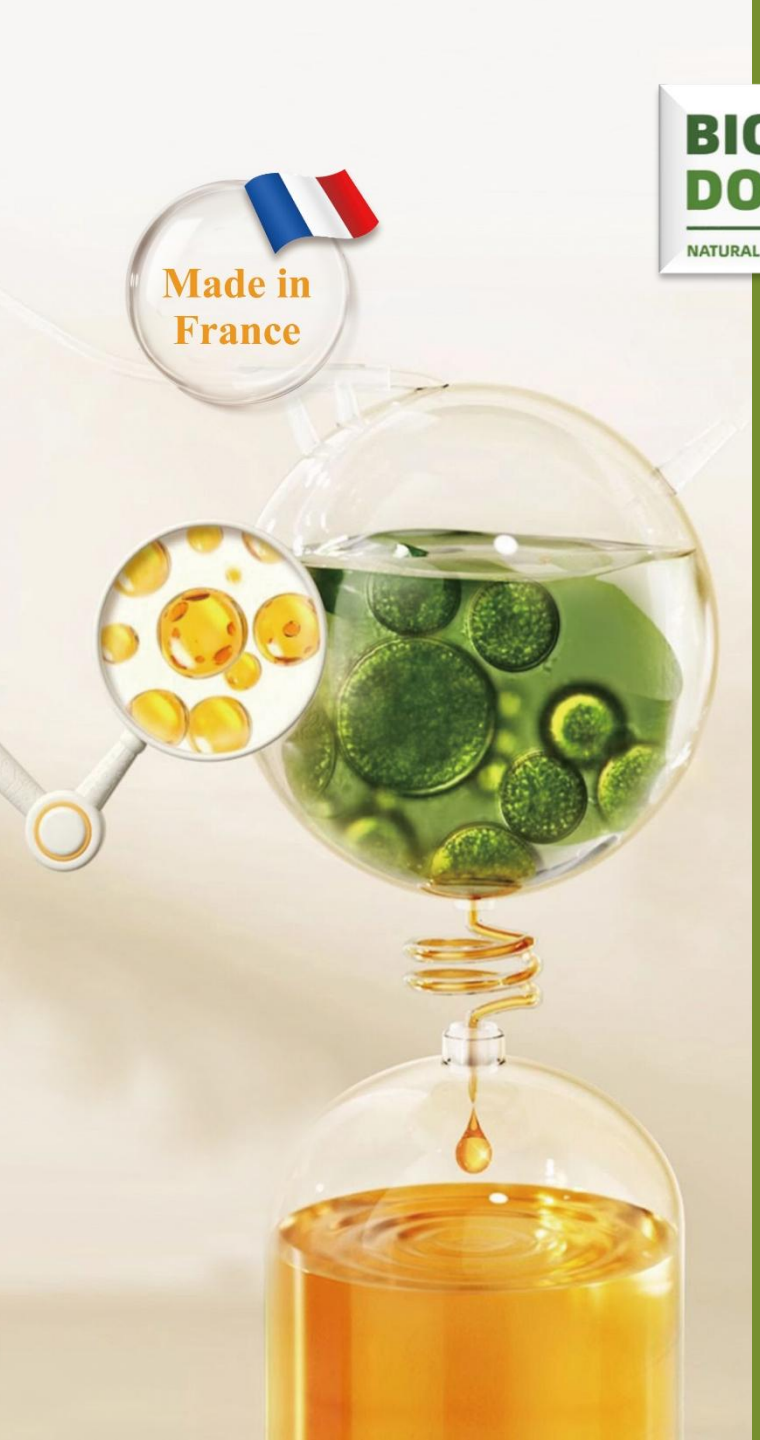


BIO-TECH DONOR
NATURAL · SUSTAINABLE · SAFE

SilCare™ Microalgae Ferment

INCI: Saccharomyces/Nannochloropsis Oculata Ferment Lysate Filtrate, Glycerin

Anti-inflammation, anti-oxidant, soothing, repairing & mositurizing

Efficacy Combines with Sustainability

SILIA INNOAVTION

2024

SILIA
COSMÉTIQUES FRANÇAIS
LABORATOIRE

Contents

01 Market Overview

02 Bioactivities of Microalgae and Yeast Ferment

03 Product Features

04 Efficacy Tests

05 Application Area & Guide

06 Technical Competence

Market Overview

- Microalgae extract and yeast ferment extract have great market potential
- Not many fermented microalgae ingredients available
- Potential real “green” ingredient for cosmetics

01

01 Market Overview

Why We Introduce SilCare™ Microalgae Ferment?

- Microalgae are a rich resource of bioactive molecules which could be beneficial for the skin.[1,2]
- Fermentation is known to be able to elevate the benefits of these compounds.[3] e.g. Skin absorption of active ingredients is improved thanks to the refined decomposition of active ingredients by enzymes from microorganisms.
- Both microalgae culture and fermentation are environmentally friendly and consume little energy.[4,5]
- On the market, there are just a few active ingredients based on microalgae, in particular, there are not many fermented ingredients.

To meet this demand we decided to create a **new active ingredient based on fermented microalgae.**

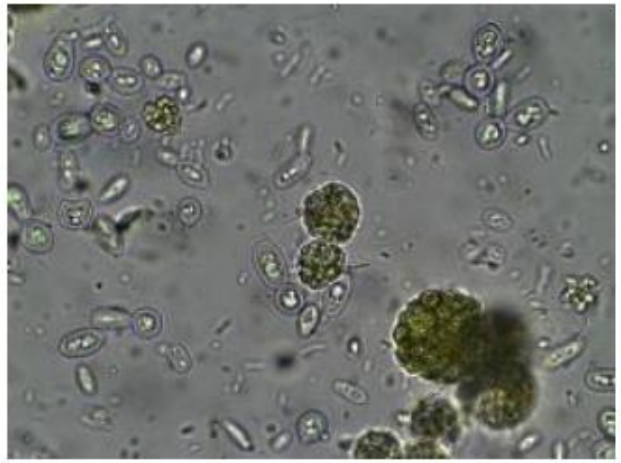
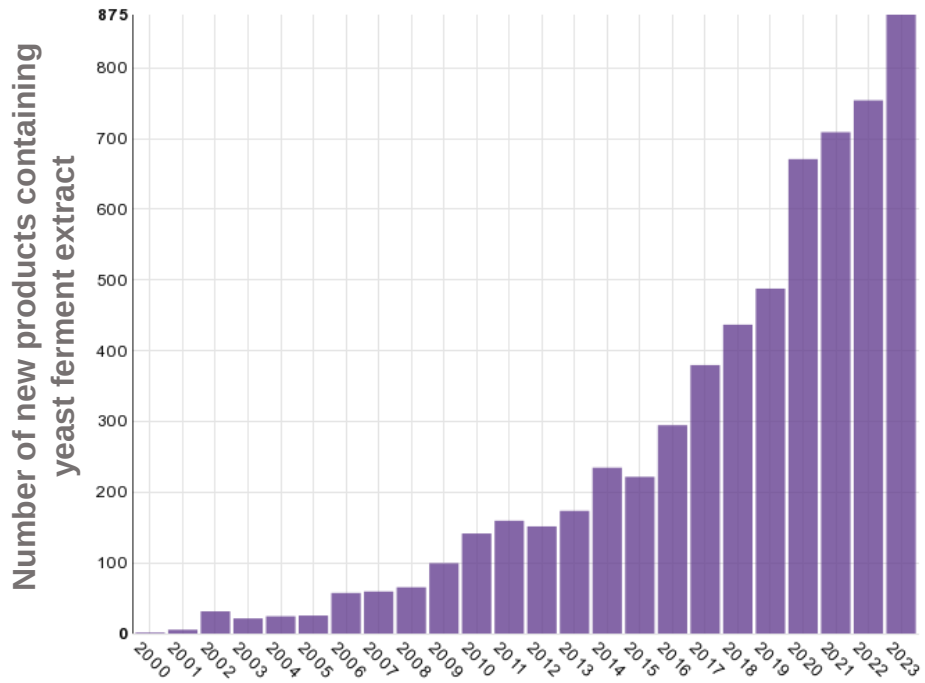


Fig. 1. Light microscopy image of fermented microalgae at day 5 (X100).

Data Source: 1. Ma XN, et al. Mar Drugs. 2016 Mar 25;14(4):61.
2. Martínez R, et al. Mar Drugs. 2022 May 11;20(5):318.
3. Garofalo C, et al. Microorganisms. 2022 Oct 19;10(10):2069.
4. Fabarius JT, et al. Trends Biotechnol. 2021 Apr;39(4):348-358.
5. Vuppaladadiyam AK, et al. ChemSusChem. 2018 Jan 23;11(2):334-355.

01 Market Overview

A



B

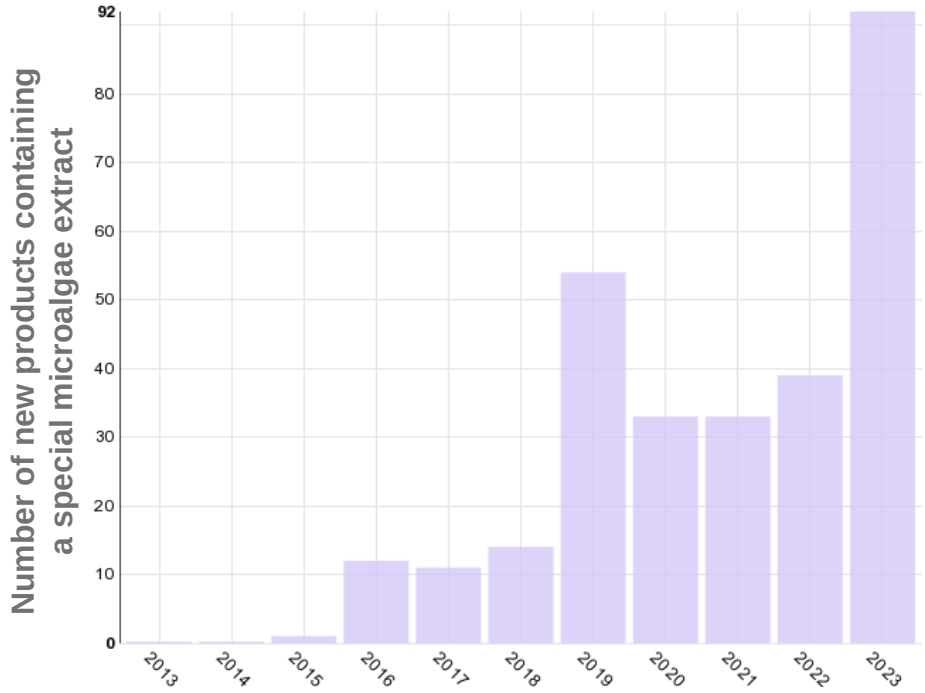


Fig. 2. Overview of newly launched products containing (A) yeast ferment extract (B) a special microalgae extract.

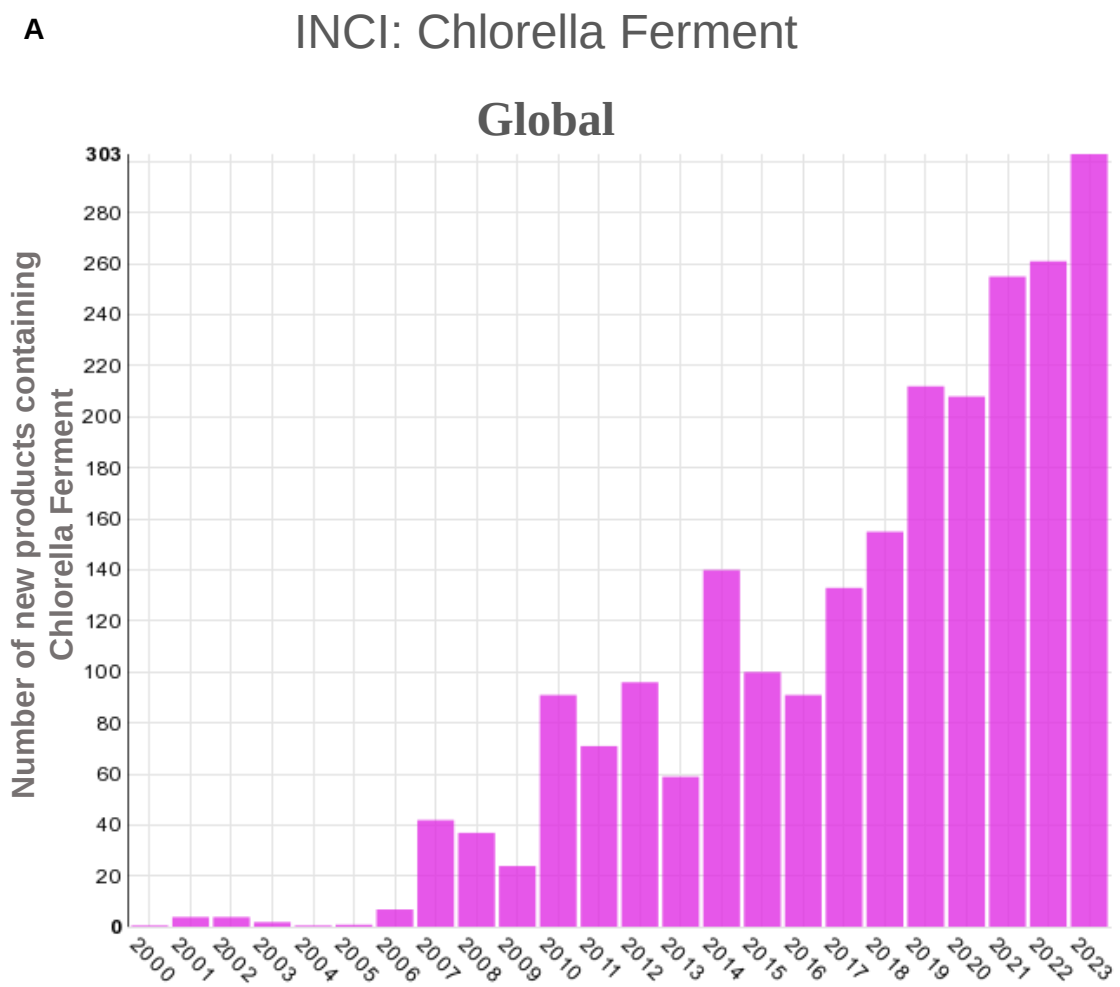
Regarding their application in cosmetic products, both yeast ferment extract and the microalgae extract experienced a steady growth in recent years on a global scale.

This coincides with the global trends of consuming ferment ingredients and marine ingredients.

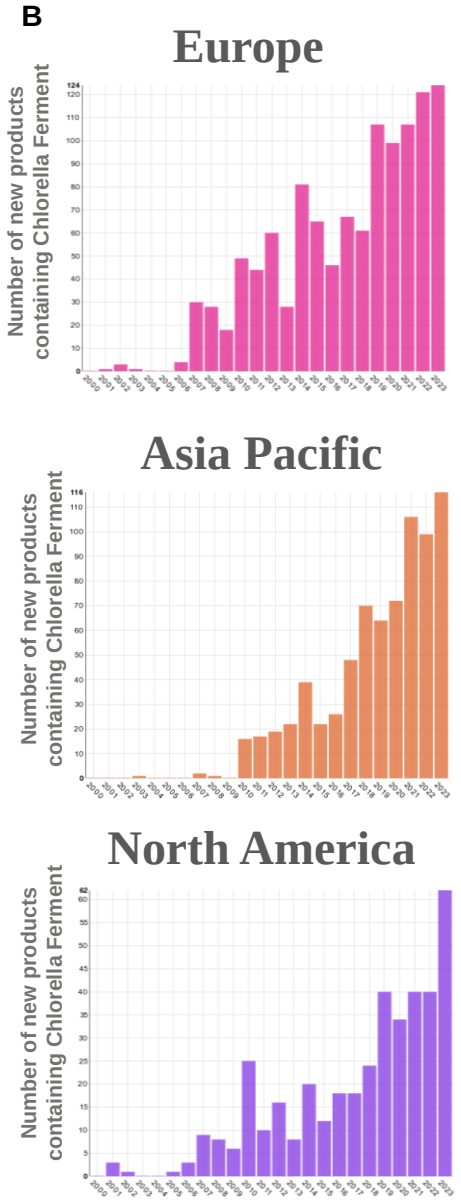
Data Source: Mintel GNPD

01 Market Overview

A



B



Chlorella is another type of microalgae.

