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In Vitro Anti-inflammatory Activity Test of Ethanol Extract of Red Dragon Fruit Peel (Hylocereus polyrhizus)

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ABSTRACT
Dragon fruit peel contains several compounds that have high antioxidant activity. Oxidative stress, which is one of the triggers for inflammation, is a problem to this day. Red dragon fruit skin contains various antioxidant compounds such as flavonoids and polyphenols. It is hoped that the presence of these antioxidant compounds can also have anti-inflammatory activity. This study aims to examine the anti-inflammatory activity of red dragon fruit skin using the red blood cell stabilization method. The test results showed that the ethanol extract of red dragon fruit peel with a concentration of 1000 ppm had the largest percentage of red blood cell hemolysis protection in induced hypotonicity, namely 92.596%. From these results it can be concluded that the ethanol extract of red dragon fruit peel has potential as an anti-inflammatory by stabilizing red blood cell membranes.

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INTRODUCTION

Free radicals are atoms or molecules that contain unpaired electrons. To achieve stability, free radicals obtain electrons from the metabolism of proteins, carbohydrates, lipids and Deoxyribonucleic Acid (DNA) (Adrian et al., 2021). Free radicals are very reactive and unstable. Free radicals that meet other molecules will result in the formation of new radicals and a chain reaction (Christodoulou et al., 2022). An imbalance between free radicals and antioxidants causes oxidative stress (Ikonne et al., 2020). If this continues in the body and is not stopped, it will result in diseases such as inflammation (Arias et al., 2022); (Hadidi et al., 2022); (Munteanu & Apetrei, 2021); (Vona et al., 2021); (Abdel-Daim et al., 2019). Inflammation is defined as a normal protective response to tissue injury caused by physical trauma, chemical insults, or microbiological agents. When stimulation occurs, substances such as histamine, bradykinin, prostaglandin and serotonin are released, resulting in vasodilation and increased capillary wall permeability (Fitriyanti et al., 2020). Several inflammatory diseases are caused by excessive free radicals in the body, such as rheumatoid arthritis (RA), Inflammatory Bowel Disease (IBD) and inflammation of the eyes (Parwata, 2015). The presence of inflammation will affect the patient's quality of life. Inflammation can be treated using non-steroidal anti-inflammatory drugs (NSAIDs). Long-term use of NSAIDs

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has a tendency to induce gastric ulcers and gastrointestinal bleeding, especially in the elderly (Fitriyanti et al, 2020).

Antioxidants can neutralize free radicals and stop free radical reactions. Antioxidants will react with free radicals to form compounds that are stable (Christodoulou et al., 2022); (Munteanu & Apetrei, 2021). The presence of these antioxidants is expected to be able to inhibit inflammation caused by free radicals. One plant that has the potential to be developed as an anti-inflammatory is dragon fruit. The part of dragon fruit that is most often used is the fruit. Dragon fruit skin is one part of dragon fruit which is quite abundant, around 30-35% of the whole weight of the fruit (Wahyuni, 2011) and its utilization is not optimal, it is only thrown away and is waste (Suryaningsih et al., 2021). Dragon fruit peel contains several compounds that have antioxidant activity such as betacyanin, flavonoids and phenols (Hendra et al., 2020); (Eveline & Audina, 2019). The antioxidant content in dragon fruit skin is expected to have anti-inflammatory activity.

METHODS

In Vitro Anti-Inflammatory Activity Test

In vitro anti-inflammatory activity testing was carried out according to the research of Siswanty et al (2017) with modifications.

a. Preparation of Red Blood Cell Suspension
   Anti-inflammatory activity was evaluated using 10 mL of blood added with 2 mL of sterile alselver solution and then centrifuged at 3000 rpm at 27°C for 10 minutes. The supernatant was taken. The red blood cell sediment was washed 5 times using isosaline until clear isosaline was obtained. The red blood cell volume was resuspended using isosaline to obtain a concentration of 10% v/v.
b. Preparation of Extract Concentration and Aspirin
   A total of 25 mg extract was dissolved in 25 mL of isosaline to obtain a concentration of 1000 ppm. The solution was then diluted into several concentrations, namely 500 ppm, 250 ppm, 125 ppm and 50 ppm. The aspirin solution was prepared by dissolving 10 mg of aspirin in 100 mL of isosaline to obtain aspirin with a concentration of 100 ppm.
c. Testing Extract Activity on Erythrocyte Membrane Stabilization
   The activity test of the extract on erythrocyte membrane stabilization was carried out by adding 1 ml of the test material (extract solution with concentrations of 1000 ppm, 500 ppm, 250 ppm, 125 ppm and 50 ppm; positive control solution, namely aspirin 100 ppm and negative control solution, namely isosaline) with 1 mL of phosphate buffer pH 7.4; 2 mL of hyposaline; and 0.5 mL of red blood cell suspension. Each solution was then incubated for 30 minutes at 37°C. The solution was then centrifuged for 20 minutes at 3000 rpm. The resulting supernatant was then read for its absorbance using a spectrophotometer at a wavelength of 560 nm. After that, the % inhibition was calculated using the formula:

   $$\% \text{ Inhibition} = (A1-A2)/A1 \times 100\%)$$

   Note:

