



## Ethnobotany study of banana plant sap (*Musa sp.*) as an incision remedy (*Vulnus scissum*)

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### ABSTRACT

The use of banana plant sap as an incision remedy has been carried out through generations in Citatah Village, Cipatat District, West Bandung Regency, Indonesia. This study aimed to examine the ethnobotanical utilization of banana plant sap as an incision remedy. The research was conducted using the snowball sampling technique by the method of structured observation and interviews with 30 respondents. The followings were tools and materials used for the research, a set of stationery, cameras, voice recorders, and laptops. The data obtained were analyzed using qualitative and quantitative descriptive analysis. The results showed that of the thirty respondents who knew the utilization of banana plant sap as wound remedy, only 60% were still using it. Parts of banana plants that were often used by the community was the banana plant shoots by 87% of the total respondents and banana leaf fronds by 13%. There was no specific type of banana used for this wound remedy. However, the type of banana most widely used by the community was *ambon* Banana (*Musa paradisiaca* var. *sapientum*) with a percentage of 20%, *kulutuk/manggala* banana (*Musa balbisiana*) 60%, and *kepok* Banana (*Musa paradisiaca formatypica*) 20%. Based on the results of the observation and interview, there were at least four benefits of using banana sap, namely preventing infection, sticking wounds, stopping bleeding, and drying the wound. While scientifically, this banana sap can be used as the wound remedy because it contains flavonoid compounds, saponins, triterpenoids, steroids, alkaloids, ascorbic acid, and tannins.

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## INTRODUCTION

A wound is tissue damage to the skin either intentionally or unintentionally caused by physical contact both originating from sharp objects, heat sources (such as chemicals, hot water, fire, radiation, and electricity), the results of medical action, or changes in physiological conditions which causes interference (Berman, 2009; Masir et al., 2012.; Purnama, Sriwidodo, & Ratnawulan, 2013; Risma, Tahir, & Yusuf, 2018). Wound that mostly occurs in the community is an incision (*Vulnus scissum*) caused by contact with instruments with sharp objects such as knives, scissors, hoes, etcetera. These incisions disrupt the anatomical functions and structures of the human body (Oktaviani et al., 2019).

In specific communities, the handling of incision utilizes biological resources such as banana plants. The part of banana plants that have the potential for wound healing treatment is the sap (Daud, 2015; Wakkary et al. 2017; Khairunnisa, Ningtyas, Haykal, & Sari, 2018). The banana plant sap has the potential to be developed in the world of medicine, including leprosy, hysteria, fever, indigestion, bleeding, epilepsy, hemorrhoids, and insect bites (Kumar, Bhowmik, & Umadevi, 2012). Banana sap contains ethanol, which can inhibit the growth of pathogenic bacteria such as *Bacillus subtilis*, *Bacillus cereus*, and *Escherichia coli*. Apart from that, the banana plant sap can help in healing wounds and preventing infection. The results of phytochemical screening on banana plant stems show that banana plant stems contain flavonoids, ascorbic acid, saponins, triterpenoids, steroids, alkaloids, and tannins. Then banana shoots are proven to contain saponins and flavonoids that have the potential to heal wounds (Pongsipulung, Yamlean, & Banne, 2012).

Utilization of banana plant sap has been carried out through generations by Indonesian people in several areas, including rural communities in Citatah Village, Cipatat District, West Bandung, Indonesia. The tradition of utilizing the banana plant sap begins with the community's urgent need to treat incision wounds found while working in the garden or the kitchen while cooking. These habits are passed down through generations into local community knowledge (Indigenous knowledge), in the branch of biology known as ethnobotany. According to Atmojo (2015), ethnobotany in terminology has a meaning as a relationship between botany (plants), which are connected with ethnic (community groups) in various parts of the earth. Ethnobotany can be interpreted as a study of the use or application of plants in people's lives.

Ethnobotany aims to study the relationship between local communities and their natural environment, including knowledge systems about plant resources (Ristanto, et al., 2020). Besides, ethnobotany has a significant effort to document the local knowledge of the community regarding the utilization and management of agricultural resources, estimation of the benefits obtained from these plants, and efforts to conserve ecological resources (Tamalene, Hasan, & Kartike, 2019; Harahap, et al., 2019; Eni, et al., 2019). The importance of ethnobotany studies for community groups is to provide better knowledge about the use of a plant, not only that ethnobotany provides knowledge of the plant's potential to the community, whether it is for drugs, clothing, boards etcetera. As well as not forgetting the learning conservation of these plants must still exist and must be preserved so that the culture of the use of these beneficial plants is still carried down through generations.

