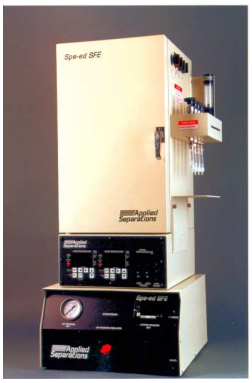
SFE Application #519

Extraction of Lycopenes from Tomato By-products

Introduction



Tomatoes contain a high concentration of carotenoids and lycopenes, significant amounts of which are found in the skins of the tomatoes. Lycopenes are valued for their important antioxidant properties, and are reported to prevent cardiovascular disease.

Methods are needed to extract lycopenes from natural sources for analytical purposes and also natural processing. Traditionally, the extraction of lycopenes has been accomplished by Soxhlet extraction, a labor intensive method that uses large volumes of solvent.

This application describes the use of supercritical carbon dioxide to quickly and naturally extract lycopenes from tomato skins. SFE is a non-toxic alternative to traditional organic solvent extraction methods that eliminates the use, exposure to, and disposal of hazardous solvents, while providing comparable extraction results in less time.

Equipment

- ✓ Applied Separations' *Spe-ed*™ SFE-NP Supercritical Extraction System

Materials

- ✓ *Spe-ed* Matrix (Cat. #7950)
- ✓ *Spe-ed* Wool (Cat. #7953)
- ✓ Carbon dioxide – welding or industrial grade with dip tube

Method

Weigh out 12 lbs of whole, ripe tomatoes and cut into quarters. Separate tomato solids from liquid by crushing the tomatoes in cheesecloth and retaining the solids. Dry tomato solids in a vacuum oven for 24 hours at 40°C. When tomatoes are dry, grind in a laboratory mill. Place a plug of *Spe-ed* Wool into an extraction vessel and pour the prepared sample into the vessel using a funnel, then place a plug of *Spe-ed* Wool on top. Compress the sample with a tamping rod, fill the void volume with *Spe-ed* Matrix, then seal the vessel. Install the vessel into the *Spe-ed* SFE. Place an amber predried and preweighed collection vial containing a plug of *Spe-ed* Wool on the discharge tube. Extract sample according to the specified extraction conditions.

Extraction Conditions

Extraction vessel:	50mL
Sample:	30g
Pressure:	680 BAR
Temperature:	80ºC
Valve temperature:	120ºC
CO_2 Flow Rate:	4L/min (gas)
Collection:	60mL pre-weighed vial
Dynamic time:	30 minutes

Comparison of Extraction Methods

	Solvent Extraction Soxhlet	**Supercritical CO_2**
Solvent	Acetone/ Hexane (1:1)	CO_2
Extraction Time	10 hours	¾ hour
Organic Solvent Consumption	200mL	0
Recovery (% soxhlet)	100%	96.1%

Applied Separations

930 Hamilton Street
Allentown, PA 18101
610.770.0900 (TEL)
610.740.5520 (FAX)

www.appliedseparations.com

Conclusion

The supercritical carbon dioxide extraction of lycopenes from tomatoes offers a viable alternative to solvent-based procedures. The accuracy and precision of the results were comparable to the standard method while extraction times were reduced. In addition, the use of hazardous solvents was eliminated.

References

Kaziunas, A. "The Supercritical Carbon Dioxide Extraction of Lycopenes from Tomato By-products." *Pittcon 2003*.

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Favati F., Fourth Italian Conference on Supercritical Fluids and Their Applications, 1997, 121-128.

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