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A2 = Absorbance of the test group
A1 = Absorbance of the negative control group

RESULTS AND DISCUSSION

Before conducting this research, an ethical test was first carried out. This research has received ethical approval from KEPK Universitas dr. Soebandi. The anti-inflammatory activity of ethanol extract of dragon fruit peel is seen from the percentage of red blood cell hemolysis protection against induced hypotonicity. The induction of hypotonicity can cause lysis of red blood cells so that hemoglobin is released into the test solution. The percent inhibition value shows the ability of the ethanol extract of red dragon fruit peel and the positive control to prevent hemolysis caused by induced hypotonicity. Red dragon fruit peel ethanol extract in inhibiting red blood cell hemolysis is directly proportional to the increase in the concentration of red dragon fruit peel ethanol extract. The test results can be seen in table 1.

Table 1. Percent Inhibition of Red Blood Cell Hemolysis by Inducing Hypotonicity

Groups	% Inhibition
Negative Control	0 %
Positive Control (Aspirin 100 ppm)	95.132 %
EEKBN 1000 ppm	92.596 %
EEKBN 500 ppm	65.112 %
EEKBN 250 ppm	48.377 %
EEKBN 125 ppm	30.629 %
EEKBN 50 ppm	21.095 %

The method used to test anti-inflammatory activity in this study was the red blood cell membrane stabilization method. Blood membrane stability can reflect the stability of the lysosomal membrane because the red blood cell membrane is analogous to the lysosomal membrane. Lysosomal membrane stability can limit the anti-inflammatory response by preventing the release of lysosomal contents, namely protease enzymes. The release of protease enzymes will cause inflammation in the tissue and extracellular fluid (Kumar et al., 2012). Damage to the lysosomal membrane will also affect the release of the phospholipase A2 enzyme, which will produce inflammatory mediators. Compounds that have membrane-stabilizing activity have the ability to significantly protect the cell membrane, thereby inhibiting the release of inflammatory mediators (Karunanithi et al., 2012; Simonaro, 2016).

The research results showed that red dragon fruit peel extract has anti-inflammatory activity. This can be seen from the percentage inhibition value obtained. The higher the concentration of ethanol extract of dragon fruit peel, the lower the absorbance, and the higher the ability to prevent hemolysis. Table 1 showed that the ethanol extract of red dragon fruit peel with a concentration of 1000 ppm had the largest percentage of red blood cell hemolysis protection in induced hypotonicity, namely 92.596%. The anti-inflammatory activity of red dragon fruit peel is related to the content of the extract, namely flavonoids. Flavonoids have several pharmacological effects, including antioxidants, antitumor, anti-allergic, anti-inflammatory, and antiviral. The anti-inflammatory activity of flavonoids is related to the

inhibition of the cyclooxygenase and lipoxygenase pathways. Flavonoids also inhibit the accumulation of histamine and leukocytes and are able to inhibit the release of arachidonic acid and lysosomal enzymes (Hidayati et al., 2022). Aspirin was used as a positive control. Aspirin is a non-selective NSAID drug that can inhibit the COX-1 and COX-2 enzymes. The above research shows that the ethanol extract of dragon fruit peel has the potential to be developed as an anti-inflammatory.

CONCLUSION

From these results it can be concluded that the ethanol extract of red dragon fruit peel has potential as an anti-inflammatory by stabilizing red blood cell membranes.

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REFERENCE

Abdel-Daim, M. M., El-Tawil, O. S., Bungau, S. G., & Atanasov, A. G. (2019). Applications of Antioxidants in Metabolic Disorders and Degenerative Diseases: Mechanistic Approach. *Oxid Med Cell Longev*, *2019*, 4179676.

Adrian, G., Suryanto, E., & Wewengkang, D. S. (2021). Antioxidant Activity And Free Radical Antidote From Fraction Of Bark Sago Baruk (*Arenga microcarpha Beccari*). *Pharmacon*, *10*(1), 762-766.

