A tissue mask with strong measurable and perceivable instant, over-night and long-lasting skin brightening effect, while maintain a fresh skin finish

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Key Words: Tissue Mask, Brightening

Abstract

Tissue mask category is gaining market share world-wide due to strong instant skin benefit perceived by consumers. However, traditional tissue mask could only provide hydration effect due to formulation constraints.

Our study is aiming to innovate a tissue mask formulation to deliver skin brightening effect. In the meanwhile, it could still keep good stability and fresh skin finish.

We have used instrumental tests to screen the optimized actives association. Then we go clinical test and big scale of consumer blind use test to validate the tissue mask performance. The results prove that, with an optimized association of optical ingredient and anti-ox actives, under well-designed emulsion formulation system, the tissue mask could deliver a positive measurable and perceived instant skin brightening effect, which could also long last to next day morning. And at the same time, the tissue mask could still remain fresh skin sensory.

Background: Tissue mask dedicated to skin care is a fast-rising category worldwide, due to the pleasant experience to creating pampering a "ME" moment, associated with a very strong instant skin benefit like hydration, radiance, freshness etc. Tissue mask became a beloved cosmetic product, rapidly integrated into the consumer's skincare routine.

However, over 90% of tissue masks mainly deliver a hydrating effect, that is why consumers also think tissue mask could only be hydration function. However, this hydration efficacy cannot be maintained for very long, as a usual ante skin condition is restored within 2-3hours.

As a tissue mask is often applied before sleep, the skin condition will return to usual on the following morning.

Due to the large amount of mask juice used in one application, to keep a good skin fresh feeling, traditional tissue mask juice always comprises aqueous formulae with classic carbomer polymer, explaining why a classic tissue mask only provides hydration.

Whitening is also an important need from skincare market especially in Asia, that is why we aim to develop a tissue mask with great whitening effect which could attract more consumers and help to gain market share.

1. INTRODUCTION

We select a light emulsion structure as formulation base of a very balanced oil and emulsifier system, which could help: 1) to stabilize phenylethyl resorcinol which is key functional active to ensure a long-term skin brightening, a skin tone evenness effect; 2) to keep good skin moisturization effect and long lasting; 3) to allow the introduction of boron nitride which could bring natural optical effect, and induce a skin desaturation aspect, much helping to obtain a great natural skin brightening effect, maintained overnight; and 4) to comprise a strong anti-oxidation ingredients of Vit C derivatives (3-O-ETHYL ASCORBIC ACID) & Vit E to further boost long term skin brightening.

In order to achieve even skin tone and keep overnight brightness, 2 systems were explored. Powder system of boron nitride and TiO2; ROS savage system of Ascorbic acid derivative and Tocopherols.

Powder materials are widely used in cosmetics products for instant skin tone adaptation. Different combinations of powder will have different effects. It's closely related to powder shape, particle size, surface modification of the powder. [1] Boron nitride was used as a slip modifier, which means it purportedly helps other substances to flow more easily and more smoothly. [2] Under our pre-investigation, boron nitride could improve skin lightness and desaturation which is key parameter of skin tone. This effect might attribute to sheet structure of boron nitride.

It has been well understood that skin pigmentation is closely related to ROS stress. [3] Beside skin tone evolution due to melanin stimulation, we also observed skin dullness increasing in one day period which caused by skin surface lipide/protein oxidation.[4]

Ascorbic acid (Vit C) and tocopherols (Vit E) have been recognized as strong anti-ox agents.[5] [6] When associated these two molecules, it will boost anti-ox efficiency. We replace ascorbic acid with ascorbic acid derivative (3-O-ETHYL ASCORBIC ACID) for a better fle stability and further optimize the ratio of Vit E and Vit C derivative.

2. EVALUATION & RESULTS

2.1 Process of preparing tissue mask

Heating aqueous including chelating ingredients, preservatives, HA and polymer to 70-80 degree, mixing well to homogenous.

Heating oil phase including main emulsifiers to 70-80 degree, mixing until total melting and homogenous.

