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Proximate Analysis of Apu-Apu Leaf Weeds in Lake Tondano Waters as Raw Material for Tilapia (Orechromis niloticus) Feed Formulation

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***Abstract*—*The purpose of this study was to analyze the nutritional content (Proximate Test) of Apu-apu Leaf weeds in the waters of Lake Tondano and to determine the growth of Tilapia (Oreochromis niloticus) fry that consume pellets of raw material for the formulation/composition of Apu-apu Leaf (Pistia stratiotes) in different percentage levels. This research is one solution to obtain raw materials for fish feed from weeds in Lake Tondano so that it can overcome the high cost of feed and minimize pollution in Lake Tondano. The general approach used to achieve the objectives of this research activity is the collection from Lake Tondano, namely the leaves of Apu-apu (Pitsia stratiotes). The test fish were obtained from fish cultivators in Eris Village, Eris District, Minahasa Regency. Fish size 5-8 cm. Prior to the research, the fish were acclimatized for one week for environmental adjustment. The study was carried out by following a 5 treatment design and 3 replications, the design used was RAL, and measurements of ratios, daily growth and feed efficiency values. The analytical method applied is proximate analysis, carried out at the Baristand Manado laboratory. This research produces outputs in the form of scientific works, namely International Journals. The results showed that treatment C gave the highest relative growth (168.99%) followed by treatment A (93.28 %), D (84.73), E (83.81%) and B (44.65%). The highest feed efficiency value was also shown by treatment C (38.01%) then treatment A (24.68%), D (22.59%), E (22.19%) and B (13.87%).*

***Keywords*— Proximate Analysis, Apu-apu Leaf, Fish Feed, Tondano Lake.**

I. INTRODUCTION

Lake Tondano is an asset owned by the Province of North Sulawesi, which is one of the places for community livelihoods. The current existence of Lake Tondano is very concerning because of the occurrence of eutrophication. Eutorfication is the enrichment of nutrients that results in the occurrence of aquatic weed blooms. The definition of weed is a plant that grows around waters whose presence is not desired in the vicinity of the cultivation activities carried out. The livelihoods of the people in Lake Tondano are fish farming activities with a floating net cage system, where fish cultivation in Lake Tondano is currently no longer going well, this situation is caused by contamination of water weeds on the surface and in water bodies. The growth of aquatic weeds in Lake Tondano causes the placement of space for fish cultivation to be narrow and overall greatly affects the quality of water for ideal fish life needs (Korah, 2000).

The phenomenon of Lake Tondano no longer looks ideal in terms of multi-functions (hydropower, PDAM, fisheries, agriculture, animal husbandry and aesthetics). This condition describes a situation that must be found a solution to minimize pollution in Lake Tondano, so that the multi-function of Lake Tondano can be carried out according to its designation. Weeds (Apuapu leaves) that grow rapidly in water bodies and on the water surface of Lake Tondano can be reduced by utilizing these weeds into a useful product, especially for the fisheries sector, which can be used as raw material for fish feed (Tamanampo et al., 1995)

Increasing fish production is highly dependent on the consumption of feed for cultured fish, but fish feed is an obstacle for cultivators. The obstacle faced by cultivators is the increasing price of feed. Fish farming activities will incur costs for feed 70% of a maintenance cycle, therefore the use and feeding must be carried out effectively and efficiently (Kusen, 2014).

II. MATERIAL AND METHODS

The target of this research is the collection of Apu-Apu Leaf weeds where the object of sampling is Lake Tondano. The number of Apu-apu leaves to be taken is according to research needs.

1. Stages of Collection and Treatment of Apu-Apu-Leaf Weeds

Weeds are taken on the surface of the lake water, in areas that are overgrown with apu-apu leaves and selected that physically look fresh. Weeds were taken as needed in fish feed formulations for fish rearing during the research period. Treatment of weeds are: (1). Washed clean to remove dirt attached to the leaves and roots removed; (2). Cut into small pieces; (3). Dried in the sun and if it is still not dry can be continued drying in the oven; (4). After drying, the weeds were blended into fine powder or powder and prepared as much as 200 grams for analysis of the nutritional content (Proximate test) in the laboratory. Treatment for fish flour, soy flour, coconut flour is made by grinding the ingredients, soybeans and coconut so that they become flour-like shapes.

2. Stages of Preparation for Trial of Feed Composition on the Growth of Tilapia (Oreochromis niloticus) Using Apu-Apu Leaves (Pistia stratiotes) as raw materials

The maintenance container is using a plastic pan with a diameter of 56 cm and a height of 30 cm as many as 15 pieces, each filled with 10 liters of fresh water. The tools used are: aerator for oxygen source, thermometer for measuring temperature, litmus paper for measuring pH, digital scales, besides that, a set of tools for making feed is also provided (grinder, sieve, spoon, tray, plastic pan and electric oven).

