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Induced breeding of Vietnam koi (*Anabas cobojius,* Hamilton, 1822) under controlled conditions at Murshidabad district, West Bengal

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ABSTRACT

Air-breathing fish culture is an age-old practice but at present these high value fishes are commercially culture in different area of West Bengal. Vietnam koi, a new variety of exotic koi, native to Vietnam getting tremendous popularity in different parts of West Bengal due to its quick increase in body weight. Murshidabad Krishi Vigyan Kendra under take programme on popularization of new breed air-breathing fish through demonstration programme during 2014 to 2015. By culturing this species farmer's were getting 150g to 200g body weight within 3-4 months and the market price of was Rs. 250-300 per kg. Realizing the huge demand of quality fish seed, KVK Murshidabad successfully under took the breeding programme of this species at KVK farm. In this breeding programme gonadoprim hormone used as inducing agents in different doses i.e. 0.25ml, 0.30ml, 0.35ml kg^{-1} of body weight for male and 0.35ml, 0.45ml, 0.50ml kg^{-1} of body weight for female. Among the different doses 0.45 ml kg^{-1} of body weight for female and 0.3 ml kg^{-1} of body weight for male was observed as the minimum effective dose of gonadoprim hormone. Relative fecundity of Vietnam koi was recorded 80000-100000 nos. of egg kg^{-1} body weight of female, fertilization rate was 90-95% and hatching rate was 85-90 % in 28-29^{0}C temperature in hapa under cemented tank. The spawn were reared in nursery pond using hapa where 70-80% survival rate of larvae was recorded.

***Keywords*:** Induced breeding, gonadoprim, hatching rate and survival rate, Vietnam koi

Vietnam koi is a native fish species in Vietnam (Hasan *et al*., 2010; Datta and Ghosh, 2015; Kohinoor *et al*., 2016). Its external physical appearance is similar to native climbing perch as of India, but two black spot found, one in operculum and another is in caudal peduncle which is not found in native climbing perch (*Anabas testudineus*).

It has great potential to develop our fishery sector due to its higher growth rate. It reached up to 200-250 g only within 4 months of culture. Murshidabad KVK has selected of this exotic air-breathing fish species for demonstration programme since 2014. Now a day's the demand of this species is increasing day by day among the fish growers of West Bengal due to higher market price. To overcome this situation, another fast growing climbing perch known as Thai koi and Vietnamese koi (*Anabas testudineus*) strain has been introduced from Thailand and Vietnam in 2002 and 2010, respectively (Kohinoor *et al*., 2016). To fulfill the hues demand of Vietnam koi fish seed KVK Murshidabad has started induced breeding programme and at its own farm.

Keeping all this in view the KVK was under taken the induced breeding of Vietnam koi with the objectives of standardization of minimum effective dose (MED) of Gonadoprim hormone and quality seed production of Vietnam koi towards fulfillment of farmers demand.

MATERIALS AND METHODS

Collection of brood fishes

This breeding programme was carried out at Murshidabad Krishi Vigyan Kendra, West Bengal University of Animal and Fishery Sciences during 2014 to 2015. Disease free, healthy and 4-5 months mature 30 nos. of male (average length 18 cm and weight 175 g) and 30 nos. of female (average length 17 cm and weight 190 g) were collected from KVK farm ponds in the month of May, 2014 and were acclimatized for 48 hours, prior to breeding operation, in the cemented tank (6 × 3 ×2 ft) filled with ground water, the water quality parameters was temperature 28-29^{0}C, pH 7.5, DO 5.2 mg L^{-1}, and hardness 110 mg L^{-1} as $CaCO_3$, APHA 1995, with aeration. Brood fishes were cultured with 26% protein feed. During acclimatization male and female brooders were treated with 1% $KMnO_4$ solution for 5 minutes to use as disinfectant for avoiding diseases outbreak and kept in separate tank to enhance desire for mating. A continuous water flow was provided and during this time no feed was provided.

Table 1: Water quality parameters for this breeding programme

Parameters	Ground water
Temperature	28-290C
pH	7.5
Dissolved oxygen	5.2 mg L^{-1}
Hardness	110 mg L^{-1}

Mode of reproduction

A. cobojius is a bisexual fish, required 4-5 months for maturation. Males are having slender body, narrow pointed vent and milt oozing out when slight pressure is applied on the abdomen and in case of female soft bulge

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abdomen with swollen and pinkish genital papilla (Singh *et al*., 2012).

