

Nanoencapsulation of Endophytic Fungal Extract (CMU-ZY2045) for Enhanced Efficacy in Lipstick Formulations

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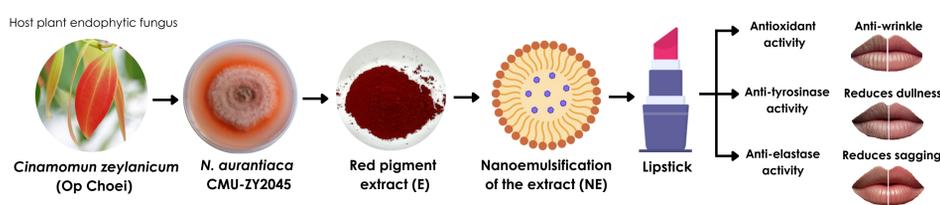
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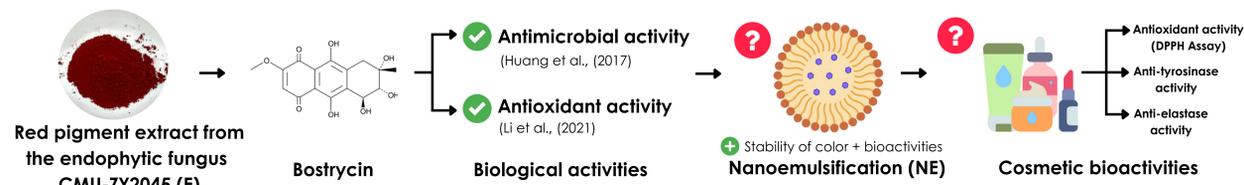
Abstract

This study investigates the cosmetic bioactivities of the red pigment extract (E) produced by an endophytic fungus *Nigrospora aurantiaca* CMU-ZY2045 and explores its potential enhancement through nanoemulsion for application in lipstick formulations. Cosmetic bioactivities were evaluated for antioxidant, anti-tyrosinase, and anti-elastase properties. The results revealed that E exhibited significant cosmetic bioactivities, with IC_{50} values of 0.23 ± 0.03 , 0.48 ± 0.21 , and 0.50 ± 0.04 mg/mL, respectively. Nanoemulsification of the extract (NE) further enhanced its cosmetic bioactivities, yielding IC_{50} values of 0.15 ± 0.02 , 0.40 ± 0.07 , and 0.05 ± 0.01 mg/mL, respectively. NE demonstrated excellent stability under accelerated conditions, including heating-cooling, freeze-thaw, and dark-light cycles, while the cosmetic bioactivities of E declined under the same conditions. NE was incorporated into a lipstick formulation and studied of physical stability under accelerated conditions, compared to a formulation containing the non-nanoemulsified extract. These findings suggest that NE can enhance the efficacy of lipstick formulations, offering multifunctional benefits such as antioxidant, skin-lightening, and anti-wrinkle effects.