Ethnobotanical study on banana plants has been carried out in various regions in Indonesia with various perspectives and goals. Kasrina & Zulaikha (2013) examined the diversity and ethnobotany of banana (*Musa* sp.) In the community in Sri Kuncoro Village, Pondok Kelapa District, Bengkulu Tengah, Indonesia. Furthermore, the research conducted by Hapsari, Kennedy, Lestari, Masrum, & Lestarini (2017) examined the ethnobotany study of banana diversity in 6 regions of Java. However, ethnobotany, which discusses the traditional practices of the utilization of banana plant sap by the public explicitly, has not been widely reported. This study aimed to ethnologically examine the utilization of banana plant sap as an

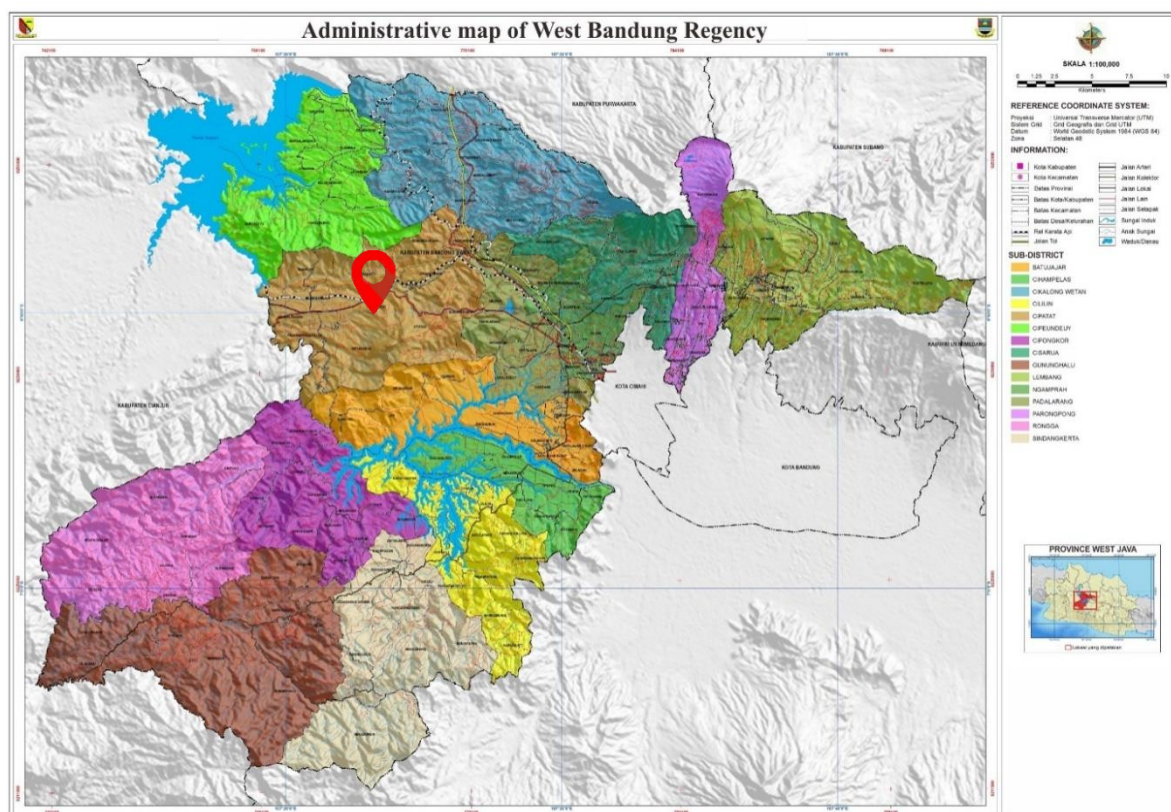
incision remedy, find out the types of bananas used by the community, and find out the banana plant parts used by the community as a source of banana plant sap.

## METHODS

This study was a descriptive qualitative with a structured observation and interview method (interview instruments consist of interview lattice).

### Time and Location

On October-November 2019 at Citatah Village, Cipatat District, West Bandung Regency, Indonesia (Figure 1).