Adding oil phase to aqueous phase, well emulsified, adding water to cooling down to 40 degrees, adding additional polymer, keep homogeneous mixing.

Step by step adding actives and keep homogenous and keep cooling to below 40 degrees.

Folding tissue and putting into sachet, filling 22g mask juice prepared by above steps, sealing sachet and message a bit ensuring fully impregnated. After QC confirms, sample ready for test.

2.2.1 Instrumental Test

Method

Three instrumental trials were carried out on the cheeks of 4 female volunteers aged from 25 to 35 through the use of the Chromasphere® (Chromosphere, Paris, France) [7] which is a diffuse daylight lightning device coupled to three calibrated 3CCD digital cameras. It allows multi-scale color measurements on a software-selected area of the cheek (a square of 400 pixels by 400pixels with 1/7mm for one pixel). Chromasphere, was used to measure the facial skin tone by L*c*h* parameters. Volunteers were asked to use the test tissue mask for 15min and removed the tissue mask to stay for another 6 hours in

standard condition (21+-1°C, humidity 40%+-1) with a half-face randomized design. Their skin tone was measured at before application(t0), immediately after removing the applied tissue mask(t1) and 6 hours after application(t6h) to test the instant and long-lasting brightening efficacy of the tissue mask. The limitation of these trail tests is their small sample size (N=4), due to the COVID-19 situation during the test period. So, we only present the mean values of the trial result without statistical conclusions.

2.2.2 Test Result

Trial 1. The issue of skin tone darkening after 6 hours; Boron Nitride (BN) vs TiO2 comparison

Both Fla1 and Fla2 improved L* immediate after application (+1.04 & + 0.69). We found in the test, the untreated bare skin tone L* drops after 6 hours (-0.89). The skin applied tissue mask Fla2 with BN tends to drop less L* than the skin applied tissue mask Fla1 with TiO2 after 6 hours (from +1.06 to +0.27 vs from 0.69 to -0.75). (Fig1 A)

Trail 2. 3-O-ETHYL ASCORBIC ACID (Vit C) + TOCOPHEROL (Vit E) benefits long lasting skin brightening

To further resolve the skin tone L* drop we found in Trial 1, Vit C + Vit E association is added to build Fla 3. In Trail 2 we compare Fla 3 with a Fla 4 with Vit C + Vit E association but only without BN. We found a potential improvement to the L* drop by just adding Vit C + Vit E association (from 0.01 to -0.17) comparing with untreated in Trail 1 (from -0.21 to -0.89).

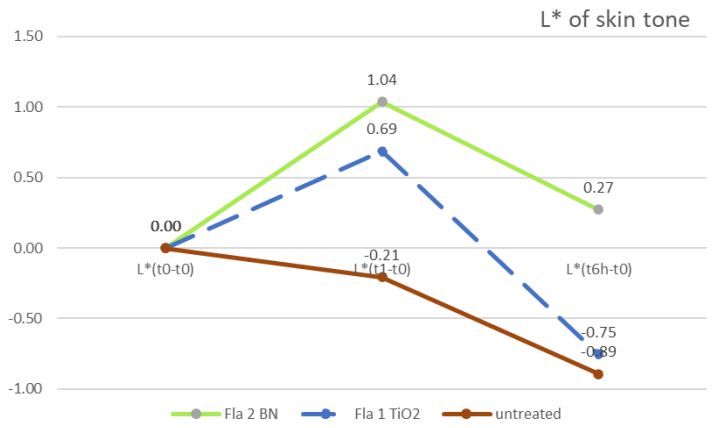
By comparing with Fla 2, the immediate effect of Fla 3 with Vit C + Vit E is not as strong, this is probably due to the distribution of BN not being good enough with a Vit C + Vit E association.

