Journal of Aquaculture and Fish Health Vol. 11(2) - June 2022
DOI : 10.20473/jafh.v11i2.32517

Tilapia (*Oreochromis niloticus*) Farming In Buckets In Sakatiga Village, Indralaya District, Ogan Ilir Regency

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Received : 2022-01-03
Accepted : 2022-01-25

Keywords :
Buckets, Land, Tilapia

Abstract

Currently, the problem of increasingly limited land availability has led to increasingly limited cultivation activities. The decreasing number of large cultivation locations requires people to be more creative in utilizing narrow locations and in saving water. Fish farming in buckets is a potential solution for aquaculture in a narrow area with more efficient use of water, easy for the community to do in their respective homes with relatively small capital, and finally able to meet the nutritional needs of the community. The purpose of this study was to determine the growth of tilapia (*Oreochromis niloticus*) kept in buckets using water spinach plants (*Ipomoea aquatica)*. This research used two treatments, namely P0: control (fish farming in buckets without using plants) and P1: fish farming in buckets using plants. Parameters observed were absolute weight growth, absolute length growth, feed efficiency, and survival. The results showed that the P1 treatment resulted in an absolute weight growth of 3.44 g, an absolute length growth of 1.12 cm, feed efficiency of 93.08%, and survival of 100%. While the P0 treatment resulted in absolute weight growth of 3.92 g, absolute length growth of 1.21 cm, feed efficiency of 81.75 %, and survival of 82.5%. Rearing tilapia in buckets without water spinach plants got better results than using water spinach plants.

INTRODUCTION

Aquaculture in Indonesia is one of the important components of the fisheries sector. Along with development developments, fish farming land is becoming increasingly narrow, on the other hand, the need is increasing. Therefore, to meet the needs of the community in increasingly narrow areas, fish farming in buckets is carried out (Yanti *et al.,* 2013; Fadri *et al.,* 2016).

Fish farming in buckets can be applied with the addition of an aquaponic system, namely cultivating fish and vegetables in one bucket (Susetya and Harahap, 2018). Based on Nursandi's research (2018), the capacity of catfish that can be kept in a bucket from a size of 5-7 cm or 11-13 cm is 60 fish. The fish used in this fish farming in buckets are fish that have the characteristics of being resistant to low oxygen such as catfish, black tilapia, catfish, spot gourami, climbing perch, cork, and carp (Pramleonita *et al.*, 2018; Solaiman and

Sugihartono, 2012; Murjani, 2011; Susila, 2016; Haser, 2017; Nofyan, 2017).

Tilapia is one of the freshwater fish that is widely cultivated because it is easy to adapt to a less favorable environment, so that its distribution in nature is very wide, both in the tropics and in temperate climates (Yanti *et al.,* 2013; Fadri *et al.,* 2016).Tilapia is an omnivorous fish that tends to be herbivorous. Tilapia has several advantages, including relatively fast growth, high environmental tolerance, relatively large body size, good taste, high survival rate, and easy maintenance. Based on Unnajmi's (2019) research, optimal growth of tilapia was obtained at a stocking density in buckets of 20 fish/60 L. Vegetable plants that are widely grown in fish farming of fish farming in buckets are water spinach (*Ipomoea aquatica*) (Prasetyo *et al.,* 2020).

Mukti *et al*. (2021) reported that the growth of catfish (*Clarias* sp.) in buckets using water spinach plants (*I. aquatica*) resulted in higher growth than the growth of catfish in buckets that did not use water spinach plants. The use of water spinach plants in fish cultivation in buckets or aquaponics systems is because water spinach plants are plants that can grow quickly and are easy to obtain (Austin, 2007). Water spinach is a type of plant that is easy to cultivate and can be planted in both soil and water growing media, therefore kale was chosen to be cultivated. The growth of kale is quite good, the harvest time is 10-16 days. Based on Nursandi (2018), on average, one bucket of budikdamber media can produce a minimum of 4.2 bunches of water spinach for 40 days of maintenance.

