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THE EFFECT OF CHITOSAN EXTRACTED FROM LOBSTER SHELLS ON THE PALATABILITY OF LOBSTER ARTIFICIAL FEED

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ABSTRACT

Lobster production is influenced by the availability of feed with the right level of preference and nutrition, chitosan can be used to increase the palatability of lobster artificial feed. This study aims to determine the effect of chitosan extracted from lobster exoskeletons on the palatability of lobster feed. This study used a completely randomized design (CRD) consisting of 5 treatments and 4 replications. The treatment given was the concentration of chitosan, namely treatment one 0%, treatment two 0.6%, treatment three 0.7%, treatment four 0.8%, and finally treatment five 0.9%. The results of the study showed that the highest palatability level was shown by treatment 1 (0.55181 gr), followed by treatment 5 (0.50967 gr), treatment 2 (0.50803 gr), treatment 3 (0.50342 gr), and finally treatment 4 (0.5061 gr). Chitosan rises significantly the palatability of lobster artificial feed.

KEYWORDS: Chitosan, Lobster, Exokeleton, Palatability.

INTRODUCTION

Lobster is a marine animal with high economic value (Sudarwati, 2020). In recent years, lobster has become a major fishery export commodity which is widely used to meet global market demand. This has an impact on the growing activities of catching and cultivating lobsters (Triharyuni & Wiadnyana, 2018). Even so, the development of lobster cultivation in Indonesia is still relatively slow. The Director General of Aquaculture, Ministry of Maritime Affairs and Fisheries (KKP) said that there are 6 obstacles in lobster cultivation, including disease, product quality, productivity, seeds and marketing as well as the feed provided (Khasani & Sopian, 2021).

Artificial feed that helps lobster cultivation in Indonesia is still not available until now. The community still uses fresh food in the form of snails, snails, trash fish, and green corals. The availability of fresh lobster feed is temporary, so it cannot continue to help lobster cultivation (Ihsan et al., 2020). An alternative to overcome this problem is to make artificial feed using chitosan as a preservative and coating on the feed.

Chitosan is a type of polysaccharide molecule that can be obtained from the shells of marine crustaceans. This organic compound is obtained by distilling chitin using sodium hydroxide at high temperatures or with the help of enzymes (Pebiansyah & Yuliana, 2021). Chitin becomes chitosan through the stages of deacetylation, demineralization and

deproteination. Chitosan has properties as an anti-microorganism and fat binder which can be used in feed products to increase their palatability. Palability (palatability) is the level of animal preference for feed (Sahara et al., 2019). Chitin and chitosan are the most abundant types of polymer after cellulose with the molecular formula ($C_6H_{13}NO_5$). The structure of this chitin differs only in the group attached to the C-2 atom position with cellulose. Chitin is abundant in marine and terrestrial invertebrates and fungi from the genera Saccharomyces, Phycomyces and Mucor. Chitin in nature is usually bound with various kinds of pigments, minerals and proteins. Marine invertebrates such as crabs, lobsters and shrimp are the main sources of chitin (Sugita et al., 2009). Previous studies related to the use of chitosan have shown that chitosan has antimicrobial activity which is useful for inhibiting the growth of bacteria and fungi that cause putrefaction (Khasani & Sopian, 2021).

Based on the results of the research above, the problems related to the use of chitosan as a basic ingredient in making feed for animals need to be improved and carried out further research, this is to provide animal-made feed that is effective and efficient with the help of natural ingredients such as chitosan. Based on previous literature studies, no research has been found that discusses the effect of chitosan variations from lobster exoskeletons on the palatability of artificial lobster feed, as well as its use as a source of biology learning.

METHOD

The stages of this research include preparation, maintenance, data processing, and manufacture of lobster feed. The research was conducted at the UIN Mataram Laboratory on the 2nd floor and the Lombok Marine Aquaculture Fisheries Center, in June-September 2022. The tools used in this study were blender, shaker, oven, 100 mesh sieve, analytical balance, glass beaker, dropper pipette, filter cloth, tray, magnetic stearer, feed printer, electric stove, mixer, measuring cup, research container, pH meters, temperature gauges and BOD (Biological Oxygen Demand). The materials used in this study were 2 kg of seawater lobster shells, seawater, 1 N HCL, 50% NaOH, 3% NaOH, fish meal, distilled water, shrimp flour, wheat flour, gluten flour, fresh shrimp, vitamin C, chitosan, lecithin, astaxantihin, vitamin mix, mineral mix, fish oil, powdered agar-agar and 5 alut lobsters.

