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Effects of Protein Levels on the Growth of Climbing Perch, *Anabas testudineus* Galam type, in Peat Water

Kartika Bungas[1*], Diana Arfiati[2], Marsoedi[3] and Hakimah Halim[4]
[1]Department of Aquaculture, University of Palangkaraya, Palangkaraya-73112, INDONESIA
[2]Department of Aquatic Resources Management, University of Brawijaya, Malang-65145, INDONESIA
[3]Department of Aquaculture, University of Brawijaya, Malang-65145, INDONESIA
[4]Department of Agronomy, University of Lambung Mangkurat, Banjarmasin- 74111, INDONESIA

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Abstract

Anabas testudineus is a one of vulnerable species of fishes caused environmental, over catching and uncultured well. Effects of protein levels of commercial feed on growth of climbing perch (Anabas testudineus Galam type) obtained from inland peat swamp, i.e. Purun village and Kamipang village on Kamipang District, Central Kalimantan, in peat water ponds were studied. The fishes were treated to four groups, i.e. (A) Purun – Feed I, (B) Purun – Feed II, (C) Kamipang – Feed I and (D) Kamipang – Feed II and cultured in peat water for 60 days. The result showed that the energy value of feed I containing 40 % protein was 364.5 kcal/100g and feed II containing 25% protein was 328.0 kcal/100g, respectively. The weight gain of climbing perch from Purun treated feed containing 40% protein was significant higher than others, meanwhile, the survival rate of all group cultured in tarp pond that filled peat water was 100%. The water quality of media culture during the experiment was observed normally. Feed with 40% protein level can be recommended for the intensive culture of climbing perch in peat water.

Keywords: *Anabas testudineus*, aquaculture, growth, protein, peat water.

Introduction

Climbing perch (*Anabas testudineus*) is an indigenous fish found in South and South East Asia, such as: Indonesia. The fresh waters inhabits; mostly in rivers, canals, lakes, ponds, swamps and paddy fields[1,2]. In Sumatra, Java and Kalimantan, this fish can be found on swamps, rivers, lakes, ditches and sewers, especially, in South and Central Kalimantan, it can grow on peat swamps[2]. Climbing perch in central Kalimantan is known there are two types: Galam and Parei. The Galam type is bigger than green and the other is smaller and yellow colour. This fish is widely traded in traditional markets in this area[3].

Climbing perch is involved the vulnerable species causing by over fishing, pollution and also the culture method is not established yet[1]. Several studies have been done to culture of climbing perch, i.e. fecundity[4], reproduction[5], domestication[6], breeding[7,8], feeding[9-17] and culture[18,19]. The growth of climbing perch is affected by protein levels in diets. The optimal growth of this fish obtained on feeding protein levels of diet around 25-40%[9,10,12,13].

The intensive efforts have been done to culture the climbing perch, such as semi-intensive and intensive techniques; cemented, ditch, tank and brackish ponds. This study was undertaken to evaluate the effects of protein levels on growth of climbing perch Galam type obtained from the peat water inland on Kamipang District in peat water ponds.

Material and Methods

The experiment was conducted in 12 tarp ponds of equal size (1.2 x 1 x 1.2 m^3) for a period of 60 days at Wet laboratory, Faculty of Agriculture, University of Palangkaraya. Each pond was filled 50 samples and mean of initial weight of fish was 3.01 to 3.04 g. The fishes were obtained from the peat swamp of Purun inland, Daun Bango village and Kamipang inland, Asem Kumbang village, Kamipang district, Central Kalimantan Province at February 2012. Fish were acclimated in the experimental systems and fed commercial pellet for one week prior to starting the experiment.

Two commercial fish feeds supplied from Comfeed were used this experiment with protein contents at 25% and 40% (table 1). Crude protein, crude fat and total ash were estimated following AOAC[20]. Modified method of De Silva[21] was used to estimate crude fiber. The carbohydrate or nitrogen free extract (NFE) was found out by difference method[22]. The energy value of feeds were calculated with the energy factor of 9 for fat, 4 for carbohydrate and 5 for protein[12].

