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The Effect of Adding Brackish Snail (*Faunus ater*) Flour to the Feed on the Growth of Dumbo Catfish (*Clarias gariepinus*)

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ABSTRACT Decreased water quality can be caused by fish losing their appetite, resulting in a buildup of food waste in the water. One of the additional ingredients that can be used is brackish snail (*Faunus ater*) flour. This research aims to determine the effect of adding brackish snail (*Faunus ater*) flour to feed on the growth of African catfish seeds and the appropriate dosage in feed that can increase the growth of African catfish seeds. The method used in this research was experimental with a Completely Randomized Design (CRD) consisting of 4 treatments and 3 replications. The treatments used were (P0) control, (P1) 10% brackish snail (*Faunus ater*) flour, (P2) 15% brackish snail (*Faunus ater*) flour, and (P3) 20% brackish snail (*Faunus ater*) flour. The test fish used were African catfish fry weighing 3-4 g and 5-7 cm long. The container used is waring with a density of 20 fish per pound. The amount of feed given is 5% of the biomass of African catfish seeds. The observation data were analyzed using Analysis of Variance (ANOVA) with the F test at a test interval of 5%, if there were significant differences, continue with Duncan's multiple range test. The results showed that the addition of 10% brackish snail (*Faunus ater*) flour gave significant results with the highest absolute length growth of 13.3±0.18 cm, the highest absolute weight growth of 36.2±0.18 g, the highest survival of 98.3±2.8%, the lowest feed conversion ratio was 1.1±0.0.

Keywords: Brackish snail flour; catfish seed; feed conversion ratio; growth; survival rate

INTRODUCTION

The development of cultivation businesses has high prospects in Indonesia so cultivation is no longer used as a side business, but people make it their main business. According to Edwards (1998), aquaculture contributes to the welfare of fish farmers by ensuring the availability of household food, nutrition, and providing employment opportunities and income in rural areas. One of the superior commodities is catfish. Catfish cultivation is widely carried out in the West Java area, this can be proven by the increasing production and public interest in catfish. Based on data from the Ministry of Maritime Affairs and Fisheries (KKP), the volume of catfish production in West Java in 2020 was 247,199.74 tons.

African catfish (*Clarias gariepinus*) is a type of catfish that is much sought after by the public because it has delicious and tasty meat and has a high protein content ranging from 17.7% - 26.7% (Nurilmala *et al*., 2009). The advantages of African catfish are not only from the nutritional aspect, but also because African catfish have fast growth, are resistant to disease, can tolerate environmental parameters within a wide range, and have good quality meat (Jailani *et al*., 2020). African catfish cultivation is in great demand by farmers because the market continues to grow, and the maintenance period is relatively fast (Yasin *et al*., 2016). Therefore, developing a catfish cultivation business will provide maximum results if it is carried out intensively and not done on the side or just as a subsistence activity.

Fish farming businesses need to be supported by good feed intake, feeding also needs to be adjusted to the type and needs of fish. African catfish is a type of omnivorous fish but tends to be carnivorous, which means it requires a higher protein intake compared to carbohydrate requirements. One important factor that influences the growth and survival of fish farming is feed. High-quality feed contains nutrients that are easily digested by fish. According to Crab *et al*. (2007) it stated that only 25% of the feed was absorbed by the fish, while 75% of the feed was not eaten by the fish. The high price of feed and the less-than-optimal use of feed for growth by fish will cause losses to farmers, so it is necessary to add other ingredients to the feed that function to maximize the utilization of feed for growth, one of which is by using milk snail (*Faunus ater*) flour in the feed.

Brackish snail (*Faunus ater*) is a type of brackish water. Faunus ater is widely distributed in coastal areas such as Pangandaran Regency and other Indonesian coastal areas which are suitable for the habitat of Brackish Snail (*Faunus ater*), namely coastal areas with brackish and muddy water (Asfi *et al*., 2019). Susuh snails (*Faunus ater*) have not been widely used by the people in Pangandaran Regency, susuh snails are mostly used as ingredients for making crackers, but the use of brackish snails (Faunus ater) as feed has not been widely used. The nutritional content of milk snails in 100 g wet weight has protein of 9.53% in wet weight, water content of 79.97%, ash 3.62%, fat 2.38%, carbohydrates 2.39%, calcium 1.017%, and 0.012% phosphorus (Tanjung, 2015). Brackish Snails (*Faunus ater*) are mixed into commercial feed using the repelleting technique to provide aroma to the feed so that it can increase the fish's appetite (Wahjuningrum *et al*., 2014). The use of Brackish Snail (*Faunus ater*) in the form of flour mixed with commercial feed for cultivating African catfish (*Clarias gariepinus*) has never been done before. Based on the description above, it is necessary to research the addition of Brackish Snail (*Faunus ater*) flour in feed on the growth performance of African catfish seeds, which includes growth in length and weight, survival rate.