Trial 3. Distribution of BN in formula; Dose effect of Vit C

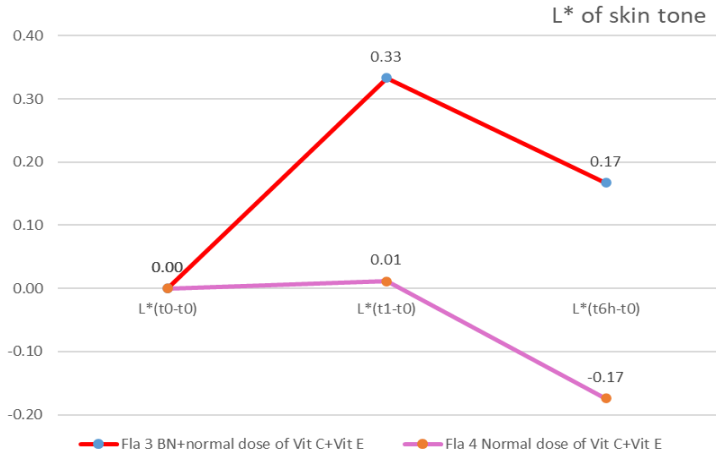
We added 0.1% POLYSORBATE 20 in both Fla 5 and Fla 6 to improve the BN distribution in tissue mask and see a promising effect of L* increase at immediate after application. (Fig1 C and Fig2 (A)(B))

By increasing the Vit C dose in formula from 1% to 2%, we didn't see further improvement to the L* increase at either immediate or 6 hours after application. (Fig1 C)

A



B



C

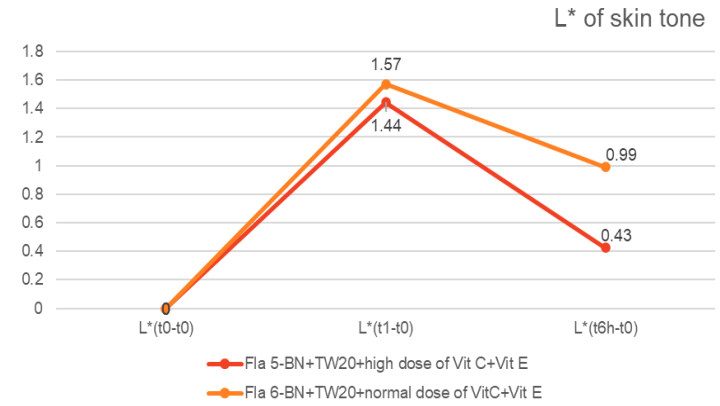


Fig 1 Instrumental trail result L* evolution immediate(t1) and 6 hours(t6h) after application. (A) result for Fla 1, Fla 2 and untreated;(B) result for Fla 3 and Fla 4 ;(C) result for Fla 5 and Fla 6

