The Fermented Seaweed had the potential as raw materials for cosmetics

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Introduction:

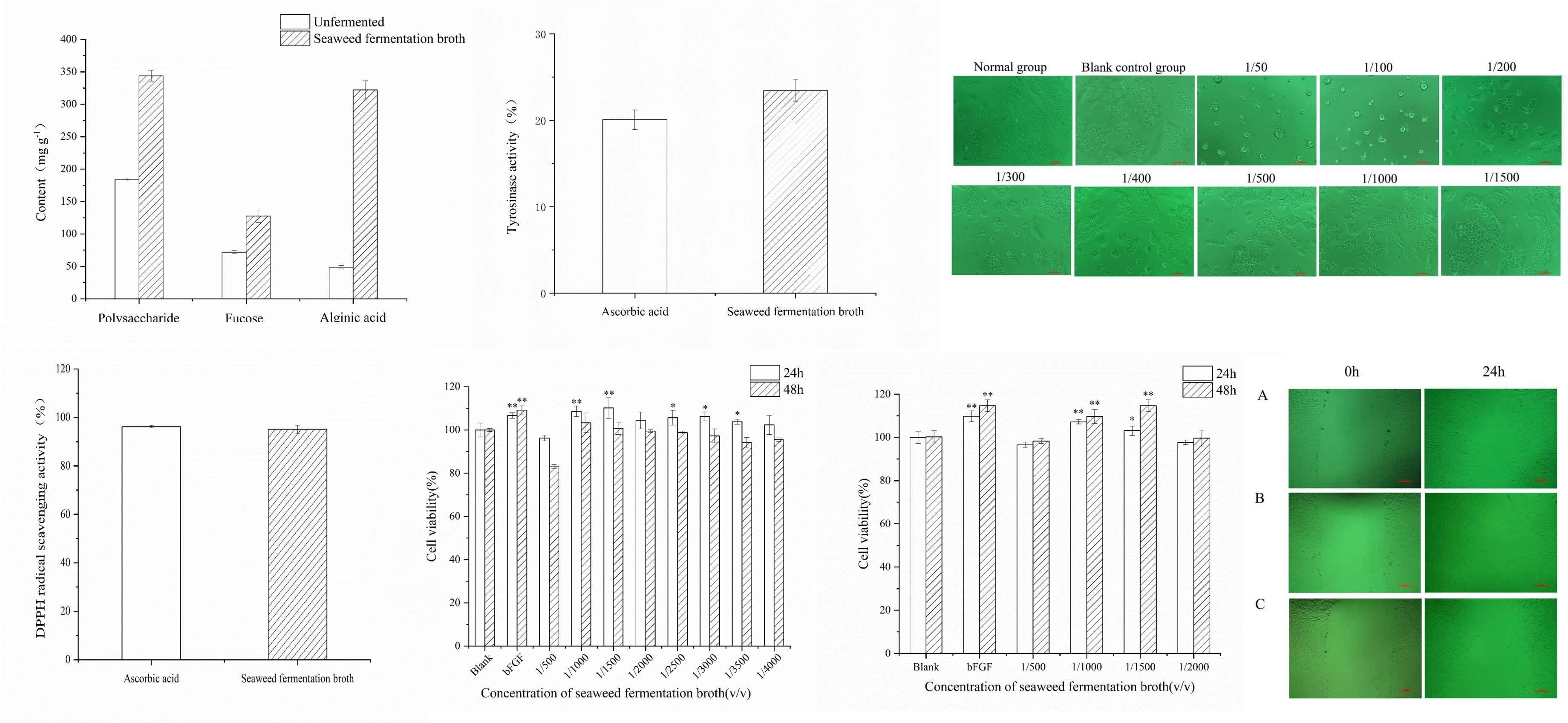
Seaweed are promising renewable marine resource. Since seaweed compounds have a wide range of biological activities, they can be used as active ingredients in cosmetics (Chandika et al., 2015; Jesumani et al., 2019). Generally speaking, when these compounds are used as cosmetic ingredients, the moisturizing and antioxidant capabilities of these compounds play major roles (Salehi et al., 2019). But the active substances are rarely extracted through fermentation. Fermentation is an eco-friendly process by which the content of biologically active compounds increases (Tabassum et al., 2017). In order to use seaweed bioactive compounds as raw materials for the preparation of cosmetics, the seaweed was fermented by a novel strain of *Bacillus siamensis*.

Materials & Methods:

The seaweed material was collected from coastal areas of China. It was stored after washing and crushing. The medium was prepared by supplemented with 6.3% dried kelp powder. *Bacillus siamensis* was inoculated and then cultured with shaking at 37°C for 24h. The supernatant was collected by centrifugation at 4°C for further analysis. The polysaccharide content was measured by the phenol-sulfuric acid method, the fucose content was measured by the Gibbons colorimetric method, and the alginic acid content was measured by the calcium coagulation-acidification method. The antioxidant capacity was measured by DPPH free radical scavenging assay, and the tyrosinase inhibitory effect was measured by spectrophotometer. To evaluate the cytotoxicity, an inverted phase contrast microscope was used to observe the effects of different concentrations of seaweed fermentation broth on cell morphology. Meanwhile, cell counting kit 8 (CCK-8) was used to detect the survival rate of HaCaT and HFF-1 cells. Each experiment was repeated at least three times. The results were expressed as mean ± standard deviation.

Results & Discussion:

The content of polysaccharide in the seaweed fermentation broth was 343.90±8.63 mg/g, the content of fucose was 127.55±9.55 mg/g, and the content of alginic acid was 322.00±14.14 mg/g. The scavenging rate of DPPH free radicals of the seaweed fermentation broth was 95.08 ± 1.60 %, showing good antioxidant capacity. Moreover, high tyrosinase activity inhibition could suppress hyperpigmentation. Furthermore, morphological observation, CCK-8 assay, and would healing assay were used to test the anti-wrinkle and skin-repairing effects of the fermentation broth on skin cells. The results show that *Bacillus siamensis* fermentation broth of seaweed at a dilution of 1:1,000 could effectively promote the growth of skin cells HaCaT and HFF-1, showing good skin-repairing and anti-wrinkle effects.



Conclusions:

In the present study, *Bacillus siamensis* was used to ferment seaweed to improve the release of bioactive compounds in seaweed. The results showed that seaweed fermentation broth contained more polysaccharide, fucose and alginate, which had high antioxidant capacity and tyrosinase inhibitory activity. The use of 1:1,000 seaweed fermentation broth could improve cell viability, indicating good skin-repairing and anti-wrinkle effects. Therefore, the *Bacillus siamensis* fermentation broth of seaweed could be used as a potential cosmetic raw material. We plan to further assess the mechanism underlying the action of bioactive components in seaweed fermentation broth on skin microbiome activity.

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References:

Chandika P., Ko S. C., Jung W. K. (2015). Marine-derived biological macromolecule-based biomaterials for wound healing and skin tissue regeneration. Int J Biol Macromol, 77, 24-35.

Jesumani V., Du H., Aslam M., Pei P., Huang N. (2019). Potential Use of Seaweed Bioactive Compounds in Skincare-A Review. Mar Drugs, 17(12), 688.

Salehi B., Sharifi-Rad J., Seca A. M. L., Pinto D. C. G. A., Martins N. (2019). Current Trends on Seaweeds: Looking at Chemical Composition, Phytopharmacology, and Cosmetic Applications. Molecules, 24(22), 4182.

Tabassum M. R., Xia A., Murphy J. D. (2017). Potential of seaweed as a feedstock for renewable gaseous fuel production in Ireland. Renewable and Sustainable Energy Reviews, 68, 136-146.