MATERIALS AND METHODS

Time and place

The research was carried out in September – October in the Pak Holil cultivation pond located in Kertayasa Village, Ci-

julang District, Pangandaran Regency, West Java with a research duration of 40 days.

Materials

The tools used in this research were 12 waring as fish-keeping containers measuring (1x1x1 m^3), fish scoops, scales, buckets, basins, stationery, pH meters, DO meters, thermometers, cellphones, pans, stoves, ovens, pellet-making machines, spoons, plastic plates, ladles, scoops, and plastic. Meanwhile, the materials used in this research were African catfish seeds (*Clarias gariepinius*) measuring 5-7 cm with a weight of 3-4 g, brackish snail (*Faunus ater*) flour, and commercial feed PF-1000.

Methods

Research design

The method used in this research was experimental using a Completely Randomized Design (CRD) consisting of 4 treatments and 3 replications. The treatments used were (P0) control, (P1) addition of 10% brackish snail (*Faunus ater*) flour, (P2) addition of 15% brackish snail (*Faunus ater*) flour, and (P3) addition of 20% brackish snail (Faunus ater) flour. Feeding was performed twice a day for 40 days with the station at 08.00 and 16.00 GMT+7.

Feed test preparation

Feed preparation in this study used the repelleting technique, namely re-making feed, divided into three stages. The first stage is that the commercial PF-1000 feed is ground using a blender. In the second stage of making brackish snail (*Faunus ater*) flour, the brackish snails (*Faunus ater*) are blended until smooth and then weighed according to the treatment. The third stage is mixing each brackish snail (*Faunus ater*) flour ingredient into the commercial feed which has become flour according to the treatment. The two ingredients are mixed using progol. The addition of progol functions as an adhesive to unite brackish snail (*Faunus ater*) flour with commercial feed (Sari, 2016). Then add enough water to bind the dough. All ingredients are mixed and then stirred until it becomes an even (homogeneous) dough. The flattened dough is then put into the feed molding machine. After the pellets are formed, the drying process is carried out using an oven. The repelleting technique in this research refers to previous research by Zainuri *et al*. (2017). The dry feed is then weighed at 5% of the weight of the fish biomass for each treatment or waring. The final process is packaging, the feed that has been weighed is then put into plastic and labeled according to the treatment (0%, 10%, 15%, and 20%).

Absolute length growth

Absolute length growth can be calculated using the formula according in Sari *et al*. (2022) as follows:

$$L = Lt - Lo$$

Information:

L = Increase in length (cm); Lt = Final length (cm); Lo = Initial length (cm).

Absolute weight growth

Absolute weight growth can be calculated using the formula according in Magwa *et al*. (2020), as follows:

$$W = Wt - Wo$$

Information:

W = Weight gain (g); Wt = Final weight (g); W = Initial weight (g).

Survival rate

Survival can be calculated using the Asni *et al*. (2006), survival rate (SR) is the percentage of surviving fish that can be calculated using the following formula:

$$SR=Nt/N0\times100\%$$

Information:

SR = Survival rate (%); Nt = Number of live fish at the end of rearing; N0 = Number of live fish at the start of rearing.

Feed conversion ratio

FCR can be calculated using the formula Suminto *et al*. (2017) as follows:

$$FCR = F / (Wt + Wd) - W0$$

Information:

FCR = Feed Conversion; F = Total amount of feed given (g); Wd = Weight of dead test animal (g); Wt = Final weight (g); Wd = Initial weight (g).

Water quality

Water quality observations in this study refer to previous research conducted by Kelana *et al*. (2021) with several parameters observed including temperature, dissolved oxygen (DO), and pH.

Statistical analysis

Data on absolute length growth, absolute weight growth, survival, and feed conversion ratio were analyzed using one-way Analysis of Variance (ANOVA) with an F test at a 5% interval to determine the effect of treatment on the observed parameters. Suppose based on the results of the one-way ANOVA analysis, the values are significantly different ($P<0.05$). In that case, a further test is carried out using Duncan's Multiple Range Test (DMRT) with 95% confidence (Firdaus *et al*., 2022). Meanwhile, water quality data including temperature, pH, and DO were analyzed descriptively.

RESULTS AND DISCUSSION

Absolute length growth

The absolute length growth of seeds African catfish during 40 days of rearing shows that the addition of brackish snail (*Faunus ater*) flour to the feed gave significantly different results ($P<0.05$), which means that it had a significant effect on the absolute length growth which can be seen in (Table 1).

