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# STUDY ON GROWTH PERFORMANCE, PRODUCTION, AND RETURN OF VIETNAMESE KOI (*Anabas testudineus)* FOR SOCIO-ECONOMIC UPLIFTMENT OF RURAL YOUTH IN MANIPUR, INDIA

M. A. Salam*, Y. Bedajit, Surajkumar Irungbam, H. Ramananda and Gunajit Oinam

Krishi Vigyan Kendra, Imphal East, Central Agricultural University, Lamphelpat, Imphal- 795004, India

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KEYWORDS

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Growth performance

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**ABSTRACT**

The climbing perch fish *Anabas testudineus*, locally known as Ukabi, is one of the important freshwater small indigenous fish of Manipur. It is very popular in the state for its delicious taste and flavor. A study was carried out in nine experimental ponds (each size 0.25 ha) to assess survival rate, specific growth rate, absolute growth, production, and benefit-cost ratio of climbing perch (*Anabas testudineus*) for four months period during the year 2020. The experiment consists of three treatments $T_1$ (P1& P2- stocking density with 80000 nos. fry/ha), $T_2$ (P3 & P4 stocking density with 100000 nos. fry/ha), and $T_3$ (P5 & P6 stocking density with 120000 nos. fry/ha). Water quality parameters of the test ponds were within the normal range for fish culture. As compared to T2 and T3, T1 was significantly higher in the specific growth rate (5.021±0.001%), absolute growth (113.25±0.18 g), production (1709.4±1.97 kg/0.25 ha), and benefit-cost ratio (3.28±0.19). Therefore, the present study was very important for the proper stocking density of its culture in the Manipur and NE region. It will help in the commercialization of its technique in maximization of production and income for the socio-economic upliftment of rural youth in the state.

* Corresponding author

E-mail: salam555@rediffmail.com (M. A. Salam)

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## 1 Introduction

Manipur, one of the eight sisters of the North Eastern Region of India, is an isolated hill-girt state stretching between 92 °58 ´E to 94 °45 ´E longitudes and 23°50´N to 25°42´N latitudes at an altitude of 790 m above mean sea level. The state has a distinct zoo-geographical identity. The total area of the state is 22,327 km² with hilly areas covering about 92% of the landscape that enclose a central valley of about 1,800 km². The growth in State Domestic Product of Manipur is largely dependent on agricultural productions. From the North Eastern Region of India, Manipur is the third largest inland fish producer with a production of 31996 tonnes against the requirement of 40810 tonnes during 2017 (Statistical Handbook of Manipur, 2017). Fish culture has become a popular enterprise in the state but the production level has not met the demand for a very long period.

The climbing perch fish *Anabas testudineus*, locally known as Ukabi, is one of the important freshwater small indigenous fish of the state. The fish is very popular in the state for its delicious taste and flavor. During the 1970s-80s, the fish was found plenty in paddy fields, ponds, swamps, marshes, canals, lakes, wetlands but late 1980s, the fish populations have drastically reduced from open waters due to environmental deterioration, overfishing, use of the huge amount of pesticides, herbicides, and fertilizers, destruction of suitable habitats, a hindrance to breeding migration, poor management, etc.

Nonavailability of seed and slow growth rate of the native strain is one of the major problems for taking culture in the ponds ecosystem in the state. To overcome these problems Vietnamese koi (*Anabas testudineus*) have been imported from West Bengal and culture in the pond ecosystem has been practices by the fish farmers of the state. Nowadays farmers have been practicing cultured of this species with higher stocking density to earn more profit in a very short period but proper culture technology was yet to be optimized and evaluated for large-scale production in the state. For these, a piece of comprehensive information on cultural technology is required to enable the farmers to earn more profit. Accordingly, the present study was planned to observe the growth, yield, and economic performance in the monoculture system for the socio-economic upliftment of rural youth in Manipur.

## 2 Materials and methods

### 2.1 Study area

The study was conducted in earthen ponds for a period of 4 months from May to August 2020. The average area of the pond was 0.25 ha with a depth of 1.5 meters.

### 2.2 Source of fingerlings

The fry of Vietnamese koi (*A. testudineus*) used for the study was collected from a private hatchery from West Bengal, India.

### 2.3 Experimental setup

Three different stocking densities of Vietnamese koi (*Anabas testudineus*) were tested in the experiment. The experiment was carried out in six numbers (P1, P2, P3, P4, P5, and P6) earthen ponds size of 0.25 ha area in farmers field of Manipur.

The experiment consists of three treatments $T_1$ (P1& P2- stocking density with 80000 nos. fry/ha), $T_2$ (P3 & P4 stocking density with 100000 nos. fry/ha), and $T_3$ (P5 & P6 stocking density with 120000 nos. fry/ha). The pond management practice in all the treatment were carried out in same manner Subsequent fertilization was done fortnightly using cow manure (104 kg) and MOC (3 kg) in all the ponds. Supplementary feeding at the rate of 3-10% per pond biomass per day was applied using CP aqua feed containing an average of 30% crude protein in all the ponds. Feeding started on the second day after stocking and was administered twice daily between 09:00 and 16:00 hr. Water depths were monitored throughout the study period, and evaporation losses were compensated through the regular filling. Physicochemical characteristics including temperature, pH, dissolved oxygen transparency, total alkalinity, nitrate-nitrogen, and ammonium nitrogen levels were monitored. At the end of the experiment, data were collected on survival percentage (mortality) per pond, Specific Growth Rate (SGR), gross production, and comparative net return of different treatment ponds were calculated. The specific growth rate was calculated as,

SGR% = [In (final weight) – In (initial weight)] / culture period x 100.

