

BIOPROSPECTING OF PONTIANAK ALOE VERA AS AN INDONESIAN PLANT FOR COSMECEUTICAL : A REVIEW

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ABSTRACT

Pontianak Aloe Vera (PAV) is one of the plants in Indonesia that is used as an icon of the city of Pontianak. This plant is widely planted in Kalimantan and is known for its medicinal and cosmetic benefits. The method used is reference search through Google Scholar, Research Gate and other electronic media and then analyzed by descriptive method. The articles reviewed in Indonesian or English language, which published between 2010 to 2022, relevantly. Based on the research results, this plant contains various chemical compounds, such as aloemoedin, aloebarbadiod, vitamin C, collagen, polysaccharides, enzymes, and minerals that have the potential as cosmeceuticals. The products made from *Aloe vera* produced by the researchers are in the form of external use products in the form of gels, creams, lotions, liquid soaps, and so on for skin and hair care and the use of products orally in the form of powders. These treatment products are reported to have benefits as an anti-dandruff and hair growth stimulate. In addition, other benefits on the skin are maintaining moisture and hydration of the skin, as a sunscreen, stimulating the growth of fibroblasts to treat wounds after surgery, brightening the skin, fading wounds and acne scars, reducing the severity of acne and maintaining skin elasticity.

Keywords: Cosmetic, Medicinal, Phytoconstituent, Kalimantan.

INTRODUCTION

Aloe vera L. is one of the leading agricultural commodities known as medicinal and cosmetic plants in Indonesia. Since 1980, aloe vera has been developed and cultivated in Pontianak

City, West Kalimantan Province (Ismawati, 2020). Pontianak is one of the main centers for aloe vera producers in Indonesia because this location has a suitable environment for the growth and development of this commodity. Therefore, Pontianak is known for its aloe vera,

namely Pontianak Aloe Vera (PAV) (Ismawati, 2017). Now, PAV has become an icon of the city (Ismawati, 2020).

PAV is generally used by farmers for the midrib to be processed into fresh drinks. However, along with industrial developments, aloe vera began to be widely developed into processed food products, medicines, and even used as cosmetic ingredients (Sahu *et al.*, 2011). At the time of Cleopatra, aloe vera was thought to have been used for cosmetic ingredients (Brandon, 2015). It is recorded in a book entitled Egyptian Book of Remedies that aloe vera has known properties, one of which is that there are various kinds of substances to meet the skin's nutritional needs (Brandon, 2015).

Cosmetic products made from aloe vera that are formulated with various permitted cosmetic ingredients will form the basis of one or more of the ingredients used. The formulation is informed to provide the desired benefits of its users (Wathoni *et al.*, 2018). The use of cosmetic products made from aloe vera are recommended to be used according to the dosage and rules of use to improve health and skin and hair care. In addition, herbal cosmetics made from aloe vera are shown to have fewer side effects than synthetic cosmetics (Zhang *et al.*, 2021).

Various studies on the benefits of using aloe vera as a cosmetic ingredient have been carried out. Aloe vera extract in gel dosage form is reported to be capable of hydrating and as a sunscreen on the skin (Fox *et al.*, 2014; Hendrawati *et al.*, 2019). In addition, other benefits have been informed from the aloe vera gel dosage form, which can be used as a hair mask to reduce dandruff and as a treatment for damaged hair (Ambarwati *et al.*, 2020). The benefits of aloe vera that its users feel, this occurs because aloe vera is reported to contain substances, such as amino acids, aloemoedin, saponins, and vitamins (Dominguez-Fernandez *et al.*, 2012). Therefore, one type of aloe vera, such as the PAV in Indonesia, has the potential to be developed and explored more deeply

for cosmetic products as well as skin and hair care. This review describes the prospects of the PAV plant for cosmeceuticals.

RESEARCH METHODS

This reference search was carried out through Google Scholar, Research Gate and other electronic media using the keywords "Aloe vera", "Aloe vera", "Cosmetics", "Cosmeceutical", "Skincare", "Lidah Buaya Pontianak", "Bioprospecting and Aloe vera" and "Cosmetics and Aloe". The articles obtained were then analyzed by descriptive method. Articles included in this review, namely, in Indonesian or English, were published in the period 2010 to 2022 and are relevant to the topic. In addition, the criteria for articles used are scientific articles in the form of national publications indexed by SINTA (Science and Technology Index), GARUDA (Digital Reference Garba), and international ones, such as Scopus.

RESULTS AND DISCUSSION

Bioecology Of Aloe Vera.