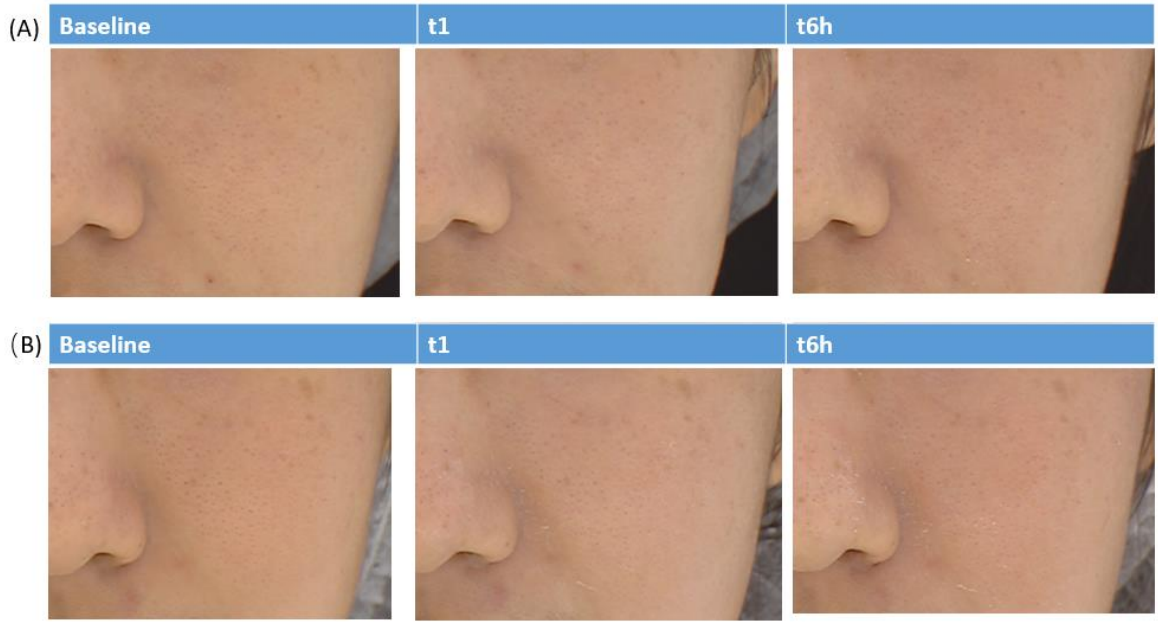


Fig 2. Chromasphere images of model's cheek área: (A)image of 26 y.o. volunteer before and after using Fla 5 at t1, t6h; (B)image of 26-year-old volunteer before and after using Fla 1 at t1, t6h

Table 1

Formula code (Fle base + different actives)	Composition
Fle base	Aqueous phase: WATER, DISODIUM EDTA, HYDROXYACETOPHENONE, RHAMNOSE, BETAINE, GLYCERIN, SODIUM HYALURONATE, XANTHAN GUM Oil Phase: GLYCERYL STEARATE (and) PEG-100 STEARATE, CETYL ALCOHOL, STEARIC ACID, DICAPRYLYL CARBONATE, HEXYLDECANOL, OCTYLDODECANOL, PHENYLETHYL RESORCINOL, BUTYROSPERMUM PARKII (SHEA) BUTTER / BUTYROSPERMUM PARKII BUTTER, GLYCERYL ISOSTEARATE

	Others: AMMONIUM POLYACRYLOYLDIMETHYL TAURATE, CITRIC ACID, SODIUM CITRATE, FRAGRANCE
Fla 1	TiO2
Fla 2	BN
Fla 3	BN + normal dose of Vit C + Vit E
Fla 4	Normal dose of Vit C + Vit E
Fla 5	BN + TW20 + high dose of Vit C + Vit E
Fla 6	BN + TW20 + normal dose of Vit C + Vit E

2.3.1 Clinical Test

Materials

Using the well screened mask fle 6, taking same process as described in 2.1, prepare samples for test with confirmed QC result.

Subjects

A total of 40 healthy Chinese female subjects aged 31-45 y.o. participated in this clinical study. 50% of the volunteers are self-declared sensitive skin and are regular users of mask with whitening needs. They should have darker skin tone with L* value ≤ 65 on cheek measured by Chromameter, presenting with spot density ≥2 with Skin Aging Atlas [8], and at least 1 pigmented spot or acne mark (PIH)≥3mm on cheek can be track and with a medium skin brightness, dullness and radiance (3≤ ≤6) by Dermatologist scoring. Subjects with history of allergy to cosmetic or personal care products and skin disease in the test areas were excluded. Pregnancy, lactation and presenting excessive exposure to sunlight or UV radiation were excluded as well. All subjects gave their written informed consent before enrollment, respecting the principle of Declaration of Helsinki.

