

**AMBON BANANA PEEL EXTRACT GEL (*Musa paradisiaca*  
*var. Sapientum* (*L.*) *Kunt*) ACCELERATES WISTAR RATS  
GINGIVA WOUND HEALING  
(*GEL EKSTRAK KULIT PISANG AMBON* (*Musa paradisiaca var.*  
*Sapientum* (*L.*) *Kunt*) *MEMPERCEPAT PENYEMBUHAN LUKA*  
*GINGIVA TIKUS WISTAR*)**

*Jhds.fkg.unjani.ac.id*  
DOI:10.54052/jhds.v1n1.p89-99

**Article History**

Received: 12/02/2021  
Accepted: 12/03/2021

Florence Meliawaty<sup>1\*</sup>, Rina Putri Noer Fadilah<sup>2</sup>, Putri Mentari<sup>1</sup>  
<sup>1</sup>Department of Oral Surgery, Faculty of Dentistry, Universitas Jenderal Achmad Yani, Cimahi, Indonesia  
<sup>2</sup>Departement of Dental Public Health, Faculty of Dentistry, Universitas Jenderal Achmad Yani, Cimahi, Indonesia  
\*Corresponding author  
florence.meliawaty@lecture.unjani.ac.id

**ABSTRACT**

A wound is a cut through the anatomical structure of tissue due to an incision of a sharp-edged object. Ambon banana peel contains tannins, flavonoids, and saponins which act as an anti-inflammatory antioxidant and antibacterial properties that facilitate the wound healing process. This research attempted to know the effect of ambon banana peel gel extract (*Musa paradisiaca var. Sapientum* (*L.*) *Kunt*) on wound length healing of gingiva mucosa cuts in Wistar rats. The was a pure experimental study with a sample size of 30 Wistar rats divided into three groups; the treatment group was given 10% ambon banana peel gel extract. The positive control group was assigned 10% povidone-iodine, and the negative control group was given aquades. The research was conducted by making an incision on maxillary gingival mucosa 3 mm wide in the horizontal direction with a depth of 0.25 mm using blade number 11. Observations were performed on days 0, 3, 7, and 14 after treatment using a digital calliper. Data were analyzed using the Kruskal Wallis test and then the post hoc test using the Mann Whitney test ( $p < 0.05$  significant). The research results showed that the treatment group given 10% ambon banana peel gel extract had a significant difference with a p-value  $< 0.05$  compared to the positive and negative control groups on days 3, 7, and 14. The research shows 10%. The concentration of

ambon banana peel gel extract affects the accelerating wound healing process in the gingiva mucosa of Wistar rats.

**Keywords:** *banana peel, wound healing*

### **ABSTRAK**

Luka adalah terpotongnya struktur anatomi jaringan akibat sayatan benda tajam. Kulit pisang ambon mengandung tanin, flavonoid, dan saponin yang berperan sebagai antioksidan anti inflamasi dan sifat antibakteri yang memudahkan proses penyembuhan luka. Penelitian ini berusaha untuk mengetahui pengaruh pemberian ekstrak gel kulit pisang ambon (*Musa paradisiaca* var. *Sapientum* (L.) Kunt) terhadap penyembuhan panjang luka pemotongan mukosa gingiva pada tikus Wistar. Penelitian ini merupakan penelitian eksperimen murni dengan jumlah sampel 30 ekor tikus Wistar yang dibagi menjadi tiga kelompok; kelompok perlakuan diberikan ekstrak gel kulit pisang ambon 10%. Kelompok kontrol positif diberi povidone-iodine 10%, dan kelompok kontrol negatif diberi aquades. Penelitian dilakukan dengan membuat insisi pada mukosa gingiva rahang atas selebar 3 mm arah horizontal dengan kedalaman 0,25 mm menggunakan blade nomor 11. Pengamatan dilakukan pada hari ke 0, 3, 7, dan 14 setelah perawatan menggunakan jangka sorong digital. Data dianalisis menggunakan uji Kruskal Wallis kemudian uji post hoc menggunakan uji Mann Whitney (signifikan  $p < 0,05$ ). Hasil penelitian menunjukkan bahwa kelompok perlakuan yang diberi ekstrak gel kulit pisang ambon 10% memiliki perbedaan bermakna dengan  $p\text{-value} < 0,05$  dibandingkan dengan kelompok kontrol positif dan negatif pada hari ke 3, 7, dan 14. Hasil penelitian menunjukkan 10%. Konsentrasi ekstrak gel kulit pisang ambon berpengaruh terhadap percepatan proses penyembuhan luka pada mukosa gingiva tikus Wistar.

