

Research Article

Production Performance of Koi (*Anabrus testudineus*) with Shing (*Heteropnestes fossilis*) and Rajpunti (*Punteus gonionotus*) in Natural Pond Condition

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Abstract: The study was carried out in 03 selected farmer's pond at Kaliganj upazilla (sub district) under Lalmonirhat district during June to September 2019 having area of pond 0.30 acre each. Before stocking, ponds were dried and cleaned for weed and unwanted aquatic animals. The dried ponds were treated with lime at the rate of 250 kg/ha. Five days after liming, water was supplied from shallow tube well to the ponds and filled up to the depth of 1.5 meter. The fry of Koi (*A. testudineus*) with Shing (*H. fossilis*) and Rajpunti (*P. gonionotus*) were stocked at the stocking density of 200000; 75,000 and 12500/ha, respectively. After stocking, fish were fed with supplementary feed (30% crude protein). Fish sampling were done at monthly interval to know the fish growth as well as feed adjustment. After four months rearing, fish were harvested by repeated seine netting. Total bulk weight and number of fish from each pond was recorded. The results showed that Koi reached the harvesting weight ranged of 127-136g. While harvesting weight range of Shing and Rajpunti were found to be 29-32g and 234-250g, respectively. Based on the number of fish harvested at the end of the experiment, survival ranged from 83 to 89%. Total production of Koi (*A. testudineus*) with Shing (*H. fossilis*) and Rajpunti (*P. gonionotus*) as recorded in trial ponds were 23318, 1976 and 2562 kg/ha, respectively. Total production of fish as recorded in trial ponds were 27856 kg/ha.

Keywords: Koi, Shing, Rajpunti, Growth Performance, Polyculture, Water quality.

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INTRODUCTION

The fisheries sector plays an important role in the agro-based economy of Bangladesh, through providing food and nutrition, alleviating poverty, creating employment opportunities and earning foreign exchange. Fisheries sector contributes 3.50% to the national GDP and 25.71% to the total agricultural GDP. The country's export earnings from this sector are 1.50% in 2017-18. Fish alone is supplementing about 60% of animal protein in our daily dietary requirement. About 11% of the total population is directly or indirectly employed in fisheries sector [1]. Fisheries of Bangladesh have immense prospects and scope of development.

Pond aquaculture in Bangladesh is expanding very fast. Currently aquaculture production accounts for about one third of the total fish production in Bangladesh. To increase the production of fish, species selection is very important. Pond aquaculture in Bangladesh is expanding very fast presently. According to FAO report, Bangladesh ranked 3rd in inland open

water capture production and 5th in world aquaculture production [1]. To increase the suitable indigenous fish species production, species selection is very important. Polyculture is a popular way to raise fish production. From the historical facts, this system was started in China [2, 3]. Polyculture is the system in which fast growing compatible species of different feeding habits are stocked in different proportions in the same pond [4], which has been practicing from the very beginning of the fish culture in China and in India. Modern fish culture means improvement of cultural practices through adopting different measures such as proper doses of fertilizer application, maintenance of physico-chemical factors, utilizing the total pond area selecting the fishes those graze on different layers of the pond, regular feeding, disease prevention and various control measures. These culture techniques are partially followed in this country. It is perhaps the right time to think as to how the fish production could be increased at minimum time, labor and money.

Koi is an integral component of subsistence fisheries for thousands of years but has gained popularity in very recent years. Shing and Rajpunti are better performing species in the pond aquaculture system of Bangladesh. These two fishes are great favorite to consumers because of its mouth-watering taste and therefore have a great demand and high price in the fish market. Though these two species have been reported quite favorable under standard conditions of carp farming, their culture technique with carps in polyculture system is still under developed. This trial was designed to evaluate the production performances of Koi (*Anabus testudineues*) with Shing (*Heteropnestes fossilis*) and Rajpunti (*Punteus gonionotus*) in polyculture management at natural pond condition.

MATERIAL AND METHODS

Experimental Ponds

Three ponds of 3 farmers at Kaliganj upazilla (sub-district) were used under Lalmonirhat district June to September 2019. The average of pond area was 0.35 acre each.

Preparation of pond

Selected ponds were free from predatory animals, unwanted fishes and aquatic higher vegetation. Flexible plastic pipes were used for water supply from the deep tube-well. The embankment was well protected and covered with grass. Prior to commencing the experiment, rotenone (12.50 kg/ha) was applied to eradicate predators and small fish. Then ponds were treated with lime at the rate of 250 kg/ha.

