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Utilization of butterfly pea leaf meal as supplementary feed of Nile tilapia (*Oreochromis niloticus*)

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Abstract
Butterfly pea plants contain quite high protein and many pharmacological content, the telang leaf is very good as a feed additive, in order to increase antioxidants in fish. This study aims to determine the effect of butterfly pea leaf meal on feed to the growth rate and the feed conversion ratio of tilapia. This research has been carried out at the Ciparanje Inland Fisheries Area Hatchery, Faculty of Fisheries and Marine Sciences, Universitas Padjadjaran. The study was conducted using a Completely Randomized Design (CRD) of 4 treatments and 3 replications. The parameters observed include growth rate, feed conversion and water quality. Data were analyzed using Anova and continued with Duncan Test if there were differences in the results obtained. The results showed that the addition of butterfly pea leaf meal to tilapia feed showed daily growth rates and feed conversion that were not significantly different in each treatment. Based on these results it can be concluded that the addition of butterfly pea leaf meal to 15% in feed, does not have a negative impact on reducing the growth rate and feed conversion of tilapia.

Keywords: Growth, feed convertion ratio, stress, tilapia

1. Introduction
Intensive tilapia aquaculture has challenges in the form of stress-prone fish due to deteriorating aquatic quality and high density [12]. Prevention of disease due to stress in carried out with the role of artificial feed given since larval stadia fish. The availability of feed with good quantity and quality, on time, nutritional value, and has a functional effect is needed where in addition to having nutritional value, it also has the ability to maintain health and prevent disease, as well as other positive effects on animal nutrition [15].
In vivo research for antioxidant activity is research [20]. which revealed that jaloh leaves have antioxidant sources and can reduce free radicals. The results obtained are that the addition of jaloh leaf flour to commercial tilapia fish is effective at giving 5% to decrease lipid peroxidation in tilapia day tissue. But the ineffectiveness of supplementing jaloh leaf flour with relatively high concentrations in inhibiting lipid peroxidation, due to the content of jaloh consisting of 8-20% tannins causes a bitter taste in food supplementation of jaloh leaf flour so that it is not liked by fish.
Telang plants have extraordinary pharmacological potential, namely as an antioxidant, antimicrobial, anticancer, anti-inflammatory, analgesic, antipyretic, antidiabetic, anticidal, and potential for the central nervous system (Central Nervous System). This potential as a medicinal ingredient is supported by phytochemical studies that find active ingredients such as tannins, plobatin, aponin, triterpenoids, phenols, flavonoids, alkaloids, anthraquinones, anthocyanins, flavonoids, glycosides, steroids, essential oils, and stigmas-4-ena -3,6-dion [4].
In research. [14] about the identification of bioactive components by FTIR analysis and *in vitro* antioxidant activity of leaves and flowers of telang plants. The leaves of the telang plant showed the amount of phenol at 358.99 ± 6.21 mg / g and flavonoids at 123.75 ± 2.84 mg / g [2].
The superoxide dismutase enzyme converts superoxide free radicals into oxygen and hydrogen peroxide [23]. With this enzyme can control the level of free radicals in the body. Testing of antioxidant activity *in vivo* needs to be done, considering that there is still little research on antioxidant activity *in vivo* especially in fish. *In vivo* antioxidant activity testing was carried out using the Marklund and Marklund (1974) method because the material is easier and easier

to obtain, and can be analyzed quickly, inexpensive instruments, and simple operating protocols [5]. In this case, it is necessary to conduct research on the use of telang plants as a source of antioxidants to increase antioxidant levels by looking at the amount of the enzyme superoxide dismutase in the liver of tilapia expressed as the many enzymes needed to inhibit auto-oxidation from free radical attack, which indirectly increases antioxidants in the fish's body. in order to make tilapia more resistant to environmental changes and disease.

2. Materials and Methods

2.1 Materials

The materials used in this research was wet telang leaves that have been harvested at the beginning of research in the field laboratory Faculty of Agriculture Universitas Padjadjaran, commercial feed PF1000 in the form of pellets with 40% protein as a feed mixture, and CMC pro analysis as binder, then 1.5 month old tilapia wighing 6-13 grams which are kept for 40 days in a land fishery hatchery Ciparanje, Universitas Padjadjaran.

2.2 Methods

The research method used was experimental design, specific using a Completely Randomized Design (CRD) with four treatments and three replications. The treatment given is distinguished based on the concentration in the addition of butterfly pea meal mixed with commercial feed, as follows:

Treatment A = Commercial Feed (Control)
Treatment B = 5% addition of butterfly pea leaf meal
Treatment C = 10% addition of butterfly pea leaf meal
Treatment D = 15% addition of butterfly pea leaf meal

2.3 Procedure

Tilapia used is 1,5 month old with a weight of 6 – 13 grams and a size 6 – 8 cm. Tilapia was take from breeder in Purwakarta with type of Nirwana.