**Kata Kunci:** kulit pisang; penyembuhan luka

### **INTRODUCTION**

A wound is a loss or damage of body tissue or a break in the normal anatomical structure of the tissue due to trauma. One type of wound is an

incision wound. Incisions can occur accidentally (surgical wounds) or accidental (incidental wounds) caused by a sharp-edged object cut. The wound is elongated with straight edges, and there is no

damage around the wound area.<sup>1-3</sup>

The wound healing process goes through an inflammatory phase, a proliferation phase, and a remodelling phase. The inflammatory phase lasts for 3-5 days. This phase is characterized by clinical manifestations of the inflammatory phase, namely *rubor, calor, tumor, dolor*, and function *laesa*. On day 7, there is a transition phase from the inflammatory phase to the proliferative phase. Endothelial cells experience peak proliferation due to inflammatory mediators *growth factors such as vascular endothelial growth* (VEGF). It can stimulate granulation tissue formation.<sup>1</sup> On the 14th day, and a remodelling phase occurs, collagen type III will decrease and change to collagen type I with stronger collagen fibres arranged along the wound line resulting in the closure of the wound.<sup>2,4,5-7</sup>

Plants can be used as alternatives to accelerate wound healing, one of which is the skin of the Ambon banana fruit. Ambon banana peel contains active compounds such as tannins, flavonoids, and saponins.<sup>8,9</sup> Tannins can accelerate inflammation and wound healing by preventing the oxidation process, increasing the migration of inflammatory cells, and increasing cell proliferation so that the formation of granulation tissue increases. Apart from that, tannins also help. Tannins also have antibacterial properties.<sup>10,11</sup> Flavonoid (antioxidants) reduce lipid peroxidation concentrated in the open wound (90% Diosi and 10% hesperidin) to increase vascularity and vascular endothelium protection flavonoids. Research by Landolfi *et al.* Shows that flavonoids can modify the

metabolism of arachidonic acid platelets that have an anti-inflammatory effect.<sup>12,13</sup> Saponin compounds can trigger VEGF and increase the migration of macrophages to the wound area, so that cytokine production increases and fibroblasts in the wound tissue are activated. Saponins help form collagen type 1, which plays a role in wound healing.<sup>14-16</sup>

## METHOD

The research was conducted at the Pharmacy Laboratory of the Faculty of Pharmacy, Unjani Cimahi, and the Pharmacology Laboratory of FK UNPAD Bandung from November 2020 to December 2020. Ethical approval was obtained from the Research Ethics Committee of the Faculty of Medicine, Padjadjaran University, with number 1124 / UN6.KEP / EC / 2020 . This research was an experimental laboratory study with a *post-test only control group design*. The research consisted of making Ambon banana peel extract, making Ambon banana peel extract gel, giving treatment, and measuring the length of the cut. The object of the study: 30 rats of the Wistar strain (*Rattus norvegicus*) obtained from the SITH ITB animal development laboratory (based on Federer's formula). The rats were divided into three groups: the negative control group was given distilled water, the positive control group was given *povidone-iodine* 10%, and the treatment group was given 10% Ambon banana peel extract gel.

