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ASSESSMENT OF OVATIDE INDUCED BREEDING PERFORMANCE OF FRESHWATER FISH *Channa punctatus* (BLOCH, 1793) FED ON WHEAT GRASS MIXED FORMULATED FEED

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ABSTRACT

The culture of *Channa punctatus* is mostly integrated with agriculture crops such as wheat, rice and banana. The present trial was attempted to investigate the ovatide induced breeding performance of *Channa punctatus* (Bloch, 1793) fed on control and wheat grass mixed formulated feed. The experiment was performed during September to December 2021 under agro-climatic condition in closed recirculation aquaculture system at Jalgaon (Jamod), Maharashtra, India. The hormone-induced fish showed breeding behaviour 3-4 h after injection. Each female paired with a single male. At all times, the more active and aggressive male paired with the female while the other one was found to be passive and idle in the corner of the breeding tank. Mating was preceded by elaborate courtship. Spawning rituals commenced after 8–12 h of the hormone injection and continued until the releasing of gametes. Spawning was noticed within 27–31 h after the hormone administration. Minimum latency period was observed for the experimental group. The total fecundity, relative fecundity, fertilization rate and hatching rate were high in fish fed with wheatgrass mixed formulated feed. The incubation period ranged from 24 to 28 h at the water temperatures of 29 ± 1.5°C. In the present study, maximum survival was observed in larvae produced by fish fed on wheatgrass mixed formulated fed. There was no size differences in larvae produced by fish fed on control and experimental feed.

(Key words: Agriculture, *Channa punctatus,* dietary wheatgrass, induced breeding, ovatide, synthetic hormone)

INTRODUCTION

The science of fish nutrition has advanced over the last few decades primarily in response to development in commercial aquaculture. Proper nutrition is one of the most important factors influencing the ability of cultured fishes to attain the genetic potential for growth, reproduction and longevity. Food quality and quantity affect fish reproduction. Adequate protein is essential for egg development, spawning, formation of follicles, ovarian tissues, growth and development of embryo. Feed should be formulated to meet the nutritional needs of the reproducing fish which is the key factor of attaining desired brood and seed quality (Sotolu, 2010). The brood stock diet should be cheap, low cost, with low conversion efficiency and high conversion ratio with less wastage and will improve reproductive potential and yield maximum production of fry, high larval survival and fry growth ultimately increasing the profit (Jayprakas, 2017).

A sustainable and cost effective technology for brood stock development and mass production of fry and fingerlings will be the key factor for developing aquaculture industry. Dietary protein significantly affects fertility, gonad maturation, fecundity, hatching and viability of fish eggs and larval growth. Egg size and composition are useful indicators of seed production in terms of hatchability and larval quality. Larger fish egg size will eventually result in larger fry at hatching (Saumen, 2020). Larger fries possess the advantage of better survival and growth through more efficient prey capture and tolerance to survival. Thus, nutrition plays a major role in the reproductive performance and production of quality eggs and larvae which in turn enormously enhances gross fish production and improves aquaculture industry and ornamental fish culture trade globally (Jayprakas, 2017).

The wheatgrass (15%) mixed formulated feed having high nutrient contents and showed the efficacy in culture of spotted snakehead, *Channa punctatus* (Bloch, 1793). It is locally known as spotted murrel and one among the highly priced freshwater food fish species in India. It is found to be distributed throughout the South East Asian countries and has been identified as a potential candidate species for aquaculture in derelict and swampy water as it is a hardy and an air-breathing fish. The fish is well known for its taste, high protein content and low intramuscular

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spines, high nutritive value, recuperative and medicinal qualities, and is recommended as a diet during convalescence (Haniffa *et al.*, 2004). Over the last 10 years, its wild population has undergone a steady decline due to overexploitation, loss of habitat, introduction of alien species, disease, pollution, siltation, poisoning, dynamite, and destructive fishing. These factors not only destroyed the feeding and breeding grounds but also caused havoc to the biodiversity of this important fishery. As a result, according to IUCN status, it has been listed among the few low-risk near threatened fish species in India (Butle *et al.*,2021).

Therefore, the present study was attempted to investigate the breeding performance of *Channa punctatus* (Bloch, 1793) fed on control and wheatgrass mixed formulated feed.

