

## Development and Verification of Make-up Base Containing Aloe

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### Abstract

Aloe is a popular and effective agent used to cosmetic ingredient. It could replace artificial pigment on make-up base product and it is highly probable that might be useful as ingredients of multi-functional color cosmetic. In this study, we made a makeup base containing aloe extract and tested the effectiveness, safety and stability. Contents of polyphenol and flavonoid from the aloe extract were measured. To determine the antimicrobial effect from the aloe we used the paper disc diffusion method. We assessed the safety of make-up base containing aloe to cultured macrophage RAW 264.7 cells by MTT assay. Polyphenol contents of aloe extract and flavonoid respectively were 48 mg/g and 10 mg/g, in the 10 % concentration aloe extract. In case of aloe make-up base, the clear zone against *Staphylococcus epidermidis* was 9~11 mm and *Staphylococcus aureus* was also 9~11 mm. Growth activity of macrophage RAW 264.7 cells was over 80% in all concentration of make-up base containing aloe and general make base product. In conclusion aloe extract may be able to substitute the synthetic pigments and considered to be uses for ingredients multi-functional color cosmetic's ingredient.

**Key words** : Aloe, Make-up Base, Color cosmetic, Effectiveness, Safety

### I. Introduction

A make-up base is cosmetic product that used to prepare the skin before using foundation. There are many types of make-up base products available. It works best on cleansed, prepared skin, and if the skin is exceptionally dry, then make-up base can be used on the skin after moisturizer (Academy of

freelance maekup, 2011). The color pigments of make-up base were synthetic pigments and used to control skin tone.

There have been many reports that Artificial pigments were cause carcinogenic and genetic toxic effects. It is constantly issued. People concerns about safety on synthesized pigments. Thus, demand of natural pigments is gradually increased and many kinds of natural pigments

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have been developed (Lee et al., 2013). Tar dye could make medical skin troubles and cause to change biological function as it used coloring agent in color cosmetics (Brown et al., 1979). Point of view, it has taken on renewed substitution for tar dyes in natural pigments.

Aloe gel has been described in the popular literature as a cleanser, anaesthetic, antiseptic, antipyretic, antipruritic, nutrient, and moisturizer. There are promoting effect on cell proliferation from the aloe gel. Aloe gel is used externally for its wound healing properties and is supported by clinical investigation. The action of the gel as a moisturizing agent is still a popular concept and may account for much of its effect (Reynolds and Dweck, 1999; Wenker and Lippold, 1999). As previous studies, natural aloe had moisturizing agent as well as antibiotic ability. In terms of moisturizing, aloe had soothing and cooling effects. Due to, it has high water and mineral content which make it ideally suited for use as a make-up base product. There are many studies related natural aloe and for the most part, they investigated effects of aloe properties. However, very little has been applied natural pigment in color cosmetics to substitute the synthetic pigments.

Therefore interest in natural pigments that can replace synthetic ones, which caused many side effects. Recently in response to this trend, tend to use natural pigments as adding natural materials in the natural dyeing, healthy functional foods for human health and safety have been gradually expanded (Bener et al., 2010).

In the experiment, we made a make-up base containing the aloe extract and then we measured amounts of polyphenol and flavonoid contents as active ingredient. Also we tested the cell viability as safety.

## II. Material and Method

### 1. Materials

Natural aloe as natural pigment was purchased from Jeju island. For the extraction, we dipped 250 g of natural aloe in 100% ethanol 1 l. It was allowed to stand for 24 hours. A 250 g sample of crushed aloe was extracted with 1 L of 100% ethanol for 24 h. Then the extract was filtered with paper (Whatman No.3, England). The 30 ml of extract was taken for decompression concentration process at 45°C by a rotary evaporator (IKA-Werke GmbH & Co., Japan). The extract was lyophilized by a freeze dryer at -80°C for 4 days, and then pulverized into fine power form.

### 2. Preparation of Makeup Base Containing Aloe

Cosmetic formulae of ingredients on permeation of aloe are shown in Table 1. Mainly, thickner or increasing agents are vinyl dimethicone/methicone, silsesquioxane, crosspolymer, dimethicone/ vinyl dimethicone crosspolymer, PEG-10 dimethicone, bentonite, sodium chloride, and trihydroxystearin. Lauryl/myristyl benzoate, cetyl PEG/PPG-10/1 dimethicone, polyglyceryl-4 isostearate, and dimethicone were used as surfactants. Glycerin, dipropylene glycol, methyl gluceth-20, cyclohexasiloxane, cyclohexasiloxane, hexyl laurate, and allantoin were used as humectants. For coloring the make-up base PEG/PPG-20/20 dimethicone and chromium oxide greens were used.