Source of Fingerlings

The fingerlings of Rajpunti were used in this experiment were produced in Freshwater sub-station, Bangladesh Fisheries Research Institute, Nilphamari. Another species, Koi and Shing were collected from the Privet Fish Hatchery, Adamdighi, Bogura district. The initial weight of Koi, Shing and Rajpunti were 1g, 2.2g and 2.0g, respectively.

Stocking of fish

The fry of Koi (*A. testudineues*) with Shing (*H. fossilis*) and Rajpunti (*P. gonionotus*) were stocked at the stocking density of 200000; 75,000 and 12500/ha, respectively.

Feed and Feeding Management

The fingerlings of Koi, Shing and Rajpunti were stocked on 01 June 2019. After stocking, in all treatments, a 30% protein containing pelleted feed were applied at the rate of 12-3% of estimated fish biomass twice daily at 7.0 pm and 8.0 am. The fingerlings were fed at the rate of 12% of their body weight for the first two weeks and it was reduced to 3% on the subsequent months. During the culture trail, lime and salt were applied in all the ponds fortnightly interval at the rate of 50 and 100 kg/ha, respectively.

Fish Sampling

Twenty fish of each species from each pond were caught at each monthly sampling day using a seine net. Individual weight of each species was measured by using a portable balance (Tanita, Japan; accuracy 1g). After weighted, all fishes were returned into the ponds after sampling.

Study of water quality parameters

Transparency (cm): Water transparency of the experimental ponds was measured by a Secchi-disk.

Temperature (°C): Water temperature data were collected from the ponds by using portable thermometer.

Dissolved oxygen (mg/L): Dissolved oxygen of water was measured by portable digital dissolved oxygen (DO) meter (model: DO5509, Lutron, made in Taiwan).

pH (Hydrogen-ion concentration): pH was determined by a portable digital pH meter (Hanna Instruments, Italy, model-H 196107).

Free carbon dioxide (mg/L): For determining free carbon dioxide of water, samples were collected in 250 ml black plastic bottles and titrated with 0.022N sodium hydroxide solution using phenolphthalein as indicator.

Total alkalinity (mg/L): To determine total alkalinity, samples were collected in 250 ml black plastic bottles and total alkalinity of water samples was determined by titrimetric method using methyl orange indicator.

Harvesting

At the end of the experiment, the fishes were harvested, first by seine netting and then by draining out of the ponds. The harvested fishes were counted and weight was recorded to find out the survival rate and production.

Data Analysis

Data were analyzed using the statistical package, Stat Graphics Version 7. ANOVA was performed on all the dependent variables to find out whether treatments had any significant difference on growth.

RESULTS

Water quality parameters

Environmental parameters exert an immense influence on the maintenance of a healthy aquatic environment and production of natural food organisms. Growth, feed efficiency and feed consumption of fish are normally governed by a few environmental factors.

Mean values of five months data of each of the parameter are presented in Table-1.

Table-1: Water quality parameters of different ponds

Parameter	Kaliganj Upazila		
	Pond-1	Pond-2	Pond-3
Temperature (°C)	35.05±4.59 ^a	35.88±0.04 ^a	36.50±3.06 ^a
Transparency (cm)	29.10±5.19 ^a	31.19±0.55 ^a	35.40±5.50 ^b
Dissolved oxygen (mg/L)	5.04±2.57 ^a	5.17±1.13 ^b	5.23±0.25 ^b
pH	7.13±1.91 ^a	7.99±0.93 ^b	7.67±2.58 ^b
Total Alkalinity (mg/L)	133.27±13.13 ^a	147.31±11.77 ^b	154.5±30.26 ^b

*Figures in the same row having the same superscripts are not significantly different ($P>0.05$)

Growth and production performances

For reporting the growth performance, only weight was considered along with other yield

parameters. Details of stocking, growth and production performances in different treatments are presented in Table-2.