3. Stages of Experiment Implementation

Each container is stocked with 10 tilapia fish and the initial weight is weighed, The frequency of feeding 3x a day at 07.00, 12.00 and 17.00 with a dose of 5% of body weight, Adjustments to the feeding of the test fish were carried out every 2 weeks and the test fish were weighed using a digital scale. Temperature measurements are carried out once a week while pH measurements are carried out before and after water changes. Siphoning of feces in containers is carried out every day by using a plastic hose to remove leftover feed and feces at the bottom of the container. Water changes were carried out 2 times a day by replacing of the water from the research container. The measurement of fish weight was carried out at an interval of 2 weeks and the measurement time was for 2 months.

4. Research design

Treatment Design: there were 5 treatments that were tested and each treatment was replicated 3 times thus there were 15 experimental units, the treatments being tested were:

1) Treatment A : Pellets without Buffalo Leaves as a Control,
2) Treatment B: Pellets with 10% Apu-apu Leaf flour,
3) Treatment C: Pellets with 20% Apu-apu Leaf flour,
4) Treatment D: Pellets with 30% Apu-apu Leaf flour,
5) Treatment E: Pellets with 40% Apu-apu Leaf flour.

Environmental Design: The design used is a Completely Randomized Design (CRD) which is based on the assumption that all experimental units and environmental conditions are homogeneous with a mathematical model:

Response Design: Parameters measured were relative growth, daily growth and feed efficiency value. The growth observed was the growth of fish body weight where the measurement was using a scale. The analyzed variables are: Relative Growth (%) how to calculate it by using the formula (Weatherley, 1988).

III. RESULTS AND DISCUSSION

The results of observations on the growth of tilapia seeds during the study period showed a good response where the feed given could be consumed. The presence of a reduction in the amount of Apu-Apu Leaf flour contained in the test feed (A, B, C, D and E) had an effect on the amount of growth that could be achieved by each test fish, so that at the end of the study, differences in relative growth and feed efficiency value. The results of the calculation of the weight growth obtained from each time the fish fry are weighed the value required in Appendix 2. The calculation of the relative growth achieved by each treatment is shown in Appendix 3. The amount of feed given during the study is shown in Appendix 4. Summary of the effect of the use Apu-Apu leaf meal flour on the growth of tilapia fry and the efficiency value of the test feed is shown in Table 1.

Table 1. Growth of Fish Seed Values Given Apu-Apu Leaf Starch Feed and Efficiency Value of Each Test Feed

Treatment	Average Weight (gr)		Growth (%)		Feed Consumption	
	First	And	Nisbi	Daily	Total (gr)	Feed Efficiency (%)
A	34.7	67.0	93.28	4.71	130.90	24.68
B	34.3	49.7	44.65	2.64	111.07	13.87
C	34.3	92.3	168.99	7.07	152.60	38.01
D	34.7	64.0	84.73	4.36	129.73	22.59
E	35.0	64.3	83.81	4.35	132.07	22.19

The highest daily growth rate was shown by fish that received treatment C and the lowest was found in fish that received treatment B. The temperature and pH of the water, which are water quality parameters measured in each container during the study, were in a suitable range for the life of tilapia fry. water temperature was recorded between 26-27ºC and water pH between 6.5-7.5.

1. Relative Growth

Tilapia seeds that were tested on different feeds in the amount of Apu-Apu Leaf flour contained therein showed a response to the growth of each treatment with changes in time. The results of the calculation of the relative growth which is the response of each treatment are then analyzed by calculating the analysis of variance from the results of these calculations, which are then described in Table 2.

Table 2. Analysis of Various Effects of Treatment on Relative Growth

Diversity	DB	JK	KT	Fcount	F_{table} 0.05	F_{table} 0.01
Treatment	4	4391.01	1097.753	16.915	3.478	5.994
Error	10	648.96	64.896			
Total	14	5039.98				

Based on the results of the analysis of variance in Table 2 above, it can be seen that the value of Fcount (16.915) is greater than the value of Ftable (3.478-5.994). This gives an answer that the experimental treatment has a significant effect on the relative growth of tilapia fry. This also shows that there is a different effect between the treatments being tested. To find out more about the difference between each treatment, Duncan's multiple-area test was conducted.