Methods

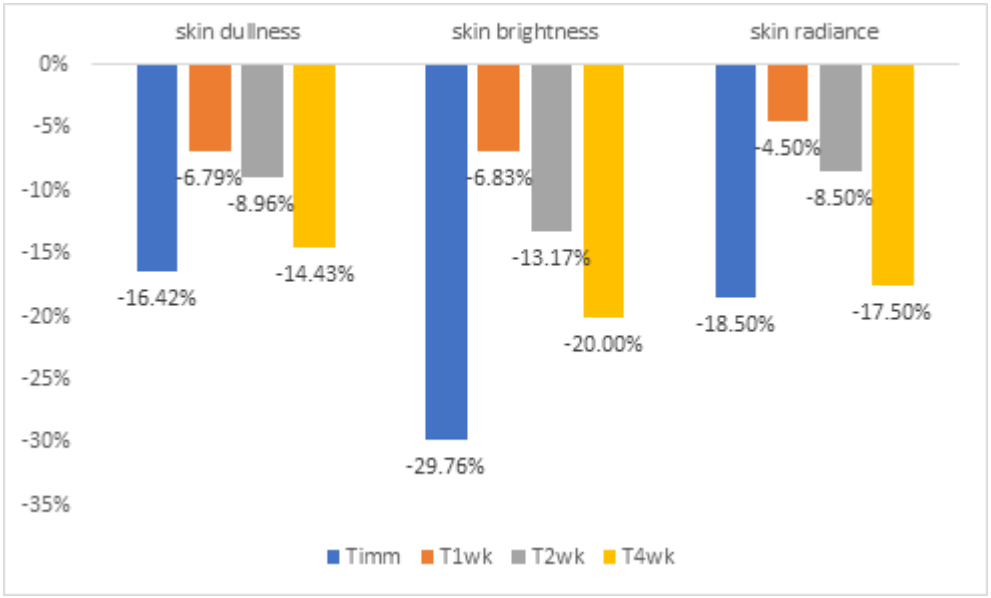
A 4week clinical study was performed in Shanghai CRO. All the measurements were taken under the standard room condition (21±1°C and 45±5% relative humidity) after an acclimatization of 30mins. Chromameter (Konica Minolta CR400) was used to assess the

facial skin tone by L, a*, b* values and calculated ITA value, the assessment was performed at T0, Timm, T8h and T4w. Six attributes were assessed by clinical grading at T0, Timm, T1wk, T2wk and T4w: skin brightness, skin dullness and skin radiance (10 point scale), or at T0, T2wk and T4w: density of pigmentary spots(L'Oréal Atlas: 0 to 7 scale), localized pigmentary spots on the cheek(L'Oréal Atlas: 0 to 5 scale) and size of the selected spot(0 to 9 scale). Standardized photos were captured by VISIA®-CR (Canfield Scientific, Inc) on left, front and right sides with five lighting modes for demonstration. Data entry was performed by using Excel (Microsoft®). For further advanced statistical analysis, data was imported to SPSS (IBM®). The statistical analysis was performed by the certified/ trained statistician or his/her designee. All statistical tests were two-sided and at the 5% level of significance.

