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Utilization of *Aloe vera* Plants as a Raw Materials for Cosmetics: A Narrative Review

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A B S T R A C T

One of the plants that can be used as natural ingredients in cosmetics is aloe vera (Aloe vera). Aloe vera is very easy to get and has also been widely cultivated in Indonesia. The benefits of aloe vera are very diverse, including as an antibiotic, antiseptic, antibacterial, antiviral, anti-infective, anti-inflammatory, and anti-swelling. Aloe vera is effective in replacing damaged cells and improving skin conditions because there are polysaccharides that work together with essential amino acids and protein-breaking enzymes. Other aloe vera content in vitamins A, B12, E, inositol, and folic acid. The mineral content includes calcium (Ca), magnesium (Mg), potassium (K), sodium (Na), iron (Fe), zinc (Zn), and chromium (Cr). Aloe vera can be used as cosmetic preparations in the form of hair tonic, lotion, lip balm, shampoo, creambath, and liquid soap.

1. Introduction

Currently, beauty trends have changed a lot due to the influence of globalization. As time goes by, their need to beautify themselves has become a top priority for women in everyday life. Women will try to change their appearance and beautify themselves using cosmetics. Cosmetics are materials or mixtures of materials used to be rubbed, poured, sprayed, or used on parts of the human body for the purpose of cleaning, maintaining, increasing attractiveness, or changing appearance, and are not classified as drugs. Currently, there are quite a lot of cosmetics on the market, but most of these cosmetics contain several compounds that have the potential to cause interference with the barrier and skin structure. Therefore, it is necessary to carry out a comprehensive exploration effort for the development of cosmetics that are safer against the barrier and skin structure. Indonesia is a country rich in biological resources. Indonesia is the second-largest country with biodiversity after Brazil. This biological wealth gives Indonesia great potential for the development of new therapeutic modalities by utilizing natural ingredients. Every natural ingredient is rich in primary and secondary metabolites, where primary metabolites are used by plants for their survival and secondary metabolites are usually not used directly by plants for their survival and have the potential to be developed into new therapeutic modalities for cosmetics.[1-3]

Aloe Vera (*Aloe vera* L.)

One of the plants that can be used as natural

ingredients in cosmetics is aloe vera (*Aloe vera*). Aloe vera is very easy to get and has also been widely cultivated in Indonesia. Aloe vera can be useful as a raw material for the pharmaceutical cosmetic industries, as well as raw material for health food, beverages, and medicines without containing chemical preservatives. The benefits of aloe vera are very diverse, including as an antibiotic, antiseptic, antibacterial, antiviral, anti-infective, anti-inflammatory, and anti-swelling. Aloe vera is effective in replacing damaged cells and improving skin conditions because there are polysaccharides that work together with essential amino acids and protein-breaking enzymes. Aloe vera (Aloe vera) comes from Africa and belongs to the Liliaceae family. This plant is widely found in Indonesia and easily inhabits tropical and subtropical climates. Plants such as cacti with this type of succulent contain a lot of fluid. Aloe vera is a plant that can live at high temperatures or is grown as an ornamental plant in the yard. The characteristics of aloe vera are spur-shaped, thick, brittle, jagged edges or slightly pointed leaves in the form of small spines. The mottled surface is 15-36 cm long and 2-6 cm wide. Aloe vera is excellent in the cosmetic field because it contains many nutrients that are good for the skin. Aloe vera is made up of 95% water and 5% water. The rest consists of active ingredients such as essential oils, amino acids, minerals, vitamins, enzymes, and glycoproteins. The content of Vitamin C and Vitamin E in aloe vera is very effective for tightening the skin. Aloe vera also helps to nourish the hair, making it soft and shiny. These benefits are achieved by many of the key substances in aloe vera, including vitamin B1, vitamin B2, vitamin B3, vitamin B6, vitamin C, choline, folic acid, glucose, mannose, aldopentose, and enzymes. Aloe vera contains quite the complete nutrients that the body needs. Other aloe vera content in vitamins A, B12, E, inositol, and folic acid. The mineral content includes calcium (Ca), magnesium (Mg), potassium (K), sodium (Na), iron (Fe), zinc (Zn), and chromium (Cr).[4-6]