Table-2: Growth and production performances of the fish in different ponds

Fish sp.	Initial Wt. (g)	Stocking density/ha	Harvesting Wt. (g)	Survival (%)	Total Species wise Production (kg/ha)	Total Production (kg/ha)
Koi	1.0±0.32	200000	131±8.43 ^a	89	23318±16.01	27856±14.21
Shing	2.20±1.24	75,000	31±5.03.2 ^a	85	1976±36.03	
Rajpunti	4.40 ±2.32	12500	247±3.35 ^a	83	2562±24.11	

DISCUSSION

The water temperature recorded during the study period was more or less similar in different ponds under three treatments. Temperature varied from 35.02 to 36.55 with mean values of 35.05±4.59, 35.88±0.04, and 36.50±3.06 °C in pond-1, 2 and 3, respectively (Table-1). There were no significant differences among the treatments when ANOVA was performed ($P>0.05$). Paul [5] recorded temperature ranged from 25 to 35°C is suitable for fish culture. Ali [6] stated that water temperature of ponds remain 20.20 to 36.50 °C which was favorable to fish culture. Kohinoor *et al.*, [7] stated that water temperature of ponds remain 28.70 to 28.81 °C which was favorable to koi, shing and tilapia polyculture. In the present experiment water temperature was favorable for fish culture.

Water transparency values of different ponds under the treatments showed variations on different sampling dates. The transparency values ranged from 27 to 38 cm with mean values of transparency were found to be 29.10±5.19, 31.19±0.55, and 35.40±5.50 cm in pond-1, 2 and 3, respectively (Table-1). Significant differences among the treatments were observed when ANOVA was performed ($P<0.05$). Transparency values increased with increasing the stocking density of Pabda due to lower abundance of phytoplankton, indicating that Pabda grazed more on plankton. Rahman [8] stated that the transparency of productive waterbodies should be 40cm or less (turbidity resulting from plankton). Chowdhury *et al.*, [9] recorded transparency values ranging from 17 to 34 cm in tilapia monoculture. Kohinoor *et al.*, [7] recorded transparency values ranging from 26 to 36 cm in koi, shing and tilapia polyculture. The water transparency values of these ponds were within productive range in the present experiment.

The values of dissolved oxygen were found to range from 5.01 to 5.24 mg/L with mean values of mean values of pond-1, 2 and 3 were 5.04±2.57, 5.17±1.13 and 5.23±0.25 mg/L, respectively (Table-1). The water transparency values of these ponds were within productive range in the present experiment. Mazid [10], Sharmin *et al.*, [11], Majumder [12], Sarker [13] found more or less similar results. In the present experiment the mean dissolved oxygen values were within suitable range.

During the study period, the pH values of pond water under different treatments were found to be alkaline. The values of dissolved oxygen were found to range from 7.11 to 8.13 mg/L with mean values of mean values of pond-1, 2 and 3 were 7.13±1.91, 7.99±0.93 and 7.67±2.58 mg/L, respectively (Table-1). Different authors have reported a wide variations in pH from 6.7 to 7.2 [14]; 6.7 to 8.3 [15], 7.18 to 7.24 [16] and 7.78 to 7.89 [7] in fertilized fish ponds and found to be productive. The values of pH recoded in the present experiment are well within above reported ranges, indicating the productive nature of the ponds.

The total alkalinity values of the pond water under different treatments were found to be productive level. The values of total alkalinity were found to range from 131 to 155 mg/L with mean values of pond-1, 2 and 3 were 133.27±13.13, 147.31±11.77 and 154.5±30.26 mg/L, respectively. Significant variations ($P>0.05$) were observed among the treatments. Majumder *et al.*, [12] recorded total alkalinity values ranging from 164 to 167 mg/L. Kohinoor *et al.*, [7] stated that the total alkalinity of medium productive water ranged from 135-147 mg/L.

The average final weights of Koi, Shing and Rajputi were 131 ± 8.43 , 31 ± 5.03 and 247 ± 3.35 g, in the experimental ponds. The mean values of survival rates in pond-1, 2 and 3 were 89, 85 and 83%, respectively. Sultan [17] obtained survival rates 93.75%, 91.88%, 86.88% under treatment-1, treatment-2, and under treatment-3 in polyculture of tilapia, rui, catla and mrigal. After four months rearing, the production of Koi, Shing and Rajputi obtained were 23318 ± 16.01 , 1976 ± 36.03 and 2562 ± 24.11 kg/ha, respectively (Table-2). The total production was 27856 kg/ha. Kohinoor et al., [18] recorded an average production from semi-intensive culture of Koi, Shing and tilapia under treatment-1, treatment-2, and under treatment-3 in four months culture period as 17995, 16805 and 17310 kg/ha, respectively.

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