Research Article

Extraction of Antioxidant Lutein from Various Flowers

Kamalambigeswari R., Jeyanthi Rebecca L.*
Department of Industrial Biotechnology, Bharath University, Agaram Road, Selaiyur, Chennai, Tamilnadu, India.
***Corresponding author's E-mail:** hodibt@bharathuniv.ac.in

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ABSTRACT

Antioxidant lutein is a fat-soluble xanthophyll and could be found in a wide range of natural sources. A variety of separation and analytical methods have been developed for the determination of lutein, including solvent extraction, supercritical fluid extraction, and high performance liquid chromatography. The objective of the present study was to extract and estimate lutein in variety of flowers. Solvent extraction was carried out using Petroleum ether, Ethanol and diethyl ether as a solvent system. The extracted lutein was estimated using UV-Vis spectrophotometer. The lutein content was found to be higher in ethanolic extracts from flowers of flame tree among the flowers investigated and estimated to be 0.083µg/g. The least was found in extracts of Petroleum ether from Rose and estimated to be 0.01 µg/g.

Keywords: Ethanolic extracts, Lutein, Solvent extraction.

INTRODUCTION

Lutein ($C_{40}H_{56}O_2$) is a xanthophyll and one of 600 known naturally occurring carotenoids. Lutein is synthesized by photosynthetic organisms. It is called a carotenoid vitamin. It is a highly unsaturated compound; it is inherently susceptible to the oxidative stresses associated with thermal and UV exposure. It is alipophilic molecule and is generally insoluble in water. The presence of the long chromophore of conjugated double bonds provides the distinctive light-absorbing properties. The polyene chain is susceptible to oxidative degradation by light or heat and is chemically unstable in acids. Lutein cannot be synthesized by human so it must be obtained through dietary sources.[1]

Lutein (b-,3-carotene-3,30-diol) belongs to a class of oxygenated carotenoids (xanthophylls).This xanthophyll, like its sister compound zeaxanthin, has primarily been used as a natural colorant due to its orange-red color. Lutein absorbs blue light and therefore appears yellow at low concentrations and orange-red at high concentrations. Besides zeaxanthin, lutein isone of the carotenoids, a basic fundamental pigment present in central region of the retina, known as the yellow pigment[2].Many people think of lutein as "the "eye vitamin." There, it may serve as a photo protectant for the retina from the damaging effects of free radicals produced by blue light, thereby protecting the eye tissues from sunlight damage. They use it to prevent eye diseases including age-related macular degeneration (AMD)[3,4] protecting the arteries and lungs from damaging free radicals.[5] Specifically, it is a dihydroxy derivative of a-carotene. Lutein is also anti angiogenic. It inhibits vascular endothelial growth factor (VEGF). It reduces the risk of heart diseases and cancers.[6]

MATERIALS AND METHODS

Sample Preparation

The flowers used for the study are Solid aster, Golden aster, Rose, Gerbera, Flame tree and Yellow bloom (Figure 1) The flowers used were bought fresh from the market and washed under tap water, cleaned with sterile water and air dried at room temperature. The raw materials were chosen based on their availability and also on the basis of information gathered during literature studies. The scientific and local names of the selected flowers that were used in this study were mentioned in Table 1.

Table 1: Scientific, family, common and local names of the plants investigated

Scientific name	Family name	Common name
Solidasterlutens	Asteraceae	Solidaster
Chrysopsis	Asteraceae	Golden aster
Rosa	Rosaceae	Rose
Gerbera daisy	Asteraceae	Gerbera
Delonix regia	Fabaceae	Flame tree
Delonix regia var. flavida	Fabaceae	Yellow Bloom

Extraction

The samples (2.5 g each) were grounded with a mortar and pestle and mixed with solvent. Three different solvents (10 ml) (i.e.) Petroleum ether, diethyl ether and ethanol were used. The solution was filtered using Whatman No. 1 filter paper. The filtrate was centrifuged at 10,000 rpm for 10 minutes. The aqueous phase was collected and stored at 4˚C.[7]

Measurement of Absorbance

Absorbance was measured using UV-Vis spectrophotometer [8] at a wavelength of 445nm.

Concentration of lutein was calculated using the following formula;

$$\text{Concentration of lutein (µg/g of sample)} = \frac{A \times V(ml) \times \text{dilution factor}}{E^{1\%}\ cm \times w\ (g)}$$

Where,

A =Absorbance,

V = Volume (ml),

$E^{1\%}$ cm = Extinction coefficient of solvents

W= Weight in (g)

Test for carotenoids

The colour of sample containing pigments in solvent disappears after the addition of 5% solution of sodium nitrite and 0.5M H_2SO_4. This test was performed for samples in order to confirm the presence of carotenoids.