***Aloe vera* as a hair tonic**

A type of cosmetic that can be used to treat hair loss is hair tonic. Hair Tonic is a cosmetic preparation in liquid form and is a mixture of chemicals with other ingredients used to help strengthen, repair, grow and maintain hair condition. The function of hair tonic is to prevent hair loss, prevent dandruff and itching, and promote hair growth. The use of aloe vera as a hair tonic is because aloe vera contains vitamins A and C, amino acids, Cu, Inositol, enzymes, and minerals that can reduce hair loss and strengthen hair roots.[7]

A study conducted a stability test of hair tonic preparations with variations in the concentration of propylene glycol formulations. The ingredients used in each formula are aloe vera and celery extracts. After that, each formula was tested for evaluation. The results obtained from this study are that each formula is less stable due to precipitation on the 7th day. However, based on the specific gravity and viscosity that has been obtained, the formula that best meets the stability requirements is the propylene glycol concentration of 15%.[8]

Then further research uses aloe vera extract and honey for hair tonic preparations. This research was conducted to see the effect of the proportion of aloe vera extract and honey. In this study, we compared two basic ingredients with a ratio of 1 ml: 5 ml, 3 ml: 3 ml, and 5 ml: 1 ml. After that, aloe vera extract was made using the infundation method, and the preparation was evaluated. Based on the results of the research and it was found that there was an effect of the proportion of aloe vera extract and honey on the hair tonic results, then based on chemical tests on the content of the hair tonic X3 preparation with the proportion of aloe vera extract and honey 5 ml: 1 ml it can be seen that X3 contains vitamin A of 11.81 mg/100 ml, amino acids of 9.50 mg/100 ml, vitamin B5 of 2.45 mg/100 ml, and vitamin C of 4.80 mg/100 ml. Thus, it is said that the nutritional content in hair tonic X3 is still there and is not lost after going through the extraction process using two phases, namely the aqueous phase and the alcohol phase.[9]

Another study conducted three combinations of lime fruit extract and aloe vera extract. Based on the results obtained from this study, it was found that the combination formulation (1%:2%) showed the best physical stability and hair growth results in white male rabbits. In accordance with the quality requirements of pH (3.0-7.0), the combination of lime and aloe vera extract (5.53-5.83) is acidic. The results of the stability of the hair tonic preparation did not change color and odor.[8,9]

***Aloe vera* as a lotion**

Skin damage can be caused by several external factors, such as ionizing radiation, lack of nutrition, environmental pollution, alcohol consumption, and exposure to UV rays. Skin exposed to sunlight will absorb UV radiation and produce reactive oxygen species (ROS). ROS will cause damage at the cellular level, such as in the cell wall. Another cause of skin damage is hydration or the process of evaporation of water in the stratum corneum and sweat glands. The water content of 10-20% in the stratum corneum is needed to make the skin soft and firm. Dry skin due to loss of moisture can cause rough, cracked, itchy, and erythematous skin caused by dilatation of capillary blood vessels in the dermis. A natural plant that can be used to protect against water loss in the stratum corneum is aloe vera. Aloe vera extract 3% can reduce levels of transepidermal water loss.[10]

In another study, Simplicia of yellow leaves and aloe vera were extracted by sonication. The sonication method is carried out to obtain a high antioxidant content in a short time. Based on the results of the evaluation of the physical properties of the lotion preparation, it was found that the lotion had met the requirements of good preparation. Organoleptic observations showed a yellow lotion with a distinctive aroma of yellow leaf extract with a smooth texture. The homogeneity test did not contain coarse particles, the dispersion test was 7.31 cm, pH 7, the type of lotion was oil in water, and the stickiness was 45 seconds.[11]

