VETERINARSKI ARHIV 72 (1), 51-56, 2002

Induced spawning of spotted murrel (*Channa punctatus*) and catfish (*Heteropneustes fossilis*) using human chorionic gonadotropin and synthetic hormone (ovaprim)

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HANIFFA, M. A. K., S. SRIDHAR: Induced spawning of spotted murrel (*Channa punctatus*) and catfish (*Heteropneustes fossilis*) using human chorionic gonadotropin and synthetic hormone (ovaprim). Vet. arhiv 72, 51-56, 2002.

ABSTRACT

Induced spawning of the spotted murrel (*Channa punctatus*) and catfish (*Heteropneustes fossilis*) was successfully carried out using ovaprim and human chorionic gonadotropin (HCG). Breeders were administered a single intramuscular injection of the hormones at varying dosages. Fecundity in *C. punctatus* was 3273 ± 75 for ovaprim and 1253 ± 126 for HCG, whereas in *H. fossilis* it was 6692 ± 790 for ovaprim and 82922 ± 5432 for HCG. Successful spawning of *C. punctatus* was observed at 0.3 and 0.5 ml/kg body mass for ovaprim and at 2000 and 3000 IU/kg body mass for HCG. For *H. fossilis* successful spawning was observed at 0.3, 0.5 and 0.7 ml/kg body mass for ovaprim and 1000, 2000, and 3000 IU/kg body mass for HCG.

Key words: induced spawning, ovaprim, human chorionic gonadotropin, *Channa punctatus, Heteropneustes fossilis*

Introduction

During the past two decades induced breeding by carp pituitary extract has been attempted in obligatory air-breathing fishes (ZONNEVELD et al.,

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ISSN 0372-5480
Printed in Croatia

1988). The ever increasing cost of donor pituitary and the cumbersome process obliged experts to test alternative hormones such as human chorionic gonadotropin (HCG) (MOLLAH and TAN, 1983; ZAIRIN et al., 1992; INYANG and HETTIARACHCHI, 1994), luteinizing hormone-releasing hormone (BILLARD et al., 1984; DE LEEUW et al., 1985; FERMIN 1992) and ovaprim (ALOK et al., 1993; HANIFFA et al., 1996). The present study compared the effects of a natural (HCG) and a synthetic (ovaprim) hormone on induced breeding of two air-breathing fishes, *Channa punctatus* and *Heteropneustes fossilis*, from the freshwater systems of southern India.

Materials and methods

Breeders were selected by external morphological characteristics and hand stripping (BILLARD et al., 1984). HCG (1000 IU to 3000 IU/kg body mass) and ovaprim (0.1ml to 0.7 ml/kg) were injected intramuscularly into the dorsolateral region of both males and females in a single dose (HANIFFA et al., 1996). Control fish were given corresponding volumes of physiological saline solution. Immediately after administering the hormones the breeding sets (two males and one female in each set) were released into cement tanks (capacity: 500 L) containing dechlorinated tap water (DO: 6.1 - 6.5 ppm; CO_2: 5.1 - 6 ppm; pH: 7.9 - 8.1; salinity: 1.01 - 1.04‰; temperature: 27 - 29 °C) flowing at a rate of 11 L/min. Eggs were collected from each breeding tank and the percentage of fertilization was estimated by examining a sample of at least 150 eggs from each tank.

Egg output was determined by hand stripping of a separate set of three females for each dosage after 24 h latency period in the case of *C. puntatus* and 18 h for *H. fossilis*. The number of eggs released was calculated following the gravimetric method (LAGLER, 1992; LEGENDER, 1986).

Results were evaluated statistically. Results obtained by different doses of the same hormone were compared by Student Newmans Kuels multiple range test. The efficacy of ovaprim and HCG was compared by student's "t" test.

Results and discussion

Increase in dosage of the hormones produced elevated values in egg output and the enhancement was statistically significant (Table 1, $P<0.05$). SALAMI et al. (1994) reported a similar increase in egg output (10,940) due to the administration of HCG in *C. gariepinus* when compared to carp pituitary (7,650 - 8,355). However, the increase in egg output due to ovaprim administration was not statistically significant ($P>0.05$) in *C. punctatus*. The total number of eggs produced was 30,000 - 35,000 in mrigal and 50,000 - 60,000 in rohu injected with gonadotropin-releasing hormone, pimozide and calcium, respectively (HALDER et al., 1991). In the present study spawning was complete in the medium (0.3 ml ovaprim and 2000 IU HCG) and high (0.5 ml ovaprim and 3000 IU HCG) dosages of both the hormones. But no spawning was noticed in low dosages of both ovaprim (0.1 ml) and HCG (1000 IU) indicating that the selected dosages were insufficient to induce spawning. The dosage of ovaprim selected by previous authors for induced spawning in carp and murrel ranged between 0.3 ml/kg and 0.6 ml/kg body mass (NANDEESHA et al., 1993; FRANCIS, 1996; HANIFFA et al., 1996). The minimal HCG dosage required to induce ovulation

Table 1. Effect of different dosis of two hormones on induced spawning in *C. punctatus* and *H. fossilis*. The low, medium and high dosages with different superscripts are significantly different ($P<0.05$).