The experimental feed was made by air drying the butterfly pea leaves for 3 days, then mashed it into meal. Afterwards the butterfly pea leaves were filtered to separate the flour and pulp. Then, the butterfly pea leaf meal was mixed with commercial feed with predetermined concentration according to each treatment. In the process of mixing commercial feed and butterfly pea leaf meal, 1% CMC of the total feed was added. Feed mixture was then stirred, and added with warm water to form a paste. The finished dough was molded using a hollow basin. And the resulting pellets were air dried for 1 day.

The number of fish used was120 fish and 80 fish as stock. Stocking densities of 10 fish per aquarium, stocked at the beginning of breed after feed was made. Stocking by inserting fish that are still in containers into ponds. The amount of feed given is 3% of body weight per day, 3 times a day for 40 days. Water change was done every two days to maintain good water quality by siphoning off the bottom of the aquarium to take away dirt and leftover food and drain 1/3 of the aquarium

water, then refill it with clean water, and every week, ¾ water inside of the aquarium was changed.

2.4 Data Analysis

To find out the effect of the treatment, data was analyzed with an F test at 5% level, and if there was an effect on the treatment, Duncan's Multiple Range Test was performed. The software used is Microsoft Excel by applying a simple statistical formula.

3. Result

3.1 Daily Growth Rate

Growth is a process of increasing the length and weight of an organism in units of time, which is influenced by several factors, namely internal and external factors. Daily growth rate is the basis for knowing the percentage growth of fish weight per day during the period of cultivation. The increase in the average weight of tilapia can be seen in Figure 1. Based on the observations, each treatment resulted insignificant difference in the growth of tilapia. The increased growth shows that the feed given can be eaten and utilized by tilapia (Figure 2).

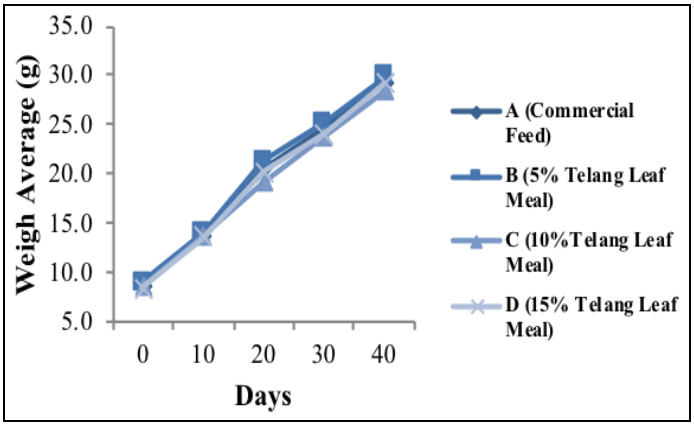

Fig 1: Average Weight Increase of Tilapia

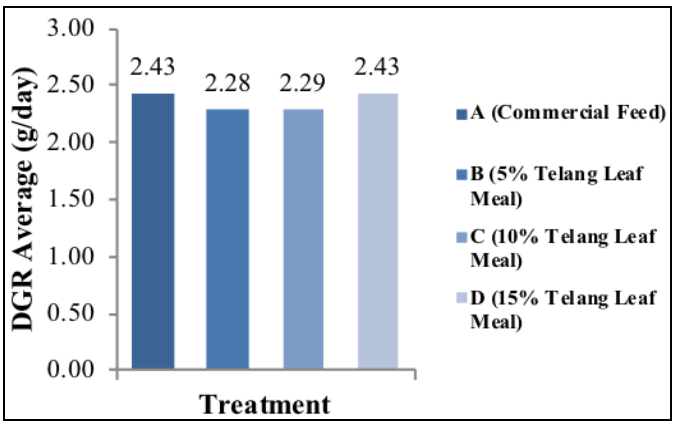

Fig 2: Graphic of Average Daily Growth Rate of Tilapia

3.2 Feed Conversion Ratio (FCR)

Feed conversion or Feed Convertion Ratio (FCR) is a comparison between the amount of feed given during cultivation with the amount of weight produced, where the smaller the conversion value, the better the results. Feed conversion shows how much food is consumed into fish body biomass. The results of feed conversion can be seen in Figure 3.

