

EVALUATION OF ANTI-AGING AND ANTI-ACNE EFFECT OF ANDALIMAN (*ZANTHOXYLUM ACANTHOPODIUM* DC.) ETHANOLIC EXTRACT PEEL OFF GEL MASK

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ABSTRACT

Objective: The study was conducted to evaluate the anti-aging and anti-acne effect of andaliman ethanolic extract in the form of peel off gel mask on human skin.

Methods: The formulation of PGM base was consisted of polyvinyl alcohol, glycerine, methylparaben, propylparaben, Carbomer 940, and distilled water (blank). The AEE (30%) was formulated in the PGM base and labeled as F1. The anti-aging and anti-acne tests were conducted by comparing the blank and the F1. The evaluation of anti-aging activity was conducted using skin analyzer apparatus. The aging parameters were moisture, evenness, pore size, black spot, and wrinkle of the skin. The anti-acne evaluation was conducted on color, shape, volume, and number of acne. The data were collected for 4 weeks.

Results: The anti-aging evaluation of andaliman PGM showed that the and AEE PGM could pretend the skin moisture, skin evenness, small pore size, and declined in number of black spot and wrinkle. The anti-acne evaluation showed the healing of acne after 4 weeks treatment.

Conclusion: It is concluded that and AEE PGM can be used as an effective anti-aging and anti-acne dosage form.

Keywords: Andaliman, Anti-acne, Anti-aging, Peel off gel mask.

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INTRODUCTION

Acne is a small fat-like lump in the skin that contains fat. The cause of the occurrence of acne due to the blockage of the oil glands that become a source of nutrients for the growth of bacteria, especially *Propionibacterium acnes* which later causes inflammation and eventually forms acne [1]. Topical therapy is the first-line treatment in mild acne, whereas, for moderate and severe acne, systemic therapy is required in addition to topical therapy. Topical therapy has associated side effects and the undesirable physicochemical characteristics of certain important agents such as tretinoin and benzoyl peroxide which affect patient compliance and alter the acne treatment [2]. Premature aging is also a problem for women skin and who gets attention other than acne. This skin problem is quite disturbing because it is associated with a decrease in confidence due to the lack of beauty of the face [3].

At present, the selection of natural product for treatment is based on the research result; therefore, the usage of natural product for treatment can directly to the target. Besides, it is more cost-effective, the side effect of the plant as a medicine is also very small compared to the synthetic drug; therefore, the utilization of plant as dosage form is very important and of course more safe and effective [4].

One of the potential plants that can be used to treat acne and the premature aging problem is andaliman (*Zanthoxylum acanthopodium* DC.) This plant is from Rutaceae family which can be found in North Sumatera, especially at Toba lakeside. Andaliman fruits contain alkaloid, flavonoid, and triterpenes/steroids that have antibacterial and antioxidant properties [5-7]. The extract of andaliman fruit had been successfully formulated in the form of peel off gel mask (PGM) in the previous study [8]. This study was the continuation of the effect evaluation of andaliman PGM to overcome the aging and acne problems.

MATERIALS AND METHODS**Materials**

Andaliman fruits were obtained from Ria-Ria Village, Humbang Hasundutan District, North Sumatera Province, Indonesia. Polyvinyl

alcohol (PVA), Carbomer 940, glycerine, methylparaben, propylparaben, and distilled water were purchased from Bratachem (Indonesia). Ethanol was obtained from Merck. All chemicals were analytical grade and used without further purification.

Methods**Preparation of and aliman ethanolic extract (AEE)**

The extraction of andaliman fruit was done by percolation method using 96% ethanol as stated in the 4th Edition of Indonesian Pharmacopoeia [9].

Formulation of AEE PGM

The PGM was made with modification of peel off gel standard formula by Rieger [10]. The concentration of 30% AEE was chosen as suggested in the previous study as an effective concentration for antibacterial [8]. The AEE PGM formula was consisted of PVA, glycerine, AEE, methylparaben, propylparaben, Carbomer 940 as the recommended gelling agent in the previous study and distilled water (F1). A blank formula was also made with no addition of AEE (F0).

