

# Development and Evaluation of a Novel Skin Peeling System Containing Natural Fatty Acid for Skin Aging

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## Introduction:

Currently, our skin is losing transparent skin due to severe air pollution and slowing skin regeneration (skin turnover) due to various harmful substances, and due to excessive keratin accumulation. It is aging as it turns into a dull skin that has lost transparent skin as a symbol of healthy skin. Facial skin aging is one of the most prevalent cosmetic concerns to women. The many noticeable manifestations such as wrinkles, sagging, uneven skin tone, and dull and dry skin can significantly impact self-esteem and social relations [1]. Skin aging is a complex biological process influenced by combination of endogenous or intrinsic (genetics, cellular metabolism, hormone and metabolic processes) and exogenous or extrinsic (chronic light exposure, pollution, ionizing radiation, chemicals, toxins) factors [2]. These factors lead together to cumulative structural and physiological alterations and progressive changes in each skin layer as well as changes in skin appearance, especially, slowing of the epidermal turnover rate and cell cycle lengthening coincides with a slower wound healing and less effective desquamation in older adults [3]. Many of these features are targets to cosmetics to accelerate the cell cycle, in the belief that a faster turnover rate will yield improvement in skin appearance and will speed wound healing [4]. A number of studies are being conducted to overcome the major phenomena of skin aging, and this study intends to discuss the effect of improving skin aging and brightening effects to facial skin through the novel peeling system containing natural fatty acid.

## Materials & Methods:

A novel peeling system was obtained from natural peeling solution (natural P-Sol). Natural P-Sol was made by saponification methods using olive oil (rich in oleic acid) and coconut oil (rich in lauric acid) using potassium hydroxide with glycerin, alcohol denat. and water as a base solvent. Preparation of cosmetics with Natural P-Sol were conducted by adding natural P-Sol concentration 2% and 3% respectively. The cosmetics was added slowly and mixed until homogeny and become emulsion.

The peeling effect was evaluated by the melanin solubility and decomposition ability of keratin as the in vitro biological activity. To evaluate melanin solubility activity assay, 2 mg of melanin (Sigma, M.8361) was put in each 5ml tube, and 5ml of Natural P-Sol was added by concentration (0%, 1%, 5%, 10% in DW). After vortexing at 5 minute intervals for 30 minutes, centrifugation was performed at 4000 rpm for 3 minutes, and the absorbance of the supernatant is measured at 405 nm. The melanin dissolving ability was quantified by substituting the standard curve. To evaluate the decomposition ability of keratin, experiments are conducted by measuring the decomposition ability of keratin azure. keratin azure (Sigma, K-8500) is used to measure the color change caused by azo dye as the substrate decomposes. In this, 4.5ml of various dose samples were added to a 5ml tube containing 20 mg of keratin azure. 20 units of Protease K, a positive control, reacted with 20 mg of keratin azure in 4.5 ml of 50 mM sodium phosphate buffer. The mixture was incubated at 37°C for 1 hour on shaker. The reaction mixture was centrifuged and absorbance of released azure dye was measured at 595 nm.

The anti aging and brightening improvement effect was evaluated by the human clinical test about keratin decreasing, moisture increasing, pigmentation decreasing, brightness increasing, wrinkle decreasing, dermal density increasing, skin transparency increasing and skin irritation. A total of 113 healthy Korean women volunteers (aged 20-56) were participated in the study. The subjects were divided by clinical test into 5 groups (1 group - keratin decreasing: 20 women (aged 20~55), 2 group - moisture increasing: 21 women (aged 21~54), 3 group - pigmentation decreasing, brightness increasing, skin transparency increasing: 22 women (aged 25~55), 4 group - wrinkle decreasing, dermal density increasing: 20 women (aged 38~56), 5 group - skin irritation: 30 men or women (aged 20~50). All volunteers should visit the controlled rooms at temperature and humidity, and wait for at least 30 minutes after wash the face using general cleanser. The present study was performed in February 2020 and September 2020, using noninvasive methods.

