

EFFICACY OF VARIOUS CONCENTRATIONS OF SYNTHETIC HORMONES ON THE INDUCED BREEDING OF *Channa marulius* (SOLE)

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Introduction

Channa marulius (bullseye snakehead) is a valuable freshwater species in aquaculture, known for its rapid growth, and significant market demand. The species is particularly sought after due to its nutritional value, offering a rich source of high-quality protein. However, natural spawning challenges have necessitated the use of induced breeding techniques to ensure consistent production. This study investigates the effectiveness of various synthetic hormone concentrations in enhancing the breeding success of *Channa marulius*, aiming to improve the efficiency of its aquaculture practices.

Methodology

- Study Design**
An experimental study was conducted to evaluate the effects of synthetic hormones on the induced breeding of *Channa marulius* with the application of various dosages of stimulatory hormones: Suprefact® (LHRH) agonist and Ovaprim® (GnRH + dopamine inhibitor)
- Hormones Used**
First and second hormonal dosages of Suprefact® (diluted) and Ovaprim® (0.3, 0.4, and 0.5 ml for male and 0.8, 0.9, and 1.0 ml for females per kilogram body weight) were used. There were three treatments T₁, T₂, and T₃ and each treatment had three replicates. Male fish were treated with T₁ (0.3), T₂ (0.4), T₃ (0.5) ml kg⁻¹ of body weight while female fish with T₁ (0.8), T₂ (0.9), T₃ (1.0) ml kg⁻¹ of body weight
- Fish Selection**
Mature females were identified by swollen yellow abdomens and reddish genital openings; males by milt secretion and pointed genital papilla
- Injection Procedure**
Fish received intramuscular injections of the respective hormones, with dosages adjusted according to body weight
- Monitoring Parameters**
Breeding success, egg quality, hatching rates, and larval survival were monitored post-injection
- Data Analysis**
The collected data were statistically analyzed using SPSS-22 version software and applying two-way analysis of variance. A comparison of means was done by using Tukey's test

Results

Groups/treatments	Hormones used	Dosage concentrations (ml kg ⁻¹ BW)		Time interval of second dose (h)
		Male	Female	
T ₁	Suprefact	0.3	0.8	24
	Ovaprim	0.3	0.8	
T ₂	Suprefact	0.4	0.9	24
	Ovaprim	0.4	0.9	
T ₃	Suprefact	0.5	1.0	24
	Ovaprim	0.5	1.0	

Table 1. Synthetic hormones Suprefact® (LHRH) and Ovaprim® (GnRH + dopamine inhibitor) used as induced breeding stimulators, their dosage concentrations for male and female *Channa marulius*

Parameters	T1 (M: 0.3 ml kg ⁻¹ F: 0.8 ml kg ⁻¹)	T2 (M: 0.4 ml kg ⁻¹ F: 0.9 ml kg ⁻¹)	T3 (M: 0.5 ml kg ⁻¹ F: 1.0 ml kg ⁻¹)	p-Value
GSI % (female)	0.54 ± 0.54 ^a	1.80 ± 0.16 ^a	1.66 ± 0.02 ^a	0.124
GSI % (male)	0.51 ± 0.51 ^a	1.41 ± 0.09 ^a	1.35 ± 0.08 ^a	0.126
Fecundity	466.7 ± 466.7 ^b	2678.3 ± 143.1 ^a	2951.7 ± 52.9 ^a	0.010
Fertilization rate %	28.3 ± 28.3 ^a	96.0 ± 1.15 ^a	69.0 ± 19.5 ^a	0.129
Hatching rate %	15.3 ± 15.3 ^b	96.9 ± 0.58 ^a	90.9 ± 0.52 ^a	0.005
Survival rate %	32.2 ± 32.2 ^a	97.0 ± 0.23 ^a	97.1 ± 0.44 ^a	0.109
Time interval (response after second dose)	20.0 ± 20.0 ^a	46.6 ± 1.20 ^a	40.3 ± 0.88 ^a	0.350
Mortality of broodstock	0.00 ± 0.00 ^a	0.00 ± 0.00 ^a	0.67 ± 0.67 ^a	0.444

Table 2. Effect of various dosage concentrations of synthetic hormones Suprefact® (LHRH) and Ovaprim® (GnRH + dopamine inhibitor) on the induced breeding of *Channa marulius*