Anti-aging activity evaluation

The anti-aging activity test was performed on the skin face of 12 women volunteers aged 20-30 years old. The test was conducted before and after applying the PGM for 15 min once a week for 4 weeks. The skin face was observed for the aging parameters using Aramo skin analyzer. The aging parameters were moisture, evenness, pore size, black spot, and wrinkle of the skin.

Anti-acne activity evaluation

The anti-acne activity test was conducted on the skin face with acne of 12 women volunteers aged 20-30 years old. The test was conducted before and after applying the PGM for 15 min once a week for 4 weeks. The data were collected by observation and direct examination. The observation was done according to the evaluation format on acne healing included color, shape, volume, and number of acne.

Data analysis

The data were presented as a mean±standard deviation. The data were analyzed statistically using ANOVA and Duncan *post hoc* test with $p < 0.05$ considered as significant difference.

RESULTS**Anti-aging effect of andaliman PGM**

The anti-aging effect was measured based on the result of the aging parameter included moisture, evenness, pore size, black spot, and wrinkle of the skin.

Moisture level

The moisture level was measured using moisture checker of Aramo skin analyzer tools. The moisture data of the skin face before and after application for 4 weeks are tabulated in Table 1. The data showed that there was no significant difference between the moisture level before and after application of the andaliman PGM and also the blank.

It can be seen in Table 1 that all volunteers had normal moisture level which was in the range of 30–50. The treatment of PGM application did not show the elevation effect of moisture level. It indicated that the PGM can pretend the moisture level of the skin.

Skin evenness

The skin evenness was measured using skin analyzer magnification lens of $\times 60$ with the blue censor. The result of skin evenness is presented in Table 2.

Based on the evenness data, the application of andaliman PGM for 4 weeks showed no significant difference with the blank, and also there was no significant change in skin evenness.

Pore size

The pore size measurement was done using skin analyzer magnification lens $\times 60$ with the blue censor. The results of the volunteer's pore size can be seen in Table 3.

Table 1: Moisture level of the volunteer's skin face

Formula	Moisture level (mean±SD)				
	Observation time (weeks)				
	0	I	II	III	IV
F0	34.1±1.7 ^{aa}	35.7±4.3 ^{aa}	40.6±2.2 ^{aa}	31.7±0.9 ^{aa}	33.3±0.9 ^{aa}
F1	34.7±2.8 ^{aa}	37.7±0.0 ^{aa}	33.6±2.1 ^{aa}	33.3±1.2 ^{aa}	35.2±1.5 ^{aa}

Dehydration: 0–29, Normal 30–50, Hydrated: 51–100 [11], F0: Blank, F1:

Andaliman peel off gel mask, ^{aa}showed no significant difference. SD: Standard deviation

Table 2: The results of volunteer's skin evenness

Formula	Skin evenness (mean±SD)				
	Observation time (weeks)				
	0	I	II	III	IV
F0	21.67±1.5 ^{aa}	18.67±3.06 ^{aa}	21.00±1.0 ^{aa}	19.6±6.03 ^{aa}	21.3±2.0 ^{aa}
F1	22.67±6.81 ^{aa}	21.67±2.31 ^{aa}	20.67±3.51 ^{aa}	19.67±4.51 ^{aa}	19.3±0.5 ^{aa}

Smooth: 0–31, Normal: 32–51, Rude: 52–100 [11], F0: Blank, F1: Andaliman peel off gel mask, ^{aa}showed no significant difference ($p > 0.05$). SD: Standard deviation

Table 3: The pore size of volunteer's skin face

Formula	Pore size (mean±SD)				
	Observation time (weeks)				
	0	I	II	III	IV
F0	35.67±12.42 ^{aa}	28.67±10.97 ^{aa}	24.00±11.53 ^{aa}	19±7.5 ^{ab}	14±5.57 ^{ab}
F1	35±872 ^{aa}	25.33±8.5 ^{aa}	20.67±8.33 ^{ab}	16.3±7.77 ^{ab}	8.67±4.04 ^{ab}

Small: 0–19, Large: 20–39, Very large: 40–100 [1], F0: Blank, F1: Andaliman peel off gel mask, ^{ab}showed significant difference ($p < 0.05$). SD: Standard deviation

Based on Table 3, the data showed that there was a significant difference between the pore size of the volunteers before and after treatment with the andaliman PGM for 4 weeks. However, the blank group that treated without andaliman also showed the similar result.