1. Keratin decreasing effect (before, immediately after use) was evaluated on the mouth area using the Visioscan (VC98, CK electronics, Germany, software VS2000), expressed in desquamation Index, %.
2. Moisture increasing effect (before, after 8, 24, 32, 48 hours) was evaluated on the mouth area using the Corneometer (CM825, Courage and Khazaka Electronic Co., Germany), expressed in Arbitrary unit (A.U.).
3. Pigmentation decreasing effect (before, after 2 weeks) was evaluated on the cheek area using the VISIA-CR (Canfield, USA) with camera (Canon, EOS5D MarkII, Japan) and UV-NF mode, expressed in Intensity.
4. Brightness increasing effect (before, after 4 weeks) was evaluated on the cheek area using the Spectrophotometer (CM-2600D, Minolta, JAPAN), expressed Arbitrary unit (A.U.) of L value.
5. Skin transparency effect (before, after 2, 4 weeks) was evaluated on the cheek area using TLS850 (Translucency Probe, Dia-Stron Ltd., United Kingdom), expressed in Arbitrary unit (A.U.) of K value.
6. Wrinkle decreasing effect (before, after 2, 4 weeks) was evaluated on the eye area using the ANTERA 3D (Miravexn Limited, Ireland), expressed in Arbitrary unit (A.U.) of overall size and mm of depth.
7. Dermal density increasing effect (before, after 2, 4 weeks) was evaluated on the eye area using DERMA SCAN® C Ver 3. COMPACT (CORTEX TECHNOLOGY, Denmark), expressed in percentage Unit, %.
8. Skin irritation test (before, after 30 min, 24 hours, 48 hours) was evaluated on the back area using the patch test methods (International Contact Dermatitis Research Group: ICDRG), expressed in grade of Mean score (grade 1: non-irritant (Mean Score 0.00~0.75), grade 2: slight irritant (Mean Score 0.75~1.50), grade 3: moderate irritant (Mean Score 1.51~2.50), grade 4: irritant (Mean Score 2.51~4.00), grade 5: severe irritant (Mean Score 4.01~)).

All results are expressed as mean ± standard deviation (SD), and data were calculated with SPSS (PASW Statistics 18, IBM). Statistical analyses were performed using the independent t-test (if two groups).

## Results & Discussion:

### 1. Development of a Novel Peeling System



Figure 1. Development of natural peeling solution for transparent skin tone like velvet glow

### 3. Keratin Decreasing Effect

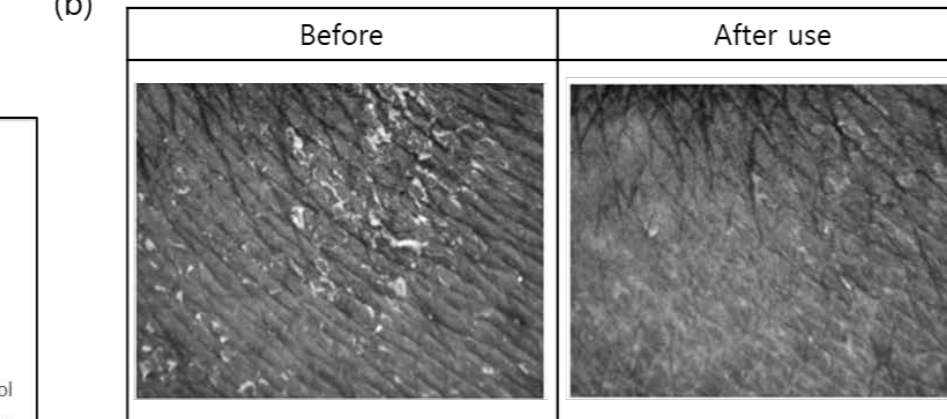
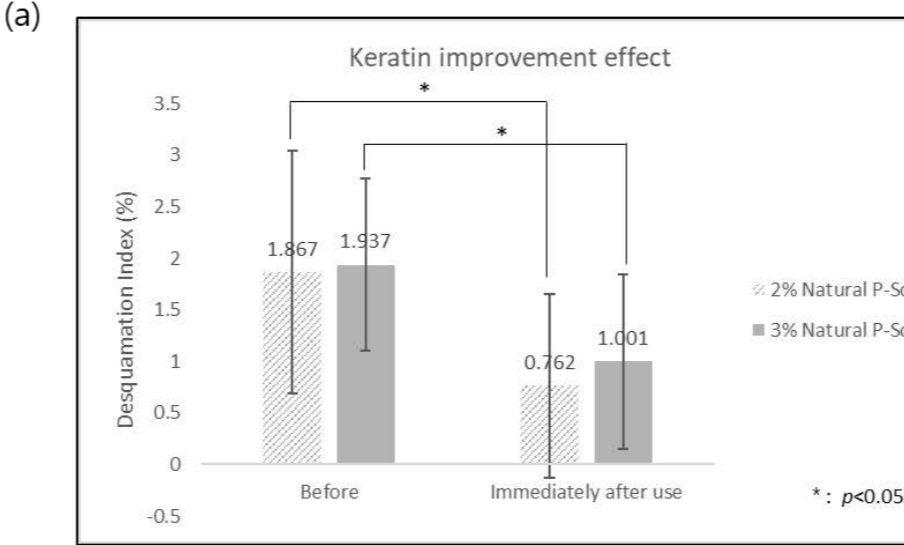