Application of its ferment, Chlorella Ferment, has also experienced fast growth in the cosmetic products, especially in Europe, Asia Pacific, and North America.

Fig. 3. (A) Global and (B) regional overview of newly launched products containing Chlorella ferment.

Data Source: Mintel GNPD

01 Market Overview

INCI: Chlorella Ferment

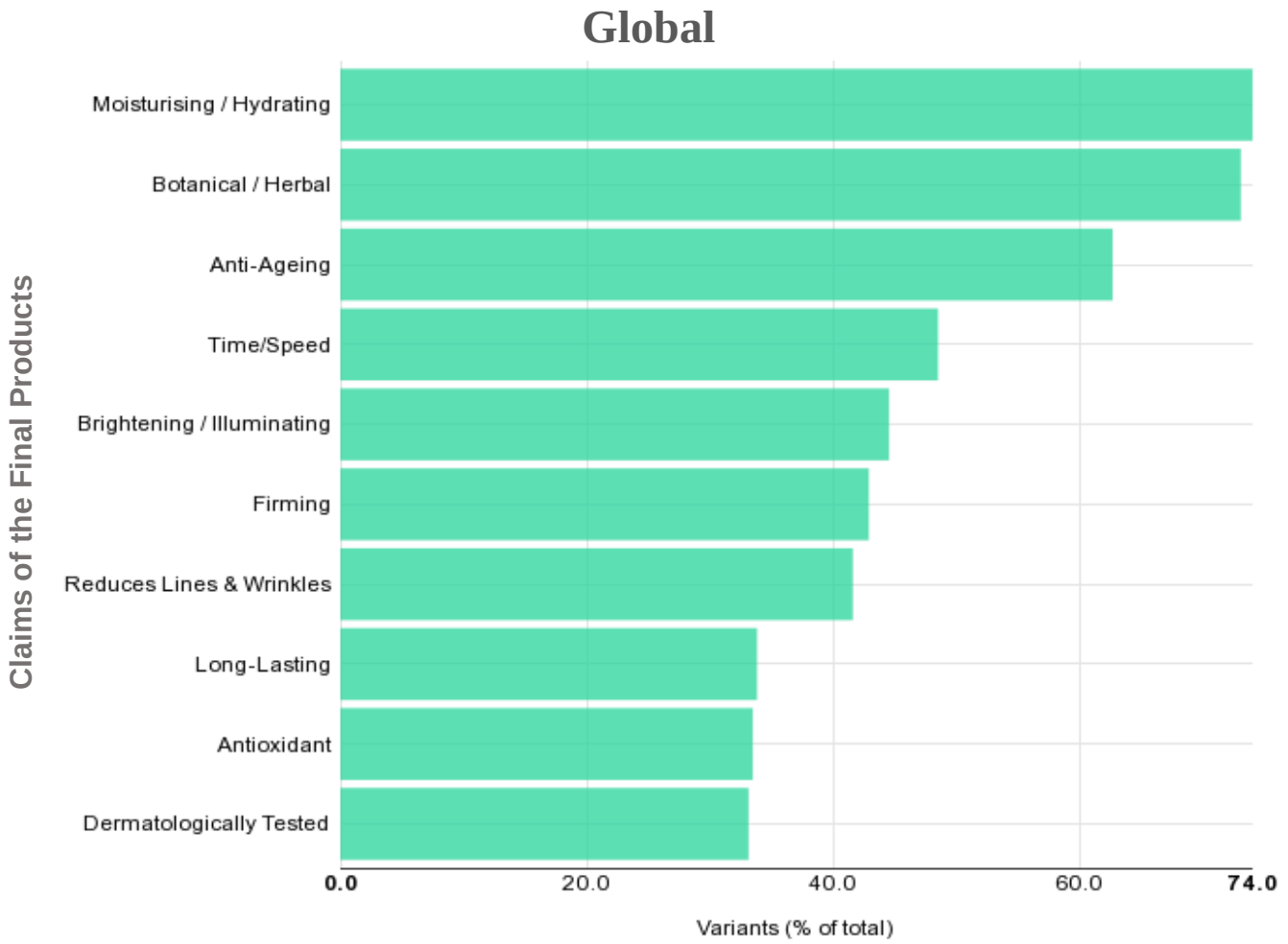


Fig. 4. Efficacy claims of newly launched products containing Chlorella ferment.

Chlorella Ferment has been widely applied in the skincare products, especially for products designed for:

- moisturising/hydrating,
- anti-aging,
- brightening/illuminating,
- firming,
- reducing lines & winkles,
- anti-oxidant

Data Source: Mintel GNPD

01 Market Overview

Commercial Products Using Ferments from Microalgae

Dr Irena Eris
Body Art Intensive Firming and Regenerating Bust Cream

Farmacy
Deep Sweep 2 % BHA Pore Cleaning Toner

RIBECS
Algae Revitalizing Ferment Pre-Essence

AFU
Rosemary Verbenomo Hydrosol

Pearlosophy
Amazing Beauty Essence

FAN BEAUTY DIARY
Dragon's Blood Lentinus Fermentation Facial Treatment Mask

NICEMIX
Bifida Ferment Revitalizing Cream

Nebe
Oil-control Fluffy Shampoo

Wetcode
Watery Whitening Sunscreen Lotion

BLACKLABO
Amino Acid Foaming Cleanser

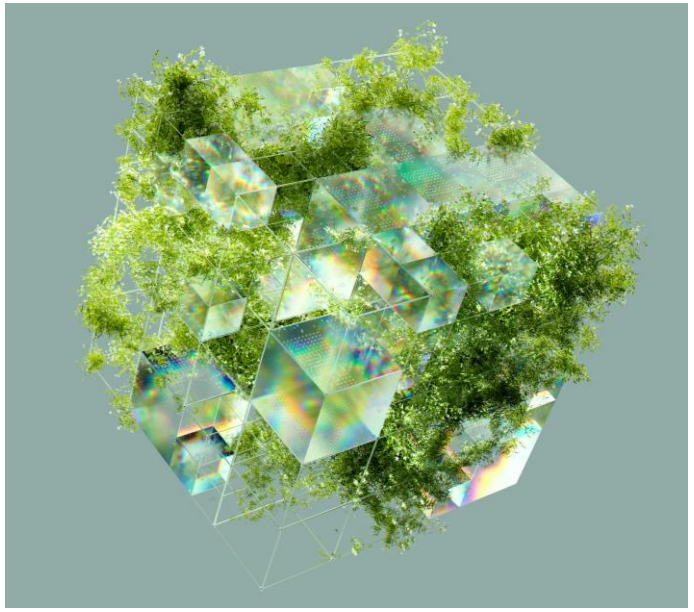
Readyoling
Ganoderma Fermented Refreshing Essence

ICE GROUND
Seaweed Extract Moisturizing Mask

01 A Genuinely “Green” Cosmetic Active

SilCare™ Microalgae Ferment belongs to the new generation of **climate-neutral active ingredients.**

- Microalgae are a renewable fermentation resource which can fix inorganic carbon through photosynthesis for their growth and the biosynthesis of various active molecules.
- Use French patented technology and energy-efficient yeast fermentation process
- Byproducts are biodegradable, used as organic fertilizer, zero waste.
- European raw materials and European localized manufacture.
- The transparency provided across its whole supply chain, offsetting of unavoidable CO_2 emissions and support of UN-sustainable development goals.



Efficacy Combines with Sustainability

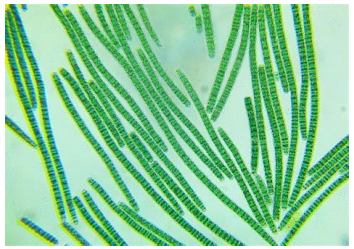
Bioactivities of Microalgae and Yeast Ferment

- Both microalgae extract and yeast ferment extract have various benefit effects for skin
- Special microalgae - Nannochloropsis oculata

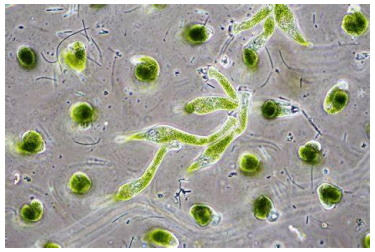
02

02 Microalgae Overview

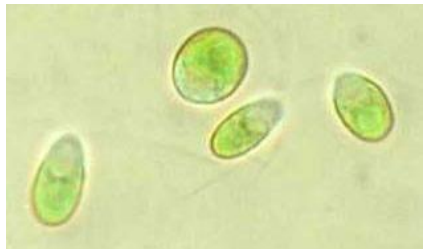
Types of Microalgae



Arthrospira platensis
Rich in proteins, vitamins (A,B,E), minerals (iron, magnesium), antioxidants. Cell regenerative, collagen production stimulation, anti-aging, revitalizing, improve skin elasticity

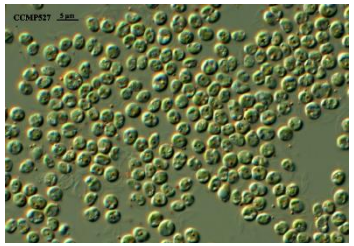


Chlorella vulgaris
Rich in proteins, vitamin B, chlorophyll, amino acids, antioxidants, fiber, essential fatty acids. Detoxifying, repairing, hydrating, soothing sensitive skin

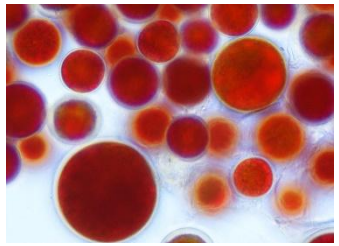


Dunaliella salina
Rich in beta-carotene, anti-aging, hydrating, skin repair

Tetraselmis suecica
Soothing, hydrating, rich in omega-3 fatty acids, antioxidants and proteins,nourishing and balancing the skin, soothing sensitive skin

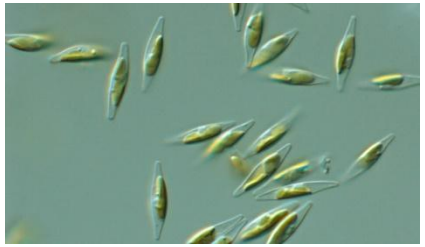


Nannochloropsis oculata
Rich in lipids, essential fatty acids, regenerative, improve the skin elasticity, reducing signs of aging, strengthening the skin barrier

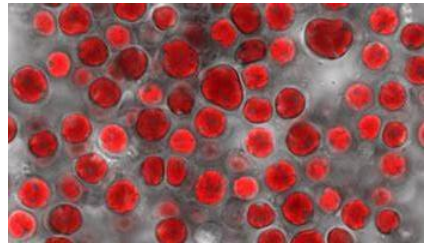


Haematococcus pluvialis
Source of astaxanthin, protect the skin, improve the skin elasticity, reduce wrinkles

Isochrysis galbana
Rich in lipids, polyinsaturedd fatty acids, antioxidants, regenerating, hydrating, restor radiance



Phaeodactylum tricornutum
Anti-aging, anti-wrinkles. Rich in antioxidants, proteins, imrpove elasticity and firmness,soothing sensitive or redness-prone skin



Porphyridium cruentum
Rich in carotenoids, fatty acids, polysaccharides, hydrating, repair, protect the skin, anti-inflammatory

02 Bioactivities of Microalgae on Skin

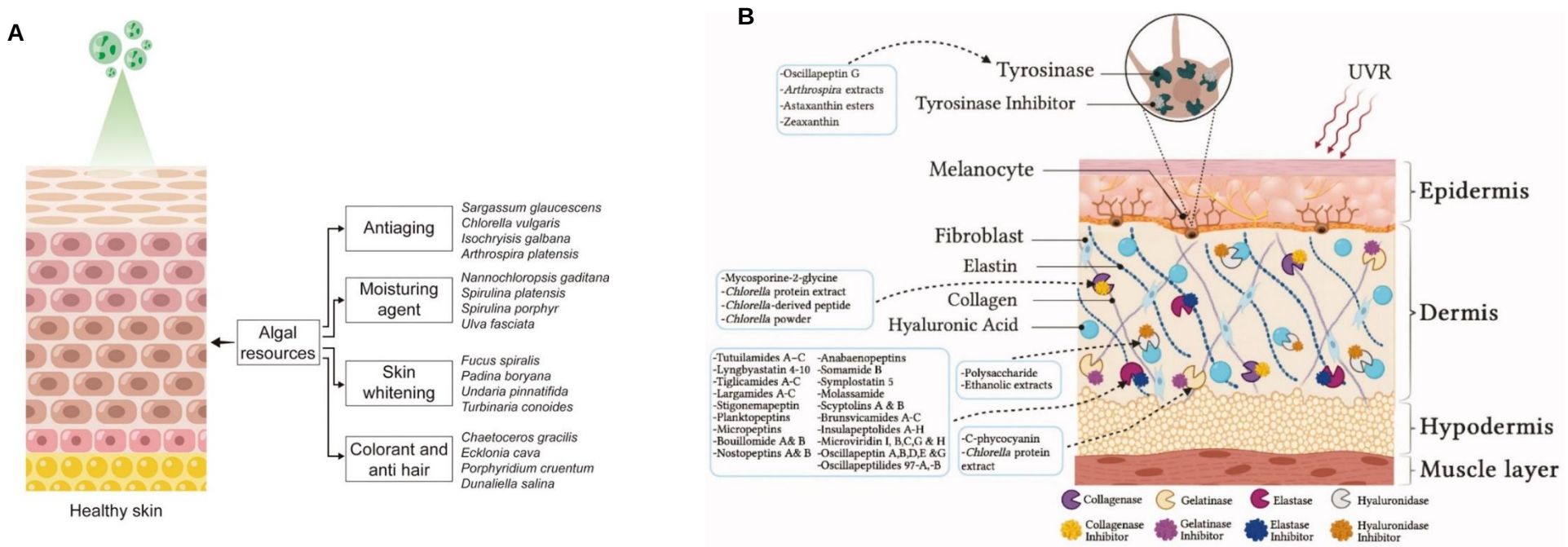


Fig. 5. Beneficial effects of microalgae bioactive compounds on the healthy skin structure, with emphasis on (A) the main efficacy of algae compounds and relevant species, (B) targets of cyanobacteria and microalgae bioactive compounds. UVR: ultraviolet radiation (adapted from Favas R et al., Aslam A et al.)

Microalgae have gained attention in the skincare industry due to their rich nutritional profile and potential skin benefits.[6,7]

- Rich in vitamins, minerals, proteins and fatty acids, which nourish the skin and support cellular health.
- Offer antioxidant properties, helping to combat free radicals and protect the skin from oxidative stress and UV radiation.
- Produce hydrating compounds, preventing dryness and promoting smoother skin.
- Demonstrate anti-inflammatory effects, soothing irritated skin and addressing redness or sensitivity.
- Microalgae pigments, such as β-carotene, may provide skin-brightening benefits and aid in reducing hyperpigmentation.

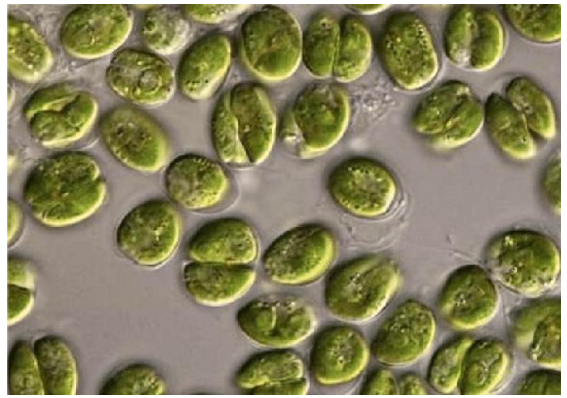
Data Source: 6. Favas R, et al. J Enzyme Inhib Med Chem. 2021 Dec;36(1):1829-1838.
7. Aslam A, et al. Sci Total Environ. 2021 Jun 10;772:144905.

02 Special Microalgae

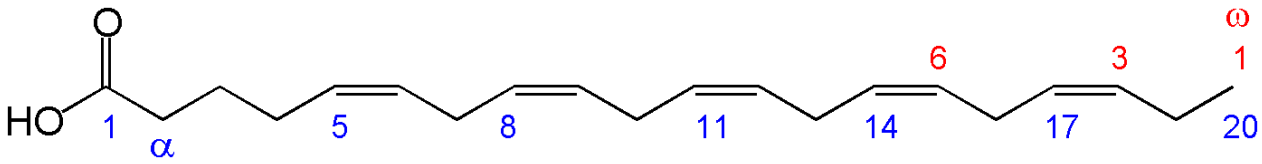
Why We Choose Nannochloropsis?

