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Burns Wound Healing Activity of Extract Gel Formula of Lidah Buaya (*Aloe vera*) and Senggani Leaf (*Melastoma polyanthum*)

(*Aktivitas Penyembuhan Luka Bakar Formula Gel Ekstrak Lidah Buaya (Aloe vera) dan Daun Senggani (Melastoma polyanthum)*)

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ABSTRACT

Aloe vera and senggani leaf can accelerate tissue regeneration, re-epithelialization, fibroblast stimulation, and collagen formation in the skin for burns wound healing. Burns wound can cause damage in the capillaries of the skin, then *Aloe vera* and senggani leaf were formulated into the gel formula for burns wound healing. The gel has the advantage of high water content; then it will hydrate the epidermis layer, increasing the penetration of the active substances. This study aims to formulate a gel of extract *Aloe vera* and senggani leaf (*Melastoma polyanthum*) and to evaluate the burns wound healing activity. The gel was formulated by composition of *Aloe vera* : senggani leaf with concentrations (0.5%: 1%); (0.5% : 3%); and (0.5% : 5%). Burns wound healing activity was observed by the diameter of the burn wound. The result showed that the gel with a concentration of (0.5%: 5%) gave a significance value of 0.692 ($p > 0.05$) against positive control, then it was the formula that effective for burns wound healing.

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ABSTRAK

Lidah buaya dan tanaman daun senggani memiliki beberapa kemampuan antara lain mempercepat pertumbuhan kembali jaringan serta epitelisasi kulit, selain itu meningkatkan pembentukan fibroblast dan kolagen terhadap aktivitas penyembuhan luka bakar. Luka bakar menyebabkan kerusakan pembuluh kapiler kulit, sehingga lidah buaya dan daun senggani diformulasikan menjadi sediaan gel untuk penyembuhan luka bakar. Gel memiliki keuntungan yaitu kadar air yang tinggi, sehingga akan menghidrasi lapisan epidermis yang meningkatkan penetrasi zat aktif. Tujuan penelitian ini untuk memformulasikan gel dari ekstrak lidah buaya (*Aloe vera* L.) dan daun senggani (*Melastoma polyanthum* Bl) serta mengetahui aktivitas penyembuhan luka bakar pada tikus putih (*Rattus norvegicus*). Formulasi gel dibuat dengan perbandingan lidah buaya : daun senggani dengan konsentrasi (0,5% : 1%); (0,5% : 3%); (0,5% : 5%). Aktivitas penyembuhan luka dengan mengamati diameter penyembuhan luka bakar. Hasil penelitian menunjukkan bahwa gel dengan konsentrasi (5%:0,5%) menunjukkan hasil yang signifian dimana p=0,692 (p > 0,05) terhadap kontrol positif sehingga formula ini efektif terhadap penyembuhan luka bakar.

Kata kunci: Penyembuhan luka bakar; Lidah buaya; Daun senggani; Gel

INTRODUCTION

The condition that occurs tissue damage or loss caused by radiation, heat, chemicals, or electricity is called a burn. It can change or damage our body systems. Direct or indirect contact between the skin surface and objects that produce heat can cause burns wound (Anggorwasito, 2014). One of the healing burns' preparations is good penetration and a long time to use on the skin. Appropriate preparations that provide a local therapeutic effect with fast healing activity are gels (Izzati *et al.*, 2015).

Gel preparations have many advantages, including precise preparations; attractive shape and appearance; elastic consistency; and good drug release. The high water content in the gel prevents skin irritation. The gel is applied to the skin tissue, or mucous membrane burned to see the therapeutic effect (Wandi et al., 2015). The high water content in the gel produces a non-sticky gel preparation, and then it will hydrate the epidermal layer, thereby increasing the penetration of active substances (Anggraini *et al.*, 2013).

One plant that has a moisture content of 99% is *Aloe vera*. *Aloe vera* also contains nutrients like protein, calcium, fat, phosphorus, vitamin A, vitamin B, and fibre (Dharmawan 2015). *Aloe vera* also has chemical metabolites such as saponins, tannins, flavonoids, and polyphenols. These metabolites are known to stimulate epidermal growth factors and improve fibroblast function to accelerate healing and closure of wound healing (Puspitasari *et al.*, 2016). According to research, Hikma (2018), a combination gel of ethanol extract of Chinese petal leaves and *Aloe vera* extract can burn wound healing at the concentration (15%: 0.5%).