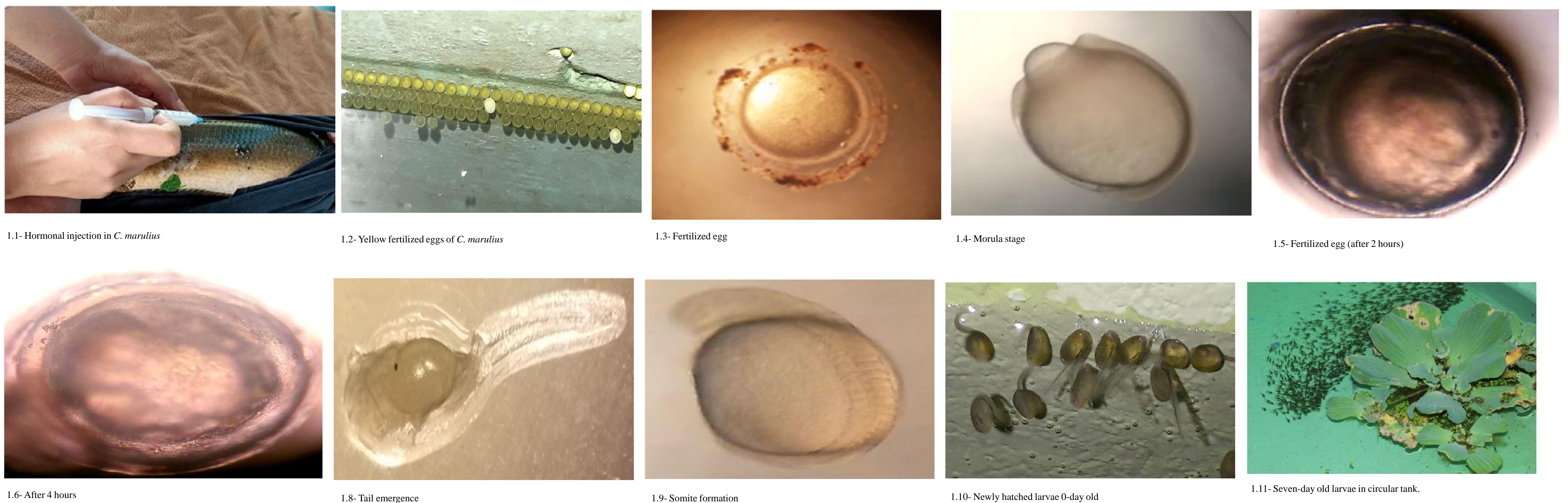


Figure 1. Egg to fry developmental stages of *Channa marulius*. (Figure 1.3, 1.6, and 1.8 at magnification 10×); (1.4, 1.5, and 1.9 at 4× magnification) following induced breeding with Suprefact (LHRH) and Ovaprim (GnRH + dopamine inhibitor).

Stage of development	Period of development	Time of appearance (h:min)	Description / Observation
Embryonic	Fertilized egg / Zygote	0 min	The eggs were yellow in color, free floating with diameter from 1.20mm-1.40mm. Blastodisc formed. Single cell embryo.
		Cleavage	15:30
		30:45	Second cleavage, 4-celled embryo
		1:00	Third cleavage, 8-celled embryo
		1:16	Fourth cleavage, 16-celled embryo
		1:35	Fifth cleavage, 32-celled embryo
		1:50	Sixth cleavage, 64-celled embryo
		2:15	Seventh cleavage, 128-celled embryo
	Morula	2:20-4:15	Blastodisc consists of many blastomeres.
	Blastula	4:20-6:30	At this time, a shield was developed, more than half the yolk entered, and there was evident anterior and posterior differentiation.
	Gastrula	6:40-9:00	With the outer epiblast and the inner one with the hypoblast There was a two-layered structure
Tail emergence	19:00	Tail development, yolk mass reduces.	
Somite stage	22:00	The formation of somite starts with the development of visible pairs of cells along the back of the embryo. The vertebral column is created by arranged these cells.	
	Twitching	45:00-48:00	In fast succession, tail became free of the yolk sphere and beat to rupture the egg membrane.
Larval	Newly hatched larvae	46:00-50:00	Hatching complete. The larvae were translucent and had free swimming ability with a straight body.
	Seven days old larvae	168:00	Larvae fully developed, mouth opened, yolk sac completely absorbed. Larvae swim actively and feed exogenously.

Table 3. Embryonic and larval developmental stages of *Channa marulius*

Conclusion

The study demonstrated that both hormones Suprefact® (LHRH) mixed with Motilium-V solution and Ovaprim® (GnRH + dopamine inhibitor) were effective and reliable synthetic hormones to induce breeding of *C. marulius*. Overall, the results of this research showed that 0.3 ml kg⁻¹ BW of these hormones administered to male and 0.8 ml kg⁻¹ BW to female *C. marulius* is the lowest effective dose to improve the breeding efficiency. However, the application of Suprefact® (diluted) and Ovaprim® doses at 0.4 and 0.5 ml kg⁻¹ for male and 0.9 and 1.0 ml kg⁻¹ for female fish significantly stimulated snakehead fish breeding activity. The present investigation also summarized the embryonic and larval developmental stages of *C. marulius* in relation to hormonal treatments.