Better than Chlorella and Arthrospira

- Comparing with microalgae species like Chlorella and Arthrospira, *Nannochloropsis* demonstrated superior effectiveness in synthesizing bioactive molecules and enhancing the vegetative growth of common bean plants.[8]
- *Nannochloropsis* also offers a better nutritional content for the skin. It is not only rich in vitamins, minerals and proteins, but also in **Omega-3 fatty acids**, particularly **eicosapentaenoic acid (EPA)**, which is known for its various beneficial effects on skin.[9,10]



Nannochloropsis oculata



Eicosapentaenoic acid (EPA)

Fig. 6. Representative image of Nannochloropsis and the chemical structure of eicosapentaenoic acid.

Data Source: 8. Gharib FAEL, et al. Sci Rep. 2024 Jan 16;14(1):1398.
9. Thomsen BJ, et al. J Cutan Med Surg. 2020 Sep/Oct;24(5):481-494.
10. Huang TH, et al. Mar Drugs. 2018 Jul 30;16(8):256.

02 Bioactivities of Omega-3s on Skin

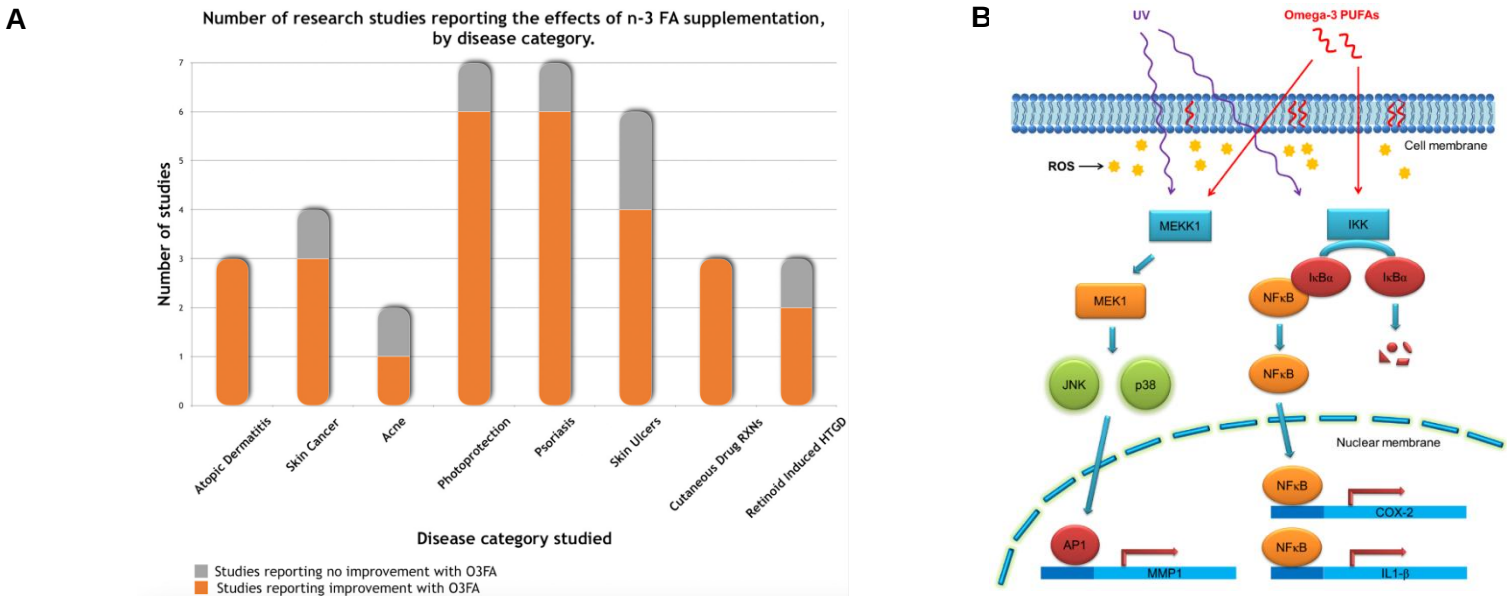


Fig. 7. (A) Number of studies reporting the effects of omega-3 fatty acid supplementation, by disease category. (B) The possible mechanisms of the photoprotective capability of omega-3 fatty acid. O3FA, omega-3 fatty acid (adapted from Thomsen BJ et al., Huang TH et al.)

Omega-3 fatty acids, specifically eicosapentaenoic acid (EPA) have been associated with various skin benefits such as moisturizing, anti-oxidation, anti-inflammatory, UV protection, and wound healing effects. Thus besides soothing the skin, Omega-3s are especially helpful for improving inflammatory skin conditions like acne, psoriasis, and eczema.[9,10]

Comparing with supplementation of other microalgae extracts, supplementation of Omega-3-rich microalgae extract could further help maintaining the structure and function of cell membranes, keeping the skin barrier intact, retaining moisture, and repairing UV-induced damages.

Data Source: 9. Thomsen BJ, et al. J Cutan Med Surg. 2020 Sep/Oct;24(5):481-494.
10. Huang TH, et al. Mar Drugs. 2018 Jul 30;16(8):256.

02 Bioactivities of Yeast Ferment on Skin

Yeast ferment extract, similar to the microalgae extract, is also associated with various positive effects for skincare, [11,12] including:

1. Hydration, 2. Antioxidant properties, 3. Brightening effect, 4. Anti-inflammatory properties

In addition, yeast ferment extract could promote:

1.Collagen and elastin synthesis: further help reducing the appearance of fine lines and wrinkles.[11,12]

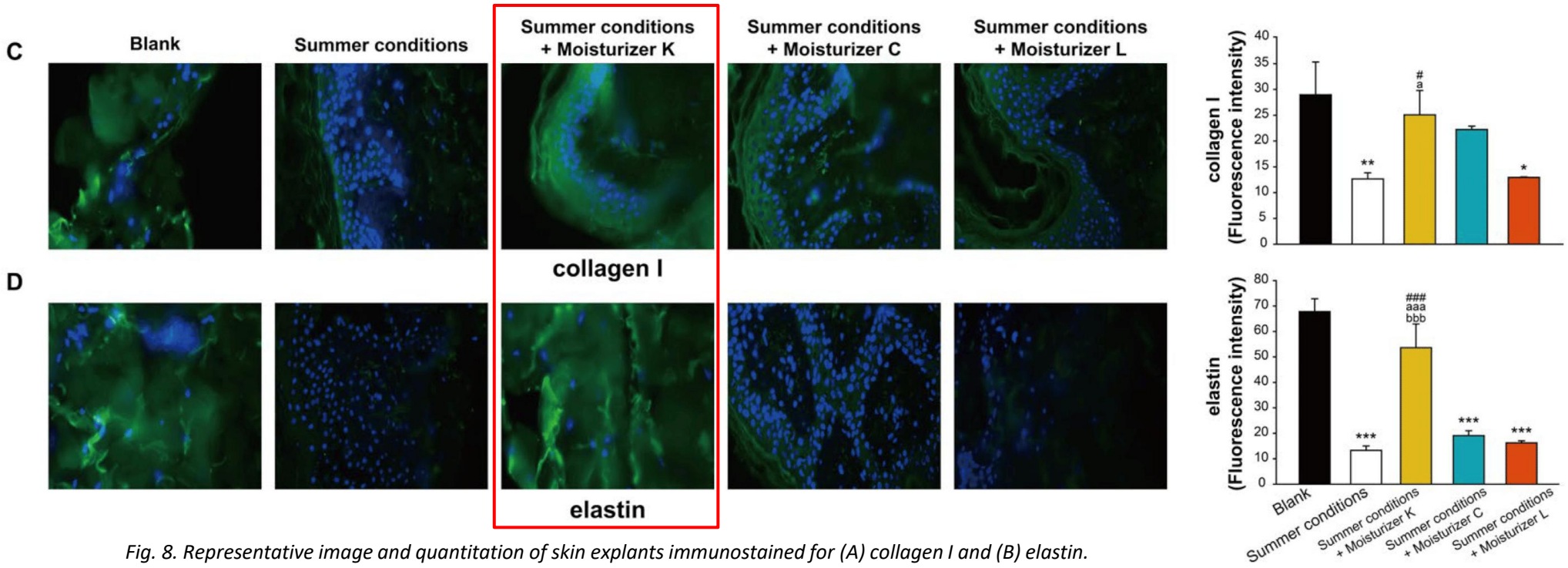
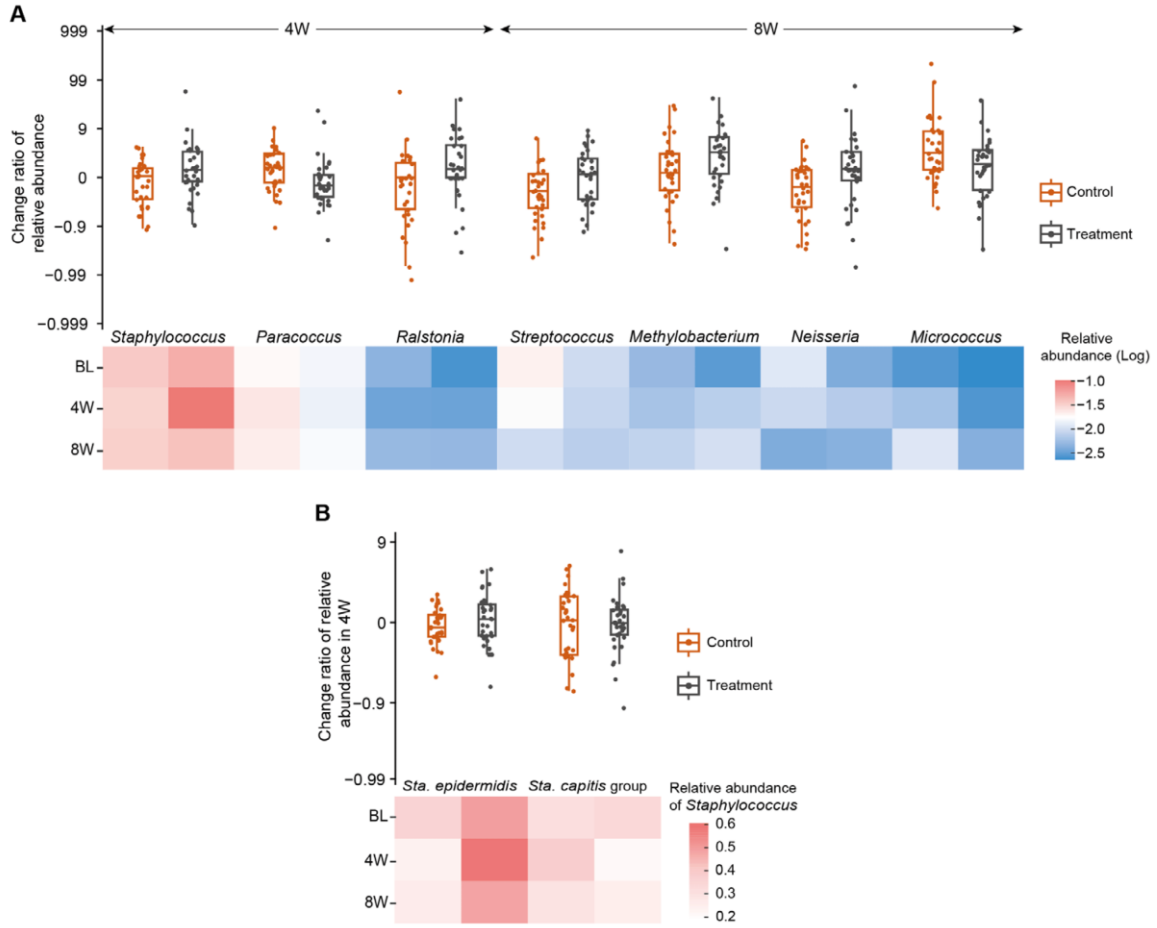


*Fig. 8. Representative image and quantitation of skin explants immunostained for (A) collagen I and (B) elastin. (###p<0.001, #p<0.05 vs. Summer conditions, ***p<0.001, * * p<0.01, *p<0.05 vs. Blank, adapted from Wang DQ, et al.)*

Data Source: 11. Thomsen BJ, et al. J Cutan Med Surg. 2020 Sep/Oct;24(5):481-494.
12. Wang DQ, et al. J Clin Med. 2023 Sep 20;12(18):6078.

02 Bioactivities of Yeast Ferment on Skin

In addition, yeast ferment extract could promote:
2.Microbiome support: a skin postbiotic moisturizer with yeast extract was shown to provide a holistic barrier (involving skin microbiome, physical, chemical, and immune barriers) to protect the skin against environmental aggressors.[12]



Compared with the other two moisturizers without yeast extract, Moisturizer K (water gel with yeast extract) **enabled the potential growth of beneficial bacteria**, including Sta. epidermidis and Ralstonia, in addition to **the better maintenance of bacterial and fungal richness.**

Fig. 9. Change ratio of the relative abundance of different taxa among untreated and Moisturizer K-treated samples. (A) Change ratio of bacterial genera relative abundance shows significant differences at 4 W and 8 W after using Moisturizer K. (B) Change ratio of the relative abundance of the genus Staphylococcus shows significant differences between moisturizer K treatment and untreated samples at 4 W. (adapted from Wang DQ, et al.)

Data Source: 12. Wang DQ, et al. J Clin Med. 2023 Sep 20;12(18):6078.

Product Features

- European high-quality microalgae as the fermentation raw material
- Optimized fermentation and purification of natural yeast
- Rich in a variety of amino acids, minerals, polyphenols and unsaturated fatty acids

03 SilCare™ Microalgae Ferment

Why is SilCare™ Microalgae Ferment so special ?

SilCare combines the effects of special microalgae with the benefits of the yeast ferment to boost its performances.

