

Nasution Sri Lestari Ramadhani, Revina Monica, Yuliani Riski, Nasution Sri Wahyuni. The Effectiveness Comparison of *Aloe Vera* and *Nothopanax Sutellarium* Extract Toward Thermal Burn on White Rat (*Rattus Norvegicus*). *Journal of Education, Health and Sport*. 2019;9(4):580-590. eISSN 2391-8306. DOI <http://dx.doi.org/10.5281/zenodo.2653313>
<http://ojs.ukw.edu.pl/index.php/johs/article/view/6869>

The journal has had 7 points in Ministry of Science and Higher Education parametric evaluation. Part B item 1223 (26/01/2017).
1223 Journal of Education, Health and Sport eISSN 2391-8306 7

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The authors declare that there is no conflict of interests regarding the publication of this paper.

Received: 15.04.2019. Revised: 25.04.2019. Accepted: 29.04.2019.

The Effectiveness Comparison of *Aloe Vera* and *Nothopanax Sutellarium* Extract Toward Thermal Burn on White Rat (*Rattus Norvegicus*)

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Abstract

Thermal burn is depicted as tissue damage which is caused by heat contact, chemical material, electricity and radiation. Several herbal materials that can be used as burn healing are *Aloe Vera* and *Nothopanax Scutellarium*. This study is aimed to find out the effectiveness comparison between 50% and 70% concentration on each herbal materials. The sample that used is 30 white rats (*Rattus Norvegicus*) which is chosen according to the inclusion criteria, and will be divided into 6 groups in which each of groups are given different treatment including: positive control, negative control, 50% formulation of *N. scutellarium* extract ointment, 75% *N. scutellarium*, and 50% *A. vera*. The extract formulation is obtained using maceration method using 96% ethanol solvent, and then the extract will be formulated to be *A. vera* extract ointment and *N. scutellarium* with 50% and 75% concentration. The withe rats which given thermal burn treatment will be applied using ointment extract, and it will be left out and observed every three days. Afterward, from the results, the significant will be assessed using ANOVA method. Thus, the results show that *A. vera* has $p = 0,045$ and *N. scutellarium* has $p = 0,038$ and for both of them are $p < 0,05$. The T significance then assessed by the result of *A. vera* extract and *N. Scutellarium* are $p = 0,000$ and $p < 0,005$, respectively. Hence, from the result of assay, the smallest level of burn severity is on *N. scutellarium* extract, therefore it can be said as the most effective for wound healing with 75 % concentration than *A. vera*.

Keywords: *aloe vera*, *Nothopanax Sutellarium*, *thermal burn*, *ointment*.

1. INTRODUCTION

Thermal burn is defined as tissue damage which is caused by heat high temperature contact (as like fire, hot water, chemical material, and radiation) or even by the lowest temperature. Due to tissue damage, there will be some problems appeared in which it will cause thermal burn high morbidity and mortality wound.

Afterward, thermal burn is described as burn healing in which the damage includes the entire of epidermis and some parts of dermis layer. The response can be in a form of acute inflammatory reaction, and exudation process (the wound look 'wet' due to the loss of epidermis) [1]. Furthermore, the mortality rate caused by thermal burn reaches 300.000 in every year [2]. In Indonesia itself, especially in East Java, there are 105 cases of thermal burn and 25 patient (23,8%) should be treated in burn center of hospital [3].

The main problem faced in the recovery of burn healing is a prolonged inflammatory process which causes tissues' fragile and will lead into structure configuration and end with deformity and dysfunction form. However, it can be prevent by recovery on first phase which are the loss and/or epithelium or even the tissue which become structure with the below structure [1]. Patients who have thermal burn will get some problems if it does not well-recover, such as: 1) the increase in bacteria that will cause infection, 2) disruption of body circulation that will lead into shock, 3) the disruption of input and output of body fluids that will cause body's electrolyte fluid [4].

Nowadays, burn therapy being developed through topical and herbal extracts [5]. The Indonesian society has been familiar and taken beneficial on herbal plants as an effort to overcome the health problems faced.