The o/w emulsions were prepared by adding the oil phase to the aqueous phase, pre-heated to 75°C under vigorous mixing for 5 min. Aloe was added with mixing below 40°C.

Table 1. Ingredients of Make-up Base

	Ingredients	% of QTY
Make-up base	Water	to 100
	Cyclopentasiloxane	12.400
	Glycerin	10.000
	Dimethicone	8.625
	Dipropylene Glycol	6.000
	Cyclohexasiloxane	4.200
	Titanium Dioxide	4.090
	Phenyl Trimethicone	4.000
	Lauryl/Myristyl Benzoate	3.000
	Polymethyl Methacrylate	2.500
	Vinyl Dimethicone/Methicone Silsesquioxane Crosspolymer	2.000
	Synthetic Fluorphlogopite	2.000
	Dimethicone/ Viny Dimethicone Crosspolymer	1.500
	PEG-10 Dimethicone	1.375
	Methyl Gluceth-20	1.000
	Bentonite	1.000
	Cetyl PEG/PPG-10/1 Dimethicone	0.900
	Polyglyceryl-4 Isostearate	0.800
	Hexyl Laurate	0.800
	Sodium Chloride	0.700
	PEG/PPG-20/20 Dimethicone or aloe powder	0.400
	Chromium Oxide Greens or aloe powder	0.390
	Trihydroxystearin	0.300
	Phenoxyethanol	0.300
	Methyl Paraben	0.200
	Talc	0.120
	Triethoxycaprylylsilane	0.090
	Allantoin	0.050
Tocopheryl Acetate	0.050	
Iron Oxides(CI77492)	0.030	
Disodium EDTA	0.020	
Fragrance	q,s	

### 3. Determination of Total polyphenol and Flavonoid Content

The concentration of total polyphenol was measured using the Folin-Denis(Folin & Denis, 1912). The assay conditions were as follows: *Persicaria tinctoria* were dissolved in distilled water(1.0 mL) and add to 1.0 mL Folin reagent.

After 3min, 1.0 mL of 10% Na<sub>2</sub>CO<sub>3</sub> was added to the mixture and then, placed 1 hour at room temperature. Absorbance of resulting mixture was measured at 700 nm. The content was determined by Davis' method. The sample was dissolved in distill water(1.0 mL). Then, diethylene glycol 10.0 mL and NaOH 1.0 mL was add to the mixture. After standing 1hr, the

absorbance was measured with uv-spectrometer at 420 nm(UV-1200, Shimadzu Co. Ltd., Kyoto, Japan).

#### 4. Antimicrobial Activity

Aloe makeup base were investigated for their antibacterial activity against, *Staphylococcus epidermidis*, *Staphylococcus aureus*. Culture of strains of *Staphylococcus epidermidis* was used the solid medium nutrient agar (NA). Solid medium in a *Staphylococcus aureus* was used a tryptic soy agar (TSA). The plates were plated by the 100  $\mu\text{l}$  with sterile sealer and incubated at 37°C for 72 hr. Each sample was dissolved in 1.25%, 2.5%, 5%, 10% concentration of the paper disk and the incubator for 37°C for 24 hours amount was observed. Antibacterial activity was evaluated by measuring the clear zone.

#### 5. MTT-assay

Cytotoxic effect of aloe extract on the cultured RAW 264.7 cells was assessed using the MTT-assay. The cells were adjusted at a concentration of  $5 \times 10^4$  cells/well, divided per 90  $\mu\text{l}$ /well in 96 well microplates cultivated in an incubator (Forma, Germany) at 37°C, 5% CO<sub>2</sub> for 24 hr to attach the cells, and added 10  $\mu\text{l}$  each to adjust extracts at concentrations of 31.25 ppm, 62.5 ppm, and 125 ppm. A 20  $\mu\text{l}$  of MTT (3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyl tetrazolium bromide) solution at a concentration of 5 mg/mL was added to each well, and then cultured in an incubator for 4 h. The untransformed MTT was the absorbance in each well was read at 540 nm using the ELISA(ELX 808, Biotek Instruments, Vermont, USA). The viability was calculated as

$$\text{cell viability(\%)} = (\text{OD of treated cells} / \text{OD of}$$

control cells)  $\times$  100

#### 6. Stability evaluation

Make-up base containing aloe of stability was evaluated observe of viscoelastic properties using rheometer. Rheometer was used an AR550 model of TA Instruments, Inc. (USA). Makeup base containing aloe and make-up base on the market as the control sample were measured at room temperature, up to 10 g per each plate.