Hormone	Fish mass (g)	Dosage kg/bw	Latency period (h)	Fertilization rate (%)	Egg output	Hatching rate (%)	Survival rate of hatchlings (%)
C. punctatus							
Ovaprim	65 - 80	0.1 ml	-	-	30 ± 8^{a}	-	-
	65 - 80	0.3 ml	28 - 34	73.5	3276 ± 75^{b}	65.0	30
	75 - 85	0.5 ml	28 - 34	75.0	198 ± 10^{c}	50.0	10
	60 - 70	1000 IU	-	-	102 ± 20^{a}	-	-
HCG	70 - 80	2000 IU	28 - 34	75.5	699 ± 78^{b}	65.5	50
	65 - 85	3000 IU	28 - 34	78.0	1253 ± 126^{c}	70.5	65
H. fossilis							
	100 - 105	0.3 ml	18 - 24	70.0	258 ± 85^{a}	50.5	10
Ovaprim	90 - 105	0.5 ml	18 - 24	75.0	1052 ± 220^{a}	60.0	30
	90 - 100	0.7 ml	18 - 24	70.0	6692 ± 790^{b}	50.0	15
	80 - 105	1000 IU	18 - 24	78.0	6336 ± 800^{a}	75.0	60
HCG	90 - 100	2000 IU	18 - 24	75.0	18376 ± 1020^{b}	60.5	50
	110 - 115	3000 IU	18 - 24	70.0	82922 ± 5432^{c}	60.0	55

in *Clarias macrocephalus* was 2000 IU /kg body mass, and 1000 IU /kg was only partially effective (MOLLAH and TAN, 1983). Similarly, *Clarias bactrachus* did not spawn at 2100 IU/kg (ZAIRIN et al., 1992), suggesting that the number of ovulated eggs is dose related. Hence, ZONNEVELD et al., (1988) recommended a dose of 3000 IU HCG for inducing ovulation in *C. bactrachus.* The dosage doubtless varies in different species, depending on how closely the endogenous gonadotropin is related to HCG.

In the present study, a latency period of 28-34h was noticed for *C. punctatus* irrespective of the hormones. *H. fossilis* spawned after a latency period of 18-24h for both hormones. The latency periods reported in the literature are 6-25h for *C. punctatus* (BANERJI, 1974), 22-25 h for *H. fossilis* (KOHIL and GOSWAMI, 1987), and 16-20h for *Clarias gariepinus* (MUNSHI and HUGHES, 1991).

Irrespective of the hormones and fish species, fertilization was 70% and above for the different dosages tested. The highest percentage of fertilization (78%) was noticed in *C. punctatus* injected with high dosage of HCG, whereas the same was recorded in low dosages in the case of *H. fossilis* (Table 1). Hence, no generalization could be made. Whatever the case may be, fertilization rate as a function of ovaprim was slightly less when compared to HCG.

HANIFFA et al. (1998) reported a fertilization rate of 60-70%, 65-79%, 75-80% and 95-98% for *C. striatus* injected with pituitary extract, HCG, LHRHap and ovaprim, respectively. Hatching rate was more (above 60-75%) for HCG injected *C. punctatus* and *H. fossilis* when compared to ovaprim (50 - 65%) injected test fish (Table 1). Similarly, the survival rate of hatchlings was also higher (50-60%) for HCG injected individuals than for those injected with ovaprim (10-30%; Table 1). SALAMI et al. (1994) also reported a better performance due to HCG administration than carp pituitary extracts in *C. gariepinus*.

Acknowledgements

This study was supported by a major grant awarded to Dr. M. A. Haniffa by the Indian Council of Agricultural Research (New Delhi). Thanks are due to S. Vijayakumar and J. Shaik Mohamed for their assistance, and to Rev. Fr. Antony A. Pappuraj, S. J., Principal, St. Xavier's College, for providing the necessary facilities.

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Received: 5 November 1998
Accepted: 22 February 2002

HANIFFA, M. A. K., S. SRIDHAR: Potaknuto mriješćenje vrste *Channa punctatus* i soma *Heteropneustes fossilis* primjenom ljudskog korionskog gonadotropina i sintetskog hormona ovaprim. Vet. arhiv 72, 51-56, 2002.

SAŽETAK

Mriješćenje je uspješno potaknuto primjenom sintetskog hormona ovaprima i humanog korionskog gonadotropina (HCG). Maticama su jednokratno ubrizgane različite doze hormona. Plodnost u matica vrste *C. punctatus* bila je 3273 ± 75 pri primjeni ovaprima te 1253 ± 126 pri primjeni HCG, dok je u matica *H. fossilis* iznosila 6692 ± 790 za ovaprim i 82922 ± 5432 za HCG. Uspješna indukcija mriješćenja u vrste *C. punctatus* ustanovljena je pri dozi ovaprima od 0,3 i 0,5 ml/kg tjelesne mase i 2000 odnosno 3000 I.J. HCG-a na kg tjelesne mase. U vrste *H. fossilis* uspješno mriješćenje utvrđeno je pri dozama ovaprima 0,3, 0,5 i 0,7 ml/kg tjelesne mase i HCG-a od 1000, 2000, 3000 I.J.

Ključne riječi: indukcija, mriješćenje, ovaprim, humani korionski gonadotropin, *Channa punctatus*, *Heteropneustes fossilis*