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Antioxidant Activity of Mud Crabs (Scylla Serrata) in the Kawaliwu Waters of Sinar Hading Village, Lewolema District

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ABSTRACT

Kawaliwu waters are one of the areas with high potential for mangrove crabs. This study aimed to examine the antioxidant potential of mangrove crabs (Scylla serrata) collected from Kawaliwu waters in Sinar Hading Village, Lewolema District. This research method was experimental and employed a quantitative descriptive approach. Mangrove crab samples were prepared, dried, and extracted using 70% ethanol using the maceration method. The antioxidant activity of the extracts was tested using the DPPH (1,1-diphenyl-2-picrylhydrazyl) method. The results showed that antioxidant activity increased with increasing extract concentration. The IC_{50} (Inhibition Concentration 50%) value of the mangrove crab extract was 65.25 ppm, which is categorized as a strong antioxidant. This finding indicates that mangrove crabs possess bioactive compounds with potential as a source of natural antioxidants.

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1. INTRODUCTION

Mangrove crab (Scylla serrata) is a type of crab that lives in mangrove and estuary forest ecosystems. Mangrove crab (Scylla serrata) is found in abundance. The diversity of mangrove crabs is greatly influenced by the type of sediment, the type of substrate used to determine the number and type of macrobenthos such as mangrove crabs in an ecosystem (Sonarto et al., 2015). According to (Murniati DC, Pratiwi R. 2015), there are four types of crabs that are generally consumed, namely S. serrata, S. tranquebarica, S. paramamosain and S. olilvacea. The type of S. serrata is the most popular type of crab as a food ingredient and has a very expensive price.

The Kawaliwu waters are one of the areas with significant mangrove crab potential. Mangrove forests serve as habitat for mangrove crabs. Based on my survey, Kawaliwu fishermen stated that, along with increasing public understanding of the nutritional value of mangrove crabs as an edible aquatic resource besides fish, this research was conducted to assess the antioxidant activity of mangrove crabs in the Kawaliwu waters of Sinar Hading Village, Lewolema District.

Antioxidants are molecules in cells that can prevent free radicals from taking electrons, so that free radicals do not cause cell damage (Widyakusuma et al., 2019). Free radicals can cause cell damage and also damage biomolecules such as Deoxyribo Nucleic Acid, proteins and lipoproteins in the body which can ultimately trigger degenerative diseases such as heart cancer, arthritis, cataracts, diabetes and liver (Rustini and Ariati, 2017). A large amount of antioxidants is needed to enter the body to prevent the dangers of free radicals in the body. Therefore, it is necessary to get antioxidants from external sources (Widyakusuma el al., 2019). Antioxidants are divided into 2 groups, namely natural antioxidants and synthetic antioxidants. Natural antioxidants come from natural ingredients such as fruits, vegetables, grains, and animals (Inggrid et al., 2014). Meanwhile, synthetic antioxidants come from chemicals such as BHA (butylated hydroxyl toluene), TBHQ (tertiary butyl hydroquinone) and PG (propyl gallate) which have side effects of liver damage and toxic and carcinogenic effects on the human body in long-term use (Puspita et al., 2019).

This study aimed to test the antioxidant potential of mangrove crabs (Scylla serrata) collected from the Kawaliwu waters of Sinar Hading Village, Lewolema District. This research is expected to indicate that mangrove crabs contain bioactive compounds that have the potential to act as a source of natural antioxidants.

2. METHODS

This research is an experimental method that uses a quantitative descriptive approach. The selection of the experimental method using a quantitative descriptive approach aims to study the nutritional content of dry noodles with the addition of fish meat substituted with mocaf. The location of this research was conducted in the Fisheries Product Technology laboratory of the Larantuka Teacher Training and Technology Institute, East Flores Regency in May-June 2024. Mangrove crabs were collected in the waters of Kawaliwu, Sinar Hading Village, East Flores Regency, sample preparation was carried out in the Fisheries Product Technology laboratory of the Larantuka Teacher Training and Technology Institute. Antioxidant testing was continued at the Food Quality Control Laboratory (Kupang State Agricultural Polytechnic). The equipment in this study consisted of a blender, Erlenmeyer flask, beaker, test tube, test tube rack, stirring rod, analytical balance, vacuum rotary evaporator, cuvette, spectrophotometer, sample bottle, Buchner funnel, petri dish, clamp, aluminum foil, sterile cotton, plastic wrap and spatula. Meanwhile, the materials in this study included 5 kg of mangrove crab, ethanol, 2,2-diphenyl-1-picrylhydrazyl (DPPH).