03 Product R&D Process

Optimization of Fermentation Conditions

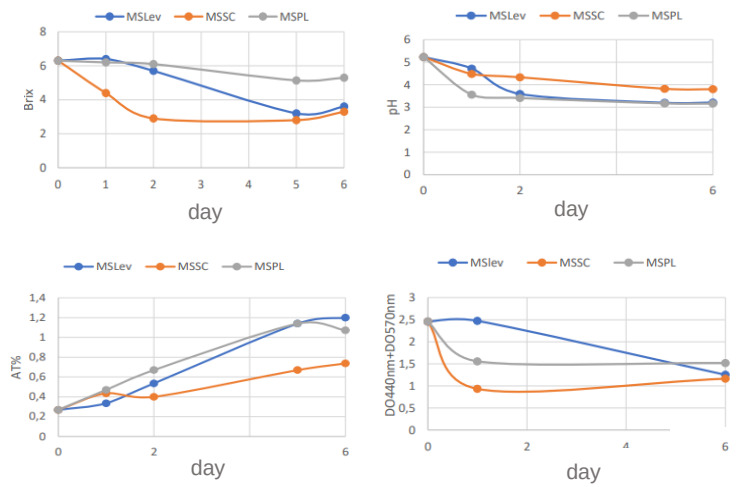
Selection of Fermentation Conditions

1. MSLEV
(fermentation alcoolique et acétique dominantes)

2. MSSC
(fermentation alcoolique dominante)

3 . MSPL
(fermentation lactique dominante)

A Individual parameters monitoring



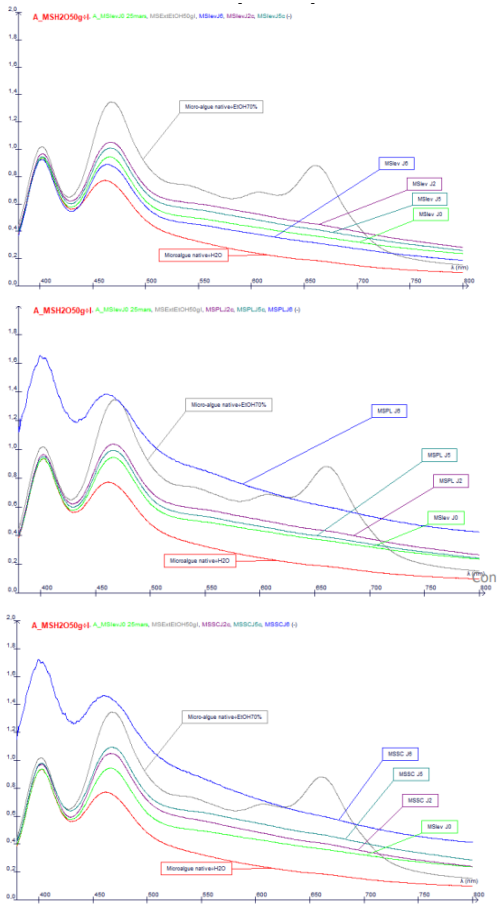
Jours/Brix	MSSC1	MSSC2	MSSC3	Moy.	Ecart type	CV%
J0	6,3	6,6	6,6	6,5	0,17	2,7
J1	4,4	4,5	4,5	4,5	0,06	1,3
J4	3,10	3,0	3,0	3,0	0,06	1,9
J5	3,3	3,2	3,4	3,3	0,10	3,0
J7		3,1	3	3,1	0,07	2,3
J8		3,2	3,2	3,2	0,00	0,0
J11			3,3	3,3	-	-

Jours/pH	MSSC1	MSSC2	MSSC3	Moy.	Ecart type	CV%
J0	5,28	5,34	5,32	5,31	0,03	0,6
J1	4,88	4,91	4,91	4,90	0,02	0,4
J4	4,17	4,18	4,19	4,18	0,01	0,2
J5	4,16	4,16	4,16	4,16	0,00	0,0
J7		4,08	4,08	4,08	0,00	0,0
J8		3,90	3,93	3,92	0,02	0,5
J11			3,89	3,89	-	-

Jours/EtOH	MSSC1	MSSC2	MSSC3	Moy.	Ecart type	CV%
J0	0	0	0	0	0,0	-
J1	18,96	19,36	18,79	19,0	0,3	1,5
J4	15,2	14,88	16,43	15,5	0,8	5,3
J5	19,4	18,40	21,48	19,76	1,6	8,0
J7		18,19	17,60	17,9	0,4	2,3
J8		12,62	13,74	13,18	0,8	6,0
J11			9,91	9,91	-	-

Jours/AT	MSSC1	MSSC2	MSSC3	Moy.	Ecart type	CV%
J0	0,17	0,17	0,17	0,17	0,00	0,0
J1	0,34	0,27	0,34	0,31	0,04	12,4
J4	0,54	0,54	0,50	0,52	0,02	3,7
J5	0,67	0,60	0,67	0,65	0,04	6,0
J7		0,80	0,80	0,80	0,00	0,0
J8		0,94	0,87	0,90	0,05	5,2
J11			1,68	1,68	-	-

B UV-visible spectrums, different



C HPLC analysis, different wavelengths

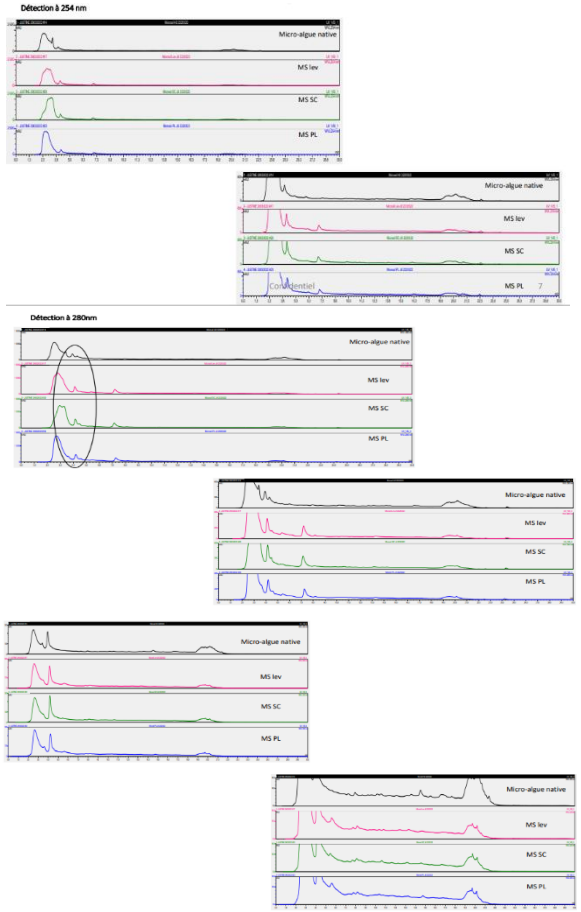


Fig. 10. Representative results of selecting the best fermentation condition. (A) individual parameters monitoring, (B) different UV-visible spectrumsand (C) HPLC analysis.

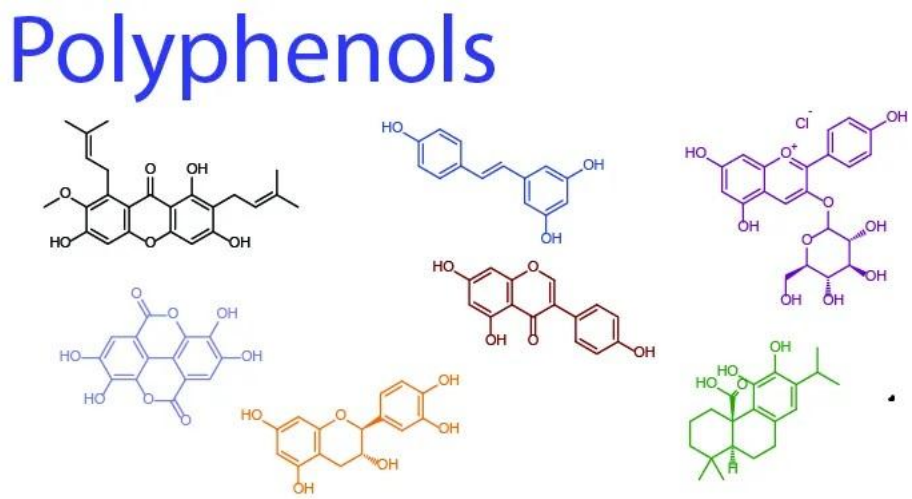
03 Product R&D Process

Determination of Polyphenol Content

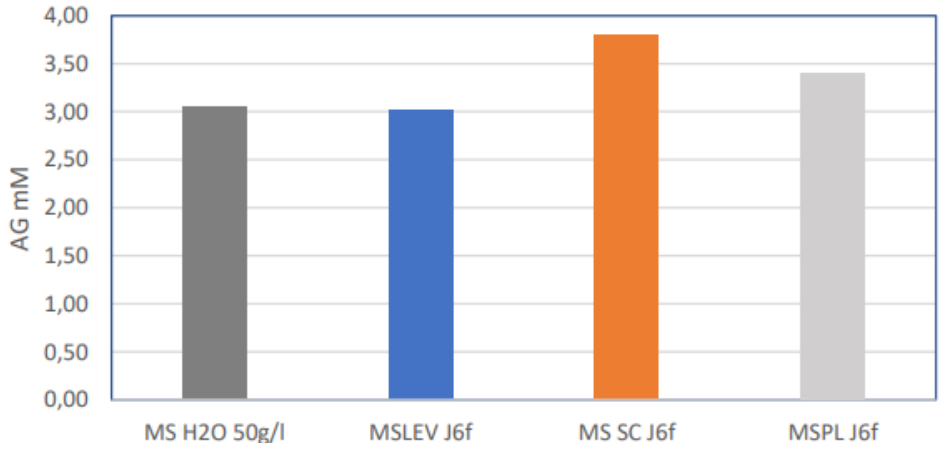
MSSC Product Has the Highest Polyphenol Content

1. MSLEV ; 2. MSSC; 3 . MSPL

A



B



	dil	DO	mM	AG mg/ml
MS H2O 50g/l	10,00	0,28	3,05	0,52
MSLEV J6f	10,00	0,27	3,01	0,51
MS SC J6f	10,00	0,38	3,80	0,65
MSPL J6f	10,00	0,33	3,39	0,58

Fig. 11. (A) Common polyphenols and (B) quantitation of polyphenol concentration in microalgae ferment under different fermentation condition.

Polyphenols

Abundant in plants, boast potent antioxidant properties that can combat harmful free radicals, potentially mitigating the risk of oxidative stress and chronic diseases. Incorporating these compounds into cosmetics may support skin overall health and contribute to a radiant appearance.

03 Product R&D Process

Determination of Anti-inflammation Potential

- **Fermentation Increases the Anti-inflammation Potential of Microalgae Extract,**
- **MSSC Product Has the Highest Anti-inflammation Capacity**

1. MSLEV ; 2. MSSC; 3 . MSPL

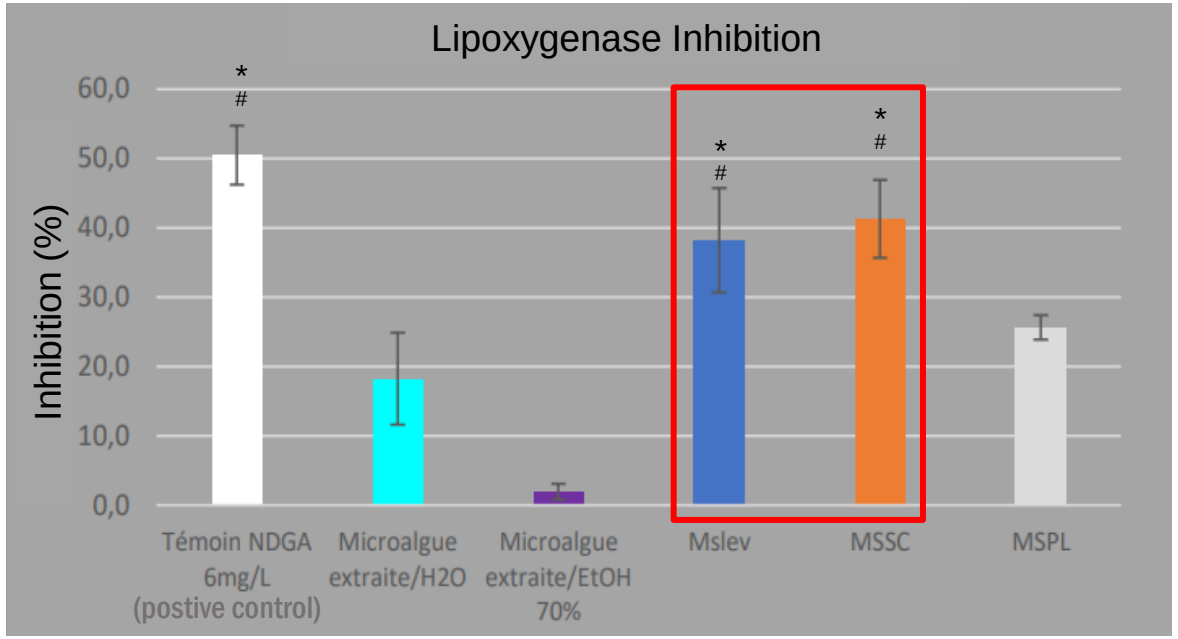


Fig. 12. Inhibitory effects of different microalgae ferments on lipoxygenase.
($p < 0.05$ vs Microalgae extract/H_2O, # $p < 0.05$ vs Microalgae extract/EtOH 70%)*

Lipoxygenase

Lipoxygenase can contribute to inflammation by producing pro-inflammatory mediators like leukotrienes and serve as a marker for inflammation.

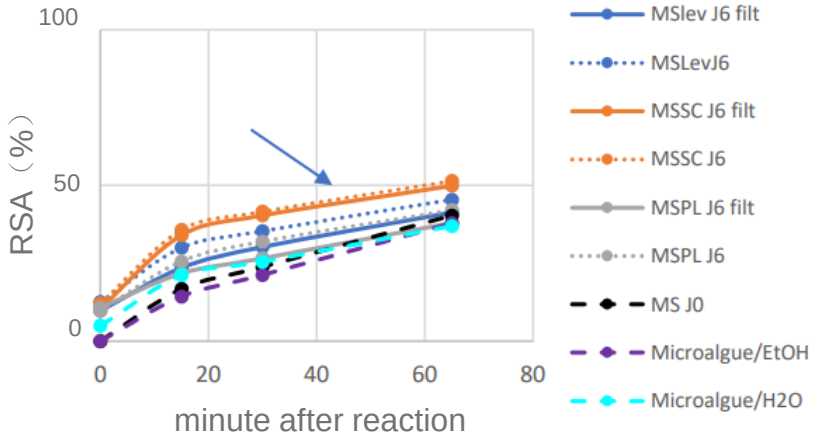
03 Product R&D Process

Determination of Antioxidant Potential

- **Fermentation Increases the Antioxidant Potential of Microalgae Extract,**
- **MSSC Product Has the Highest Antioxidant Capacity**

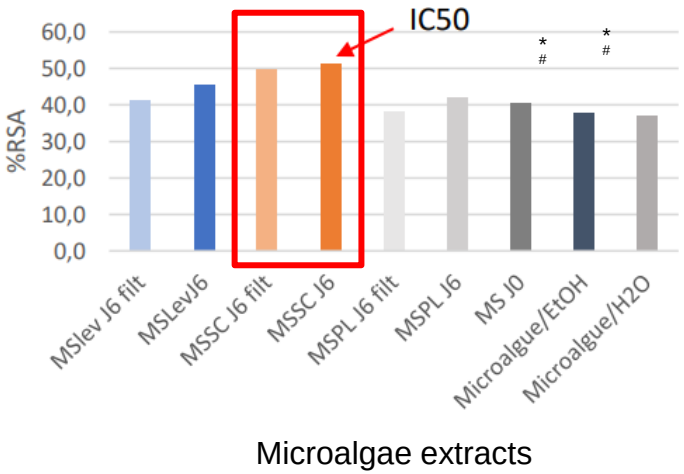
1. MSLEV ; 2. MSSC; 3 . MSPL

Radical Scavenging Activity (RSA) %



Microalgues	% RSA
MSlev J6 filt	41,35
MSLevJ6	45,43
MSSC J6 filt	49,90
MSSC J6	51,45
MSPL J6 filt	38,00
MSPL J6	42,10
MS J0	40,31
Microalgue/EtOH 70%	37,90
Microalgue/H2O	37,00

Antioxidant potential of fermented microalgae after 65 minutes of reaction



Microalgae extracts

Fig. 13. Evaluation of anti-oxidant potential among different microalgae ferments.
(p < 0.05 vs Microalgue/H2O, # p < 0.05 vs Microalgue/EtOH)*

After comprehensive evaluation, MSSC was selected as the favorable fermentation condition for SilCare™ Microalgae Ferment

Oxidative stress

Negative stress produced by free radicals in the body and is widely considered to be an important contributor for aging and disease.

03 Product R&D Process

Reproducibility Tests of MSSC Conditions

Batch No.	2220330	22205121	22205122	22205123
Brix	3.3	3.1	3.3	3.4
Dry matter(%)	1.8	1.8	1.75	1.88
Total acid (%)	0.74	0.67	0.94	1.91
pH	3.8	4.04	4.13	3.96
Anti-oxidant potential （DPPH decrease at OD 515 nm after 20 min）	0.116	0.148	0.141	0.163
Lipoxygenase inhibition (%)	46.6	47.7	51.7	54.6

Table 1. Reproducibility test result of the different batches using selected MSSC condition.

The reproducibility tests showed the superior reproducibility of the MSSC fermnentation condition under our quality control system.

03 Product Features

Rich Nutrient Profile of SilCare™ Microalgae Ferment

Test Item	Test Method	Result	RDL
Total amino acids（g/100g）	GB 5009.124-2016	0.0074	——
LEU（g/100g）		ND	0.0014
THR（g/100g）		0.00089	0.00019
VAL（g/100g）		0.0033	0.00013
LYS（g/100g）		0.00083	0.000418
ILE（g/100g）		ND	0.00050
PRO（g/100g）		ND	0.0035
MET（g/100g）		ND	0.0030
ALA（g/100g）		ND	0.0039
TYR（g/100g）		ND	0.0038
PHE（g/100g）		ND	0.0033
SER（g/100g）		0.00047	0.00024
GLU（g/100g）		0.00072	0.00028
GLY（g/100g）		0.00039	000034
HIS（g/100g）		ND	0.00079
Asp（g/100g）		0.00041	0.00014
ARG（g/100g）		ND	0.0026

Test Item	Unit	Detection Limit	Test Result
Ca	mg/kg	10	44
P	mg/kg	10	48
Mg	mg/kg	10	107
K	mg/kg	10	88
Na	mg/kg	10	290

Table 2. Representative nutrient profile of SilCare™ Microalgae Ferment .

intertek
Total Quality. Assured.