Aloe vera (*Aloe vera* L.) is known as a commodity crocodiles tongue in the UK, called jadam in Malaysia, and known as aloe in other countries. This commodity belongs to the *Liliaceae* family or flowering plants (CABI, 2019). This family is estimated to have 4000 species of plants divided into 240 genera and 12 sub-families spread throughout the world (Ismawati, 2020). Aloe vera has >250 plant species widely cultivated and adapted to dry, Mediterranean, tropical and sub-tropical conditions (CABI, 2019).

Aloe vera is a succulent plant that can thrive in poor soil conditions. In addition, this commodity belongs to the Crassulace Acid Metabolism (CAM) type, which is resistant and can grow in drought conditions (CABI, 2019). This happens because this commodity is efficient in the use of water. Stomata on this commodity are open at night or in dark conditions when the air is cold so that

there is no water evaporation and can retain fluids in the body (Ismawati, 2020).

Based on CABI (2019), the taxonomy of aloe vera (Figure 1), includes the following:

Kingdom : Plantae
 Phylum : Spermatophyta
 Class : Monocotyledonae
 Order : Liliales
 Family : Liliaceae
 Genus : Aloe
 Species : *Aloe vera* var. *chinensis* Baker



Figure 1. Pontianak Aloe vera

Source : UPTD Agribisnis Dinas Pertanian
 Perikanan dan Kehutanan
 Kota Pontianak; Ismawati, 2020.

Aloe vera chinensis is a commodity widely developed in Indonesia and is suitable for planting, especially in the province of West Kalimantan. This type of commodity is known as Pontianak Aloe Vera. The morphology of this type of aloe vera is that it has orange flowers, with a light green midrib that has white spots when it is young, and is slightly concave on the upper midrib (Ismawati, 2020).

Phytoconstituents of Aloe Vera

Aloe vera contains chemical compounds that play an important role in maintaining and caring for healthy skin and hair. The chemical compounds contained in aloe vera include amino acids, alanine, arginine, aloin (Figure 2),

anthraquinones (Figure 3), emodin, glycine, histidine, lignin, saponins, serine, threonine, and minerals. The content of these chemical compounds is reported to have functions to hydrate the skin, reduce erythema, act as a sunscreen and maintain and care for hair health (Ardini & Sumardilah, 2021; Dominguez-Fernandez *et al.*, 2012; Gracia *et al.*, 2019; Hendrawati *et al.*, 2019).

The content of other chemical compounds found in aloe vera, namely vitamin C (Table 1). Based on research by Reddy Uma *et al.* (2011), vitamin C in aloe vera can fade acne scars. The content of these chemical compounds is reported to be able to brighten and fade any scars on the skin (Pangkanon *et al.*, 2020).

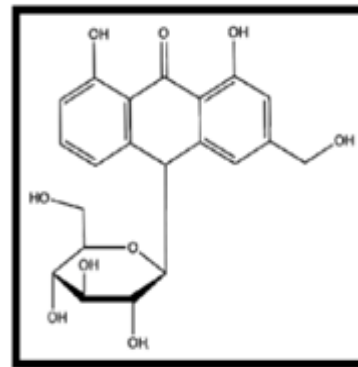


Figure 2. Chemical structure of aloin in aloe vera

Source : Sahu *et al.*, 2013

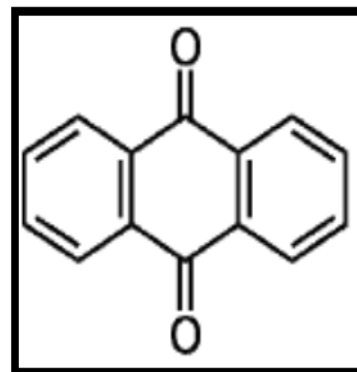


Figure 3. Chemical structure of anthraquinone in aloe vera

Source : Sahu *et al.*, 2013

Table 1. The result of the analysis of the content of Pontianak Aloe Vera gel components in 100gr of ingredients

Chemical Compound Ingredient	Percentage
Water	99.500%
Fat	0.067%
Carbohydrate	0.0043%
Vitamin A	
Vitamin C	
Total Dissolved Solids = 0.49%	

Source : UPTD Agribisnis Dinas Pertanian Perikanan dan Kehutanan Kota Pontianak; Ismawati, 2020.

The use of aloe vera is good for the treatment of postoperative scars. This happens because aloe vera contains glucomannan compounds. Glucomannan has an important role in influencing fibroblasts' growth to treat skin wounds (Zhang *et al.*, 2021).

