Effects of different feed doses of Majapahit leaves (*Crescentia cujete* L.) on the growth of Nile tilapia (*Oreochromis niloticus*)

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Abstract. Phytochemical test results of Majapahit leaf extract contain active ingredients saponins, tannins, steroids and triterpenoids which have in vitro potential as antibacterial and from the results of GCMS analysis in previous studies. Majapahit leaves contain active ingredients such as 2-Methoxyl4-vinylpheol, Thiosulfuric acid, Octade9-enoicacid, n-Hexadeconoic acid which has the potential as an antibacterial insilico. This study aims to determine the effect of the addition of Majapahit leaf powder (*Crescentia cujete* L.) in feed with different doses to the growth of tilapia (*Oreochromis niloticus*) The parameters observed in this study were the growth of tilapia weight by treating different doses of majapahit leaf powder with doses A (7.5%), B (10%), C (12.5%) and D (0%). To find out the weight of the fish, sampling was done every 5 days. The results showed the best absolute weight growth in treatment C (12.5%) which was 21.33 g higher than the control treatment which was 10.33 g.

1. Introduction
Parrot fish or fish of Tilapia (*Oreochromis niloticus*) is an economically important freshwater fish commodity because it is easily accepted by the wider community, its rapid growth, delicious meat and relatively low prices. Moreover, it can be maintained at high densities because it can receive natural and artificial feed. One of the obstacles faced in aquaculture is the feed factor which is the biggest cost component, around 60-70% of the cost comes from feed for fish rearing. Protein is the main source of nutrients in feed which has a higher price than other nutrient sources so that the benefits obtained by farmers are relatively lower in tilapia farming [1].

One alternative in overcoming cost constraints in providing feed is to use natural ingredients that are widely available around us and have the ability to increase fish growth. The use of natural ingredients in feed has been done a lot of research including by; [2] researching about fermented kiambang leaves and used as tilapia food feed proved to be able to increase growth, feed efficiency, and survival of tilapia. Other studies have shown that feed containing 5% jaloh leaves significantly affected absolute weight gain, daily growth rate, feed conversion ratio and feed efficiency [3].

The aim of this study was to determine the effect of the addition of majapahit leaf powder (*Crescentia cujete* L.) in feed with different doses on the growth of tilapia, and determine the use of the best dose of growth of tilapia (*Oreochromis niloticus*).

2. Materials and methods
The material used in this study was majapahit leaf powder obtained by drying majapahit leaves and then mashed and mixed with commercial feed by using progol as an adhesive. Tilapia seeds used an average size of 10 grams / head as many as 400 individuals.

The method used in this study is an experimental method with 3 treatments and 3 replications for each treatment. The research design uses a completely randomized design. (RAL). The treatment given was mixing majapahit leaf powder in tilapia feed with treatment doses A = 7.5%, B = 10%, C = 12.5% and D = 0% as a control. The parameters observed in this study were absolute weight growth, which was the difference in total body weight of fish at the end and beginning of the study. Weight growth is calculated using the formula [4]

\[ W = W_t - W_o \]

Information:
- \( W \): Absolute Weight Growth (g)
- \( W_t \): Final Fish Weight (g)
- \( W_o \): Initial Fish Weight (g)
- \( t \): length of maintenance (days) is calculated using the formula according to [4]

The research procedure begins with; preparation of tools and materials, research containers, aerator installation, feed preparation, fish stocking, feeding twice a day morning and evening for one month. Heavy sampling is done every 5 days, the data collected is then analyzed using the ANOVA test.

3. Results and discussion

3.1. Nutrition value of Majapahit leaf powder

The results of the analysis of majapahit leaf powder proximates (Crescentia cujete L.) are:

| Nutritional content of Majapahit leaf powder | Amount (g/100g) |
|---------------------------------------------|-----------------|
| Protein                                     | 8,266           |
| fat                                         | 2,767           |
| Water                                       | 9,686           |
| ash                                         | 8,416           |
| Carbohydrate                                | 70,864          |

Table 1 shows the highest nutrient content in majapahit leaf powder (Crescentia cujete L) is a carbohydrate content of 70.864% higher than the protein content of 8.266%. The high fiber content of hydrated food can prolong satiety and is able to produce an energy source, although according to [2], the use of leaves as a feed ingredient is constrained by high crude fiber because it can reduce the level of feed digestibility. According to [5], usually the use of leaf flour is limited to 5-10% due to the high fiber content in the leaves which can reduce the quality of feed besides fish also have limitations in digesting feed with high fiber content.