Based on the results of observational measurements, it shows that the highest average absolute length growth value was in treatment P1, around 13.3 cm, followed by treatment P2, 12.1 cm, then 11.54 cm, and the lowest treatment was in treatment P0 (control) around 10.58 cm. Based on the results of statistical analysis using One-Way ANOVA analysis, the results showed that absolute length growth was significantly different in each treatment. This can be seen from (Fhit>Ftab) with a calculated F value of around 79.7 and F table (0.05) around 3.5, therefore a further test was carried out using the Duncan test which can be seen in (Table 1).

The results of research for 40 days showed that the addition of brackish snail (*Faunus ater*) flour to the feed had a significant effect on the absolute length growth of African

Table 1. Duncan's multiple distance test absolute length growth of dumbo catfish seeds absolute weight growth aveage treatment.

Treatment	Average absolute length growth
P0 (control)	10.58 ± 0.1[a]
P1 (10% Faunus ater flour)	13.3 ± 0.18[c]
P2 (15% Faunus ater flour)	12.1 ± 0.4[c]
P3 (20% Faunus ater flour)	11.54 ± 0.2[b]

catfish seeds. Treatment P1 had the highest absolute length growth value, namely 13.3 cm. This is because the feed given to African catfish seeds can be utilized optimally. According to Effendi in Lazuardi & Sudarto (2014) the energy obtained from the food eaten by fish will be used to maintain the body, for movement and replace damaged cells, the rest will be used for the growth process. The highest length growth in the P1 treatment was also influenced by the use of Bracksih snail (*Faunus ater*) flour which has a fishy aroma so it can increase appetite and is also different from other treatments because the protein content in P1 can be utilized optimally and effectively, therefore, it can increase growth. This is also under the statement of Zainuri *et al*., (2017) that food that has a distinctive aroma can stimulate the fish's appetite, apart from the distinctive aroma of brackish snails (*Faunus ater*), it also has a protein content of 9.53% and fat of 2.38% (Tanjung, 2015).

Absolute weight growth

Fish weight growth was measured using a 50% sampling method, which refers to research by Hadijah *et al*. (2022), in each treatment, measuring 5 fish out of 20 fish for each treatment. The absolute weight growth of African catfish seeds reared for 40 days of research with the addition of milk snail flour in the feed according to the treatment dose can be seen in (Table 2).

Table 2. Duncan's multiple distance test absolute growth weight of dumbo catfish seeds absolute weight growth average treatment.

Treatment	Absolute weighted growth average
P0 (control)	22.3 ± 0.1[a]
P1 (10% Faunus ater flour)	36.2 ± 0.18[d]
P2 (15% Faunus ater flour)	33.73 ± 0.4[c]
P3 (20% Faunus ater flour)	31.12 ± 0.2[b]

Based on the results of observations and measurements of the absolute weight growth of African catfish seeds which can be seen in Table 2, it explains the growth of African catfish seeds during the 40 days of research for each treatment P0 (control), P1 (10% brackish snail (*Faunus ater*) flour), P2 (15% brackish snail (*Faunus ater)* flour), and P3 (20% brackish snail (*Faunus ater*) flour). The results of weight measurement observations showed that the highest average absolute weight growth value was in treatment P1, around 36.2 g, followed by treatment P2 with 33.73 g. Treatment P3 with 31.12 g, and the lowest treatment was P0 (control) 22.3 g. Based on the results of statistical analysis using one-way ANOVA analysis with the F test at a test interval of 5%, the results showed that absolute weight growth was significantly different in each treatment. This can be seen from (Fhit>Ftab) with a calculated F value of around 96.05 and an F table (0.05) of around 3.5, therefore a further test was carried out using the Duncan test which can be seen in (Table 2).

Growth with low values was in treatments P0 and P3, treatment P0 with an average growth value of 22.3 g, and P3 with an average growth value of 31.12 g. The low growth of African catfish seeds can be caused by several factors, one of which is the acclimatization or adaptation process. The growth of African catfish fry can be disrupted due to the fish's lack of adaptation to the new environment. According to the statement by Setyani *et al*. (2021), this insignificant growth cloud is caused by the fish being less able to adapt to the rearing container. Sabriah & Sunarto (2009), stated that the speed of growth, quality of water and offspring, age and body resistance, and how to digest food. Under Prihartono (2000) statement, the increase in fish body weight is related to the ability of the fish itself. The low weight gain value in the P0 treatment was due to the fish only relying on nutrition in the feed for growth. Meanwhile, in the P3 treatment, the highest treatment obtained the lowest growth value, this could be influenced by the protein content in the feed. According to Winarno (1986), excessive or insufficient protein content in feed will disrupt fish in their development. This is under the statement of Tiyanto *et al*. (2022) that excessive protein will cause fish to lose their appetite.