Growth: The weight of fishes was taken in a pre-weighed (with water) beaker by using a electronic balance (Model A J 100, Metler Company) with an accuracy of 0.0001 g. The following growth parameters were studied to observe the percent weight gain = average final weight – average initial weight/average initial weight x 100. Specific growth rate (SGR) = Ln W_2 – Ln

$W_1/T_2 - T_1$ x 100[23]. Where, W_2 = Final live body weight (g), W_1 = Initial live body weight (g), $T_2 - T_1$ = Duration of the experiment (day). The number of fish was counted on 60th day i.e. at the end of the experiment to find out the survival rate. The following formula was used to calculate percent survival rate: % survival = Number of fish alive up to 60th day x 100/Total number of fish stocked[17].

Table-1
Composition of test feed (%)

Composition	Feed I	Feed II
Dry matter	88,0	88.0
Protein	40.0	25.0
Lipid	6.5	5.0
Ash	13.0	13.0
Moisture	12.0	12.0
Crude fiber	2.0	5.5
Nitrogen free extract	26.5	39.5
Energy (Kcal/100 g)	364.5	328.0

Water quality: Water quality parameters such as temperature, pH, dissolved oxygen, carbon dioxide and phosphate levels were monitored every 2 weeks. Water temperature was recorded by using a Celsius thermometer. Dissolved oxygen and pH were determined using a digital DO meter (HANNA, model HI 9142) and a direct reading digital pH meter (HANNA, model HI 9025), respectively.

Statistics analysis: The data were expressed on mean and deviation standard. The data were analyzed by analysis of variance to assess the treatment effect and the determination of the best of among treatments was assayed by the least significant difference method[24]. The level of confidence in this research was 5 %. All the statistical analyses were done on a computer using statistical software package SPSS (version 16.0).

Results and Discussion

Growth: The increasing of body weight of samples during experiment was shown on figure 1. The initial of body weight all of fishes were used in the experiment were not significantly different ($p>0.05$), but at the end experiment, the body weight of fishes treated 40% protein was significant higher compared to other treatments ($p<0.01$). The weight gain and specific growth rate of fishes given 40% protein were the higher statistically ($p<0.01$) than others, too, meanwhile, the survival rate of all of fish at the end experiment was 100 % (table 2).

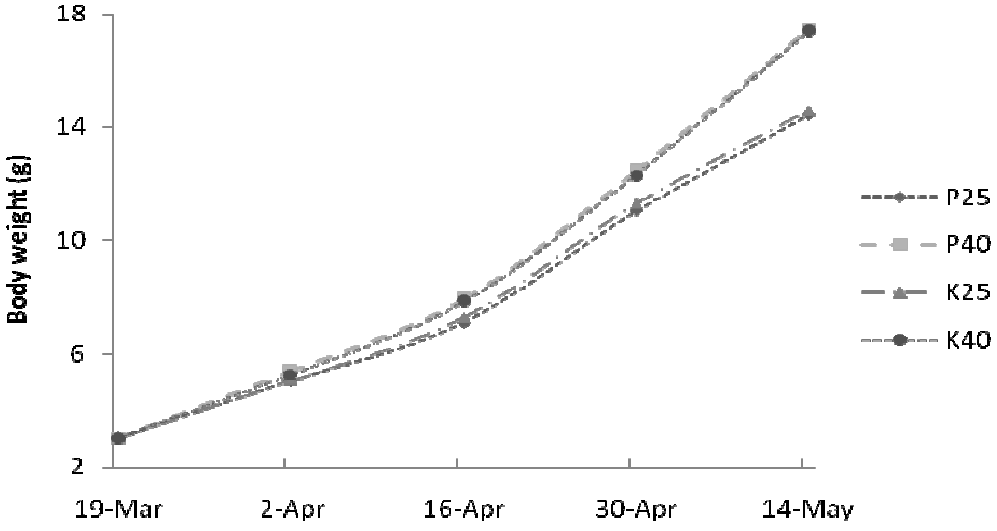

Figure-1
The body weight of climbing perch during experiment period

Table-2
Mean initial and final body weight, daily weight gain and survival rate of climbing perch from Purun village and Kamipang village fed different protein levels