Figure 1: Sources of Lutein employed in this study

RESULTS AND DISCUSSION

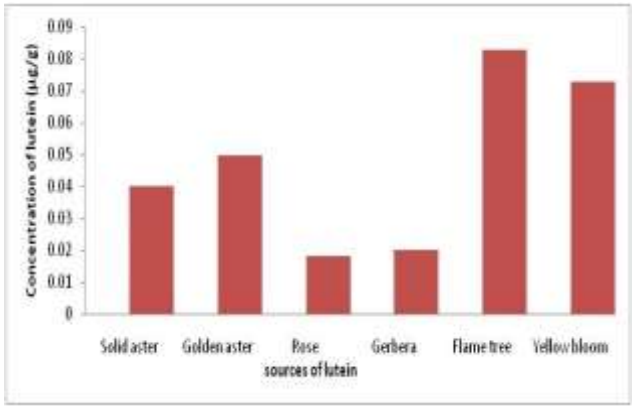

Figure 2: Concentration of lutein in Ethanolic extracts

The experiment was carried out to look for the most suitable raw material for extraction of lutein. The lutein extraction was carried out in all the sources mentioned in Figure 1 with different solvents such as Ethanol, Diethyl ether and petroleum ether the most preferred solvents for extracting lutein and the results were shown in Figure 2, Figure 3 and Figure 4 respectively.

The colour of the residue was found to be yellow which indicates the complete extraction of lutein from these sources. The extracted lutein was estimated in UV-Vis spectrophotometer at 445nm.

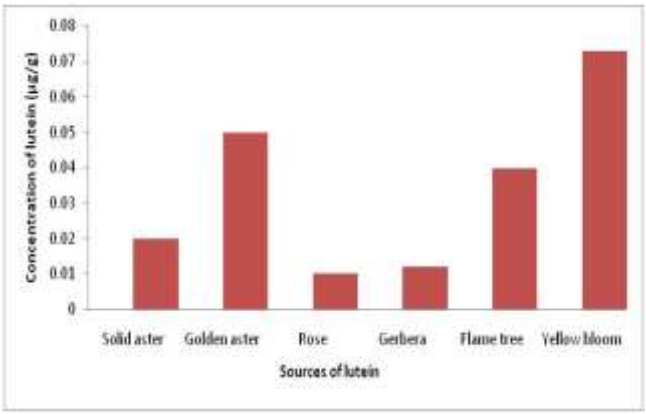

Figure 3: Concentration of lutein in extracts of Diethyl ether

In this set of experiments the maximum extraction was found to be higher in ethanolic extracts from flowers of flame tree among the flowers investigated and estimated to be 0.083µg/g. The least was found in extracts of Petroleum ether from Rose and estimated to be 0.01µg/g. However, Rajashree Hajare et al., has reported that the ethanolic extracts from marigold was found to have the highest content of lutein(1.163 µg/g) among the various sources employed for the study.[9]

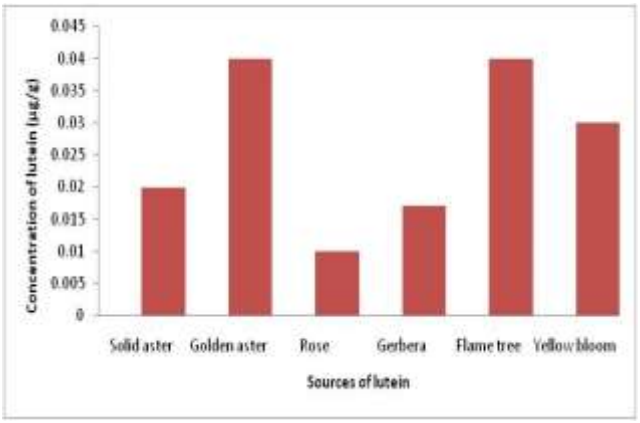

Figure 4: Concentration of lutein in petroleum ether

CONCLUSION

Lutein is of major commercial interest because of its use in functional food and cosmetics, as well as in pharmaceuticals. The production yield is very important for the large-scale extraction of lutein, in terms of cost efficiency. In this study, "Ethanolic extracts from flowers of flame tree" was determined to be the best candidates for the commercial extraction of lutein, because of their

yield and antioxidant activities among other flowers employed in the experiment. Moreover it is observed that the yield of the extraction depends on the solvent used also. However ease of purification of this antioxidant needs further study.

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