The Use of Aloe vera Gel on Scar Collagen

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ABSTRACT

Aloe vera have active chemicals substances including saponins, tannins, flavonoides, and polyphenols. Saponin takes a role as a disinfectant, so it is normally effective for healing any open wounds, while tannins have ability to be an antiseptic. This study aims to see how the effect of the Aloe vera gel on wound collagen, and too inspect which is the most effective concentration of the Aloe vera gel in the formation of wound collagen in wistar strains (*Rattus novergicus*) rats. This study uses a post-test only method with control group design. The subjects of this study were 28 male Wistar rats (*Rattus novergicus*). The subjects were divided into 4 groups consisting of 1 negative control group and 3 treated groups, the control group was not given any treatment, while the treated group was given the Aloe vera gel with each concentrations of 12.5%, 25%, and 50% respectively. The experiment was started by making a wound on the back of the rat which then be followed by applying the gel to the wound for 14 days. The results showed the group with the 50% Aloe vera gel treatment had the best collagen formation, followed by a concentration of 25%, 12.5%, and the control group. Therefore, the used of Aloe vera has given good change in scar collagen, and the best scar collagen can be viewed in the group with 50% concentrate of Aloe vera.

The definition of wound is the loss of tissue continuity.¹ Wounds are the damaged parts of some of the bodies tissues that can occur in our daily lives. Some of the causes of wound can be divided into wound because of chemical substance, thermal wound, and mechanic. Mechanic wound usually happen varying/depending on the object that made touches it.² Wound is a common case that happens to humans. The top three injuries that Indonesians suffers are excoriation/contusion amounting to about

70,9% and vulnus laceratum around 23,2%.³

Since old times, Indonesians have known and took advantages of medicinal plants as one of the effort to resolve health problems, precisely for wound treatment by using herbal ingredients. Maintenance and development of traditional plants continued and its developments are pushed through extractions, experiments and productions of herbal medicines using modern equipments.⁶

Some of the previous research showed the effect of aloe vera on wound

healing. There are substances that are capable of helping wound heals founded in aloe vera leaves.⁴

Aloe vera plants, both the leaves and roots contains substances such as saponin, tannin, flavonoid, and polyphenol. Saponin takes a role as a disinfectant, so it is normally effective for healing any open wounds, while tannins have ability to be an antiseptic.⁴ Flavonoid and polyphenol have the ability as antiseptic as well. In some countries aloe vera is commonly used as first aid step on wound. Aloe vera contains a lot of active substances that can be helpful on wound recovery because it has glucomannan, lignin, vitamin A, vitamin C, enzymes, and amino acids that has roles in cell regenerations.¹

One previous study showed that there is a connection between the application of aloe vera gel to the formation of wound fibrotic tissue. It is also mentioned that aloe vera has very profound effect for the proliferation phase in which it provides the effects of wound reduction and size of the wound.⁴

Because there hasn't been any research done about the effect of aloe vera gel on scar collagen, the we are interested to study the effect of aloe vera gel on scar collagen.

RESEARCH METODOLOGY

This type of research is a laboratory experimental research using complete randomized design with posttest only control group design. This research used 28 animal tester which are the male white rats (*rattus norvegicus* strain wistar). The experimental animals are divided into 4 simple-randomized group that consists of 3 behavior group and 1 control group. For the upkeep and handling/treatment of the experimental animals and also

histopathological examination will be done in the pharmlology laboratory of the veterinary medicine faculty of syiah kuala university. Herbarium laboratory of the biology major of the math and science faculty (FMIPA) syiah kuala university for the herbarium test and chemistry laboratory of the math and science faculty (FMIPA) syiah kuala university for the phytochemical test. The research is done in april-november 2018. The data will be collected in September-October 2018.

The study is done on experimental animals which are the 28 male white rats (*rattus norvegicus* strain wistar).

The tools used for the research are: rats nest, rats feeding and drinking place, experimental animal analytical scales, fur shaver, gloves, mask, rulers, blenders, vacuum rotary evaporator, erlemeyer, Buchner funnel, sterilized gloves, aluminium foil, filter paper, cotton buds, digital camera, measuring glass, minor surgery tools/equipment, and microtechnics tools to make the histology preparations (object glass, cover glass, paraffin mold, oven, and microscope).

The materials used for this research are the aloe vera meats that came from the aloe vera plants that are obtained through, 70% ethanol, alcohol, aquades, tools to make the histology preparations, 10% ormalin solution, paraffin, xylitol solution, hematoxylin-eosin, rats food such as pellet 529 and its drinks which is aquades.

RESULT

Herbarium study is done to determine the plant being used and to establish the validity. According to the determined result, the plant being used in this research is aloe vera. Phytochemical test results of leaf ethanol extract contains substansces such as alkaloids, steroids,

flavonoids, saponins, and phenolics / tannins.

Table 1 Phytochemical test result

Uji Fitokimia	Ekstrak Etanol Daun Binahong
Alkaloid	+
Steroid	+
Terpenoid	-
Saponin	+
Flavonoid	+
Fenolik / Tanin	+

Based on the results of the research conducted within the span of 14 day it obtained the macroscopic examination data and microschophic wound slices of the experimental animals on day 14th can be seen below.

Image 1 Average length of wound slices

According to the two tables below it can be seen that aloe vera gels with 50% concentration is the most effective concentration in wound healing, it is identified by the average wound length and the biggest average collagen thickness.