Spot

The spot measurement was done using skin analyzer magnification lens $\times 60$ with the orange censor. The results of spot measurement are presented in Table 4.

Based on the data in Table 4, the treatment of andaliman PGM showed a significant difference from the 2nd week. It also showed that the application of andaliman PGM significantly declined the number of spots compared to the blank, as seen in Fig. 1.

Wrinkle

The number of wrinkle measurement can be seen in Table 5. Based on the measurement at the initial time, it showed that the skin of the volunteers was in the level of wrinkled (20–52). The wrinkle of the volunteers that treated with and aliman PGM significantly decreased after 2 weeks application. It also showed a significant difference in wrinkle number between the blank and the aliman PGM after 4 weeks treatment, as shown in Fig. 2.

The anti-acne activity on the volunteers

Based on Fig. 3, it showed that AEE PGM could heal acne due to the significant decrease of acne number after 4 weeks treatment compared to the blank. In addition, the physical observation also showed that the andaliman PGM could eliminate the redness and inflammation of the acne.

DISCUSSION

The ability of stratum corneum to bind water is very important for the flexibility and the elasticity of the skin [12]. The ability of skin to absorb is affected by metabolism, moisture and the thickness of the skin [13]. The flavonoid compounds in andaliman ethanolic extract can increase the extracellular collagen production. The collagen synthesis will elevate the skin moisture and increase the elasticity of the skin [14].

Dry and rude skin is the common symptom shown when the skin undergoes premature aging. If the skin is often exposed to the sunlight, the collagen and the elastin in the skin layer will be damaged and lead to dead cells. The dead cells on stratum corneum will cause the surface of the skin become less smooth; therefore, the skin is rude [15]. In addition, the skin also will be rude, dark, and scally due to the alteration of skin ability to release the old dead cells to be replaced with the new skin cell [4].

The treatment done showed that the pore sizes of the volunteers decrease after the usage of PGM. The decrease in pore size was

Table 4: The spot measurement on volunteer's skin face

Formula	Spot				
	Observation time (M)				
	0	I	II	III	IV
F0	19.33±5.86 ^{aa}	17.3±5.86 ^{aa}	14.0±5.29 ^{aa}	15±6.0 ^{aa}	14.0±4.58 ^{aa}
F1	21.0±10.54 ^{aa}	14.3±6.11 ^{aa}	9.67±2.08 ^{ab}	7.3±1.5 ^{ab}	5±2.6 ^{bc}

Rare spot: 0–19, A lot of spot: 20–39, Huge number of spot: 40–100 [11], F0: Blank, F1: Andaliman peel off gel mask, ^{abc}showed significant difference (p<0.05). SD: Standard deviation

Table 5: The number of wrinkle on the volunteer's facial skin

Formula	Number of wrinkle				
	Observation time (week)				
	0	I	II	III	IV
F0	33.67±14.22 ^{aa}	28.67±12.42 ^{aa}	24.00±8.76 ^{aa}	21.67±8.14 ^{aa}	20.67±8.14 ^{aa}
F1	27.0±2.65 ^{aa}	21.33±2.31 ^{aa}	15±5.57 ^{ab}	12.33±3.79 ^{ab}	5.6±1.1 ^{bc}

Non wrinkled: 0–19, wrinkled: 20–52, severe wrinkled: 53–100 [11], F0: Blank, F1: And aliman peel off gel mask, ^{abc}showed significant difference (p<0.05). SD: Standard deviation

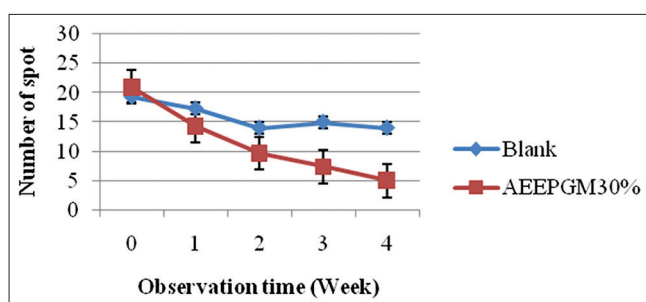


Fig. 1: The formulation effect on the number of spot, AEEPGM - andaliman ethanolic extract peel off gel mask