The research conducted in this case uses a quantitative approach with the type of True Experimental research. This type of research can control all external variables that can affect the experiments carried out, so that the quality of the implementation of the research design becomes better. The form of this experimental design is a completely randomized design (Factorial RAL). With 5 treatments and 4 repetitions. The combination of treatments in the study is as follows:

1. P1 = Feed without chitosan solution (0%).
2. P2 = Feed + (0.6%) chitosan solution.
3. P3 = Feed + (0.7%) chitosan solution.
4. P4 = Feed + (0.8%) chitosan solution.
5. P5 = Feed + (0.9%) chitosan solution.

Table 1. Treatment design of variation of chitosan concentration on artificial feed

Treatment	Repetition			
	U1	U2	U3	U4
P1	P1U1	P1U2	P1U3	P1U4
P2	P2U1	P2U2	P2U3	P2U4
P3	P3U1	P3U2	P3U3	P3U4
P4	P4U1	P4U2	P4U3	P4U4
P5	P5U1	P5U2	P5U3	P5U4

Research procedure

a. Manufacturing of Chitosan

1) Preparasi sample

Prepare the lobster shell waste that has been obtained then wash the other ingredients with running water and dry them in the sun for 12 hours or in an oven with 800C for 24 hours to get a dry product with a moisture content of + 10%. The material is then crushed (using a limp and pestle) and sifted using sieve number 60 to obtain the particle size to be used (+ 3 mm) (Na'im, 2018).

2) Deproteinasi

Deproteination was carried out with the aim of removing protein elements by adding 3% concentration NaOH with a ratio of 1:5 (w/v) to the mashed lobster exoskeleton and then heating it to a temperature of 60-700C while stirring using a magnetic stirrer for 2 hours? After that it is cooled and then filtered until a solid is obtained, then washed with distilled water and dried in the oven (SOFIA et al., 2017).

3) Demineralisasi

Demineralization was carried out to remove minerals by adding 1 N HCL to lobster shell powder with a ratio of 1:10 (w/v), then heating at 800C and stirring with a magnetic stirrer for 1 hour. Then the solids were filtered and washed with distilled water until the pH was neutral and then dried in the oven (Azmin et al., 2019).

4) Deasetilasi

Deacetylation was carried out aiming to remove the acetyl group by adding 50% NaOH with a ratio of 1:15 (w/v), then heating it using an electric stove at 1000C and stirring it with a magnetic stirrer for 90 minutes. The solution obtained was then cooled, then filtered, filtered using Whatman filter paper number 42, after that it was washed until a neutral pH was obtained. After that, drying was carried out at 800C for 6 hours until chitosan was formed (Azmin et al., 2019).

b. Preparation of chitosan concentration (Na'im, 2018).

1) Calculation of chitosan concentration

- Chitosan $0{,}6\% = \frac{0{,}6}{100}\,30$ = 0,18 gram
- Chitosan $0{,}7\% = \frac{0{,}7}{100}\,30$ = 0,21 gram

- Chitosan $0{,}8\% = \frac{0{,}8}{100}\,30$ = 0,24 gram
- Chitosan $0{,}9\% = \frac{0{,}9}{100}\,30$ = 0,27 gram

2) Dissolving chitosan using 1% acetic acid
   - 0.6% chitosan = 0.15 gram of chitosan + 30 ml of 1% acetic acid
   - 0.7% chitosan = 0.21 gram of chitosan + 30 ml of 1% acetic acid
   - 0.8% chitosan = 0.24 gram of chitosan + 30 ml of 1% acetic acid
   - 0.9% chitosan = 0.27 gram of chitosan + 30% acetic acid

c. Palatability formula

$$(BKSP \times SP) - BKSA = P$$

Information:
P = Palatability
BKSP = dry weight of feed residue
SP = Stable feed
BKSA = Final dry weight

d. Production of lobster feed

Making lobster feed consists of several steps including preparing fresh ingredients, weighing ingredients, making dry dough, making liquid agar, mixing dry mix with liquid agar, printing feed, steaming, drying and cutting feed (Ihsan et al., 2020).

e. eeding method

The feeding method used in this study was the ad libitum method. Ad libitum is a method of feeding animals based on 3-5% of their body weight per day (Wazzan, 2020). Feed is given once at a time weighing 2 grams without using tools (directly)

f. Edible coating procedure

Edible coating is done by weighing 10 grams of feed, then soaking it in a chitosan solution with the concentration that has been prepared for 5 minutes, then drying it until it matches the desired texture.

