
Efficacy of Synthetic Hormones *Ovatide* and *Ovaprim* in Induced Breeding of Major Indian and Chinese Carps

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Abstract The formulation of synthetic hormones, *Ovatide* and *Ovaprim* was tested for the induced breeding in major Indian and Chinese carps *viz* *Ctenopharyngodon idella* (grass carp), *Hypophthalmichthys molitrix* (silver carp), *Labeo rohita* (Rohu), *Cirrhims mrigala* (Mrigal). Six pairs each of grass carp, silver carp, Rohu and Mrigal were stimulated with formulation of synthetic hormones *ovatide* and *ovaprim* for spawning, fertilization and fecundity rate. Results indicated that 100% spawning was achieved in studied carps with both the hormones; however, differential responses were shown by different carps in regard to fecundity and fertilization rate to each tested hormone. In response to *ovaprim*, highest average fecundity values (89441) and fertilization rate (70 %) were recorded in Silver carps. *Ovatide* induced similar tendency in Grass carps where fecundity was 88015 and fertilization rate 97 %. Overall, results of this study suggested that *ovatide* induced maximum fecundity and fertilization in grass while *ovaprim* in silver carps.

Keywords: Aquaculture, induced breeding, synthetic hormones, fecundity, fish farming

Introduction

Fresh water fish culturing is an important sector of food production in Asia and throughout the world for raising the quality and quantity of domestic fish production for human consumption (Gjedrem *et al.*, 2012). During the last two decades, growth in human population, rising incomes and changes in

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commodity prices have changed human food consumption patterns with inclination towards eating meat, fish and other nutritious diets (Diouf, 2009; Gjedrem *et al.*, 2012). This tendency has shifted huge investments towards fish farming and aquaculture in many parts of the world. In Pakistan, the carp culture is also rapidly expanding but non-availability of quality fish seed is one of the major problems in fish farming.

In recent years, induced breeding for qualitative and quantitative improvement of fish has been widely recognized as a popular technique for significant expansion of reproductive processes of domestic fishes (Dhawan and Kaur, 2004). Induced breeding is based on the principals of manipulating hormonal or environmental factors for stimulation of reproduction in fishes (Marimuthu *et al.*, 2009). One of the pre-requisite for enhanced reproduction in fishes is the process of ovulation which is controlled by the body's internal chemicals (hormones) and the external environment (Peter and Yu, 1997). Ovulation is regulated by important endogenous hormones like gonadotropin releasing hormone, gonadotropic hormone and gonadotropin inhibiting factor which are interdependent on each specific hormone or factor for proper regulation and corresponding signal mediation necessary for ovulation (Peter and Yu, 1997; Peter *et al.*, 1998; Marimuthu *et al.*, 2009). In fisheries, stimulation of ovulation by synthetic means is gaining popularity because successful ovulation correspond to maximum fish production and economic benefits if other conditions required for fish raising are strictly maintained. A large variety of synthetic formulations containing GnRH are now available which have successful application in stimulating ovulation process in different fish species (Marimuthu *et al.*, 2009). Among synthetic commercial formulations, Ovatide and Ovaprim are widely used in induced breeding. Brood stock development is of great importance in obtaining successful results in artificial of induced spawning along with pond size depth, proper species ratio, use of nutritive feed, and maintenance of water quality (Triptai, 1992). The mass breeding and production of quality seeds of three major carps (*Catla catla*, *Labeo rohita* and *Cirrhims mrigala*) with the aid of ovaprim are reported by Pander and Singh (1997). Dhawan and Kaur (2004) used ovatide and ovaprim for induced breeding of Indian carps. They found that ovaprim was more effective than ovatide in breeding induction in *Catla catla*; however, in *Labeo rohita* and *Cirrhina mrigala*, ovatide resulted in high fecundity and fertilization

rate. Sahoo *et al.* (2005) reported that different doses of Ovatide effectively induced ovulation in *Clarias batrachus* and breeding performance was ideal. Khan *et al.* (2006) stated that Ovatide was better than Ovaprim-C in induced spawning, fecundity, hatching and fertilization breeding of *Labeo rohita*. Khakesh *et al.* (2010) documented that both Ovatide and Ovaprim were effective in spawning success, fecundity, hatching and fertilization rate in *Barbus sharpeyi*. The purpose of this study was to evaluate Ovatide and Ovaprim hormones for spawning, fecundity and fertilization performance of major Indian and Chinese carps.