Research materials: Ambon banana peel obtained from Manako Lembang Experimental

Garden, West Bandung, povidone-iodine, distilled water, 70% alcohol, anaesthetic liquid (*ketamine*), and 30 Wistar strain rats

### Procedures

Making 10% Ambon banana peel extract: Ambon banana peel washed, then cut into small pieces and dried in the oven for 48 hours at a temperature of 45°C, then mashed using a blender. Five hundred grams of powder is macerated for 3x24 hours with 70% ethanol. Ethanol is used as a solvent because it has the most optimal work in flavonoid extraction and is relatively safe to use. The macerated material is then evaporated with a *rotary evaporator* until it thickens into extracts. Preparation of 10% concentration of Ambon banana peel extract by taking 10 ml of 100% extract of Ambon banana skin and adding 90 ml of distilled water and stirring until well blended.<sup>17,18</sup>

Making gel 10% (Ambon banana peel extract) preparations begins by weighing the gel ingredients according to the dosage of the formula. Then, *hydroxypropyl methylcellulose* (HPMC) was dissolved with methylparaben added with hot water 90°C to the *gelling agent* HPMC. Then put 10% ambon banana peel extract and add propylene glycol to the HPMC, stirring until mixed to form a gel using a mortar and pestle. The formulation for making Ambon banana peel extract gel can be seen in the table.<sup>18</sup>

Treatment of experimental animals: Wistar rats were adapted for seven days, then performed anaesthetic action with *ketamine* solution at a dose of 10 ml / 1000g (0.1-0.2 ml) intraperitoneally. Place the anaesthetized mice on the table and then perform aseptic action by giving 70% alcohol. Make an incision wound on the RA anterior gingival mucosa along the 3 mm horizontal direction with a depth of 0.25 mm using *blade* No. 11. The wound was then irrigated using distilled water, and the bleeding was stopped by pressing sterile gauze on the wound area 2-3 times. The group was treatment smeared with 0.5 ml of Ambon banana peel extract gel once a day. The positive control group was smeared with *povidone-iodine* 10% as much as 0.5 ml once a day. The negative control group was given distilled water. Measurements on days 0, 3, 7, and 14 used digital callipers three times and then the mean value was calculated. The rats were terminated using ketamine solution.

### Data Analysis

Data from the research results were statistically analyzed using SPSS. The data were tested using the *Kruskal Wallis* test followed by the *post hoc* test using Mann Whitney's test with  $p < 0.05$ .

### RESULT

The treatment group was given 10% ambon banana peel extract gel, the positive control group was given *povidone-iodine* 10%, and the negative control group was given aquades. Figure 1 is a clinical picture of an incision wound on the



A



B

maxillary gingival mucosa of Wistar rats before and after the injury.

**Figure 1.** Clinical picture of the gingival mucosa before and after the injury. A. Before the wound. B. After the wound.

**Table 1.** Effect of banana peel extract gel on the length of the gingival cut wounds of the Wistar rats on day 0

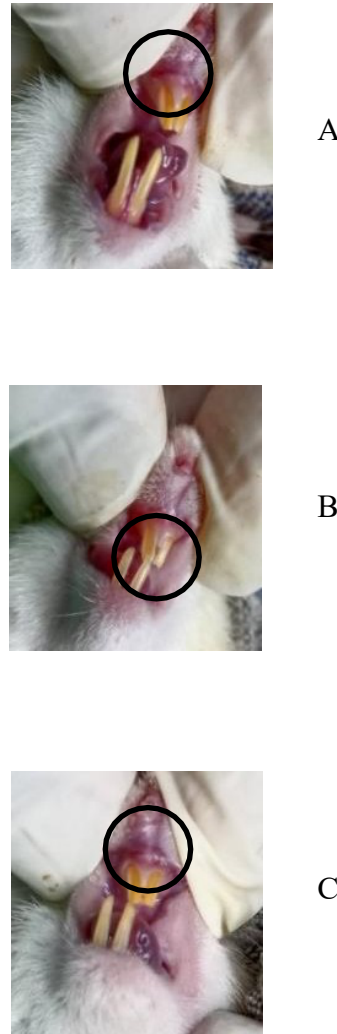
Variable	Groups			p-Value
	Negative Control N=10 (mm)	Positive Control N=10 (mm)	Treatment N=10 (mm)	
Length of incision on day 0				
Mean±Std	3,00	3,00	3,00	1,00
Median	3,00	3,00	3,00	
Range (min-maks)	3,00	3,00	3,00	

Description: *Kruskal Wallis test*  $p < 0.05$ , significant

Table 1 The statistical analysis results using the *Kruskal Wallis test* showed that the three groups had the same mean wound length on day 0, i.e. 3.00 mm. The results of the statistical test of the research group on day 0 obtained  $p \text{ value} > 0.05$ , which means it is not significant or not statistically significant. The result happened because the measurement of the wound on day 0 was carried out before the application of Ambon banana peel extract gel and *povidone-iodine* in the positive control group.

