Supercritical Fluid Processing of Carotenoids with Z-isomerization

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Carotenoids exist in plants usually as the (all-E)-configuration which have higher crystallinity and lower solubility in organic solvents compared to the Z-isomers. When they are converted to Z-isomers (cis forms), bioavailability increases due to the lower crystallinity and higher solubility [1, 2]. We have studied Z-isomerization of carotenoids such as lycopene and beta-carotene and behavior of the isomers in extraction process and fine particle formation process. Since Z-isomers have higher solubility in supercritical CO_2, extraction of carotenoids from plant materials is enhanced. Fine particle formation process is also influenced due to the difference in the crystallinity as well as the solubility.

Z-isomerization behavior of lycopene in the oleoresin was studied by adding various vegetable oils and the key component to enhance the isomerization was revealed. When the plant materials were pretreated to convert Z-isomers, the extraction rate of carotenoids by supercritical CO_2 or subcritical dimethyl ether increased considerably [3]. Lycopene Z-isomers were efficiently separated and concentrated from tomato pulp using supercritical CO_2. The separation relies on the different solubility of (all-E)-lycopene and the Z-isomers [4].

For particle formation by SAS process, smaller particle was obtained by Z-isomerization pretreatment, whereas (all-E)-form of carotenoid produced larger crystal form of particles [5]. Nanoparticle formation of PVP/astaxanthin inclusion complex by solution-enhanced dispersion by supercritical fluids was infuenced by Z-isomer content [6].

Reference

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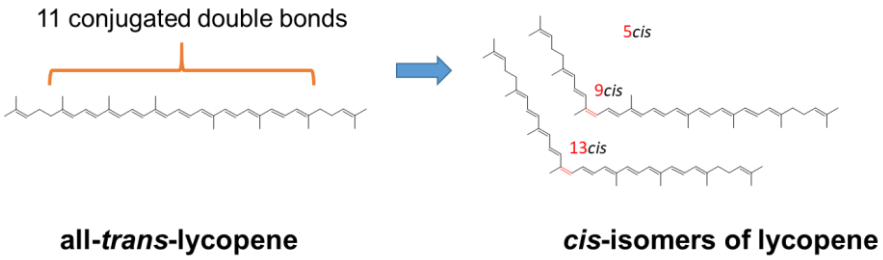

Figure 1 Z-isomerization of lycopene