**Figure 1.** Map of West Bandung Regency, Indonesia (Source: Government of West Bandung Regency, 2013)

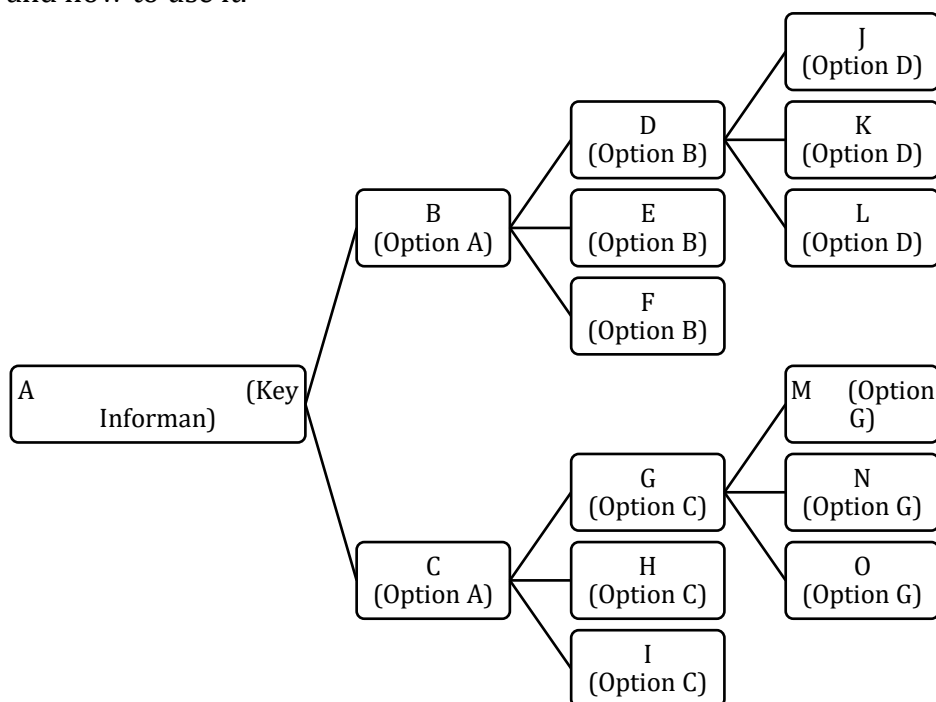
### General conditions of research

Geographically the village of citatah is between 6°50'16.55 "South Latitude and 107°24'51.80" East Longitude directly adjacent to the village of Cipatat and Gunung Masigit. The total population in citatah village is 16,500, with the majority working as farmers. With such a large number of agriculture in this village, there are many community habits in farming and daily life, one of which is using banana tree sap as a wound medicine.

### Data collection

The sampling technique was carried out by snowball sampling with the key informants and the general public, who is considered to know the benefits of banana plant sap as a wound medicine as the research sample. The number of samples taken was 30 respondents. Snowball sampling is a technique that utilizes several vital informants to help researchers deliver to group members or people who can be trusted sources (Nurdiani, 2014). Like a snowball, the

chosen person will choose trusted, and so on, so the number of samples is getting more significant than we expect (Figure 2). The number of respondents interviewed refers to Ingleby's (2012) guidelines, which state that the larger the sample of the size of the population is, the better with a minimum limit of 30 respondents. Tools and materials used include a set of stationery, cameras, voice recorders, and laptops. Data collection is done by structured interviews regarding a list of questions such as name, age, gender, profession, knowledge of the benefits of banana plant sap, the application of banana tree sap, the type of banana plant used, the parts used, and how to use it.



**Figure 2.** Illustration of snowball sampling (Adaptation from Sugiyono, 2008)

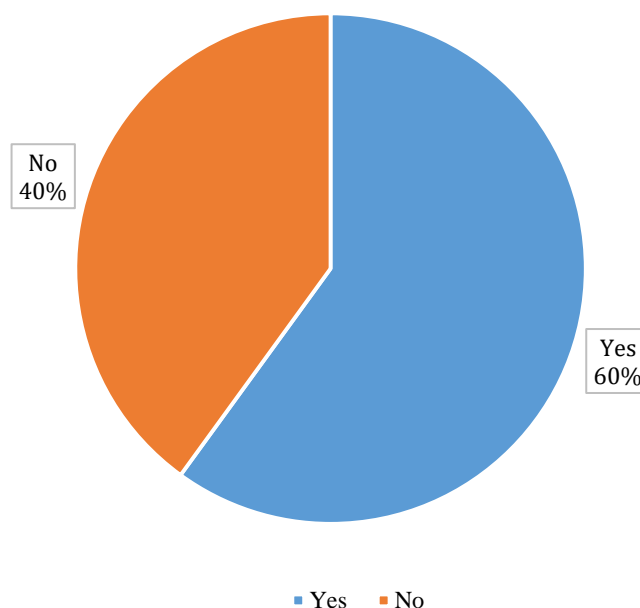
### Data analysis

The data obtained were analyzed using qualitative and quantitative descriptive analysis. Qualitative data were obtained from interviews with the community to determine the level of community knowledge, the level of use of banana sap by the community, how to use banana sap as an incision wound, and the portion of banana trees used. Quantitative data are presented in the form of a percentage of the level of community knowledge, the use of banana sap by the community, and the portion of banana trees used. This data is processed using Microsoft Excel applications.

