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GLOBAL

PERSONAL CARE

INGREDIENTS • FORMULATION • MANUFACTURE



⋮ Interview:
⋮ Clariant global
⋮ personal care VP
⋮ Michael Haspel

⋮ In focus:
⋮ Skin care
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⋮ Sun care

⋮ Plus: Harnessing
⋮ the power of
⋮ microbiome
⋮ manipulation

Boosting astaxanthin benefits with phospholipids

Encapsulation of cosmetic active ingredients in skin-friendly particles potentiates their skin interaction and results in a superior and long-lasting cosmetic effect. PhytoSolve® Astaxanthin is an innovative natural product comprising a synergistic complex of the antioxidant astaxanthin (AXN) and natural phospholipids.

AXN is produced by aquatic organisms like *Haematococcus pluvialis* algae. It has a high capacity to scavenge reactive oxygen species (ROS) responsible for oxidative stress,¹ contributing to skin ageing by damaging proteins, lipids and DNA within the cells. Topical AXN application has been reported to have several skin health benefits, including anti-wrinkle effects, protection against UV irradiation, and increased skin hydration, which suggest promising applications in anti-ageing products.

Phospholipids are highly versatile materials offering both technical and physiological benefits for cosmetic formulations. They are endogenous, highly biocompatible, safe, and hence pre-destined for advanced skincare products.²

Owing to their amphiphilic nature and their ability to interact with human skin, phospholipids can serve as active ingredients for skin protection and skin rejuvenation, as carrier systems for cosmetic active ingredients, and as skin-friendly emulsifiers.

PhytoSolve® Astaxanthin is a complex between AXN and highly purified soybean phospholipids (non-GMO). The small oil droplet size (ca. 50-100 nm diameter) of the emulsion and the solubilisation of AXN in the oil droplets enable a strong interaction with the skin to synergistically enhance the cosmetic benefits (Figure 1).

Technical product features

PhytoSolve® Astaxanthin is a deep red liquid concentrate containing 4 mg/mL of natural AXN from *Haematococcus pluvialis* encapsulated in a pre-formulated emulsion. The product is vegan, free of preservatives, and comprises raw materials from non-GMO origin without palm/palm kernel oil or its derivatives.

PhytoSolve® Astaxanthin can be added easily to aqueous and semi-solid formulations during the cooling phase within a recommended pH range of 5 to 8. Resulting formulations take on a pleasant, pastel peach to vivid orange-red colour that gives the skin a healthy and glowing appearance (Figure 2).

Studies on the cosmetic effects of PhytoSolve® Astaxanthin

Enhancement of skin antioxidant potential



The antioxidant properties of PhytoSolve® Astaxanthin in comparison to a placebo formulation were evaluated *in vitro* by measurement of the skin antioxidant potential (SAP). The SAP was determined by labelling a skin sample with a test radical and quantifying the decrease in free radical concentration 10 and 30 minutes after application of the test formulations.³

The SAP value of the placebo cream was normalized to 100%. The cream with 10% PhytoSolve® Astaxanthin showed an increase of the SAP value to 125% (after ten minutes) and 148% (after 30 minutes) (Figure 3).

The study confirmed a significantly higher SAP for PhytoSolve® Astaxanthin than for the

placebo formulation. Therefore, the antioxidant activity of PhytoSolve® Astaxanthin in the skin was successfully demonstrated.

Protection from skin damage caused by UVB irradiation

In a further *in vitro* study the protective effect of PhytoSolve® Astaxanthin against UVB irradiation, which is an important environmental driver of skin ageing, was assessed.

The viability of a cell-based full-thickness skin model was measured with an established dye-based assay⁴ after the following treatments: (1) no irradiation, (2) UVB-irradiation with 80 mJ/cm², and (3) UVB-irradiation with 80 mJ/cm² after application of the test formulation.

The non-irradiated sample functioned as control and showed full viability. After irradiation, the viability decreased to 63%. When applying the formulation containing 10% PhytoSolve® Astaxanthin, the adverse effects of UVB-irradiation have been eliminated and a cell viability of 98% was maintained (data not shown).

Therefore, PhytoSolve® Astaxanthin effectively protects the skin from UVB irradiation-caused damage and maintains skin viability.

Clinical study on anti-ageing effects and consumer satisfaction

In order to examine the efficacy and tolerability of PhytoSolve® Astaxanthin, the product was tested by 20 male and female volunteers with healthy skin under the supervision of a dermatologist. The volunteers applied a cream containing 2% PhytoSolve® Astaxanthin twice daily for 28 days.

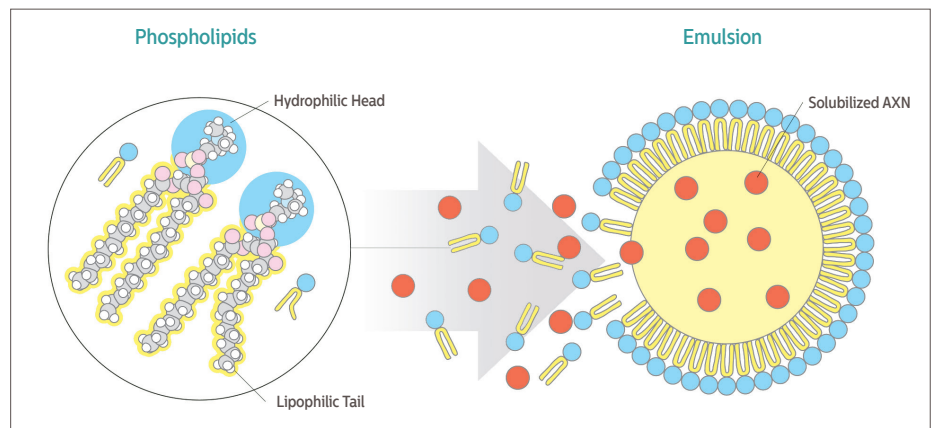


Figure 1: Schematic picture of phospholipids and their role as emulsifiers in the formation of oil droplets, in which AXN is dissolved

The anti-wrinkle effect was determined by single fold-depth measurements in the eye area and visually with standardized photographs. Moreover, the opinion of the consumers was evaluated with a questionnaire-based survey.