Graphical abstract



Introduction

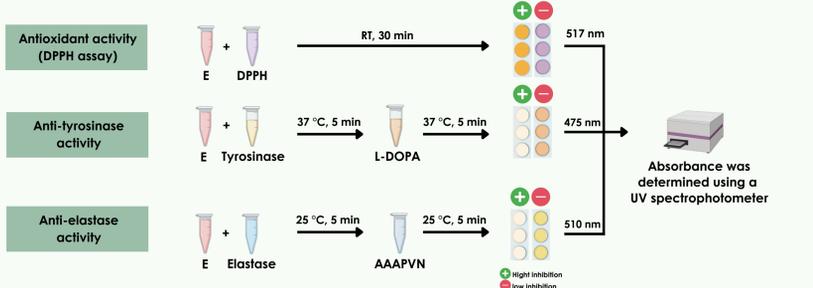


Objectives

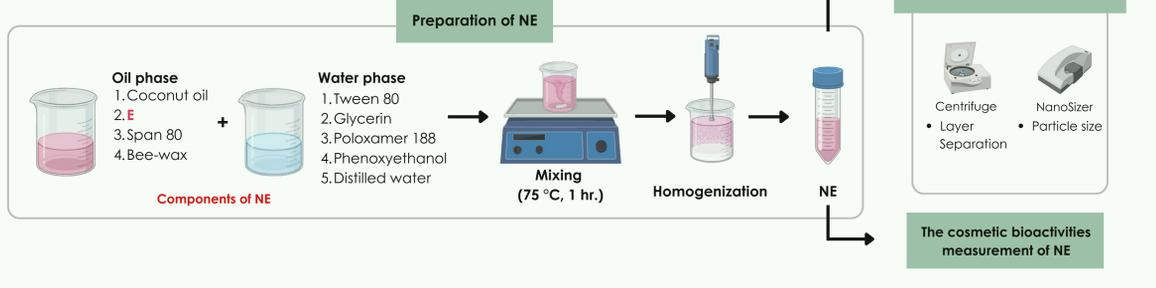
- To evaluate the cosmetic bioactivities of the red pigment extract (E), including its antioxidant, anti-tyrosinase, and anti-elastase properties
- To enhance cosmetic bioactivities stability and color retention of the red pigment extract (E) via nanoencapsulation technology
- To develop a lipstick formulation containing a nanoemulsification of the red pigment extract (NE)

Methodology

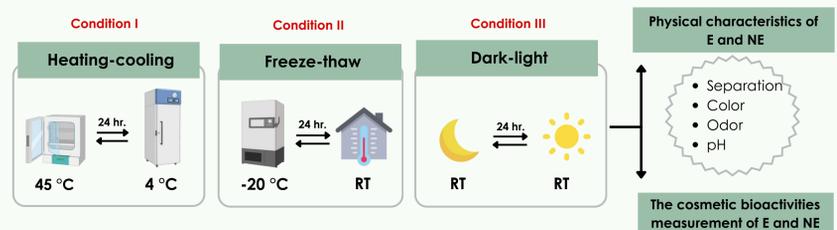
1 Study on the cosmetic bioactivities of E