Some of plants which have beneficial effect on burn healing are *Aloe vera* and *Nothopanax scuteliaium merr*. Saponin is considered to be one of the *A. vera* ingredients that

help to accelerate the burn healing. It has function as antibacterial by damaging the bacteria wall, thus the bacteria will be lysis and at last will decrease the risk of infection. Besides, saponin also accelerates the growth of new cells and able to maintain body fluids, so therefore the body fluids will be balance [6]. Furthermore, *A. vera* also contain of tannin which has function to prevent the wound infection due to the antiseptic potency and burn healing medication [6, 7].

Meanwhile, the root and leaf of *N. scutellarium* has a lot beneficial as herbal plants and medication, *N. scutellarium* contains of flavonoid, alkaloid, saponin, polyphenol, and fat. The benefits from *N. scutellarium* are ease the digestive system, prevent hair loss, burn healing, antibacterial, anti-inflammation, accelerate the blood circulation, prevent anemia symptom, and body antioxidant [8].

For the recovery of thermal burn can be obtained using *A. vera* and *N. scutellarium*. Both of the plants can be used as burn healing due to the ingredients which can inhibit the bacteria as like saponin and tannin on *A. vera* and saponin on *N. scutellarium*. Hence, the study is aimed to discover the comparison on *A. vera* and *N. scutellarium* extract in ointment preparation so therefore it will accelerate the burn healing on white rats.

2. MATERIALS AND METHOD

The tools that is used in this study are involving maceration tank, blender, scales, filter cloth, stirrer, aluminum foil, glassware, oven, water bath, rotary evaporator, mouse cage, food drink container, handscoon, tissue, Veet, spatula, stove, metal with 20 mm x 20 mm, syringe, caliper, small brush, ointment container, sterile gauze, and camera. Afterward, the material that is used in this study are *N. scutellarium* leaf, *A. vera* rind, 96% ethanol, and Vaseline flavum, aquadest, Bouchard reactor, Dreagen dorff reactor, Mayer reactor, Wagner reactor, alcohol, HCL concentrated, 5 % iron trichloride (FeCl₃), H₂SO₄ concentrated, and Bioplacenton.

2.1 Extraction Process

***A. vera* rind**

Prepare *A. vera* and take the rind, then clean it from the mucus and cut it into pieces. Afterward, put it into the oven with a 50°C temperature to remove the water content. The dried *A. vera* rind is blended to be powder. Then, the simplisia powder is extracted using maceration method by pouring it into container and added 96% of 5L ethanol solvent, stirred, covered by aluminum foil, and then stored in a place that do not exposed by sunlight. Afterward, let it for 3 days, but keep to stir it occasionally on each day. On the third days, filter the solvent, take the pulp and add the same solvent as well as the amount. Then, let it again for 2 days, and do it for two times. The filtering results combine and being concentrated with a rotary evaporator till the concentrated extract of *A. vera* rind is obtained.

***N. scutellarium* leaves**

N. scutellarium leaves are cleaned and cut into pieces, put in oven with 50°C temperature to remove the water content. The dried *N. scutellarium* is blended till become powder. Afterward, the simplisia powder is extracted using maceration method by pouring it into container and added 96% of 5L ethanol solvent, stirred, covered by aluminum foil, and then stored in a place that do not exposed by sunlight. Afterward, let it for 3 days, but keep to

stir it occasionally on each day. On the third days, filter the solvent, take the pulp and add the same solvent as well as the amount. Then, let it again for 2 days, and do it for two times. The filtering results combine and being concentrated with a rotary evaporator till the concentrated extract of *N. scutellarium* leaves is obtained.

2.2 Phytochemicals Screening

Phytochemicals screening is done by identifying alkaloid, flavonoid, saponin, and tannin.

2.3 The Preparation of Animals' Test

The white rats that will be used for experiment are prepared and let for a week. The rats are weighing once in every day. The preparation of these animals is obtained so that it can adapt in the new place to control its health.

A. vera Rind and *N. scutellarium* Leaves Extract Preparation

In this study, the ointment preparation will be obtained using *A. vera* rind extract and *N. scutellarium* leaves extract with 50% and 75% concentration.