Figure 3. Keratin decreasing effect immediately after using cosmetics with 2%, 3% natural P-Sol (p<0.05). (a) The results of keratin desquamation index (b) Keratin image pictures

### 4. Moisture Increasing Effect

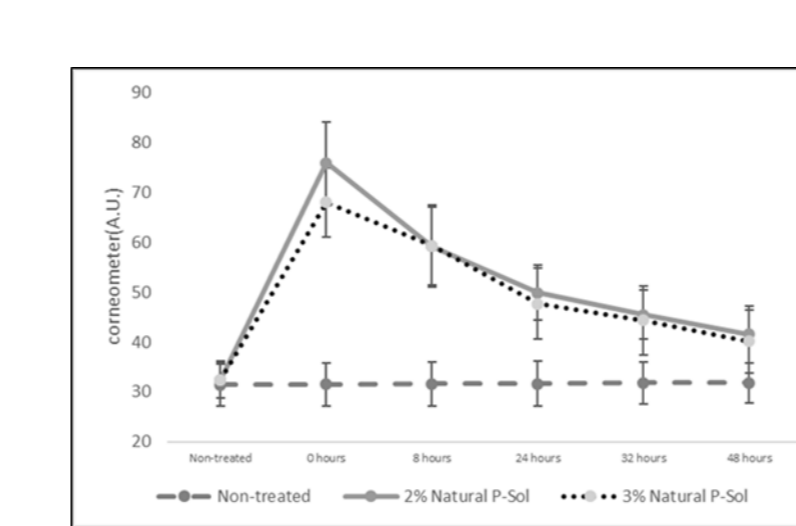


Figure 4. Moisture increasing effect after using cosmetics with 2%, 3% natural P-Sol for 48 hours (p<0.05).

