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Dynamics of accumulation of antioxidants and vitamin P in leaves and fruits of plants of stem Carya L. during vegetation

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Plants organisms possess sufficient resistance to oxidizing damages which arise only at sharp change of a physiological condition of a plant or influence of various external factors (light, temperature, etc.). It is caused by existence in a vegetative cell effective antioxidant systems. The purpose of work was studying dynamics of accumulation of water-soluble antioxidants and vitamin P in leaves and fruits of plants of stem Carya L. (C. tomentosa and C. cordiformis) during vegetation in ecological conditions of the Kaliningrad area.

Researches were spent from May till October, intensity of light and temperature of air was considered. Dynamics of accumulation of antioxidants in leaves of plants of stem Carya L. Has shown, that at the studied kinds in the beginning of vegetation (the end of May – the beginning of June) has noted been the highest level of antioxidants. In the beginning of summer (June) their content decreased, however, from the end of July, the pool of antioxidants again raised. The maximal content of antioxidants during the autumn period has been fixed on 20-th week of research. By the end of vegetation (last weeks of October) the level of antioxidants in leaves decreased to following values: at C. tomentosa – with 17,97 up to 12.95 mg/g, and at C. cordiformis – with 16.93 up to 10.08 mg/g. The same high values antioxidant activity were characteristic to young leaves in the first week of vegetation.

During ripening fruits (18-th – 23-rd weeks of research) C. tomentosa and C. cordiformis the level of antioxidants in them changed within the limits of 2.84 – 3.23 mg/g and 2.45 – 4.15 mg/g accordingly. The content of antioxidants in fruits was below, than in leaves.

Thus, a level of antioxidants in leaves of plants of stem Carya L. during vegetation changed as follows: in the beginning vegetations (May) the pool raised and in the summer – decreased and only in the autumn, as well as in the spring, the increase in the content of antioxidants has noted been. In fruits the level of antioxidants always was below, than in leaves. Positive correlation between the content of antioxidants in leaves and ripening fruits of the studied kinds and intensity of light, and also temperature it has not been revealed.

Maximum level rutin in leaves of representatives of stem Carya L. In the beginning of the period of vegetation it was marked on 2-nd week of research and has made (36.8 and 40.53 μg/g for C. tomentosa and C. cordiformis accordingly). In the summer decrease in a pool of vitamin P was observed. In the middle of October (on 23 week of research) the content rutin was minimal: C. tomentosa – 4.8 μg/g, and at C. cordiformis – 6.4 μg/g.

During all period of ripening of fruits (18–23 week), investigated kinds were characterized by decrease in a level rutin which changed within the limits of 4.8–9.6 μg/g. The maximal content of vitamin P in fruits C. tomentosa has been revealed on 20-th week, and at C. cordiformis on 19-th week of research, i.e. in the end of September.

Thus, representatives of stem Carya L. (C. tomentosa and C. cordiformis) were characterized by similar dynamics of accumulation rutin in leaves. In the beginning of the period of vegetation (the middle of May-the beginning of June) was marked its raised content, in the further the pool rutin decreased down to the end of vegetation. Dynamics of accumulation of vitamin P in fruits, also as well as in leaves, was characterized by decrease in a level rutin in process of their ripening.

The statistical analysis of data has shown, that between intensity of light and the content the rutin in leaves has been revealed positive correlation dependence ($r = 0.67$; $r = 0.65$ for C. tomentosa and C. cordiformis accordingly). Also positive correlation between accumulation of vitamin P in leaves and fruits of plants of stem Carya L. (for C. tomentosa $r = 0.62$ has noted been; C. cordiformis $r = 0.86$).

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Contribution of hydrophilic fractions to the antioxidant activity in selected fruits

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Fruits and vegetables provide our diet with a complex mixture of natural substances, especially lipophilic phenolic compounds, with well documented antioxidant properties. The major aim of the present study was to evaluate the antioxidant activity of the hydrophilic fraction in pulp, peel, grain and juice of various types of fruits.

The selected fruits (lemon (Citrus limon), orange (Citrus sinensis), grapefruit (Citrus paradise), apple (Malus domestica), pear (Pyrus communis), and peach (Prunus persica) were portioned into pulp, peel, and grain samples and hydrophilic extracts of the samples were prepared. Juices from all types of fruits were also prepared. A luminol-enhanced chemiluminescence method was used to follow up the ability of studied samples to scavenge peroxyl radicals produced by thermal decomposition of 2,2′-azobis(2-amidinopropane).

The highest antioxidant activity was observed in juices of individual fruit samples. This observation is in a good concordance with a high antioxidant activity detected in pulp samples. A lower antioxidant activity was seen in peel samples and the lowest antioxidant activity was recorded in grains of the fruits studied. Irrespective of the parts of fruits, the absolutely most efficient antioxidant activity was observed in lemon samples. Generally, the citrus fruits (Rutaceae family (lemon, orange, and grapefruit)) showed higher antioxidant activity when compared to the fruits of Rosaceae family (apple, pear, and peach). Interestingly, some apple samples (pulp and juice) exerted antioxidant activity comparable to that of citrus fruits.

It can be summarized that hydrophilic antioxidants contribute to the total antioxidant activity of fruits to a great degree.

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