Table 1. Ointment Formulation

Formulation	Concentration	
	50%	75%
<i>A. vera</i> rind extract (g)	50 g	75 g
<i>N. scutellarium</i> rind extract (g)	50 g	75 g
Vaseline flavum (g)	50 g	25 g

A. vera rind and *N. scutellarium* leaves extract are made by 100 grams on each for 21 days. The first step in the *A. vera* and *N. scutellarium* ointment extract formulation are by weighing the materials based on the calculation. Each of material is put into container, crushed till become homogeny. Afterward, drop the 96% ethanol, crushed till become homogeny. After all, the preparation of *A. vera* and *N. scutellarium* ointment extract with 50% and 75% concentration put into ointment container.

The Making of Thermal burn

Thermal burn is made on the right back of rat's body. The area then cleaned using Veet. Afterward, the injured area is sterilized using alcohol and waited to dry. The rats is sedated with 0,3 cc of ketamine. When the mice is fainted, the wound area is affixed with 20 mm x 20 mm iron plate which has been heated till become red. Then, put the plate on the rat's back area which has been cleaned for 3 seconds.

Thermal burn Recovery Treatment

The six groups of animals' testing which consist of 5 rats for each group are being prepared. The first group is given no treatment (negative control); the second of group is given bioplacenton ointment (positive control); the third group is given *A. vera* rind extract; the fourth group is given *N. scutellarium* leaves extract. Afterward, the preparation of *A. vera*

rind and *N. scutellarium* leaves extract ointment and bioplacenton are being prepared.

Thermal burn recovery testing:

K1: given no treatment (negative control)

K2: given bioplacenton preparation (positive control)

K3: given the preparation of *N. scutellarium* leaves extract ointment with 50% concentration

K4: given the preparation of *N. scutellarium* leaves extract ointment with 75% concentration

K5: given the preparation of *A. vera* rind extract ointment with 50% concentration

K6: given the preparation of *A. vera* rind extract ointment with 75% concentration

The applying of preparation for all groups is obtained twice a day; in the morning and evening, then it covered with sterile gauze.

The Observing of Thermal burn for 21 days

The observing for thermal burn recovery is done a day after giving the treatment. It takes 21 days for observing. On every 3 days, the macroscopic observation is done to know the development of thermal burn recovery on rat's back. Meanwhile, the severity burn is measured using digital calipers. The thermal burn is treated until it covers.

3. RESULT AND DISCUSSION

The result showed that Aloe Vera rind extract and *N. Scutellarium* leaves were contained with alkaloid, saponin, flavonoid and tannin compounds. The chemical compound test was done in order to know the compounds that dissolved after the extraction of simplicia and ethanol process. After knowing the compounds, the work mechanism from Aloe Vera rind extract and *N. Scutellarium* leaves towards the thermal burn healing could be estimated. The compounds inside Aloe Vera rind extract and *N. Scutellarium* leaves could dissolved in semi polar solvents, such as ethanol.

Phytochemical Screening of Aloe Vera rind Extract and *N. Scutellarium* Leaves

Table 2. The Result of Phytochemical Screening of Aloe Vera rind Extract and *N. Scutellarium* Leaves

Sample	Identification			
	Alkaloid	Saponin	Flavonoida	Tannin
<i>A. Vera</i> Rind	Bouchardart (-)	Aquadest (+)	FeCl ₃ 5% (+)	FeCl ₃ 1% (+)
	Dragendorff (+)	Aquadest+ Alcohol 96% (+)	NaOH 10% (-)	
	Maeyer (-)	Aquadest+ Alcohol 96% (+)	H ₂ SO _{4(p)} (+)	
	Wagner (-)		Mg _(s) + HCl _(p) (+)	
<i>N. Scutellarium</i> Leaves	Alkaloid	Saponin	Flavonoida	Tannin
	Bouchardart (++)	Aquadest (++)	FeCl ₃ 5% (+)	FeCl ₃ 1% (+)
	Dragendorff (++)	Aquadest+ Alcohol 96% (+)	NaOH 10% (-)	Polyphenol
	Maeyer (+)	Aquadest+ Alcohol 96% (+)	H ₂ SO _{4(p)} (+)	Steroid & Triterpenoid
	Wagner (++)		Mg _(s) + HCl _(p) (-)	Salkowsky (-)

