EXTRACTION AND EVALUATION OF CAROTENOIDS FROM ROYAL POINCIANA (*Delonix regia*) FLOWERS

By

HAZEM SAYED GOLSHANY
B.Sc. Agric. Sci. (Food Science), Fac. Agric., Cairo Univ., 2013

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Reviewer **Vice Dean of Graduate Studies**

APPROVAL SHEET

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SUPERVISION SHEET

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ABSTRACT

The effect of extraction time, ultrasound intensity, plant material/solvent ratio and extraction technique on the extraction yield of total carotenoids from *Delonix regia* flowers were investigated. Spectrophotometer was used to determine the total carotenoids. Combination of ultrasound and magnetic stirring extraction techniques (US+S) was compared with the conventional stirring (S) alone. Ultrasound assisted extraction proved to be as a promising technology for extracting carotenoids from *Delonix regia* flowers at relatively short extraction times compared with the conventional method. The optimal conditions for obtaining the highest yield of carotenoids from *Delonix regia* petals were: 1:20 (w/v) material/solvent ratio, 10% ultrasonic intensity of the maximal power (300 W) for 50 min. At these conditions, the yield of total carotenoids was 503.0 µg/g dry weight. Increasing acoustic power density degraded carotenoids. HPLC analysis was used for the quantification of β-carotene in the extract. The carotenoid-rich extract that was obtained by using US+S was evaluated in terms of its DPPH (1,1-diphenyl-2-2-picrylhydrazyl) radical scavenging activity and FRAP (Ferric reducing antioxidant power). Results of this study implied that combination of US+S was the best technique for carotenoid extraction from *Delonix regia* flowers with high antioxidant activities compared with butylated hydroxy toluene (synthetic antioxidant). The possibility to improve the oxidative stability of sunflower oil by enriching it with carotenoids from the petals was studied. Enrichment of sunflower oil with carotenoid-rich extract at 67.46 mg carotenoids/kg oil improved its oxidative stability by more than 50% as measured by Rancimat method. Therefore, carotenoids extracted from the petals could be used as a natural antioxidant in pharmaceutical and in food industry. The obtained results indicated the efficiency of the extract against HepG-2 and HCT-116 cancer cell lines. Storage of flowers powder for one year at room temperature affected negatively its total carotenoids content. These results propose that the investigated extract has the potential to be used as bio-preservative in food products.

Key words: Carotenoids, *Delonix regia*, oxidative stability, sunflower oil, ultrasonic.

DEDICATION

I dedicate this work to whom my heartfelt thanks; to my mother for her prayers, to my father for his support, as well as to my brothers and sister for all the support they lovely offered along the period of my post-graduation.

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LIST OF ABBREVIATIONS

ANOVA	Analysis of variance
AV	Acid value
BHT	Butylated hydroxy toluene
CDB	Conjugated double bond
DE	Dried extract
DMEM	Dulbecco's Modified Eagle's medium
DMSO	Dimethyl sulfoxide
DNA	Deoxyribonucleic acid
DPPH	2,2-diphenyl-1-picrylhydrazyl
FFA	Free fatty acid
FRAP	Ferric reducing antioxidant power
HCT-116	Human colon cancer cell line
HeLa	Human cervical cancer cell line
HEPES	4-(2-hydroxyethyl)-1-piperazineethanesulfonic acid
HepG-2	Human liver cancer cell line
HPLC	High performance liquid chromatography
IC_{50}	The half maximal inhibitory concentration
MCF-7	Human breast cancer cell line
nm	Nanometer
OD	Optical density
OSI	Oxidative stability index
PC-3	Human prostate cancer cell line
ppm	Part per million
PV	Peroxide value
S	Stirring
SD	Standard deviation
TCA	Trichloroacetic acid
UAE	Ultrasound assisted extraction
US	Ultrasound
UV	Ultraviolet
VIS	Visible

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