



Exploring the application of Dendrobium Candidum fermentation broth in cosmetics through cell experiments

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Introduction:

Dendrobium officinale is famous for its high medicinal and dietary value^[1]. The active ingredients found in dendrobium officinale including polysaccharides, flavonoids, phenols, amino acids, vitamins and other substances which have wide range of applications in cosmetic and pharmaceutical fields.

This paper focuses on extracting active substance from Dendrobium officinale via microbial fermentation and evaluating the effect on skin whitening. Most of the active substances of Dendrobium officinale are encapsulated inside the cell wall. By applying the fermentation method, the cell wall can be destroyed, allowing desired substances to be freed. Besides, the fermentation process also produce some other valuable secondary metabolites^[2]. The experiment result demonstrated in this paper applied a combination of yeast and cellulase to conduct the fermentation. The goal was to explore a relatively optimal condition for fermentation.

Materials & Methods:

Preparation:

Disolve a vial of yeast needed for the experiment into necessary base and sterilize the dendrobium officinale raw material needed for the fermentaion process.

Main Experiment:

➤ Optimization:

5 different types of carbon sources: glucose, fructose, maltose, lactose, glycerin. Examining the hydroxyl radical scavenging rate after fermentation to determine the best carbon source.

➤ Comparative experiment:

Adjust the factors influencing the fermentation seperately and observe the results :

temperature(4 °C, 25 °C, 37 °C, 50 °C)

strain ratio(yeast: cellulase 3:1, 3:2, 1:1, 2:3, 1:3)

fermentation time (1 d~5 d)

material-to-liquid ratio(1:3, 1:3.5, 1:4, 1:4.5, 1:5)

➤ Analysis:

With the aid of Design-Expert software, performing data analysis to deterimine the optimal condition.

➤ Effect on hydroxyl radical scavenging

Measured by Fenton reaction method^[25], $H_2O_2 + Fe_2^+ = OH^- + H_2O + Fe^{3+}$, calculate the hydroxyl radical scavenging rate comparing with a portion without applying the product.

➤ Experiment in vivo:

30 volunteers with moderate photoaging symptoms randomly divided into three equal groups tested for 2 months. Each subject was insturacted to use a lotion containing either dendrobium officinale ferment filtrate or 7% vitamin C.

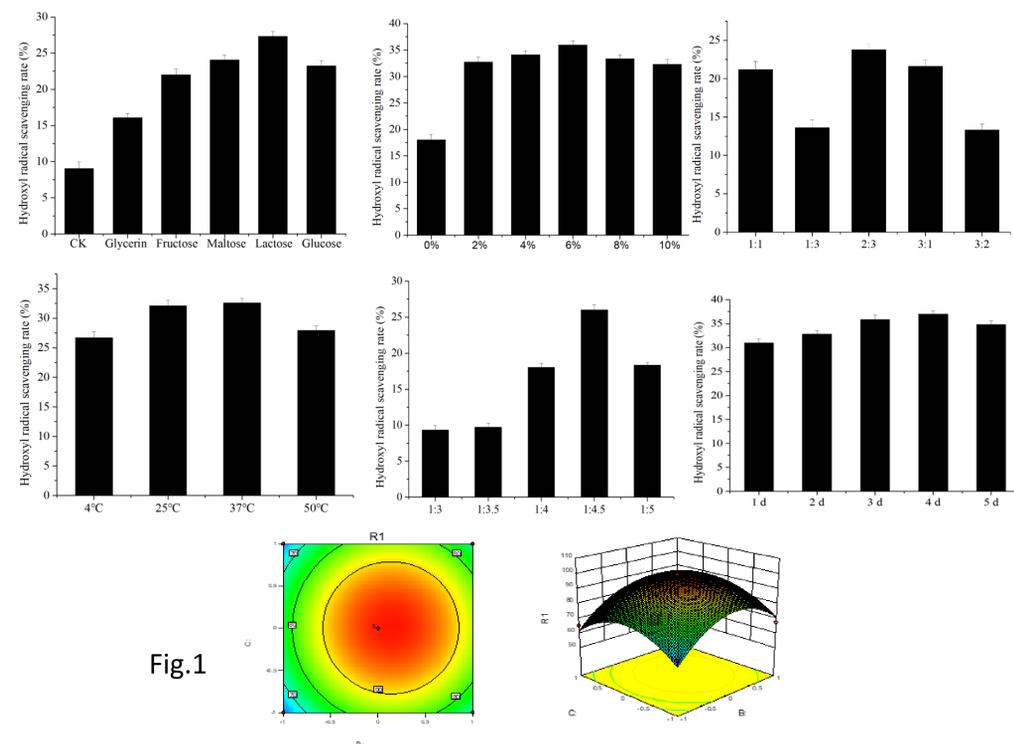
References:

1. Wu HS, Xu JH, Chen LM (2004) Studies on anti-hyperglycemic effect and its mechanism of Dendrobium candidum. China Journal of Chinese Materia Medica 29:160-163.
2. Wang YX, Mao X, Wang Y (2017) The history evolution and modern research of Liushen Qu. Lishizhen Medicine and Materia Medica Research 28:1182.

Results & Discussion:

1. Fermentation Result: (Optimization Analysis)

The comparative experiment results regarding to change in each individual factors versus hydroxyl radical scavenging rate are shown on figures below. As the data analysis indicated by Fig.1, the key factors influencing the fermentation are the temperature and the ratio of strains from the comparative experiment.



2. Human Skin Test Results: (Effect on Photoaging)

According to the report from an authorized institute, after two weeks of usage of the product containing dendrobium officinale ferment filtrate, statistically significant improvement can be observed visually comparing to other groups

Conclusions:

In this experiment, two kinds of microorganisms, yeast and cellulase, are used for the fermentation, and the results are characterized by the scavenging rate of hydroxyl radicals(the peak value was 35%) to find the optimal conditions. The optimal condition found from the experiment is: 6% lactose as carbon source, the ratio of material to liquid 1:4.5, the ratio of yeast to cellulase 2:3, and the time and temperature of fermentation is 4 days at 37 °C. For further exploration we found that the key factor was the temperature and the ratio of strains.. At last, we make experiments to verify the whitening function on human skin, significant improvement was observed in the visual evaluation.

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Dendrobium officinale was updated version following the regulation which was same with dendrobium candidum