The reports showed SilCare™ Microalgae Ferment is rich in vitamins, minerals, amino acids and fatty acids

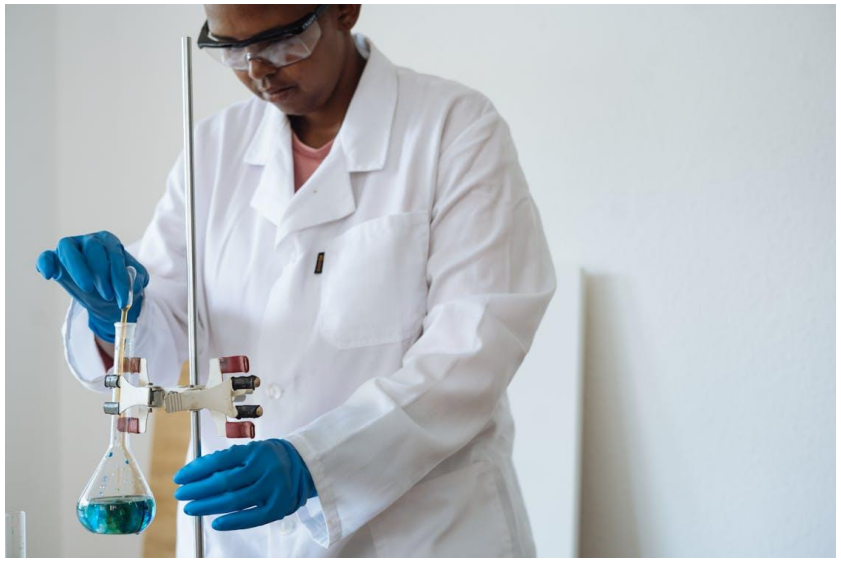
03 Product Features

Raw Material Quality Control

Fermentation Feasibility Test

Before fermentation, we ensure:

- The microalgae are not contaminated by harmful bacterial flora or spores
- The concentration of microalgae is suitable for the yeast fermentation to take place
- The nutrient composition of the microalgae is suitable for the yeast fermentation



03 Product Features

Brief Production Flowchart

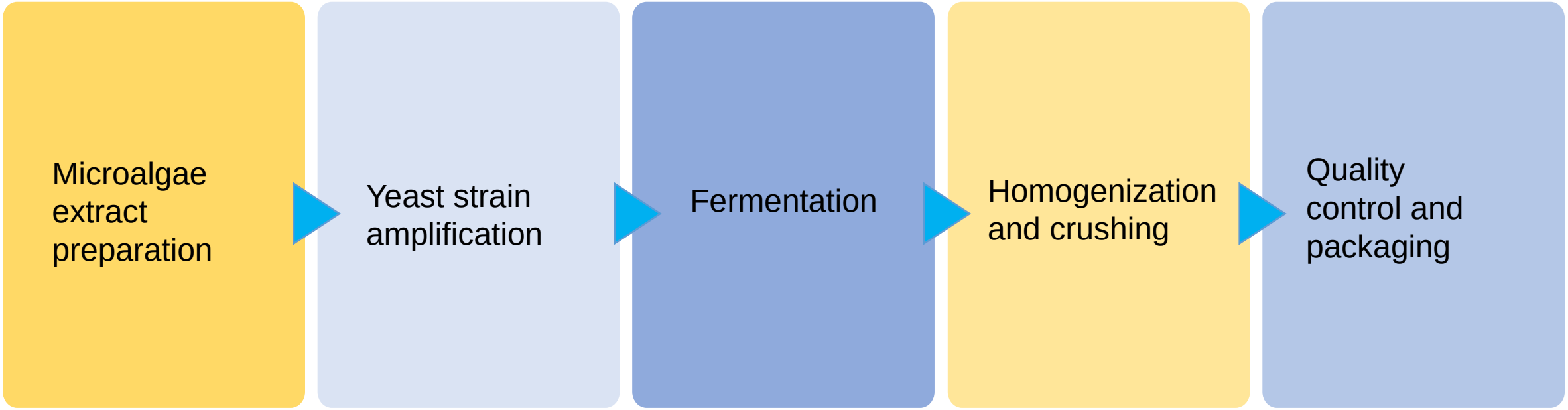


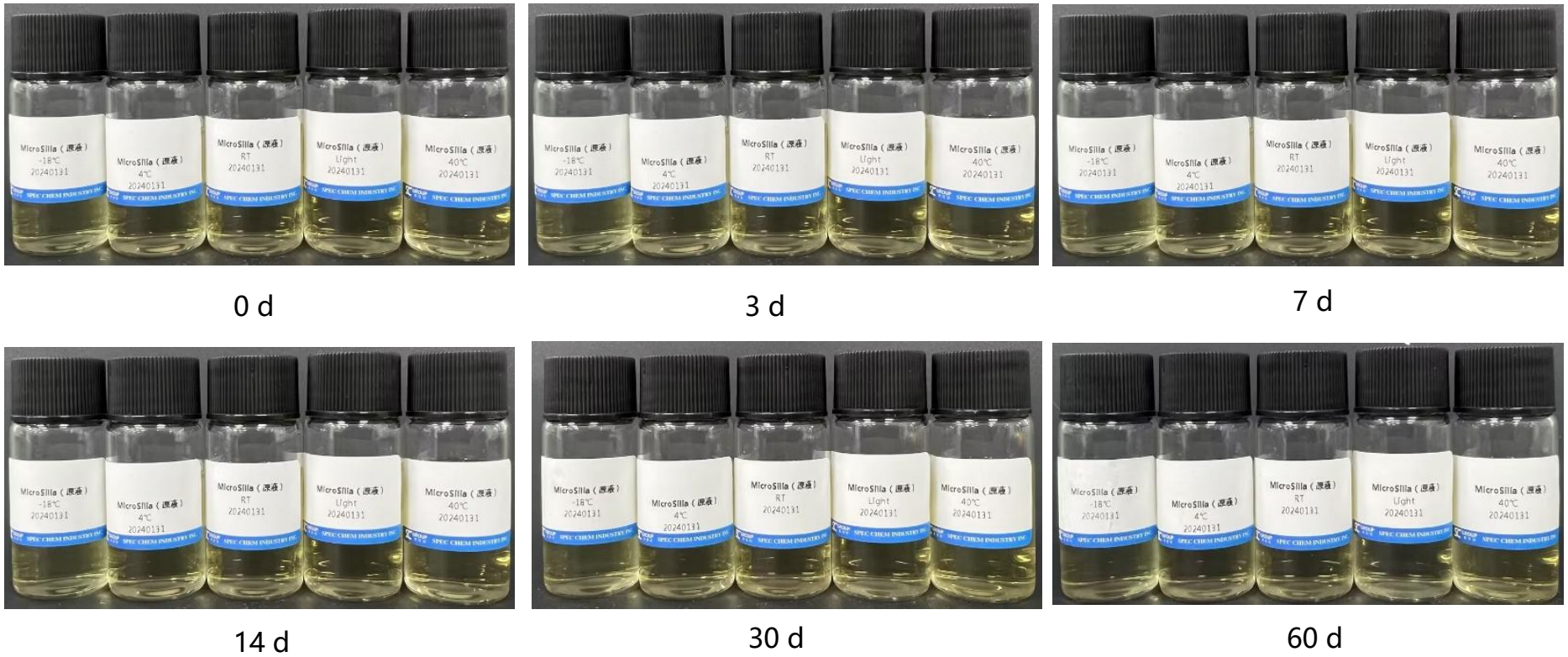
Fig. 14. Factory production flowchart for SilCare™ Microalgae Ferment products.

Our production facility is certifed with ISO9001, ISO14001, EU EFfCI, SA8000, EcoVadis & RSPO.

03 Ingredient Stability

SilCare™ Microalgae Ferment Is Stable

Stability Test, 5 Conditions (-18℃, 4℃, RT, RT+light, 40℃）



No obvious discoloration under light or high temperature,
no precipitation at low temperature.

Fig. 15. Representative photos of SilCare™ Microalgae Ferment *(100%) under different storage conditions at 0, 3, 7, 14, 30, 60 days*

03 Ingredient Stability

● Water Solutions Containing SilCare™ Microalgae Ferment Are Stable

Stability Test, 5 Conditions (-18℃, 4℃, RT, RT+light, 40℃）

	1%	2%	5%	10%
0d				
7d				
14d				
30d				
60d				

Fig. 16. Representative photos of water solutions containing SilCare™ Microalgae Ferment *under different storage conditions at 0, 7, 14, 30, 60 days*

No obvious discoloration under light or high temperature,
no precipitation at low temperature.

03 Product Features

Quality of SilCare™ Microalgae Ferment is Ensured

Product Information	
Product Name	SilCare™ Microalgae Ferment
INCI Name	Saccharomyces/Nannochloropsis Oculata Ferment Lysate Filtrate, Glycerin
Application Areas	Face care, body care, scalp care, sun care, lip and oral care, skin microbiome products, etc.
Recommended Topical Formats	Essence, lotion, cream, facial mask, shampoo, etc.
Recommended Dosage	1.0-10.0%
Storage	Cool and dry place, protected from light, room temperature for short term storage, 2-8 °C for long term storage
Shelf Life	2 years
Package	1 kg, 5 kg, 10 kg

Specification	
Appearance	Golden transparent liquid solution
Smell	Slight characteristic odor
Refractive index (20 °C)	1.39-1.41
Density (20 °C)	1.12-1.14
pH (100%)	3.0-4.5
Total acid (%)	0.5-1.0
Ethanol (%)	0.7-3.0
Dry matter (%) without glycerin	1.0 – 2.0
DO280X10	4 – 6
Lead (mg/kg)	≤10
Arsenic (mg/kg)	≤2
Mercury (mg/kg)	≤1
Cadmium (mg/kg)	≤5
Total plate count (cfu/g)	≤100
Yeast & Mould (cfu/g)	≤10
Staphylococcus aureaus	Absence
Pseudomonas aeruginosa	Absence
Escherichia coli	Absence
Candida albicans	Absence

Efficacy Tests

- Good anti-oxidant and anti-inflammatory capacity
- Good soothing potential
- Promote the proliferation of skin fibroblasts & repair the skin barrier
- Promote the growth of residential flora
- Enhance skin hydration & elasticity
- Anti-aging, help remove winkles

04

04 Efficacy Tests

Antioxidant Potential（Product In Vitro Test）

● SilCare™ Microalgae Ferment Effectively Scavenges Diverse Free Radicals

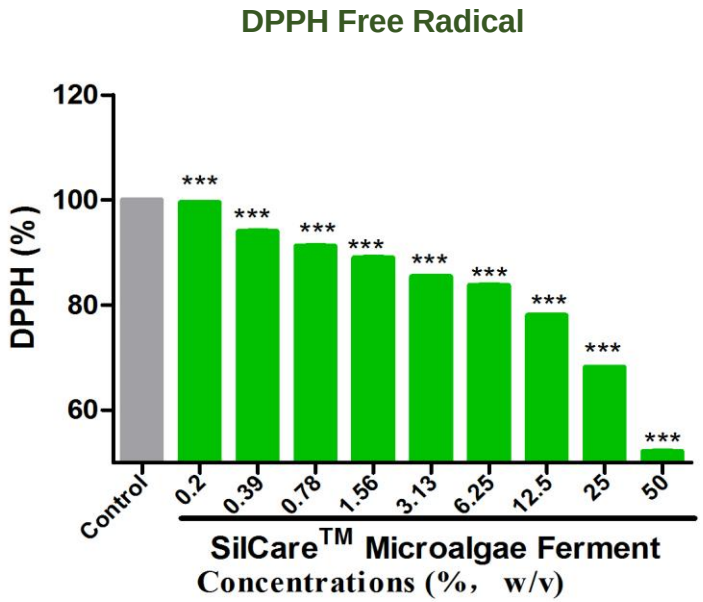


Fig. 17. Scavenging of DPPH free radicals by SilCare™ Microalgae Ferment.

Free Radicals

Induced in large quantities by various external factors and our bodies' own metabolism, which could destroy healthy skin cells and cause damage to collagen, resulting in many skin problems

04 Efficacy Tests

Anti-inflammation Potential（Product In Vitro Test）

- **SilCare™ Microalgae Ferment Suppresses Inflammation via Reducing the Release of Pro-inflammatory Cytokine**