## RESULTS AND DISCUSSION

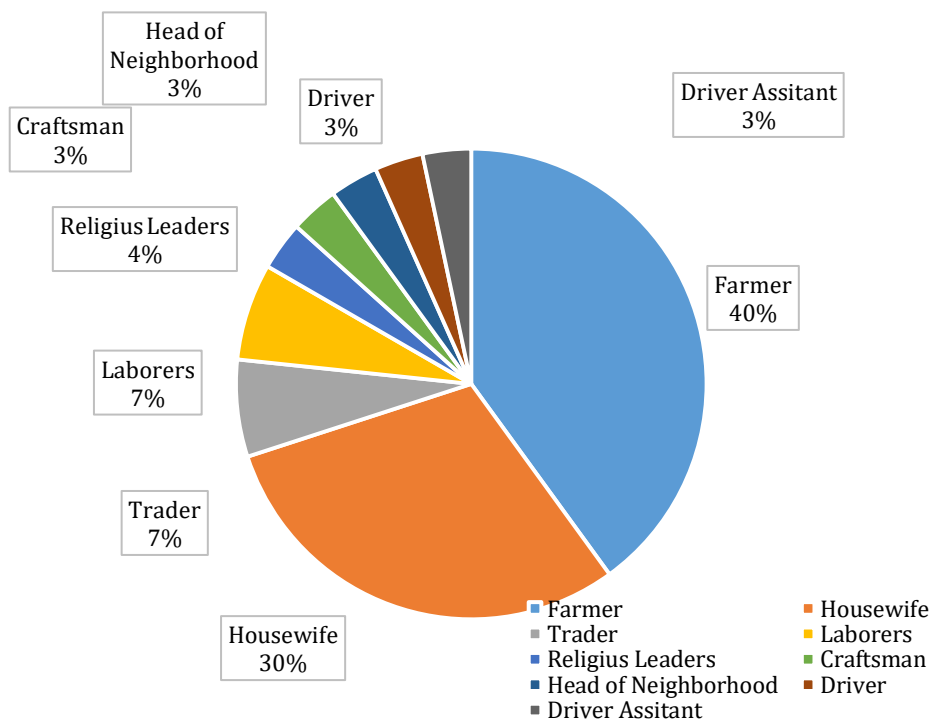
Based on interviews and observations conducted with 30 respondents, it was found that knowledge about the utilization of banana plant sap was still solid in the community. Data shows that 100% of respondents know the use of banana sap as traditional medicine for incisions. While in its use (Figure 3), out of 30 respondents, only 60% still use it. Based on the results of the interviews, the decline in the use of banana sap as a wound remedy occurs because the community has led to new ways of treatment, access to clinics or medicine places is quite easy, the profession of farmers or field workers is starting to decrease, and most of the village community has kept adhesive stock wounds and antibiotics.

Public knowledge of the benefits of banana sap as an incision remedy has been going on for generations. Based on the interview results, at least four benefits of using banana sap, namely preventing infection, sticking wounds, stopping bleeding, and drying the wound. Banana plant sap contains ingredients that play a role in wound healing, with several active compounds, banana plant sap has the potential to heal open wounds including one of them, namely burns (Wibowo, 2017). Also, banana sap sources commonly used by the community include *bogo* banana, *ambon* banana, *manggala/kulutuk* banana, *kepok* banana, and some communities do not specify the type of banana precisely. As the fastest form of treatment at the time of injury, the community must take the sap from the closest type of banana.



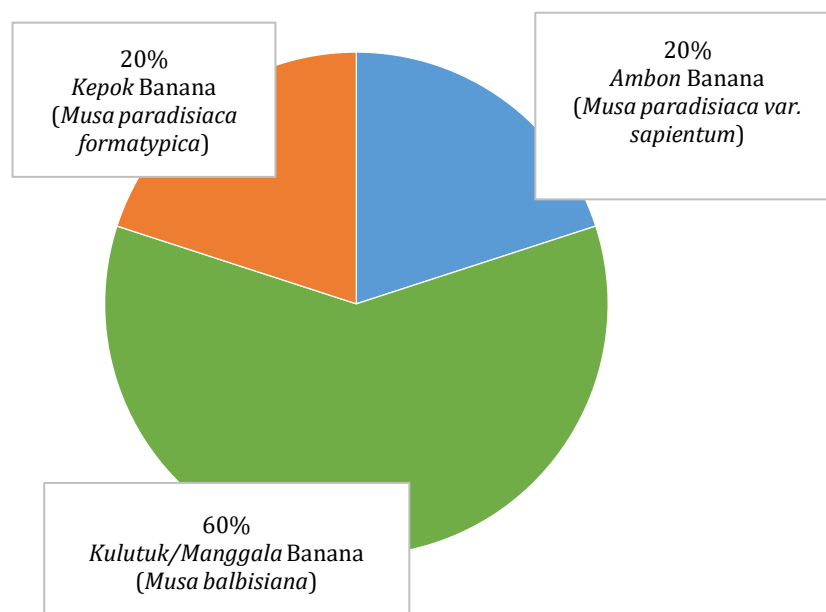
**Figure 3.** Percentage of the use of banana sap as wound remedy