### 5. Pigmentation Decreasing & Brightness Increasing effect

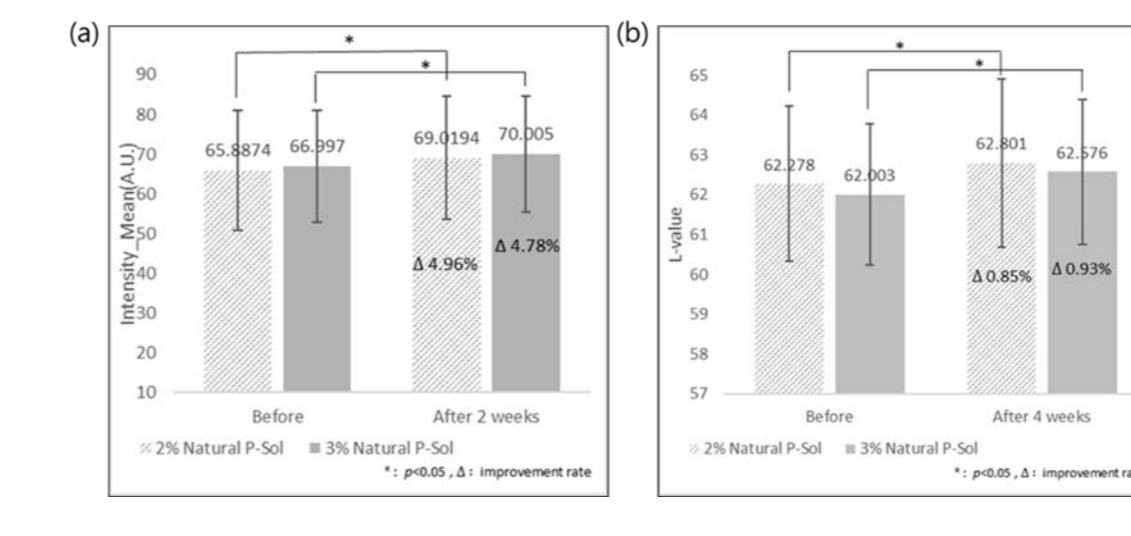


Figure 5. Pigmentation (a) & Brightening (b) improvement after using cosmetics with 2%, 3% natural P-Sol for 2 weeks & 4 weeks (p<0.05, Δ: improvement rate).

### 7. Wrinkle Decreasing Effect

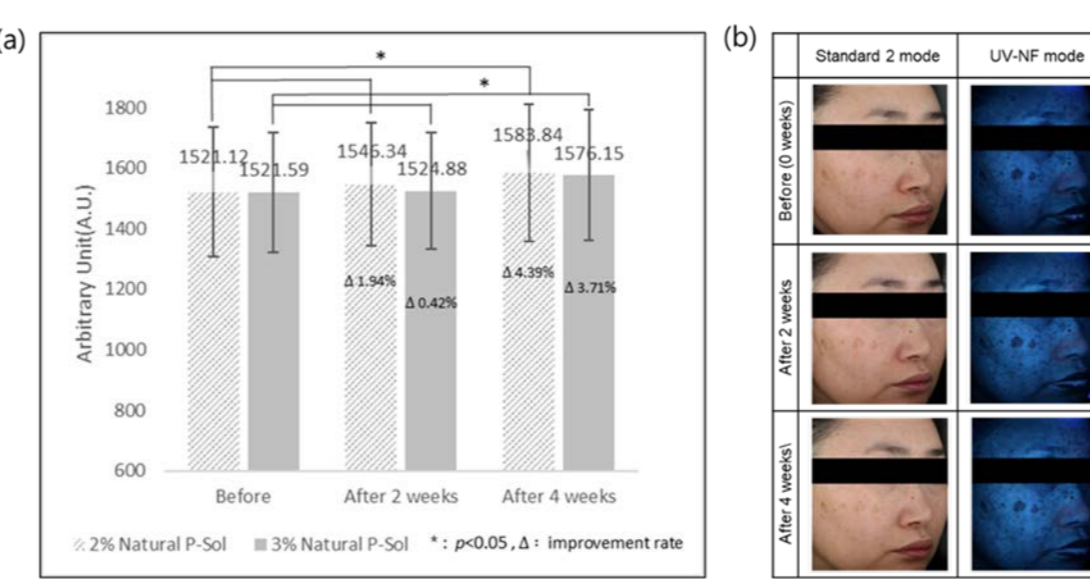


Figure 7. Anti-wrinkle effect after using using cosmetics with 2%, 3% natural P-Sol for 4 weeks (p<0.05, Δ: improvement rate). (a) overall size improvement, (b) wrinkle depth improvement (c). Image of periorbital wrinkles around the eyes taken with DSLR and Antera 3D