The research procedure is Sample preparation: A total of 3 kg of wet mangrove crabs were separated into claws, shells, and meat. The samples were washed clean, dried by airing for 3 days, then oven-dried at 60°C for 3 days. The dried samples were ground with a blender. Water Content Test: Determination of water content was carried out based on SNI 01-2354.2-2006. Extraction: Extraction was carried out using the maceration method. Mangrove crab powder was soaked in 70% ethanol with a ratio of 1:10 for 24 hours. Antioxidant Activity Test: Antioxidant activity testing was carried out based on the method (Tukan 2019). The extract was put into 6 tubes with concentrations of 5, 10, 15, 20, and 25 ppm, and 0 ppm as a control. Then each tube was added with 1 ml of DPPH mixture. After 30 minutes of incubation, the absorbance was measured at a wavelength of 520 nm. The inhibition percentage and IC_{50} values were calculated. The data from this study were analyzed using Analysis of Variance (ANOVA) with the Statistical Package for the Social Sciences (SPSS) program, and further tested using the Duncan Multiple Range Test (DMRT).

3. FINDINGSANDDISCUSSION

The research began with sampling of Sciylla serrata in the waters of Kawaliwu, Sinar Hading Village, Lewolema District on July 22. The samples were then prepared in the Fishery Product Technology processing room of the Larantuka Teacher Training Institute. Scylla serrata was then tested for water content and used 30% and 70% ethanol solvents and then tested for antioxidant activity using the DPPH method.

Water Content and Extract Yield

The water content test in this study used the gravimetric method referring to (SNI, 2006). Water content is one of the most important measurements in the food industry to determine the quality and resistance of food to possible damage (Daud et al., 2020). The calculation of water content aims to see the extract yield and to determine the shelf life of the sample, if a lot of water content in the sample will affect the sample being tested and the shelf life. The results of the study showed that the water content of Eucheuma cottoni simplicia was 7.07%, this figure is smaller than 10%, meaning that Eucheuma cottoni simplicia can be stored for a long time, the lower the water content in Eucheuma cottoni, the better the quality (Tamaheang et al., 2017).

Antioxidant Test Results of Mud Crab (Scylla serrata)

Table 1. DPPH Analysis ResultsMud Crab (Scylla serrata)

Concentration (ppm)	Average Absorbance (nm)	Inhibition (%)
0	0.633	46.60337553
50	0.602	49.24050633
100	0.574	51.54008439
150	0.544	54.11392405
200	0.459	58.39662447

From these data, it can be seen that there is an increase in the percentage of inhibition along with the increase in extract concentration. This indicates thatThe higher the concentration of mangrove crab extract, the higher its antioxidant capacity in reducing DPPH free radicals.

This phenomenon indicates a positive correlation between extract concentration and antioxidant activity. It also identifies the presence of bioactive compounds in mangrove crabs, such as flavonoids, carotenoids, or other phenolic compounds that play a role in neutralizing free radicals. The IC_{50} (Inhibitory Concentration 50%) value is an important parameter for assessing the antioxidant potential of a substance. The IC_{50} indicates the concentration of extract required to inhibit 50% of DPPH free radicals.

Based on the calculation results, the IC_{50} value obtained is65.25 ppm. Based on the classification of antioxidant activity according to Blois (1958), the IC_{50} value can be categorized as follows:

- < 50 ppm → Very strong
- 50–100 ppm → Strong
- 101–150 ppm → Moderate
- 150 ppm → Weak

Thus, mangrove crab extract hasstrong antioxidant activity. Can be seen in Figure 1. Figure Percentage of Inhibition (%) of Mangrove Crab (Scylla serrata).

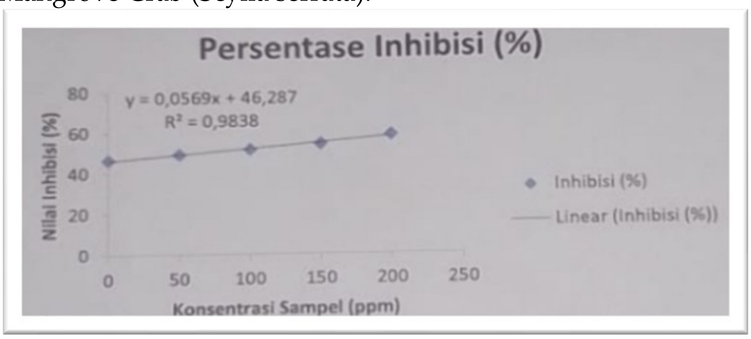

Figure 1. Percentage of Inhibition (%)Mud crab (Scylla serrata).

