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THE POTENTIAL OF MANGROVE STEM EXTRACT (Aegiceras corniculatum) ON THE HEMATOCRIT VALUE

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Abstract

Hematocrit examination is an examination used to measure the concentration of red blood cells (erythrocytes) in the blood stated in percent (%). The usual hematocrit examination uses the anticoagulant EDTA, is expensive, and rarely distributed in remote area. Alternative anticoagulants are currently being studied, one of which is the extract of mangrove stems (*Aegiceras corniculatum*). This study aims to determine the difference in hematocrit values using the anticoagulant EDTA and extract of mangrove stems (*Aegiceras corniculatum*). The type of this research was analytic observational with a cross-sectional research design. Samples were taken by non-random purposive sampling of 16 female students from a total of 31 students of class D semester VIII of Health Analyst Universitas Muhammadiyah Semarang. The results showed average hematocrit value using EDTA anticoagulant was 42.38% by using the microhematocrit method. Meanwhile, the average hematocrit value using mangrove stem extract (*Aegiceras corniculatum*) is 20.88%. The hematocrit examination using the EDTA anticoagulant were higher than using the extract of mangrove stems (*Aegiceras corniculatum*). It showed a value of 0.000 with a significant level of 0.05, which is 0.000 <0.05. Therefore, there is a difference in hematocrit value using EDTA anticoagulant and mangrove stem extract (*Aegiceras corniculatum*).

Keywords: anticoagulants, EDTA, hematocrit, immunology, mangrove

INTRODUCTION

A laboratory examination is an examination conducted for clinical purposes. The aim of clinical laboratory examinations is to help diagnose disease in patients by examining patient samples, such as blood, feces, sputum, and body fluids (Gandasoebrata, 2010).

Blood is a body tissue that is different from other body tissues. It circulates in a closed system called blood vessels and functions as a means of transport and hemostasis. It is maintaining normal osmotic pressure between blood and cell tissues, acid-base balance in the blood, regulating body temperature, and as a defense against disease. Blood examination includes several parameters, which are the hemoglobin (Hb), hematocrit (Ht), platelets, erythrocytes, leukocytes, and erythrocyte sedimentation rate (ESR) (Sadikin, 2013; D'Hiru, 2013).

Hematocrit examination is an examination used to measure the concentration of red blood cells (erythrocytes) in the blood, which is stated in percent (%). Low hematocrit levels are associated with anemia and leukemia conditions. An increase in hematocrit levels indicates hemoconcentration due to a decrease in fluid volume and an increase in red blood cells. Hematocrit examination usually uses an anticoagulant that can maintain cell morphology (D'hiru, 2013).

Anticoagulants are substances used to prevent the occurrence of blood clots which are commonly used in clinics and laboratories. Anticoagulants prevent blood clotting by inhibiting blood clotting factors in vitro during laboratory tests or transfusions. Anticoagulants act by binding to calcium or by inhibiting thrombin, which is needed to convert fibrinogen to fibrin in the clotting process. Anticoagulants are indispensable in blood tests in clinics and laboratories (Fajarwati, 2017).

The anticoagulants used in each examination have different functions and types. The types of anticoagulants include Trisodium Citrate, Double Oxalate, Heparin, EDTA (Ethylen Diamine Tetraacetic Acid), and Sodium Oxalate. The distribution of anticoagulants in several health centers in remote areas is difficult to fulfill. Hence, there is a need for alternative anticoagulants, such as garlic, mangroves, and etc. (Gandasoebrata, 2010; D'hiru, 2013).

The research on alternative anticoagulants is currently being conducted and made from natural plants. Mangrove *Aegiceras corniculatum* is one of the plants that have anticoagulant substances, which have flavonoid compounds that provide anti-blood-clotting effects (Tangkery, 2013).

Flavonoid compounds have antioxidant activity which also plays a role in inhibiting platelet aggregation and secretion. The ability of flavonoids to inhibit platelet aggregation is due to the fact that these flavonoids are able to inhibit the metabolism of arachidonic acid by cyclooxygenase. The process of clumping of platelets begins with the presence of the enzyme phospholipase A2 in the body. The enzyme phospholipase A2 converts phospholipids into arachidonic acid. Arachidonic acid is then converted by cyclo-oxygenase to cyclic endoperoxides. Cyclic endoperoxides are then converted into prostacyclin (located in the endothelium channel) and thromboxane A2 (located in platelets). Prostacyclins play a role in inhibiting platelet aggregation. The working process of thromboxane A2 is inhibited by flavonoids so that the platelet clumping process can be prevented (Hidayati, 2017).

The results of the study (Tangkery, 2013) proved that the mangrove *Aegiceras corniculatum* has anticoagulant activity

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against human blood. Moreover, it can compare the clotting time of control blood with blood that has been given *Aegiceras corniculatum* mangrove extract.

METHODS

The type of research used was *analytic observational* with a *cross-sectional* research design. This research was conducted in March until April 2022 at the Hematology Laboratory of Health Analysts, Universitas Muhammadiyah Semarang. The independent variables in this study were EDTA anticoagulant and mangrove stem extract (*Aegiceras corniculatum*). Meanwhile, the dependent variable was the Hematocrit value. The determination of the sample is based on non-random purposive sampling, namely the sample taker based on certain criteria made by the researcher himself and based on the characteristics or characteristics of the population that are already known (Notoatmodjo, 2012). The sample in this study was 16 female students who met the research criteria.

RESULT

This research was conducted at the Laboratory of Health Analyst Hematology, the University of Muhammadiyah Semarang, with the samples obtained were each put into a tube containing liquid EDTA anticoagulant 10 µl/1 mL of blood and extract of mangrove stem (*Aegiceras corniculatum*) 120 µl/1 mL of blood. The sample was examined for hematocrit (Ht) using the microhematocrit method. The results were presented in the form of graphs and tables using the SPSS test statistic test.