### III. Results and Discussion

#### 1. Polyphenol and Flavonoid Content

Polyphenol substances that are widely present in plants are known to play an important role for antioxidant effects and defense action in the plant or the human body (bener et al., 2010). Looking for effectiveness of selected aloe as plant natural ingredient, the contents of total polyphenol and flavonoid were determined. The contents of polyphenol in aloe extract respectively were 14 mg/g(1.25%), 18 mg/g(2.5%), 30 mg/g(5%), 48 mg/g(10%) by concentration. As increasing the concentration, it is showed the polyphenol contents are increased.

The contents of polyphenol are presented in figure 1. Yu(2014) have investigated antioxidant activity of aloe vera powder. According to their finding, the total phenol contents of aloe vera powder were  $35.31 \pm 6.15$  mg/g and also as increasing the concentration, the polyphenol content is increased.

The contents of flavonoid of aloe extracts respectively were 1.8 mg/g(1.25%), 2.8 mg/g(2.5%), 5 mg/g(5%), 10 mg/g(10%)<Fig.

2>. The contents of flavonoid is increased as increasing the concentration. Polyphenol contents and flavonoid contents were highest in the 10 % concentration of aloe extract.

### 2. Antimicrobial Activity

Aloe extract and makeup base containing aloe powder were experimented for their antibacterial activity against *Stapylococcus epidermidis*,

*Stapylococcus aureus* <Fig. 3>.

Above 5% concentration were observed as above 9~10 mm clear zone. All concentration of aloe extract were shown antimicrobial activity against *stapylococcus epidermidis* and *strapylococcus aureus* strain. The size of clear zone on make-up base containing aloe was identical with 5% and 10% aloe extract concentration in these two strains. Make-up base product on the market was not

