Research in
ISSN : P-2409-0603, E-2409-9325
AGRICULTURE, LIVESTOCK and FISHERIES
An Open Access Peer Reviewed Journal

Open Access
Research Article

Res. Agric. Livest. Fish.
Vol. 2, No. 2, August 2015: 369-374

COMPARATIVE STUDY ON GROWTH PERFORMANCE OF THAI SHARPUNTI (*Puntius gonionotus*) USING TWO DIFFERENT WEEDS DUCK WEED (*Lemna minor*) AND AZOLLA FERN *(Azolla pinneta)*

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ARTICLE INFO

Received
22.06.2015

Accepted
17.08.2015

Online
04.09.2015

Key words
Thai Sharpunti
Duck weed
Azolla fern
Growth performances

ABSTRACT

The comparative growth performance study of Thai Sharpunti (*Puntius gonionotus*) was conducted from 20th March to 18th May, 2012by using duck weed (*Lemna minor*) and Azolla fern (*Azolla pinneta*) as in earthen pondof the Department of Aquaculture, Bangladesh Agricultural University, Mymensingh. Duck weed and Azolla fern were supplied as dietary feed in two separate treatments and each with three replications. Fifteen fingerlings of Thai sharputi was stocked in each pond. Average size and weight of Thai sarputi were 5.75 cm and 21g in T_1 and 5.50 cm and20g in T_2, respectively. The ranges of physico-chemical parameters viz, water temperature (25.00 to 33.50°C), air temperature (31.00 to 34.50°C), transparency (28 to 34 cm),dissolved oxygen (6.00 to 7.20 mg/l), free CO_2 (2.00 to 3.33 mg/l), pH (6.9 to 7.45), total alkalinity (48 to 61 mg/l), phosphate-phosphorus (1.40 to 2.50 mg/l) and nitrate-nitrogen (2.13 to 3.20 mg/l) were within the productive range. Initial body weight, final body weight, weight gain, survival rate, specific growth rate(SGR), food convertion ratio (FCR), percent weight gain, average daily gain (ADG) were observed as21 and 20g, 356g and 308g, 335 and 288g, 90 and 85%, 558and 480% per day, 5.28 and 6.10, 1595 and 1440%, 5.58 and 4.80g in both the treatments,respectively. Calculated gross and net fish production in T_1 with duck weed were 2.40 and 2.08 ton/ha/yr and in T_2 with Azolla fern were 2.26 and 1.94 ton/ha/yr, respectively. It was found that the net fish production in T_1 was 1.32 times higher than T_2 ($P \leq 0.01, 0.05$). The present study showed influence of duck weed as dietary feed on the production of Thai Sharpunti (*P. gonionotus*) was positively significant. So it might be concluded that duckweed had better effect as dietary feed than Azolla fern on monoculture of Thai sharpunti.

To cite this article: GU Ahmed, MM Rahman, MN Alam and B Sarker, 2015. Comparative study on growth performance of thai sharpunti (*Puntius gonionotus*) using two different weeds duck weed (*Lemna minor*) and azolla fern *(Azolla pinneta)*. Res. Agric. Livest. Fish. 2 (2): 369-374.

INTRODUCTION

Fisheries sector has been playing a significant role in nutrition, employment, foreign exchange earnings, food supply and more importantly socioeconomic stability in the rural areas. In 2009-2010 total fish production of Bangladesh was 28.99 lakh metric tons but that is not enough for our growing population. Therefore, immediate attention must be given to maximize the fish production by minimizing the production cost for ever-increasing population as well as to build up the national economy. In Bangladesh more or less every rural homestead has a back yard pond which retains water for about 9-12 months. There are 2.86 million ponds in Bangladesh covering an area of 28,834 ha (Rahman and Hussain, 2000). The average fish production in traditionally managed ponds in Bangladesh was estimated to be 870.0kg/ha/year which is very low and that can be increased by many fold through improved culture and management practices. Considering the aquaculture potential of *Puntius gonionotus*, it was introduced to Bangladesh from Thailand in 1977. It grows fast, reaches marketable size within four months and is ideal for seasonal pond and road side ditches. In perennial water bodies, polyculture or mono culture of this sharpunti has economically viable and technically sustainable. Silver barb feeds on macrophytes including duck weed (Lemna spp.) and Azolla fern (Azolla spp.) and sharpunti is an appropriate species for culturing seasonal ponds and rice fields in monoculture. Noor et al. (2000) evaluated the suitability of duckweed as dietary fish meal substitute for silver barb and found that 10% of the dietary fish meal protein could be replaced by duckweed in the diet. Azim and Wahab (2003) found that duckweed has significant positive effect on growth rates of exotic Thai silver barb, common carp and indigenous catla fish. Silver barb respond well to comparatively low cost simple management practices (Akhtaruzzaman, 1991). Duck weed and Azolla holds a great potential as a cheap source of fish food. Many works already done on duck weed used as fish, but there is no work have so far been under taken about the comparative growth performance of Thai sharpunti feeding on duck weed and water fern. The present studies on the ingestion rate and growth performance of *Puntius gonionotus* were under taken to evaluate the conversion efficiency of duck weed and Azolla fern by Thai sharpunti and to study the comparative proximate composition energy distribution of duck weed and Azolla fern.