### 8. Dermal Density Increasing Effect

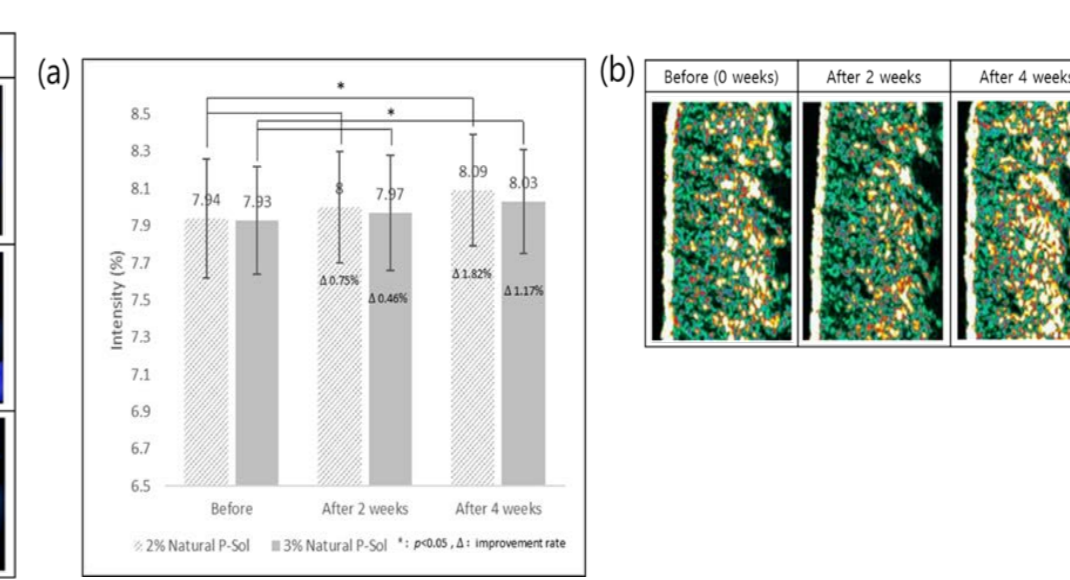


Figure 8. Effect of dermal density after using using cosmetics with 2%, 3% natural P-Sol for 4 weeks (p<0.05, Δ: improvement rate). (a) Intensity of skin density, (b) Image of skin density

