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Harnessing the Power of *Fucus Vesiculosus* to Quickly Revitalize the Eye Contour and Make it Shine

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abstract

The eye area is the first part of the body to reveal visible evidence of fatigue, stress, unhealthy lifestyle, and aging. Dark circles, crow's feet and dull skin are widely perceived to be telltale signs. As a result, many consumers are seeking safe and easy-to-use products that can protect their eye contours and limit these facial skin problems. Innovators at BASF have developed a new bioactive ingredient rich in fucoidan that is clinically proven to fight dark circles, reduce the appearance of wrinkles and enhance skin luminosity around the eyes within the first week of application. Its name is Seanactiv™*.

Introduction

The eye area is the most important part of the face, being our best asset to intensively communicate with others, but also being our emotional mirror. And in a modern digital daily life, with excessive use of computers and smartphones, but also with prolonged reading, short nights, and long working hours, we often forget to take care of this fragile part of our body. On top of this, unhealthy diet, stress but also genetics and ethnicity have an influence on the eye contour appearance. Recent research has shown that the perception of age, health and attractiveness is largely affected by several facial skin ageing features [1]. This includes dark circles, crow's feet, brown spots and the openness of the eyes [2,3]. In fact, dark circles and wrinkles are key elements in the assessment of perceived age or fatigue [4,5]. Consumers are highly aware of these perceptions, particularly because the eyes are often the most visible part of the face.

Demand is increasing for solutions that can combat these challenges and restore healthy-looking eyes. Skin conditions such as dark circles, fine lines and dehydration are high concerns especially for younger consumers, with almost 49% of UK 16 - 24 year olds who use facial skincare saying they have dark circles under the eyes. Also, in the US, 25% of women say that their eyes are their biggest concern when it comes to maintaining their healthy skin. Overall, as many as 96% of consumers worldwide have indicated that they want to reduce dark circles, while 66% want to decrease signs of aging [6].

In search of the perfect solution to improve their eye contour appearance, consumers are trying a wide range of approaches. This can include serums and creams, using concealer to cover dark circles, patting the skin around the eyes to enhance microcirculation, applying masks or using special tools. Some consumers even resort to more drastic measures such as lifting, Botox or blepharoplasty.

There is a clear need for solutions that can help to erase signs of aging around the eyes quickly and effectively. BASF has now launched Seanactiv™ (INCI: Water (and) Fucus Vesiculosus Extract (and) Gluconolactone (and) Xanthan gum (and) Sodium chloride), a new active ingredient that helps to erase signs of aging around the eyes quickly and effectively – with perceivable results within just one week of application.

A new algae active ingredient rich in fucoidan

Seanactiv from BASF is the latest innovation for anti-aging cosmetic products that target the eye contours. It uses the power of fucoidan within a well-known species of algae to quickly achieve visible results. *Fucus vesiculosus*, commonly known as bladderwrack, grows in the clear northern hemisphere waters of Nova Scotia and Brittany. Its reported health effects are largely attributed to non-digestible polysaccharides (dietary fiber) and polyphenols. Compared to other algae, *Fucus vesiculosus* contains the highest level of the polysaccharide fucoidan [7].

Fucoidan from algae is a sulphated polysaccharide characterized by fucose monomers. The algae used for Seanactiv is harvested manually from May to September under government license, in line with good collection practices that ensure regeneration of the biomass, and it is also certified as organic. It is extracted through a process that concentrates the active fucoidan molecule present in the algae.

By leveraging the power of fucoidan, Seanactiv has a quick and positive effect on diminishing both signs of eye fatigue and aging of the eye area. It offers a three-step action that

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has been proven by *in vitro* and *in vivo* tests. First, it contributes to reduce dark circles by stimulating the production of heme oxygenase. Second, it helps to reduce the appearance of wrinkles and achieve younger skin appearance thanks to its effect on the production of Collagen I. Finally, it contributes to an increase in the production of the Sirtuin-1 enzyme (SIRT-1) which consequently increases the mitochondrial activity and Adenosine triphosphate (ATP) production. It thus helps to improve overall skin luminosity of the eye area.