MATERIALS AND METHODS

A series of six ponds of Department of Aquaculture, Bangladesh Agricultural University, Mymensingh, were selected to conduct the research work from 20th March to 18th May, 2012. The ponds are rectangular in shape. The size, depth, basin conformation of all the six ponds are more or less similar. The ponds are free from aquatic vegetation and well-exposed to sunlight. The surface area of each of the ponds is about 26 m^2 with an average water depth of 1.0meter. The ponds were completely dependent on water supply from a deep tube-well. The pond's wall is well protected and covered with fine net. Fifteen fingerlings of Thai sharpunti *(P. gonionotus)* were stocked in each the pond. The average length and weight of sharpunti were 5.50 cm, and 21 g. After collection the fresh weeds were weighed and then supplied to the fish culture ponds under treatment-1 and treatment-2 at the rate of 60% of total body weight of all the fish of the ponds. The physical parameters such as temperature ($^{\circ}$C) and transparency (cm) and chemical water quality parameters such as dissolved oxygen (mg/l), pH, free carbondioxide (mg/l), total alkalinity (mg/l), phosphate phosphorus (PO_4-P) (mg/l), nitrate nitrogen (NO_3-N) (mg/l) were done by water quality parameters test kits.

Estimation of growth performances of Sharpunti (*Puntius gonionotus*)

(a) Mean weight gain (g) = Final weight- Initial weight

(b) Percent weight gain (%) = $\frac{\text{Final weight-Initial weight}}{\text{Initial weight}} \times 100$

(c) Average daily gain (g) = $\frac{\text{Final weight-Initial weight}}{60}$

(d) The survival rate was estimated by the following formula:

Survival rate (%) = $\frac{\text{No. of stocked fishes}}{\text{No.of harvested fishes}} \times 100$

(e) Specific growth rate (SGR % per day) was estimated by the following formula:

$$\text{SGR (\% per day)} = \frac{\text{Log}_e W_2 - \text{Log}_e W_1}{T_2 - T_1} \times 100$$

Where, W_1 = Initial live body weight (g) at time T1 (day).
W_2 = Final live body weight (g) at time T2 (day).

(f) Food conversion ratio (FCR) = $\frac{\text{Feed fed (dry matter)}}{\text{Live weight gain}}$

(g) Calculated gross production (ton/ha/yr)= $\frac{\text{Final weight (g)} \times 10000 \times 365}{60 \times 1000 \times 1000 \times 9}$

(h) Calculated net production (ton/ha/yr) = $\frac{\text{Mean weight (g)} \times 10000 \times 365}{60 \times 1000 \times 1000 \times 9}$

(i) Analysis of proximate composition of duckweed and Azolla fern.

(j) Energy distributionof Thai Sharpunti (Puntius gonionotus).

Statistical analysis

F-test of growth performance of Thai Sharpunti *(P. gonionotus)* in treatment-1 and treatment -2 was done by a computer using SPSS package programme.

RESULTS AND DISCUSSION

Physical and chemical parameters

The results of the physical and chemical parameters recorded during the experimental period presented in the Table 1 and Table 2.