After 28 days, single fold-depth of wrinkles was reduced by 26%. The measured reduction is supported by a visible anti-wrinkle effect and a healthier and glowing complexion (Figure 4). The cosmetic benefits were confirmed by the consumers that reported a reduction of wrinkles (70%), a healthier and glowing complexion (80%), and a good or very good skin feel (85%).

All participants reported a good or very good tolerability which was in accordance with the positive evaluation by the dermatologist. Moreover, 75% of the participants would recommend PhytoSolve® Astaxanthin (data not shown).

Conclusion

PhytoSolve® Astaxanthin showed excellent cosmetic benefits. The antioxidant effect and capability to mitigate UVB-induced skin damage was proven *in vitro*. A study with volunteers showed a pronounced and visible anti-wrinkle effect.

In addition, the volunteers judged the product as highly attractive with a good skin feel and reported a rejuvenated skin appearance and a healthier and glowing complexion.

Overall, PhytoSolve® Astaxanthin is an excellent anti-ageing product and a perfect component for advanced skin care products, providing a synergistic complex between natural phospholipids and the powerful antioxidant AXN.

Ingredients (INCI)

Glycerin, Aqua (Water), Caprylic/Capric Triglyceride, Lecithin, *Haematococcus Pluvialis* Extract, Tocopherol, Sodium Chloride, Sodium Hydroxide, Helianthus Annuus (Sunflower) Seed Oil. **PC**

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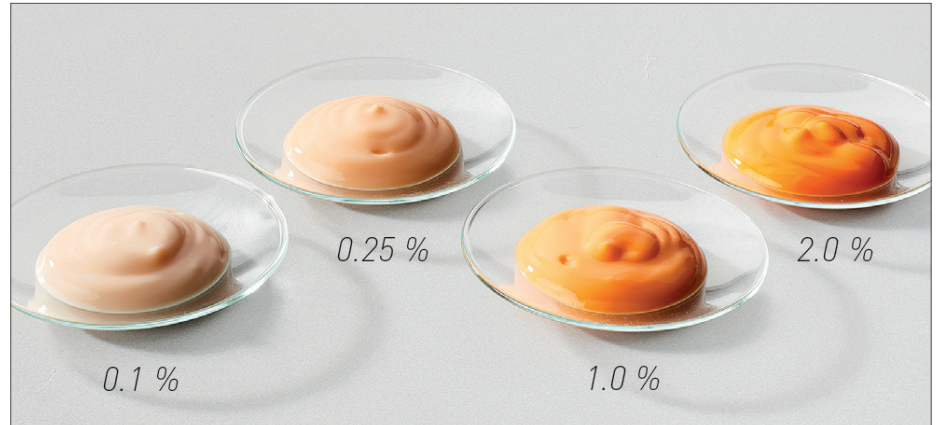


Figure 2: Representative cream formulations containing PhytoSolve® Astaxanthin in concentrations of 0.1 to 2%

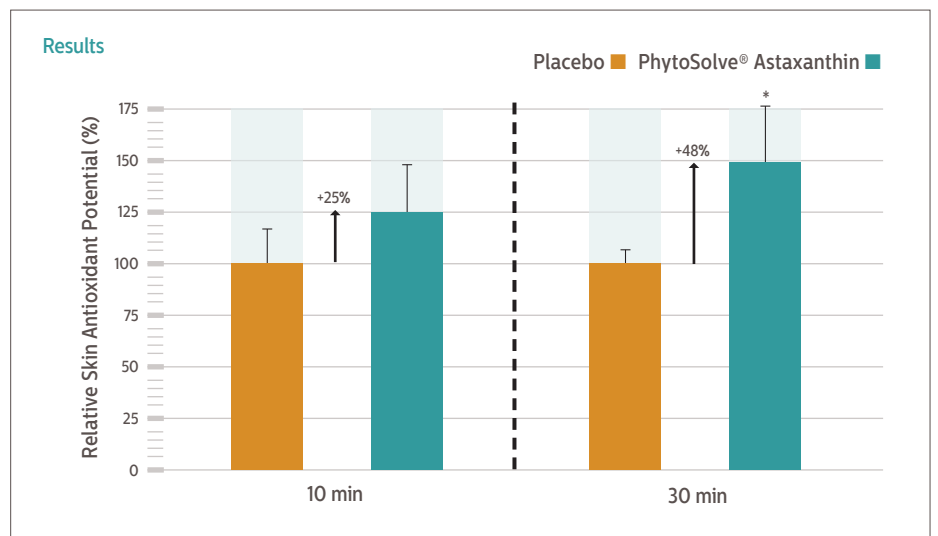


Figure 3: SAP values of a formulation with 10% PhytoSolve® Astaxanthin in relation to the placebo formulation after 10 and 30 minutes of incubation (n = 4-5 ± SD, *p < 0.05)

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Figure 4: Single fold-depth in the test area before and after applying a cosmetic formulation with 2% PhytoSolve® Astaxanthin twice daily for 28 days (n=20 ± SD)