

Investigation of extraction conditions to obtain marigold extracts rich in lutein and antioxidants

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Lutein which is commercially extracted from marigold flowers, is significantly used in food, pharmaceutical and poultry industries. However, low yields, formation of inactive isomers and high cost of production are the problems associated with current extraction methods. Therefore, optimization of extraction conditions to obtain lutein extracts from marigold flowers with high pigment yield as well as high antioxidant activity (AOA) in an economical manner is important. In this study, crude lutein was extracted from marigold flowers into four different solvents (hexane, ethyl acetate, acetone and methanol) using maceration, sonication and soxhlet extraction. Thin layer chromatograms of the extracts indicated the presence of several carotenoids while lutein being the major. The UV-visible spectra of the extracts enabled to determine the pigment concentration of the extracts using the Beer-Lambert law. The highest pigment concentration was obtained for the sonicated acetone extract (7.0×10^{-6} mol L⁻¹). The highest AOA was obtained for the sonicated methanol extract which displayed the highest results in the Folin-Ciocalteu assay (total antioxidant capacity (AOC) = 564 µg pyrogallol equivalents (PGE)/mg) and the Ferric Reducing Antioxidant Power (FRAP) assay (FRAP = 472 µg of ascorbic acid equivalents (AAE)/mg). However, it was found that maceration of marigold petals in acetone is the best extraction condition to obtain a significantly high lutein concentration (5.0×10^{-6} mol L⁻¹) along with high antioxidant activity (total AOC = 381 µg PGE/mg and FRAP of 448 µg AAE/mg).

Key words: *Extraction techniques, Folin-Ciocalteu assay, FRAP assay, Lutein, Marigold.*

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