Optimization of Extraction Parameters on the Carotenoid Recovery from Tomatowaste

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Carotenoids are natural pigments that occur in bacteria, plants, fungi, and animals, comprising a class of hydrocarbons (carotenes) and their oxygenated derivatives (xanthophylls). Carotenoid extracts are desirable for use in dietary supplements and as additives to processed foods. They are generally extracted from plant material, using polar or non-polar organic solvents or by use of supercritical fluid extraction.

Our research has been focused in carotenoids recovered from tomatowaste, a by-product of tomato processing industries. Extraction efficiency is determined by the structure of the individual carotenoids present. Solvents used for extracting lycopene include hexane, ethyl acetate, methylene chloride, methanol, ethanol, propanol, and acetone. Currently, ethyl acetate is most commonly used for extracting carotenoids to be used in food products, however it is less efficient in extracting the all-trans isomer of lycopene. It is also not considered to be environmentally friendly and is highly flammable. We selected ethyl lactate as a solvent for carotenoids because it is environmentally friendly, it has been approved for use in food products and it is completely biodegradable into CO_2 and water.

In our study we tried to optimize the extraction procedure of carotenoids, in terms of solvent used, temperature, time and successive extraction steps. We applied five solvents (hexane, acetone, ethanol, ethyl acetate and ethyl lactate) at three different temperatures (25°C, 40°C and the third close to their boiling point) and three successive extraction steps. We concluded that the optimum extraction time was 30 min and we considered ethyl lactate as a possible solvent for a diverse range of carotenoids and their stereoisomeric forms.

Total carotenoid recovery in solvent extracts, expressed as mg of lycopene / kg dry tomatowaste, was determined spectrophotometrically by recording the maximum absorbance of lycopene at each extract.