Subsequent studies have shown that aloe vera gel extract can be added to sunscreen lotions and serves as protection against the negative effects of sun exposure. The test results showed that the addition of aloe vera gel extract resulted in pH and SPF values in the national standard of SNI 16-4399-1966. The highest SPF value of 10.21 was obtained from 20% aloe vera gel extract.[11]

Then in another study, testing the antioxidant activity of aloe vera gel was carried out by adding DPPH, which acts as a free radical. Aloe vera gel tested using the DPPH method measured at a wavelength of 517 nm showed that the percentage of radical scavenging was 23.21%. The antioxidant activity of the sample was determined by the amount of DPPH radical inhibition by calculating the percent inhibition of DPPH uptake. Based on the results of this study, it was found that the addition of aloe vera gel had an effect on the specific gravity, humidity, pH, and antioxidant activity of skin lotion preparations. The results of the physical and chemical properties test of skin lotion with a viscosity value of 8,333 cP; specific gravity 1.01 g/ml; 100% emulsion stability; product moisture 98.07%; pH 7.771; antioxidant activity 16.60%; irritation value 0; total microbes 9.5 x 10^1 cfu/ml.[12]

***Aloe vera* as a lip balm**

In lip care, lip preparations are the main thing for people to moisturize their lips, care for their lips, and improve their appearance. One of the most commonly used lip care is lip balm. Lip Balm is a cosmetic product that is widely used by the public. Indonesia is a country with a tropical climate, which increases the risk of skin damage caused by UV rays. It is also possible for dryness, especially on the skin of the lips / chapping, and at risk of actinic cheilitis. Lip Balm is a lip cosmetic that is packaged in a semi-solid form, which is formed from the main ingredients of oil, fat, and wax.[13]

Making lip balm from natural ingredients is one alternative that can be done at this time. In this study, lip balm preparations were made using aloe vera extract with variations in the concentration of aloe vera gel extract. The process of extracting aloe vera is

done by maceration. Based on the results of this study indicate that the lip balm preparations from the four preparations are 75% homogeneous. Then all preparations meet the standard requirements for melting point according to SNI and meet the pH standard requirements for cosmetic preparations, namely 4.5 - 5.5. Furthermore, all of the formulas showed that the formula was 100% stable in color, 100% in odor stability, and 85% in form stability.[13]

In the next study, research was carried out on making formulations of aloe vera extract lip balm preparations with variations in concentration as lip cosmetics. Evaluation of the preparations carried out included homogeneity, melting temperature, and pH test. Based on the results of the study, it was found that the characteristics of aloe vera extract (*Aloe vera* L.) had good stability. There was no significant change in color, odor, or texture after being stored for 14 days at room temperature.[13]

Aloe vera as a shampoo

Based on research results, the aloe vera plant is known to have many benefits and properties, such as anti-inflammatory, anti-fungal, antibacterial, and cell regeneration. In addition, it functions to lower blood sugar levels for diabetics, control blood pressure, and stimulate immunity against cancer. Another benefit of aloe vera is as a shampoo to clean the scalp, moisturize the skin, blacken hair, and avoid hair loss; Aloe vera gel or mucus, when taken orally, can soothe the throat, reduce coughing, and loosen the throat; Anthelmintic, meaning to shed or expel worms; and as a cosmetic ingredient.[14]

Natural ingredients such as candlenut, aloe vera, apple, and honey, which are extracted and then made into hair tonics or creams, are proven to accelerate hair growth. Several aloe vera gel shampoo formulas have been researched. One formula is to use 5 ml of lerak extract added with filtrate from aloe vera leaf flesh that has been blended and filtered 9 ml, and 0.2 ml of kaffir lime essential oil. In another study, making shampoo using powder from natural ingredients containing aloe vera powder (10%) combined with other plant powders, namely Hibiscus rosa Sinensis 15%, Mentha piperita 5%, Citrus lemon 10%, Acacia concinna 15%, Emblica officinalis 15%, Ocimum sanctum 5%, Azadirachta indica 5%, Lawsonia inermis 5% proved effective as anti-dandruff.[14]