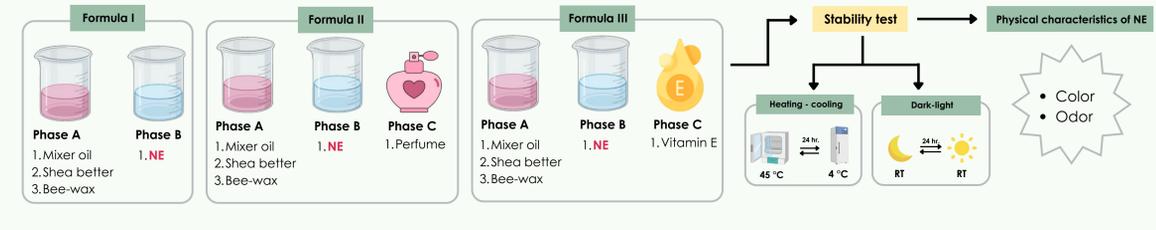
2 Optimization of NE Formulation



3 Stability test of E and NE under accelerated conditions

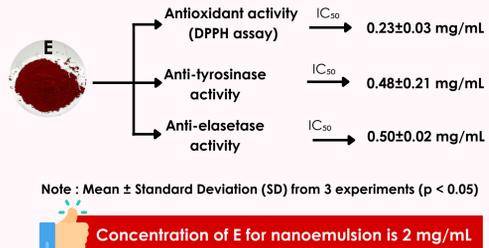


4 Lipstick formulation containing NE

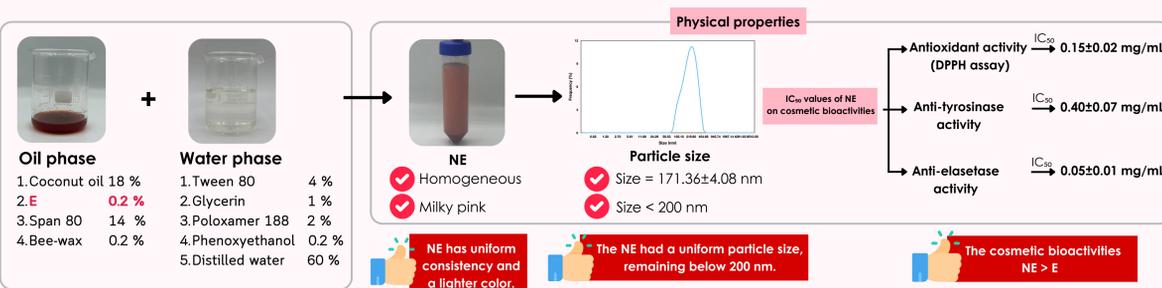


Results

1 IC_{50} values of E on cosmetic bioactivities



2 Ingredients in NE formulation

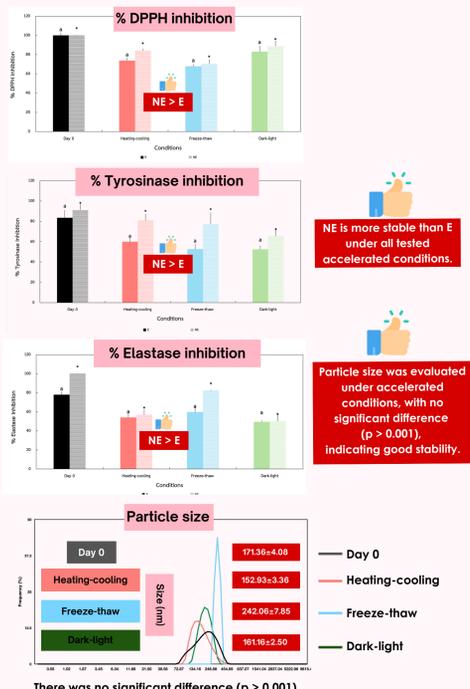


3 Stability test of E and NE under accelerated conditions

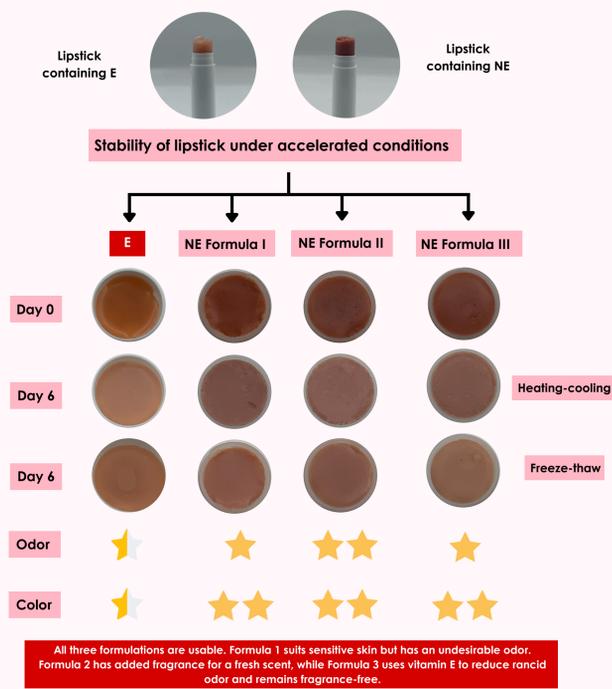
Stability assessment of E and NE: color, odor, pH, and homogeneity under accelerated conditions

Condition	Day	Color		pH		Odor		Homogeneous	
		E	NE	E	NE	E	NE	E	NE
Heating-cooling	0	NC	NC	8	7	NC	NC	Ho	Ho
	6	NC	NC	8	7	NC	NC	Ho	Ho
Freeze-thaw	0	NC	NC	8	7	NC	NC	Ho	Ho
	6	+++	+++	8	7	NC	NC	Ho	Hf
Dark-light	0	NC	NC	8	7	NC	NC	Ho	Ho
	6	---	---	8	7	NC	NC	Ho	Ho

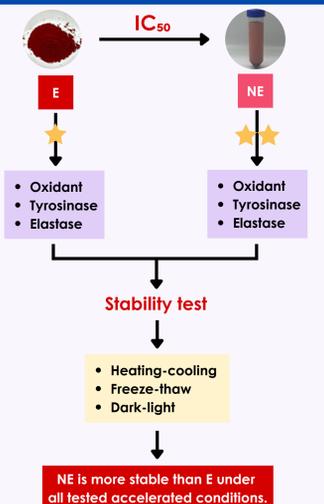
Note: NC = No Change, Ho = Homogeneous, Hf = Heterogeneous
 ++ = The color changes slightly, --- = Significantly lighter in color
 + = Faded slightly, --- = Significantly lighter in color



4 Comparison of lipstick formulations containing E and NE



Conclusion



Acknowledgements

This project would have been impossible without the support from Dr. Nakin Suwannarach, Dr. Napalai Chaiwan, and Miss Siritip Pechraj, Algal and Cyanobacterial Research Laboratory, and Research Center of Microbial Diversity and Sustainable Utilization (RCMU), Faculty of Science, Chiang Mai University, Chiang Mai, Thailand.

References

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