Materials and methods

The present breeding experiment was conducted at Carp Hatchery and Training Center Sherabad Peshawar (CH&TC) during April-August 2006. Major Indian and Chinese carps viz *Ctenopharyngodon idella* (grass carp), *Hypophthalmichthys molitrix* (silver carp), *Labeo rohita* (Rohu), *Cirrhims mrigala* (Mrigal) were obtained from commercial fishery farm and their sexes were identified based on morphological characters like swollen abdomen, pinkish vent and smooth pectoralfin in female and rough petoralfin in mature male. Brooders were then transferred to holding tanks for the purpose of acclimatization and excreta. The temperature of the water was 23.5-26 °C. Water was supplied from tube well. Weight of carps was determined with digital balance (Model 235, Salter Company, England). Healthy brooders weighing between 1 to 4 Kg were selected to obtained good results.

For female carps, 0.5ml of ovatide Kg body weight⁻¹ was used in all four species of rohu, mrigal grass carp and silver; while for male carps 0.3ml/Kg of body weight was supplied through injection. After treatment with Ovatide and Ovaprim, craps were left circular tank having area of 5sq. feet where females and males usually in the ration 1:2 were recovered. The temperature of the circular tank was between 23.5-26 °C, dissolved oxygen, CO₂ and hardness was 6.2, 10 and 260 ppm respectively. pH and alkalinity were maintained as 7.5 and 210 respectively (Table 1).

Table 1. Quality of water in circular tank

Dissolved O ₂	Dissolved CO ₂	Hardness	Alkalinity	pH	Temperature (°C)
6.2 ppm	10 ppm	260 ppm	210	7.5	26

10-18 hours of injection, the spawning was started. Breeding time was different during different trails. Both methods of fertilization i.e., natural and artificial were managed. In natural fertilization, after ripening the female oozed out eggs and male gave milt, the fertilization took place. Required female was examined whether they were ready to strip. Females yielded eggs freely by applying a very slight pressure on their belly. Fecundity means, fertilization rate, hatching capacity and other parameters were determined following the method described by Naeem *et al.* (2013).

Results

Data on different parameters (fecundity, fertilization, eggs/Kg body weight and hatching capacity) of different major Indian and Chinese carps in response to Ovotide and Ovaprim hormones is presented in Table 2. In Grass, Rohu and Mrigal carps maximum fecundity was induced by Ovotide which corresponded to 88015, 72287 and 49024 against Ovaprim which yielded 59349, 62637 and 37592 in same carps respectively. In Silver carps however, fecundity was higher at Ovaprim (89441) than Ovotide (43638) (Table 2 & Fig. 1).

Table 2. Response of major Indian and Chinese carps to Ovotide and Ovaprim

Carps	Fecundity (No.)		Fertilization (%)		Eggs/Kg body weight		Hatching (%)	
	Ovotide	Ovaprim	Ovotide	Ovaprim	Ovotide	Ovaprim	Ovotide	Ovaprim
Grass	88015	59349	63	70	59,369	53,632	56.5	48
Silver	43638	89441	97	62	25,402	40,985	41.5	54
Rohu	72287	62637	73	67	81,851	60,741	82	60
Mrigal	49024	37592	40	43	12,601	74,439	34.5	61