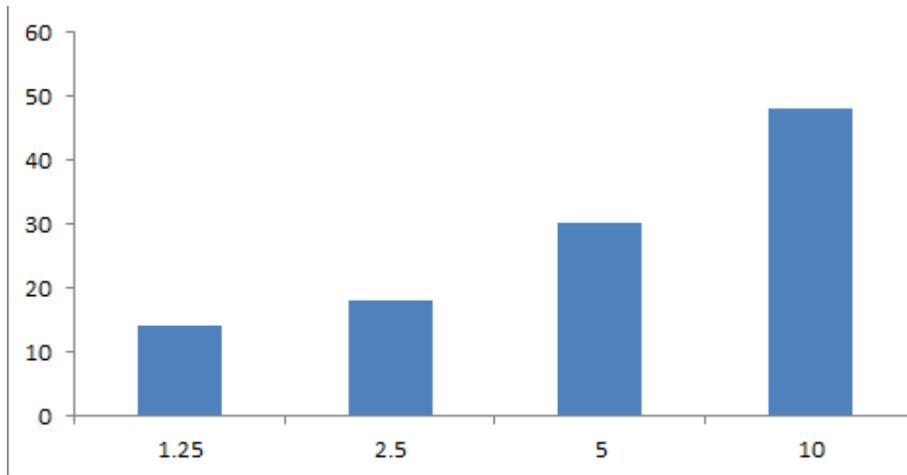


Figure 1. Polyphenol Content of Aloe Extract

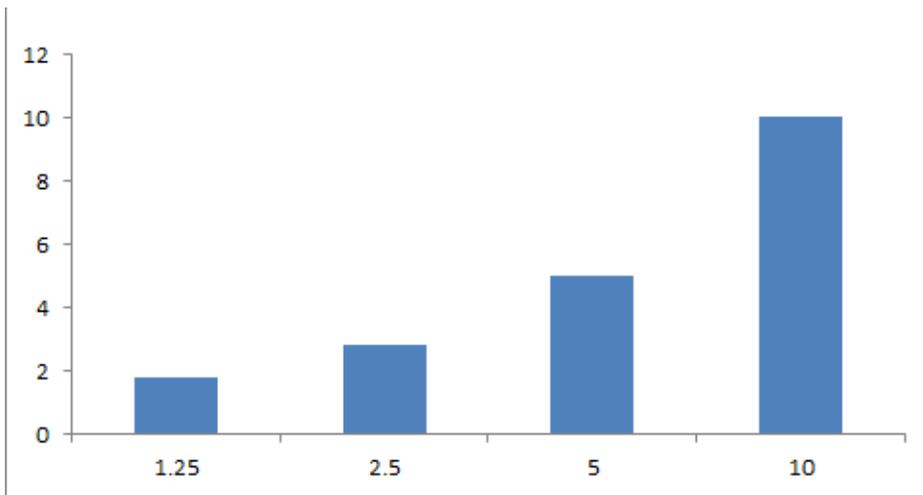


Figure 2. Flavonoid Content of Aloe Extract

showing the antimicrobial activity (Table 2). Therefore Aloe sample is expected to have resistance to *Stapylococcus epidermidis*, *Stapylococcus aureus* and when we prepare a make-up base added to aloe.

### 3. MTT-assay

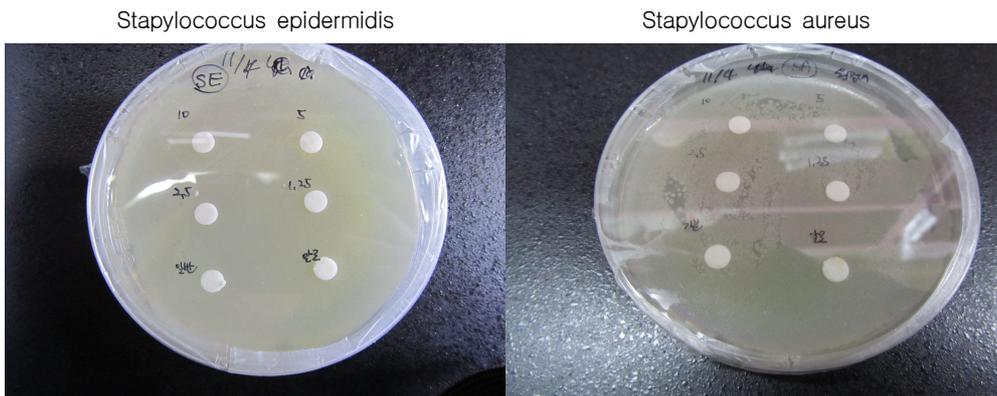
Makeup base containing aloe and control sample (make-up base product on the market) of the viability (%) has the following Fig. 4. After

treatment with various concentrations of make-up base containing aloe and control sample, cell toxicity was not observed in RAW264.7 cells. The cell viability of Makeup base containing aloe was obtained over 80% at all concentrations. Also The cell viability of control sample as general make-up base product was showed similar result. In this finding, we could verify the safety of make-up base containing aloe and control sample in RAW264.7 cells.

**Table 2. Antimicrobial activities of aloe extract**

Plant	Inhibition zone size, mm	
	<i>Stapylococcus epidermidis</i>	<i>Stapylococcus aureus</i>
Aloe(10%)	++	++
Aloe(5%)	++	++
Aloe(2.5%)	+	+
Aloe(1.25%)	+	+
Aloe Makeup base	++	++
Makeup base	-	-

- : not detected., + : above 8 ~ blow 9 mm,  
 ++ : above 9 ~ blow 10 mm, +++: above 10 ~ blow 11 mm



**Figure 3. Aloe extract against *Stapylococcus epidermidis* and *Stapylococcus aureus***

#### 4. Stability of Aloe make-up base

We assessed the stability of make-up base containing aloe and control sample using rheometer observe of viscoelastic properties. Viscosity value of control sample is obtained

4800 cP and viscosity value of make-up base containing aloe is 4100 cP. The viscosity value of make-up base containing aloe was dropped a little by comparison with viscosity value of control sample. However, there is not much difference of stability of make-up base product.