Stimulating heme oxygenase synthesis to help reveal eye freshness

The first *in vitro* test evaluated the ability of Seanactiv to stimulate heme oxygenase-1 (HO-1), an enzyme that promotes heme degradation into less intensely colored products, which also show cell-protective effects. This helps to limit the appearance of dark circles around eyes – which is the top priority of consumers. Seanactiv was applied to cultured human keratinocytes ($p < 0.001$) at 0.02% and 0.06%, using a capillary electrophoresis-based protein analysis system (Sally Sue) to quantify the presence of HO-1 protein.

Seanactiv stimulated synthesis of HO-1 protein by human keratinocytes by 413% and 598% at 0.02% and 0.06% respectively compared to the untreated control (UC) (**Figure 1**). This shows its potential to break down the intensely colored heme and to contribute to limit the appearance of dark circles under the eyes. The degradation products of heme also support cell protection. As demonstrated by similar results obtained with the standard fucoidan molecule (data not shown), the activity was supported by the ingredient's richness in fucoidan.

Stimulating Collagen I synthesis to help revive eye contour youthfulness

In vitro tests also investigated the capacity for Seanactiv to stimulate Collagen I synthesis in the extracellular medium in a model of cultured dermal fibroblasts, while evaluating whether the characterized molecule fucoidan was responsible for this effect. Wrinkles and fine lines are linked to loss of Collagen I and cell senescence. Stimulating Collagen I synthesis should help to counteract the decrease in collagen fibers in the skin, while helping to regenerate and strengthen the der-

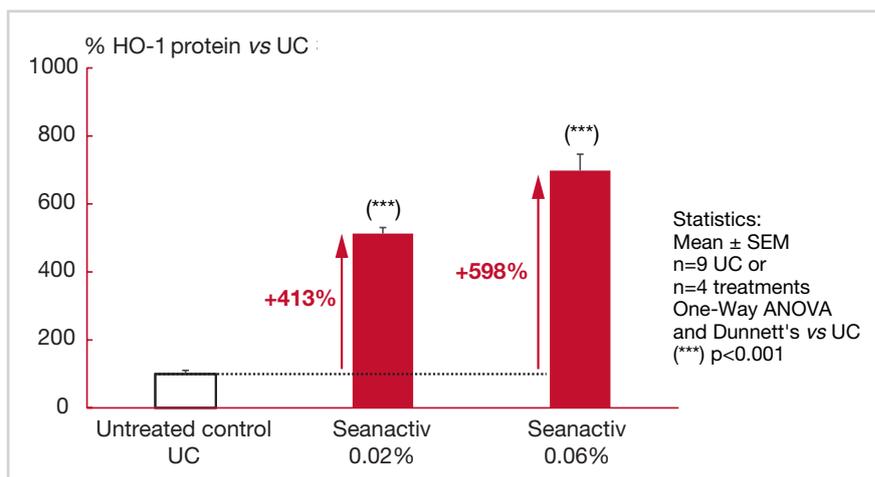


Fig.1 Evaluation of the effect of Seanactiv on HO-1 synthesis by normal human epidermal keratinocytes.

