Progressive Agriculture 28 (3): 249-252, 2017 **ISSN: 1017 - 8139**

Progressive Agriculture
Journal homepage:http://www.banglajol.info/index.php/PA

Effects of stocking density on growth and production in monoculture of Thai sharpunti (*Barbonymus gonionotus*)

M Al-Emran, R Rahman, MI Miah, M Shahjahan*

Department of Fisheries Management, Bangladesh Agricultural University, Mymensingh 2202, Bangladesh

Abstract

An experiment was carried out to study the density dependent growth of Thai sharpunti (*Barbonymusgonionotus)* for two months period. Three stocking densities such as 50/decimal, 100/decimal and 150/decimal representing treatment one (T1), treatment two (T2) and treatment three (T3), respectively were tested in three replications. A commercial diet (25% crude protein) was supplied twice daily throughout the study period up to satiation level. The total production of sharpunti was found 14.67 ± 2.05, 27.06 ± 3.09 and 36.87 ± 2.16 kg/decimal in T1, T2 and T3, respectively and they were significantly different ($p<0.05$) from each other. A higher net benefit of BDT 1079.50 was obtained from T2 where the stocking density was 100/decimal. The present study indicated that the growth and production of Thai sharpunti was density dependent in monoculture systems.

Key words: Thai sharpunti, stocking density, monoculture, growth.

***Corresponding Author**: mdshahjahan@bau.edu.bd

Introduction

Thai sharpunti *(Barbonymus gonionotus)* is one of the most important herbivorous species commercially cultivated in freshwater ponds in South East Asia (Tantong*et al.,* 1980). It grows to table size within three to four months (Gipta and Rab, 1994). It was introduced in Bangladesh from Thailand considering its aquaculture potentials. It grows fast (Karim*et al*.1980) and feeds mainly on soft aquatic grasses and algae.

Stocking density is an important parameter in fish culture operations, since it has direct effect on the growth and survival and hence on production (Backeil and Le Cren, 1978). It is generally assumed that growth rate progressively increases as the stocking densities decreases and vice-versa. Generally direct relationship exists between food abundance and growth rate whereas population density of the species and its growth rate tend to be inversely related (Le cren, 1965). However, there may be no relationship between food abundance and growth rate when a space limiting effect operates on the population (Jonson, 1965).To obtain maximum economic returns it is necessary to stock the ponds at optimum stocking densities for optimum growth. The present study was undertaken to assess the effects of stocking densities on the growth and production as well as to determine the suitable stocking density for culture of Thai sharpunti (*Barbonymus gonionotus*) in ponds.

Materials and Methods

***Experimental design and pond preparation*:** The experiment was conducted with three treatments each with three replications. Three stocking densities were tested viz; 50/decimal (T1), 100/decimal (T2) and

150/decimal (T3). Before starting the experiment the ponds were drained to eradicate all fish, dried for 7-10 days undersunlight and the embankments were repaired.Pond bottoms were treated with lime (CaO) at the rate of 1kg/decimal and left for 3 days. Then ponds were filled with ground water and fertilized with cow dung at the rate of 5 kg/decimal for plankton production.

***Stocking of fingerling*:** The fingerlings of *Barbonymus gonionotus* were collected from the stock of Bangladesh Catfish Limited. Prior to releasing the fingerling in the ponds, they were acclimatized with the pond water for half an hour and the initial weight (g) was recorded individually.

***Feeding*:** The fish were fed a commercial pellet feed (25%) of crude protein) twice daily at the rate of 15% of the body weight of the reared Thai sharpunti and gradually it was readjusted to 14%, 13%, 12%, 11%, 10%, 9% and 8%, respectively at seven days of intervals.

***Fish sampling*:** The fishes were sampled weekly by using a seine net and weight of fishes of each pond were taken separately by using a portable balance (Model HI 400 EX).

***Analysis of water quality parameters*:** Water quality parameters such as Temperature (°C),Dissolved Oxygen (mg/L), Free CO_2 (mg/L), Total alkalinity (mg/L) and pHwere monitored at seven days interval throughout the experimental periods.

***Statistical analysis*:** The data obtained on the growth performance of fish, survival rate and production were statistically analyzed by one way analysis of variance (ANOVA) using SPSS Version 14.0 for Windows SPSS.

Results and Discussion

In the present study, the water quality parameters monitored during the experimental period did not differ in response of different stocking densities and were suitable ranges (Table 1). More or less similar such water quality parameters have also been observed by a number of authors (Uddin *et al.,* 2007; Chowdhury *et al.,* 2008; Uddin *et al.,* 2012; Rahman *et al.,* 2012; Talukdar *et al.,* 2012; Siddika *et al.,* 2012) in the aquaculture ponds in the same experimental area.