Based on the results of Duncan's multiple-area test, where the comparison of the average values showed that treatment A (pellets without apu-apu leaf powder) and treatment C (pellets with 20% hibiscus leaf powder had the same effect (not significant) on relative growth. , the percentage of growth obtained was higher than other treatments (B, D, and E). This illustrates that the use of apu-apu leaf meal (20%) will provide a good relative growth compared to the use of apu-apu leaf meal which is slightly or too much. The use of 10% and without Apu-Apu Leaf flour showed results in the form of an insignificant effect on the relative growth gain, this means that the amount of fish meal replaced by Apu-Apu Leaf flour, although reducing the amount of protein content, has not shown any significant effect. The effect is because the range of protein requirements by tilapia fry is still below the range in feed B (27.59%). Treatments E and B gave the same effect on the acquisition of the relative growth rate, this means that the amount of Apu-apu leaf meal contained in the feed formulation for tilapia was 40 and 10%, the effect was still higher (83.81%) compared to the treatment B (44.65). The low achievement of the two treatments was possible because the percentage of fish meal replaced by the use of apu-apu leaf meal (40 and 20%) had an impact on reducing the percentage of protein content in the test feed (13.51-27.59).

The best results from treatment C with a protein content of 23.07% were also shown by Lapadi (2001) where the use of feed containing 30.19% protein which was mixed from caterpillar flour from oil palm waste gave a relative growth of 598.68% for tilapia size 13-15 grams / head. Furthermore, Luquet (1991) added that value fish will grow well if the food contains 29% protein. To find out more about the relative growth response that has been achieved during the study, it can be seen in Figure 4. In the observation of the weight gain of tilapia fish which were weighed every two weeks, it was seen that there was a difference in growth rate where treatment C at each weighing showed the highest achievement rate (from the first development to fourth), this is because all the feed given can be used for growth. In the second weighing the relative growth shown by treatments D and E was the same (49.13%), this was because the amount of energy in the two test feeds was not so different (430.45) and 420.49 calories/gr). Treatments D and E were always on the lowest graph because they were influenced by the insufficient nutrient content in the feed to stimulate growth. There were two main factors that caused the low growth rate of treatment E, the first was the very low protein content, which was only 13.51% and the second was the lack of energy (420.49%). In the third measurement (sixth week) it was seen that there was a difference between treatments A and D, where treatment A showed a higher growth rate than treatment D. This was because the amount of feed consumed by the test fish that received treatment A was more than with treatment D where in treatment D it was found that there were food remnants that were not eaten by the test fish. Likewise, the fourth measurement of treatment A was greater than treatment B where the feed given to treatment B could not be consumed entirely by the test fish, this was because during the sixth week the appetite of the test fish decreased.

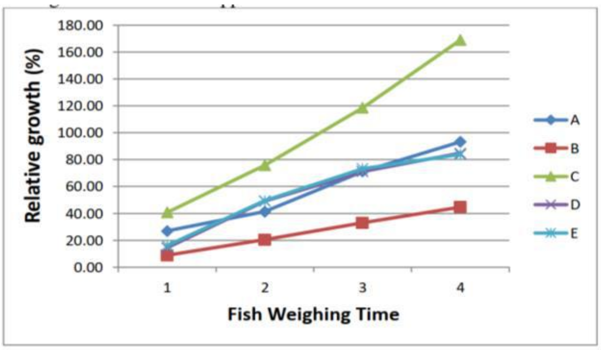

Fig.1. Test Fish Relative Growth Chart

From Figure 1 it is clear that the increase in fish weight with changes in maintenance time. The mapping of the data on the highest relative growth of tilapia seeds was given by treatment C (168.99%) for eight weeks of rearing when compared to other treatments. The results of the proximate analysis showed that the protein content decreased along with the increase in the ApuApu Leaf flour that made up the pellet formulation. From the proximate results of the test feed in Table 2, it shows that treatment A without butterflyfish leaves contains 38.65% protein, treatment B with pellets composed of 10% butterflyfish leaf, 27.59% protein, treatment C with 20% composition, 23 protein. 0.07%, treatment D with a composition of 30%; protein 22.76% and treatment E with a composition of 40%; 13.51% protein. When viewed from treatment A, the protein content was higher than the protein possessed by treatments B, C, D, and E. It appears that the higher the addition of Apu-Apu Leaf flour will decrease the protein content, this is because Apu-Apu Leaf flour is not a good source of protein. major in feed.

The large variety of raw materials used in the preparation of the formulation of a pelletshaped feed determines the quality of the feed, because the more varied the use of raw materials, it is clear that the amino acid content that composes the protein is more complete, as well as other elements such as fats, carbohydrates, vitamins and minerals. In this study, tilapia is a herbivorous type of fish, so it can be seen that although the use of fish meal in treatment A was much higher than that in treatment C, it seems that tilapia has good growth with the addition of 20% Apu-Apu Leaves, this can be seen from received response to the growth of tilapia. Furthermore, Djajasewaka (1985), stated that to get good growth is not only determined by high protein but also by supporting substances such as fat, carbohydrates, vitamins and minerals.