Treatment	Initial body weight (g)	Final body weight (g)	Weight gain (g/day)	Specific growth rate (%/d)	Survival rate (%)
Purun : Feed I	3.037 ± 0.091	14.420 ± 0.425[a]	0.189 ± 0.008[a]	4.052 ± 0.073[a]	100
Purun : Feed II	3.017 ± 0.093	17.473 ± 0.275[b]	0.241 ± 0.005[b]	4.452 ± 0.036[b]	100
Kamipang : Feed I	3.043 ± 0.068	14.563 ± 0.162[a]	0.192 ± 0.002[a]	4.073 ± 0.019[a]	100
Kamipang : Feed II	3.027 ± 0.071	17.353 ± 0.078[b]	0.239 ± 0.001[b]	4.437 ± 0.008[b]	100

At the end of experiment shown that climbing perch treated 40% protein levels were more weight than these treated 25% protein levels. The weight gain and specific growth rate of climbing perch fishes from Purun and Kamipang village treated protein 40% shown higher than its treated 25% protein levels (table 2). The energy value of the feed II was higher than other (table 2). It indicates that 40% protein level of feed is the optimal level for the growth of climbing perch in peat water. This typical growth response to changing dietary protein level of fish feed on climbing perch fingerlings and fry treated by feeds contained protein 40% has been reported[12,13]. Protein is the main source of nutrient and energy for the growth of climbing perch. The maximum growth of fish is related to provide the right protein level to the fish. The maximum growth of fish will obtained if all energy of protein in diets is used by fish to growth.

The survival rate of all of climbing perch treated protein until the end experiment period showed 100 %. It means that the survival of climbing perch in peat water not affected by treatment of feeds containing 25% and 40% protein level. The mortality of climbing perch fry can be occurred on the fish treated with feed containing protein level below 25%[13]. The growth and performance of fish can be influenced by the availability of nutrient, mainly protein.

Water quality: During the experiment, water quality of media culture was monitored normal. The peat water quality of media culture of climbing perch during experiment was shown on table 3.

Table-3
Peat water quality in tarp pond during experiment

Sampling date	Temperature (^oC)	DO (mg/L)	pH
March 19th	28.28 ± 0.26	3.2 ± 1.07	5.07^a ± 0.06
April 2nd	28.59 ± 0.38	3.7 ± 0.26	5.40^b ± 0.02
April 16th	28.51 ± 0.45	3.2 ± 0.58	5.49^c ± 0.01
April 30th	28.55 ± 0.45	3.3 ± 0.06	5.79^e ± 0.02
May 14th	28.67 ± 0.25	3.6 ± 0.10	5.69^d ± 0.01

Temperature and dissolved oxygen of peat water during experiment period was not significant statistically (table 3). Media culture temperature of climbing perch have been observed on cemented tanks and ponds around 25-32^{o}C[14,18]. The fishes from family Anabantidae grow well in temperature of water between 25-30^{o}C[11]. Temperature is one of the most important factors that affect the metabolism of the pond ecosystem as well as fish life[28]. As drastic changes of water temperature can be fatal to fish life[29, 30, 31]. Dissolved oxygen of media culture on climbing perch culture has been reported between 4 to 6.8 mg/L[11] and 5.5 to 6.2 mg/L[14], respectively. The normal dissolved oxygen of water for aquaculture ponds was 5 to 8 mg/L[26]. The amount of oxygen present in a water body is the net result of temperature, pressure, abundance of biota, decomposition and the pollutants. The dissolved oxygen in water influences the metabolism of the fish[26-28,30,31].

The acidity of peat water was significant statistically (table 3). The pH of water for the climbing perch culture has been reported between 6.5-6.9[11]; meanwhile, the normal pH for aquaculture was 6.5-9[26]. Fish can tolerate to change pH around 5 to 9[26]. The pH water in this study increased during research, although it was still in the normal level. It indicates that decomposition or waste of feed during experiment period have been affected water quality of media culture. Protein of feed that it dissolved in water able to increase the alkalinity of water.

Conclusion

Anabas testudineus Galam type treated protein level 40% grow optimal in the peat water ponds.

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