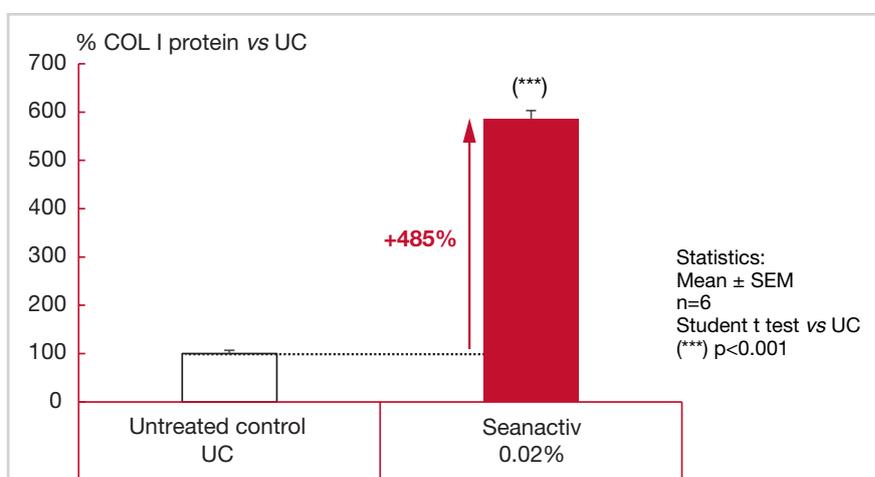


Fig.2 Evaluation of the effect of Seanactiv on Collagen I synthesis by normal human dermal fibroblasts.

mal extracellular matrix to limit the appearance of wrinkles. Normal human dermal fibroblasts were prepared and treated with Seanactiv at 0.02%, with a standard fucoidan molecule at dry weight (dw) or without any product (UC). This experiment used a method based on the DELFIA® method developed by BASF Beauty Care Solutions France SAS that allows very precise quantification of extracellular mature (or deposited) Collagen I.

Seanactiv stimulated the *in vitro* synthesis of Collagen I by 485% compared to the untreated control (UC) in cultured human fibroblasts ($p < 0.001$) (**Figure 2**). As demonstrated by similar results obtained with the standard fucoidan molecule (data not shown), the activity was supported by the ingredient's richness in fucoidan.

Stimulating SIRT-1 synthesis for cell vitality to help offer a wave of radiance

Further *in vitro* tests explored the capacity for Seanactiv to improve cell vitality and limit cell aging and senescence by reacti-