Phytosterols, enzymes, polysaccharides, phosphorylated monosaccharides, and minerals that chemical compound group we can find in aloe vera. The content of these chemical compounds are informed to have an important role in skin care. Based on research done by Mazzarello *et al.* (2018), Phytosterols, enzymes, polysaccharides, phosphorylated monosaccharides and minerals in aloe vera can reduce the severity of acne on the skin.

Ascorbic acid, coumaric acid, cinnamic acid, and pyrocatechol are chemical compounds found in aloe vera. The content of these chemical compounds are showed to have antibacterial activity (Sari & Ferdinand, 2017). In addition, aloemoedin and aloebarbadiod in aloe vera were reported to have antifungal activity.

The content of other chemical compounds found in aloe vera, namely collagen. Saito *et al.* (2016) explained that collagen is able to maintain skin elasticity. In addition, another role of collagen is to prevent photoaging (Saito *et al.*, 2016).

The use of aloe vera is not only good for skin health, aloe vera also has an important role in the hair. We can find the chemical compounds lysine and cysteine in aloe vera (Dominguez-Fernandez *et al.*, 2012). The content of these chemical compounds are informed to stimulate hair growth (Indriaty *et al.*, 2018).

Aloe Vera For Cosmetics and Skin Care.

The following are some of the research results on products or ingredients derived from aloe vera. This is a potential for Pontianak aloe vera as cosmetics and skin care. The results of the study, among others, are as follows:

Sunscreen Lotion

Aloe vera gel extracted in the formulation of sunscreen lotion efficiently protects the skin from the sun. Based on research done by Hendrawati *et al.* (2019), the addition of 20% aloe vera extract, which is the treatment with the highest concentration, has an SPF value of 10.21, measured using UV-Vis spectrophotometry with a wavelength of 290-320 nm. The SPF value in this lotion is informed to have a significant relationship with the concentration of aloe vera gel extract. The higher the concentration of aloe vera gel extract, the higher the dispersive value of the SPF preparation and the higher the resulting SPF value.

Gel Lotion

The aloe vera gel extracted in the gel lotion formulation could hydrate the skin and reduce erythema. The use of aloe vera gel lotion within 150 minutes after use is showed to be able to hydrate the skin (Fox *et al.*, 2014). In a study conducted by Fox *et al.* (2014), a measurement to determine the anti-erythema effect using Mexameter®. The use of aloe vera gel lotion 2x1 day every morning and night can significantly reduce skin erythema and maintain skin moisture.

Silicone Gel

Silicone gel containing aloe vera extract is capable to brighten the skin,

reduce itching, have a calming effect and even reduce pain on injured skin, and reduce skin pigmentation in scars. In addition, aloe vera extract's chemical composition can treat surgical wounds (Reddy Uma *et al.*, 2011; Zhang *et al.*, 2021). In fact, the gel can prevent the formation of keloids (Pangkanon *et al.*, 2020). In addition, aloe vera silicone gel is reported to increase skin elasticity (Saito *et al.*, 2016). The gel is informed to be able to lighten the skin (Dominguez-Fernandez *et al.*, 2012). The use of aloe vera silicone gel 2x1 day was to be able to reduce skin pigmentation seen at the 4th and 12th weeks of use (Panganon *et al.*, 2020).

Powder (Oral)

Oral administration of a powder containing 0.3% aloe vera gel extract can increase skin elasticity and prevent skin photoaging. This happens because aloe vera gel powder is reported to be able to prevent the decrease in hyaluronic acid (HA) content in the skin, so that skin elasticity is maintained (Saito *et al.*, 2016). In addition, oral administration of aloe vera gel powder was able to attenuate the UVB-induced decrease in serum adiponectin, and was able to promote the expression of hyaluronan synthase 2 (HaS₂) so that photoaging of the skin could be prevented (Saito *et al.*, 2016).

Cream

A topical cream containing 10% aloe vera leaf juice combined with 20% propolis extract and 3% tea tree oil is able to treat acne, reduce erythema, and fade acne scars (Mazzarello *et al.*, 2018). In addition, aloe vera leaf juice contained in the cream is informed to reduce the severity of acne. The use of topical cream by male and female correspondents routinely carried out 2x1 day showed significant changes in reducing acne scars, erythema, and the number of total acne lesions seen on the 15th and 30th days of use (Mazzarello *et al.*, 2018).

Lip balm

Lip balm containing aloe vera gel extract is able to maintain lip moisture and

overcome dry lips. Based on research conducted by Ardini & Sumardilah (2021), the use of 6% concentration of aloe vera extract in lip balm was showed to be able to hydrate dry lips. As for when applied 1x1 day the difference in lip moisture when used on days 1 and 5. In fact, the lips look healthy and moist after 30 days of use.