Hormone administration

In this experiment gonadoprim hormone was used as inducing agents in different doses *i.e*. 0.25ml, 0.30ml, 0.35ml kg^{-1} of body weight for male and 0.35ml, 0.45ml, 0.50ml kg^{-1} of body weight for female. Minimum dose of hormone, fecundity (nos. of egg kg^{-1} of body wt. of female), fertilization rate (%), hatching rate (%) and survival rate (%) was observed and the data were statistical analyzed following the method given by Gomez and Gomez (1984).

After spawning, numbers of eggs were counted gravimetrically (Haniffa *et al*., 2002). One gram of egg sample was randomly withdrawn from the bulk and weighed. Sampling and subsequent weighing was repeated thrice. All the weighed egg samples were counted manually and then averaged.

Relative fecundity =Total number of eggs ÷ Total body weight of female (kg)

Fertilization of eggs was very much obvious soon after sprinkling but was confirmed after 6-8 h. Egg development was very slow, however it was easily differentiable from unfertilized eggs. Percent fertilization was calculated as per the following method suggested by Muir and Robert, 1985.

$$\text{Fertilization rate } (\%) = \frac{\text{Number of fertilized eggs}}{\text{Total no. of eggs}} \times 100$$

RESULTS AND DISCUSSION

Relation between fecundity and doses (ml kg of body weight)

It was observed that, fecundity (no. of eggs kg^{-1} body weight) of Vietnam koi varied with different doses of gonadoprim. The highest fecundity was observed at dose 0.45 ml kg^{-1} of body weight (120000 nos, eggs kg^{-1} of body weight) and the lowest fecundity was recorded at the dose of 0.5 ml/kg of body weight (45000nos. of eggs kg^{-1} of body weight). A negative linear correlation was observed between fecundity and doses at 1% level significance ($r = -0.052$; $p < 0.01$, $n = 30$). There was negative linear correlation between relative fecundity and doses (Fig.1).

Relation between fertilization rate (%) and doses (ml kg^{-1} of body weight)

It was found that fertilization rate (%) of Vietnam koi was varied from doses to doses. The highest (95%) and lowest (45%) fertilization rate were obtained at dose of 0.45 (ml kg^{-1} of body weight) and 0.5 (ml kg^{-1} of body weight) respectively. A negative linear correlation was found between fertilization rate (%) and doses (ml kg^{-1} of body weight) at 1% level ($r = -0.33$; $p<0.01$; $n = 30$) of significance. Fertilization rate (%) was increased with increased its optimum level and there after decreased (Fig. 2).

Relation between fertilization rate (%) and fecundity

It was recorded that fertilization rate (%) of Vietnam koi was varied with fecundity (no. of eggs kg^{-1} of body weight). The highest (95%) and lowest (40%) fertilization rate were obtained at fecundity 90000 (no. of eggs kg^{-1} of body weight) and fecundity 45000 (no. of eggs $kg^{-1}$of body weight) respectively. A positive correlation was found between fertilization rate (%) and fecundity (no. of eggs kg^{-1} of body weight) at 1% level of significance ($r= 0.59$; $p<0.01$; $n=27$). Fertilization rate (%) was increased with the increasing rate of fecundity (no. of eggs kg^{-1} of body weight) (Fig. 3).

Relation between hatching rate (%) and Fecundity (no. of eggs kg^{-1} of body weight)

It was observed that hatching rate (%) of Vietnam koi was varied with fecundity (no. of eggs kg^{-1} of body weight). The highest (90%) and lowest (60%) hatching rate were obtained in 28-29^{0}C temperature in hapa under cemented tank in this breeding programme. A positive correlation was found between hatching rate (%) with fecundity (no. of eggs kg^{-1} of body weight) at 1% level of significance ($r= 0.60$; $p<0.01$; $n=27$). Hatching rate (%) was increased with the increased rate of fecundity (no. of eggs kg^{-1} of body weight) (Fig. 4).