Furthermore, senggani leaf (*Melastoma polyanthum*) is known to have several abilities, including accelerating tissue regrowth and skin epithelialization; increasing the formation of fibroblasts and collagen against burn healing activities; and having an anti microorganism effect. Chemical metabolites in senggani leaf (*Melastoma polyathum*) are tannins, flavonoids, triterpenoids, steroids, glycosides, saponins, and phenolics. Chemical metabolites such as steroids, tannins, saponins, and flavonoids help burn wound healing activities (Izzati et al., 2015). According to the research of Wandi, et al. (2015), the ethanol extract gel of senggani leaf at 5% concentration provides healing *combustion* level II in male rats.

Based on the previous study, this study produced gel preparations of extract *Aloe vera* and senggani leaf (*Melastoma polyanthum*) that has activities in burn wound healing. This study aims to formulate a gel of extract *Aloe vera* and senggani leaf (*Melastoma polyanthum*) and to evaluate the burns wound healing activity.

MATERIAL AND METHODS

Materials

Aloe vera samples were collected from Pinrang, South Sulawesi. Senggani leaf samples were collected from Burau, Luwu Timur, South Sulawesi. Sampling was collected in the morning at 07.00 - 09.00. Aquadest, benzoic acid, carbopol, glycerin, and propylene glycol were purchased from PT Sumber Rejeki Chemical, Indonesia. *Streptococcus mutans* was obtained from Microbiology Laboratory, Hasanuddin University.

Methods

Preparation of sample

Senggani leaf simplicia as much as 688 g, was put into a vessel then extracted by the maceration method using 96% ethanol and left to stand for 1x24 hours. After 24 hours then filtered using a filter cloth, the filtrate is collected, and the residue is added with another 96% ethanol solvent. The filtrate is collected and then put in a *rotary evaporator* at a temperature of 40-45^{o}C for the resulting extract of senggani leaf. Meanwhile, 2000 grams of aloe vera have been blended and then freeze-dried to become powder. The aloe vera sample's dry powder was put into a vessel and then extracted by maceration method using 96% ethanol and left for 1x24 hours. After 24 hours then filtered using a filter cloth, the filtrate is collected, and the residue is added with 96% ethanol solvent. The filtrate is collected and then evaporated with a rotary evaporator at a temperature of 40-45^{o}C until the resulting extract of *aloe vera*.

Formulation of gel

Gel preparations were made with various concentrations of senggani leaf and *Aloe vera* extract.

Table 1: Composition of gel preparation

No	Composition	Function	Concentration (%w/w)			
			KN	FI	FII	FIII
1	*Aloe vera* extract	Active substance	-	0.5	0.5	0.5
2	Senggani leaf extract	Active substance	-	1	3	5
3	Carbopol	Base	0,5	0,5	0,5	0,5
4	Benzoic acid	Preservative	0,5	0,5	0,5	0,5
5	Propylene glycol	Cosolvent	25	25	25	25
6	Glycerin	Humectant	15	15	15	15
7	Distilled water ad	Solvent	100	100	100	100

Notes:
KN: formula of negative control, F1: formula by the composition of *Aloe vera*: senggani leaf with concentrations (0.5%: 1%), F2: formula by the composition of *Aloe vera*: senggani leaf with concentrations (0.5%: 3%), F3: formula by the composition of *Aloe vera*: senggani leaf with concentrations (0.5%: 5%).

The first step, carbopol, was dissolved in heat water until the gel base form into mucilago. After that, benzoic acid, glycerin and propylene glycol were dissolved into water in a mortar. *Aloe vera* extract and *senggani leaf* extract were dissolved into water in the other mortar, and then added the mucilago and stirred until a homogeneous mass was obtained. The last step, distilled water, was added until the gel mass was 100 g.

Evaluation of gel

a. Cycling test
   Cycling test was carried out in six cycles for 12 days by observing any gel preparation change at 4°C and 40°C in 24 hours (Wandi et al., 2015).
b. Organoleptic test
   The gel preparations' organoleptic test was observed for every change of the forms, colour, odour, and consistency. This test was observed before and after cycling test (Yusuf, 2019).
c. pH measurement
   The indicator of universal pH paper observed measurement of pH of the gel preparations. The results were seen in the pH indicator, which showed that the pH value did not change compared to the skin's pH, which ranges from 4.5-6.5 (Wandi et al., 2015).
d. Homogeneity test
   Homogeneity test was carried out by observing particles in the gel applied into a glass beaker. The result was obtained when the gel preparation was mixed homogeneously (Wandi et al., 2015).
e. Spreadability test
   The spreadability test was determined by measuring the spreading diameter of 0.5 g gel in the between of a watch glass with a diameter of 15 cm and then given a load of 150 g for 60 seconds. The result was obtained when the gel preparation diameter was between 5-7 cm (Wandi et al., 2015).

