Antioxidant Activity of Carotenoids Extracts from *Hippophae rhamnoides*

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Abstract

The paradox of aerobic life is that oxygen, which is vital for aerobic organisms, can be dangerous for their existence. This is principally due to the metabolic process of the tissues, that form reactive species such as free radicals. The danger of these molecules is derived from the presence of unpaired electrons on their outer valence shell.

Carotenoids are present in all the photosynthetic tissues, in flowers, fruits, pollens, seeds and have a wide variety of functions: pro-vitamin A activity, important function in the photosynthesis, protection of cells and organisms against the harmful effects of light, air and sensitizer pigments, antioxidants by reacting with active oxygen species. The study of the antioxidant effect of carotenoids showed that these pigments delayed the formation of hydroperoxide.

This work aimed to verify carotenoids antioxidant activity in raw sunflower oil, oxidised with Cu^{2+} ion. In order to evaluate this activity it was used standards of β-carotene, lutein and total carotenoids extract from seabuckthorn (*Hippophae rhamnoides)*, which is rich in lutein and β-carotene.

Quantification of pigment was carried out from maximum absorbance obtained by means of visible absorption spectra, according with next formulae:

μg carotenoid / ml = DO_{445nm} x dilution / 250

where DO_{445nm} is optical density of carotenoids at 445nm.

Sunflower oil was treated with a minimum volume of $CuSO_4$ 100mM solution calculated to induce peroxydation and antioxidant activity of standards and extract was evaluate by decreasing of their amount, measured at 445nm after 1h and 50^0C heating, 24h and 50^0C heating, 48h and 50^0C heating.

Concentration of carotenoids standards used were 100μM, 200μM and 1000μM lutein and β-carotene, and 0.0075mg carotenoids/ml and 0.0125 mg carotenoids/ml from *Hippophae rhamnoides* extract.

It was verified that carotenoids had a differentiated degradation in this system, according with their chemical structure and different concentrations.

By these means, concentrations of β-carotene 100μM, 200μM and 1000μM after 1 hour of treatment with copper ion decrease with 8.2%, 3.5% and 39.9%; after 24 hours the decreasing were 71.7%, 73.6% and 61.4%; after 48 hours the percentage were 74.95%, 81.3% and 71.1%.

Concentrations of lutein 100μM, 200μM and 1000μM after 1 hour of treatment with copper ion decrease with 0.5%, 30.1% and 43.2%; after 24 hours the decreasing were 51.3%, 59.6% and 45.5%; after 48 hours the percentage were 49.9%, 57.3% and 79.9%.

Concentrations of total amount of carotenoids extracted from seabuckthorn were 6.7% and 19.7% after 1 hour for the first (0.0075mg car./ml), respectively second (0.0125 mg car./ml) carotenoids concentrations used; after 24 hours the percents of carotenoids degradation were 40.54% and 41.43% ; after 48 hour the decreasing were 57.72%, respectively 58.14%.

As it can be seen by the above results, for this system the best antioxidant activity had lutein especially at higher concentration. Comparative with lutein, β-carotene had good effect at lower concentration, with almost 8% higher antioxidant activity after 1 hour, 20% after 24 hours and

25% after 48 hours. Carotenoids extract had similar effect at the two concentrations used. Comparing with standards, the antioxidant activity of carotenoids extract from seabuckthorn is similar with 200μM and 1000μM concentration of luthein.

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The results of these experiments lead to the conclusion that chemical groups of carotenoids have great influence in the prevention of lipid peroxidation. The hydroxyl group of lutein contributed to the increasing of antioxidant activity, especially at the higher concentrations used in this work.

Key words: carotenoids, seabuckthorn, oil peroxidation

sa2008_a0418