Therefore, it is necessary to research the farming of tilapia in buckets using water spinach. The purpose of this study was to determine the growth of tilapia (*Oreochromis niloticus*) kept in buckets using water spinach plants (*I. aquatica*).

METHODOLOGY

Place and Time

The research activity was carried out in Sakatiga Village, Indralaya District, Ogan Ilir Regency, South Sumatera in June - July 2021.

Research Materials

The materials used in this study were tilapia seeds with a size of 6-7 cm, commercial pellets with 39-41% protein, water spinach , EM-4, and booster. The tools used consisted of an 80 L bucket, charcoal, pH meter, thermometer, digital scale, ruler, plastic cup, wire, pliers, and solder.

Research Design

This research used two treatments, P0: control (fish farming in buckets without using water spinach plants), and P1: fish farming in buckets using water spinach plants.

Work Procedure

Maintenance Container Preparation

The container used for maintenance is a bucket. At the top of the bucket (5 cm from the lip of the bucket), there is an additional hole on the side of the bucket to keep the water level from spilling out when it rains. Before use, the bucket is cleaned first. Then the bucket is filled with water to 60 L and 20 ml of EM-4 probiotic is added. Then it is deposited for 72 hours or 3 days. Plastic cups are used as containers for farming water spinach. Before use, the bottom of the plastic cup is given a hole by using a soldering iron so that the water spinach can grow properly. The plastic cup that has been perforated is then wired at the top, then the wire is attached to the mouth of the bucket (Susetya and Harahap, 2018).

Fish Stocking and Vegetable Planting

Tilapia stocked were 20 fish/buckets (Unnajmi, 2019). Plastic cups that have been cast are then filled with charcoal for vegetable growing media, about 50% -

80% of the volume of the plastic cups. Then the water spinach plants that have been prepared, cut, and leave the bottom (roots and stems) as high as 15 cm, then the roots and stems of the water spinach that have been cut are put into a glass that already contains charcoal. Before rearing, the fish were adapted for 3 days to feed by feeding until the fish were full or *ad satiation*. Then the fish were weighed and the initial length was measured. Fish farming in buckets of tilapia was carried out for 30 days while the water spinach is harvested every 15 days. During maintenance, fish fed was carried out 3 times a day at 07.00 a.m., 12.00 a.m, and 3.00 p.m. To maintain water quality, water changes are carried out once or twice a week. A sampling of fish is done every 2 weeks with samples used as much as 10% of the number of fish. When a fish dies, its weight is weighed and its length is measured then the fish were weighed and their weight was measured as initial data.

Parameters

Parameters observed in this research were absolute weight growth, absolute length growth, feed efficiency, survival rate, and plant absolute height growth.

Fish weight growth during rearing is calculated using the following formula:

W = Wt - Wo

Where:
W = absolute weight growth (g)
Wt = final weight (g)
Wo = initial weight (g)

Fish length growth during rearing is calculated using the following formula:

L = Lt - Lo

Where:
L = absolute length growth (cm)
Lt = final length (cm)
Lo = initial length (cm)

The formula for feed efficiency is:

$$FE = \frac{(Wt + Wd) - Wo}{F} \times 100\%$$

Where:
FE = feed efficiency (%)
Wt = final fish biomass (g)
Wd = dead fish biomass (g)
Wo = initial fish biomass (g)
F = amount of feed given (g)

Fish survival rate was calculated using the formula:

$$SR = \frac{Nt}{No} \times 100\%$$

Where:
SR = survival rate (%)
Nt = final number of fish
No = initial number of fish

Measurement of plant height is from the surface of the planting medium or the base of the plant to a high growing point, measurements are made every 2 weeks using the formula bellow (Kresna *et al.,* 2016):

H = Ht – Ho

Where:
H = absolute plant height growth (cm)
Ht = final plant height (cm)
Ho = initial plant height (cm)

Data Analysis

The data absolute weight growth, absolute length growth, feed efficiency, and survival obtained are made in the form of tables and graphs, the data will be analyzed using a comparison test (T test).

