Utilization of fermented Seligi leaf flour *Phyllanthus buxifolius* toward the specific growth rate, daily growth rate and survival rate of siam catfish (*Pangasius pangasius*)

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**Abstract.** Siam Catfish (*Pangasius pangasius*) is a freshwater fish commodity that has important economic value because of its fast growth and easily cultured. One way to increase catfish production is through fulfilling the nutritional requirements through the feed. However, the problem that often arises is the high cost of feed, so it is necessary to use the alternative feed to reduce feed costs. Seligi leaf flour (*Phyllanthus buxifolius*) is an alternative feed material that can be used as additional feed ingredients. But Seligi leaf flour has a high crude fibre content of 15.48% while the crude protein is 11.53%. Fermentation is needed to reduce crude fibre and increase protein. Specific growth rate, daily growth rate and survival rate are factors that need to be considered in the process of fish culture. The results of this study indicated that the use of Seligi leaf flour (*Phyllanthus buxifolius*) in catfish showed no significant difference (P> 0.05) with the control treatment at specific growth rates, daily growth rates, and survival of siam catfish (*Pangasius pangasius*).

1. **Introduction**

Siam Catfish (*Pangasius pangasius*) is one of the freshwater fish that has important economic value because of its fast growth and easy grow [1]. One way to increase catfish production is through providing high-quality feed, having good nutritional contents. A feed is an important factor that must be considered to increase the productivity of farmed fish.

Seligi leaves (*Phyllanthus buxifolius*) is a good candidate for fish feed ingredient due to containing high nutrient values: crude protein levels of 7.6486%, crude fat 0.5144%, crude fibre 5.8371%, and ash 3.4515%. Additionally, Seligi leaf extract is well known for several important compounds including flavonoids, polyphenols (tannins), saponins, alkaloids, quinones, and triterpenoid steroids [2]. Fermentation can improve the nutritional value, growth, and improve the digestibility of crude fibre, protein and other feed nutrients [3]. Utilization of Seligi leaves by the fermentation process is expected to be able to increase the potential of the Seligi leaves, to be able to make Seligi leaves as alternative feed ingredients that can support the growth and survival of fish, especially catfish culture [4]. Based on the information above, it is necessary to research the use of fermented Seligi leaf flour in catfish to increase the specific growth rate, daily growth rate, and survival of catfish.
2. Material and method

2.1. Materials

Materials used in the present study were Siam Catfish (*Pangasius pangasius*) with an average length of 12-15 cm obtained from the IBAT Mojokerto, East-Java province, seligi leaves, aquaria.

2.2. Procedures

Seligi leaf flour was prepared by harvesting fresh seligi leaves and dried under the sun for 3 days. The leaves were afterwards ground into fine flour and used as an ingredient for feed ingredients. On the other hand, a total of 20 aquaria with a size of 50×30×30 cm³ were firstly rinsed and filled with water. Thereafter, 10 Siam catfish seeds measuring 12-15 cm of length were stocked into each aquarium. The fish were fed with the seligi leaf containing feed for 30 days.

2.3. Observed parameter

During the experimental period, several parameters were recorded including initial and final body weight to calculate the specific growth rate and daily growth rate. In addition, any mortality was also monitored to calculate the survival rate. Furthermore, water quality parameters such as pH, temperature, DO and ammonia contents were recorded weekly to make sure that the fish were cultured under optimal conditions.

2.4. Data analysis

The obtained data were analyzed using the ANOVA (Analysis of Variance) statistical test to determine whether there were differences between treatment, followed by Duncan's Multiple Range Test with a 5% significance level to find out the best treatment.

3. Results and discussion

3.1. Specific growth rate

Specific Growth Rate is the percentage of daily growth calculated based on fish weight during the study [5]. Growth is very closely related to feeding because feed can meet the high nutritional needs of fish and feed can affect the growth rate of these fish. Proper feeding can also guarantee life and accelerate growth [6]. Based on statistical calculations it can be seen that the use of Seligi leaf flour fermentation in catfish shows no significant difference (P> 0.05) on the specific growth rate of catfish. Specific growth rate values in all treatments ranged from 1.95 to 2.09% (Table 1.). There was no significant difference (P> 0.05) in the specific growth rate values because each treatment had almost the same nutritional content so that the use of fermented Seligi leaf flour did not affect. Seligi leaves contain saponins which are a type of glycosides that are found in plants. Saponins have a bitter taste and irritate the mucous membranes in fish when given at the wrong dosage [7]. Hidayat et al [8] said that the specific growth rate is influenced by several factors, namely internal and external factors. Internal factors include heredity, resistance to disease and ability to use food, while external factors include physical, chemical and biological characteristics.

| Table 1. Data on Specific Growth Rate of Siam Catfish in Each Treatment |
|-----------------------------|-----------------------------|
| Treatment  | Specific Growth Rate (%) ± SD |
| P0          | 2.09 ± 0.07                  |
| P1          | 2.09 ± 0.14                  |
| P2          | 1.95 ± 0.15                  |
| P3          | 2.09 ± 0.15                  |