g. Palatability test

Feed palatability testing can be measured from the total feed consumption (TKP) given. The method used in this test is to provide different concentrations of the main ingredients of the feed given in several treatments and repetitions and to calculate the total amount of feed consumption by animals. The initial step of the test container is filled with 5 lobsters of about 10 grams each. Lobsters are given acclimatization for 1 hour. Then the lobsters were given 60 minutes to consume the feed. At the end of 60 minutes, the lobsters were removed from the container and weighed. The uneaten feed is removed and then dried and weighed as the final weight of the feed. The initial weight of the feed is the same as the weight of the feed in different test containers without the lobsters. Total feed is obtained from mg initial

feed / mg final feed. Then the total feed consumption is calculated as total feed mg/gram lobster.

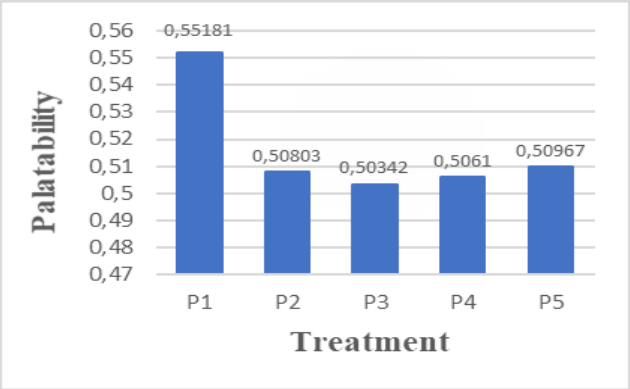
Table 2. Type and percentage of feed ingredients

Material	Percentage/Kg feed (%)
Fish Meal	133.34 grams
Shrimp Flour	13.34 grams
Wheat Flour	6.66 grams
Gluten flour	6.66 grams
Fresh Shrimp	24.26 grams
Fish Oil	1.6 grams
Vitamin Mix	1.46 grams
Mineral Mix	0.8 grams
Vitamin	0.52 grams
Chitosan	10 grams
Lecithin	1.34 grams
Total	**199.71 grams**

RESULT AND DISCUSSION

The rest of the feed becomes a reference in the growth rate of sea crayfish. The results of palatability observations carried out for 7 days showed that the first response was better than the response from day 2 to day 6, but on day 7 the lobster response increased again, following is the palatability graph below (Niloticus et al., 2022).

Table 3. Palatability treatment chart



The highest level of preference for lobsters for artificial feed in this study was shown by treatment 1 of (0.55181 gr), then followed by treatment 5 of (0.50967 gr), then treatment 2 of (0.50803 gr), after that followed by treatment 3 of (0.50342 gr), and finally treatment 4 of (0.5061 gr). The data analysis technique used in this research is the ANOVA (Analysis of Variance) analysis technique using the SPSS version 25 application. In using this test, it is necessary to complete several assumptions including: samples originating from groups must be uniform or have the same variance and the data for each -each group

has normal distribution. The normality test is used to determine whether the data population is normally distributed or not. In addition to the normality test, a homogeneity test will also be carried out to find out whether the data obtained is homogeneous or not.

There are two rules in making decisions on the homogeneity test, namely: : (Setiawan, 2019).

a. If the significance value is <0.05 then it is said that the variances of the two or more data population groups are not the same.
b. If the significance value is > 0.05, then it is said that the variances of the two or more data population groups are not the same.

Conclusions are drawn by looking at the calculated F value > F table, then H0 is rejected and H1 is accepted.

CONCLUSION

The stages of this research include preparation, maintenance, data processing, and manufacture of lobster feed. Chitin and chitosan are the most abundant types of polymer after cellulose with the molecular formula (C6H13NO5). The data analysis technique used in this research is the ANOVA (Analysis of Variance) analysis technique using the SPSS version 25 application. The rest of the feed is a reference in the growth rate of sea crayfish. The results of the study showed that the addition of chitosan from shrimp shell waste which was processed into chitosan, then processed into artificial feed was able to increase the preference of lobsters for artificial feed, the highest in this study was shown by treatment 1 of (0.55181 gr), then followed by treatment 5 for (0.50967 gr), then treatment 2 for (0.50803 gr), after that followed by treatment 3 for (0.50342 gr), and finally treatment 4 for (0.5061 gr).

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