The effect of Ambon banana peel extracts gel on the length of the Wistar gingival cut wounds on the 3rd day. Figure2 is a clinical picture of an incision wound on the maxillary gingival mucosa of

Wistar rats in the three study groups on day 3.



**Figure 2.** Clinical features of wound length on day 3 in all three groups. A. Negative control B. Positive control C. Treatment.

Clinical features of gingival mucosal wounds in the three groups on day three still showed redness of the mucosa around the wound, and bleeding was gone. The clinical picture of the wound shows an interlocking wound edge tissue. The treatment group given 10% Ambon banana peel gel extract showed that the wound edges were smooth and dry, swelling and reddish lines were still visible.

The positive control group that was given *povidone-iodine* still had swelling and redness. However, it was not as severe as the negative control group, which still experienced extensive swelling and redness. It was because *povidone-iodine* did not contain anti-inflammatory, which could reduce signs of inflammation.

**Table 2.** Effect of banana peel extract gel on the length of the gingival cut wounds of the Wistar rats on the 3rd day

Variable	Groups			p-Value
	Negative Control N=10 (mm)	Positive Control N=10 (mm)	Treatment N=10 (mm)	
The length of the incision day 3				
Mean±Std	2,25±0,27	1,97±0,14	1,49±0,21	0,0001
Median	2,25	2,00	1,40	
Range (min-maks)	2,00-2,70	1,6-2,20	1,20-2,00	

Note: *Kruskal Wallis test*  $p < 0.05$  (significant)

Table 2 shows that each group has a different mean wound length on day 3.

The treatment group given Ambon banana peel extract gel showed a greater reduction in wound length than the positive and negative control groups. The statistical test results of the research group on day 3 showed that the p-value was less than 0.05 (p-value  $< 0.05$ ), which means significant or statistically significant.

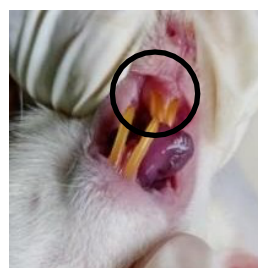
The effect of Ambon banana peel extracts gel on the length of the Wistar gingival incision on the 7th day. The clinical picture of the wound on day seven can be seen in Figure 3, showing the healing

process of the gingival mucosa characterized by a reduction in signs of inflammation in the area

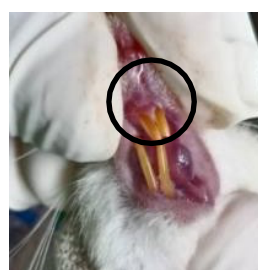
around the injured mucosa; therefore, the

Variable	Groups			p-Value
	Negative Control N=10 (mm)	Positive Control N=10 (mm)	Treatment N=10 (mm)	
The length of the incision day 7				
Mean±Std	1,58±0,17	1,15±0,15	0,93±0,17	0,0001
Median	1,60	1,15	0,90	
Range (min-maks)	1,20-1,80	1,00-1,40	0,70-1,20	

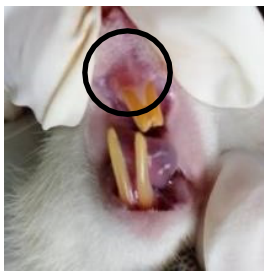
wound healing process enters the proliferation phase. The treatment group showed a reddish spot color, no swelling, and a reduction in wound length that was more than the positive and negative control groups.



A



B



C

**Figure 3.** Clinical features of wound length on day 7 in all three groups. A. Negative control B. Positive control C. Treatment.

**Table 3.** Effect of ambon banana peel extract gel on the length of the gingival cut wounds of the Wistar rats on the 7th day

Note: *Kruskal Wallis test*  $p < 0.05$ , significant

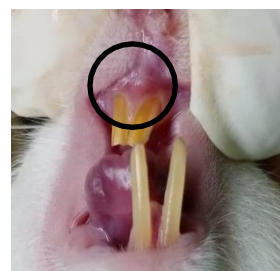
Table 3 statistical analysis results using the *Kruskal Wallis test* show that the treatment group given Ambon banana peel extract gel reduced length. Injuries were greater than the positive control and negative control groups. The results of the statistical test of the research group on the 7th day obtained a p-value  $< 0.05$ , which means significant or statistically significant.