2. Feed Efficiency Value

Data on the value of feed efficiency from each treatment that was tested during the 8-week rearing period can be seen in Appendix 3 and the results of the analysis of variance on feed efficiency can be seen in Table 3.

Table 3. Analysis of Various Effects of Treatment on the Value of Feed Efficiency

Diversity	DB	JK	KT	F_{count}	F_{tabel}	
					0.05	0.01
Treatment	4	104.55	26.137	57.910**	3.478	5.994
Error	10	4.51	0.451			
Total	14	109.06				

Based on the results of the analysis of variance in Table 3, it can be seen that Fcount is greater than Ftable at the 1% level. This means that there is a difference between the treatments being tested. On this basis, further tests were carried out with Duncan's multiple region test. The test results can be seen in Appendix 8, where treatment C was significantly different from treatment B, D, and E, and not significantly different from treatment A. Furthermore, treatment A was significantly different from treatment D and E, and significantly different from treatment B. While treatments B, D, and E each gave the same effect (not significant). To determine the response trend indicated by the value of feed efficiency mapped through the histogram in Figure 5.

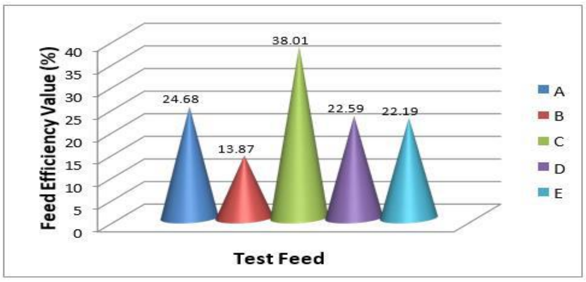

Fig.2. Histogram of Test Feed Efficiency Value (%)

Figure 2 above, shows the feed efficiency of each treatment. Treatment C gave the highest feed efficiency value (38.01%) when compared to other treatments, while treatment B was the lowest (13.87%) because treatment C with 20% Apu-apu leaf meal gave a taste or aroma favored by fish. test so that the fish's appetite increases, besides that tilapia only requires 25-30% protein so that the efficiency value of the test feed gives a good response. Feed has a function as energy that supports fish growth, therefore it is necessary to provide quality and efficient feed. Djajasewaka (1985), stated that a good feed is expected to contain 20-60% protein, 4-18% fat and 10-50% carbohydrates. Carbohydrates consisting of BETN and crude fiber greatly affect the efficiency or not of the feed given to fish. BETN is the part of carbohydrates that can be digested by fish while crude fiber is the part that is difficult for fish to digest in producing energy. Thus, the greater the crude fiber in the feed, the less favorable the fish growth, the higher the BETN in the feed, the more efficient the feed will be.

The efficient value of feed aims to determine whether the feed being tested is efficient or not, in the sense of whether the feed provided is used properly by fish and provides growth or not. According to Djarijah (1995), feed efficiency indicates the quality of the feed. Where the greater the value of the efficiency of eating, the higher the quality of the feed. Conversely, the smaller the efficiency value means the lower the quality of the feed. The use of Apu-Apu Leaf flour as much as 20% has given the highest efficiency value among treatments, the efficiency value is quite high when compared to the results achieved by the use of kale leaf meal which was tested on tilapia fish by Marthen (1999) with an efficiency value highest (49.43%), on the other hand Timburas (2000) found that the feed efficiency value of water hyacinth leaf meal was the best among the feeds tested on tilapia, which was 40.31%. while the use of water hyacinth leaf flour given to red tilapia gave a feed efficiency value of 53.05% (Girsang, 1999), using tapung cab eke in papaya grain flour pellets got an efficiency value of 176.06 (Rau, 1990). The use of corn cobs flour as a substitute for fish meal in the diet formulation for the growth of red tilapia gave the best efficiency value of 43.28% (Onibala, 1995). Meanwhile, the use of seagrass meal on the growth of red tilapia gave an efficiency value of 23.24% (Kumean, 1998). Furthermore, Mandagi (2003) obtained an efficiency value of 66.59% using noni leaf meal as fish seed feed and the use of green algae flour in tilapia seed feed gave feed efficiency of (41.81% (Solang, 2000).

IV. CONCLUSION

1. Tilapia seeds measuring 3-5 cm can consume Apu-apu leaf meal meal. Where the feed with 20% Apu-apu leaf meal gave the highest response to the relative growth (168.99%) and the feed efficiency value (53.58%).
2. The use of Apu-apu leaf meal of more than 20% as in treatments E and B gave an unfavorable response to the relative growth and feed efficiency values.

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