory's triple (Pearse, 1968) and studied under light microscope.

RESULTS AND DISCUSSION

Air and water temperature (29-33.2°C, 27.0-32.3°C), pH 7.4-8.2, DO₂ 3.30-6.98 ppm, CO₂ 4.0-14.0, alkalinity 200.0-

440.0 ppm, phosphate 0.16-1.04 ppm and nitrate 0.09-1.07 ppm were in the optimal range. Spawning in majority of the sets occurred between 10-12 h and hatching took place between 24-28 h in different sets. Spawning (latency) period was normal (10 h) in case of ovaprim while it was delayed with ovatide and wova-FH (10-12 h). Irrespective of the hormone treatment, fertilization and hatching varied between 76-90% (Table 1). Nandeesh *et al.* (1991), Lakra *et al.* (1996) and Singh *et al.* (2000) reported higher percentage of fertilization and hatching with ovaprim in carps and observed no adverse effect on the growth of hatchlings. Though the latency period extended to 10-12 h, ovatide successfully induced spawning in the Indian major carps (*Catla catla*, *Labeo rohita* and *Cirrhinus mrigala*) with no adverse effects on the larval quality

Table 1: Comparative effects of GnRH-based drugs on induced spawning of *H. fossilis*

Date	Weight (g) female	male Weight (g)	Percent fertilization	Percent hatching
Ovaprim				
24.06.08	70.00	50.00	80.00	80.00
	50.00	48.00		
25.06.08	50.00	45.00	90.00	90.00
	60.00	45.00		
08.07.08	70.00	60.00	85.00	88.00
	60.00	60.00		
	58.00	40.00		
11.07.08	58.00	50.00	90.00	88.00
	62.00	45.00		
	60.00	50.00		
Ovatide				
15.07.08	60.00	45.00	90.00	82.00
	70.00	54.00		
21.07.08	59.00	48.00	80.00	78.00
	65.00	55.00		
29.07.08	60.00	50.00	78.00	76.00
	55.00	45.00		
30.07.08	50.00	44.00	78.00	80.00
	48.00	42.00		
Wova-FH				
27.08.08	50.00	40.00	82.00	80.00
	50.00	35.00		
29.08.08	50.00	30.00	80.00	78.00
	60.00	40.00		
	30.00	40.00		
30.08.08	30.00	30.00	78.00	76.00
	45.00	35.00		
	50.00	50.00		

(Pandey *et al.*, 2001, 2002a, b, c; Singh *et al.*, 2006; Rath *et al.*, 2007). *Labeo rohita* also recorded good response to wova-FH administration even during second week of August with 95-100% fertilization and 90-95% hatching success (Pandey *et al.*, 2009).

Female *H. fossilis* responded well with ovaprim at slightly lower dose of 0.40-0.55 ml/kg body weight with normal latency period and comparatively better results. Similar observations have also been recorded in the catfish by Nayak *et al.* (2001), Singh *et al.* (2002) and Haniffa & Sridhar (2002). In the present study, ovotide induced successful spawning in *H. fossilis* with 78-90% fertilization and 76-90% hatching success. Pandey & Koteeswaran (2004) recorded induced breeding in the same catfish at dose of 0.3-0.5 ml/kg body weight with 76-80% fertilization and 72-85% hatching success. Sahoo *et al.* (2005) observed 83% fertilization and 72% hatching success in *Clarias batrachus*. As far as the spawning performance of ovotide and wova-FH is concerned, the latter appears to be better than the former, giving 86-90% fertilization and 82-90% hatching success. Nayak *et al.* (2000) observed encouraging results with low doses of SG-G100 in combination with steroid 17 α , 20 β -dihydroxyprogesterone (17 α , 20 β -P) in induced ovulation of *H. fossilis*. In the present study, males were not very comfortable with ovaprim administration and in some cases mortality was observed. Perhaps it may be due to high viscosity of the drug, however, this was not the case with ovotide and wova-FH. Though composition of all the three inducing agents are almost same, there is difference in the performance on induced spawning of the catfish.