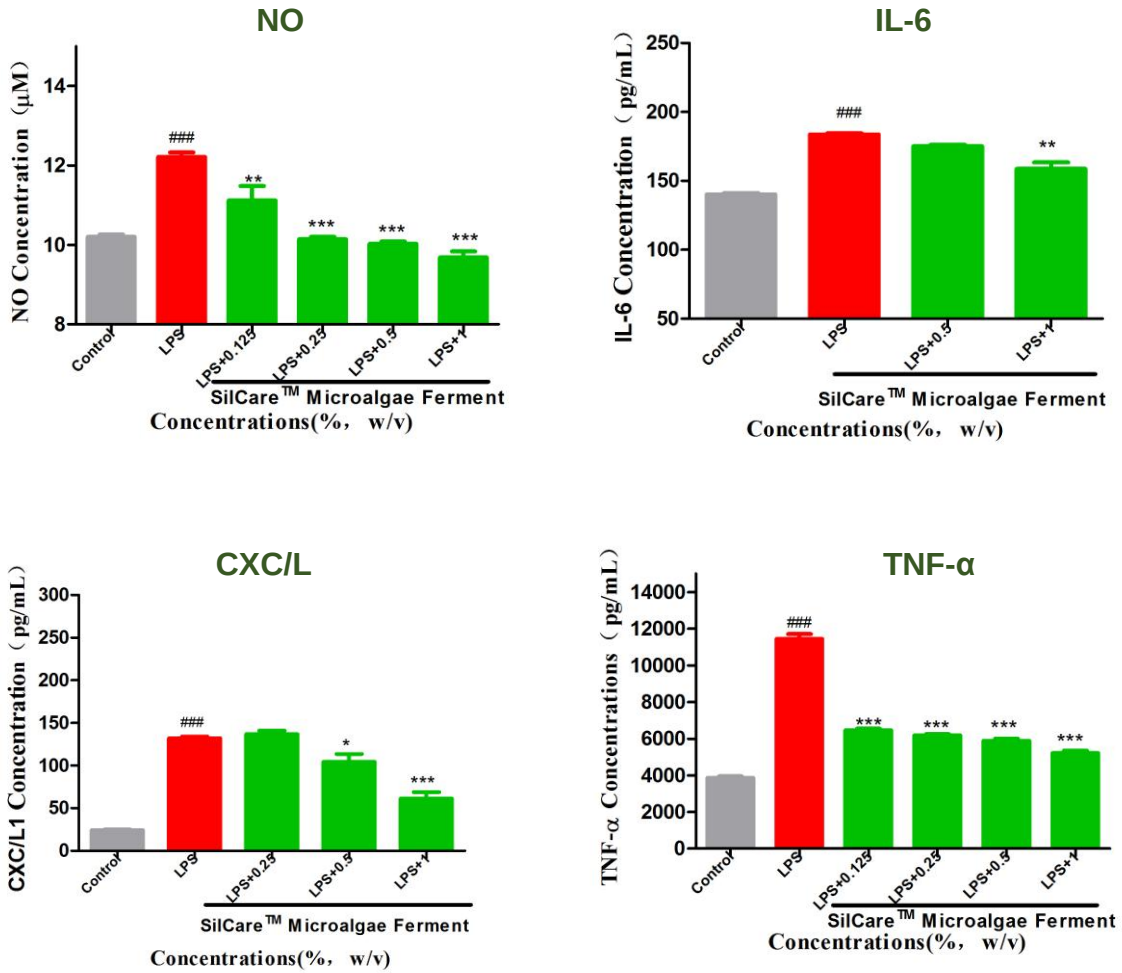


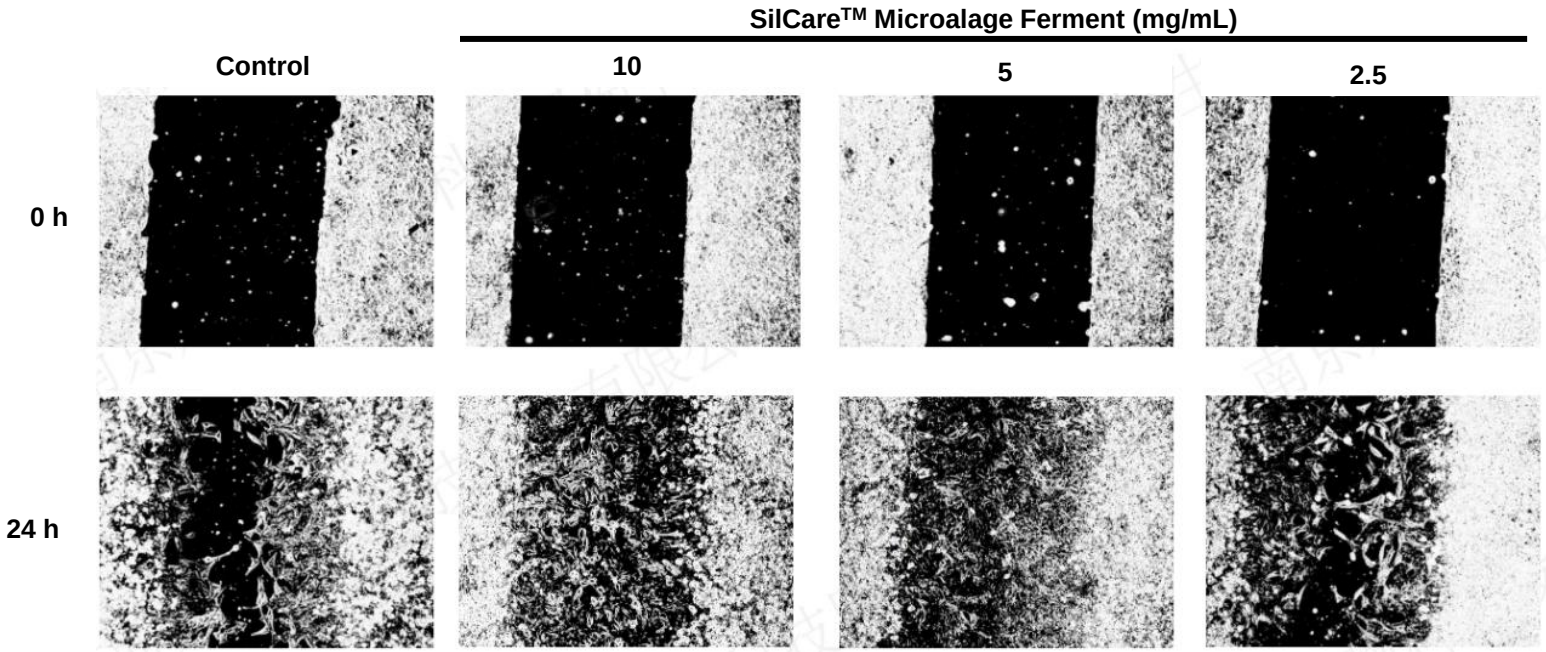
*Fig. 18. Effect of SilCare™ Microalgae Ferment on the in vitro release of pro-inflammatory cytokines from RAW264.7 cells (###p<0.001 vs. control, ***p<0.001, *p<0.05 vs. LPS)*

04 Efficacy Tests

Cell Repairing Potential（Product In Vitro Test）

- **SilCare™ Microalgae Ferment Has Good Cell Repairing Capabilities**

Cell Scratch Assay – Representative Images and Quantitation



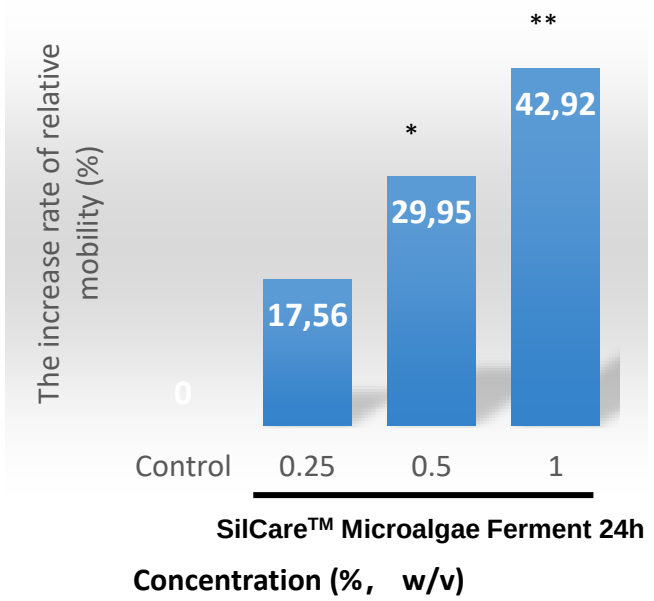


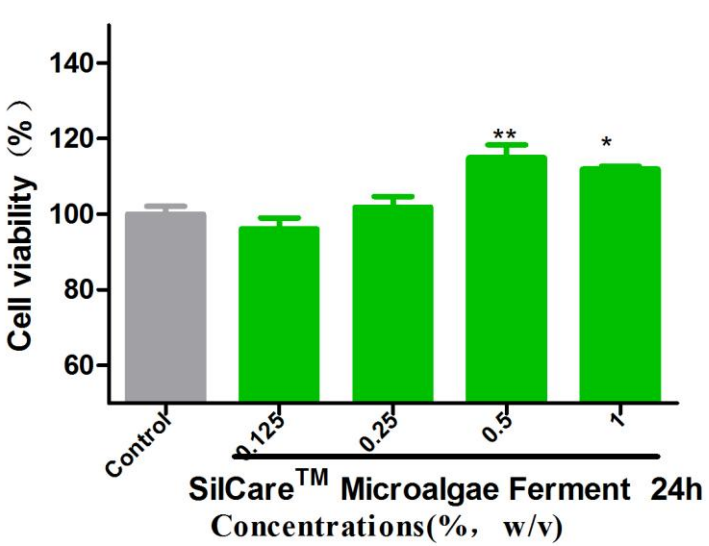
Fig. 19. Typical cell scratch assay images and quantitation of relative mobility of NIH/3T3 cells after application of SilCare™ Microalgae Ferment

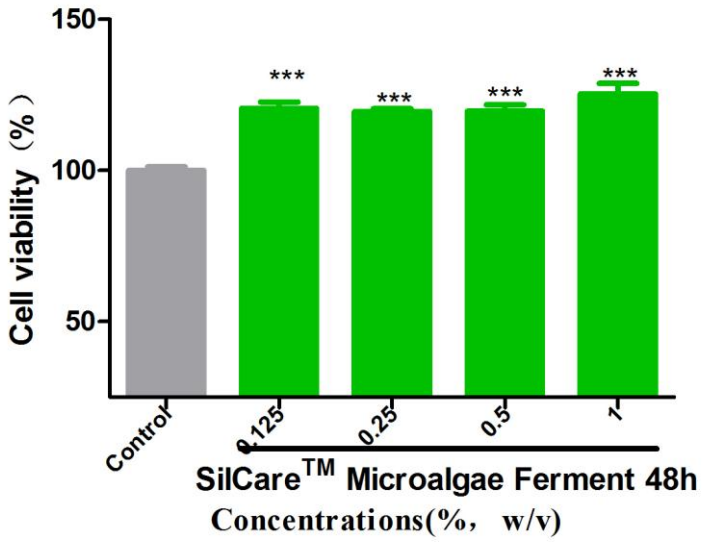
04 Efficacy Tests

Skin Barrier Strengthening Potential（Product In Vitro Test）

- **SilCare™ Microalage Ferment Promote Fibroblast Proliferation & Collagen Synthesis, Strengthen the Skin Barrier**

Promote Fibroblast Proliferation





Promote Collagen Synthesis

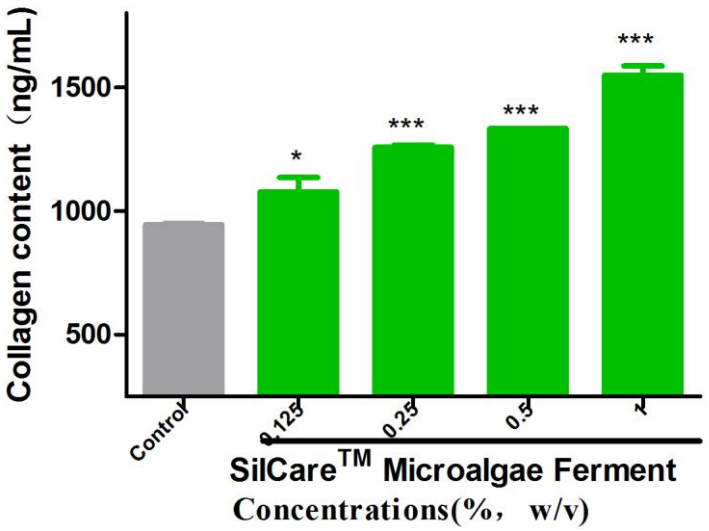


*Fig. 20. Promotion effect of SilCare™ Microalgae Ferment on fibroblast proliferation and collagen synthesis (***p<0.001, **p<0.01, *p<0.05 vs. control)*

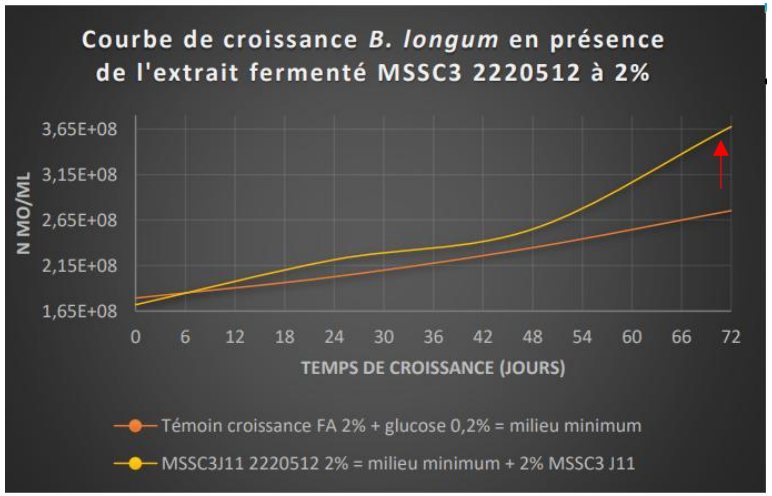
04 Efficacy Tests

Prebiotic Potential（Product In VitroTest）

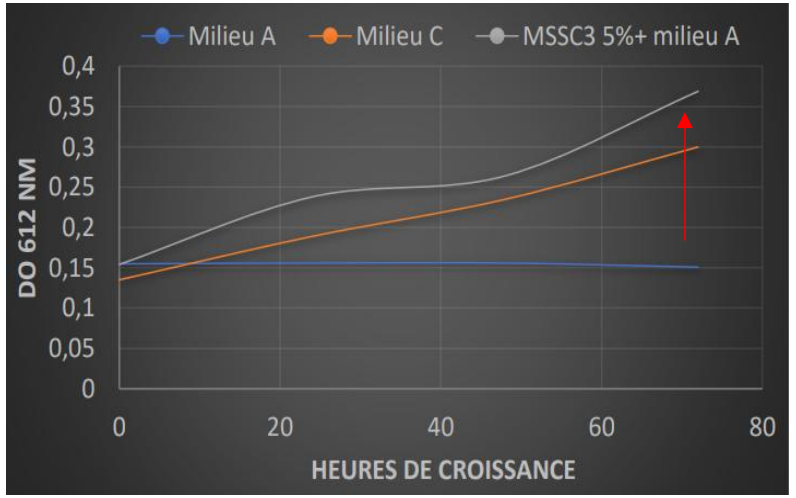
- **SilCare™ Microalgae Ferment Can Promote the Growth of Resident Flora While Limit the Growth of Harmful Flora**

Promote the Growth of Resident Flora

Bifidobacterium longum



Staphylococcus epidermidis



Limit the Growth of Harmful Flora

Escherichia coli

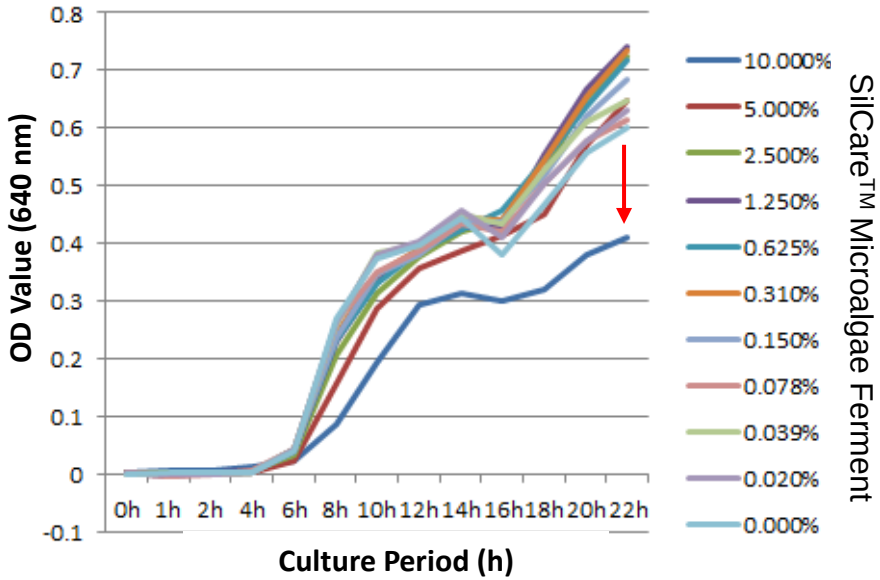


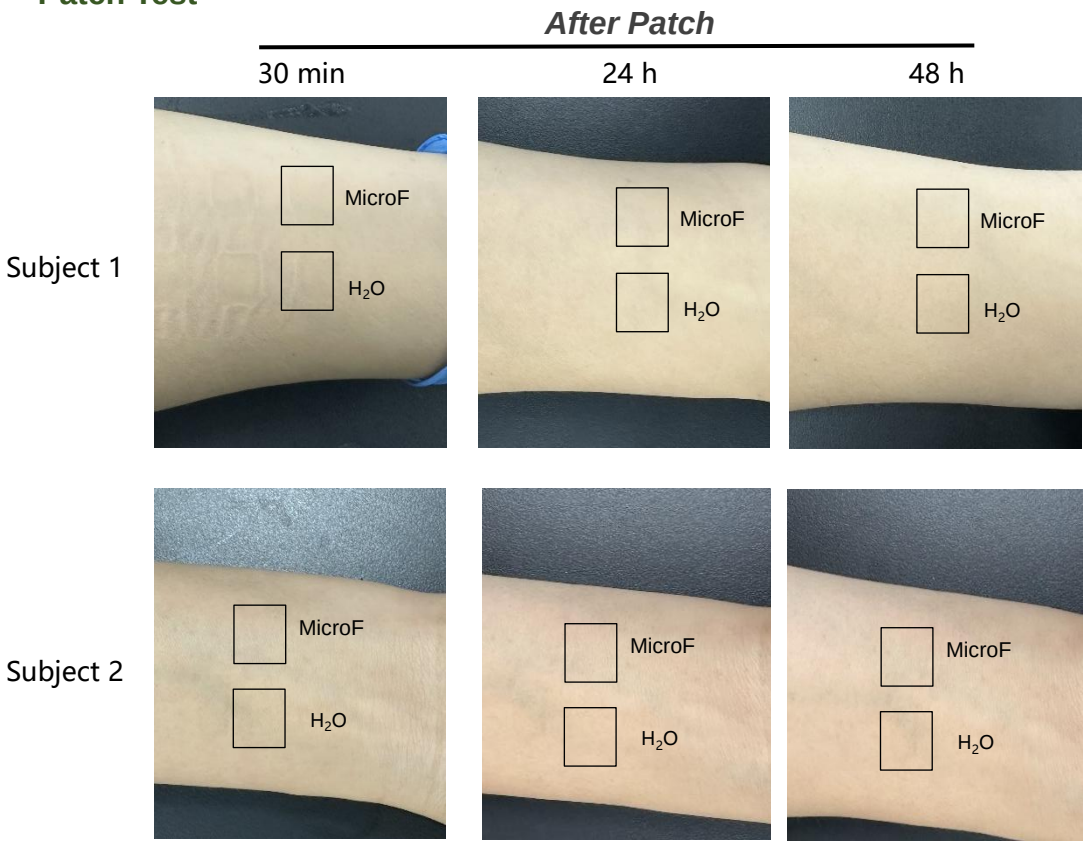
Fig. 21. Effect of SilCare™ Microalgae Ferment on the growth of Bifidobacterium longum, Staphylococcus epidermidis and Escherichia coli

04 Efficacy Tests

Irritation Test（Product Clinical Test）

● SilCare™ Microalgae Ferment Is Non-irritating

Patch Test



1. Basic information

Subjects: 8 females, 4male

Test Site: Inside of arms

Test Period: 0.5h, 24h, 48h

Test Parameters: Adverse reactions

2. Testing procedures

●Clean the arm and rest for 20 minutes in a constant temperature (20-25 ℃) and constant humidity (40%-60%) environment,

●Mark the arm, apply 0.020-0.025 mL sample evenly to the marked area via the spot tester for 24h.

