Utilization of Ambon Banana Tree Stems (*Musa paradisiaca var. Sapientum*) To Accelerate Blood Clotting

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Injury is damage to body tissue due to trauma from sharp objects or blunt objects. When a wound occurs, the body will respond to try to stop the bleeding and repair tissue. The process is called hemostasis. Banana tree stem sap is one of the herbal medicines that can accelerate the process of hemostasis. This research was conducted to determine the effect of Ambon banana tree sap (Musa paradisiaca var. Sapientum) on blood clotting time. The research design used was a static-group comparison design. And the data obtained are primary data, that is data obtained directly from the examination of blood clotting time by the Lee & White examination method. The results that have been done show the average results before being given 9.90 minutes of sap, after giving 9.15 minutes of sap with a sample size of 30, in other words an increase in blood clotting time by 7.57 %. Based on the results of this study it can be concluded that the sap of the ambon banana tree trunk (Musa paradisiaca var. Sapientum) can be used to speed up blood clotting time.

Key words: *Musa paradisiaca var. sapientum, Blood Clotting Time, Lee and White Method*

Introduction

Human daily activities do not escape the light or heavy accidents that can cause injury. Wounds are partial damage to body tissues caused by sharp or blunt force trauma. At the time of the injury, the body will respond by stopping bleeding and repairing tissue (hemostasis). Hemostasis is the process of spontaneous stopping of blood in response to damaged blood vessels (Setiabudy, 2012). The main components that are related in preventing bleeding are platelets, clotting factors, tissue repair and fibrinolysis (Nugraha 2015; Apriyani, Sunarni, and Ningsih, 2011). Blood clotting is a process in which blood fluid components are converted into semisolid material called blood clots (Ashcroft, Greenwell-Wild, Horan, Wahl, and Ferguson, 1999). Blood clots are composed of blood cells trapped in fibrin tissues. Fibrin is a protein that is insoluble and in the form of threads shaped like tissues, fibrin formed from fibrinogen found

in plasma. The change in fibrin from fibrinogen is due to the presence of thrombin, which is a proteolytic enzyme that can only work when it is active (Handayani and Haribowo, 2008). Some types of bleeding can be treated with modern and traditional treatment methods. Modern medicine generally uses modern technology in the process of making drugs. Traditional medicine tends to use natural ingredients around us, both obtained from plants and animals (Lee Huang et al., 1996).

In Indonesia there are more than 30,000 species of plants from a total of 40,000 species of plants in the world. A total of 940 of them have been declared efficacious as medicines, or around 90% of all medicinal plants in Asia (Nugroho, 2010). The use of traditional medicine is intensified because it is more easily accessible to the community, both in price and availability. Medicines are traditionally processed, hereditary, based on prescriptions of ancestors, customs, beliefs, or local customs, both magic and traditional knowledge are still believed to be able to treat various diseases. Plant parts of traditional medicine that can be utilized are roots, stems, leaves, sap, flowers and fruit. The type of plant used as an alternative medicine for treatment such as guava leaves, cloves, starfruit walu, banana trees, moringa leaves, crown of the gods flower, tamulawak, betel leaves and others (Thomas, 1992).

One of the plants used for treatment is the banana tree (musaceae) (Suyanti and Supriadi, 2005; Pari and Umamaheswari, 2000; Warzawer-Scwarcz, 1981). Banana trees are generally garden plants. Although in various regions the fruit has been cultivated to be taken. Banana trees always regenerate before they bear fruit through the shoots that grow on their bulbs. Appropriate climate and soil conditions that contain lots of humus allows bananas to spread in Indonesia (Dalimartha, 2005). Banana trees are widely used for various purposes of human life and are known as multipurpose plants because in addition to the fruit, parts of banana trees can be used, one of which is the sap of a banana tree that can be used as a healing wound (Best, Lewis, and Nasser, 1984 ; Warzawer-Scwarcz, 1981).

Banana tree trunks are widely used by the community because they have effectiveness for wound closure, antiseptics and blood clots (Bobbarala, 2012; Cowan, 1999; Cushnie and Lamb, 2005). In the banana tree sap there are substances such as carbohydrates, organic acids, salts, alkaloids, fats, tannins, flavonoids, saponins, mucus, enzymes and others (Sutrian and Yayan, 2011; Wang, 2008) . One of these substances, tannin, can accelerate the release of protein from cells and precipitate these proteins on the cell surface so that it can be useful to accelerate the process of hemostasis and blood clots (Ikramullah, 2015).