When collecting data from the community, the community profession of Citatah Village (Figure 4) is generally as a farmer, with the highest percentage of 65% of the total population. Therefore, the type of respondent profession that is taken the most is farmers, with a total of 12 people (40%) respondents. This profession shows the high intensity of sharp objects such as hoes, knives, and other agricultural tools, which makes the enormous potential of farmers affected by injuries due to workplace accidents in the field. Then it was strengthened by the presence of crucial informants, namely community leaders stating that farmers who used the sap of banana as a wound remedy. In addition to farmers, housewives have a potential of indigenous knowledge about the utilization of banana plant sap because of their interactions with kitchen utensils that can sometimes injure the body, making them able to use banana plant sap as a wound remedy. Other professions were taken to equalize respondents so that the data could include professions in the Citatah Village community.



**Figure 4.** Respondent profession

Indigenous knowledge utilization of banana plant sap can be seen in the picture. From the data, about 60% of those who still use banana plant sap as a wound remedy is mostly people who have a profession as farmers due to the limited availability of wound remedy when they work in the garden. That makes people explore the natural resources around them. As an example, the sap of banana plants whose benefits have been recognized to treat incision wounds. Housewives do not use banana plant sap as a wound remedy, due to the presence of drops for wounds around the house and how effective it is.



**Figure 5.** Percentage of the types of banana plants commonly used by the community.

In principle, the community considers all types of bananas to be utilized as a source of sap for wound remedy. However, three types of bananas are widely used by the community of citatah (Figure 5), namely *ambon* banana (20%), *kulutuk/manggala* banana (60%), and *kepok* banana (20%)—the following types of banana plants commonly used as wound remedy.

**Table 1.**

Types of banana plants used as wound remedy, parts used, how to use, and benefits.

Local Name	Scientific Name	Parts Used	How to use	Benefit
<i>Ambon</i>	<i>Musa paradisiaca</i> var. <i>Sapientum</i>	Shoots/ midrib	Dripped/ smeared	Preventing infection,
<i>Kulutuk/Manggala</i>	<i>Musa balbisiana</i>			Gluing the wound,
<i>Kepok</i>	<i>Musa paradisiaca</i> formatypica			Stop the bleeding Drying the wound

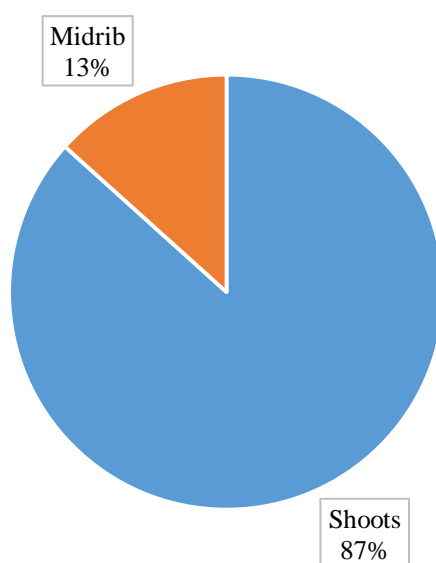
The community uses the three types of banana plants when they have a wound. For example, in a distant garden to get conventional wound medicine, the community uses the gum from the closest banana type and four types of bananas. In principle, the community considers that all types of bananas can be utilized as a source of sap as a wound remedy. However, three types of bananas are widely used by the community of citatah, namely *ambon* banana, *kulutuk/manggala* banana, and *kepok* banana. Several journals have mentioned that the sap from the banana *ambon* plant can heal open wounds. Wibowo (2017) used *ambon* banana plant sap for burns in *Mus musculus*, resulting in the chemical content in the *ambon* banana sap, such as flavonoid and saponin which are able to inhibit and kill bacteria to accelerate the inflammatory process. Also, the results of Kustiawan's research (2017) on the effectiveness test of antibacterial substances on *ambon* banana stem and stem extract (*Musa paradisiaca* var. *sapientum*) are ethanol extract from banana stem and stem which can be used by *Staphylococcus aureus* bacteria.