Survival rate

Survival rate (SR) is the result of the number of fish at the end of the study divided by the number of fish at the start of the study and multiplied by 100%. The survival of African catfish seeds reared for 40 days of research with the addition of brackish snail (*Faunus ater*) flour to the feed according to the treatment dose can be seen in (Table 3).

Based on the results of observations and measurements of the survival rate (SR) of African catfish seeds which can be seen in Table 3, it explains the survival of African catfish seeds during the 40 days of research in each treatment P0 (control), treatment P1 (10% brackish snail (*Faunus ater*) flour), treatment P2 (15% brackish snail (*Faunus ater*) flour), and treatment P3 (20% brackish snail (*Faunus ater*) flour). The results obtained during research observations were that the highest survival rate for African catfish seeds was in treatments P1 and P2 at 98.3%, while the treatments with the lowest values were

Table 3. Duncan's multiple distance test viability of dumbo catfish seeds.

Treatment	Average Survival Rate
P0 (control)	96.6 ± 5.7[a]
P1 (10% Faunus ater flour)	98.3 ± 2.8[a]
P2 (15% Faunus ater flour)	98.3 ± 2.8[a]
P3 (20% Faunus ater flour)	96.6 ± 5.7[a]

in treatments P0 and P3 at 96.6%. Based on the results of statistical analysis using one-way ANOVA analysis with the F test at a test interval of 5%, it was found that the survival results of African catfish seeds were not significantly different in each treatment. This can be seen (Fhit<Ftab) with a calculated F value of around 0.2 and F table (0.05) around 3.5, therefore a further test was carried out using the Duncan test which can be seen in (Table 3).

The survival value of African catfish seeds obtained in the P3 treatment was low, it is suspected that this was due to the high treatment dose, whereas in P0 it could be caused by cannibalism so that the survival rate in the P0 and P3 treatments was low compared to the P1 and P2 treatments. This could also be caused by several factors, such as in the initial stages of stocking, the ability of African catfish seeds is still being adjusted to the environment of the cultivation container, competition for food, and the handling process during sampling. This is in accordance with Tang (2000) statement that fish seeds require adaptation to the environment because their ability to prey and the ability to digest food has not yet developed. After all, enzymes have not yet been produced perfectly. Another cause that can occur is cannibalism in African catfish seeds.

Feed conversion ratio

Food Convention Rate or feed conversion ratio for African catfish seeds is the result of measuring the amount of feed consumed by African catfish seeds divided by the weight of African catfish seeds at the end of the study, then added by the number of fish that died during the research period, and subtracted. The weight of African catfish seeds reared for 40 days of research with the addition of brackish snail (*Faunus ater*) flour in the feed according to the treatment dose can be seen in (Table 4).

Table 4. Duncan's multiple distance test conversion ratio of dumbo catfish seed feed.

Treatment	Average Conversion Rate
P0 (control)	1.3 ± 0.3[c]
P1 (10% Faunus ater flour)	1.1 ± 0.0[a]
P2 (15% Faunus ater flour)	1.1 ± 0.0[a]
P3 (20% Faunus ater flour)	1.1 ± 0.0[a]

Based on the results of observations and measurements of the feed conversion ratio (FCR) of African catfish seeds, which can be seen in Table 4, it explains the feed conversion ratio of African catfish seeds during the research period in each treatment P0 (control), P1 (10% brackish snail (*Faunus ater*) flour), P2 (15% brackish snail (*Faunus ater*) flour), P3 (20% brackish snail (*Faunus ater*) flour). Based on the results of observations, the calculation of the feed conversion ratio shows that the highest average value of the feed conversion ratio was found in the P0 treatment at 1,3%. The treatment with the lowest value was treatment P1, P2, and P3 at 1,1%. Based on the results of statistical analysis using One-way ANOVA analysis with the F test at a test interval of 5%, the results showed that the feed conversion ratio was not significantly different from (Fhit<Ftab) with a calculated F value of 22.5, and F table around 3, 5, therefore a further test was carried out using the Duncan test which can be seen in (Table 4).

The highest feed conversion ratio was in the P0 treatment at 1.3%, followed by the P3 treatment at 1.2%. This shows that feeding cannot utilize African catfish seeds effectively. The higher the value of the feed conversion ratio, the greater the feed required to maintain African catfish fry so it is inefficient between the use of feed and the increase in fish weight. According to Melianawati *et al*. (2010) stated that a smaller feed conversion indicates that the amount of feed given is more effective for growth, while a greater level of feed conversion given during maintenance indicates that the amount of feed given is less effective for growth.

