

INDUCED SPAWNING OF ASIAN CATFISH, *CLARIAS BATRACHUS*, WITH DIFFERENT DOSES OF sGnRH-BASED DRUGS

A. K. Yadav, R. K. Mishra, S. K. Singh, P. K. Varshney, A. K. Pandey* and W. S. Lakra**

Aquaculture Research & Training Unit of NBFGR, Chinhat, Lucknow-227 105, India

*National Bureau of Fish Genetic Resources, Canal Ring Road, Lucknow-226 002, India

**Central Institute of Fisheries Education, Versova, Mumbai-400 061, India

email: akpandey_cifa@yahoo.co.in

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ABSTRACT – Induced spawning of catfish, *Clarias batrachus*, was attempted using different doses of ovatide and ovaprim at varying latency period (interval between the time of injection and spawning). In both the sGnRH-based drugs, decreased doses with increased latency period gave better results of fertilization and hatching. Preparatory dose of ovaprim (male 0.1 ml/kg; female 0.5 ml/kg) administered intramuscularly 45 days prior to spawning for gonadal maturity resulted in higher rate of fertilization and hatching success. Optimum doses of ovaprim and ovatide were found to be 0.8-1.0 and 0.6-1.0 ml/kg body weight with latency period between 14-16 h.

Key words : Ovateide, ovaprim, induce spawning, *Clarias batrachus*.

INTRODUCTION

The Asian catfish, *Clarias batrachus*, distributed in Bangladesh, Myanmar, Sri Lanka and India, inhabits derelict waters, swamps, ponds and rivers (Singh and Hughes, 1971). Because of high nutritional value, taste, flavour, delicacy and medicinal properties of the flesh, air-breathing fishes enjoy very good demand in internal markets, particularly in the North-eastern and a few states of south India like Kerala and Karnataka. They are hardy in nature and may be cultured in marshy and derelict water bodies unsuitable for carp culture. The air-breathing catfishes are tolerant to diseases, fluctuations in water quality parameters and amenable to culture in high densities under intensive aquaculture. These fish fetch good market price as they are sold in live condition. Also, flesh of air-breathing catfishes is rich in copper and iron which are essentially required for blood formation.

In India, Ramaswami and Sundararaj (1957) achieved success in induced spawning of *Clarias batrachus* by using homoplastic pituitary glands. Khan (1972) and Khan and Mukhopadhyay (1975) used heteroplastic pituitary gland of carps and found that a single dose of 135-150 mg/kg to the female could affect spawning. Successful spawning was also obtained using pituitary of freshwater catfish, *Wallago attu* at 50-260 mg/kg with 84.6% fertilization as well as with the marine catfish pituitary extract (Devaraj *et al*, 1972). Rao and Janakiram (1991) showed that female *C. batrachus* could be readily spawned even when administered a much lower dose (30 mg/kg body weight) of Indian major carp pituitary

extract. Freshwater aquaculture in Asia has been mainly concerned on propagating carps and their aquaculture techniques have been standardized and transferred to fish farmers (Ayyappan *et al*, 2006). In India, culture of *C. batrachus* has been given priority under diversification of aquaculture as it grows about 380 mm (400 g) and readily accept artificial feed (Ayyappan *et al*, 2006), however, the major constraints in culture of the species are the lack of spawning under captivity resulting in insufficient supply of seed (Manikam and Joy, 1989). An attempt has, therefore, been made to induce spawning in *Clarias batrachus* using sGnRH-based drugs at varying latency period under captivity.

MATERIALS AND METHODS

The wild brood catfish were collected from village ponds and transported to Aquaculture Research & Training Unit, Chinhat (Lucknow). They were reared in 0.10 ha ponds for 2-3 months and fed with traditional protein-rich diet. The water quality parameters, monitored during the period, were in the optimal range (Table 1). Breeding experiments were conducted in circular cement cisterns (diameter 3-6', water depth 1') during 2008-2009.

During June-August 2008, the experiments on induced spawning of *C. batrachus* were conducted using ovateide. The brood fish weighing 100-250 gm were selected for induced breeding based on the soft distended belly in females and reddish pointed genital papilla in males. Six sets of catfish were injected with varying doses of ovateide (0.60-2.00 ml/kg body weight).

During July-August 2009, the experiments on induced

Table 1: Water quality parameters in cement cisterns during breeding experiments.

