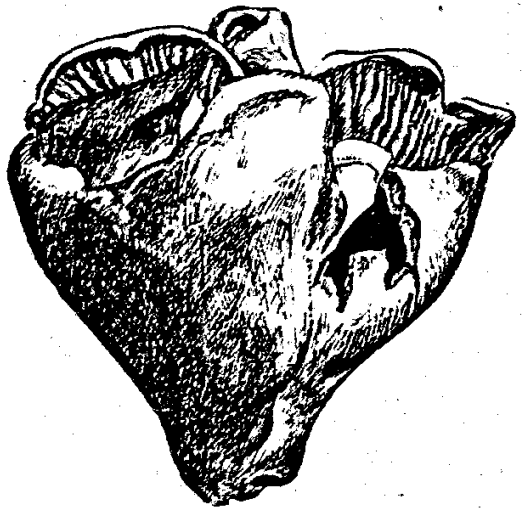

Fig. 1. Peziza-like teratology of Clitocybe odora (1/1).

area populated with many other species of Basidiomycetes such as: Amanitu citrina (Schff.) S.F.Gray, Collybia asema Fr., Collybia butyracea (Bull.ex Fr.) Quél., Cortinarius trivialis Lge., Cystoderma amiantinum (Scop.ex Fr.) Fay., Hypholoma fasciculare (Huds.ex Fr.) Kummer, Laccaria amethystina (Bolt.ex Hooker) Murr., Lepista nebularis (Fr.) Harmaja, Lepista nuda (Bull.ex Fr.) Cke., Mycena inclinata (Fr.) Quél., Mycena pura (Pers.ex Fr.) Kummer, Mycena pura var. rosea (Schum.) ex Kühner, Paxillus involutus (Batsch) Fr., Pluteus atricapillus (Scor.) Sing., Psathyrella hydrophila (Bull.ex Merat) Quél., Stropharia aeruginosa (Curt.ex Fr.) Quél., Xerocomus chrysenteron (Bull.ex St.Amans) Quél.

It is to be noted that in Romania this has been the first teratological case with Clitocybe odora reported so far.

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INSTITUTUM AGRONOMICUM "DR.PETRU GROZA" CLUJ-NAPOCA/ROMANIA/
NOTULAE BOTANICAE HORTI AGROBOTANICI 1981, XI.

CHEMATAXONOMIC RESEARCHES IN HIGHER PLANTS. XV. CAROTENOID AND CHLOROPHYLL PIGMENTS IN THE LEAVES OF CANNABIS SATIVA L.

G. NEAMȚU, GH. ILLYÉS, ECATERINA POP

Abstract:
NEAMȚU G., ILLYÉS GH., POP ECATERINA, 1981, Chemataxonomic researches in higher plants. XV. Carotenoid and chlorophyll pigments in the leaves of Cannabis sativa L., Not. Bot. Hort. Agrobot. Cluj., 1980, XI, 57 - 60. In the leaves of Cannabis sativa L there were found the following carotenoid pigments: β-carotene, lutein, zeaxanthin, violaxanthin, neoxanthin and β-cryptoxanthin The ratio between the content of β-carotene and lutein - which are the principal foliar carotenoids - was supraunitary, a feature that might be used as a chemotaxonomic criterion. It is worth to be mentioned the relatively high content of zeaxanthin and β-cryptoxanthin in comparison with the level of these pigments in the leaves of most higher plants. The ratio between the content of chlorophyll a and b was of 2,17.

Index words: Cannabis sativa, carotenoid pigments, chlorophyll.

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Within the frame of our chemotaxonomic investigations on higher plants, we carried out a study on carotenoid and chlorophyll pigments from female plants of Cannabis sativa, in view of identifying the specific and characteristic pigments of this species, rich in narcotic, hypnotic, sedative, diuretic and excitant substances (1). In spite of its wide area of spread, as hemp is cultivated in numerous countries as an important fibre plant, there were no available data regarding to its carotenoid and chlorophyll pigments.

Material and method

The identification and determination of carotenoid and chlorophyll pigments was performed on fresh leaves harvested in September 1979 from female species of hemp C.sativa, cultivated on the fields of the Didactic Experimental Station of the Agronomy Institute of Cluj-Napoca.

The extraction of pigments from the leaves was carried out with acetone up to the point when the extract became colourless. The pigments from the acetonic extract were subsequently transferred into petroleum ether. For the separation and purification of pigments, it was mostly utilized the column chromatography using as adsorbant a mixture of magnesium oxide and fine sand in a weight ratio of 2:1. The purification of carotenoids was carried out on adsorbant columns consisting of magnesium oxide and silica gel in a volume ratio of 1:2. The chromatographical columns were developed with a mixture of petroleum ether - benzene - acetone in ratio of 7:2:1.

For the mixture chromatograms it was used also the thin layer chromatography having MgO and silica gel as adsorbant in a volume ratio of 1:1 and as developing solvent, a mixture of petroleum ether - chloroform - ethilic alcohol in ratio 30:2:1.

