K121

SELECTIVE EXTRACTION OF LUTEIN FROM CHLORELLA VUGALIS WITH SUPERCRITICAL CO_2

(熊大バイオエレクトリクス研)○Ruen-ngam Duangkamol, (正)Machmudah Siti, (正)後藤元信,
(熊大院自)(正)佐々木満, (Chulalongkorn 大工) Shotipruk Artiwan and Pavasant Prasert

1. Introduction

Chlorella valgaris is one type of green alga as well known source of carotenoids such as astxanthin, cantaxanthin and also small amount of β-carotein and lutein. Lutein is famous carotenoid in form of strong antioxidant and anticancer. Previous information about lutein extraction exposed that lutein could be extracted from *C. vulgaris* by using supercritical CO_2 with ethanol as co-solvent [1]. However, lutein yield was low. Furthermore, we tried to improve extraction method to acquire higher yield of lutein.

2. Materials and Methods

A spray-dried *Chlorella vulgaris* was supplied by Chlorella Industry Co., Ltd, Japan. Preliminary procedure, chlorophyll a, b and β-carotene inside the alga were removed by ethanol as eluting solvent then the ethanol-mixed algae was further used in extraction process by using supercritical CO_2. About 10 g of ethanol-mixed algae was charged in the middle part of cylindrical 50 ml extractor which was sandwiched with 10 g of 0.2 cm diameter glass beads, and then the extractor was placed in the middle part of oven as shows in Fig. 1. First of all set the operating condition as temperature and pressure were adjusted by using temperature controller and back pressure regulator (BPR). After the temperature and pressure reached to the desired point then CO_2 was pumped through the extractor with 3 ml/min flow rate and then collected the extract in vessel and CO_2 was measured by flow meter. The temperature was set in the level of 70, 80 and 90°C whereas the pressure was set in the level of 20, 30 and 40 MPa. The optimum condition which could provide the maximum amount of lutein was further used to examine effect of CO_2 flow rate. Amount of lutein and other types of carotenoids as chlorophyll b and β-carotene which dissolved in ethanol were analyzed by HPLC with intelligent UV/visible detector (UV-970, Jasco, Japan) column and using methanol:THF 90% (v/v) as mobile phase with 1.5 ml/min flow rate. The solvent was injected through 20 μL loop and separated by an STR ODS-II column (5 μm; 4.6 x 250 mm; Shinwa Chemical Industries, Ltd., Japan) at 30°C. Lutein, chlorophyll b and β-carotene were detected at 450nm whereas chlorophyll a was detected at 428nm. Total amount of lutein in alga was measured by soxhlet extraction using chloroform as solvent that obtained around 8.25% (g/g alga).

3. Results and Conclusion

Elution with ethanol before using supercritical carbon dioxide extraction could remove chlorophyll a, b and β-carotene and could enhance the amount of lutein in the extracted. Increasing in temperature and increasing in pressure in supercritical carbon dioxide extraction process could increase in amount of lutein in the extracted.

4. Reference

[1] K. Kitada et al., *J. Chem. Technol. Biotechnol* **84**: 657-661 (2009).

*Corresponding author, email: mgoto@kumamoto-u.ac.jp

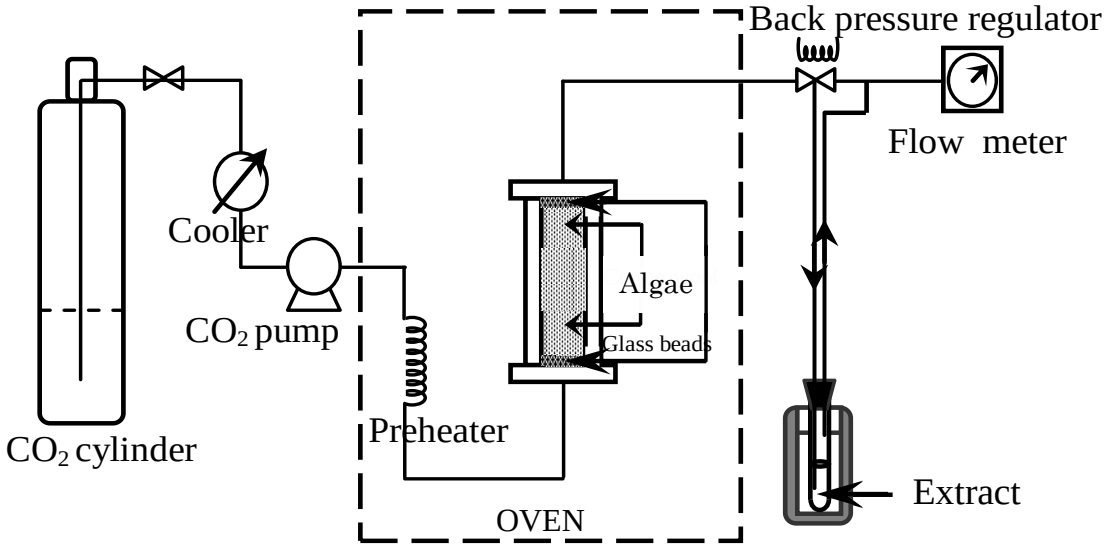

Fig. 1 Schematic diagram of supercritical CO_2 extraction