Based on previous studies Majapahit leaf extract from the phytochemical test results containing active ingredients saponins, tannins, steroids and triterpenoids which in vitro has the potential to be antibacterial [6]. According to [7], the results of GCMS analysis of Majapahit leaves contain 2-Methoxy4-vinlypheol active ingredient, Thiosulfuric acid, Octadec9-enoicacid, n-Hexadeconoic acid which has insilico potential as an antibacterial, besides that the active ingredient also acts as an
immunostimulant. The use of majapahit leaf powder for sangkuriang catfish feed also influences growth performance [8]

3.2. Growth of Nile tilapia
The results of growth of tilapia (Oreochromis niloticus) which were fed with a mixture of majapahit leaf powder with different doses during the study can be seen in Figure 1.

![Figure 1](image)

**Figure 1.** Graph of growth of tilapia (Oreochromis iloticus) during the study.

Based on the graphic image above it is known that the highest average yield is treatment C using a dose of 12.5% showing an average weight of 21.33 (grams), treatment B using a dose of 10% shows an average weight of 17.00 (grams), A treatment using 7.5% dosage shows an average weight of 14.67 (grams), treatment D (control, no addition of Majapahit leaf powder) shows an average weight of 10.33 (grams). The use of doses in treatment C is better than other treatments including the need for control. This shows that majapahit leaf powder can be used as a feed mixture for tilapia up to 12%.

Furthermore, statistical analysis was performed with the ANOVA test as in table 2

| Sources of Diversity | Free Degrees (db) | Number of Squares (JK) | Middle Squared (KT) | F count | F Table 5% | F Table 1% |
|----------------------|-------------------|------------------------|---------------------|---------|------------|------------|
| Deuteronomy          | 3                 | 189,7                  | 63,23               | 42,95   | 4,76       | 9,78       |
| Treatment            | 2                 | 15,17                  | 7,585               |         |            |            |
| the rest of it       | 6                 | 8,833                  | 1,472               |         |            |            |
| Total                | 11                | 213,7                  |                     |         |            |            |

Based on Fcount = obtained 42.95> Ftable 1% = 9.78 there is a very significant difference in the research treatment, so it can be interpreted that the addition of majapahit leaf powder (Cresentia cujete L.) on the feed has a very significant effect on the absolute growth of tilapia (Oreochromis niloticus). Then the LSD test was performed to determine the best treatment that gave the highest growth effect, in table 3
Table 3. Absolute least significant difference (LSD) table for absolute growth.

| Treatment | Average | Notation 5% | Notation 1% |
|-----------|---------|-------------|-------------|
| D         | 10.33   | a           | A           |
| A         | 14.67   | bc          | B           |
| B         | 17      | cd          | Bc          |
| C         | 21.33   | e           | Cd          |

Based on table 3 it is known that treatment D (control) has the same notation which means it does not have an effect on growth, whereas treatments A, B and C have different notations, this means that treatments A, B and C give an influence on the growth of tilapia (*Oreochromis niloticus*). The best treatment is treatment C with a dose of 12.5%, this is in accordance with the results of the analysis of the treatment feed showing that C food has the highest protein content compared to other treatment feeds (Table 4).

Table 4. Results of feed analysis for each treatment

| Treatment | Protein (%) |
|-----------|-------------|
| A         | 35, 369     |
| B         | 36.069      |
| C         | 36.642      |

Among the three tested foods turned out to be feed C with a dose of 12.5% having the highest protein content of 36.642% higher than the other treatments. According to [9] the protein needed by fish in the diet is 20 - 60% while in intensive cultivation, feeds that contain 25% protein provide optimum growth for gift value fish (*Oreochromis* sp.). Preparation of fish feed formulations requires ingredients that are tailored to the needs of fish, among others: nutrient content, a feed ingredient must be sufficient in accordance with the needs of fish, easy to digest and relatively cheap prices. The food consumed by fish will be emitted into energy which will then be used for growth. Fish growth will occur if there are excess energy after it is used for body maintenance, metabolism and activities. According to [10] the nutrient content needed by fish in the feed to achieve maximum growth are protein, carbohydrates, vitamins and minerals Effective and efficient feeding will produce optimal fish growth. The addition of majapahit leaf powder (*Crescentia cujete* L.) in the feed mixture has a significant effect on the growth rate (gram) of tilapia.