●Collect data after removing the spot tester at 0.5h, 24h, 48h.

Fig. 22. Representative photos of testing areas after patch test (two volunteers). MicroF: SilCare™ Microalgae Ferment *100%*

04 Efficacy Tests

Moisturizing Test（Product Clinical Test）

● 2% SilCare™ Microalgae Ferment Has Good Moisturizing Effect

1．Testing objectives

Evaluate the moisturizing ability of SilCare™ Microalgae Ferment. Test product: 2% SilCare™ Microalgae Ferment water solution, purified water.

2．Basic information

Subjects: 7 females, 1 male

Test Site: Inside of arms

Test Period: 0h, 1h, 3h, 5h, 7h

Test Parameters: Transepidermal water loss (TEWL), Water content in stratum corneum (WCSC)

Test Instrument: VapoMeter SWL5, MoistureMeter SC

3. Testing procedures

●Clean the arm and rest for 20 minutes in a constant temperature (20-25 ℃) and constant humidity (40%-60%) environment,

●Mark the arm (3.5cm*4cm rectangular frame),

●Collect data at 0h,

●Apply quantified (0.014 g/cm^2) samples at the labeled site,

●Collect the data at 1h, 3h, 5h, 7h respectively.

04 Efficacy Tests

Moisturizing Test（Product Clinical Test）

● 2% SilCare™ Microalgae Ferment Has Good Moisturizing Effect

Moisturizing Test

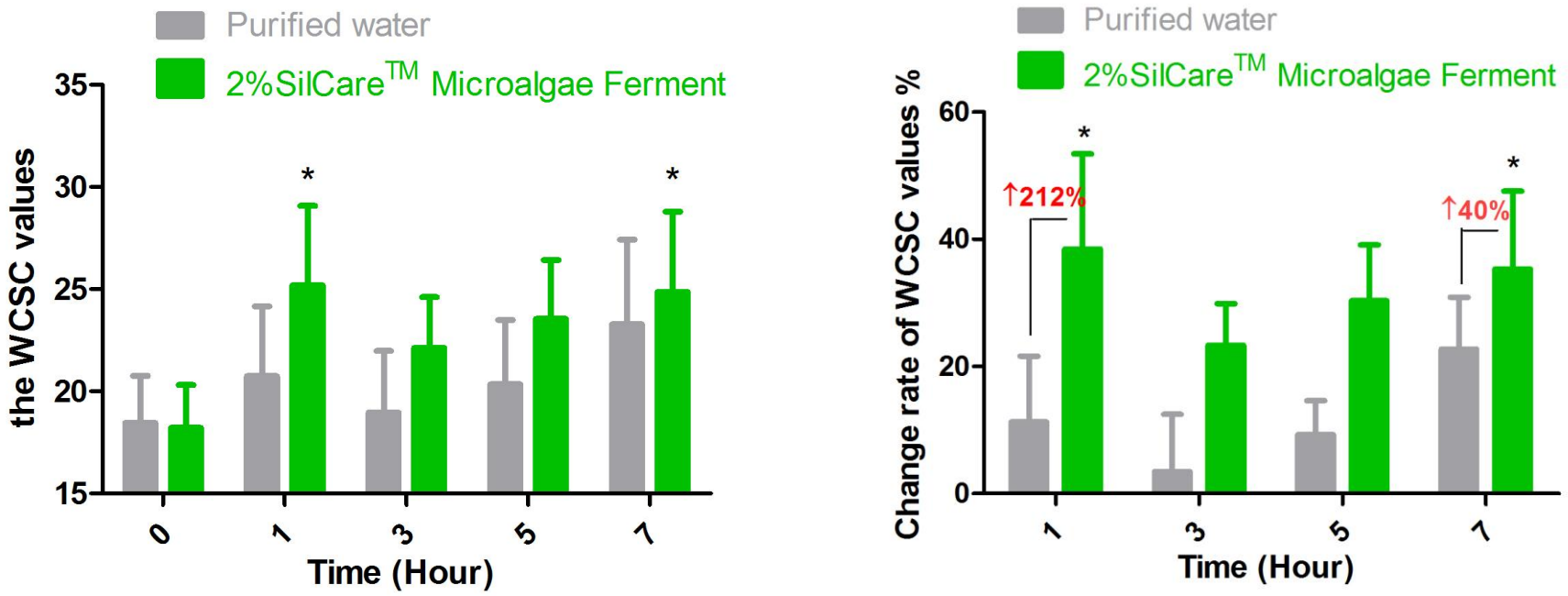


*Fig. 23. Water content and change rate of water content in stratum corneum at different time points (*p<0.05 vs. control)*

04 Efficacy Tests

Skin Gloss, Elasticity and Erythema Test （Product Clinical Test）

● 2% SilCare™ Microalgae Ferment Improve Skin Gloss, Elasticity and Erythema

1. Testing objectives

Evaluate the clinical effect of SilCare™ Microalgae Ferment. Test sample: 2% SilCare™ Microalgae Ferment cream, Control cream.

2. Testing basic information

Subjects: 23 females

Ages: 20-55 years

Test Site: Face (left and right face)

Test Period: 0D, 7D, 14D, 28D

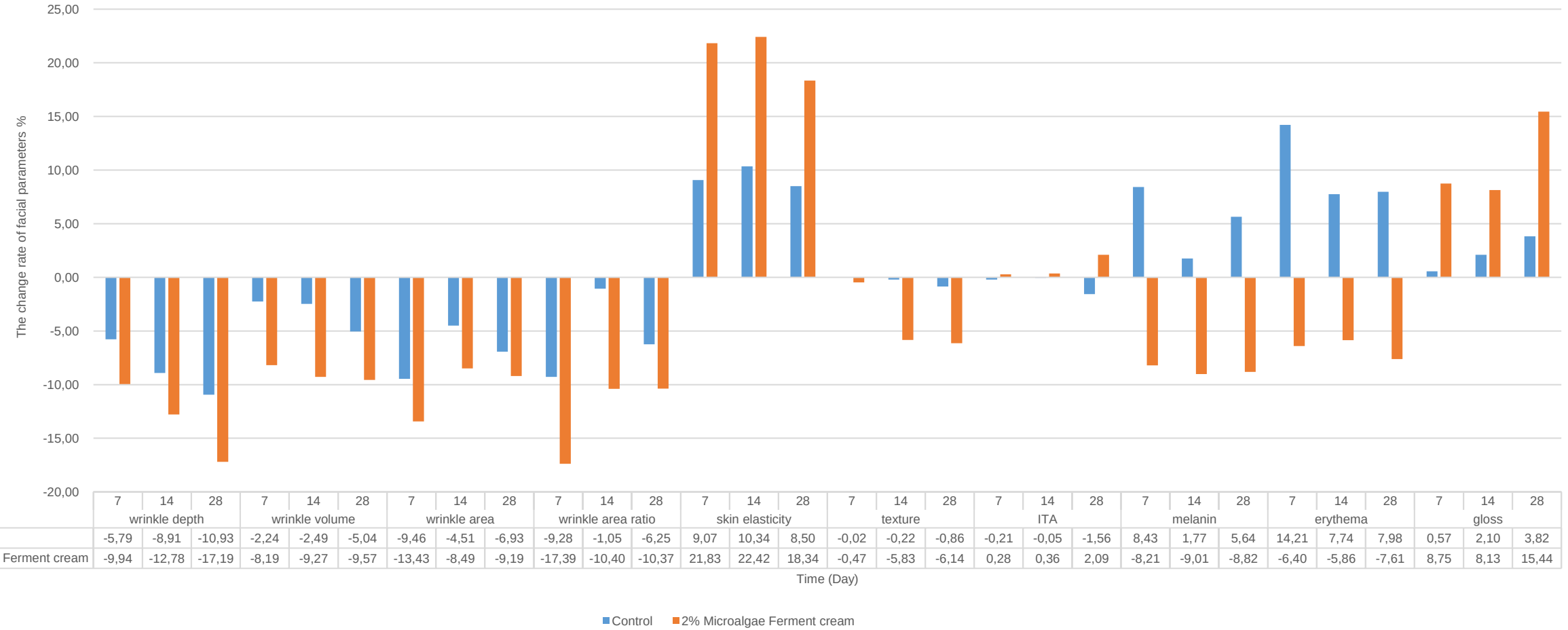
Test instrument: VisioFace 1000D, ElastiMeter, C-CUBE, Mexameter® MX 18, Skin-Glossymeter GL 200

3. Testing procedures

- Clean the face and rest in a constant temperature (20℃ -25 ℃) and constant humidity (40%-60%) for 20min.
- Collect the facial image of 0D and test the skin elasticity, melanin, erythema and gloss.
- Apply to face (left and right face) once in the morning and once in the evening after cleansing, gently press until absorbed.
- Collect the facial image at 7D, 14D and 28D respectively and test the skin elasticity, melanin, erythema and gloss (data collected after cleaning the face for 20min).

Skin Gloss, Elasticity and Erythema Test （Product Clinical Test）

● 2% SilCare™ Microalgae Ferment Improve Skin Gloss, Elasticity and Erythema



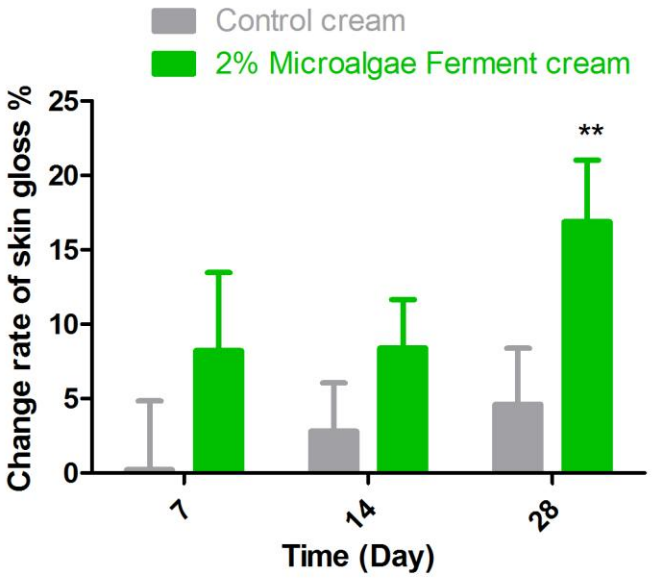
	7	14	28	7	14	28	7	14	28	7	14	28	7	14	28	7	14	28	7	14	28	7	14	28	7	14	28	7	14	28
	wrinkle depth			wrinkle volume			wrinkle area			wrinkle area ratio			skin elasticity			texture			ITA			melanin			erythema			gloss		
Control	-5,79	-8,91	-10,93	-2,24	-2,49	-5,04	-9,46	-4,51	-6,93	-9,28	-1,05	-6,25	9,07	10,34	8,50	-0,02	-0,22	-0,86	-0,21	-0,05	-1,56	8,43	1,77	5,64	14,21	7,74	7,98	0,57	2,10	3,82
2% Microalgae Ferment cream	-9,94	-12,78	-17,19	-8,19	-9,27	-9,57	-13,43	-8,49	-9,19	-17,39	-10,40	-10,37	21,83	22,42	18,34	-0,47	-5,83	-6,14	0,28	0,36	2,09	-8,21	-9,01	-8,82	-6,40	-5,86	-7,61	8,75	8,13	15,44

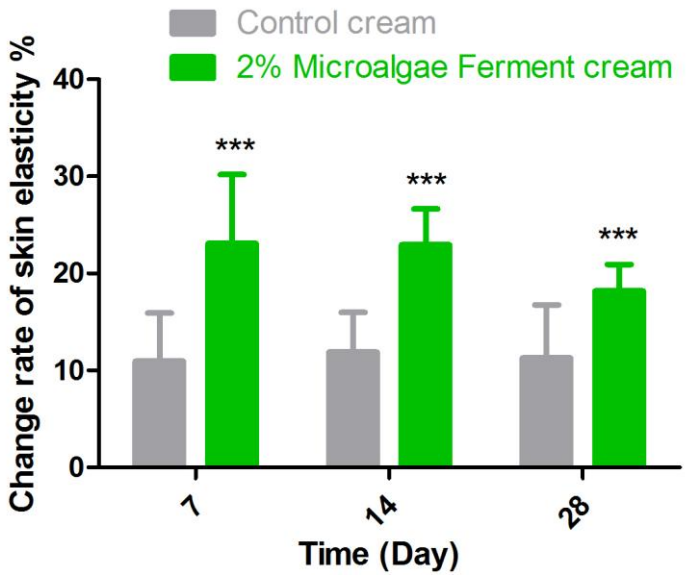
Fig. 24. Changes in wrinkle volume, wrinkle area, wrinkle area ratio, wrinkle depth, skin elasticity, texture, ITA, melanin, erythema and gloss at different times after using 2% SilCare™ Microalgae Ferment cream

04 Efficacy Tests

Skin Gloss, Elasticity and Erythema Test （Product Clinical Test）

- **2% SilCare™ Microalgae Ferment Improve Skin Gloss, Elasticity and Erythema**





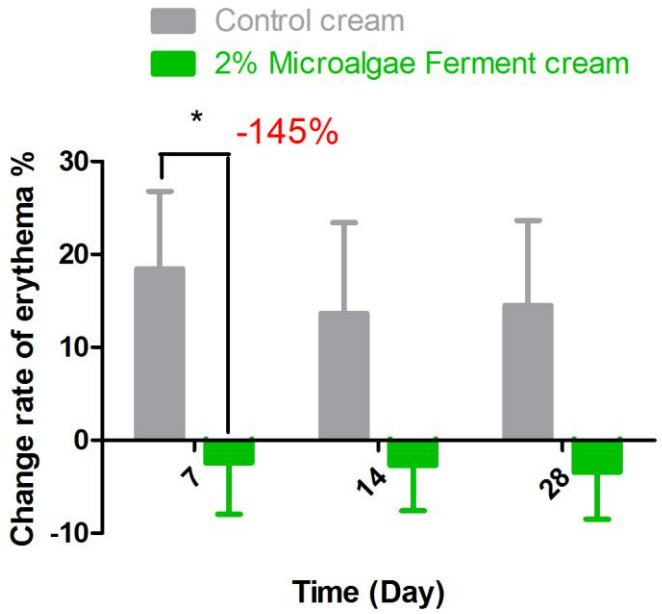


Fig. 25. Effect of facial cream containing 2% SilCare™ Microalgae Ferment on change rates of human skin gloss， elasticity and erythema
*(***p<0.001, **p<0.01, *p<0.05 vs. 0 day/control)*

04 Efficacy Tests

Skin Gloss, Elasticity and Erythema Test （Product Clinical Test）

● 2% SilCare™ Microalgae Ferment Improve Skin Gloss, Elasticity and Erythema

Redness

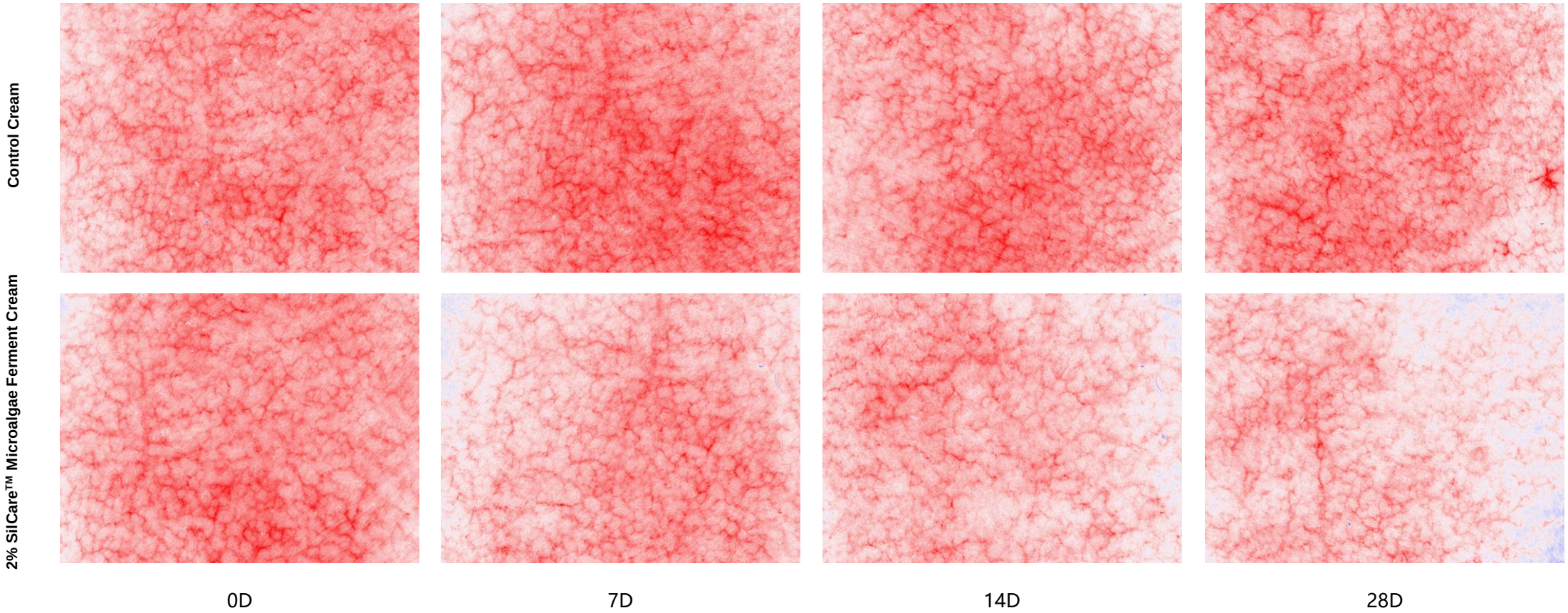


Fig. 26. Typical facial redness after using 2% SilCare™ Microalgae Ferment cream

Application Area & Guide

- Suitable for face care, body care, scalp care, sun care, lip and oral care & skin microbiome products
- Ideal for use in serums, lotions, creams, masks, shampoos, etc.