The effect of Ambon banana peel extracts gel on the length of the Wistar gingival incision on day 14. The clinical picture of the wound at day 14 showed better wound closure than the observation on day 7 of each group. In the treatment group given 10% Ambon banana peel extract gel, the clinical picture of the gingival mucosal wound was similar to the normal

clinical picture of the gingival mucosa, leaving a small proportion who had not yet experienced complete wound closure. In the positive control group, the color of the gingival surface was still visible with reddish spots, with the wound surface partially covered and in the negative control group. However, in the negative control group, the redness caused more than the positive control group. The clinical picture of gingival mucosal wound healing conditions in Wistar rats on day 14 can be seen in Figure 4



A



B



C

**Figure 4.** Clinical features of wound length 14 days in all three groups. A. Negative control B. Positive control C. Treatment.

**Table 4.** Effect of ambon banana peel extract gel on the length of the gingival cut wounds of the Wistar rats on the 14th day

Variable	Groups			p-Value
	Negative Control N=10 (mm)	Positive Control N=10 (mm)	Treatment N=10 (mm)	
The length of the incision day 14				
Mean±Std	0,50±0,3 5	0,22±0,29	0,07±0,12	0,040
Median	0,70	0,05	0,00	
Range (min-maks)	0,00-0,90	0,00-0,70	0,00-0,40	

Note: *Kruskal Wallis test*  $p < 0.05$  (significant)

Table 4 statistical analysis results using the *Kruskal Wallis test* showed that The treatment group showed a greater reduction in wound length than the positive control group and the negative control group. The results of the statistical test of the study group on day 14 showed a p-value  $< 0.05$ , which means significant or statistically significant.

The results obtained in the form of the average length of the cut wounds in the three groups from day 0, 3, 7, and 14 can be seen in Table 5.

**Table 5.** The average length of the wound from day 0, 3, 7, and 14

Variable	Day-1(mm)	Day 3 (mm)	Day 7 (mm)	Day 14 (mm)
Negative Control	3,00	2,25±0,27	1,58±0,17	0,50±0,35
Positive Control	3,00	1,97±0,14	1,15±0,15	0,22±0,29
Treatment	3,00	1,49±0,21	0,93±0,17	0,07±0,12

Note: *Kruskal Wallis test*

Table 5 shows that the average length of the

wound from day 0, 3, 7, and 14 in the treatment group given Ambon banana peel extract gel had faster-wound healing than the positive control group given *povidone-iodine* 10% and the negative control group that was given distilled water.

## DISCUSSION

Wound length in the treatment group given 10% Ambon banana peel extract gel was reduced due to active compounds such as flavonoids. Mirzoeva *et al.* explained that flavonoids contain antibacterial activity that can inhibit bacterial motility and that the anti-inflammatory content of tannins and flavonoids also plays a role.<sup>19</sup>

According to Karodi's, Tannins can affect the migration of inflammatory cells to increased wound tissue, thus forming blood clots with the fibrin matrix. Flavonoid (anti-inflammatory) modified platelet arachidonic acid metabolism inhibiting cyclooxygenase and increasing intracellular cyclic AMP.<sup>5,13,20</sup>

The content in the Ambon banana peel increases the formation of granulation tissue on the 7th day of the proliferation phase with 3 main processes: *angiogenesis*, *fibroblasts*, and re-epithelialization. This phase occurs proliferation of *layer single* keratinocyte cell on a basal membrane and then migrate to the wound surface and meet in the middle of the wounds. Cells that migrate stop, and the basement membrane begins to form ends with the closure area. The proliferation phase aims to balance tissue regeneration and scar tissue formation.<sup>21</sup>