3.2. Daily growth rate

The daily growth rate is an increase in length or weight in time [9]. Growth occurs because there is a protein that is absorbed by the body of the fish, the amino acid content contained in protein used by the...
body of the fish to form new tissue during the growth period [10]. Growth is related to feed because feed also plays an important role in growth. The good nutritional content and the right amount of doses and supported by good water quality will be one of the main factors in the growth period. Fish growth is influenced by external and internal factors [11]. Internal factors include age, heredity, body resistance to disease and ability to digest food, external factors include physical and chemical properties of the environment, the amount of food, a measure of the nutritional value of food available and the amount of fish available [12]. This is supported by [13], the amount of feed that can be consumed by fish every day is one of the factors that influence the potential of fish to grow optimally and the rate of daily food consumption is closely related to stomach capacity and emptying. However, based on statistical calculations it can be seen that the use of seligi leaf flour fermentation in catfish shows no significant difference (p> 0.05). The average value of the daily growth rate (GR) in all siam catfish treatments ranged from 0.45 gr/day - 0.55 gr/day (Table 2.). Growth is also influenced by the balance of nutrients present in the feed. This is consistent with [9], that growth occurs when there is excess energy produced by metabolism after it is used for body maintenance and activity. The consumed food will be used to nourish the body and replace damaged cells, the rest is used for growth. Fish can grow well if the intake of nutrients is sufficient, especially protein needs. The protein content in feed influences the high and low growth of siam catfish. Protein deficiency in feed can cause stunted growth, followed by loss of body weight due to the use of protein from body tissues to maintain vital functions [14].

| Treatment | Daily Growth Rate (gr) ± SD |
|-----------|-----------------------------|
| P0        | 0.45 ± 0.04                 |
| P1        | 0.55 ± 0.09                 |
| P2        | 0.49 ± 0.03                 |
| P3        | 0.52 ± 0.07                 |

### 3.3. Survival Rate
Survival is a parameter of the success of a cultivation activity. According to Djunaidah et al [15] survival is a comparison between the number of individuals who lived at the end of the experiment and the number of individuals at the beginning of the experiment. Based on statistical calculations it can be seen that the use of seligi leaf flour fermentation in catfish shows no significant difference (P> 0.05) on the survival of catfish. The average value of survival (SR) in all catfish treatments ranged from 94% - 100% (Table 3.). Death in siam catfish, especially in the treatment of P3 that occurred during the study allegedly due to deposition of organic and inorganic materials that accumulate in the aquarium which causes a decrease in water quality, the level of turbidity of the P3 treatment and the location of the aquarium that is less exposed to sunlight. This of course can affect fish breathing and affect fish response to feeding. This is supported by Khairuman et al [16] that good water quality in maintenance provides good survival for fish. Survival is the ratio between fish that live at the beginning of maintenance with the number of fish that live at the end of maintenance. In the cultivation of mortality is a determinant of the success of the business [17]. conditions such as water quality were still within the range of eligibility for catfish life [19].

| Treatment | Survival Rate% ± SD |
|-----------|---------------------|
| P0        | 98 ± 4.47           |
| P1        | 100 ± 0.00          |
| P2        | 96 ± 5.47           |
| P3        | 94 ± 5.47           |

The survival rate is influenced by water quality, especially the temperature and oxygen content. Low oxygen levels can cause a decrease in fish appetite so that it affects the rate of growth and survival.
Survival rates can also be influenced by internal and external factors. Survival is influenced by internal factors which include sex, heredity, age, reproduction, resistance to disease and external factors including water quality, stocking density, number and composition of amino acid completeness in feed [18]. One way to create an ideal environment is by changing water. Considering that not all fish have died, it can be ensured that the tolerance of fish populations in different containers, both for food and environmental.

### 3.4 Water quality

Water quality is one of the determinants of life, especially for catfish. Measurement of water quality in this study was carried out by measuring pH, temperature, DO, ammonia (Table 4.). Temperature is one of the physical factors of water quality that is important in fish farming because it affects the appetite of fish so that it affects the growth and survival of fish. During the maintenance period, the temperature range is at 27.8°C - 29.3°C. The temperature range is under SNI [20] which is 27°C -300C, so the water temperature during the study can be said to be optimal for catfish. Dissolved oxygen (DO) levels during this maintenance period ranged from 4.23 to 6.28 mg/L. The range of DO content during the maintenance period is under SNI [20] which states that the optimal range for catfish is > 4 mg/L. Dissolved oxygen is an important environmental factor for fish growth, if the oxygen content is low it can cause the fish to lose its appetite so that it is susceptible to disease and can result in stunted growth. Another factor affecting fish growth is the degree of acidity (pH). The pH range during maintenance was 7. According to [20] states that the pH of the water suitable for catfish is 5.5 to 8.5, but for optimal growth in the range of 7-8, so the pH at the research shows optimal pH for siam catfish. Ammonia measurement results during the study ranged from 0-0.025 mg/L. Ammonia content value is under SNI [20] that the optimal range for catfish is <0.2 ppm.

**Table 4. Water quality range data**

| Parameter             | Values       |
|-----------------------|--------------|
| Suhu (°C)             | 27.8 – 29.3  |
| pH                    | 7.00         |
| Dissolved Oxygen (mg/L)| 4.23 – 6.28 |
| Amonia (mg/L)         | 0 – 0.025    |

### 4. Conclusions

The use of fermented Seligi leaf flour as feed ingredients for catfish up to a dose of 6% had no significantly different from the commercial feed on the specific growth rate, Daily growth rate of Siam catfish and survival of siam catfish (*Pangasius pangasius*).

### 5. References

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