Table 1. Average results of descriptive analysis of hematocrit levels using EDTA anticoagulant and mangrove stem extract (*Aegiceras corniculatum*).

	Σ	min	max	Rata-rata
Antikoagulan EDTA	16	20	54	42,38
Ekstrak Batang Mangrove (*Aegiceras corniculatum*)	16	10	30	20,88

Table 1. showed that the results of hematocrit levels using the anticoagulant EDTA and mangrove stem extract (*Aegiceras corniculatum*) are very much different. There was even a difference in the average hematocrit level of 21.5.

Chart 1. The results of the hematocrit value using EDTA anticoagulant and Mangrove stem extract (Aegiceras corniculatum).

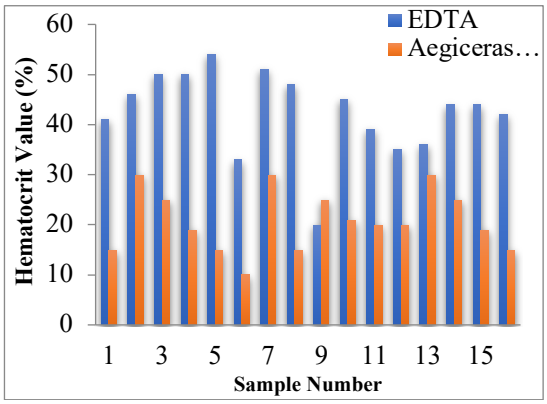

Chart 1. It shows that from each sample with two treatments, namely using EDTA anticoagulant and Mangrove stem extract (Aegiceras corniculatum) there is a hematocrit value (%) that uses Mangrove stem extract tends to be lower than those using EDTA anticoagulant.

The normality test of parametric data used the Shapiro Wilk test for hematocrit values for 16 samples with 2 treatments, namely EDTA anticoagulant and extract of mangrove stems (*Aegiceras corniculatum*). Based on the results of data normality test, data from the examination have significant values of 0.198 and 0.242, respectively. The significance value of both was greater than 0.05, which means that data was normally distributed.

Data were normally distributed and followed by hypothesis testing using the Independent Sample t-Test, with a 95% confidence level. The statistical test results obtained p-value of 0.000, which means p-value <0.05. Besides that, H0 was rejected, and Ha was accepted. Hence, the conclusion of the hypothesis was there was a significant difference in the hematocrit value using EDTA anticoagulant and mangrove stem extract (*Aegiceras corniculatum*).

DISCUSSION

Hematocrit is one of the special blood tests that are useful to help diagnose several diseases, including Dengue Hemorrhagic Fever (DHF), anemia, polycythemia, and severe diarrhea. Low hematocrit values occur in cases of anemia and leukemia. Meanwhile, an increase in hematocrit values occurs in cases of dehydration and polycythemia vera (Sutedjo, 2009).

Anticoagulants are substances used to prevent blood clotting by inhibiting blood clotting factors in vitro during laboratory tests or transfusions. It is important to pay attention to the use of anticoagulant concentrations in blood. This is because if the anticoagulant concentration is insufficient, it will cause the cells to coagulate. On the other hand, if the anticoagulant concentration is excessive, it will cause the cells to create or shrink (Sinaga, Tominik, & Hardiyanti, 2018).

Mangrove stem extract (*Aegiceras corniculatum*) has flavonoid compounds. These compounds have antioxidant activity, which also plays a role in inhibiting platelet aggregation. The inhibition of the platelet aggregation process is due to the fact that flavonoids are able to inhibit the metabolism of arachidonic acid by cyclooxygenase. The process of platelet clumping begins with the presence of the enzyme phospholipase A2 in the body. Afterward, the enzyme phospholipase A2 converts phospholipids into arachidonic acid. Arachidonic acid is then converted by cyclooxygenase into cyclic endoperoxides. Cyclic endoperoxides are then converted into prostacyclin and thromboxane A2 (located in platelets). Hidayati, 2017; Shalehah, Cahaya, & Fadlillaturrahmah, 2015).

From the observation of hematocrit (Ht) values in microcapillary tubes using extract of mangrove stems (*Aegiceras corniculatum*), there are two red layers in the tube, with the bottom layer being darker than the top one. It is stated that the lysis of erythrocytes occurs. Thus, the serum that should be clear in color becomes faint red. One of the factors that can affect the results of hematocrit (Ht) in vitro is the concentration of anticoagulants or substances used to inhibit blood clotting. Inappropriate anticoagulant concentrations greatly affect cell shape and the coagulation process that occurs. The concentration of 100% of the extract of mangrove stems (*Aegiceras corniculatum*) is the concentration used in this study, which causes thin lysis of erythrocytes even though there is no clotting in the blood.

The results of this study are in accordance with the results of research conducted by Tangkery (2013). In his research on the anticoagulation activity test of mangrove extract (*Aegiceras corniculatum*), namely the flavonoid compounds contained in

the extract, this material can inhibit the occurrence of coagulation activity. It is characterized by the absence of blood clots in the tube.

CONCLUSION

This study aims to determine the difference in hematocrit (Ht) results using EDTA anticoagulant and mangrove stem extract (*Aegiceras corniculatum*). The results obtained that the average hematocrit value using EDTA anticoagulant and mangrove stem extract (*Aegiceras corniculatum*) Are 42.38% and 20.88%, respectively. Meanwhile, the results of the Independent Sample t-Test statistical test stated that there is a difference in the hematocrit value using EDTA anticoagulant and mangrove stem extract (*Aegiceras corniculatum*).

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