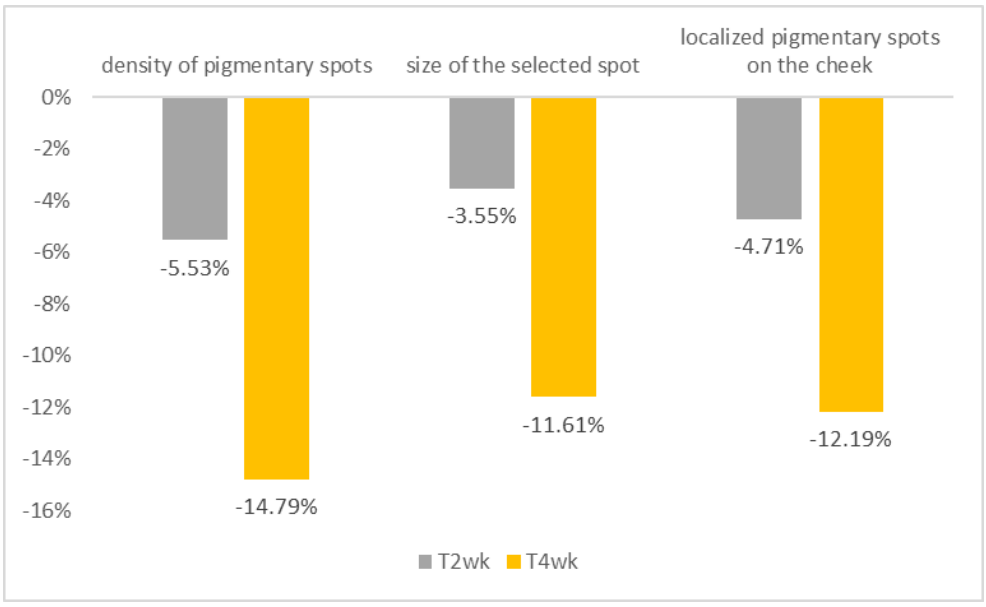
2.3.2 Test Results

A. Clinical scoring:

Compared to baseline, fla 6 significantly improved skin dullness, skin brightness, skin radiance at Timm, T1wk, T2wk and T4wk. (Fig 3 (A)) and significantly improved density of pigmentary spots, size of the selected spot, localized pigmentary spots on the cheek at T2wk and T4wk. (Fig 3 (B))



(A)



(B)

Fig3. Perceived improvement of different attributes by clinical grading on skin dullness, brightness and radiance(A) and densitiy of piamentary spots, size of the slected spot and localized pigmentary spots on the cheek (B). A significant (P< 0.05) improvement was observed for all attibutes at all timepoints.

B. Instrumental- Colorimetry

Compared to baseline, fla 6 significantly increased L*, and ITA value at Timm, and significantly improved ITA value at T8h and T4wk. (Fig 4, Fig 5)

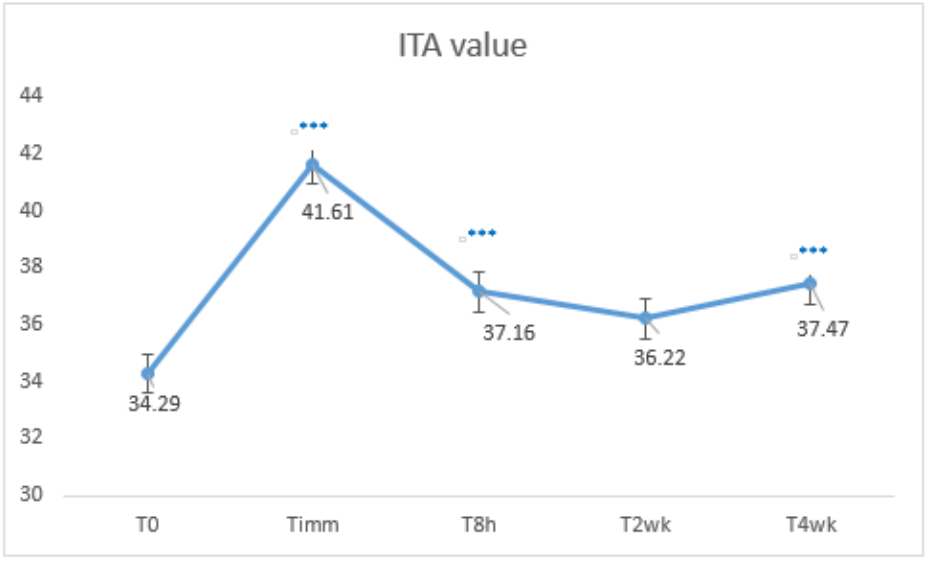


Fig 4. Change of ITA value from baseline (T0) to the follow up visit (week4). ***P < 0.05.

