WATER-BREAK TECHNOLOGY SERUM AS THE INNOVATIVE TEXTURE FOR SENSITIVE SKIN PEOPLE IN TROPICAL CLIMATES WITH EXCELLENT EFFICACY

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Background

Sensitive skin was defined as the occurrence of abnormal burning, itchy, and tingling sensations due to several triggering factors. These sensations can be reduced by improving skin barrier and replenishing moisture content in the skin. Therefore, sensitive skin products necessitate abundant moisturizer-agent, which is commonly present as a thick formula. On the other hand, tropical countries such as Indonesia, which location are passed by equator, have particular climate. They have high humidity level (between 60 - 95%) and their average temperature is about 22.8 - 30.2 °C. As a result, it is not convenient for people to wear thick products, since it gives a heavy after-feel.

This study aims to identify the optimal formulation that achieves the delicate balance that is sensorially comfortable but also scientifically effective in enhancing the skin barrier for sensitive skin.

Material & Methods

1 Optimization of Serum Formulation

The water phase was added into the silicone phase gradually to create a W/Si (Water in Silicone) emulsion formula. The emulsion was mixed with IKA Stirrer resulting white opaque cream. Several designs of water and silicone ratio were investigated to find the optimum formula with water break effect.



Fig. 1 IKA Stirrer used for making the emulsion.

2 Sensory Evaluation

Sensorial Assessment using Blind Test method to 25 panelists. Each panelist will rate the product score on each parameters.

3 Stability Test

Stability test was conducted to assess the product's stability in various condition that represent real market condition for 3 months.

Conditions:

- Room Temperature
- Freezer (-4 C)
- Oven 45 C
- Sunlight Exposure

4 Safety Test

- **Dermatology Assesment**

29 healthy woman subjects aged 22-35 years old with sensitive acne-prone skin used the serum on face, twice daily, for 14 days.

- **Single Patch Test**

43 healthy male and female subjects 18 to 65 years old.

Study design: double blind study, non-comparative study, subjects serve as their own reference. The subjects are instructed to keep the patches unmoved on their back and dry during the 48-hour study period.

- **Human Repeat Insult Patch Test (HRIPT)**

54 healthy male and female subjects 18 to 65 years old.

This method is based on the BIS 4011:2018 (Methods of test for safety evaluation of cosmetics) guidelines of patch testing for contact allergens by 24 hours' occlusive patch test.

5 Efficacy Test

35 healthy woman subjects aged 30-55 years old with dry damaged skin used the serum on face, twice daily for 14 days. Their skin was analyzed by several instruments to see the improvement.

Instruments used:

- Corneometer
- Tewameter
- Antera
- Visioscan

Results and Discussions

Optimization of Serum Formulation

Table 1. Experiment result for several ratios between water phase and silicone phase of serum emulsion.

Formula	Water Phase	Silicone Phase	Centrifuge Test	Globule Size Range	Viscosity	Water Break Effect
Formula A	90%	10%	not separated	not measurable	75330 cPs	poor
Formula B	85%	15%	not separated	10-35 µm	19170 cPs	good
Formula C	70%	30%	separated	21-42 µm	1100 cPs	no water break effect

Serum with W/Si emulsion system was chosen to increase its adhesiveness on the skin and give occlusive properties compared to gel type formula. Specialized emulsifier was used to give a water break effect so it could give a fresh and light sensory feel, while giving a unique experience. Ratio of water and silicone phase of emulsion is the key for achieving water break effect yet have stable performance over time.

Furthermore, emulsifying process played important role in making perfect emulsion. Water phase should be added slowly and gradually to silicone phase during stirring process. From the experiment, ratio of 85:15 (Formula B) was chosen because it had best performance in water break effect and showed no separation in centrifuge test. Formula B then being evaluated and tested further. Its microscope imaging could be seen on Figure 2.

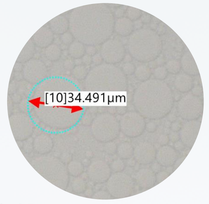


Fig. 2 Emulsion globules of W/Si serum (Formula B) under microscope observation.