This condition shows that Ambon banana peel extract gel can accelerate wound healing in the



proliferation phase. Minocha's (2015) active tannin compounds contained in Ambon banana peel can help the formation of new blood vessels due to increased cell proliferation. Flavonoid (antioxidants) reduce lipid peroxidation (concentrated in open wound areas due to exposure to the outside world, prevent cell necrosis). Flavonoids can increase vascularization in the proliferation phase.<sup>11,22,23</sup>

The healing process on the 14th day enters the remodelling phase, collagen remodelling, and the wound's contraction. Fibroblasts will differentiate into *myofibroblasts* resulting in wound contraction due to the influence of the TGF- $\beta$  cytokine. There will be a decrease in collagen type III during the maturation process to become stronger type I collagen, where these collagen fibres will be arranged on the wound edge. The extracellular matrix collagen will undergo simultaneous synthesis and degradation up to 3 weeks after injury until the tissue is more stable.<sup>5,21</sup>

The Ambon banana peel extract gel group experienced wound closure faster than the other research groups due to saponin compounds which can help the formation of the first collagen, which has a role in stabilizing the tissue formed in the remodelling phase.<sup>24</sup>

Ambon banana peel content showed flavonoids, tannins, and saponins play a role in the wound healing process in the inflammatory phase, the proliferation phase, and the remodelling phase. This research follows Odilia (2020), which examined the topical anti-inflammatory effects of the ethanol

extract of Ambon banana peel induced by carrageenan. The anti-inflammatory effect in the wound healing process also plays a role in accelerating wound healing.<sup>25</sup>

## CONCLUSION

Based on the results and discussion, it can be concluded that the Ambon banana peel extract gel has an effect on the length of healing of the gingival wounds of the Wistar rats on the 3rd, 7th, and 14th days. Healing of cuts in the Ambon banana peel extract gel group was faster than wound healing was given *povidone-iodine* 10% and distilled water.

## CONFLICT OF INTEREST

We declare that there is no conflict of interest in the scientific articles we write.

## ACKNOWLEDGEMENT

We want to express our gratitude to Fahrauk Faramayudha Apt.,M.Si Faculty of Pharmacy Unjani and LPPM Unjani.

## REFERENCES

1. Gottrup F, Jensen SS, Andreasen JO. Wound healing subsequent to injury. In: Andreasen JO, Andreasen FM, Andersson L, editors. Textbook and color atlas of traumatic injuries to the teeth. 4<sup>th</sup> ed. Victoria: Blackwell Publishing; 2007. p.1-8.
2. Dorland, W. A. Newman. Kamus Kedokteran Dorland. Edisi 31. Jakarta: EGC; 2010. hal. 2429.

3. Putrianirma R, Triakoso N, Yunita MN, Yudaniayanti IS, dkk. Efektivitas ekstrak daunafrika (*Vernonia amygdalina*) secara topikal untuk reepitelisasi penyembuhan luka insisi pada tikus putih (*Rattus novergicus*). J Med Vet 2019; 2(1): 30.
4. Shetty V, Bertolami CN. Wound healing. In: Miloro M, editor. Peterson's principles of oral and maxillofacial surgery. 2<sup>nd</sup> ed. Hamilton: BC Decker Inc; 2004. p.3-6.
5. Primadina N, Basori A, Perdanakusuma DS. Proses penyembuhan luka ditinjau dari aspek mekanisme seluler dan molekuler. Qanun Med-Med J Fac Med Muhammadiyah Surabaya 2019; 3(1): 31.
6. Sudiana IK, Pangestuti W, Lestari WT. Perbedaan efektivitas penyembuhan luka bakar dengan propolis dan silver sulfadiazin 1%. Jurnal Ners 2006; 4(2): 1283-8.
7. Nofikasari I, Rufaida A, Aqmarina CD, dkk. Efek aplikasi topikal gel ekstrak pandan wangi terhadap penyembuhan luka gingiva. Majalah Kedokteran Gigi Indonesia 2017; 2(2): 53-9.
8. Mustika, Jaluri P, Lovianie M. Pengaruh pemberian sediaan emulgel-kitosan ekstrak kulit buah pisang ambon (*Musa paradisiaca l.*) untuk penyembuhan luka bakar pada kelinci. Jurnal Borneo Cendekia 2018; 8(11): 1-10.
9. Agarwal PK, Singh A, Gaurav K, Goel S, Khanna HD, Goel RK. Evaluation of wound healing activity of extracts of plantain banana (*Musa sapientum var. paradisiaca*) in rats. Indian J Exp Biol 2009; 47(1): 32-40.
10. Ashok PK, Upadhyaya K. Tannins are Astringent. Journal of Pharmacognosy and Phytochemistry 2012; 1(3): 45-49.
11. Minocha S. An overview on tannins. Int J Pharm Biol Sci Arch 2015; 3(2): 1-3.
12. Mello SVG, Rosa JS, Facchin BM, Luz ABG, Vicente G, Faqueti LG, *et al.* Beneficial effect of *Ageratum conyzoides Linn (Asteraceae)* upon inflammatory response induced by carrageenan into the mice pleural cavity. J Ethnopharmacol 2016; 194: 337-47.
13. Estrela C, Sydney GB, Bammann LL, Felipe Júnior O. Mechanism of action of calcium and hydroxyl ions of calcium hydroxide on tissue and bacteria. Braz Dent J 1995; 6(2): 85-90.
14. Septianoor M, Carabelly A, Apriasari M. Uji efektivitas antifungi ekstrak metanol batang pisang Mauli (*Musa sp*) terhadap *Candida albicans*. Jurnal PDGI 2013; 62(1): 7-10.
15. Kimura Y, Sumiyoshi M, Kawahira K, Sakanaka M. Effects of ginseng saponins isolated from red ginseng roots on burn wound healing in mice. Br J Pharmacol