### 2.4 Statistical analyses

Statistical analysis was worked out by using SPSS version 16.0 for Windows. One-Way ANOVA was used to analyzed the variance to determine the relationship between the specific growth rate, production, and benefit-cost ratio ($\alpha$=0.05).

## 3 Results

### 3.1 Water quality parameters

Mean levels of water parameters for around 120 days of rearing of fishes are presented in Table 1. The mean water temperature for all three treatments was almost the same during the culture period. The level of DO was decreasing in T2 and T3 during the period of culture. Similarly, the transparency of water in T2 and T3 were also decreased. Despite these variations, the water parameters in the present study were within the normal range for fish culture.

Table 1 Mean water quality parameters measured in various treatment ponds

| Parameters | Treatments | | |
|---|---|---|---|
| | T1 | T2 | T3 |
| Temperature (°C) | 27.53 | 27.77 | 27.57 |
| pH | 7.51 | 7.49 | 7.49 |
| DO (mg/l) | 6.18 | 4.05 | 3.40 |
| Transparency (cm) | 29.84 | 26.94 | 24.69 |
| Ammonia (mg/l) | 0.19 | 0.23 | 0.25 |

### 3.2 Survival, growth and benefit cost ratio of fish

The highest survival rate among the three experimental groups was observed in T1 (75.00±0.115) whereas there was no significant difference ($p<0.05$) in survival rate (%) between T2 (63.76±0.145) and T3 (63.76±0.145). The specific growth rate (5.021±0.001%), absolute growth (113.25±0.18g), production (1709.4±1.97kg/0.25ha), and benefit-cost ratio (3.28±0.19) was significantly higher in T1 in contrast to T2 and T3.

Table 2 Survival rate, specific growth rate, and benefit-cost ratio of *Anabas testudineus* after four months of rearing

| S.N. | Treatment | Stocking density/ 0.25 ha | Survival rate (%) | Specific growth rate (%) | Absolute growth (g) | Production (Kg/0.25ha) | BC ratio |
|---|---|---|---|---|---|---|---|
| 1 | T1 | 20,000 | $75.00\pm0.115^{a}$ | $5.021\pm0.001^{a}$ | $113.25\pm0.18^{a}$ | $1709.4\pm1.97^{a}$ | $3.28\pm0.19^{a}$ |
| 2 | T2 | 25,000 | $63.76\pm0.145^{b}$ | $4.880\pm0.006^{b}$ | $98.21\pm0.67^{b}$ | $1576.9\pm9.03^{b}$ | $2.47\pm0.16^{b}$ |
| 3 | T3 | 30,000 | $63.76\pm0.145^{b}$ | $4.691\pm0.004^{b}$ | $81.19\pm0.19^{c}$ | $1566.9\pm0.95^{b}$ | $2.16\pm0.03^{b}$ |

Different superscripts indicate significant differences ($p<0.05$).

## 4 Discussion and conclusion

The water quality parameters play a very important role in maintaining a healthy aquatic environment for fish production. Fish growth and feed consumption are normally influenced by few environmental factors (Brett, 1979). Water temperature which ranged between 27.53 to 27.77 and pH of 7.49 to 7.51 in all the experimental ponds was within the acceptable range. The dissolved oxygen of T2 (4.05 mg/l) and T3 (3.40 mg/l) has no significant difference and ranges between 3-4 mg/l. The decreased in DO in the above treatment may be due to an increase in stocking density, high organic load, excess faecal matter, etc. Fluctuation of dissolved oxygen concentration in the ponds might be attributed to stopping photosynthetic activity at night, and might be due to utilization of buffer stock of oxygen at night by the fishes and other aquatic organisms. This phenomenon was observed by Boyd (1982) and Saha et al. (1988). Transparency of water decreases with the increase of stocking density, due to continuous fish movement inside the water bodies. Ammonia nitrogen above a specific level is lethal to fish and it causes mortality to the fishes. In T2 and T3 the level of ammonia nitrogen (0.23 mg/l and 0.25 mg/l, respectively) shows above the acceptable range which might be due to higher stocking density which leads to the released of higher faecal matter in the pond bottom (New, 1987). The suitable range of ammonia nitrogen in fish culture is less than 0.1mg/l (Boyd, 1982). The survival rate in T1 (75.00±0.115%) is significantly higher ($p<0.05$) compared to T2 (63.76±0.145%) and T3 (63.76±0.145%). The higher survival rate in T1 may be due to lower stocking density. A similar observation was also reported by Hosen (2014) and Rahaman et al. (2013). The findings of the present study concerning specific growth rate and absolute growth were similar to the findings reported by Islam et al. (1978) and Kohinoor et al. (2007). The production in T1 (1709.4±1.97 kg/0.25 ha) was higher than in T2 (1576.9±9.03 kg/0.25 ha) and T3 (1566.9±0.95 kg/0.25 ha). However, higher stocking density can lead to maximizing output with proper feeding and cultural practices (Hosen, 2014). The benefit-cost ratio of the present study for T1, T2, and T3 were 3.28, 2.47, and 2.16, respectively. The BC ratio in the present study was found to be higher than BC reported by Nabi et al. (2020) and Hosen (2014) as the selling price is Rs 400/kg in Manipur.

Climbing perch is an appealing and famous species to the people of Manipur due to its delicious and nutritious food value. This species could also be one of the potential candidate species to enhance fish production and reduce the fish requirement gap in the state. So far, there is no established culture technique of climbing perch culture in Manipur, especially in the Northeastern part of India. Stocking density and proper culture management is one of the most important factors for the production of such species. Therefore, the present study was very important to learn about the proper stocking density in its culture in Manipur and NE region. This will also help in the commercialization of its culture technique in maximization of production and income for the socio-economic upliftment of rural youth in the state.

### Conflict of interests

The authors declare no conflict of interest.

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