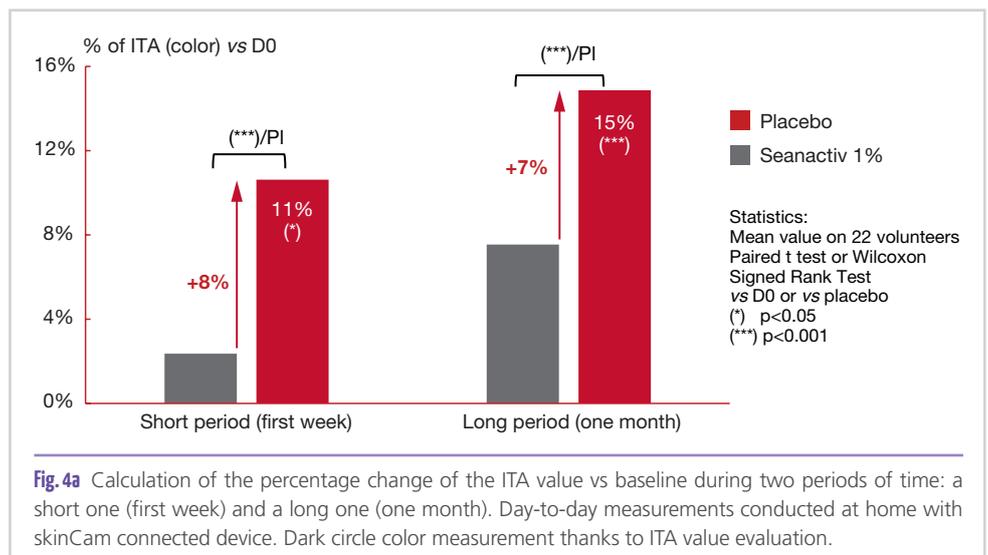
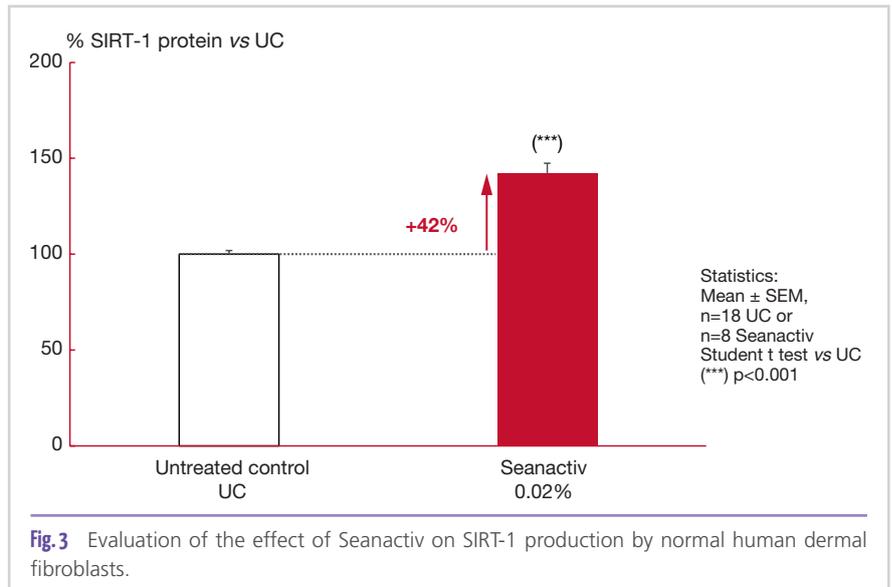
vating the synthesis of epigenetic SIRT-1, as well as ATP production and mitochondrial activity. SIRT-1 enzyme is an epigenetic regulator and protector of cell longevity. It limits histone acetylation that is caused by aging or UV exposure, and is also associated with cell energy, longevity and mitochondrial activity. Synthesis of SIRT-1, production of ATP and mitochondrial activity are three indicators of aging phenotype that contribute to low cell activity or vitality, and cell longevity [8]. Boosting ATP production or mitochondrial activity could help to produce a more youthful, radiant and healthy appearance of the skin [9]. The experiment used a capillary electrophoresis-based protein analysis system (Sally Sue) that allows quantification of SIRT-1. ATP production was evaluated with luminescent assay and mitochondrial activity was investigated with spectrophotometry assay. The cells were treated with or without the active ingredient at a concentration of 0.02% for 24 hours.

Seanactiv *in vitro* stimulated the synthesis of SIRT-1 by 42% compared to UC in cultured human fibroblasts ($p < 0.001$; **Figure 3**). As demonstrated by similar results obtained with the standard fucoidan molecule (data not shown), the activity was supported by the ingredient's richness in fucoidan. As a result of SIRT-1 stimulation, ATP production and mitochondrial activity were enhanced by 258% and 138% respectively compared to UC in cultured human fibroblasts (data not shown). These results indicate the potential for Seanactiv to limit cell aging and increase cell vitality in the dermis to help to improve the appearance of dull skin.

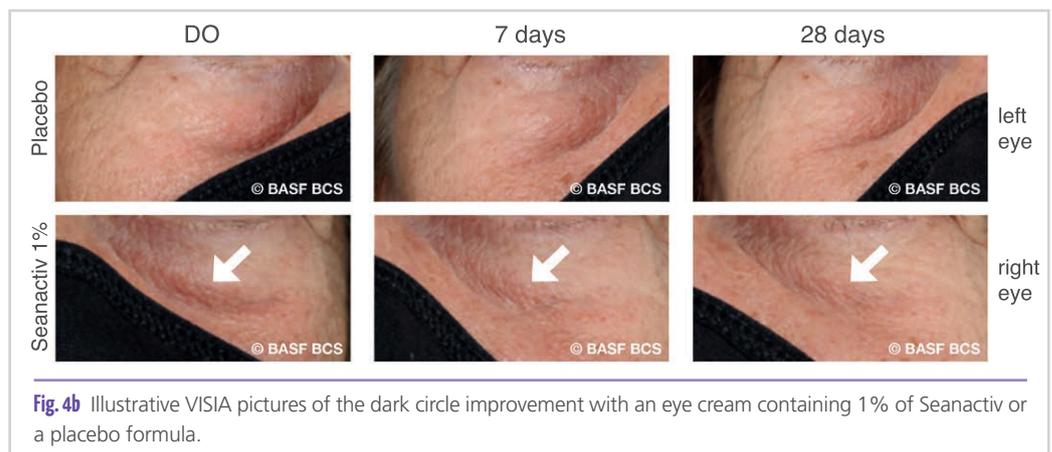
Improving the appearance of dark circles and crow's feet