RESULTS AND DISCUSSION

Absolute Weight and Length Growth

Data of tilapia's growth during maintenance are presented in Figure 1.

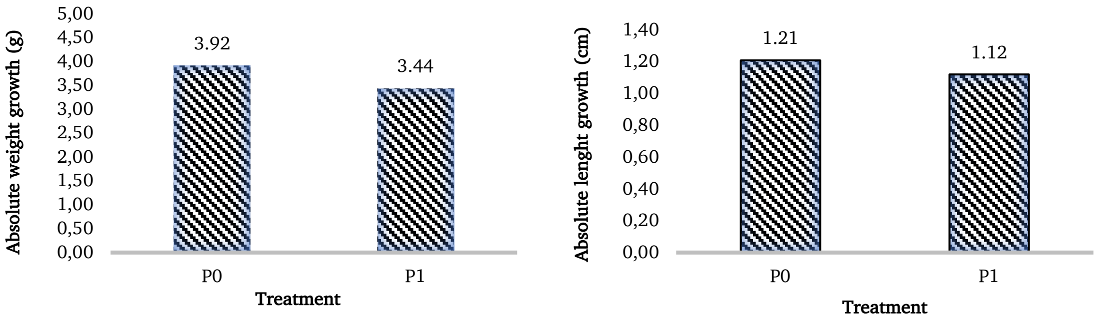

Figure 1. (a) Absolute weight growth of tilapia, (b) absolute length growth of tilapia.

Based on Figure 1 shows that the P1 treatment resulted in an absolute weight growth of tilapia of 3.44 g and an absolute length growth of 1.12 cm, while in the P0 treatment the absolute length growth of tilapia was 1.21 cm and absolute weight growth of 3.92 g. Based on the research conducted, it showed that rearing fish in P1 treatment resulted in lower absolute weight growth compared to P0 treatment. This is presumably because the number of fish that live in P1 treatment is higher than that of rearing without using plants. This is following Sihite *et al*. (2020) who explains that differences in fish stocking density affect fish growth.

Feed Efficiency

Feed efficiency data of tilapia during maintenance is presented in Figure 2.

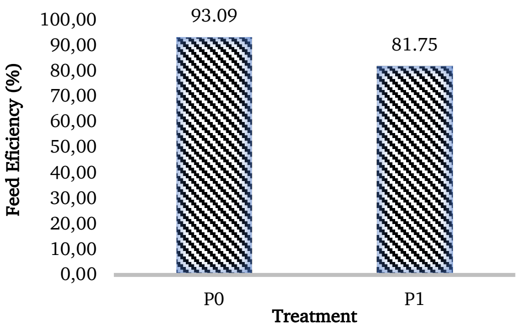

Figure 2. Feed efficiency of tilapia.

Feed efficiency is the ratio value between weight gain and feeds consumed expressed in percent. The feed efficiency obtained in the P0 treatment was 93.08 % and the P1 treatment was 81.75%. This shows that the efficiency of feed using plants is higher than without using plants. This happens because the maintenance container using plants has better water quality than the maintenance container without using plants. According to Febriyanti (2017), the efficiency of feed used by fish depends on the type and amount of feed given, species, fish size, and water quality. Azhari and Tomasoa (2018) added that aquaponics systems or fish farming using plants are more effective in converting ammonia compounds into nitrate compounds and maintaining the quality of tilapia cultured water

Survival Rate

Survival rate of tilapia during maintenance is presented in Figure 3.

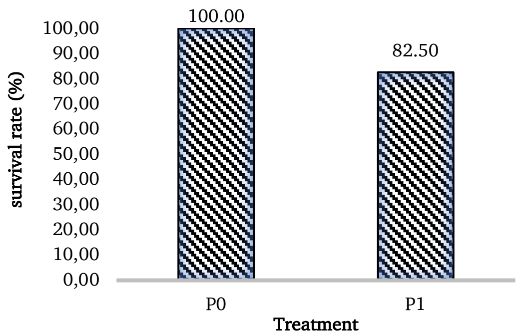

Figure 3. Survival rate of tilapia.