MATERIALS AND METHODS

Experimental diets

For the experiment, both the formulated feed containing 15% wheatgrass powder and the locally available commercial feed were used.The proximate compositions of feed were estimated by using the Association of Analytical Chemists (Anonymous, 1995) methods with some modifications (Mohammad *et al.*,2019). The composition of experimental diet is given in Table 1.

Table 1. Proximate composition of the experimental feeds (on % basis)

Contents	Control	Experimental
	Commercial feed	Wheatgrass (15%) based feed
Moisture	7.46	3.67
Crude protein	24.27	39.63
Crude lipid	5.75	6.18
Crude fibre	15.11	25.87
Crude Ash	16.99	9.51
NFE	17.94	15.14
Gross energy (kjg^{-1})	13.48	18.60

Experimental fish and feeding

Channa punctatus is commonly known as the spotted snakehead murrel. For experiment, the specimens were collected from the local sources. They were disinfected with 0.1% $KMNO_4$ solution to avoid fungal infection. These collected fishes were acclimatized for 2 weeks and maintained in specially designed closed re-circulating system tanks in groups (control and test feeds; Table 1). During acclimation, fish were fed the control diet to satiation twice a day at 09:00 and 15:00 hours. After acclimation, fish were fasted for one day; batch weighted and randomly distributed. During the experiment, fish were fed on experimental diet to satiation third a day at 08:00, 12:00 and 16:00 hours.

Experimental system

The closed recirculation aquaculture system was used for the experimental trailer. The culture system composed of different tanks with specific volumes. System primarily composed of rearing tanks of 200 L volume of each. The fish were maintained in these tanks. The rearing tank also aerated by air pump for supply of oxygen to individuals. The drain settled in tanks is collected by drainage pipe is transferred to filtration unit. The filtration unit composed four different chamber settling tank, gravel filter, sand filter and bio-filter of 250 each.

Water quality standards

Water quality was maintained during the feeding trial with light: dark cycle of 12:12 h during study.The water analysis is performed according to American Public Health Association (Anonymous, 2000). The water composition and characteristics were maintained within the effective range (Bhatnagar and Devi, 2013). During the experimental period, water temperature was 28.5±2.5^{O}C; pH 8.1±0.5; total dissolved solids 240.5±19.5 mg l^{-1}; dissolved oxygen 4.42±0.24 mgl^{-1}; biological oxygen demand 1.70±0.20 mgl^{-1}; free CO_2 13.4±1.3 mgl^{-1}; alkalinity 65.3±5.0 mgl^{-1}; hardness 123.20±16.76 mgl^{-1}; ammonia 0.55±0.01 mgl^{-1}; nitrate 0.136±0.28 mgl^{-1}; nitrite 11.39±0.37 mgl^{-1}; salinity 0.3±0.1 ppt in the experimental tanks.

Experimental procedures

In the present study, a trial was made for controlled breeding of experimental diet fed *Channa punctatus* was attempted. The breeding operations were made with the methods suggested byHaniffa and Sridhar (2002), Haniffa *et al.* (2003), Haniffa *et al.* (2004), Saikia (2016) with some modifications.

The control and experimental diet fed adults of *Channa punctatus* were selected. Breeders were selected by external morphological characteristics and hand stripping. A sex-ratio was 6:3 as male: female for undertaking stripping operation. The ovatide (Hemmo Pharma, India) were injected intramuscularly into the dorso-lateral region of both males and females in a single dose. Immediately after administering the hormones the breeding sets were released into rearing tanks containing de-chlorinated water. Aquatic macrophytes such as were introduced into the breeding tank for performing their breeding activities under hiding condition. After spawning, eggs were collected, the number of eggs spawned (spawning fecundity) and rate of fertilization was calculated. Dead eggs were removed from the egg batches by siphoning. Two hourspost-spawning, a total of 500 fertilized eggs from each breeding set were collected and incubated in glass aquariato determine the hatching rate.

Statistical analysis

The reproductive performance and survival rate of experimental fishes were evaluated by using the following set of formulae suggested by Hajizadeh *et al.* (2008) with necessary modifications.

a) Total Fecundity = the number of eggs in a freshly spawned batch of eggs

b) Relative Fecundity = Total no. of eggs / weight of fish

c) Hatching Rate = [No. of hatched eggs / Total no. eggs in batch]× 100

d) Survival (Fertilization) Rate= [No. of hatch alive up to larvae stage / Total no. of hatchling]× 100

The data obtained from this study were then tabulated using Microsoft Office Excel 2010 and Represented as Mean ± SD.