### 2. Melanin Solubility Activity & Decomposition Ability of Keratin

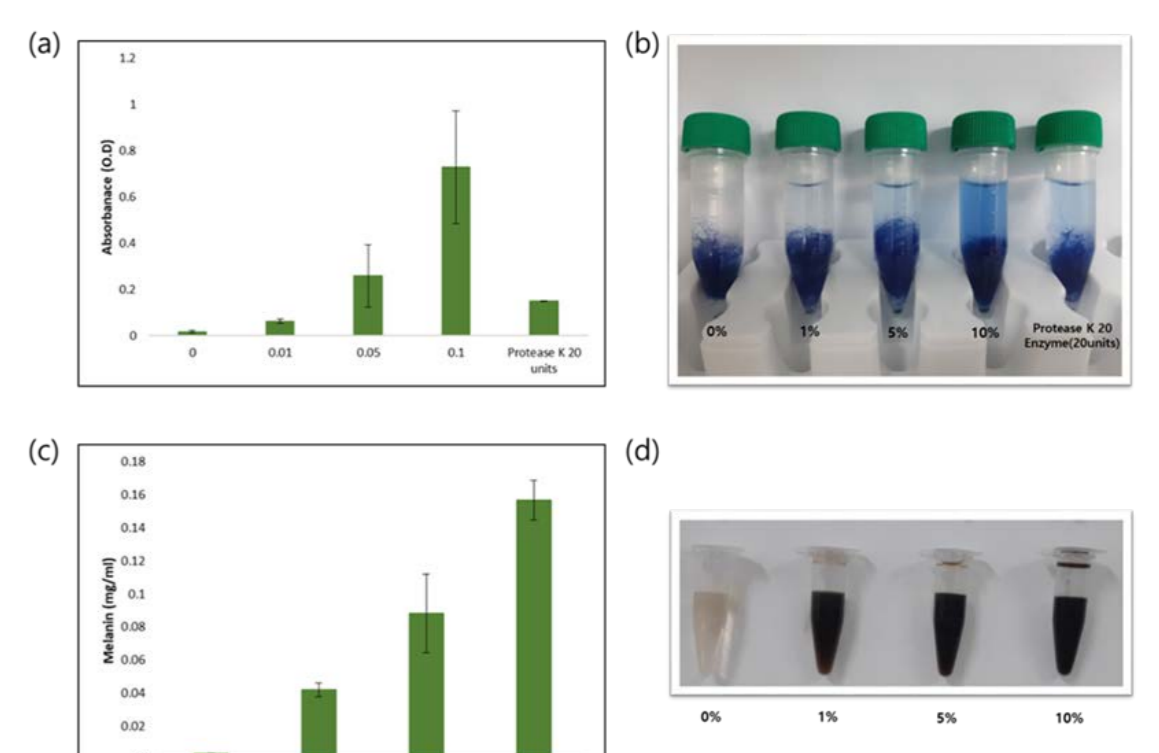


Figure 2. Effect of dead stratum corneum improvement at Natural P-Sol (0%, 1%, 5%, 10%) on decomposition ability of keratin (a, b) and melanin solubility (c, d).