From the table it can be seen that the higher the concentration of the extract used, the greater the percentage of inhibition against DPPH free radicals. And this phenomenon can show a positive correlation between concentration and antioxidant activity which can identify that there are active compounds in mangrove crabs and play a role in producing free radicals effectively with the results of the analysis. The IC50 value of 50 ppm is very strong, 100 is strong, 150 is moderate, 200 is weak.

Table 2. Percentage of inhibition

IC50	Y	A	b
65.25483304	50	0.0569	46,287

The inhibition percentage indicates the extent to which the extract is able to neutralize free radicals. The details are as follows: At the concentrationAt 0 ppm (control), there was already an inhibition of 46.60%, which may be caused by the ethanol solvent or nonpolar natural components in the control solution. At a concentration of 200 ppm, the highest inhibition value was 58.40%, indicating that the antioxidant capacity increases with increasing concentration. The increase in inhibition from 46.60% to 58.40% in the concentration range of 0–200 ppm indicates that the mud crab extract contains active compounds that work in a dose-dependent manner.

The results of the study showed that the extract of mangrove crab (Scylla serrata) has strong antioxidant activity with an IC_{50} value of 65.25 ppm. Based on the Blois (1958) classification, this value is included in the strong category, because it is in the range of 50–100 ppm. This finding is in line with the theory that antioxidant activity is closely related to the content of bioactive compounds in an organism, such as flavonoids, phenols, carotenoids, and other natural pigments that play a role in neutralizing free radicals (Rustini & Ariati, 2017). The increase in the percentage of inhibition along with the increase in extract concentration also shows a positive dose-response relationship, which indicates that the active compounds in mangrove crab work effectively in the free radical scavenging mechanism.

When compared with previous research, these results have a strong correlation. For example, researchPuspita and Sumantri (2019) studied sweet orange (Citrus sinensis) extract and found that the flavonoid and vitamin C content in the fruit can provide significant antioxidant activity. The IC_{50} value of the orange extract ranged from 50–100 ppm, almost identical to the results obtained from the mud crab extract in this study. This reinforces the notion that natural antioxidants are not only found in plants such as fruits and vegetables but can also be found in animal organisms, including mud crabs.

Furthermore, these findings are also relevant to a study by Inggrid et al. (2014), which emphasized the importance of exploring natural antioxidant sources as alternatives to synthetic antioxidants. Synthetic antioxidants such as BHA and TBHQ have been shown to have toxic and carcinogenic side effects when consumed long-term. Therefore, the successful identification of antioxidant activity in mangrove crabs opens up opportunities for the development of animal-based functional foods that are safer for health.

The results of this study also align with the report of Tukan et al. (2019) who found that yellow root extract (Fatuoa pilosa) has antioxidant properties while inhibiting the activity of the α-glucosidase enzyme, with an IC_{50} value in the strong category. The similarity of the pattern between this study and the results of research on mangrove crabs indicates that the presence of phenolic compounds and other bioactives does play an important role in the mechanism of free radical inhibition. Thus, the active compounds in mangrove crabs have the potential not only as antioxidants, but also have implications for other health benefits, particularly in preventing degenerative diseases.

Upon closer inspection, the low water content of the dried mud crab sample, at 7.07%, also contributes to the quality of the resulting extract. According to Daud et al. (2020), low water content allows the material to be more resistant to deterioration and fermentation. Therefore, the resulting mud crab extract is relatively stable and of good quality for further testing. This strengthens the reliability of the research results, as the quality of the raw materials used is well maintained.

From an ecological perspective, the presence of bioactive compounds in mangrove crabs can be linked to their natural habitat in the mangrove ecosystem.Sonarto et al. (2015) found that substrate type and environmental conditions significantly influence macrobenthos diversity, including mangrove crabs. The mangrove environment, rich in organic matter and secondary metabolites, allows the organisms living within it, including Scylla serrata, to accumulate beneficial bioactive compounds. Therefore, the relatively pristine waters of Kawaliwu may contribute to the high bioactive compound content of the mangrove crabs studied.