Table 1. Fluctuations of physical parameters in treatment-1 and treatment-2 during the experimental period

Parameter	Treatment	Sampling date								Mean± S.D
		20 Mar	28 Mar	6 Apr	15 Apr	23 Apr	2 May	10 May	18 May	
Transparency (cm)	T_1	32.33	30.00	29.00	28.00	31.00	30.33	32.33	30.33	30.41±2.04
	T_2	34.00	33.33	29.33	31.33	32.33	34.00	34.33	32.00	32.58±1.48
Water temperature (˚C)	T_1	29.25	30.25	32.00	31.50	32.75	32.75	32.25	31.00	31.46±1.37
	T_2	30.50	33.33	32.33	32.50	33.33	33.50	33.00	31.33	32.47±1.14
Air temperature (˚C)	T_1	31.50	32.00	32.80	33.00	34.00	34.50	33.00	32.40	32.97±1.04
	T_2	31.50	32.00	32.80	33.00	34.00	34.50	33.00	33.50	33.03±1.04

Table 2. Fluctuations of chemical parameters in treatment-1 and treatment-2 during the experimental period

Parameter	Treatment	Sampling date								Mean± S.D
		20 Mar	28 Mar	6 Apr	15 Apr	23 Apr	2 May	10 May	18 May	
Dissolved Oxygen (mg/L)	T_1	6.90	7.10	6.70	6.80	6.63	6.60	6.10	6.46	6.66±0.34
	T_2	6.83	7.20	6.33	6.90	6.40	6.33	5.90	6.43	6.54±0.45
FreeCO_2 (mg/L)	T_1	3.23	2.93	3.13	3.00	2.30	2.70	2.60	2.60	2.81±0.35
	T_2	3.33	3.00	3.00	3.20	2.93	2.85	2.33	2.80	2.93±0.28
pH	T_1	7.43	7.26	6.93	7.13	6.90	7.20	7.13	7.00	7.12±0.23
	T_2	7.03	7.20	7.01	7.00	7.13	7.03	7.23	7.03	7.08±0.13
Total alkalinity (mg/L)	T_1	50.33	48.00	53.00	49.33	52.33	50.33	51.33	50.00	50.58±1.98
	T_2	47.33	48.33	53.00	48.00	61.33	53.33	50.33	49.66	50.16±2.67
PO_4-P (mg/L)	T_1	2.50	1.80	1.40	1.90	2.30	1.70	1.93	1.57	1.89±0.37
	T_2	2.43	1.83	1.53	2.00	2.23	1.73	2.03	2.03	1.98±0.32
NO_3-N (mg/L)	T_1	2.90	2.13	2.63	2.90	3.20	2.40	3.00	2.86	2.75±0.39
	T_2	2.90	2.30	2.73	3.00	3.10	2.33	3.03	2.90	2.79±0.33

In the present study, range of water temperature was within suitable range for fish culture (29.25 to 33.50˚C). Wahab *et al.* (1994) found transparency ranging from 15-55 cm in polyculture pond. Kohinoor (2000) recorded transparency ranging from 15 to 58 cm. In the present experiment, the transparency values in treatment-1 and treatment-2 were closely near to productive range (28 to 34 cm). Aminul (1996) stated that the water temperature ranged from 25 to 35˚C was suitable for culture of fish.

Kohinoor (2000) measured dissolved oxygen 2 to 7.4 mg/L in the research ponds of Bangladesh Agricultural University campus, Mymensingh. From the above findings, it was concluded that the oxygen content of the present experimental ponds were within the good productive range. During the study period the fluctuations of free carbondioxide in treatment-1 and treatment-2 range from 2.30 to 3.33 mg/L. The mean values of free carbondioxide were 2.81 ±0.35 mg/L in T_1 and 2.93 ± 0.28 mg L in T_2. Israfil (2000) and Kabir (2003) observed more or less similar results. Fluctuations of the pH values of the experimental treatments ranged from 6.90 to 7.45. The mean values of pH were 7.12 ± 0.23 in T_1 and 7.08 ± 0.13 in T_2. Dewan et al. (1991) stated that the optimum pH range for carp polyculture in pond is 6.5 to 9.0.Israfil (2000) and Kabir (2003) found almost similar results. According to Rahman (1992) total alkalinity of productive ponds should be 20 ppm or more. Total alkalinity in the experimental treatments ranged from 48.00 to 61.33 mg/L. The mean values of total alkalinity were 50.58 ± 1.98 mg/L in T_1 and 50.16 ± 2.67 mg/L T_2. The variations of phosphate-phosphorusranged from 1.40 to 2.50 mg/L. The mean values of PO_4-P were 1.89 ± 0.37 mg/L in T_1 and 1.98 ± 0.32 mg/L T_2. Wahabet al. (1995) found the concentrations of phosphate-phosphorus from0.09to5.20 mg/Lexperimental ponds at Bangladesh Agricultural University, Mymensingh. From the present findings, it might be concluded that phosphate-phosphorus content, were within the productive range.Variations of nitrate-nitrogen of ranged from 2.13 to 3.20 mg/L during the study period. The mean values of nitrate-nitrogen were 2.75 ± 0.39 mg/L in T_1 and 2.79 ± 0.33 mg/L in T_2. From the above discussion, it may be concluded that all the parameters of experimental ponds were suitable for fish culture.