Arias, A., Feijoo, G., & Moreira, M. T. (2022). Exploring The Potential Of Antioxidants From Fruits And Vegetables And Strategies For Their Recovery. *Innovative Food Science & Emerging Technologies*, *77*(1), 102974-102990.

Christodoulou, M. C., Orellana Palacios, J. C., Hesami, G., Jafarzadeh, S., Lorenzo, J. M., Dominguez, R., Moreno, A., & Hadidi, M. (2022). Spectrophotometric Methods for Measurement of Antioxidant Activity in Food and Pharmaceuticals. *Antioxidants (Basel)*, *11*(11).

Eveline, & Audina, M. (2019). Utilization of Super Red Dragon Fruit Peel (*Hylocereus Costaricensis* (F.A.C. Weber) Britton & Rose) in the Making of Fermented Beverage. *IOP Conference Series: Earth and Environmental Science*, *292*(1), 012037.

Fitriyanti, Hikmah, N., & Astuti, K. I. (2020). Efek Antiinflamasi Infusa Bunga Asoka (Ixora coccinea l) pada Tikus Jantan yang Diinduksi Karagenan. *Jurnal Sains dan Kesehatan*, *2*(4), 355-359.

Hadidi, M., Orellana-Palacios, J. C., Aghababaei, F., Gonzalez-Serrano, D. J., Moreno, A., & Lorenzo, J. M. (2022). Plant by-product antioxidants: Control of protein-lipid oxidation in meat and meat products. *Lwt*, *169*(1), 114003-114014.

Hendra, R., Masdeatresa, L., Abdulah, R., & Haryani, Y. (2020). *Red dragon peel (Hylocereus polyrhizus) as antioxidant source* The 8th International Conference of the Indonesian Chemical Society (Icics) 2019.

Hidayati, S., Oktavianti, F., Susanti, D. A., Aini, Q. (2022). In Vitro and In Vivo Anti-Inflamatory Activities of Ethanol Extract *Mangifera indica* L. Leaves. *Jurnal Sains dan Kesehatan. 4*(5); 488-494.

Ikonne, E. U., Ikpeazu, V. O., & Ugbogu, E. A. (2020). The Potential Health Benefits Of Dietary Natural Plant Products In Age Related Eye Diseases. *Heliyon*, *6*(7), 1-7.

Karunanithi, M., Raj, C. D., Jegadeesan, M., & Kavim-
ani, S. (2012). Comparative gc-ms Analysis
and In Vitro Screening of Four Species of
Mucuna. Asian Journal of Pharmaceutical
and Clinical Research, 5(4), 239–243

Karunanithi, M., Raj, C.D., Jegadeesan, M., Kavimani, S. (2012). Comparative GC-MS Analysis and In Vitro Screening of Four Species of Mucuna. *Asian Journal of Pharmaceutical and Clinical Research, 5*(4), 239-243.

Kumar, V., Bhat, .A., Kumar, D., Khan, N. A., Chashoo, I.A. (2012). Evaluation of Anti-Inflamatory Potensial of Leaf Extracs of *Skimmia anquetilia.Asian Pasific Journal of Tropical Biomedicine. 627-630*

Munteanu, I. G., & Apetrei, C. (2021). Analytical Methods Used in Determining Antioxidant Activity: A Review. *Int J Mol Sci*, *22*(7), 1-30.

Parwata, I. M. O. A. (2015). *Antioksidan* (U. Udayana, Ed.).

Simonaro, C. M. (2016). Lysosomes, lysosomal storage diseases, and inflammation*. Journal of Inborn Errors of Metabolism and Screening*, 4:1-8

Siswanty, P.W., Wibowo, M.A., Harlia. (2017). Aktivitas Toksisitas Antioksidan dan Antiinflamasi secara In Vitro dari Ekstrak Metanol Daun Mangga Bacang *(Mangifera foetida* L). *JKK,* 6(1), 42-49.

Suryaningsih, S., Muslim, B., & Djali, a. M. (2021). The Antioxidant Activity Of Roselle And Dragon Fruit Peel Functional Drink In Free Radical Inhibition. *Journal of Physics: Conference Series*, *1836*, 1-6.

Vona, R., Pallotta, L., Cappelletti, M., Severi, C., & Matarrese, P. (2021). The Impact of Oxidative Stress in Human Pathology: Focus on Gastrointestinal Disorders. *Antioxidants (Basel)*, *10*(2), 1-26.

Wahyuni, R. (2011). Use Super Red Dragon Fruit Skin (*Hylocereus costaricensis*) As A Source Of Antioxidants In Natural Dyes And Jelly Making. *Jurnal Teknologi Pangan 2*(1), 68-85.