Table 1. Average values (Mean ± SD) of water quality parameters under different treatments throughout the study period

Treatments	Temperature (°C)	Dissolved oxygen (mg/L)	pH	Transparency (cm)
T1	28.08 ± 0.46 (26.50 - 30.13)	5.24 ± 0.09 (4.80 - 5.78)	7.62 ± 0.19 (6.78-8.71)	35.38 ± 0.89 (31.5-43.33)
T2	28.40 ± 0.42 (26.40 - 30.02)	5.39 ± 0.13 (4.81- 5.90)	7.36 ± 0.15 (6.68-7.97)	38.58 ± 1.27 (32.89-46.23)
T3	28.38 ± 0.41 (26.28 - 30.04)	5.30 ± 0.09 (4.83-5.75)	7.40 ± 0.12 (7.04-8.07)	39.38 ± 1.33 (32.30 -45.76)

In the present study, the highest mean weight gain was 52.48±1.83 g in T1 with lowest stocking density of 50/decimal compared to T2 (100/decimal) and T3 (150/decimal) although same type of feed was supplied in all treatments (Table 2). These phenomenon indicated that lower stocking density reduces competition among the fishes which influenced them to take feed properly and it might be absent in the treatments with higher stocking densities. The present results coincided with the findings of Alikunhi (2005), Hasan *et al.*(1998) and Haque *et al.* (1984) who achieved best growth from lower stocking densities. Powel (1972) reported that the harmful effects of higher stocking density on the culture of fish induced the reduction of growth rates. The survival rate of Thai sharpunti in T1, T2 and T3 were 89.67, 86.66 and 82.11%, respectively. More or less similar survivability was recorded in by Hossian *et al.* (1997) and Hasan (1998) which are good agreement with the present study. The SGR (% per day) was 5.12±0.05, 5.05±0.02 and 4.98±0.02 in T1, T2 and T3, respectively. The SGR (% per day) of sharpunti reported by Nirod (1997) were 3.52 to 3.87 (% per day) in different treatments.

The production of Thai sharpunti was found to be 14.67 ± 2.05 kg/decimal in T1, 27.06 ± 3.09 kg/decimal in T2 and 36.87 ± 2.16 kg/decimal in T3

(Table 2). Kohinoor et al. (1993) conducted an experiment on the growth and production of *Barbonymusgonionotus* (Bleeker) in fertilized ponds with supplementary feeding and obtained a yield of 2,384.26 kg/ha/6 months. In another study, Kohinoor et al. (1994) evaluated production and growth performance of local sharpunti (*Puntiussarana*) and Thai sharpunti (*B. gonionotus*) under semi-intensive culture system at stocking density of 16,000 fish/ha and they obtained a yield of 1304 kg/ha/6 months and 2075 kg/ha/6 months, respectively.In comparison with the findings of the above researchers the production of Thai sharpunti (*B. gonionotus*)1811 kg/ha/6 months (T1), 3342 kg/ha/6 months(T2), 4554.18 kg/ha/6 months(T3) in the present study was satisfactory.

Table 2. Growth parameters (Means ± SD) of Thai sharpunti (*Barbonymusgo nionotus*) under three treatments during the experimental period.

Growth parameters	Treatments		
	T1	T2	T3
Initial weight (g)	2.05±0.35[a]	2.05±0.35[a]	2.05±0.35[a]
Final weight (g)	54.53±0.51[a]	52.04±26.76[b]	49.90±0.56[c]
Weight gain (g)	52.48±0.51[a]	49.99±0.55[b]	47.85±0.56[c]
% Weight gain	2560.16±25.29[a]	2438.37±26.76[b]	2333.98±27.33[c]
Average daily weight gain	0.82 ±0.01[a]	0.78 ±0.01[b]	0.75 ±0.01[c]
SGR (%/day)	5.13±0.02[a]	5.05±0.02[b]	4.99±0.02[c]
Survival (%)	89.67±1.45[a]	86.67±0.88[a]	82.11±1.16[b]
Production (Kg/decimal)	14.67 ± 2.05[c]	27.06 ± 3.09[b]	36.87 ± 2.16[a]

In row, figures with same or without letter do not differ significantly whereas figures with dissimilar letter differ significantly ($p < 0.05$).

A simple cost-benefit analysis was performed to estimate the amount of profit that has been generated from these types culture. The results of the analysis are shown in Table 3. The cost of production was Tk. 1289, Tk. 2303 and Tk. 3637 in T1, T2 and T3, respectively. The cost of production was higher in T3 and lower in T1. The higher net profit of Tk. 1097.50 was obtained from T2 where Thai sharpunti was stocked in 100/decimal.

Table 3. Economic analysis of Thai sharpunti (*Barbonymusgonionotus*) production under different treatments during the study period.

Investment (BDT/decimal)	T1	T2	T3
Pond preparation	25.00	25.00	25.00
Lease Cost (BDT/decimal)	120.00	120.00	120.00
Cost of fry	834.00	1668.00	2502.00
Feed cost	160.00	340.00	800.00
Operational cost	150.00	150.00	150.00
Total cost	1289.00	2303.00	3637.00
Fish production (kg/decimal)	14.67	27.06	36.87
Price of fish/kg	130.00	125.00	125.00
Gross income	1907.10	3382.50	4608.75
Net profit	618.00	1079.50	971.75
Cost benefit ratio	1.48	1.47	1.27

Hussain *et al.* (1989) analyzed the cost and benefit of Nile tilapia *(Oreochromis niloticus)* in monoculture condition and got the net benefit of Tk. 72,827/ha/6 months where fish were fed with rice bran and mustard oil cake. Therefore, the growth, production and benefit of Thai sharpuntiwere density dependent in monoculture systems.