The identification and determination of carotenoid and chlorophyll pigments, was carried out by means of the very same chromatographic and spectrophotometric methods already used in previous investigations (3-5).

The content of pigments shown in Table 1, is the average of three determinations.

Results and Discussion

The chromatogram and content of carotenoid and chlorophyll pigments from the leaves of Cannabis sativa are given in Table 1.

In the leaves of Cannabis sativa were found common carotenoids frequently present in the leaves of autotrophic plants. The proportion between the principal foliar carotenoids - β-carotene and lutein - was superunitary in an inverse ratio comparatively to the majority of terrestrial higher plants, a fact which might be considered as a chemotaxonomic criterion for the Cannabis genus.

As a characteristic feature there could be mentioned the relatively highy content of zeaxanthin and β-cryptoxanthin versus the content

of these pigments in the leaves of most other higher plants (5).

The carotenoid pigments were present in the leaves in a free state and not under the form of esters.

In the leaves of hemp prevailed - from a structural standpoint - the carotenoids with a β-ionone structure. Amongst the carotenoids with an α-ionone structure, there was identified only the lutein. However, there was impossible to assess any correlation between the nature (kind) of carotenoids and the content in narcotic substances. In the absence of such correlation, it was concluded that the carotenoid pigments did not contribute to the formation of narcotic, sedative, hipnotic etc. substances existing in the leaves and seed of C. sativa.

Tab. 1.

Content and chromatogram of carotenoid and chlorophyll pigments from the leaves of Cannabis sativa (μg/g DM)

Pigments	Maximum of absorption in petroleum ether in nm			Quantity in μg/g
A. Carotenoid pigments				
Neoxanthin	466,	435,	417	68,4
Violaxanthin	467,	438,	418	88,7
Zea xanthin	478,	448,	424	126,3
Lutein	470,	444,	422	478,2
β-cryptoxanthin	475,	445,	425	65,1
β-carotene	477,	448,	424	528,6
Total of carotenoids		-		1355,3
B. Chlorophyll pigments				
Chlorophyll a	640,	590,	458	647,2
Chlorophyll b	660,	618,	420	288,0
Total of chlorophylls		-		945,2

As the leaves of this species had a high content of β-carotene considered as the principal pro-vitamin A, we deemed advisable to use the leaves of Cannabis sativa as principal sources for obtaining β-carotene and β-cryptoxanthin, these carotenoids playing the role of pro-vitamins A.

Amongst the non-provitaminic carotenoids, lutein and zeaxanthin might be used as supplements to the basal diet of poultry and fish, in order to intensify the pigmentation of the body and of the egg yolk and to improve the biological value of alimentary products of poultry and fish origin.

It should be noted that so far the leaves of C.sativa have not been utilized from this point of view, so that yearly great amounts were lost. If the leaves of C.sativa were used in the diet of poultry as sources of carotenoids (both provitaminic and non-provitaminic), there could be spared great amounts of maize flour, presently used in the poultry rearing units as sources of carotenoids.

At the same time this raw material could be turned to a better account, instead of utilising it, - as it happens in various countries, - for producing narcotic drugs, especially of hashish.

As far as the chlorophyll pigments are concerned, it should be pointed out the relatively high content of chlorophyll b. The ratio between chlorophyll a and b was 2,17 times lower that in the instance of several other higher plants.

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INSTITUTUM AGRONOMICUM "DR.PETRU GROZA" CLUJ-NAPOCA/ROMANIA/
NOTULAE BOTANICAE HORTI AGROBOTANICI 1981, XI.

WHEATGRASS VARIABILITY (AGROPYRON, SECT. ELYTRIGIA) IN A NATIVE COLLECTION FROM TRANSYLVANIA. II. AGROPYRON REPENS (L.)P. BEAUV.

A.T. SZABÓ

Abstract:
SZABÓ T.A., 1981, Wheatgrass variability (Agropyron Sect. Elytrigia) in a native collection from Transylvania, II. Agropyron repens (L.) P. Beauv. Not. Bot. Hort. Agrobot. Cluj, XI,61 - 68.
In continuation of former studies regarding Wheatgrass variability (Agropyron Gaertn. sect. Elytrigia /Desv./Rchb.) carried out on 89 different populations collected along a transect in Transylvania (Not. Bot. Hort. Agrobot. Cluj, 1979, X. 89-99) results regarding 31 A.repens (L.) P.Beauv populations are presented in this paper.

Average values per population for open pollination fertility (OPF) varied between 0.0 - 40.0 %; spike length: 59-196 mm; spikelet length: 8.8-17.0 mm; number of caryopses per spike 0.0-40.0 etc.

The results may contribute to the explanation of some microevolutionary processes and differential spreading patterns found in Elytrigia section.

Index words: Agropyron repens, A. intermedium, OP fertility, phenetic variability, germination.

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Phenetic and genetic studies carried out in the members of the genus Agropyron by Y.CAUDERON 1966, D.R.DEWEY 1961-1978, S.SAKAMOTO 1966-1978, G.L.STEBBINS et al. 1946 and others suggests a complex reticulate evolution of the taxa concerned. Results regarding the pat-