DERIVATIZATION AND ANALISIS
OF CAROTENOIDS ERIGERON ANNUUS L HERB.

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Introduction. Carotenoids are the most widely distributed pigments in nature. Carotenoids are a class of pigments rangingfrom yellow to red in color and are found ubiquitously in plants (bothedible and nonedible) and photosynthetic microorganisms. Due to the coloring properties of carotenoids, they are often used in food, pharmaceutical, cosmetics, and animal feed industries. Carotenoids are responsible for the red color in tomatoes, orange in sweet potatoes, and yellow in squashes. Carotenoids are converted to vitamin A as the body needs, with varying degrees of conversion efficiency. The forms of provitamin A carotene are found in dark green and yellow-orange leafy. Darker colors are associated with higher levels of this provitamin. Carotenoids have been extensively studied in different matrices to analyze their distribution and levels, as diet richin carotenoids imparts health benefit properties. In plants, they act as accessory pigments for photosynthes is and precur-sor to plant hormone ABA and strigolactones. They are 40 carbon highly unsaturated hydrocarbons derived from isoprene units and composed either entirely of carbon and hydrogen (carotenes) or carbon, hydrogen, and oxygen (xanthophylls). There are over 700 known carotenoids to date. One function of carotenoids in plants is to aid photo-synthesis, mainly by absorbing light and protecting against photosensitization. Additionally, the carotenoid biosynthetic pathway also produces abscisic acid, a critical plant hormone involved in plant growth and response to environmental stress. From several hundred naturally occurring carotenoids, only 50 have significant biological activity and they can be divided into two groups, with and without the provitamin A. The carotenoids that are precursors of vitamin A should have at least one ring of β-ionone not replaced and side polienic chain with at least 11 carbons. Some carotenoids have provitamin A activity (including b-carotene, α-carotene, and b-cryptoxanthin; those carotenoids with a b-ionone ring) while most do not (lycope-ne, lutein, zeaxanthin, etc.). Additionally, consumption of carotenoidrich foods (including those containing carotenoids that cannot be converted to vitamin A) has been associated with a decreased risk of disease, including cancer, and cardiovas-cular disease. Carotenoids can act as antioxidants by reacting with free radicals, including singlet oxygen and peroxyl radicals. Moreover, biological matrices often contain hundreds to thousands of other plant metabolites that interfere with detection of carotenoids. The presence of conjugated double bonds and cyclic groups at ends leads to the formation of variety of stereoisomers. Innature, carotenoids existas cis/trans isomer, however, they existprimarily in the more stable all-trans isomeric form, but cis isomers do occur. Different carotenoids vary significantly in their ab-sorption maximaas well as in their fine structure. Absorption spectra of carotenoids are unique, mostly showed three proximately distinct peaks. The ratio of absorption peak heights from the trough between peak II and III is used for distinguishing caro-tenoids and their isomers. The isomers can also often be tentatively identified by the presence of a “cis peak”. Carotenoids are involved in various defense mechanisms: due to the presence of bound double bonds, they can bind singlet oxygen and inhibit the formation of free radicals, preventing their negative effect on the body. Provides protection against ultraviolet radiation. They have antioxidant properties, protecting sensitive tissues and labile compounds from oxidation. One of the most important functions of carotenoids is A provitamin activity. Human and animal are not able to synthesize vitamin A, which is essential for vision, growth, reproduction, protection against various bacterial and fungal diseases, normal functioning of the skin and mucous membranes. An important function of carotenoids is the ability to form complexes with proteins. This ability causes changes in membrane permeability. Carotenoids can maintain the body's water balance, promote the work of olfactory receptors and chemoreceptors.

Aim. This work is devoted to the study of carotenoids of Erigeron annuas L herb.