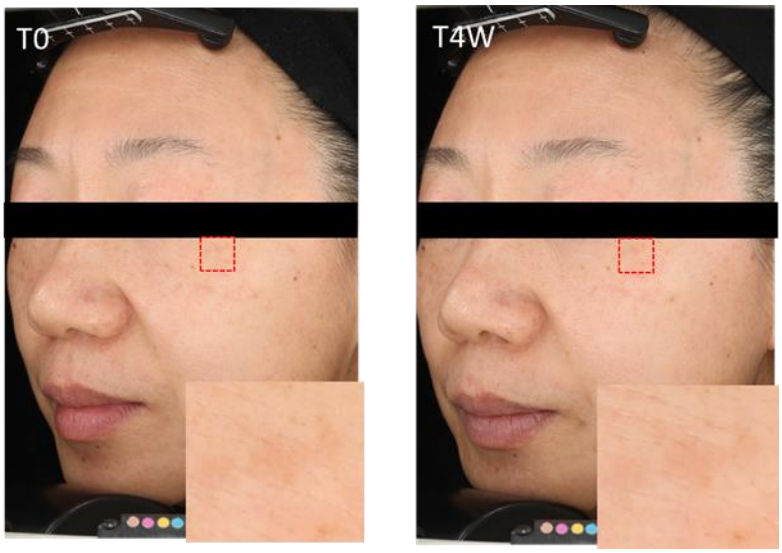


Fig 5. Improvement in size of the selected spot by representative standardized pictures from T0 to T4week by standard lightening mood taken with VISIA-CR

2.4.1 Consumer Blind Use Test

Materials

Taking same process as described in 2.1, prepare fle 1 and fle 6 samples for test with confirmed QC result.

Method

Consumer quantitative test (blind use, monadic test) was conducted in May - June 2021 to validate fle 1 vs. fle 6 in Shanghai and Beijing among n=240 female aged 18-35 with all skin types, who are regular users of whitening tissue mask, i.e., use mask with whitening benefit at least two times per week.

2.4.2 Test Result (95% significant differences/tendencies)

Fle 6 had an advantage over fle. 1 in terms of overall liking, ‘skin looks brighter/whiter on next morning’, ‘instant skin softness immediately after taking it off’. (Fig 6)

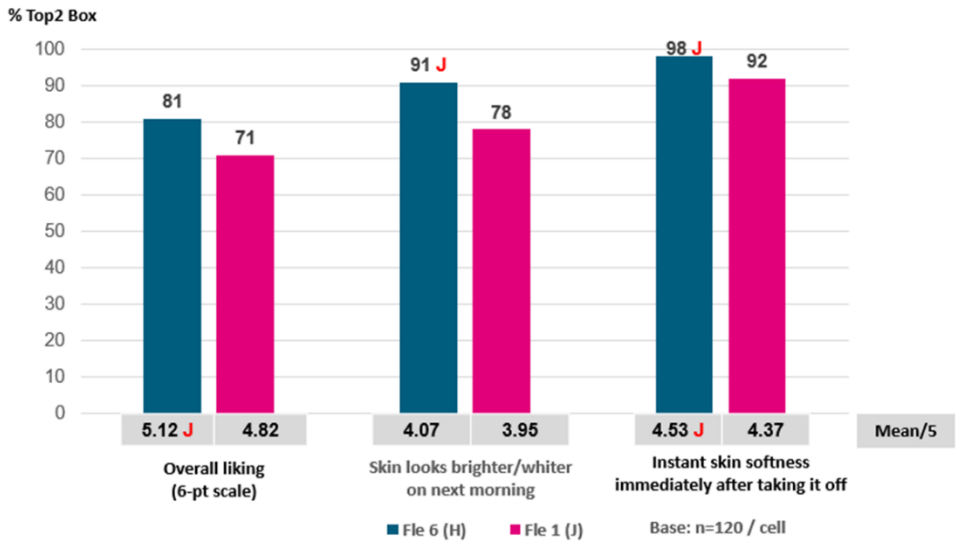


Fig 6. BUT consumer perception fle 6 wins over fle 1

3. CONCLUSION

For tissue mask product, it is often challenging to maintain skin brightening effect over-night or all day long. Our research work proposed a solution that BN with better dispersion, together associated with Vit C derivatives and Vit E, could well deliver instant skin brightness efficacy, and could maintain to next day morning. Then with clinical test and consumer quantitative test, all shows fle 6 (BN + TW20 + normal dose of Vit C + Vit E) could well deliver instant brightening effect, overnight and long last to 2 weeks even 4 weeks, and this effect could be well measurable, detectable and perceivable.

Acknowledgments. We thank Lin Xinrong, LV Rui, HUANG Mian, YI Yi, FANG Freddy, DONG Lucy, CAI Jacqueline, FU Lei for their support during the project development and performance validation.

Conflict of Interest Statement. NONE.

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