The Result of Thermal burn Healing

The wounded area was measured for 21 days with time interval for once every three days and calculated the average of the treatment area. The effectiveness of Aloe Vera rind extract and *N. Scutellarium* leave toward thermal burn healing based on the treatment group, including negative control, positive control, 50% and 75% of Aloe Vera rind extract and 50% and 75% of *N. Scutellarium* leaves was done with ANOVA test, which could be seen in the result table below:

Table 3. The Result Test of Aloe Vera Rind Extract against Wound Area based on Treatment Group

ANOVA					
Wound Area					
	Sum of Squares	df	Mean Square	F	Sig
Between Groups	81.107	3	27.036	2.748	.045
Within Groups	1338.220	136	9.840		
Total	1419.328	139			

Table 4. The Result Test of N. Scutellarium Leaves Extract against Wound Area based on Treatment Group

ANOVA					
Wound Area					
	Sum of Squares	df	Mean Square	F	Sig
Between Groups	122.573	3	40.858	2.881	.038
Within Groups	1928.609	136	14.181		
Total	2051.182	139			

Table 3 showed that the score of sig-p = 0.045 was smaller than 0.05. Thus, it could be concluded that Aloe Vera rind extract gave significant influence toward wounded area. It indicated that by giving Aloe Vera rind extract based on the given concentration for thermal burn could help reducing the wounded area significantly. In other words, Aloe Vera rind extract was effective in healing thermal burn in white rats (*Rattus norvegicus*).

While the table 4 denoted that the score of sig-p = 0.038 was smaller than 0.05, which could be summed up that the extract of *N. Scutellarium* leaves gave significant influence toward wound area. It showed that by giving *N. Scutellarium* leaves extract based on the given concentration has been succeeded to reduce the wounded area significantly. Similar to A. Vera rind extract, *N. Scutellarium* leaves extract was also effective in healing thermal burn in white rats (*Rattus norvegicus*).

Furthermore, this study used Tukey test to know the most effective concentration of A. Vera rind extract and N. Scutellarium leaves in healing thermal burn. The result of Tukey test could be seen in table 5 below:

Table 5. The Result of Tukey Test of *A. Vera* Rind Extract among the Concentration Treatment Groups

Tukey HSD		
Wounded Area		
Tukey HSD ^a		
Treatment (concentration)	N	Subset for alpha = 0.5
		1
75%	35	13.8486
50%	35	14.0557
K+	35	14.7429
K-	35	15.7986
Sig.		.050

Means for groups in homogeneous subsets are displayed

a. Uses harmonic mean sample size = 35.000

Table 6. The Result of Tukey Test of *N. Scutellarium* Leaves Extract among the Concentration Treatment Groups

Tukey HSD			
Wounded Area			
Tukey HSD ^a			
Treatment (concentration)	N	Subset for alpha = 0.5	
		1	2
75%	35	13.3457	
50%	35	14.1529	14.1529
K+	35	14.7429	14.7429
K-	35		15.9129
Sig.		.410	.210

Means for groups in homogeneous subsets are displayed

a. Uses harmonic mean sample size = 35.000

The table 5 above showed the subset of group 1 had the biggest wounded area for 15.79 which obtained from the treatment K (-). Meanwhile, the smallest wounded area obtained in treatment with 75% concentration for 13.84. It indicated that the treatment with 75% concentration was more effective in healing thermal burn. However, the table 4 above also showed that there were no significant differences among six treatments. It could be seen through the significance score = $0.050 \geq 0.05$.

In table 6, the subset of group 1 and group 2 had the biggest wounded area, obtained from treatment K (-) for about 15.91. While the smallest wounded area was obtained from 75% concentration treatment for 13.34. It showed that the treatment using 75% concentration was more effective in healing thermal burn. It was found that there were no significant differences among the fourth treatment, which indicated by the significant score for $0.410 > 0.05$.