According to [11] states that growth is influenced by energy sources from available feed, such energy sources are carbohydrates, fats, and proteins. Non-protein sources (carbohydrates and fats) that are right in the feed can reduce the use of protein as an energy source. If the non-protein energy source is sufficient, then the function of protein for growth can be accomplished. The results showed that all treatments had an influence on the growth of tilapia. The best treatment for treatment C with the best dose of 12.5% means that the more majapahit leaf powder is given, the better the growth of tilapia. Previous research stated that the active ingredient contained in Majapahit leaves functions as an antibacterial agent and as an immunostimulant material both in insilico ([7]; and in vitro [6] and invivo [7]. The administration of majapahit leaf powder in feed also affects the system tilapia immune, so that fish have good immune system, are more resistant to stressors and can prevent the entry of germs.

The use of leaf flour in feed for fish has been widely carried out, among others; [13] that feeding with the addition of gamal leaf flour (*Gliricidia sepium*) gave no significant difference in the growth of gouramy fish (*Osphronemus gouramy*), it can be concluded that gamal leaf flour mixed into the feed with an optimum dose of 5-15%. According to research [14] administration of sweet potato leaves to feed at a dose of 100 grams can increase the growth of goldfish, because sweet potato leaves
have a carbohydrate content of 24.3% and have a flavonoid content that can increase appetite. In addition, research [15] on the provision of cassava leaves in tilapia fish feed affects growth with the best treatment at a dose of 10% giving the highest effect on the growth of red tilapia seed growth. Cassava leaves have a crude protein content of 29% and contain flavonoids which are useful for increasing appetite in fish.

4. Conclusions
The addition of majapahit leaf powder (Crescentia cujete L) in tilapia fish feed (Oreochromis niloticus) affected the growth with the best dose in treatment C dose 12.5% or 12.5 grams / kg of feed.

5. References
[1] Dewi C D, Zainal A M and Sugito 2013 Depik 2, 45-49
[2] Warasto, Yulisman and Fitrani M 2013 Indonesian Swamp Aqua. J. I, 173-183
[3] Fadri S, Muchlisin Z.A and Sugito 2016 Mar. Fish. Student Sci. Unsyiah J.I, 210-221
[4] Effendie M I 2002 Fisheries Biology. (Yogyakarta: Pustaka Nusantara) pp 96-106
[5] Khairuman and Amri K 2003 Smart Book Cultivation 15 Fish consumption (Jakarta: Agromedia Pustaka)
[6] Rahmaningsih S and Jumiati 2016 Proceedings of the National Seminar on Fisheries and Maritime Affairs Faculty of Fisheries and Maritime Affairs (Malang: Universitas Brawijaya) pp 52-58
[7] Rahmaningsih S and Andriani R 2018 Proceedings of the National Seminar on the Results of Research and Community Service (Tuban: Universitas PGRI Ronggolawe) pp 80-87
[8] Rahmaningsih S, Sudianto A and Zaenudin M 2018 Proceedings of the National Seminar on Research and Community Service Results III (Tuban: PGRI Ronggolawe University) pp 225-228
[9] Handajani H 2006 GAMMA J. I, 162-170
[10] Subandiyono and Hastuti 2010 Fish Nutrition Textbook Educational Development and Quality Assurance (Semarang: Institution at Diponegoro University) p 233
[11] Wijayanti K 2010 The Effect of Giving Different Natural Feeds on the Survival and Growth of Palmas Fish Seed (polypterus senegalus senegalus) Thesis Aquaculture Biology Department (Depok: University of Indonesia)
[12] Luthfi M, Rahmaningsih S and Sudianto A 2017 Effect of Majapahit Leaf Extract (Crescentia cujete) with different dosages to reduce the activity of Aeromonas hydrophila bacteria on tilapia (Oreochromis niloticus) cultivation Proceedings of the Seminar on Research Results and Community Service II (Tuban: Ronggolawe PGRI University) pp 209-214
[13] Syaputra R 2018 Effect of Addition of Gamal Leaf Flour (Gliciridia sepium) on Artificial Feeds on the Synthesis and Growth of Gouramy Fish (Osphronemus gouramy) (Lampung: Lampung University)
[14] Anggraini D 2006 The Effect of Giving Sweet Potato Leaves with Different Doses to the Survival of Carp (Cyprinus carpio L.) Seed in Transportation Thesis (Indragiri Islamic University)
[15] Amarwati H 2015 Utilization of Fermented Cassava (Manihot Utilissima) Leaf Flour in Artificial Feed Against Growth of Red Tilapia (Oreochromis niloticus) Seed Growth (Semarang: Diponegoro University)

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