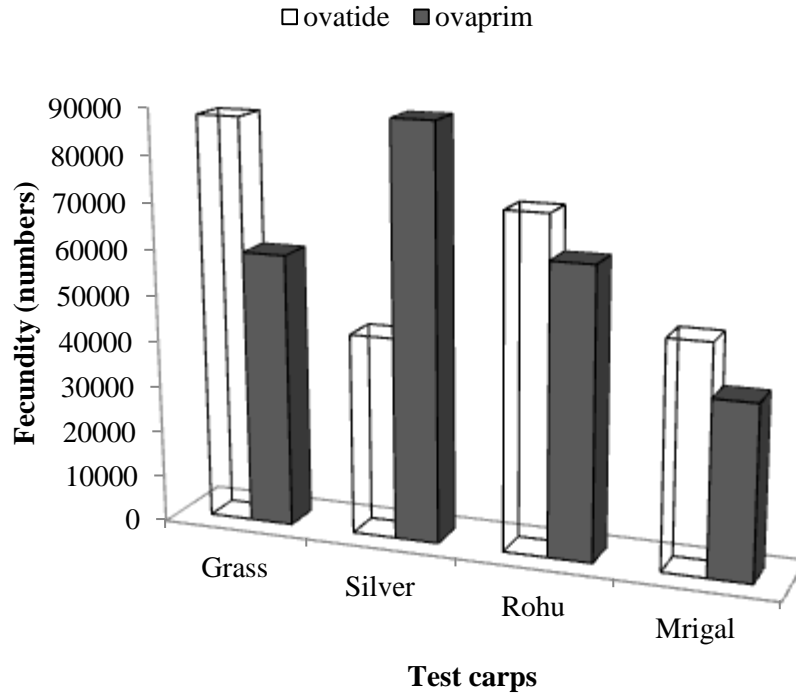


Figure 1. Fecundity rate of test carps to Ovatide and Ovaprim

Highest fertilization rate (97 %) was recorded in Silver carps at Ovatide followed by Rohu (73 %), Grass (63 %) and Mrigal (40 %). Ovaprim caused highest fertilization in Grass carps which corresponded to 70 %. This was followed by Rohu, Silver and Mrigal which showed fertilization at Ovaprim as 67, 62 and 43 % respectively (Fig. 2).