Clotting time (CT) is an examination to determine the time it takes for blood to clot in vitro, the unit used in the examination is minutes. This examination is considered effective and efficient, but this examination requires a long time and a decrease in coagulation factors that are less significant will not be measured (Nugraha, 2015).

Research conducted by Zaetun (2014) shows the average results of Clotting Time measurements on venous blood samples without the addition of sap of sap space is 6 minutes 18 seconds. Whereas the venous blood sample that is added to the sap is 1 minute 34 seconds. So it can be seen that the difference in blood clotting time between the two different treatments is very significant. The results of another study conducted by Tantan et al (2012) on "Effect of Musa Paraisiaca latex on the time of blood clots in mice in vitro". The results showed that the experimental group had an average blood clotting time at 16.46 seconds, while in the control group it was 35.02 seconds. The results of the study also showed a very significant difference in blood clotting time, with the experimental group having a faster blood clotting time. Based on this, this research was conducted using human blood samples.

Research Method

This type of research is experimental, where a study looks for influence between one variable with another variable with conditions that have been determined by the author. This research was conducted by Static-group comparison design. This study aims to determine the effect of an action on a group of subjects who received treatment, then compared with a group of subjects who did not get treatment (Nursalam, 2015). The sample is part of a number of characteristics possessed by the population used for research, is representative and must be valid (Sugiono, 2016). The number of participants involved was as many as 30 people. In order for the characteristics not to deviate from the population, before inclusion of samples it is necessary to determine the inclusion criteria, as well as the exclusion criteria. Inclusion criteria are general characteristics of research subjects in the target population and affordable populations. (Sastroasmoro and Sofyan, 2014). Inclusion criteria in this study were 1) participants did not have a history of hemostatic disorders (leukemia, hemophilia, thrombocytopenia); 2) participants are not taking anticoagulam (aspirin) drugs; and 3) non-lysis blood samples. While the exclusion criteria are some of the subjects who meet the inclusion criteria must be excluded from the study due to various reasons (Sastroasmoro and Sopian, 2014). Exclusion criteria in this study were participants who were not willing to be the research subjects.

Tools and Materials

The tools used in this study were 3 ml syringes, torniquet, watrbath, 100 µl and 50 µl micropipets, serology tubes, stopwatches, knives, and sterile bottles. While the materials used are 70% alcohol cotton, label paper, ambon banana tree sap (Musa paradisiaca var. Sapientum), and venous blood samples.

Collection of Ambon Banana Stem Tree Sap (Musa paradisiaca var. Sapientum)

The sap is taken by cutting the trunk of a young ambon banana tree aged 2-3 months using a knife. The sap that comes out of a banana tree trunk is accommodated in sterile bottles of 200 ml and covered so as not to dry.

Lee & White Method Clotting Time Measurement

In this examination 6 test tubes were prepared. Tubes 1, 2 and 3 were not given the sap of the ambon banana tree. Whereas tubes 4, 5 and 6 were given the sap of the banana tree trunk of 150 µl each and then homogenized. After the six test tubes are ready, venous blood is collected using a syringe as much as 3 mL. When blood enters the syringe, the time is measured directly using a stopwatch. Next remove the needle from the syringe and put blood in tubes 1, 2 and 3 each 1 ml in each tube. Tubes 1, 2 and 3 are then put into a water bath to be heated at 37 ^{o}C. Observations were made by tilting the tube to an angle of 450. The time reported as clotting time is the total time from blood entering the syringe until the formation of clots in tube 3. Then steps 3 through 8 are repeated for tubes 4, 5, and 6 without the addition of stem sap. Ambon banana tree.

Results and Discussion

In this study the data used are primary data, that is data obtained from the results of direct inspection. Available data will be presented in the form of descriptive tables and processed statistically to make it easier to explain the results of the study (see Table 1).