RESULTS AND DISCUSSION

The data regarding breeding performances of freshwater fish *Channa punctatus* (Bloch, 1793) induced by ovatide are presented in Table 2 and 3.

The hormone-induced fish showed breeding behaviour 3-4 h after injection. Each female paired with a single male. At all times, the more active and aggressive male paired with the female while the other one was found to be passive and idle in the corner of the breeding tank. Mating was preceded by elaborate courtship. Spawning rituals commenced after 8–12 h of the hormone injection and continued until the releasing of gametes. Spawning was noticed within 27–31 h after the hormone administration. Minimum latency period was observed for the experimental group. The total fecundity, relative fecundity, fertilization rate and hatching rate were high in fish fed with wheatgrass mixed formulated feed. The incubation period ranged from 24 to 28 h at the water temperatures of 29 ± 1.5ºC. In the present study, maximum survival was observed in larvae produced by fish fed on wheatgrass mixed formulated fed. There was no size differences in larvae produced by fish fed on control and experimental feed.

Recently ovatide has been successfully used to induce spawning in stinging catfish, *Heteropneustes fossilis* (Marimuthu *et al.,* 2000); snakehead murrel, *Channa striatus* (Marimuthu *et al.,* 2007); and in walking catfish, *Clarias batrachus* (Sahoo *et al.,* 2005), freshwater fish *Channa punctaus* (Marimuthu *et al.,* 2009); freshwater Gang magur *Hemibarus menoda* (Hasan, *et al.,* 2021). In the present trial, ovatide also induced spawning in *Channa punctatus* (Bloch, 1793) fed on control and wheatgrass mixed formulated feed. The maximum latency, total fecundity, relative fecundity, fertilization rate and hatching rate were high in fish fed with 15% wheatgrass mixed formulated feed than control feed. According to Sotolu (2010) and Jayprakas (2017), protein rich diets help to enrich the breeding performance of fish (Jha and Neupane, 2019; Saumen, 2020). It suggested that wheatgrass mixed diets is rich in nutrients contents and it helped to improve the breeding performance of freshwater fish *Channa punctatus*(Bloch, 1793).

Table 2. Preparatory data of performed breeding experiment in*Channa punctatus* fed on control and wheatgrass powder based fish feed

Group	Dosage(kg bw^{-1})	No. of fishes		Fish Weight (g)			
		Male	Female	Male		Female	
				Mean	±SD	Mean	±SD
Control	0.5	6	3	76.96	5.67	56.18	2.76
Experimental	0.5	6	3	76.96	5.44	56.88	1.53