Treatment of experimental animals

A total of 15 experimental male white rats (*Rattus norvegicus*) were divided into five groups, respectively
Group 1: Rats were burns wound and given a KN gel formula as a negative control.
Group 2: Rats were burns wound and given a FI gel preparation
Group 3: Rats were burns wound and given a FII gel preparation
Group 4: Rats were burns wound and given a FIII gel preparation
Group 5: Rats were burns wound and given a bioplasenton gel® (Neomycin sulfate 0.5% and placenta ex bovine 10%) as a positive control.

Burn wound healing activity

Rats skin were shaved and anaesthetized using ethyl chloride. It was useful for reducing pain due to burning induction. A hot iron plate created the burns induction with a diameter of 2 cm, which was heated for 3 minutes. After that, it is attached to the back of the rats for 5 seconds. Gel preparations in each group were given by applying directly to the burn wound using a *cotton swab* since the wound occurred 3 times a day. Observations were carried out for up to 21 days to reduce the burn wound's diameter using callipers (Wandi *et al.*, 2015).

Statistical analysis

The experiments' data were analyzed by one-way analysis of variance (ANOVA) and post-hoc LSD statistical tests. It was used to assess the statistical significance ($p<0.05$).

RESULTS AND DISCUSSION

Aloe vera was obtained from Kab. Pinrang and senggani leaf (*Melastoma polyanthum*) were obtained from Kec. Burau, East Luwu, South Sulawesi. The extraction method depends on the properties of the material and compound to be extracted. Before choosing an extraction method, the chemical

metabolites' target needs to be determined (Mukhriani, 2014). *Aloe vera* and senggani leaf are not resistant to heating. So the maceration method is suitable for the extraction of samples. The principle of this method is extracting by soaking with 96% ethanol as solvent. The extraction process is useful so that there is a balance in the concentration of compounds in the solvent and plant cells (Mukhriani, 2014). The results of the extraction of each sample can be seen in table 1

Table 1. Extraction results

Sample	Simplicia weight (g)	Extract weight (g)	Yield (%)
Aloe vera	2000	4	0.2
Senggani leaves (*Melastoma polyanthum*)	688	66	9.59

Aloe vera contains 99% water content and senggani leaf are considered for burns wound healing activity. The gel base used carbopol, which has a high viscosity and produces a more transparent gel. In-gel preparations, the gel stability needs to be known. The gel stability test is carried out throughout the storage and usage period to ensure the identity, strength, quality, and purity of the product (Ariyanti, 2019).

The gel is given to the skin tissue, or mucous membrane burned to see the therapeutic effect (Wandi et al., 2015). The high water content in the gel produces a non-sticky gel preparation, and a high amount of water content will hydrate the epidermal layer, thereby increasing the penetration of active substances (Anggraini *et al.,* 2013) so that the gel preparation was chosen because of the high water content, which is expected to provide a cooling effect on the skin and reduce irritation. Gel stability test using accelerated storage method and extreme temperature difference. The result showed that there was no change in organoleptic, pH, dispersibility, and homogeneity can be seen in tables 2 and 3.

Table 2. Evaluation before cycling test

Evaluation	Before cycling test				
	KN	FI	FII	FIII	KP
Form	semisolid	semisolid	semisolid	semisolid	semisolid
Colour	transparent	light green	dark green	dark green	cloudy
Odour	characteristic	characteristic	characteristic	characteristic	fragrant
pH	5	5	5	5	5
Dispersibility	5,6 cm	5,5 cm	5,3 cm	6 cm	5,2 cm
Homogeneity	homogeneous	homogeneous	homogeneous	homogeneous	homogeneous