The gonadotrophs (cynophils) were distributed in the proximal pars distalis (PPD) of pituitary gland of *H. fossilis* (Pandey *et al.*, 2007) exhibiting enhanced cellular activity (hyperactivity) and degranulation in response to ovaprim, ovotide and wova-FH administration thereby suggesting release of the hormone (gonadotropin) in blood circulation of the recipient brood fish. Similar observation has also been recorded by Rath *et al.* (2007) in the Indian major carps administered with these drugs for induced breeding.

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REFERENCES

APHA (1999). Standard Methods for the Examination of Water and Wastewaters. American Public Health Association, Washington, D.C.

Alok, D., Krishnan, T., Talwar, G.P. & Garg, L.C. (1993).

Induced spawning of catfish, *Heteropneustes fossilis* (Bloch), using D-Lys⁶ salmon gonadotropin releasing hormone analogue. *Aquaculture*, 115: 159-167.

Dehadrai, P.V. & Kamal, M.Y. (1993). Role of air-breathing fish culture in rural upliftment. In: Souvenir: Third Indian Fisheries Forum (October 14-16, 1993). G.B. Pant University of Agriculture & Technology, Pantnagar. p. 28-31.

Dehadrai, P.V., Kamal, M.Y. & Das, R.K. (1985). Package of Practices for Increasing Production of Air-breathing Fishes in Aquaculture. Aquaculture Extension Manual No. 3. Central Inland Fisheries Research Institute, Barrackpore. p. 1-14.

Haniffa, M.A. & Sridhar, S. (2002). Induced spawning of spotted murrel (*Channa punctatus*) and catfish (*Heteropneustes fossilis*) using human chorionic gonadotropin and synthetic hormone (ovaprim). *Veterin. Arch.*, 72: 51-56.

Lakra, W.S., Mishra, A., Dayal, R. & Pandey, A.K. (1996). Breeding of Indian major carps with the synthetic hormone drug ovaprim in Uttar Pradesh. *J. Adv. Zool.*, 17: 105-109

Nandeesh, M.C., Rao, K.G., Jayanna, R., Parker, N.C., Varghese, T.J., Keshavanath, P. & Shetty, H.P.C. (1990a). Induced spawning of Indian major carps through single application of ovaprim. In: Proceedings of the Second Asian Fisheries Forum (eds. Hirano, R. & Hanyu, I.). Asian Fisheries Society, Manila, Philippines. p. 581-585.

Nandeesh, M.C., Das, S.K., Nathaniel, D.E. & Varghese, T.J. (1990b). Project Report on Breeding of Carps with Ovaprim in India. Asian Fisheries Society: Indian Branch. Special Publication No. 4. p. 1-41.

Nandeesh, M.C., Ramacharya, C. & Varghese, T.J. (1991). Further Observations on Breeding of Carps with Ovaprim. Asian Fisheries Society: Indian Branch. Special Publication No. 6. p. 1-41.

Nayak, P.K., Pandey, A.K., Singh, B.N., Mishra, J., Das, R.C. & Ayyappan, S. (2000a). Breeding, Larval Rearing and Seed Production of the Asian Catfish, *Heteropneustes fossilis* (Bloch). Central Institute of Freshwater Aquaculture, Bhubaneswar. 68 p.

Nayak, P.K., Mishra, J., Singh, B.N. & Ayyappan, S. (2000b). Low doses of steroid hormones and salmon gonadotropin induced oocyte maturation in catfish, *Heteropneustes fossilis*. *Indian J. Fish.*, 47: 321-327.

Nayak, P.K., Mishra, T.K., Singh, B.N., Pandey, A.K. & Das, R.C. (2001). Induced maturation and ovulation in *Heteropneustes fossilis* by using LHRHa, pimoziide and ovaprim for production of quality eggs and larvae. *Indian J. Fish.*, 48: 269-275.

Nayak, P.K., Mishra, T.K., Mishra, J. & Pandey, A.K. (2004). Effects of combined thyroxine and cortisol treatments on the hatching of eggs and post-embryonic growth and survival of *Heteropneustes fossilis*. *J. Indian Fish. Assoc.*, 31: 125-137.

Pandey, A.C., Pandey, A.K. & Das, P. (1999). Breeding of fishes with the synthetic hormone drug ovaprim: an overview. *J. Nat. Conserv.*, 11: 275-283.