Survival rate (%)

One-day-old hatchlings were held in hapas. Three days after hatching they started feeding externally. Yolk sacs were completely absorbed between days 3 and mixed plankton collected from natural water bodies was fed to larvae from day-3 onwards. Fishes were released into hapa which was placed in nursery pond. Fish reached an average of 2.5 cm after one month of rearing. Survival rate of larvae was recorded 70-80%.

In the present investigation, it was observed that complete spawning occurred at the dose @ 0.45 ml/kg of body weight. A negative linear correlation was observed between fecundity and doses at 1% level of significance ($r = -0.052$; $p< 0.01$, $n=30$) and doses (Fig.1). Similar results were recorded by Marimuthu *et al*., 2007 in *Channa striatus* treated with 0.4 ml kg^{-1} of ovatide. However, a higher dose of 1 ml kg^{-1} ovatide was required to obtain complete spawning in *C. batrachus reported by* Sharma *et al*., 2010. Pius, 2010 observed that when ovaprim was used, a higher dose of 0.5 ml kg^{-1} was ineffective in inducing ovulation in *Anabas testudineus*.

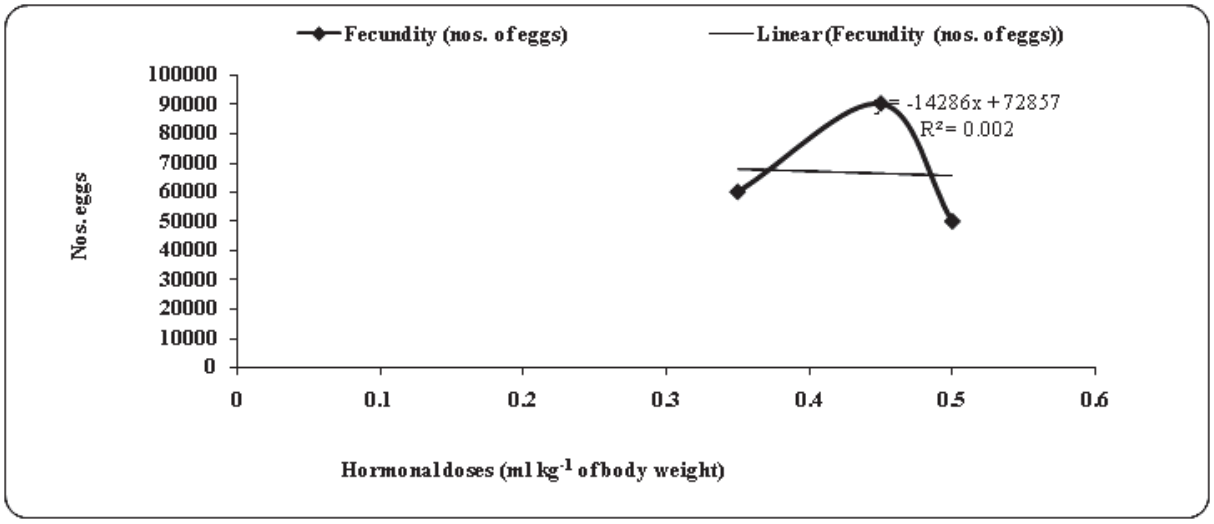

Fig. 1: Correlation between relative fecundity (no. eggs kg^{-1} of body weight) and hormonal doses