05 Application Area

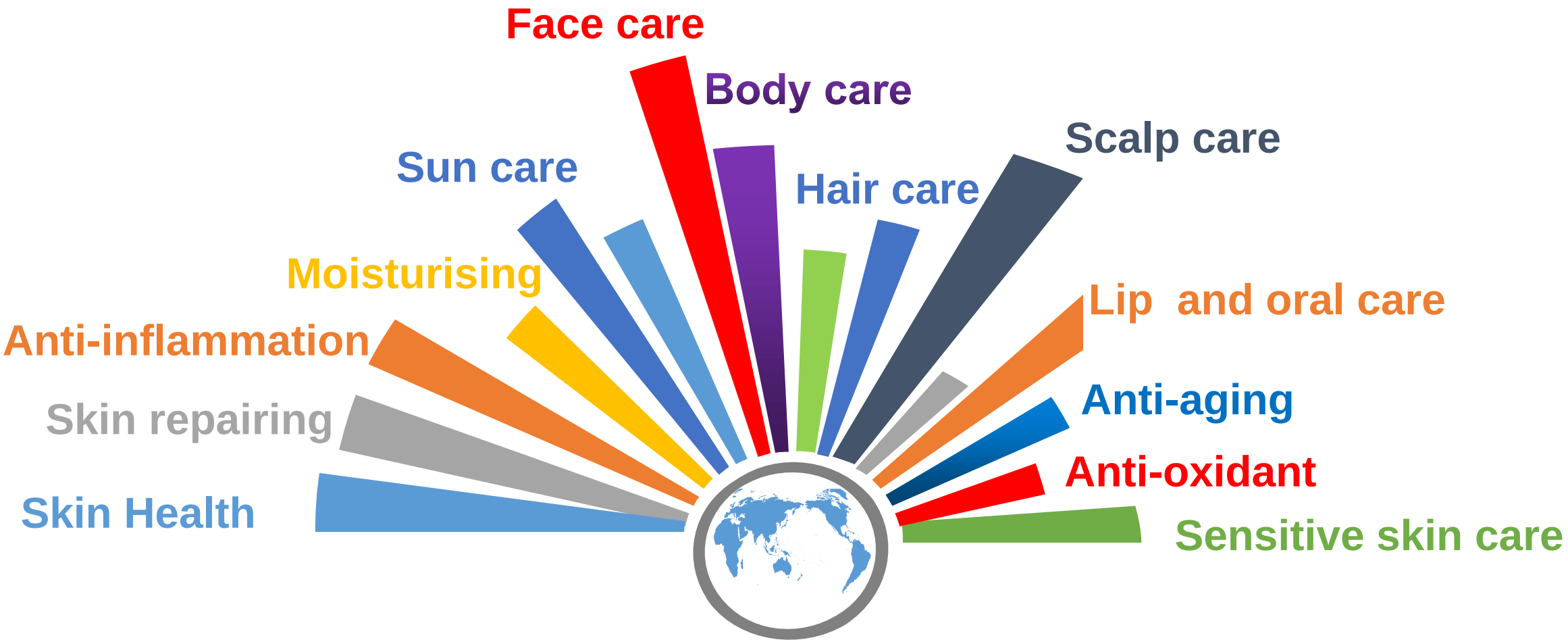


Fig. 27. Major application areas of SilCare™ Microalgae Ferment.

05 Application Area

2% Microalgae Ferment Essence Cream

w/w%	Ingredient	INCI Name	Supplier	Function
Part A				
To 100	Water	Water		Solvent
3.0	Glycerin	Glycerin		Moisturizer
0.2	SpecThem® XTG200	Xanthan gum	**SpecChem**	Thickener
0.1	SpecKare® ALLA	Allantoin	**SpecChem**	Anti-inflammation
0.03	Disodium EDTA	Disodium EDTA		Chelator
Part B				
0.3	SpecKare® VEA	Tocopheryl acetate	**SpecChem**	Antioxidants
2.0	Cetiol® CC	Dioctyl carbonate	BASF	Emollient
1.0	SpecKare® GTCC	Caprylic/Capric triglyceride	**SpecChem**	Emollient
1.0	SpecKare® SQA	Squalane	**SpecChem**	Emollient
2.5	SpecSufc® SC-M68	Cetearyl glucoside, cetearyl alcohol, water	**SpecChem**	Emulsifier
1.5	SpecThem® C1618	Cetearyl alcohol	**SpecChem**	Emollient
2.0	Cetiol® SB 45	Butyrospermum parkii (Shea) butter	BASF	Emollient
0.5	SpecThem® GMS	Glyceryl stearate	**SpecChem**	Emulsifier
Part C				
0.8	Sepinov™ EMT 10	Hydroxyethyl acrylate/Sodium acryloyldimethyl taurate copolymer	Seppic	Thickener
3.0	Butylene glycol	Butylene glycol	OQ	Moisturizer
Part D				
2.0	**SilCare™ Microalgae Ferment**	**Saccharomyces/Nannochloropsis Oculata Ferment Lysate Filtrate, Glycerin**	**SpecChem**	**Skin conditioner**
0.5	ParbFree® PCG	Caprylyl glycol, phenoxyethanol	**SpecChem**	Preservative
2.0	SpecKare® TRHL02	Trehalose	**SpecChem**	Moisturizer
q.s.	NaOH	Sodium hydroxide		pH adapter
0.15	Fragrance			Fragrance

Manufacturing Procedure:

1. Mix phase A and heat up to 85℃, stir well.
2. Mix phase B and heat up to 85℃, stir well.
3. Mix phase C in advance in room temperature and set aside.
4. Add phase B into phase A, then add phase C, and homogenize for 3 min.
5. Cool down to below 45°C, add pre-dispersed phase D, and homogenize for 2 min.
6. Stir until the system is completely uniform, discharge.

Properties: Appearance: off-white emulsion

pH: 6.0±0.5

Viscosity (25℃, 4#, 12rpm, mPa·s): 20186

Stability:

-18℃ 4℃ RT RT+light 45℃ -18℃ 4℃ RT RT+light 45℃

0 Day 90 Day

05 Application Area

2% Microalgae Ferment Moisturizing Hand Cream

w/w%	Ingredient	INCI Name	Supplier	Function
Part A				
To 100	Water	Water		Solvent
3.0	Glycerin	Glycerin		Moisturizer
0.2	SpecThem® XTG200	Xanthan gum	**SpecChem**	Thickener
0.1	SpecKare® ALLA	Allantoin	**SpecChem**	Anti-inflammation
0.03	Disodium EDTA	Disodium EDTA		Chelator
Part B				
0.3	SpecKare® VEA	Tocopheryl acetate	**SpecChem**	Antioxidants
1.0	**SpecKare® BTS Oils**	**Camellia Sinensis Seed Oil**	**SpecChem**	Emollient
1.0	Ethylhexyl palmitate	Ethylhexyl palmitate		Emollient
2.0	SpecKare® SQA	Squalane	**SpecChem**	Emollient
2.0	Cetiol® CC	Dioctyl carbonate	BASF	Emollient
1.0	SpecKare® GTCC	Caprylic/Capric triglyceride	**SpecChem**	Emollient
2.5	SpecSufc® SC-M68	Cetearyl glucoside, cetearyl alcohol, water	**SpecChem**	Emulsifier
2.0	SpecThem® C1618	Cetearyl alcohol	**SpecChem**	Emollient
3.0	Cetiol® SB 45	Butyrospermum parkii (Shea) butter	BASF	Emollient
1.5	SpecThem® GMS	Glyceryl stearate	**SpecChem**	Emulsifier
Part C				
0.8	Sepinov™ EMT 10	Hydroxyethyl acrylate/Sodium acryloyldimethyl taurate copolymer	Seppic	Thickener
3.0	Butylene glycol	Butylene glycol	OQ	Moisturizer
Part D				
2.0	**SilCare™ Microalgae Ferment**	**Saccharomyces/Nannochloropsis Oculata Ferment Lysate Filtrate, Glycerin**	**SpecChem**	**Skin conditioner**
0.5	ParbFree® PCG	Caprylyl glycol, phenoxyethanol	**SpecChem**	Preservative
2.0	SpecKare® TRHL02	Trehalose	**SpecChem**	Moisturizer
q.s.	NaOH	Sodium hydroxide		pH adapter
0.15	Fragrance			Fragrance

Manufacturing Procedure:

1. Mix phase A and heat up to 85℃, stir well.
2. Mix phase B and heat up to 85℃, stir well.
3. Mix phase C in advance in room temperature and set aside.
4. Add phase B into phase A, then add phase C, and homogenize for 3 min.
5. Cool down to below 45°C, add pre-dispersed phase D, and homogenize for 2 min.
6. Stir until the system is completely uniform, discharge.

Properties: Appearance: off-white emulsion

pH: 6.0±0.5

Viscosity (25℃, 4#, 12rpm, mPa·s): 23050

Stability:

-18℃ 4℃ RT RT+light 45℃ -18℃ 4℃ RT RT+light 45℃

0 Day 90 Day

05 Application Area

SilCare™ Microalgae Ferment

Recommended Topical Formats: Essence, lotion, cream, facial mask, shampoo, etc.

Recommended Dosage: 1.0-10.0%

Recommended Usage:

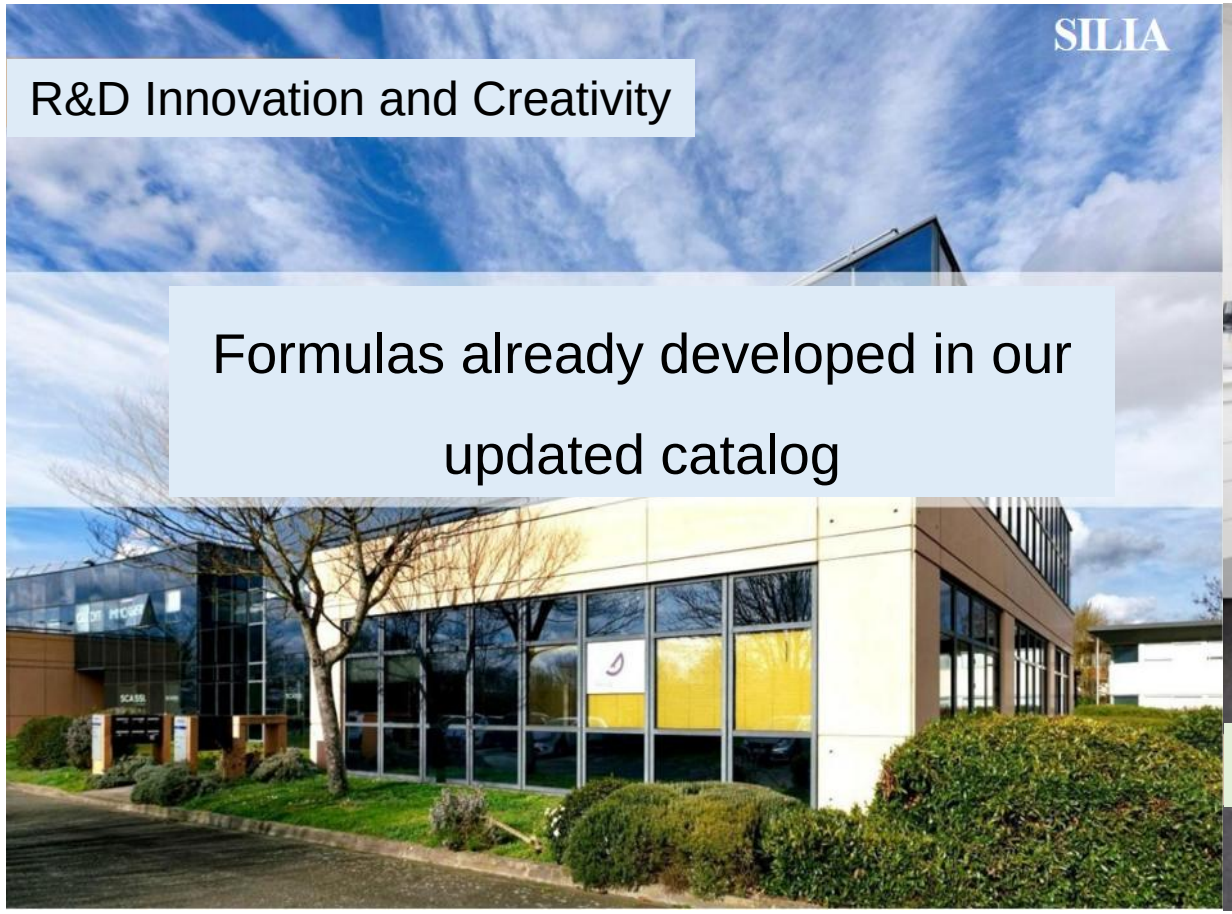
1. Add SilCare™ Microalgae Ferment during the cooling phase of the production process to preserve its beneficial properties.
2. SilCare™ Microalgae Ferment is generally stable in a wide pH range, but it's essential to ensure compatibility with the overall pH of your formulation. We recommended a final pH range of 5.5-7.0.
3. Avoid extreme pH conditions as excessive acidity or alkalinity might affect the performance of SilCare™ Microalgae Ferment.
4. Avoid ingredients with strong oxidizing properties, as they may diminish the antioxidant benefits of SilCare™ Microalgae Ferment.
5. Storage SilCare™ Microalgae Ferment at low temperature, avoid light, and airtight.

Technical Competence - SILIA

- Silia: France-based R&D laboratory and manufacturing facilities
- Experienced and passionate technical team
- Well-equipped R&D center for raw ingredients and cosmetic applications
- Robust cooperation with global leading institutions

06 Technical Competence

Experienced Technical Team and Cutting-edge R&D Center for the Cosmetic Industry In France
SilCare™ Microalgae Ferment is Produced in France



THANK YOU

Manufacturer：

- SILIA SAS Innovation
- https://silia.fr/

Distributor：

- SpecChem Industry Inc.
- +86 25 84523390 84523391
- sc@specchemind.com
- http://www.specchemind.com