- Pandey, A.K. & Koteeswaran, R. (2004). Ovatide induced breeding of the Indian catfish, *Heteropneustes fossilis* (Bloch). *Proc. Zool. Soc. Calcutta*, 57: 35-38.
- Pandey, A.K., Mahapatra, C.T., Sarkar, M., Kanungo, G., Sahoo, G.C. & Singh, B.N. (2001). Ovatide induced spawning in Indian major carp, *Catla catla* (Hamilton-Buchanan) for mass scale seed production. *J. Adv. Zool.*, 22: 70-73.
- Pandey, A.K., Mahapatra, C.T., Sarkar, M., Kanungo, G. & Singh, B.N. (2002a). Ovatide induced spawning in Indian major carp, *Cirrhinus mrigala* for mass scale seed production. *J. Exp. Zool. India*, 5: 81-85.
- Pandey, A.K., Mahapatra, C.T., Sarkar, M., Kanungo, G. & Singh, B.N. (2002b). Ovatide induced spawning in Indian major carp, *Labeo rohita* (Hamilton-Buchanan). *Aquacult*, 3: 1-5.
- Pandey, A.K., Koteeswaran, R. & Singh, B.N. (2002c). Breeding of fishes with synthetic hormone drug ovatide for mass scale seed production. *Aquacult*, 3: 137-142.
- Pandey, A.K., Rani, M., Mahapatra, C.T. & Shrivastava, P. (2007). Hypothalamo-neurosecretory system of the freshwater catfish, *Heteropneustes fossilis* (Bloch). *J. Natur. Resour. Develop.*, 2: 1-6.
- Pandey, A.K., Mahapatra, C.T., Kanungo, G. & Singh, B.N. (2009). Induced breeding of the Indian major carp, *Labeo rohita*, with synthetic hormone drug wova-FH. In: Recent Advances in Hormonal Physiology of Fish and Shellfish Reproduction (eds. Singh, B.N. & Pandey, A.K.). Narendra Publishing House, New Delhi. p. 257-260.
- Pearse, A.G.E. (1968). *Histochemistry: Theoretical and Applied*. Churchill Livingstone, London & Edinburgh.
- Rath, S.C., Sarkar, S.K., Gupta, S.D. & Sarangi, N. (2007). Comparative account of induced breeding of Indian major carps with ovaprim, ovatide, wova-FH and carp pituitary extract. *Indian J. Anim. Sci.*, 77: 1057-1060.
- Sahoo, S.K., Giri, S.S. & Sahu, A.K. (2005). Effect of breeding performance and egg quality of *Clarias batrachus* (Linn.) at various doses of ovatide during spawning induction. *Asian Fish. Sci.*, 18: 77-83.
- Singh, B.N., Das, R.C., Sahu, A.K., Kanungo, G., Sarkar, M., Sahoo, G.C., Nayak, P.K. & Pandey, A.K. (2000). Balanced diet for broodstocks of *Catla catla* and *Labeo rohita* and induced breeding using ovaprim. *J. Adv. Zool.*, 21: 92-97.
- Singh, B.N., Das, R.C., Sarkar, M., Kanungo, G., Sahoo, G.C. & Pandey, A.K. (2002). Balanced diet for rearing of singhi, *Heteropneustes fossilis* (Bloch), broodfish and induced breeding using ovaprim. *J. Ecophysiol. Occup. Hlth.*, 2: 57-64.
- Singh, R.K., Khandagale, P.K., Chavan, S.L. & Sapkale, P.H. (2006). The relationship of ova diameter to fertilization rates, hatching rates, survival percentages and specific growth rates in common carp and Indian major carps. *Asian Fish. Sci.*, 19: 257-269.
- Viswanathan, N. & Sundararaj, B.I. (1974). Seasonal changes in the hypothalamo-hypophysial-ovarian system in the catfish, *Heteropneustes fossilis* (Bloch). *J. Fish Biol.*, 6: 331-340.
- Zairin, M. Jr., Furukawa, K. & Aida, K. (1992). Induction of ovulation by HCG injection in the tropical walking catfish, *Clarias batrachus* reared under 23-25°C. *Nippon Suisan Gakkaishi*, 59: 1681-1685.