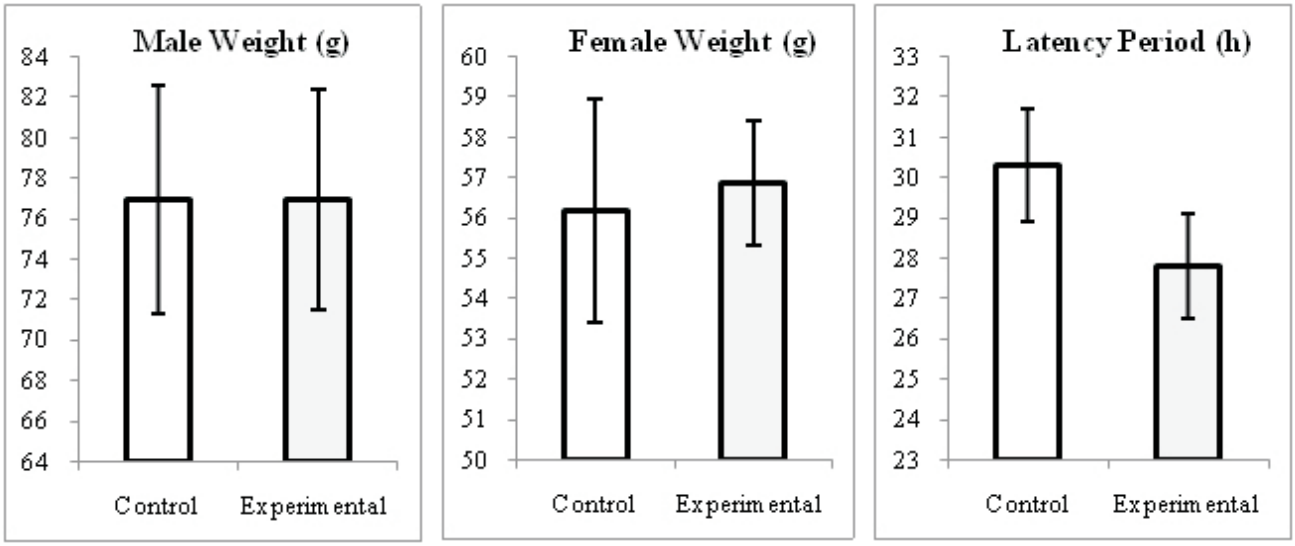

Figure 1. Preparatory data of performed breeding experiment in *Channa punctatus* fed on control and wheatgrass powder based fish feed

Table 3. Ovatide induced breeding performance of *Channa punctatus* fed on control and wheatgrass powder based fish feed

Group	Latency Period(h)		Total Fecundity		Relative Fecundity		Fertilization Rate (%)		Hatching Rate (%)	
	Mean	±SD	Mean	±SD	Mean	±SD	Mean	±SD	Mean	±SD
Control	30.3	1.4	1145	249	21.6	1.7	78.4	2.6	66.4	5.4
Experimental	27.8	1.3	2139	226	39.9	4.6	95.0	4.0	93.3	3.8

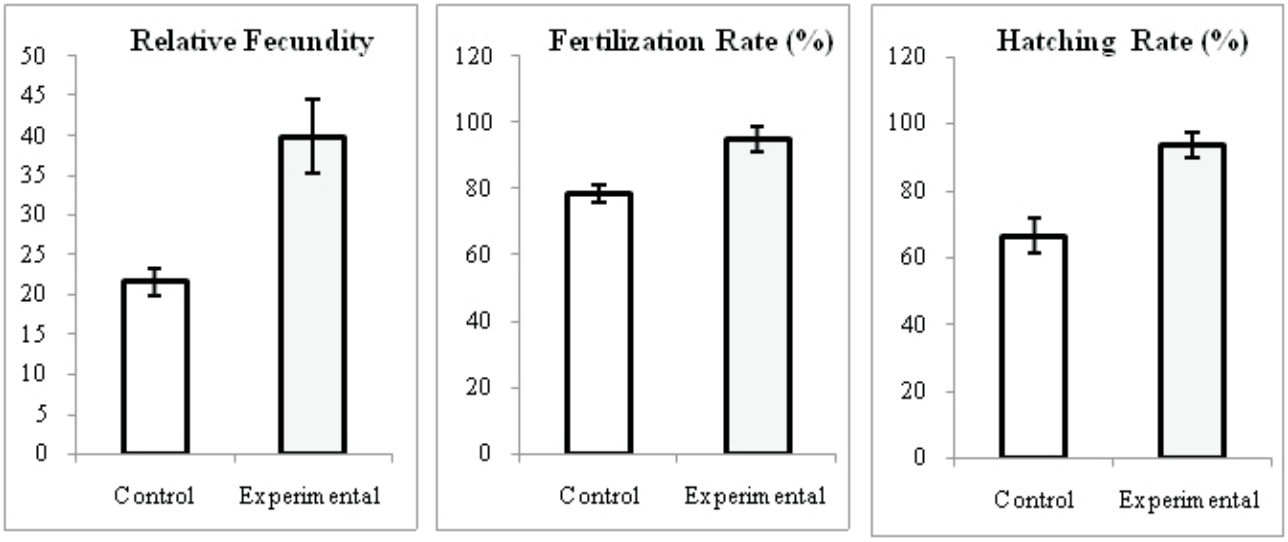

Figure 2. Ovatide induced breeding performance of *Channa punctatus* fed on control and wheatgrass powder based fish feed

The present trial was carried out to investigate the ovatide induced breeding performance of *Channa punctatus* (Bloch, 1793) fed on control and wheatgrass mixed formulated feed. The results indicated the normal breeding behaviour with minimum latency period and increased total fecundity, relative fecundity, fertilization rate and hatching rate in fish fed with wheatgrass mixed formulated feed. Hence it can be concluded that the supplementation of wheatgrass in fish feed improved the overall breeding performance of this important fish species.

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