S.No.	Parameters	Range	
		2008	2009
1	Temperature (°C)		
	(a) Air	29.00-33.20	26.00-32.00
	(b) Water	27.00-32.30	24.00-28.00
2	pH	7.40-8.20	7.50-8.10
3	DO (mg l ⁻¹)	3.30-6.98	4.35-6.50
4	CO ₂ (mg l ⁻¹)	4.00-14.00	3.00-12.50
5	Alkalinity (mg l ⁻¹)	200-440	220-410
6	Phosphate (mg l ⁻¹)	0.16-1.04	0.25-1.35
7	Nitrite (mg l ⁻¹)	0.09-1.07	0.10-1.25

spawning of *C. batrachus* were conducted employing ovaprim. The brood fish ranging 70-200 gm were selected. Preparatory dose of ovaprim (male @ 0.1 ml/kg; female @ 0.5 ml/kg) was administered to few brood fish 45 days prior to breeding experiments, kept in separate cement cistern and monitored for gonadal development. In another experiment, four sets were tried with varied doses of ovaprim (0.80-1.50 ml/kg body weight). In each set of experiment, male brood fish were dissected out to remove testes which were squeezed, macerated and diluted with physiological saline to obtain the sperm suspension. The sperm motility was checked under microscope for movement of spermatozoa.

In both the experiments, after initial setting of dose, the hormone doses were decided based on observation of the gonadal development in females. The hormone injections were administered intramuscularly (i.m.) and fishes were released in the cement cisterns. At the end of the latency period, the females were stripped into clean dry enamel tray and the eggs were mixed with few drops of sperm suspension by employing a feather. The eggs were washed thoroughly with water and released in incubation trays with continuous flow of water @ 0.20l / m. After about three hours of incubation, the translucent eggs were considered fertilized and percentage of fertilization was worked out. On hatching, the hatching percentage was calculated.

RESULTS AND DISCUSSION

Effects of ovatide and ovaprim on spawning success of the Asian catfish have been summarized in Table 2 and 3, respectively. In first three sets, the doses of ovatide administered varied between 1.5-2.0 ml with latency period between 8.0-14.0 h. The fertilization in these sets ranged from 60-65% with hatching 30-45%. In last three sets, the hormone was injected @ 0.6 -1.0 ml and fertilization varied from 70-75% and hatching 50-55%. In second set of experiments, the latency period varied between 14.30-16.0 h with lower dose of hormone (0.6-1.0 ml). Pandey and Koteeswaran (2004 - *H. fossilis*) and Sahoo *et al* (2005 - *C. batrachus*) observed increased rate of fertilization and hatching with low dose of the drug under prolonged latency period (14-23 h). They have also recorded that the administration of higher doses of inducing

Table 2 : Effect of ovatide administration on induced spawning of *Clarias batrachus*.

Sl. No.	Date	Female (gm)	Male (gm)	Ovatide (ml)	Latency period (hr)	Eggs (No.)	Fertilization (%)	Hatching (%)
1	19.06.08	140	200	2.00	8.00	5000	65	40
2	24.06.08	250	250	1.50	10.00	5000	60	30
		150						
3	03.07.08	100	100	2.00	14.00	5000	64	45
		150	100					
		160						
4	07.07.08	220	100	1.00	14.30	2000	75	50
		110						
5	05.08.08	150	200	0.60	14.30	1000	70	55
		180						
6	27.08.08	200	100	0.60	16.00	2300	70	50
		220						

Table 3 : Effect of ovaprim administration on induced spawning of *Clarias batrachus*.

Sl. No.	Date	Female (gm)	Male Wt (gm)	Ovatide (ml/kg)	Latency (hrs)	Eggs (No.)	Fertilization (%)	Hatching (%)
1	15.07.09	120	190	0.80	15.5	4000	80	70*
		110						
2	22.07.09	100	200	1.00	15.0	3500	70	80*
		140						
3	01.08.09	150	150	1.50	14.5	3000	60	60
		90						
4	01.08.09	100	150	0.80	15.5	2000	75	80*
		70						

*Preparatory dose of ovaprim was injected to both female (0.5 ml/kg) and male (0.1 ml/kg) brood fishes 45 days prior to spawning.

agents (30 µg sGnRHa+15 mg domperidone and 40 µg sGnRHa+20 mg domperidone) and stripping at 20-23 h post-injection resulted in decreased fertilization and hatching rate which may probably be due to the deterioration of egg quality. Similar observations have also been made by Rowland (1983-*Macquaria ambigua*) and Haraldsson *et al* (1993-*Salvelinus fontinalis*). Pandey and Koteeswaran (2004) have reported larval deformities to the extent of 35±8.3% in *H. fossilis* at the dose of 1.0 ml/kg body weight. In present study, the optimum dose of ovatide for *C. batrachus* was found to be 0.6-1.0 ml with latency period between 14-16 h.