Table 1 Data from the Measurement of Blood Clotting Time Using the Lee and White Method

Blood Clotting Time	N	Average Time (Minute)	Minimum Time (Minute)	Maximum Time (Minute)	Standard Deviation
Without Giving the Banana Tree Trunk	30	9.90	8.0	12.0	1.25
By Giving Banana Tree Trunk	30	9.15	7.0	11.5	1.20

Table 2 Statistics Test Results From Comparison of Blood Clotting Time

Blood Clotting Time	N	Average+SB	Difference +SB	IK 95%	P
Without Giving the Banana Tree Trunk	30	9.90±1,25			
			0,78±0,42	0,87±0,55	<0,001
By Giving Banana Tree Trunk	30	9.157±1,20			

The data in Table 1 shows that there is a time difference between the sample given with ambon banana tree sap and those without ambon banana tree sap. The blood clotting time which was given by banana tree sap was 0.72 minutes faster than the sample without banana tree sap. Or in other words the freezing time is shorter by 7.57%. To see the significance of these two results, a statistical test was carried out using the paired T test (see Table 2). T test results showed a P Value of 0.00. This value is below the value of 0.05. So it can be said that the difference is significant and the administration of ambon banana tree sap can accelerate blood clotting time.

The time difference obtained shows that the content of chemical elements in the sap of the ambon banana tree trunk (Musa paradisiaca var. Sapientum) can accelerate blood clotting. The acceleration was due to the chemical content in the sap of the ambon banana tree trunk (Musa paradisiaca var. Sapientum), including tannins and flavonoids. One of the chemical compounds contained in the sap of the ambon banana tree trunk (Musa paradisiaca var. Sapientum) is tannin which is able to accelerate the release of blood protein, namely fibrinogen from cells and precipitate these proteins on the cell surface. Fibrinogen forms fribin threads assisted by thrombin to form blood clots, blood clots occur because fibrin threads will be related to one another and form fibrin meshes that travel in all directions and capture blood cells. And tannins are also polyphenols which have medicinal properties as a wound due to their hemostatic activity by depositing proteins to form clots in the wound (Ikramullah, 2015; Hassanpour, Maheri, Eshratkhah, and Mehmandar, 2013). Besides tannin, there are also chemical compounds that can accelerate hemostasis, namely flavonoids (Cushnie and Lamb, 2005; Lewis, Fields, and Shaw, 1999). Flavonoids have a hemostatic effect by accelerating the increase in platelet counts (Ikramullah, 2015; Cushnie and Lamb, 2005).

As for samples that do not show the acceleration of blood clotting time (sample numbers 14, 17, 19 and 20 (given the sap of the ambon banana tree), the blood clotting time is not

different from the sample without being given the sap, even the clotting time is longer. can be related to factors that can affect blood clotting time which consists of technical factors or clinical factors.Technical factors can be caused by several things such as when carrying out blood from the syringe is too hard, causing blood lysis and storage of latex samples and clinical factors can be caused by Pathological conditions, for example in patients with hemophilia, von Willbrand's disease and thrombocytopenia, the effects of drugs and alcohol consumption can also lead to prolonged hemostasis (Zaetun, 2014).

In different conditions the shortening of blood clots can occur due to several things such as the taking of venous blood which is inappropriate and too long which results in blood foam in the syringe which can cause a shorter clotting time. In addition, impurities in the tube can trigger platelet aggregation which causes shorter blood clotting times. In a person who has thrombophilia (a state of hypercoagulation) can also cause a shorter coagulation time (Zaetun, 2014).

Conclusion

Based on the results of research conducted, it can be concluded that the sap of the ambon banana tree trunk can be used to speed up blood clotting time. The freezing time obtained by giving the sap of the ambon banana tree trunk (Musa paradisiaca var. Sapientum) shows the average time of 9.15 minutes. Whereas the blood clotting time obtained without giving the sap of the ambon banana tree trunk (Musa paradisiaca var. Sapientum) shows the average time of 9.90 minutes. So there is a significant time difference on the results of the clotting time examination with a time difference of 0.72 of 7.57%. Despite this, further research needs to be done. Especially in terms of the antibacterial properties of the ambon banana tree sap.

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References

Apriyani, S., Sunarni, T., dan Ningsih, D. (2011). Efek Estrak Etanol Herba Babadotan *(Ageratu, conijoides, L)* Terhadap Waktu Pendarahan Dan Pembekuan Darah Pada Tikus Putih Jantan (*Rattus norpegicus)*. *Jurnal farmasi Indonesia*.

Ashcroft, G. S., Greenwell-Wild, T., Horan, M. A., Wahl, S. M., Ferguson, M. W. J. (1999). Topical Estrogen Accelerates Cutaneous Wound Healing In Aged Humans Associated With An Altered Inflammatory Response. *Am. J. Pathol*. 155:1137-1146.