In *kulutuk* or *manggala* banana from the results of the antibacterial activity test and ethyl acetate extract, both *Pseudomonas aeruginosa* and *Staphylococcus* bacteria epidermidis extracts. This is due to the results of methanol and ethyl acetate extracts from banana pseudostems containing flavonoids, saponins, and tannins, which already contain seblumnya that phytochemical substances are used as antibacterial (Damayanti, 2017). Bananas contain antibacterial substances because they contain compounds saponins, flavonoids, and alkaloids. Midrib extract and *kepok* banana weevil are proven to inhibit the growth of *S. aureus* and *E. coli* (Azizah & Artanti, 2019). In addition to the stem and stem of banana *kepok*, the study results showed that the banana extract of *kepok* is able to inhibit the growth of *Staphylococcus aureus* bacteria. Banana peels contain phenolic and active ingredients such as tannins and flavonoids (Wardini, 2017; Pratama et al., 2018). In essence, the three types of bananas above have phytochemical compositions consisting of flavonoids, saponins, alkaloids, tannins, etcetera, which can inhibit bacterial growth. This bacterium can overcome the growth problems caused by this plant.

*Ambon* bananas, including *Sapientum* varieties, have characteristics of an average pseudostem diameter of 1.25-3.2 meters, pseudostem diameter of 0.17-0.19 meters, pseudostem color in green, pseudo-pattern of black purplish stems, the shape of the edge of the leaf midrib (*petioles*) does not clamp the stem, the shape of the leaf base is rounded, the banana flower is formed in a bunch of flowers (*ontong*) or also known as mixed flower (*influrecensia*). The color of the flower sheath (*spatha*) is pink. The characteristics of *kepok* bananas included in the *Formatypica* variety are pseudostem height of more than 3 meters with a greenish-brown tint, brown leaf stem clamping shape, and black midrib edge leaf, both leaf base is rounded, and have large seeds. (Sariamanah et al., 2016). The shape of the base of the bractea is rounded and

broken; the exterior color of the bractea is purplish red. The fruit's position is straight toward the stem, the number of combs per bunch 4-7, and the number of fruits per comb 13-16. Fruit length  $\leq 15$  cm, straight fruit shape, pointed fruit tip, different fruit surface, the color of the ripe fruit is not green while the color of the ripe fruit skin is yellow, the color of the ripe fruit flesh is white (Ambarita et al., 2015).

The character of the *kulutuk/manggala* banana (*Musa balbisiana*) belongs to the tall and robust banana clump up to 7.5 m, the leaf sheath forms a pseudostem, the leaf stems are arranged vertically, the pseudostems reach 6.25-7.20m, diameter of 40.5 cm with a pseudostem color that is light green with a cream-colored waxy sheath with pink-purple pigmentation on the inner surface, shiny pseudostem, and much sap. Stalks of green leaves 71 cm long, canal margins curved inward, bases without pigmentation or dark brown spots, lamina width 280 × 78 cm, green, shiny, green abaxial with a smooth touch, symmetrical base, both rounded sides, green midrib dorsiventral (Borborah, Borthakur, & Tanti, 2016). Parts of banana plants that are often used by the community presented in Figure 6.