- 2006; 148(6): 860-70.
16. Astuti SM, Sakinah AMM, Andayani BMR, Risch A. Determination of saponin compound from anredera cordifolia (ten steenis plant (binahong) to potential treatment for several diseases. *J Agric Sci* 2011; 3(4): 224-32.
  17. Maulidya E. Uji efektivitas ekstrak etanol kulit buah pisang muli (*Musa Acuminata Colla*) terhadap lama penyembuhan luka sayat pada mencit (*Mus musculus Linnaeus*, 1758). Bandar Lampung: Fakultas Matematika dan Ilmu Pengetahuan Alam Universitas Lampung. 2019.
  18. Hasniar. Pengaruh variasi konsentrasi ekstrak etanol kulit buah pisang kepok (*Musa paradisiaca*) dalam bentuk sediaan gel menggunakan basis hpmc terhadap penyembuhan luka sayat pada kelinci (*Oryctolagus cuniculus*). Makassar: Fakultas Kedokteran dan Ilmu Kesehatan UIN Alauddin. 2018.
  19. Mirzoeva OK, Grishanin RN, Calder PC. Antimicrobial action of propolis and some of its components: The effects on growth, membrane potential and motility of bacteria. *Microbiol Res* 1997; 152(3): 239-46.
  20. Karadi R V, Shah A, Parekh P, Azmi P. Antimicrobial activities of musa paradisiaca and cocos nucifera. *JRPB* 2011; 2(1): 264-7.
  21. Velnar T, Bailey T, Smrkolj V. The wound healing process: an overview of the cellular and molecular mechanisms. *J Int Med Res* 2009; 37(5): 1528-42.
  22. Sumono A, Wulan A. The use of bay leaf (*Eugenia polyantha Wight*) in dentistry. *DentJ (Majalah Kedokteran Gigi)* 2008; 41(3): 147.
  23. Ardo S. Pemanfaatan flavonoid di bidang kedokteran gigi. *Maj Kedokteran Gigi (Dental Journal) FKG-Unair* 2003; 36: 81-7.
  24. Jaya AM. Isolasi dan uji efektivitas antibakteri senyawa saponin dari akar putri malu (*Mimosa pudica*). Malang: Fakultas Sains dan Teknologi UIN Maulana Malik Ibrahim. 2010.
  25. Putri Odilia. Efek Antiinflamasi Topikal Ekstrak Etanol Kulit Buah Pisang (*Musa paradisiaca L.*) “Ambon” pada Mencit Terinduksi Karagenin. Yogyakarta: Fakultas Farmasi Universitas Sanata Dharma. 2020.