In vivo tests have also been conducted to examine the capacity for Seanactiv to reduce the appearance of dark circles and wrinkles around the

eyes. The study involved 24 healthy female volunteers aged between 18 and 65 who had crow's feet wrinkles grade 3-4 (assessed by a clinical scientist) and/or eyebags and/or un-



dereye dark circles. A cream containing 1% Seanactiv was applied to the face once in the morning and once in the evening in a double-blind randomized, split-face and placebo-



bo-controlled study. The effect on the eye contour was evaluated during two periods of time – a short period (D1 to D7) and a long period (D1-D28). Measurements were conducted every day by volunteers at home after waking up, just before the morning application. Undereye images and crow's feet area images were assessed using a new device called Skin-Cam that can be connected to a smartphone. This allowed day-to-day image acquisition throughout the treatment, with the images quickly transferred to the expert analyzer. After a quality control check to eliminate low-quality images and data, 22 and 18 subjects were included in the final analysis for undereye area and crows' feet area respectively.

Seanactiv decreased the dark circle color by increasing the Individual Typology Angle (ITA) value by 11% during the short period and 15% during the long period (Figure 4a). The ITA is a measure of skin pigmentation degree. These results were significantly better than placebo and a visually perceivable improvement of dark circle color was clear to see (Figure 4b).

Seanactiv also reduced the roughness of the skin surface. This was measured in terms of the mean surface texture (Spq) value, which decreased by 14% during the short period and 12% during the long period. These results were significantly better than placebo ($p < 0.01$) and a visually perceivable improvement in the appearance of crow's feet wrinkles was clear to see (data not shown).

Taken together, these *in vivo* test results show that applying an eye cream containing 1% Seanactiv contributes significantly to the reduction of the appearance of dark circles and crow's feet wrinkles.

Improving skin luminosity

The same *in vivo* tests also investigated the capacity for Seanactiv to improve the overall appearance of the eye contour by increasing skin luminosity. This involved measuring the lightness of skin color, denoted as the L value. Seanactiv increased the L value by 1.7% during the short period and 2.6% during the long period (Figure 5a). An increase in this value indicates lighter skin color. These results were significantly better than placebo ($p < 0.001$) and a visually

perceivable improvement in skin luminosity was clear to see (Figure 5b). This indicates that applying eye cream containing 1% Seanactiv contributes to significantly increasing skin luminosity from the first week, compared to the placebo and baseline.

Conclusion

Seanactiv is a new bioactive ingredient from BASF that uses an alga extract rich in fucoidan to quickly help diminish signs of eye-fatigue and aging of the eye area. The solution is 99.8% from natural origin and provides a three-step action to revitalize the eye area with visible results within just one week of application. This enables companies that manufacture cosmetic and skin care products to meet rising consumer demand for solutions to address their concerns about signs of aging and tiredness such as dark circles, crow's feet, and dull skin.

In vitro testing has shown that Seanactiv is able to reinforce cytoprotection and limit the appearance of dark circles under the eyes by stimulating synthesis of HO-1 by human dermal keratinocytes by 413% and 598% at 0.02% and 0.06% respectively.