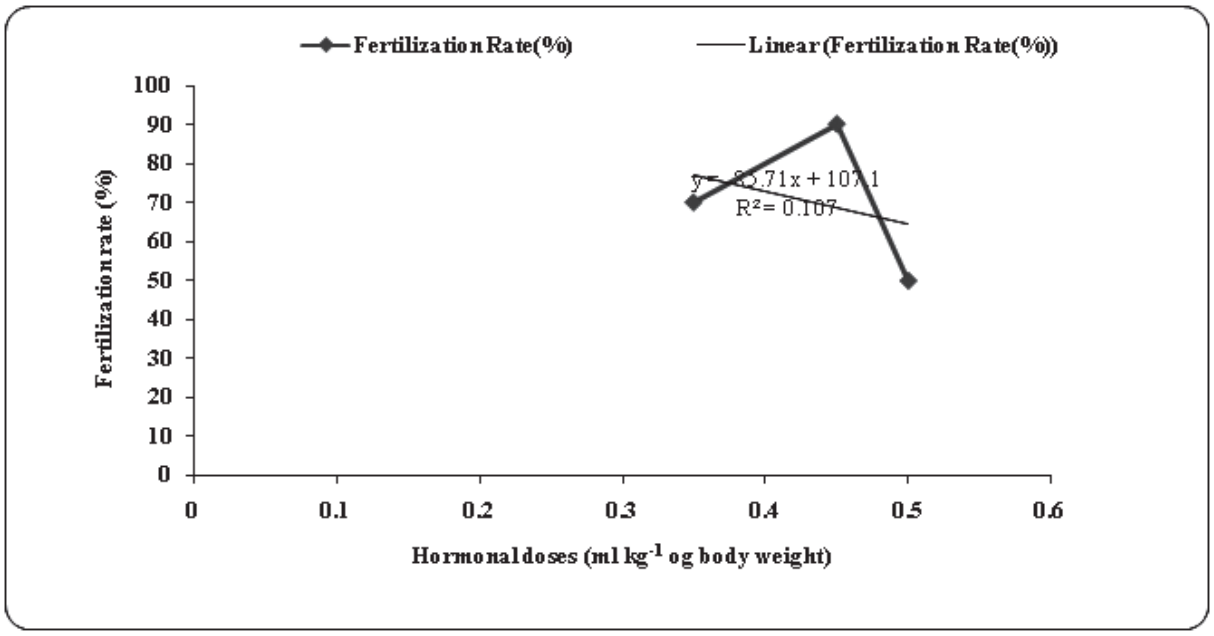

Fig. 2: Negative correlation between fertilization rate (%) and doses (ml kg^{-1} of body weight)

The optimum water temperature for breeding *A. testudineus* under laboratory condition was 28±1^{0}C as reported by Moitra *et al*., 1979. In the present study, the water temperature was 28^{0}C which was quite favorable for breeding.

It was found that fertilization rate (%) of Vietnam koi was varied from dose to dose. The highest (95%) and lowest (45%) fertilization rate were obtained at dose of 0.45 (ml kg^{-1} of body weight) and 0.5 (ml kg^{-1} of body weight) respectively. A negative linear correlation was found between fertilization rate (%) and doses (ml kg^{-1} of body weight) at 1% level significance ($r = -0.33$; $p<0.01$; $n = 30$ Fertilization rate (%) was increased with increased its optimum level and there after decreased (Fig. 2). Similar results of successful spawning through a single dose of Ovaprim have been reported in several carp species in India by Nandeesha *et al*., 1990; Das *et al*., 1994. Nandeesha *et al*. (1990), (1993); Alok *et al*. (1993) also observed that fertilization rate (%) and hatching rate (%) increased using Ovaprim. They also observed that the highest percentage of fertilization (95-98%) was observed in ovaprim-injected *C. striatus.* Azad and Shimray (1991) observed 90% fertilization in Mrigal when injected with ovaprim. Nayak *et al*. (2001) reported