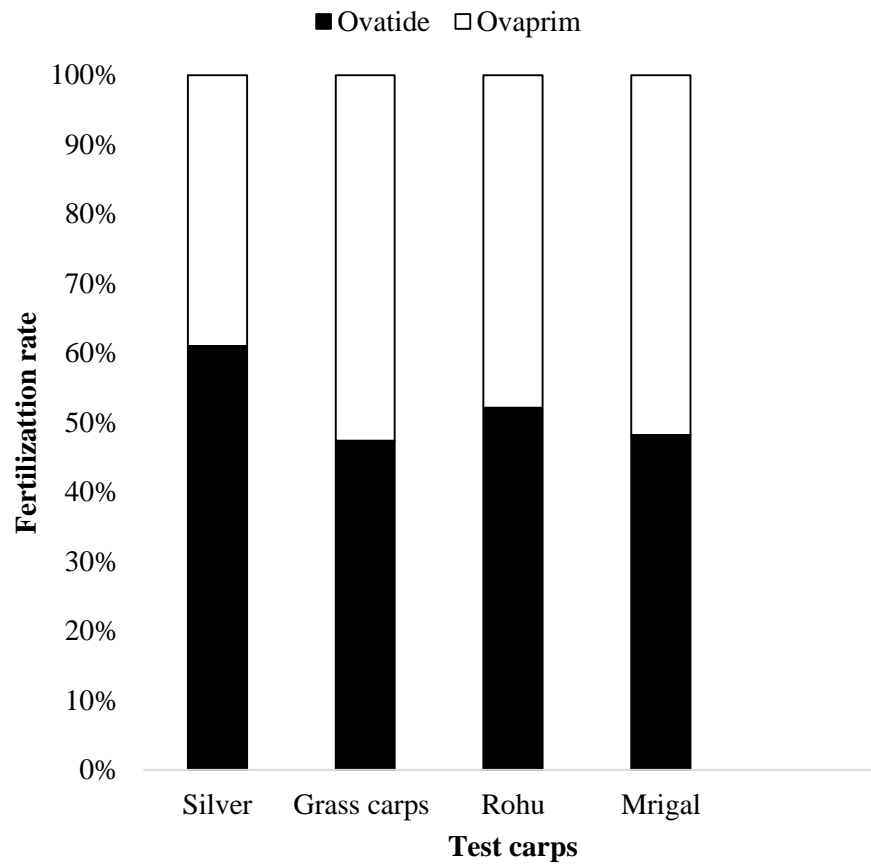


Figure 2. Fertilization rate of different carps in response to synthetic hormones Ovatide and Ovaprim.

Discussion

Although our results suggested that both hormones were effective in inducing hatching, fecundity and fertilization in tested carps; however, Ovatide was found superior than Ovaprim by causing highest fertilization in all carps except Grass carps where Ovaprim was effective. Moreover, variable responses were shown by different carps in response to administered hormones. Ovatide and ovaprim are commercially synthesized hormones which are used for spawning in fishes. Among the various analogue of salmon releasing hormone D-Arg, Trp, Pru, and Net has been found to be highly effective and this particular analogue is used in Ovaprim. This high effectiveness of salmon

releasing hormone is due to its higher affinity for binding sites in the pituitary (Peter *et al.*, 1998; Marimuthu *et al.*, 2009). One of the pre-requisite for enhanced reproduction in fishes is the process of ovulation which is controlled by the body's internal chemicals (hormones) and the external environment (Peter and Yu, 1997). Ovulation is regulated by important endogenous hormones like gonadotropin releasing hormone, gonadotropic hormone and gonadotropin inhibiting factor which are interdependent on each specific hormone or factor for proper regulation and corresponding signal mediation necessary for ovulation (Peter and Yu, 1997; Peter *et al.*, 1998; Marimuthu *et al.*, 2009).

In fisheries stimulation of ovulation by synthetic means is gaining popularity because successful ovulation correspond to maximum fish production and economic benefits if other conditions required for fish raising are strictly maintained. A large variety of synthetic formulations containing GnRH are now available which have successful application in stimulating ovulation process in different fish species (Marimuthu *et al.*, 2009). Ovatide and ovaprim has almost similar active ingredients with differences that ovatide is less viscous and cost effective (Dhawan and Kaur, 2004). Different researchers have reported different results of the two hormones. Naeem *et al.* (2011) states that Ovaprim is advantageous than Ovatide in inducing ovulation and fecundity. On the other hand, Dhawan and Kaur (2004) prefer ovatide over ovaprim. Results of this study are in agreement with Dhawan and Kaur (2004) and Marimuthu *et al.* (2009) but contradicts the finding of Naeem *et al.* (2013). Moreover, the mass breeding and production of quality seeds of three major carps (*Catla catla*, *Labeo rohita* and *Cirrhims mrigala*) with the aid of ovaprim are reported by Pander and Singh (1997). Brzuska and Adamek (1999) stimulated ovulation in four groups of *Silurus glanis* (European catfish) using injection of LHRH ethylamide (200mg/Kg) and pimozone (10mg/Kg), ovaprim (Salmon GnRH and domperidone, 0.33mlg/Kg) or carp pituitary extract (4 mg/Kg in one or two doses). A higher percentage of ovulating females (Producing eggs of high quality) was obtained with the LHRH analogue and Ovaprim treatments (100 and 80 percent respectively) as compared with fish treated with pituitary extract (66.67 and 60 percent for the groups receiving one and two doses respectively).

In conclusion, Ovatide and Ovaprim yielded effective stimulation of fecundity, fertilization and hatching in four major Indian and Chinese carps.

Differential responses were observed among different carps under the influence of two hormones; however, overall effectivity of Ovatide was greater than ovaprim because it caused maximum fecundity and fertilization tested carps.

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