In terms of health implications, the results of this study confirm the theory of Widyakusuma et al. (2019) which states that the human body requires external antioxidant intake to fight free radicals. Excessive free radicals can trigger various degenerative diseases such as cancer, heart disease, diabetes, and liver dysfunction. With an IC_{50} value of 65.25 ppm, mangrove crab extract can be considered a potential source of natural antioxidants to support public health. This finding not only adds to the scientific knowledge in the field of fishery product technology but also provides opportunities for the development of functional food products based on mangrove crab.

4. CONCLUSION

Based on the results of research on the antioxidant activity of mangrove crab (Scylla serrata) extract using the DPPH method, it can be concluded that: Antioxidant activity increases with increasing extract concentration, indicating a positive correlation between concentration and the percentage of DPPH free radical inhibition. The IC_{50} value of mangrove crab extract is 65.25 ppm, which is included in the strong category based on the classification of antioxidant activity. These findings indicate that mangrove crab contains bioactive compounds that have the potential as a source of natural antioxidants. Further research is recommended to isolate and identify specific active compounds responsible for antioxidant activity in mangrove crab.

REFERENCES

Alharbi, F., Luo, S., Zhang, H., Shaukat, K., Yang, G., Wheeler, C. A., & Chen, Z. (2023). A brief review of acoustic and vibration signal-based fault detection for belt conveyor idlers using machine learning models. *Sensors*, *23*(4), 1902.

Bajda, M., & Hardygóra, M. (2021). Analysis of the Influence of the Type of Belt on the Energy Consumption of Transport Processes in a Belt Conveyor. *Energies*, *14*(19), 6180.

Brahma, A., & Wynn, D. C. (2020). Margin value method for engineering design improvement. *Research in Engineering Design*, *31*(3), 353-381.

Dhandapani, V., & Balasubramanian, G. (2025). Optimizing switching sequences in AC-AC converters for enhanced safety and performance in conveyor systems. *Scientific Reports*, *15*(1), 30786.

Ghodki, M. K., Swarup, A., & Pal, Y. (2020). A novel solar-powered master-slave electric motor-based energy-saving and cooling approach for the motors of conveyor system. *International Transactions on Electrical Energy Systems*, *30*(10), e12563.

Glock, C. H., Grosse, E. H., Neumann, W. P., & Feldman, A. (2021). Assistive devices for manual materials handling in warehouses: a systematic literature review. *International Journal of Production Research*, *59*(11), 3446-3469.

Guo, S., Huang, W., & Li, X. (2020). Normal force and sag resistance of pipe conveyor. *Chinese Journal of Mechanical Engineering*, *33*(1), 48.

Inggrid, M., Santoso, H., *Ekstraksi Antioksidan dan Senyawa Aktif dari Buah Kiwi (Actinidia deliciosa), Perjanjian No: III/LPPM/2014-03/10-P*, Universitas Katolik Parahyangan, 2014.

Puspita, A.D., dan Sumantri. 2019. Aktivitas Antioksidan Perasan Jeruk Manis *(Citrus sinensis)* dan Jeruk Purut *(Citrus hystrix)* Menggunakan Metode ABTS.

Rustini, N. L., & Ariati, N. K. (2017). Aktivitas Antioksidan Dari Ekstrak Etanol Daun Ungu. Cakra Kimia *(Indonesian E-Journal of Applied Chemistry)*, 5(2), 145-151.

Sunarto dan Nurlin (2015). "Dampak logam berat. Cu (tembaga) dan Ag (perak) pada limbah cair industri perak terhadap kualitas air sumur dan kesehatan masyarakat serta upaya pengendaliannya di Kota Gede Yogyakarta." Jurnal Ekosains, VII(1), hlm. 13.

Tamaheang, T., Makapedua, D. M., Berhimpon, S. 2017. Kualitas Rumput Laut Merah (*Kappaphycus alvarezii*) dengan Metode Pengeringan Sinar Matahari dan *Cabinet Dryer*, serta *Rendemen Semi-Refined Carrageenan* (SRC). Jurnal Media Teknologi Hasil Perikanan, 5(2), 152-157.

Tukan, M. N. M., Falah, S., Adrianto, A. 2019. Aktivitas Antioksidan dan Inhibisi α-Glukosidase Ekstrak Akar Kuning (*Fatuoa pilosa gaudic*). Tesis. Institut Pertanian Bogor. Bogor.

Widyakusuma, N. N. et al. (2019) 'Literasi Pengobatan Bagi Apoteker: Sebuah Tinjauan', Jmpf, 9(1), pp. 12–18.