Best, R., Lewis, D. A., and Nasser, N. (1984). The Anti-Ulcerogenic Activity of The Unripe Plantain Banana *(Musa Species)*. *Br. J. Pharmacol*. 82(*1*): 107-116.

Bobbarala, V. (2012). *Antimicrobial Agents*. Croatia: Intech.

Cowan, M.M. (1999). Plant Products as Antimicrobial Agents. *Clinical Microbiology Reviews*. 12: 564 – 582.

Cushnie, T.P.T., dan A.J. Lamb. (2005). Antimicrobial Activity of Flavonoids. *International Journal of Antimicrobial Agents*. 26: 343 – 356.

Dalimartha, S. (2005). *Atlas Tumbuhan Obat 2nd Ed*. Jakarta: Trubus Agriwidya.

Handayani, W., dan Haribowo, A. S. (2008). Asuhan keperawatan pada klien dengan gangguan hematologi. Jakarta:.

Hassanpour, S., Maheri, N., Eshratkhah, B., dan Mehmandar, F. B. (2011). Plants and Secondary Metabilotes (Tannins): A Review. *Int. J. Forest, Soil, and Erosion*. 1(*1*): 47-53.

Ikramullah, M. (2015). Efek anti pendarahan alga coklat (*Sargassum sp, dan Padina sp*) pada ekor mencit (*Musmusculus*) (*pilot Study*). Makassar: Fakultas Kedokteran Gigi Universitas Hasanudin Makassar.

Lee Huang, S., P.L. Huang, P.L. Nara, H. Chen, H. Kung, P. Huang and H.I. Huang. (1996). Plant Protection Useful For Treating Tumors and HIV Infections. *US Patent*, 5(484): 889.

Lewis, D. A., Fields, W. N. and Shaw, G. P. (1999). A Natural Flavonoid Present In Unripe Plantain Banana Pulp *(Musa sapientum* L. var. paradisiaca) Protects The Gastric Mucosa From Aspirin-Induced Erosions. *J. Ethnopharmacol*. 65(*3*): 283-288.

Nugraha, G. (2015). *Panduan Pemeriksaan Labolatorium Hematologi Dasar*. Jakarta Timur: CV Trans Info Media.

Nugroho (2010). *Lokakarya Nasional Tumbuhan Obat Indonesia 2th Ed*. Jakarta: Afrogen.

Nursalam, (2015). *Metodologi Penelitian Ilmu Keperawatan 4th Ed*. Jakarta selatan: Salemba Medika.

Pari, L. and Umamaheswari, J. (2000). *Musa Sapientum* Commonly Known As Banana Is Widely Used In Indian Folk Medicine For The Treatment Of Diabetes Mellitus. *Phitother Res*. 14(*2*).

Sastroasmoro, S. dan Sofyan, I. (2014). *Dasar-Dasar Metodologi Penelitian Klinis 5th Ed*. Jakarta: Sagung Seto.

Setiabudy, R. D. (2012). *Hesmostasis dan Trombosis 5th ed*. Jakarta: Fakultas Kedokteran Universitas Indonesia.

Sutrian, dan Yayan, S. (2011). *Pengantar Anatomi Tumbuh-Tumbuhan Tentang Sel Dan Jaringan*. Jakarta: Rineka Cipta.

Suyanti dan Supriadi, A. (2005). *Pisang 5th Ed*. Jakarta: Penebar Suadaya.

Tantan, R. G., Thunyakunsatja, E., Padillo, J. P., Promkun, N., dan Hwa, C. Y. (2012). Pengaruh getah pisang (*Musa Paradisiaca*) pada waktu pembekuan darah tikus albino (*Rattus Norvegicus*). Mandaue: Universitas Biologi Departemen Cebu Dokter.

Thomas, S. (1992). *Tanaman Obat Tradisional 2nd Ed*. Yogyakarta: Kanisius.

Wang, H. (2008). Antiinflamatory Activities of Triterpenoid Saponin from Polygala Japonica. *Phytomedicine*.15(*5*): 321-326.

Warzawer-Scwarcz, L. M. D. (1981). Treatment Of Plantar Warts With Banana Skin. *Plastic and Reconstructive Surgery.* 68(*6*) : 975.

Zaetun, S. (2014). Daya Hambat Getah Tanaman Jarak Tintir (*Jatropha multifida linn*) Terhadap Proses Penyembuhan Luka Ditinjau Dari Hasil Pemeriksaan Clotting Time. *Jurnal Kesehatan Prima*, 8(*2*):1308 – 1314.