Survival rate is the percentage of the number of cultured fish that live within a certain time. The survival rate of tilapia in P1 treatment is 100%, while the survival rate in P0 treatment is 82.5%. Tilapia's death occurred in the early days of rearing. Tilapia experiencing stress when moving from the old environment to the new environment is one of the causes of fish death. This is thought to be an adaptation response to the environment and treatment (Wijayanti *et al.,* 2019). The use of plants in fish cultivation media is also able to maintain water quality so that the survival of catfish is higher. This is in line with research conducted by Effendi *et al.* (2015) that catfish using water spinach as a phytoremediator resulted in a high survival rate.

Plant Height Growth

The absolute height growth of water spinach in the P1 treatment was 26.4 cm for 14 days of maintenance. This result is lower than the study of Sunardi *et al.* (2013) which reported that the growth of water spinach plant height was 41.24 g for 9 days of maintenance on hydroponic media. The growth of water spinach in the aquaponic system is influenced by the availability of sufficient nutrients in the form of nitrate and phosphate which will be absorbed by the water spinach plant in the aquaponics system (Hasan *et al.*, 2017). Nitrate is obtained from the oxidation process of ammonia with the help of bacteria and oxygen. It is suspected that the low growth of water spinach in this study was thought to be due to the low nutrient content of the maintenance medium.

Water Quality

Water quality data during tilapia rearing are presented in Table 1.

Table 1. The results of water quality measurements during the study.

Parameter	Treatment		Standard (KKP, 2009)
	P0	P1	
Temperature (°C)	25.3-25.9	25.2-25.9	25-32
pH	6.8-7.2	6.7-7.2	6.5-8.5
Ammonia (mg/K)	1.78-2.75	0.73-1.21	<0.02

Water quality in fish farming is one of the most important factors in aquaculture. The water temperature in the P0 and P1 treatments ranged from 25.2-25.9 °C. This temperature range value is good for tilapia growth, this is in line with BSN (2009) that the optimum temperature for tilapia is 25-32 °C. The pH value obtained in the process of rearing tilapia in the P0 and P1 treatments was 6.7-7.2. This value indicates a good pH in the maintenance process. This is in line with BSN (2009) that a good pH value range for rearing tilapia is 6.5-8.5. Ammonia value obtained in the process of rearing tilapia treatment P0 is higher than treatment P1. This shows that the water spinach plant in the P1 treatment was able to give an effect on the concentration of the total existing ammonia value. This is following the statement of Listyanto and Andriyanto (2008) that the use of plants in aquaponics is proven to be able to absorb toxic substances in the form of ammonia and nitrates from feed residues, feces, and fish urine. Dauhan *et al.* (2014) added that the water quality in aquaponic media is maintained due to the presence of plants that can reduce ammonia to nitrate. Furthermore, Cohen *et al.* (2018) stated that a fish rearing system with aquaponics will pump ammonia in fish rearing media to aquaponic growing media. The ammonia will be overhauled by nitrogen-degrading bacteria into nitrate and utilized by plants and then released back into the fish rearing container so that it can support the growth of the fish being kept.

CONCLUSION

The results showed that the P0 treatment resulted in absolute weight growth of 3.92 g, absolute length growth of 1.21 cm, feed efficiency of 81.75 %, and survival of 82.5%. While the P1 treatment resulted in an absolute weight growth of 3.44 g, an absolute length growth of 1.12 cm, feed efficiency of 93.08%, and survival of 100%. Rearing tilapia in buckets without water spinach plants better results than using water spinach plants.

ACKNOWLEDGMENT

The authors are grateful to all parties who have aided in the completion of this research.

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