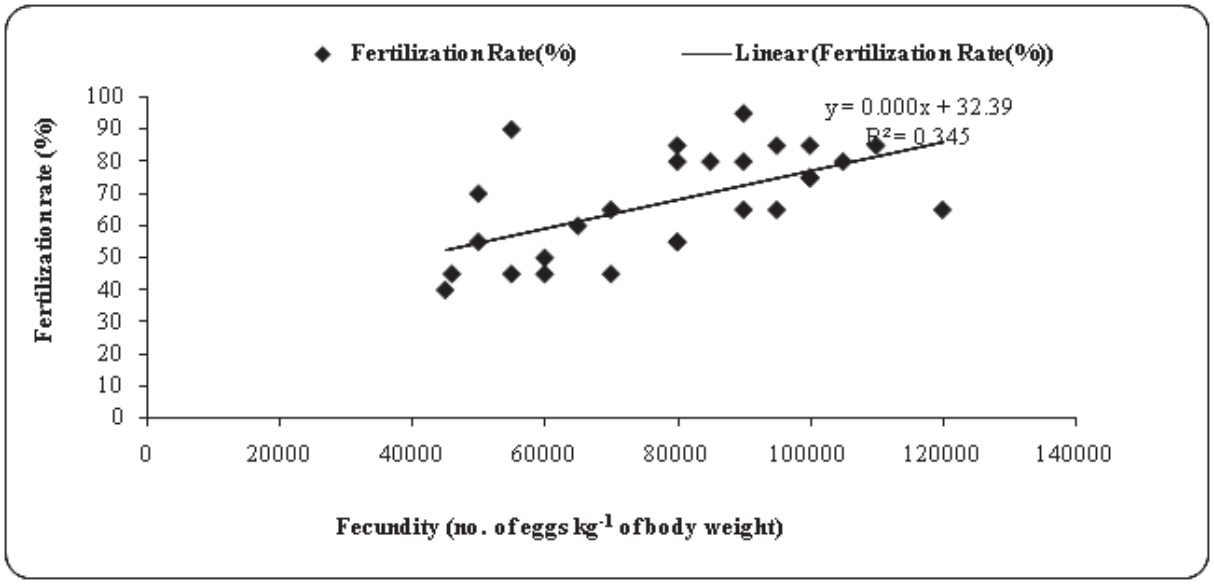

Fig. 3: Correlation between fertilization rate (%) and Fecundity (no. of eggs kg^{-1} of body weight)

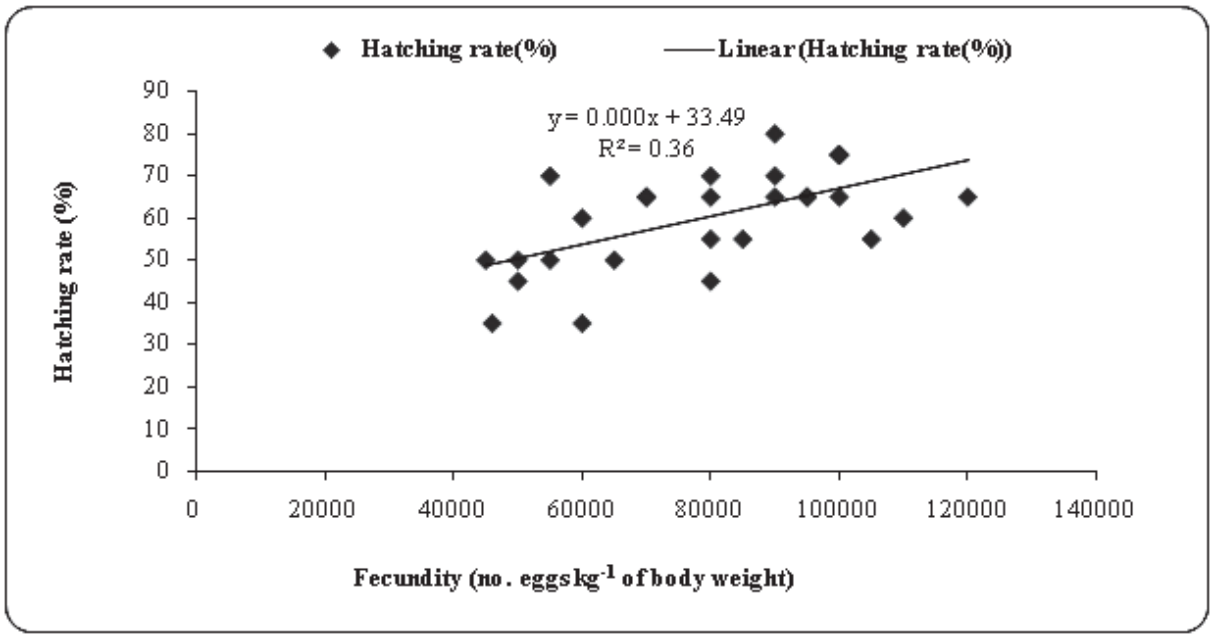

Fig. 4: Correlation between hatching rate (%) and Fecundity (no. of eggs kg^{-1} of body weight)

that the use of ovaprim cause increase in fertilization and hatching rate (%) of eggs in *H. fossilis*.

The objective of the present breeding programme was fulfilled. Gonadoprim administered at 0.45 ml kg^{-1} body weights produces the highest spawning rate, egg production, and hatching rate in *A. cobojius*. The positive response of both males and females to a single dose of gonadoprim was significant for commercial fish seed production. This breeding protocol does not require a high investment, so it can be adopted by small farmers for seed production as well as be used for species restoration and conservation.

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