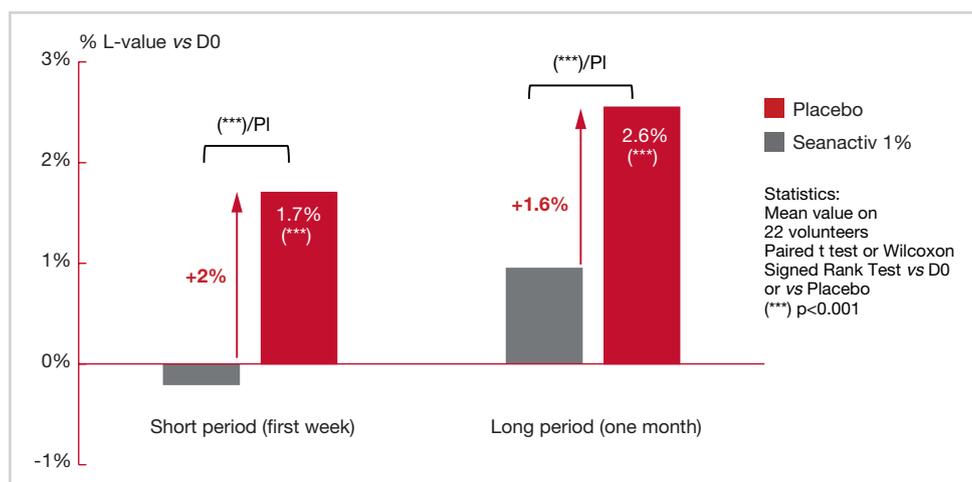


Fig. 5a Calculation of the percentage change of the L value vs baseline during two periods of time: a short one (first week) and a long one (one month). Day-to-day measurements conducted at home with skinCam connected device.



Fig. 5b Illustrative pictures (Parallel Polarized) of the improvement of skin luminosity under the eye. Day-to-day measurements conducted at home with skinCam connected device before and after treatment with 1% of Seanactiv.

Furthermore, *in vitro* tests have proven its efficacy in boosting synthesis of Collagen I by human dermal fibroblasts by 485% and limiting the appearance of wrinkles. It has also demonstrated its capacity to increase synthesis of SIRT-1 by 42%, while stimulating ATP production and mitochondrial activity by 258% and by 138% respectively. *In vivo* tests have demonstrated that Seanactiv is able to reduce the appearance of dark circles and crow's feet wrinkles, while significantly increasing skin luminosity from the first week.

Altogether, these results show that Seanactiv harnesses the power of fucoidan to visibly improve key aspects of eye contour appearance quickly and effectively within just one week.

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Formulations examples:

CC-Eye perfector (CC-FR-21-BC-50872-05) - see page 7

Silky Eye Concentrate (SC-FR-21-BC-50922-01) - see page 8

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CC-Eye perfector

Concealer | CC-FR-21-BC-50872-05



BASF
We create chemistry

The perfect solution to take care of your eye contour in one unique ritual thanks to the CC-eye perfector concealer, offering both color correction with pigments and bioactive and a fresh relooking with instant results.