Water quality

Water quality observations were carried out during the 40-day maintenance period by feeding a mixture of brackish snail flour. Water quality samples measured include measurements of temperature, pH, and dissolved oxygen (DO) levels. The results of air quality observations with the addition of brackish snail (*Faunus ater*) flour to the feed according to the treatment dose can be seen in (Table 5).

Table 5. Water quality.

Parameter	Treatment				Optimum Value	Reference
	P0	P1	P2	P3		
Temperature (°C)	27.4-28.0	27.4-28.0	27.4-28.0	27.4-28.0	25.0-30.0	SNI 6484.4:2014
pH	7.17-7.95	7.16-7.95	7.16-7.95	7.16-7.95	6.5-8.0	SNI 6484.4:2014
DO (mg/L)	5.0-6.3	4.6-6.0	5.5-6.4	5.9-6.4	>3	SNI 6484.4:2014

Based on the results of measuring water quality parameters in (Table 5.), explain the water quality in research activities for African catfish seeds during the 40 days of research in each treatment P0, P1, P2, and P3. Based on the results of observations and measurements regarding water quality in research activities for African catfish seeds, it shows that the average water quality temperature value obtained is in the range of 27,4-28°C. This is under normal conditions and this temperature range is included in the optimum temperature for culture African catfish, under SNI 6484.4:2014 which states that the temperature range for African catfish cultivation activities is around 25-30°C. Low water temperatures can affect fish metabolic processes, fish easily experience stress, decrease appetite, and have an impact on the growth rate of fish weight and length (Liswahyuni *et al*., 2021).

The degree of acidity (pH) of the air during the 40-day research period obtained an average value ranging from 7.16 to 7.95, which is considered normal conditions. This is also under SNI 6484.4:2014 that the pH range value for African catfish cultivation activities ranges from 6.5-8. The results of measurements and observations obtained during the research period with the addition of brackish snail (*Faunus ater*) flour in the feed at the pH range of the water during the 40-day study.

Were in good condition for African catfish seeds. The pH value in water describes the acid-base conditions of a body of water. (Table 5) shows that the pH value in the waters is within the normal range, between 7.16-7.95. This is under statement Ernawati (2014) that a pH below 6.5 or higher than 9.0 can reduce the reproductive ability and growth of fish.

Dissolved oxygen (DO) or dissolved oxygen is a description of the volume of dissolved oxygen in water. The DO value during the 40-day research obtained an average value ranging from 4.6 to 6.4, including good condition. This is also under SNI 6484.4:2014 that the DO range value for African catfish cultivation activities is >3. Oxygen has an important role in metabolic processes in the body of farmed fish. This is related to the statement by Augusta (2016), the water quality parameter that is good DO for the growth and survival of African catfish is around 4.4-4.6 mg/l. The high and low DO values are influenced by the concentration of ammonia and carbon dioxide in the water. According to Dhiba (2019) low oxygen followed by high levels of ammonia and carbon dioxide in waters can cause the nitrification process to be hampered, which can disrupt the survival of fish.

CONCLUSION AND RECOMMENDATION

Conclusion

The addition of Brackish Snail (*Faunus ater*) flour in African catfish (*Clarias gariepinus*) seed feed can increase absolute length growth with the highest value of 13.3 ± 0.18 cm in the treatment of 10% Brackish Snail (*Faunus* ater) flour, and absolute weight growth with the highest value amounting to 36.2 ± 0.18 g, survival with the highest value of 98.3 ± 2.8%, and feed conversion ratio with the lowest value of 1.1 ± 0.0 in the 10% Brackish Snail (*Faunus ater*) flour treatment. The addition of Brackish Snail (*Faunus ater*) flour can increase the growth of African catfish (*Clarias gariepinus*) seeds with the best treatment found in P1 (10% Brackish Snail (*Faunus ater*) flour).

Recommendation

Based on the results of research that has been carried out regarding the effect of adding Brackish Snail (*Faunus ater*) flour, it is recommended to carry out further research regarding the use of Brackish Snail flour in feed using different types of fish to obtain appropriate treatment doses to increase the growth of these fish.

AUTHORS' CONTRIBUTIONS

RS: performed the experiment, analyzed the data, wrote the first version of the manuscript, and designed the study. RG: reviewed the first version of the manuscript, reviewed the first version of the manuscript, and approved it for publication. RI: reviewed the first version of the manuscript and approved for publication. KH: reviewed the first version of the manuscript and approved for publication.

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