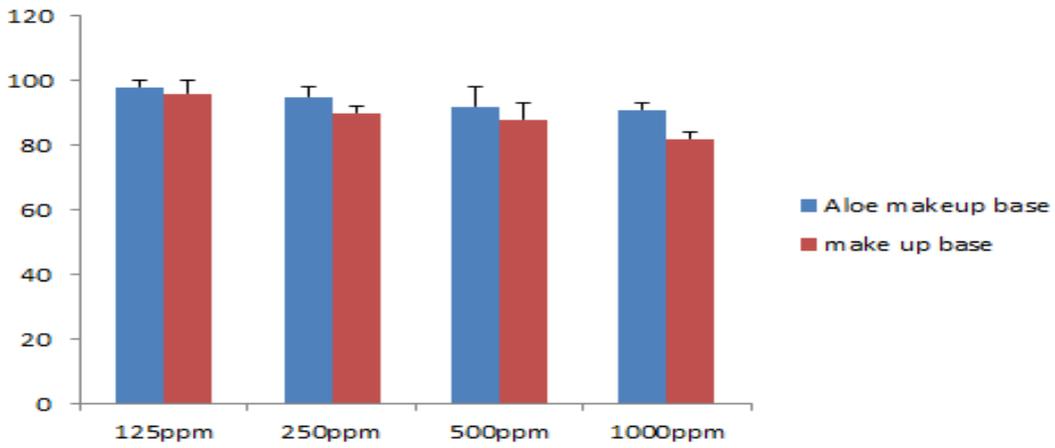


Figure 4. The Effects of Make-up Base that Contained Aloe Extra and the Control Sample on Viability in the RAW 264.7 Cells.

\* Levels of the cell viability were measured using the MTT assay. Data are expressed as percent(%) of control.

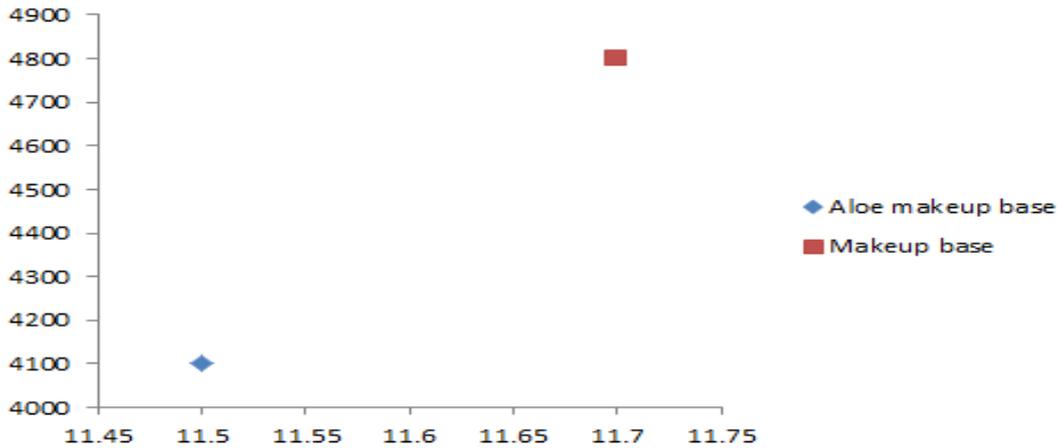


Figure 5. The Viscosities of the Make-up Base that Contained Aloe and a Commercial Makeup Base

#### IV. Conclusion

To describe possibility of aloe as a renewed substitution for multi-functional cosmetic ingredient, we made a make-up base containing aloe and tested effectiveness, safety and stability.

The polyphenol content of aloe respectively were 14 mg/g(1.25%), 18 mg/g(2.5%), 30 mg/g(5%), 48 mg/g(10%) by concentrations and the flavonoid contents of aloe respectively were 1.8 mg/g(1.25%), 2.8 mg/g(2.5%), 5 mg/g(5%), 10 mg/g(10%). The contents of polyphenol and flavonoid are increased as increasing the concentration. Aloe extract and make-up base containing aloe were experimented for their antibacterial activity against *Stapylococcus epidermidis*, *Stapylococcus aureus*. Clear zone size of make-up base containing aloe was above 9 ~ blow 10 mm. When we prepare a make-up base added to aloe, It is verified to have resistance to *Stapylococcus epidermidis*, *Stapylococcus aureus*.

After treatment with various concentrations of make-up base containing aloe and control samples, cell toxicity was not observed in RAW264.7 cells. In this finding, we could verify the safety of make-up base containing aloe and control sample in RAW264.7 cells. The viscosity value of make-up base containing aloe was dropped a little by comparison with control sample ones. However, there's not much difference of stability of make-up base product.

In conclusion, we verify that aloe may be able to substitute the synthetic pigments on make-up base product and considered to be used for the ingredient of multi-functional color cosmetic's.

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