There is an effect of adding aloe vera on all physical properties of anti-dandruff shampoo based on lerak, which includes: aroma, color, foaming power, panelist preference, viscosity and pH value. The amount of aloe vera 9 ml, namely in sample X9, is the most preferred shampoo product by panelists with the criteria: no lerak and aloe vera scent, light brown color, very foamy, viscosity 2.21 cp, pH value 5.01. Anti-dandruff shampoo based on lerak with a combination of aloe vera can be formulated as a shampoo preparation that has met the requirements of the physical properties test and is in accordance with the pH value of the shampoo in SNI, and which is in the range of 5-9.[14]

The use of aloe vera extract in the manufacture of anti-dandruff shampoo is categorized as safe for use on the scalp. The manufacture of aloe vera extract shampoo can be applied to families, so that family members avoid scalp disease, namely dandruff.[14]

Aloe vera as a creambath

The use of aloe vera extract in different amounts in the original cream has an effect on the finished creambath cosmetics (X1, X2, X3, X4) both in terms of texture, thickness, and aroma. The organoleptic properties of the texture have the highest value in X4, namely the ratio of 100 grams of original cream, 73 cc of aloe vera extract, while the highest value of viscosity in X3 is the ratio of 100 grams of original cream, 49 cc of aloe vera extract, and aroma with the highest value. On X2, namely the ratio of 100 grams of original cream, 25 cc of aloe vera extract. The comparison of the original cream with aloe vera extract has an effect on the organoleptic properties (smooth texture, the thickness is quite dense, the distinctive aroma of aloe vera extract is quite sharp), namely in the ratio of original cream 100 grams of aloe vera extract 25 cc and original cream 100 grams, aloe extract crocodile 49 cc. Based on the results of observations made, it

shows that the use of original cream and aloe vera extract has an effect on the texture of creambath cosmetics.[15]

The results of observations made show that the aroma of creambath cosmetics is influenced by the use of the amount of aloe vera extract, because the more aloe extract, the sharper the aroma. Observations showed that aloe vera extract had an effect on the aroma of creambath cosmetics.

***Aloe vera* as liquid soap**

Liquid soap from aloe vera leaf extract has antibacterial activity against Gram-positive bacteria (*S. aureus, S. epid, B. subtilis,* and *B. cereus*) and Gram-negative bacteria (*S. typhi, P. mirabilis, P. aeruginosa,* and *E. coli*). The presence of antibacterial activity in the liquid soap may be caused by the content of secondary metabolites which are contained in aloe vera, namely saponins, flavonoids, terpenoids, tannins, and anthraquinones. Saponins can damage bacterial cell membrane integrity. Flavonoids can kill bacteria by lysing the cell wall of bacteria and reducing bacterial cell density. Terpenoids can dissolve bacterial cell walls by weakening the membrane network. Tannins inhibit bacterial cell wall synthesis by forming complex bonds irreversible with prolene protein. Anthraquinones kill bacteria by inhibiting protein synthesis and nucleic acid synthesis.[16]

Study results show that there is a significant difference in the value of the Inhibition zone of liquid soap in eight types of bacteria, which is indicated by the value of significance <0.05. Soap inhibition zone value liquid also has a significant difference between positive control and negative control. While in the test that was carried out on the negative control, namely testing using soap base without using an extract sample, it is known that no zone formation was found inhibited on soap base testing against eight pathogenic bacteria tested, namely *S. aureus, S. epid, B. subtilis, B. cereus, S. typhi, P. mirabilis, P. aeruginosa, and E. Coli.*[17]

2. Conclusion

Aloe vera can be used as cosmetic preparations in the form of hair tonic, lotion, lip balm, shampoo, creambath, and liquid soap.

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