Liquid soap

Aloe vera leaf bark extracted in a liquid soap formulation has antibacterial activity on the skin. Based on Sari & Ferdinand's research (2017), the use of 10g of aloe vera leaf extract in a liquid soap formulation consisting of 10g of castor oil, 15g of olive oil, 10g of coconut oil, etc. was informed to be able to inhibit the growth of gram-positive and negative bacteria. In fact, when using liquid soap for the first time, it can inhibit bacterial activity. Meanwhile, after the bacterial activity test or the use of liquid soap containing aloe vera skin extract against the bacterial activity, it resulted in an average inhibition zone for gram-positive and gram-negative bacteria, including gram-positive bacteria *Staphylococcus aureus* 10.41 mm, *Staphylococcus epidermidis* 9, 21 mm, *Bacillus subtilis* 11.08 mm, *Bacillus cereus* 10.38 mm and gram-negative bacteria *Salmonella typhimurium* 10.22 mm, *Proteus mirabilis* 9.62 mm, *Pseudomonas aeruginosa* 11.59 mm and *Escherichia coli* 9.39 mm (Sari & Ferdinand, 2017).

Aloe Vera for Hair Care

The following are some of the research results on products or ingredients derived from aloe vera. This is a potential for PAV as a hair and scalp treatment. The results of the study, among others, are as follows:

Shampoo

Shampoo containing aloe vera extract combined with essential oils (coconut oil, lavender, rosemary, and eucalyptus) can make hair smooth, shiny, and healthy. This shampoo reportedly passed the conditioning performance test

on correspondents (Babu *et al.*, 2021). The use of a shampoo containing aloe vera extract makes the hair mass feel smooth and shiny. In addition, there is no scalp irritation (Babu *et al.*, 2021). Therefore, the use of aloe vera shampoo makes hair and scalp look healthy. It is suspected that aloe vera extract contains nutrients needed by hair (Dominguez-Fernandez *et al.*, 2012). After 4 weeks of using a shampoo containing aloe vera extract, significantly 59% hair growth was resolved (Garcia *et al.*, 2019). In addition, the use of this shampoo is reported to be able to stop hair loss, stimulate hair growth and regenerate hair, strengthen hair follicles, prevent hair aging, and dry hair (Garcia *et al.*, 2019).

Hair Mask

Aloe vera gel extracted in the formulation of a hair mask is able to reduce dandruff on the scalp. Based on research by Ambarwati *et al.* (2020), using an aloe vera hair mask that is applied 3x1 a week can significantly reduce dandruff and itching that occurs due to dandruff on the scalp. The average value of dandruff reduction after using an aloe vera mask was 0.800 mg compared to the control treatment, which only used pandanus leaf extract (0.699 mg).

Hair Tonic

The aloe vera gel extracted in the hair tonic formula is effective as a hair conditioner. Based on research that has been done by Indriaty *et al.* (2018), the concentration of aloe vera extract 7.5%, licorice extract 2.5%, ethanol 96% with a percentage of 15% in the hair tonic formula significantly accelerated hair growth of 0.1635 cm/day. In addition, the use of hair tonic 1x1 day for 28 days was reported to increase the rate of hair growth by 2.6617 cm and hair weight increased by 0.1854 g.

CONCLUSION AND SUGGESTION

Conclusion

PAV is one of the plants in Indonesia that is used as an icon of the city of Pontianak. The plant is known for its

medicinal and cosmetic benefits. The potential or prospect of Pontianak aloe vera is as a cosmeceutical. This happens because aloe vera contains chemical compounds that play an important role in maintaining and caring for healthy skin and hair. The content of these chemical compounds, namely amino acids, alanine, arginine, aloin, anthraquinone, emodin, glycine, histidine, lignin, saponins, serine, threonine, minerals, vitamin C, glucomannan, enzymes, monosaccharides, polysaccharides, phytosterols, collagen, ascorbic acid, coumaric acid, cinnamic acid, pyrocatechol, lysine, cysteine, aloemoedin, and aloebarbadiod. The following are products made from aloe vera resulting from research by researchers, among others, for cosmetics and skin care such as sunscreen lotion, gel lotion, silicone gel, oral powder, cream, lip balm and liquid soap and as well as for hair care such as shampoo, mask and hair tonic.

Suggestion

The authors hopes that the Pontianak aloe vera commodity is better known in various foreign countries, and there is a need for further research on this commodity which has the potential to be used as an ingredient in the formulation of various types of products that are useful.

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