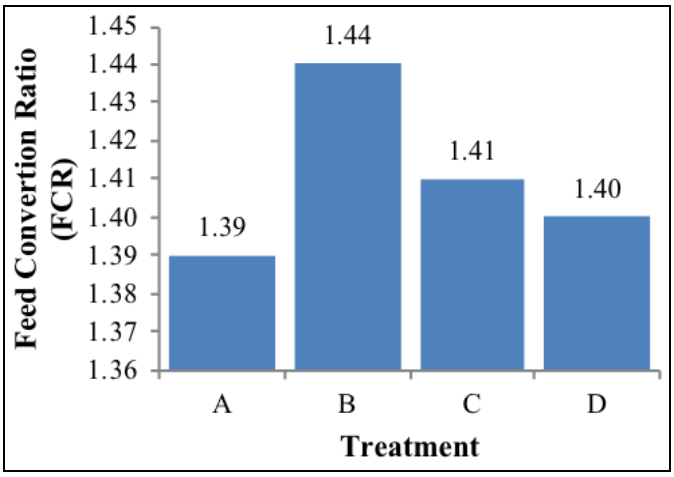

Fig 3: Graphic of Feed Conversion Ratio

A = Commercial Feed
B = 5% Telang Leaf Meal
C = 10% Telang Leaf Meal
D = 15% Telang Leaf Meal

3.3 Water Quality

Water quality is a very important factor in fish farming, the water used must meet the optimal needs of fish. Water quality parameters measured are temperature, dissolved oxygen (DO), and the degree of acidity (pH). Water quality measurements carried out 5 times with a span of 10 days to 40 days of cultivation period. The results of measurement of water quality parameters can be seen in Table 1.

Table 1: Water Quality Parameter during the study

Treatment	Sustainability (%)			
	Maximal Temperature (℃)	Minimum Temperature (℃)	DO (mg/L)	pH
A (Control)	32 – 33	26 – 27	4.3-7.4	7.03–8.17
B	33	26 – 27	4.0-7.3	7.01-8.20
C	32 – 33	26	3.8-7.1	6.87–8.25
D	33	26 - 27	3.9-7.1	7,0 – 8.5
National Standar d of SNI	30	25	Min 5	6.5 – 8.5

A = Commercial Feed
B = 5% Telang Leaf Meal
C = 10% Telang Leaf Meal
D = 15% Telang Leaf Meal

4. Discussion

Based on observations, the daily growth rate of tilapia in each treatment resulted in the growth of tilapia that was not different. The increased growth shows that the feed given can be eaten and utilized by tilapia. During the 40-day maintenance period the growth of Tilapia's weight had increased. Increased weight of tilapia is caused by several factors, according to Prihadi [17]. stating growth can be influenced by factors from within and from outside, one of which is food, especially feed conversion.

Conversion of feed obtained shows that the feed provided is not fully utilized by fish for growth, but is used to maintain the body from high ambient temperatures. According to Yanti *et al*. [25] the digestibility of fish to digest feed is influenced by several factors, namely the chemical nature of water, type of feed, size, age of fish, nutrient content of feed, frequency of feeding, digestive enzymes found in the digestive tract and temperature water.

Stress does not inhibit the overall growth rate of test fish, because fish will change their diet to absorb nutrients for growth. This is in accordance with research from Leal *et al*. [13] which states that chronic stress will reduce the level of food intake at the time of stress, but fish can modify their daily diet in an effort to avoid disruption at the time of the stressor, so the fish will continue to experience growth but not tall.

Feed efficiency is also influenced by stress caused by the environment which is in accordance with the results of research by Leal *et al*. [13] which shows that stress in aquaculture will disrupt feeding behavior, especially reducing food intake and the negative effect on feed conversion efficiency.

Temperature is a very important factor in fish culture that determines the success of tilapia cultivation, because tilapia is a cold-blooded organism [3]. Temperature during the cultivation period affects the growth and survival of fish. During the cultivation, the fish were kept in temperature of 26 ℃ - 33 ℃, which is still around the optimum range of 25 ℃ - 30 ℃. Increasing the temperature of the water up to 33 ℃ can cause heat stress as a source of oxidative stress during cultivation. This condition results in low feed efficiency which indicates that the nutrients absorbed by the body are used to adjust to ambient temperature. In heat stress treatment, the temperature is increased to the maximum limit, as long as the temperature increases still around the optimal limit of 30 ℃, the fish will utilize food that makes the process of digestion and metabolism also increase.

Dissolved oxygen (DO) is a water quality parameter that shows the solubility of oxygen in a body of water.Where dissolved oxygen is influenced by atmospheric pressure, salinity and temperature [16]. Dissolved oxygen levels during cultivation ranged from 3.9 to 7.4 mg / L which were in poor condition that is <5 mg / L. This is caused by an increase in temperature that exceed the optimal temperature of 30 ℃. Agustiningsih [1] states that temperature and oxygen content have an inverse relationship where the lower the temperature the oxygen content will increase and the higher the temperature the oxygen content will drop.

The pH range during cultivation of tilapia were around 6.87 - 8.25. According to SNI 7550 [19] good pH ranged between 6.5 - 8. So, the pH was optimal for cultivation. pH value that is too low (very acidic) or too high (very basic) can disrupt fish growth. However, most fish can adapt to aquatic environments with a pH of 5-9.

5. Conclusion

The addition of butterfly pea leaf meal did not have a different effect on the growth and feed conversion ratio of tilapia. This shows that butterfly pea leaf meal can be added as additional source of protein in feed without having a negative effect on fish growth and feed conversion.

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