Growth Performances of Thai Sharpunti (*Puntius gonionotus*)

The final weight was 356g in T_1 and 308g in T_2. The final weight in T_1 was significantly higher than T_2 ($P \leq 0.01$). The live weight gain was 335g in T_1 and 288g in T_2. The live weight gain in T_1 was significantly higher than T_2 ($P \leq 0.01$). The percent weight gain was 1595% in T_1 and 1440% in T_2. The percent weight gain in T_1 was significantly higher than T_2 ($P \leq 0.05$). The average daily weight gain was 5.58g in T_1 and 4.80g in T_2. The

average daily weight gain in T_1 was significantly higher than T_2 ($P \leq 0.01$). The specific growth rate was 558% in T_1 and 480% in T_2. The specific growth rate in T_1 was significantly higher than T_2 ($P \leq 0.01$). The food conversion ratio was 5.28 in T_1 and 6.10 in T_2. The food conversion ratio (FCR) in T_1 was significantly lower than T_2 ($P \leq 0.01$). The gross production was 2.40 ton/ha/yr in T_1 and 2.08 ton/ha/yr in T_2. The gross production in T_1 was significantly higher than T_2 ($P \leq 0.01$). The net production was 2.26ton/ha/yr in T_1 and 1.94 ton/ha/yrin T_2. The net production in T_1 was significantly higher than T_2 ($P \leq 0.01$).

Talukder *et al.* (2004) found SGR of fish *(P. gonionotus)* from 2.42to 2.03% in treatment-1 and treatment-2 respectively where duck weed were used as supplemental feed at a rate of 40% body weight.Talukder *et al.* (2004) found 2.76 ton/ha/yr net production of sharpunti where fresh duck weed was supplemental feed and the production was significantly higher in ponds with supply of duck weed than without supply of duck weed. Kohinoor *et al.* (1999) observed the effectiveness of duck weed as low cost supplementary feed through 6 months production trial of Thai sharpunti. Abdel-Fattah and Abdel-Aziz (1990) used *Azolla pinnata* as protein source for tilapia *(Oreochromis niloticus)* fingerlings. FCR value in T_1 was significantly lower than T_2. The reason behind the higher production in T_1 was due to the supply of duck weed as dietary feed which had higher nutritive value of protein content then Azolla fern in T_2.

F-test of gross and net productions showed($P \leq 0.01, 0.05$) significantly higher production in T_1 than T_2 i.e. influence of duck weed as dietary feed on the production of Thai Sharpunti *(P. gonionotus)* was positively significant. So it might be concluded that duckweed had better effect as dietary feed than Azolla fern on monoculture of Thai sharpunti.

Table 3. Proximate Composition of 100g supplied Duckweed and Azolla fern

Compositon (g)	**Duckweed per 100g**	**Azolla fern per 100g**
Crude protein(g)	38.86	25.78
Crude fibre(g)	13.22	15.71
Crude fat (g)	3.80	3.47
Moisture(g)	3.00	9.2
Ash(g)	16.00	15.76
Dry matter (g)	97.00	90.8
Gross energy (Kcal)	325.7(Kcal)	262.05(Kcal)

Energy distribution mechanism in Thai Sharpunti*(Puntius gonionotus*)

- Sharpunti (100C)=20P +37R +2U +41F
- Duck weed (2953.76)=410P +1092R +59U +1210F
- Azolla fern (1855.94)=371P +686R +37U +760F

Where,

C (Consumtion) = The gross energy content of the food ingested.
P (Production) = Energy utilized in growth materials.
R (Respiration) = Net loss of energy as heat.
U (Urinary loss) = Energy loss in nitrogenous excretory product.
F (Fecal loss) = Energy loss in the feces.

CONCLUSION

The present study showed higher growth performance in treatment-1 followed by treatment-2.The net fish production was 1.32 times higher than T_2. FCR value in T_1 was significantly lower than T_2.F-test of gross and net productions showed ($P \leq 0.01, 0.05$) significantly higher production in T_1 than T_2 i.e. influence of duck weed as dietary feed on the production of Thai Sharpunti *(P. gonionotus)* was positively significant. So it might be concluded that duckweed had better effect as dietary feed than Azolla fern on monoculture of Thai sharpunti.

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