Table 3. Evaluation after the cycling test

Evaluation	After cycling test				
	KN	FI	FII	FIII	KP
Form	semisolid	semisolid	semisolid	semisolid	semisolid
Colour	transparent	light green	dark green	dark green	cloudy
Odour	characteristic	characteristic	characteristic	characteristic	fragrant
pH	5	5	5	5	5
Dispersibility	6 cm	6 cm	5 cm	5,5 cm	5 cm
Homogeneity	homogeneous	homogeneous	homogeneous	homogeneous	homogeneous

Notes: KN: formula of negative control, F1: formula by the composition of *Aloe vera*: senggani leaf with concentrations (0.5%: 1%), F2: formula by the composition of *Aloe vera*: senggani leaf with concentrations (0.5%: 3%), F3: formula by the composition of *Aloe vera*: senggani leaf with concentrations (0.5%: 5%), KP: bioplasenton® gel.

The degree of burn depth is divided into three groups: first-degree burns, second-degree burns, and third-degree burns (Moenadjat, 2016). In this study, the degree of burns carried out was second-degree

burns, namely superficial-dermal burns. Second-degree burns occurred in the epidermis layer and part of the dermis layer. The characteristic of second-degree burns, there are *bullae* which are non-vital tissue. After the induction of burns was detached from the dermis layer, it was continued with the topical application of gel to the wound according to the treatment group. The treatment was carried out every day until the 21st day, 3 times a day. Then the observation of burn wound healing diameter was carried out, as shown in Figure 1.

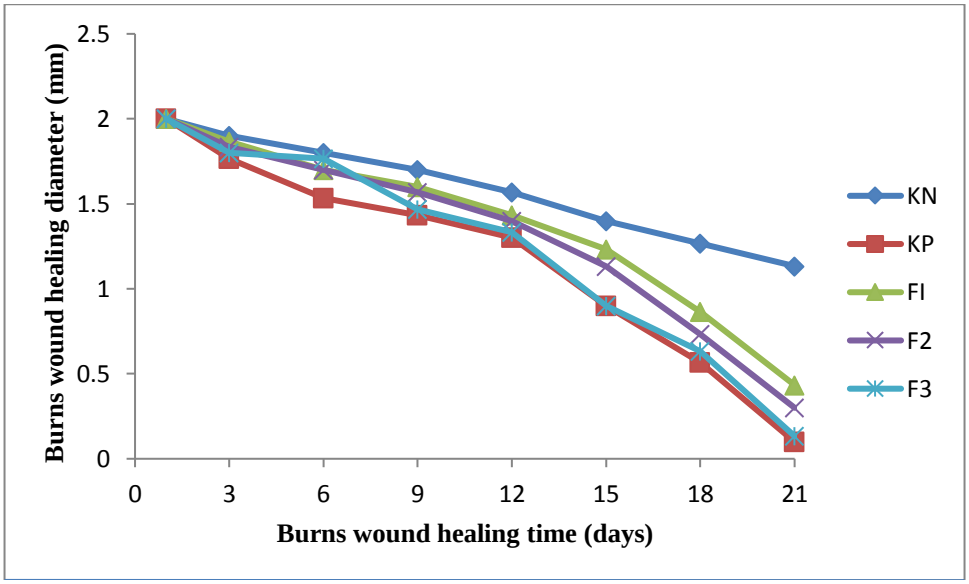

Figure 1. Burns wound healing activity

In this study, observations were made by looking at the reduction in burn diameter observed for 21 days. From the results of the reduction in the diameter diagram of the burn, it is known that formula 3 by the composition of *Aloe vera* and seggani leaf 5%: 0.5% shows results that are not different from formulas 1 and 2. When burns are induced, the diameter of the wound in each rat is 2 mm, on day 3, the average burn diameter has decreased, burn wound healing activity in rat continues to change. On day 21, the burn area was close to 0 mm for positive control, while for the negative control, until the 21st day, the burns change diameter was over 1 mm.

The research results were then continued with SPSS processing using the test, One Way ANOVA, which showed that on the 21st day, the value of $p = 0.000$ ($p < 0.05$). It was followed by post hoc LSD to determine which groups were significantly different. The results showed that in formulas 1, 2 and 3 the value of $p = 0.000$ against negative control ($p < 0.05$). Meanwhile, compared with positive control, formula 3 has a value of $p = 0.692$ for positive control ($p > 0.05$). Based on this, it is known that formula 3 gel with a concentration ratio of aloe vera and senggani leaves (5%: 0.5%) was not significantly different from the positive control, namely Bioplacenton®.