**Figure 6.** Parts of banana plants that are often used by the community.

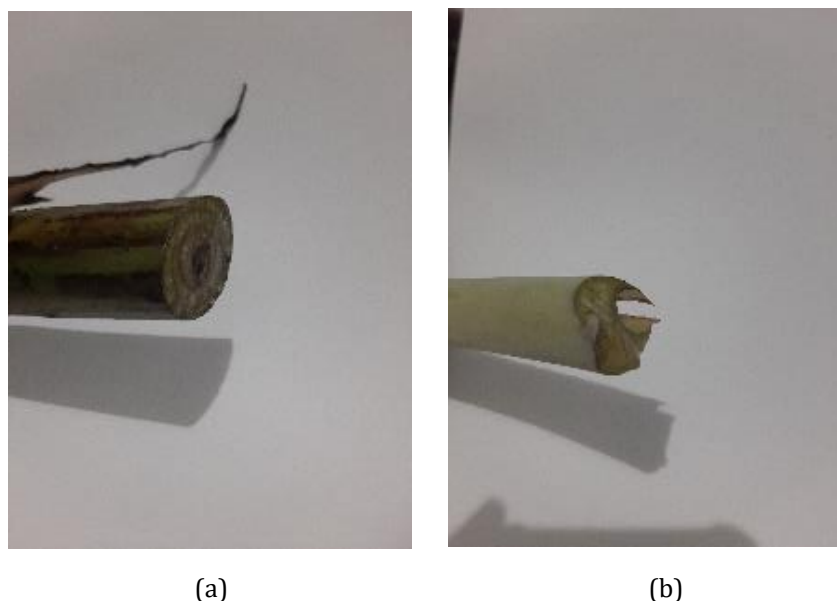
Wound healing phytochemicals include alkaloids, tannins, saponins, and flavonoids (Budi et al., 2015). Alkaloids play a role in the formation of free radical chain reactions in lipid oxidation, which can accelerate the wound healing process and protect tissue from oxidative damage (Rahayu, Supriyatin, & Fauziah, 2019; Kurniati, Rahayu, Sukmawati, & Maharani, 2019). Tannins are antimicrobial that can accelerate the process of wound healing through various cellular mechanisms, including cleaning reactive oxygen and free radicals, increasing wound closure, increasing the formation of blood capillaries, and increasing epithelialization. Fibroblasts need saponins in synthesizing the collagen in the wound healing phase (proliferation) (Agarwal et al., 2009; Sheikh et al., 2011). Proliferation is a phase of wound healing in which the process of wound contraction occurs. This phase is marked by angiogenesis or new blood vessels, reepithelialization, collagen formation, formation, and formation of granulation tissue (Gonzalez et al., 2016). Flavonoids are antimicrobial that could reduce lipid peroxidation, increase epithelialization speed, and are potent antioxidants (Rahayu, Zahara, Afifah, & Supriyatin, 2019). Reduction of lipid peroxidation can prevent tissue damage, repair vascular tissue, and improve collagen fiber resistance (Khairunnisa et al., 2018). Wound closure, increasing the formation of blood capillaries and increasing epithelialization.

Steroids have an antimicrobial activity that can trigger epithelial growth in wound tissue



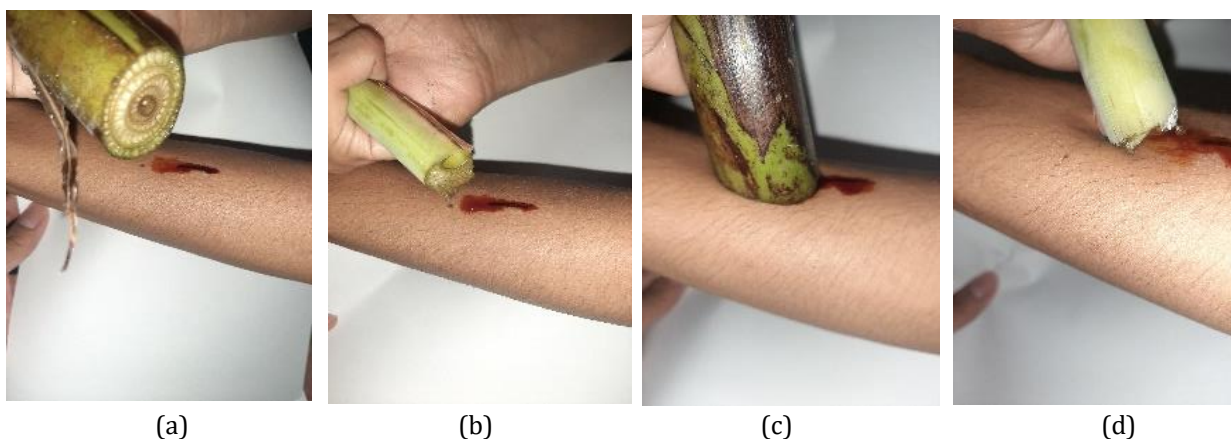
(Widia, Abdassah, Chaerunisaa, & Rusdiana, 2018). Triterpenoids are secondary metabolites that have prominent physiology that are often used as medicines. In plants this compound works as an anti-fungus, insecticide, anti-predator, anti-virus, and antibacterial (Widiyati, 2006). Ascorbic acid plays a role in strengthening and accelerating the growth of connective tissue (Syamsuddin, 2018). The antimicrobial effects of banana stem sap are due to its active ingredients in the form of saponins, quinones, anthraquinones, and lectins. These four compounds can cause damage to the microbial cytoplasmic membrane, resulting in impaired energy metabolism and growth in the microbes (Hananta, Listyarini, & Haryati, 2005).

Based on the exposure of key informants, there are generally two ways of using the banana plant sap, which is by dripping or smeared it to the wound. How to use it is as follows (Figure 7).



