



June 22, 2026

Functional properties identified for the colorless carotenoids “phytoene” and “phytofluene” Next-generation cosmetic ingredients that inhibit elastin degradation and melanin production

Harima Chemicals Group, Inc.

Through joint research with Meijo University, Harima Chemicals Group, Inc. has identified four functional characteristics of the carotenoids phytoene and phytofluene. These include beauty-related benefits such as the ability to inhibit elastase activity associated with wrinkle formation.



Carotenoids, such as lycopene, β -carotene, and astaxanthin, are functional pigments known for their potent antioxidant properties. Widely used in food, cosmetics, and animal feed, they have recently gained increasing attention for their potential health and beauty benefits.

While most carotenoids impart orange or red coloration, phytoene and phytofluene are colorless and transparent, allowing them to be incorporated into cosmetics without affecting product appearance. Their antioxidant activity is comparable to that of other carotenoids, making them particularly attractive as functional beauty ingredients. However, detailed research has been limited due to their extremely low natural occurrence and the difficulty of purification.

Using advanced purification technology, Harima successfully isolated these compounds at high purity, despite the inherent technical challenges.

The purified compounds were then evaluated for their functional properties through in vitro testing.

[Key Functions of Phytoene and Phytofluene]

- **Elastase-inhibiting activity** **Phytoene**

Phytoene was found to inhibit elastase, an enzyme that degrades elastin, a key component responsible for skin elasticity. In vitro, phytoene inhibited elastase activity by more than 90%.

- **Tyrosinase-inhibiting activity** **Phytoene**

To the best of our knowledge, phytoene was confirmed for the first time in the world to inhibit tyrosinase activity, an enzyme involved in melanin production. It exhibits a relatively high inhibitory effect even at low concentrations, achieving a comparable effect to arbutin, a widely used skin-brightening ingredient, at approximately one-half to one-fifth the concentration (based on generally reported values).

- **Potent antioxidant activity** **Phytoene** **Phytofluene**

Phytoene and phytofluene exhibit excellent singlet oxygen scavenging activity, effectively neutralizing harmful reactive oxygen species generated by UV radiation and other factors. Their antioxidant activity was more than 10 times greater than that of gallic acid, a well-known potent antioxidant.

- **High UV-absorption capacity** **Phytoene** **Phytofluene**

Phytoene: Provides 2 to 4.5 times higher maximum UV-B absorption than existing UV absorbers, helping protect against age spots and freckles.

Phytofluene: Provides 1.3 to 4.4 times higher maximum UV-A absorption than existing UV absorbers, helping protect against wrinkles and skin sagging.

Going forward, Harima will continue its collaboration with Meijo University to further evaluate the safety and formulation suitability of phytoene as a cosmetic ingredient. In parallel, Harima is also exploring bioprocess-based production technologies for commercialization by fiscal 2027.

Building on its carotenoid research, Harima will continue to develop cosmetic ingredients based on phytoene and other functional compounds.

■ References

- This study was published on May 17, 2026, in *Food Research International*, an international academic journal published by Elsevier.

<https://doi.org/10.1016/j.foodres.2026.119474>

NOTE: These findings are based on in vitro evaluations of purified ingredients and do not directly demonstrate the efficacy of the final cosmetic product or its effects on the human body.

Contact

Public Relations, Harima Chemicals Group, Inc.

URL: <https://www.harima.co.jp/en/contact/>