### 6. Skin Transparency Increasing Effect

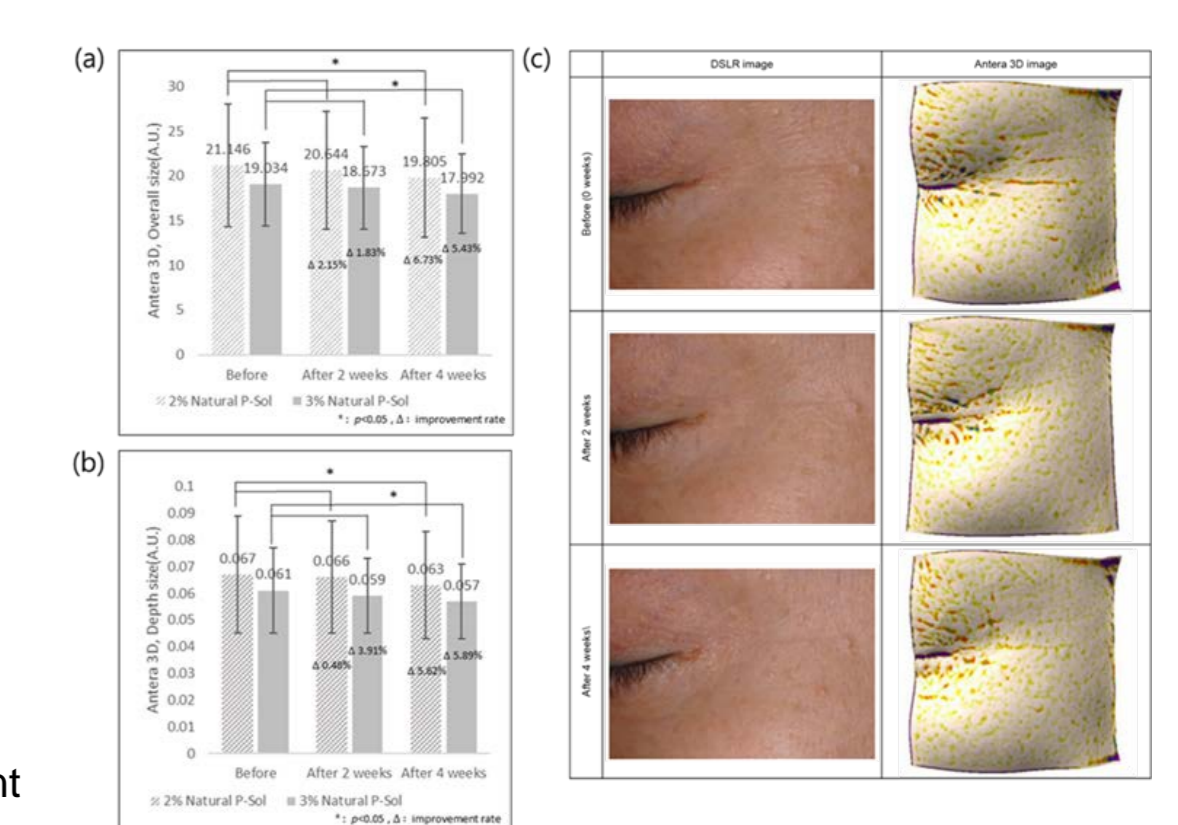


Figure 6. Skin transparency improvement after using cosmetics with 2%, 3% natural P-Sol for 4 weeks (p<0.05, Δ: improvement rate) (a) Skin transparency, (b) Image in standard 2 mode and UV-NF mode.

### 9. The Result of Skin Irritation Test

No.	Sample name	Mean score	Grade
1	Natural P-Sol (5% water solution)	0.00	non-irritant
2	Natural P-Sol (10% water solution)	0.00	non-irritant
3	Cosmetics with 2% natural P-Sol	0.00	non-irritant
4	Cosmetics with 3% natural P-Sol	0.00	non-irritant

In the 24 hours occlusive patch test, the mean skin reaction score of the tested natural P-Sol was shown in Table 1. Natural P-Sol show that they can be used safely on the skin without irritation.

## Conclusions:

Skin aging is one of the most concerned in women, and it can be noticed as wrinkles, sagging, uneven skin tone, and dull or dry skin [5]. The causes of skin aging can be categorized into intrinsic and extrinsic factors. Extrinsic factors especially ultraviolet are superimposed on intrinsic factors and account for most age-associated changes in skin appearance. Ultraviolet irradiation causes the aging skin by producing free radicals and reactive oxygen species (ROS), which interferes collagen synthesis, degrades collagen and elastin, and damages lipid component of membranes leading to ceramide and arachidonic acid release causing more water loss and more inflammation, respectively [6]. Facial skin brightening encompasses abundant light reflection from an evenly pigmented skin surface conferring the visual appearance of healthy skin. Since skin brightening is multifactorial, this formulation was designed to brighten the skin by containing an innovative combination of active ingredients [7]. Chemical peeling is grounded on the scientific foundation of skin restorative pattern observed with chemical burns. For decades, this technique of skin rejuvenation has been in fashion, however, in less refined ways. They help in achieving skin radiance and luminosity with youthful smoother tighter, more even toned textured skin with refreshed appearance [8, 9]. To provide anti-aging & brightening effect to the skin, topical products may combine various ingredients. The present evaluation revealed improvements in skin aging, pigment appearance, dry skin and slowing of the epidermal turnover rate that were in agreement with the anti-aging & brightening effects of topical cosmetics with natural P-Sol on Korean women. And this study revealed that the novel peeling system with natural P-Sol is expected superior melanin pigment resolution and keratin protein resolution than chemical peeling agents such as AHA (alpha hydroxy acid). Because the pain of skin peeling is expected lower than that of AHA chemical peeling. And it was found that when applied to the skin for 4 weeks, the skin aging phenomenon was significantly improved 52~58% keratin improvement effect immediately after use, 48 hours lasting moisturizing effect, 4.78~4.96% pigmentation improvement effect after 2 weeks of use, 0.85~0.93% skin brightness improvement effect, 1.17~1.82% improvement of dermal density, 5.43~6.73% eye wrinkle improvement effect and 3.71~4.39% skin transparency improvement effect after 4 weeks of use. The novel peeling system with natural P-Sol developed through this study exhibited good potential as anti-aging cosmeceutical and can either be used alone or as an additive to an anti-aging formulation. And it considered to be substitutable the existing chemical peeling agent like AHA and can be used as a peeling system that is safe for the skin.

## Aknowledgments:

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