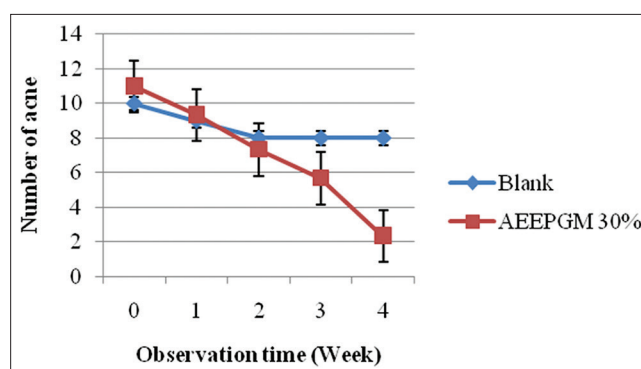


Fig. 3: The effect of peel off gel mask formula on the number of acne

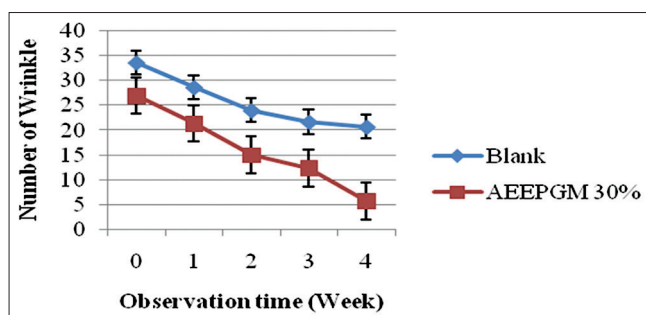


Fig. 2: The effect of peel off gel mask treatment on the number of wrinkle

happened due to the ability of the PGM to lift the dirt and the dead cells. The accumulation of the dead cells can enlarge the size of the skin pore [16]. Furthermore, the increase in age can also enlarge the size of the skin pore due to the decrease of skin elasticity and the sunlight exposure. Too many activities that increase the body temperature also can enlarge the size of the skin pore [15]. The big size of the skin pore can cause the dust and other dirt easily to attach which can lead to blackheads formation. The size of the skin pore can be decreased by routine peeling or using the PGM.

Mulyawan and Suriana stated that the black spot can appear on the skin that starts to aging also on young skin by various factors [17]. Commonly, this black spot will appear on the part of the body that often exposed to the sunlight [15]. If the skin is exposed to the sunlight in long period, it can increase the melanin production and cause spot on the skin [18].

Flavonoid has effect as competitive enzyme tyrosinase inhibitor which can inhibit the tyrosine become DOPA and Dopaquinone; therefore, it

can alter the number of melanin production in melanocyte cell [19]. Flavonoid also has an antioxidant effect that can protect the skin from free radical substances [20,21]. The exposure of ultraviolet (UV) light for a long period will generate the damage to the skin. Skin will start to slack and stretch. This condition is caused by the changes of collagen and elastin fibers which keep the elasticity of the skin become stiff, not elastic; therefore, lose its elasticity. Flavonoid has role to inhibit and prevent the damage to the skin caused by free radicals from the UV light exposure by binding the single oxygen and inhibit the lipid peroxidation [21,23]. Since the AEE had this flavonoid compound, therefore, the role of the flavonoid could act as a protection to prevent the aging of the skin.

In this research, the volunteers had acne with the low level white head. Whitehead is a disorder as a small bud with small or no hole caused by the sebum that usually comes with bacteria accumulate in the skin follicle, cannot getting out and opened. The topical treatment by applying gel mask has purposed to overcome the black or white head formation, decrease the inflammation and bacteria colonialization, also heal the acne lesion [4].

The PGM containing ethanolic extract of andaliman fruit had flavonoid compounds which were effective as antibacterial and anti-inflammation; therefore, it could help to overcome infection on acne and could decrease the pain that contributes to the acne healing.

CONCLUSION

It is concluded that AEE PGM can be used as an effective anti-aging and anti-acne dosage form.

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CONFLICT OF INTEREST

There is no conflict of interest.

AUTHORS CONTRIBUTION

T. Ismanelly Hanum: The main investigator that do the research and do the final approval for the manuscript.

Lia Laila: The second investigator that helping in data collection and make the draft of the manuscript.

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