This is based on the chemical content in senggani leaves, respectively flavonoids, tannins, steroids, and saponins found in both aloe vera extract and senggani leaf. Tannins are known to have the function of shrinking skin pores so that they function as wound closures and prevent bleeding. Saponins are also known to be antiseptic to prevent infection due to microorganisms' growth during the wound healing process. Flavonoids and steroids have anti-inflammatory effects, but flavonoids accelerate wound healing compared to steroids. Flavonoids are also known to prevent oxidation from being anti-pain and anti-inflammatory (Izzati et al., 2015).

Meanwhile, *Aloe vera* stimulates epidermal growth factors, increase fibroblast function and form new tissue so that it can accelerate wound healing and closure burn (Puspitasari *et al.*, 2016). Based on the

chemical content contained in *Aloe vera* extract and senggani leaf, this is by the effectiveness of the content of positive control, namely Bioplacenton® gel. Bioplacenton® gel has a composition of placenta extract and neomycin sulfate. The effect of placenta extract is to accelerate new tissue and wound healing, while neomycin sulfate is an antibiotic against various bacteria during the wound healing process (Ningsih *et al.,* 2015).

CONCLUSION

The results showed that the gel formula of aloe vera (*Aloe vera*) and senggani leaves (*Melastoma polyanthum*) with a concentration ratio of 0.5%: 1%; 0.5%: 3%; and 0.5%: 5% indicated that there was no change in organoleptic, pH, dispersibility, and homogeneity. The burn healing activity test of *Aloe vera* and senggani leaf extract gel on 21st day for the concentration (0.5%: 5%) showed a decreasing in burn diameter of 0.13 mm. This has not significancy different with the positive control which showed a change in diameter burns of 0.08 mm.

REFERENCES

Anggowarsito, J. L. (2014). Luka Bakar Sudut Pandang Dermatologi. *Jurnal Widya Medika Surabaya Vol.2* No.2.

Ariyanti, Masruriati, E., Wanti, L. A. (2019). Stabilitas Formulasi Gel Ekstrak Buah Naga.*Jurnal Farmasetis Volume 8* No 2, Hal 83- 88

Dharmawan, R. (2015). *Pengaruh pemberian sediaan gel penyembuh luka pada tikus jantan galur wistar dengan kombinasi bahan aktif kitosan dari limbah kulit udang windu (Peneaus mondon) dan ekstrak (Aloe vera)* (Unpublished undergraduate thesis), Sanata Dharma University, Indonesia.

Hikma, N. N. (2018). *Pengaruh sediaan gel kombinasi ekstrak daun petai cina (Lauceaena leucocephala) dan ekstrak lidah buaya (Aloe vera) terhadap aktivitas luka bakar pada tikus (Rattus norvegicus)* (Unpublished undergraduate thesis), Syarif Hidayatullah University, Indonesia.

Izzati, U. Z., Fahrurroji. A.,& Andrie. M. (2015). *Efektivitas Penyembuhan Luka Bakar salep Ekstrak Etanol Daun Senggani (Melastoa malabathricum L.)Pada Tikus (Rattus Norvegicus) Jantan Galur Wistar* (Unpublished undergraduate thesis), Tanjugpura University, Indonesia.

Mukhriani. (2014). Ekstraksi, Pemisahan Senyawa, Dan Identifikasi Senyawa Aktif. *Jurnal : Kesehatan Vol. 2* No. 27.

Ningsih, S., Paturusi, A.A.E., Amalia, N.R. (2015). Uji Efek Penyembuhan Gel Ekstrak Daun Jarak Merah (*Jatropha gossypifolia* Linn.) Terhadap Luka Sayat Pada Kelinci (*Oryctolagus cuniculus*). *Journal Farmasi UIN Alauddin Makassar Vol. 3* No.3.

Puspitasari, R., Sunyoto.,& Arrosyid, M. (2016). Uji efektivitas ekstrak lidah buaya (*Aloe vera* L.*)* terhadap penyembuhan luka sayat pada mencit jantan (*Mus musculus)* Galur Swiss.*Cerata journal of pharmacy science.*

Wandi, R., Fahrurroji, A., & Wahdaningsih, S. (2015). *Efektifitas Gel Combustio Derajat II Ekstrak Etanol Daun Senggani (Melastoa malabathricum L.) Pada Tikus Jantan (Rattus Norvegicus)*(Unpublished undergraduate thesis), Tanjugpura University, Indonesia.