Materials and methods. Extraction of Carotenoids.As carotenoids are lipophilic compounds, they are usually extracted using a mixture of organic solvents. The solvents used depend on the sample matrix and the relative polarity of the carote-noids of interest. For extraction of carotenoids from plant samples, mixture of differ-rent extraction solvents comprising diethyl ether: chloroform (1:2), methanol: chloro-form: dichloromethane (1:2:1), methanol: chloroform: acetone (1:2:1) and dichloro-methane: chloroform (1:2) were evaluated. Of these, a better resolution and recovery was obtained with dichloromethane: chloroform (1:2), as it does not contain metha-nol, therefore it also eliminates the metabolites interfering with the detection of caro-tenoids. Homogenization of the sample with the extracting solvents is preferred for complete quantitative analysis. During liquid–liquid extractions, carotenoids are par-titioned into the organic phase, which is removed and evaporated prior to chromategramphic analysis. UV/Vis Spectophotometric Methods. As a result of a series of conjugated double bonds, most carotenoids absorb in the range of 400–500 nm (although some lycopene precursors, such as phytoene and phytofluene, absorb maxi-mally in the UV region). Spectral information is a useful tool for distinguishing and identifying different carotenoid species; however, it is important to keep in mind that, for common carotenoids, the UV/Vis spectra only provides information about the chromophore of the carotenoid. For example, α-carotene and lutein cannot be identi-fied from each other solely by spectra, and other factors, like retention time, must be considered in distinguishing between these two compounds. Additionally, carotenoid spectra can be influenced by different solvents and carotenoids can interact with pro-teins and lipids, altering spectral characteristics. Carotenoids are unique in that many species usually have three more-or-less distinct peaks instead of a single band. Diffe-rent carotenoids can vary significantly in their wavelength of maximum absorption as well as in their fine structure.

Results and discussion. Soxhlet extraction is a type of atmospheric liquid extraction, utilizing solvents at boiling temperature and low pressures (ambient pres-sure), for the selective extraction of targeted compounds. Soxhlet extraction is a con-ventional technique providing the highest recovery of carotenoids. Thus, it is com-monly used for evaluating the performance of other methods. However, it's time consuming, and also uses significant amounts of solvents, thus increasing the cost of extraction. Additionally, the high temperature and long extraction time increases the possibilities of thermal degradation and cis-trans isomerization of carotenoids. Obtai-ning a lipophilic extract from Erigeron annuus L. herb took 30 g (exact sample) of the raw material and was extracted in a Soxhlet apparatus, solvent (500 ml chloroform). The yield of the lipophilic extract was 3.03%. Quantitative determination of carote-noids was performed by spectrophotometric method. 0.01 g (exact sample) of the lipophilic fraction was dissolved in 96% ethyl alcohol in a 25.0 ml volumetric flask, the optical density of the resulting solution was determined on a "Specord 2000" spectrophotometer at 440 nm in a cuvette with a layer thickness of 10.0 mm. Compensation solution - 96% ethyl alcohol. The concentration of carotenoids was calculated by the formula:

$$C_{carot.} = 4{,}7 * A_{440} - 0{,}27 * C_{chl.a+chl.b}, \text{ where}$$

A_{440} - optical density of the solution at a wavelength of 440 nm;

$S_{chl.a+chl.b}$ - concentration of chlorophylls (mg / l) α and b in solutions.

The content of carotenoids (mg / 100g) was calculated by the formula:

$$X = \frac{Ccarot \cdot V \cdot 100}{m \cdot 1000}, \text{ where}$$

In lipophilic herb extract of carotenoids the content of carotenoids is 1.6%.

Conclusions. Studies show the relationship between increased consumption of foods rich in carotenoids and the risk reduction of various diseases. The presence of carotenoids in Erigeron annuus L. herb has been determined by a spectrophotometric method. The study of biologically active compounds from Erigeron annuus L. herb is ongoing.

DETERMINATION OF FORMALDEHYDE BY REACTION WITH POTASSIUM CAROATE

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Introduction. Formaldehyde is produced worldwide on a large scale by catalytic, vapour-phase oxidation of methanol. Formaldehyde is used mainly in the production of various types of resin. Phenolic, urea, and melamine resins have wide uses as adhesives and binders in the wood-production, pulp-and-paper,