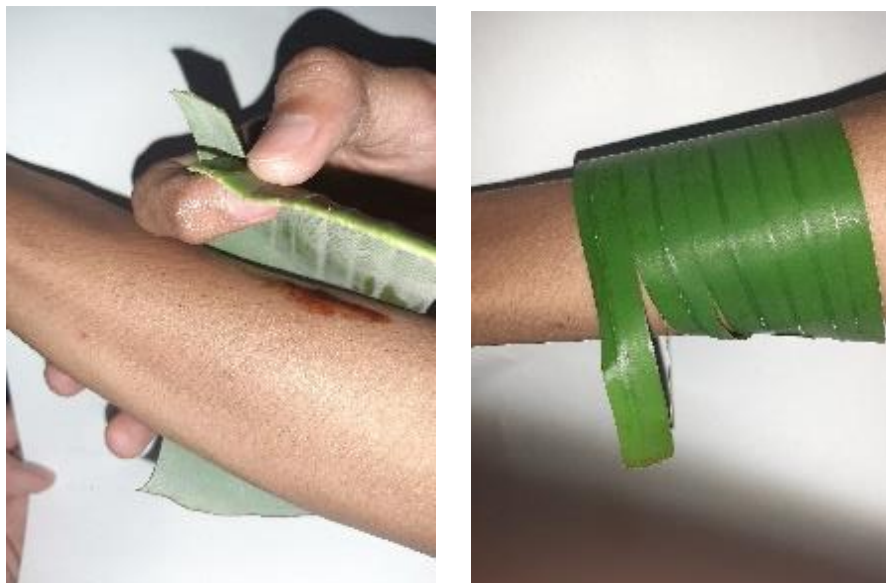
**Figure 7.** Parts of banana plants are used as a source of sap; (a) Banana shoots, and (B) Banana stem.

When taking these parts of the banana plant, some people use banana shoots as a source of sap (Figure 8), while others use banana fronds (Figure 9). Of the two parts that have the same benefits and content of the sap, the difference is the habit of people using it.



**Figure 8.** Application of banana plant sap in wounds; (a) Banana plant sap from the bud is dripped, (b) Banana plant sap from the midrib is dripped, (c) Banana plant sap from the bud is smeared, and (d) Banana plant sap from the midrib is smeared.

After the banana plant part is obtained, the sap, which is still dripping on the banana plant part taken, is directly applied to the wound by being dripped or smeared directly. The community explained that the process of using bananas' sap when applied to the wound was temporarily painful, but the wound is quickly dried.



**Figure 9.** Covering the incision wound using banana plant leaves

Infection or exposure to other microorganisms is avoided by using banana plant leaves to wrap the wound until it is tightly covered, leaving no access for microorganisms. In addition to using banana leaves, wounds can be covered using a cloth. According to Zulfa, Nurachmah, & Gayatri (2008), the selection of the right, effective, and efficient bandage is an important decision made to repair damaged skin tissue. A proper wound bandage has criteria including maintaining the humidity of the wound and bandage, does not inhibit gas exchange, eliminates excessive exudate, maintains warm temperatures, is protective from bacteria and free from particles, and can be released without causing trauma during the exchanging bandages until the wounds already recovered.

The process of wound healing is very complex, through the inflammatory phase from day 0 to 5 after injury. The proliferation phase continues from day 3 to 21 after injury. Finally, the Maturation phase occurs from the 21<sup>st</sup> day to 1 year after injury. The aim is to restore the strength and structural integrity of the new tissue (Primadina, Basori, & Perdanakusuma, 2019). Biologically, the healing process carried out by banana sap occurs because the banana sap, which is dripped into an incision wound, has a function as a chemotactic factor that attracts the presence of inflammatory cells from the blood circulation and migrates into the tissues. These chemotactic factors help organize the response of inflammation until healing occurs, and this response is part of the body's defense to control infection (Febram, Wientarsih, & Pontjo, 2010). The traditional treatment process is still inherent in the culture of the rural community of Citatah Village. This is worth preserving because it is not just medical knowledge based on ancestral heritage. However, it has been scientifically proven that the content in banana sap can treat incision wounds.

## CONCLUSION

Ethnobotanically, the level of knowledge on the benefits of banana plant sap as an incision remedy in the community of Citatah Village, Cipatat District, West Bandung Regency, Indonesia,

is still very strong. With a percentage of the level of community knowledge of 100%. The types of banana plants that are often used by the community as a source of sap for incision wounds are *ambon* banana plant types (*Musa paradisiaca* var. *sapientum*), *kulutuk/manggala* banana (*Musa balbisiana*), and *kepok* banana (*Musa paradisiaca formatypica*). The portion of the banana plant that is often used by the community is the banana plant shoots by 87% of the total respondents and banana leaf fronds by 13% of the total respondents. Banana plant sap contains flavonoid compounds, saponins, triterpenoids, steroids, alkaloids, ascorbic acid, and tannins that play a role in wound healing. Researchers recommend that the utilization of banana tree sap can be developed further so that it can become a health product.

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