Image 2 Average of collagen thickness

One way test ANOVA is a test to determine whether there are any major effect toward the treatment. Hypothesis (Ho) is accepted if there's any significant numbers/value, which is a sign that there is no major/meaningful effect towards the treatment. On the contrary, if there's significant numbers $\leq 0,05$ ($p \leq 0,05$) then Ho is denied, which signify a significant effect towards the treatment. If from the calculation result there is smaller F value calculated than F table then the hypothesis (Ho) is accepted.

Table 2 wound alterations/changes from the ANOVA test result day 0-14

	Jumlah Kuadrat	Derajat Bebas (df)	Kuadrat Tengah	F hitung	P-value
Antara Kelompok	7,134	3	2,378	12,049	0,000
Dalam Kelompok	4,736	24	,197		
Total	11,870	27			

However, if from the calculation result there is bigger F value calculated than F table then hypothesis (Ho) is denied. The result from one way ANOVA test method that is listed in table 2 as follows. According to the result of table 4.3 it is obtained that P value = 0,000 ($p \leq 0,05$). Then the conclusion can be drawn that the result of

Table 3 The connection between collagen thickness in sliced wounds with wound length alteration.

	N	Rerata $\pm$ SD	p-value
Perubahan hari 0-14 (cm)	28	0,7911 $\pm$ 0,66305	0,000
Ketebalan Kolagen (μm)	28	516,19 $\pm$ 105,564	

Table 4 The comparison of wound length between control and each treatment.

	Kelompok	Perubahan (cm)
Kelompok Kontrol	Aloe vera 12,5%	-0,57
	Aloe vera 25%	-1,20
	Aloe vera 50%	-1,22

Table 5 The result of the Duncan test about sliced wound length alteration (cm) day 0-14.

Perlakuan	N	Alpha=0,05		
		1	2	3
Kontrol Negatif	7	-0,0429		
Aloe vera 12,5%	7		-0,6143	
Aloe vera 25%	7			-1,2429
Aloe vera 50%	7			-1,2643
P – value		1,000	1,000	0,929

Table 6 the result of the Duncan test about collagen thickness (μ m) in sliced wounds day 14

Perlakuan	N	Alpha=0,05			
		1	2	3	4
Kontrol Negatif	7	384,208			
Aloe vera 12,5%	7		465,678		
Aloe vera 25%	7			566,124	
Aloe vera 50%	7				648,792
P – value		1,000	1,000	1,000	1,000

one way ANOVA has major/ significant effect to every research group. Next, a differentiation test was performed using Duncan method. According to table 3 it can be concluded that there is a significant relation between wound length examination (macroscopic) and collagen thickness

(microscopic). Subsequently in 4 showed the comparison of controlled group to each treatment.

Next, using the Duncan method which is a differentiation test that aims to see and compare treated group which have major

differences. Hypothesis (Ho) is accepted if the significance value $0,05$ ($p \leq 0,05$) which means there is no major differences between treated groups. However, Hypothesis is denied if the significance value $\leq 0,05$ ($p \leq 0,05$), in which case there According to table 4,4 dan 4,5 above we found changes to the wounds length and collagen thickness are the best using aloe vera gel 50% treatment and then followed by 25%,12.5%, and the last is negative control. Therefore, it can be concluded that aloe vera gel with 50% concentration is the most efficient in healing sliced wound on male white rats (*rattus norvegicus* strain wistar).

DISCUSSION

Application of aloe vera gel with heightened concentration towards experimental animals showed significant differences at the highest concentration which is 50%. According to the result of the 14 days research, it showed that the higher the aloe vera gel concentration that was applied to the experimental animals, the thicker the collagen connective tissue gets. According to the phytochemical test result, aloe vera gel contains various chemical compound such as alkaloids, steroids, saponins, flavonoids, and phenolics / tannins.

Collagen is a family of extracellular proteins which are the main components of connective tissue. Collagen gives strength and flexibility, consisting of a family that has a triple helix configuration. From the observation on day 14 in each group, there are phase 2 wound healing process which is observed/ marked by the shortened distance at the of the wound and also the formation of collagen fibre on microscopic examination/inspection.

According to the phytochemical test result that we did, aloe vera gel contains various chemical compound such as

alkaloids, steroids, terpenoids, saponins tannins, and flavonoids which are beneficial towards wound healing on experimented animals. The research is also backed by other previous research such as Napanggala, dkk (2013), stated that saponins composition in aloe vera can help trigger collagen growth in the healing process and supports formations of new cells.

Based on the research result by Nycho Alva Chindo (2015) in a journal titled "Benefits of aloe vera substances antiinflammatory of stomatitis" stated that aloe vera has a complex role in wound wound healing. Aloe vera contains amino acids like tryptophane and phenylalanine that has anti inflammatory activity. Aloe vera also contains salicylic acid that function as prevention towards prostaglandin biosynthesis and arachidonic acid, therefore we can conclude that aloe vera has analgesic effect and helps reduce inflammation so that it contribute/aid the quality of wound healing.

Proliferation phase is proven by the presence of angiogenesis, collagen tissue deposition, epidermal maturation, and shrinking of the wound. In the proliferation phase or epithelialization phase, there is forming of granulation in which the wound looks freshly-shiny and reddish in color, that is why this phase is called granulation phase. The granulated tissue consists of a combination of fibroblast, inflamed cell, new blood vessel, fibronectin, and hyaluronic acid. Proliferation phase is also known as collagenisation phase.

CONCLUSION

The result of this research can conclude that aloe vera gel is infact effective towards the formation of wound collagen on male white rats (*rattus norvegicus* strain wistar). The higher the concentration of the aloe vera gel that was applied, the thicker the collagen tissue found on male white rats

(rattus norvegicus strain wistar) wound, and it is expected that aloe vera can be used as an alternative medicine to treat wound in our daily live.

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