Phase	Ingredients	INCI	% by weight	Function
A	Dehymuls® PGPH	Polyglyceryl-2 Dipolyhydroxystearate	5.00	Emulsifier (W/O)
	Lameform® TGI	Polyglyceryl-3 Diisostearate	2.00	Emulsifier (W/O)
	Cutina® PES	Pentaerythrityl Distearate	1.50	Structurant
	Cosmedia® Gel CC	Dicaprylyl Carbonate, Stearalkonium, Hectorite, Propylene Carbonate	7.00	Rheology modifier
	Cetiol® Sensoft	Propylheptyl Caprylate	7.00	Emollient
	DOWSIL 9041 Silicone Elastomer Blend (Dow Corning)	Dimethicone, Dimethicone Crosspolymer	2.00	Skin feel modifier
B	Water, demin.	Aqua	56.94	
	1,3-Butanediol	Butylene Glycol	2.00	Humectant
	Magnesium Sulfate	Magnesium Sulfate	1.00	Stabilizer
	Preservative		q.s.	Preservative
C	Cetiol® A	Hexyl Laurate	4.00	Emollient
	Cetiol® C 5C	Coco-Caprylate/Caprates	4.00	Emollient
	DK-PGT Paste Ti (Daito Kasei Kogyo)	Polyglyceryl-2 Triisostearate, Titanium Dioxide, Aluminum Hydroxide	3.00	Colorant
D	Chione™ M SVA	Synthetic Fluorophlogopite, Lauroyl Lysine	2.00	Skin feel modifier
	Timica® Terra Yellow MN4502	Mica, Iron Oxides, Titanium Dioxide	1.10	Effect pigment
	Timica® Terra Red MN4506	Mica, Iron Oxides, Titanium Dioxide	0.33	Effect pigment
	Timica® Terra Black MN4498	Mica, Iron Oxides, Titanium Dioxide	0.13	Effect pigment
E	Seanactiv™ BC10113	Aqua, Fucus Vesiculosus Extract, Gluconolactone, Xanthan Gum, Sodium Chloride	1.00	Active ingredient

Specifications:

Viscosity (Brookfield; RVT; spindle TC, Helipath; 20 rpm; 20°C): 17000 mPa s, **Appearance:** Beige fluid

Processing

1: Heat Phases A and B to 80°C under stirring, **2:** Add Phase C into Phase A under stirring, **3:** Add Phase B into Phase A+C under stirring, **4:** Add phase D under stirring, **5:** Cool down to 30°C, then add Phase E under stirring.

Stability:

Stable 3 months at 4°C, RT, 40°C and 45°C

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Silky Eye Concentrate

SC-FR-21-BC-50922-01



Enjoy a rested night with the Silky Eye Concentrate, to awake with a fresh look reenergize, free of signs of fatigue and dark circles

Phase	Ingredients	INCI	% by weight	Function
A	Water, demin.	Aqua	84.85	
	Glycerin	Glycerin	3.00	Humectant
	Cosmedia® Ace	Sodium Polyacrylate, Dicaprylyl Carbonate, Polyglyceryl-3 Caprate	1.20	Rheology modifier
	Rheocare® XGN	Xanthan Gum	0.10	Rheology modifier
	Preservative		q.s.	Preservative
B	Lameform® TGI	Polyglyceryl-3 Diisostearate	1.00	Emulsifier (W/O)
	Cetiol® SB 45	Butyrospermum Parkii Butter	1.00	Emollient
	Cegesoft® VP	Olus oil, Hydrogenated Vegetable Oil, Candelilla cera [EU], Vegetable Oil, Hydrogenated Vegetable Oil, Euphorbia Cerifera (Candelilla) Wax	2.00	Emollient
	Cetiol® 4 All	Dipropylheptyl Carbonate	2.50	Emollient
	Preservative		2.50	Emollient
C	Seanactiv™ BC10113	Aqua, Fucus Vesiculosus Extract, Gluconolactone, Xanthan Gum, Sodium Chloride	1.00	Active ingredient
	Perfume	Parfum	0.15	Fragrance
	Sodium Hydroxide (18% solution)	Sodium Hydroxide	0.70	pH Adjustment

Specifications:

pH value (20°C): 5.8, **Viscosity** (Brookfield; RVT; spindle TC, Helipath; 20 rpm; 20°C): 52000 mPa s.

Processing

1: Heat phases A and B at 75°C, **2:** Add phase B into phase A while mixing, **3:** Allow to cool to room temperature under gentle mixing, **4:** Add ingredients of phase C one by one at 30°C.

Stability:

Stable 3 months at 4°C, RT, 40°C and 45°C

Perfume:

Lait de coton RS94159 (TechnicoFlor) (no allergens to declare)

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