Stability Test

The serum was undergone a 3 months accelerated stability test under various conditions. It showed that the formula has a good stability profile. There was a bit increase of viscosity under oven condition but the texture was still within the acceptable range. Emulsion was not separated and the water break effect could be maintained.



Fig. 5 Serum appearance after being tested for stability for 3 months.

Sensory Evaluation

25 panelists gave positive feedback for the sensory feel and and 92% of them noticed and appreciated the water break effect. Sensory profile as a summary of their sensory evaluation could be observed on the Figure 4.
In addition, 88% of panelists liked the texture and agreed that this serum is comfortable to use in tropical climate.



Fig. 3 Appearance of serum's texture: (a) before spreading and (b) after spreading the water break was visible.

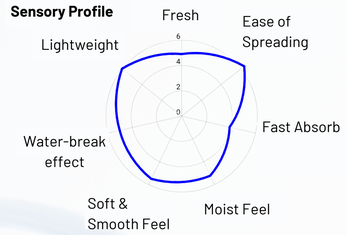


Fig. 4 Sensory profile of serum formulation (Formula B) based on 25 panelists' evaluation.



Fig. 6 Viscosity profile of serum at various conditions.

Safety Test

The patch test of the serum showed mean irritation index (M.I.I.) below 0.20 and considered as non irritant. HRIPT also showed no irritation and hypoallergenic results. In addition, the serum passed the safety assessment by dermatology evaluation (-1.81% (ns) for acne non-inflammatory lesions and -40.00% ($p<0.05$) for acne inflammatory lesions). One of the factors that contribute to formula mildness is its simple minimalism formulation with no irritant raw material, such as fragrance.

Efficacy Test

This serum gave excellent efficacies regarding skin hydration, TEWL, erythema, and skin scaliness, as a sign of sensitive skin improvement. All the efficacy results are thanks to 3 strategies: sufficient moisturizer, potent soothing agent, and skin microbiome regulator. Moisturizers mainly come from glycerin, a well known humectant that is able to improve skin moisture. Moreover, there was a combination of ceramide and saccharide isomerate in the formula, which reportedly could reduce TEWL. Finally, trehalose and hyaluronic acid were added to attract more water and support skin moisturizing, so the skin barrier also improved.
On the other hand, soothing agent is an important key for reducing irritation signs that come from sensitive skin. Combination of allantoin and *Mirabilis jalapa* extract in this product was proven to reduce erythema by 5.48% ($p<0.05$). In addition, Bifida ferment lysate as paraprobiotic which could regulate skin microbiome, also had activity on IL-10, IL-12, and DNA repair. It helped to reduce sensitive skin signs. This combination of active ingredients could give excellent efficacy results even though the serum layer is thin.

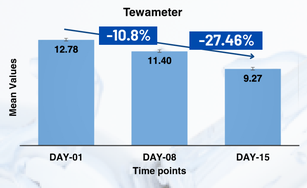


Fig. 7 TEWL measurement using Tewameter on each time points

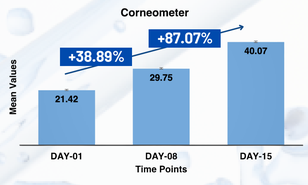


Fig. 8 Skin hydration measurement using Corneometer on each time points

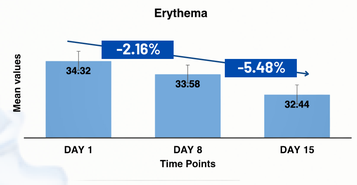


Fig. 9 Erythema measurement using Antera on each time points

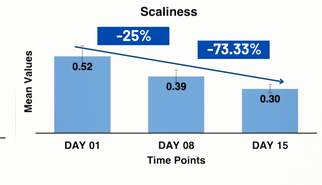


Fig . 10 Scaliness measurement using Visioscan on each time points

Conclusion

The formula of water break serum was proven to have a light pleasant texture and high efficacy, especially in skin moisturizing and soothing, which is suitable for sensitive skin people in tropical country.

Acknowledgement

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