In second experiment using ovaprim with preparatory dose, the latency was kept higher and varied from 14.5-15.5 h. The fertilization and hatching ranged between 70-80%. The preparatory dose administered 45 days prior to the spawning gave better results in terms of fertilization and hatching. In control (without preparatory dose), the fertilization and hatching both were 60% only. The spawning results with respect to fertilization and hatching were better in case of the sets where the predatory doses were administered. Varshney *et al* (1990) also administered HCG 3 months earlier to breeding for inducing gonadal maturity in female Indian major carps resulting in higher rate of fertilization and hatching. Kanungo *et al* (1999) and Mani and Pandey (2007) recorded better fertilization and hatching success in *H. fossilis* given low doses of HCG (25, 50 IU/kg body weight) and WOVA-FH (0.2 ml/kg body weight) at bi-weekly intervals for 28 days. Optimum doses of ovaprim was observed to be 0.8-1.0 ml/kg body weight with latency period between 14.5-15.5 h. Sahoo *et al* (2005) could not obtain normal larvae irrespective of hormone doses when

the females were stripped at latency period of 11 h. They reported ideal latency period for ovaprim in *C. batrachus* between 14-17 h. Nayak *et al* (2001) also obtained better spawning and hatching responses in *H. fossilis* with ovaprim at the dose 0.6-0.8 and latency period between 15-18 h.

In the present study, the water quality parameters, monitored regularly, were almost in the optimum range. Lam (1983) suggested the combination of hormonal and environmental approaches to obtain better results in induced spawning of teleosts. Optimum doses of ovaprim 0.8-1.0 ml and ovatide 0.6-1.0 ml were recorded in the induced spawning of *C. batrachus* with latency period between 14-16 h.

REFERENCES

- Ayyappan S, Jena J K, Gopalakrishana A and Pandey A K (2006) *Handbook of Fisheries and Aquaculture*. Directorate of Information and Publications in Agriculture (ICAR), New Delhi. 755 p.
- Devaraj K V, Varghese T J and Rao G P S (1972) Induced breeding of freshwater catfish, *Clarias batrachus* (L.) by using pituitary glands from marine catfish. *Curr. Sci.* 44, 868-870
- Haraldsson H, Sveinsson T and Skulason S (1993) Effects of LHRHa treatments upon the timing of ovulation and upon egg and offspring quality in Arctic charr, *Salvelinus fontinalis* (L.). *Aquacult. Fish. Manage.* 24, 145-150.
- Kanungo G, Sarka M, Singh B N, Das R C and Pandey A K (1999) Advanced maturation of *Heteropneustes fossilis* by oral administration of human chorionic gonadotropin. *J. adv. Zool.* 20, 1-5.
- Khan H A (1972) Induced breeding of air - breathing fishes. *Indian Farming* 22, 44-45.
- Khan H A and Mukhopadhyay S K (1975) Production of stocking materials of some air breathing fishes by hypophysation. *J. Inland Fish. Soc. India* 7, 156-161

- Lam T J (1983) Environmental influences on gonadal activity in fish. In: *Fish Physiology. Vol. IXB. Reproduction, Behaviour and Fertility Control* (eds. Hoar W S, Randall D J and Donaldson E M), 65-116. Academic Press, New York.
- Mani C V and Pandey A K (2007) Effects of HCG and WOVA-FH administration on ovarian maturation and spawning of *Heteropneustes fossilis* (Bloch). *J. Exp. Zool. India* **10**, 317-319.
- Manickam P and Joy K P (1989) Induction of maturation and ovulation by pimozone-LHRH analogue treatment resulting high quality egg production in the Asian catfish, *Clarias batrachus*. *Aquaculture* **83**, 193-199.
- Nayak P K, Mishra T K, Singh B N, Pandey A K and Das R C (2001) Induced maturation and ovulation in *Heteropneustes fossilis* by using LHRHa, pimozone and ovaprim for production of quality eggs and larvae. *Indian J. Fish.* **48**, 269-275.
- Pandey A K and Koteeswaran R (2004) Ovatide induced breeding of the Indian catfish, *Heteropneustes fossilis* (Bloch). *Proc. Zool. Soc. Calcutta* **57**, 35-38.
- Ramaswami L S and Sundararaj B I (1957) Induced spawning in catfish *Clarias*. *Naturewissen.* **44**, 348.
- Rao G R M and Janakiram K (1991) An effective dose of pituitary for breeding *Clarias*. *J. Aqua. Trop.* **6**, 207-210.
- Rowland S J (1983) The hormone induced ovulation and spawning of the Australian freshwater fish golden perch, *Macquaria ambigua* (Richardson) (Percichthyidae). *Aquaculture* **35**, 21-238.
- Sahoo S K, Giri S S and Sahoo A K (2005) Induced spawning of Asian catfish, *Clarias batrachus* (Linn.): effect of various latency periods and sGnRH α and domperidone doses on spawning performance and egg quality. *Aquacult. Res.* **36**, 1273-1278.
- Singh B N and Hughes G M (1971) Respiration in air-breathing catfish, *Clarias batrachus*. *J. Exp. Biol.* **55**, 421-434.
- Varshney P K, Mitra S D, Upadhyay R K and Chaudhary D K (1990) Fish seed production under controlled hatchery system a cottage industry. *J. Indian Fish Assoc.* **20**, 11-14.