The Effectiveness Comparison of *A. vera* Rind Extract and *N. scutellarium* Leaves Extract

The effectiveness comparison of *A. vera* rind extract and *N. scutellarium* leaves toward thermal burn recovery on white rats can be seen in the following table:

Table 7. The Effectiveness Comparison of *A. vera* Rind Extract and *N. scutellarium* Leaves Extract toward thermal burn

Parameter	N	Mean	Deviation Standard	Sig-p	Conclusion
<i>A. vera</i>	140	14.6114	3.195	0.000	Significance differences
<i>N. scutellarium</i>	140	14.5386	3.841		

According to result of comparison testing with T signification testing on table 6, it revealed that burn severity using *A. vera* rind extract treatment is about 14.61 ± 3.195 while burn severity using *N. scutellarium* leaves extract treatment is about 14.53 ± 3.841 . From the table, it can be seen that burn severity using *N. scutellarium* leaves extract is smaller than *A. vera* extract ointment. This also means that *N. scutellarium* leaves extract is more effective than *A. vera* rind extract ointment for thermal burn recovery toward white rats.

Afterward, the result signification shown that $p = 0.000$, it means that there is different on effectiveness between *A. vera* rind extract and *N. scutellarium* leaves extract in which *N. scutellarium* is more effective that *A. vera* rind extract.

The Result of Thermal burn Recovery

Wound healing is described as natural recovery process toward tissue damage which involving inflammation mediators, blood cell, extracellular matrix, and parenchyma cell. The process are consist of three phases; hemostasis and inflammation, proliferation, maturation, and remodeling. All types of trauma that causes vascular injury will initiate cellular response to start hemostasis phase. This phase happen since the wound happened till the fifth day. The ultimate contributions are vaso constriction, platelet aggregation, and fibrin deposition. Meanwhile, there is inflammation reaction in form of erythema, edema, pain, and heat which has purpose to bring the inflammation cells to the injured area [8].

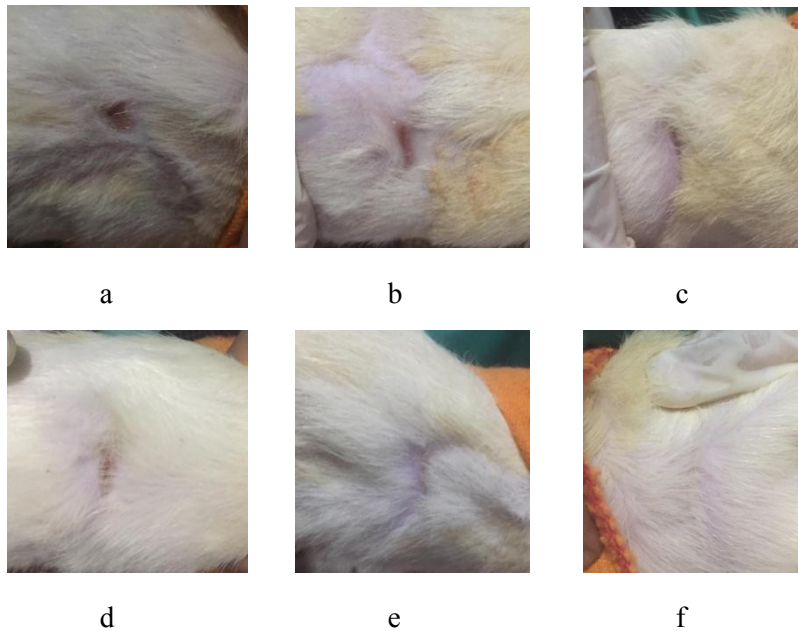
N. scutellarium leaves and root is mostly used as herbal medication. It consists of flavonoid, alkaloid, saponin, polyphenol, and fat. The benefit of *N. scutellarium* are repairing the digestive system, preventing hair loss, wound treatment, antibacterial, anti-inflammation, increasing blood pleasure, preventing anemia and antioxidant. The results of a study obtained by Hanum, 2017, using one-way ANOVA statistics, showed that differences between in the concentration of *N. scutellarium* extract on *N. scutellarium* extract soap did not have significant effect on inhibition bacteria in result of Sig. 0.097 (Sig 0.05) [9].