References

Alikunhi KH (2005). Culture of Thai sharpuntipolyculture or monoculture has been an economically viable and technically sustainable in perennial water bodies. Indian Journal of Fisheries 12: 124-144.

Chowdhury MMR, Shahjahan M, Rahman MS, Islam MS (2008). Duckweed (*Lemna minor*) as supplementary feed in monoculture of Nile tilapia, *Oreochromisniloticus*. Journal of Fisheries and Aquatic Sciences, 3: 54-59.

Gipta MV, Rab (1994). Adoption and Economics of Silver Barb (Barbonymus gonionotus) culture in seasonal waters in Bangladesh. Published by the International Center for Living Aquatic Resources

Management.Metro Manill.Philippines with financial assistance from USAID.Baridhara, Dhaka, Bangladesh.

Haque MM, Islam MA, Ahmed GU, Haq MS (1984). Intensive culture of Java tilapia (*Oreochromisnilotica*) in floating ponds at different stocking densities. Bangladesh Journal of Fisheries 7(l-2): 55 -59.

Hossain MA, Rahmatuullah SM, Islam MS, Kabir AKMA, Islam MS, Dewan S (1997). Impact of chapila (*Gadusiachapra* Ham.) on growth of carps in polyculture. Bangladesh Journal of Fisheries Research 1(2): 19-23.

Hussain MG, Rahman MA, AkhtemzzamanM, Kohinoor AHM (1989). Study on the production of *Oreochromisniloticus*under semi-intensive system in Bangladesh. Bangladesh journal of Fisheries12(1): 59-65.

Johnson WE (1965). On mechanism of self-regulation of population abundance in *Onrhynchusmerka* Mitt.International journal of vetenary of pharmacology and therapeutics13:66 -87.

Karim MA (1980). An Introduction of fish culture in Bangladesh. Department of Aquaculture and Management, Faculty of Fisheries, Bangladesh Agricultural University, Mymensingh.

Kohinoor AHM, Akhtemtzzaman M, Shaha MS (1993). Production of *Barbonymus gonionotus* (Bleeker) in ponds. Bangladesh Journal Zoology 2l (2): 77-83.

Kohinoor AHM, Haque MZ, Hussain MG, Gupta MV (1994). Growth and survival of Thai sharpunti, *Barbonymus gonionotus* (Bleeker) spawn in nursery ponds at different stocking densities. Journal of Asiatic Society, Bangladesh 20 (1): 65 -72.

Le Cren ED (1965). Some factors regulating the size of populations Freshwater. Mitt. International Verein.Theoro of Agency on Limnological 13:88-105.

Powell MR (1972). Cage and raceway culture of striped bass on brackishwater in Alabama. Proceeding. 26th Ann. Conf. Southwest Assoc. Gam Fish Comm. pp. 553- 565.

Rahman MS, Chowdhury MY, Haque AKMA, Haq MS (1982). Limnological studies of four ponds. Bangladesh Journal of Fisheries 2-5 (1-2): 25-35.

Rahman MS, Shahjahan M, Haque MM, Khan S (2012). Control of euglenophyte bloom and fish production enhancement using duckweed and lime. Iranian Journal of FisheriesSciences 11: 358-371.

Siddika F, Shahjahan M , Rahman MS (2012). Abundance of plankton population densities in relation to bottom soil textural types in aquaculture ponds. International Journal of Agricultural Research Innovation & Technology2: 56-61.

Sipitakhiat P, Leenannond Y (1994). Life history and culturing of Pla Tapian Khao. *Barbonymus gonionotus* (Bleeker). Technical paperNo.39. National Inland Fisheries Institute, Fresh water divison, Department of Fisheries, Bangkok, Thailand, 51p.

Talukdar MZH, Shahjahan M, Rahman MS (2012). Suitability of duckweed (*Lemna minor*) as feed for fish in polyculture system. International Journal of Agricultural Research Innovation & Technology 2: 42-46.

Tantong H, Thawornnan W, Khunthong J (1980). Induce spawning and culture of Plea Ta Pick Khao (*Barbonymus gonionotus Bleeker*). National Inland Fisheries Institute, Bangkok, Thailand.p.4

Uddin MN, Shahjahan M, Haque MM (2012). Manipulation of species composition in small scale carp polyculture to enhance fish production. Bangladesh Journal of Progressive Sciences and Technology 10: 9-12.

Uddin MN, Rahman MS, Shahjahan M (2007). Effects of duckweed (*Lemna minor*) as supplementary feed on monoculture of GIFT strain of tilapia (*Oreochromis niloticus*). Progressive Agriculture 18:183-188.