A. vera is one of the medical plants which has medical beneficial. It often use as medical material since several thousand years ago to treat thermal burnn, hair loss, skin infection, sinus inflammation, and pain in the gastrointestinal tract. Some previous researchers has proven that *A. vera* has benefit on anti-inflammation, anti-pyretic, anti-

fungal, antioxidant, antiseptic, antimicrobial, and antiviral [10].

However, this result study also similar with Christian's research entitled The Evaluation of Aloe Vera Extract Leaves toward Thermal burn Recovery of Rabbit Skin (*Oryctolagus cuniculus*). The result shows that the *A. vera* extract can be used for accelerating thermal burn recovery on rabbit skin.

Fig 1. The Shape of the Form Changes to the Microscopic Findings of the Wound after 21 days



Note:

a = Negative control

b = Positive control

c = *A. vera* 50%

d = *A. vera* 75%

e = *N. scutellarium* 50%

f = *N. scutellarium* 75%

4. CONCLUSION

A. vera rind extract with 50% and 75% concentration, and *N. scutellarium* with 50% and 75% concentration have effect as thermal burn medication. The most effective of group concentration between *A. vera* rind extract and *N. scutellarium* extract toward thermal burn recovery on 75% concentration.

Burn healing using *N. scuterallium* is more effective than *A. vera* extract toward

thermal burn on white rats (*Rattus norvegicus*) which is proven by the burn severity that become smaller.

REFERENCES

1. Moenadjat, Y. Luka Bakar: Masalah dan Tatalaksana. Jakarta: UPK Luka Bakar RS Cipto Mangunkusumo; 2006.
2. Mitsunaga, Jr J., Gragnani, A., Ramoz, M. Rat an experimental model for burn: a systematic review. *Acta Cir Bras*, 2012;27(6), 417-423.
3. Hidayat, T.S.N., Noer, M.S., Saputro, I.D. Five years retrospective study of burns in Dr. Soetomo General Hospital Surabaya. Department of Plastic Reconstructive and Aesthetic Surgery. In Pit Perapi Medan; 2012.
4. Nielson, et al. Burns: Pathophysiology of Systemic Complications and Current Management. *Journal of Burn Care And Research*; 2016.
5. Gauglitz, GG, Korting, HC, Pavicic, T, Ruzucka, T, and Jeschke, MG. Hypertrophic Scarring and Kelloid: Pathomechanisms and Current & Emerging Treatment Strategies. *Mol Med*, 2011;17(1-2), 113-125.
6. Lakhanpal G, Bhalerao S, Sharma S et al, (2015). To Study the Efficacy of Different Formulations of Aloe Vera (Spp. *Aloe barbadensis*) On Wound Healing in Rat. *Research Journal of Pharmaceutical, Biological and Chemical Sciences (RJPBCS)*, 2015;6(4), 432-440.
7. Nagar, P, Kumar, M. Efficacy of Aloe Vera Gel Dressing In Chronic Leg Ulcer of Diabetic, Traumatic and Burns Origin. *Research Journal of Pharmaceutical, Biological and Chemical Sciences (RJPBCS)*, 2015;6(6), 482-4.
8. Wim DJ, Sjamsuhidayat, R. Buku ajar ilmu bedah. Jakarta: EGC; 2011.
9. Hanum, GR, Ardiansyah, S. Sabun Ekstrak Mangkokan (*Nothopanax Scutellaium merr*) Sebagai Antibakteri Terhadap *Staphylococcus Aureus*. *Stigma Journal of science*, 2017;10 (1), 36-39.
10. Tjahajani, A, Widurini. Aloe vera leaf anti Inflammation's activity speeds up the healing process of oral mucosa ulceration. *Journal of Dentistry Indonesia*, 2011;18, 17-20.
11. Yunita, E., Suprapti, N., dan Hidayat, J. Pengaruh Ekstrak Daun Teklan (*Eupatorium riparium*) terhadap Mortalitas dan Perkembangan Larva *Aedes aegypti*. *Bioma*, 2010;11(1), 11-17.