ECOPHYSIOLOGICAL RESEARCHES IN CROP PLANTS AT AGROECOSYSTEMS FROM NORTHEASTERN ROMANIA

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This present study is an approach of the physiological aspects of cultivated plants as ecological point of view. It were analyzed the photosynthetic pigments and sugars metabolism in crops plants(gramineous plants: Avena sativa varieties, Zea mays L. and leguminous plants:Medicago sativa as perenne and Soja hispida) from stations in Northeastern Romania belonging of two great geographic units: Moldavian Plain and Prut Meadow, middle section. The mean of analyzed photosynthetically parameters in cultivated plants in Moldavian Plain had a greater values not only in comparison with the mean of the same parameters of species from hay fields and pastures studied in Moldavian Plain but also than the same cultivated plants from others agroecosystems in Prut middle meadow.

Key words *:Moldavian Plain, Prut Meadow, chlorophylls, sugars*

The physiological studies about Moldavian Plain are few and fragmentized. There are more about other ecosystems in North-eastern Romania, middle Prut Meadow because of the anthropic interventions(dykes, embankments, with the agricultural purposes) during eighties, the vegetations were became from hygrophilous one to an steppic one, resisting to great drought in the summers and to flooding in the springs(Antohe et al., 1998).

From the 2006 until now, it were performed some interdisciplinary studies about Moldavian Plain. It was studied from an ecological point of view the natural and anthropized ecosystems from this great geographic region. It were analyzed the photosynthetic pigments and sugars metabolism of the dominant species in hay fields, patures, natural forest, plantation and agroecosystems [1].

The aim of this paper is to evaluate the photosynthetic capacity and sugars metabolism in the cultivated plants at agroecosystems from Northeastern Romania (Moldavian Plain and Middle Prut Meadow). The results will be given the informations about the metabolism capacity and the comparison with the others ecosystems plant metabolism from the same areas will able to find out some more about the adjustment to the environment of this species.

MATERIAL AND METHOD

The biological samples used were fresh leaves from cultivated plants.

The stations investigated were the following: Sculeni, Cotu Morii-Iasi Couty representing agroecosystems from Middle Prut Meadow, and as well as Zaboloteni, Dămideni and Răuseni-Botosani county representing the Moldavian Plain.

It were analyzed photosynthetic parameters as chlorophyll a, chlorophyll b and carotenoids complex by the method with acetone 85 % Meyer-Berthrand modified by Ştirban, 1985 [8]. The results were expressed in mg/g fresh weight (mg/g fr.w.).

It also, performed the analysing of the sugars metabolism about monosaccharides, dissacharides and polysaccharides by the method Berthrand and Borell, 1953. The results were expressed in g of glucosis per cent (g %) from dry matter.

RESULTS AND DISCUSSIONS

The studies about the Moldavian Plain are practic inexistent as a ecophysiological researches.

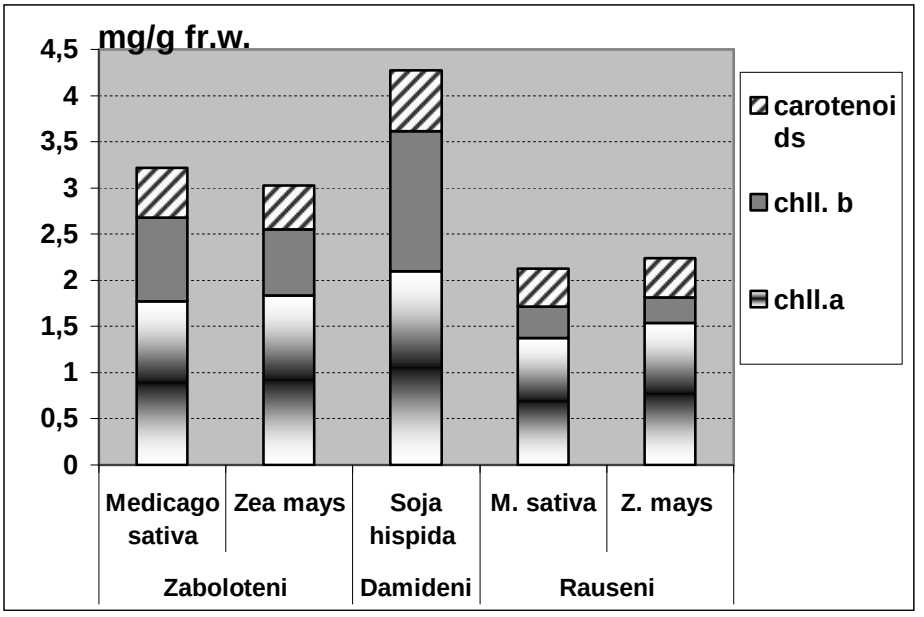

Figura 1 **Variation of photosynthetic parameters in cultivated plants from Moldavian Plain**

According with most authors, chlorophylls are going to a maximum during flouring phenophasis, after a period of a month these parameters decreased [4, 6]. As is presented in *fig. 1* photosynthetic pigments presented a different register of values of them. Thus, **chlorophyll a** registered the variation between 2,096 mg /g fr.w (*Soja hispida*, Dămideni station) until 1,378 mg /g fr.w (*Medicago sativa*, Răuseni station), **chlorophyll b** between 1,518 mg /g fr.w(*S. hispida*, Dămideni

station) until 0,274 mg /g fr.w(*Zea mays*, Răuseni station) and **carotenoid pigments** between 0,655 mg /g fr.w (*Soja hispida*) until 0,409 mg /g fr.w (*Medicago sativa).*

The values of photosynthetic pigments are lower at station Răuseni(having closer values of both analyzed species) probably of the reactions of PS II (photosystem II) and closure of the stomata because of changing the intensity of light (sun was gone into clouds and started raining). Native plants have a continuum of stomata responses to a natural light in open environment. Like native plants, crop plants also commonly experience with variable light levels due clouds and within-canopy shading [*5*]. However, little information exists on crop species responses to a variable sunlight under field conditions. Fay et al., 1993 showed a rapid decreasing of rate of photosynthesis under light variation in crop plants.

The greatest values of chlorophylls and carotenoids are observed in *Soja hispida* from Dămideni station (station with higher humidity of soil).

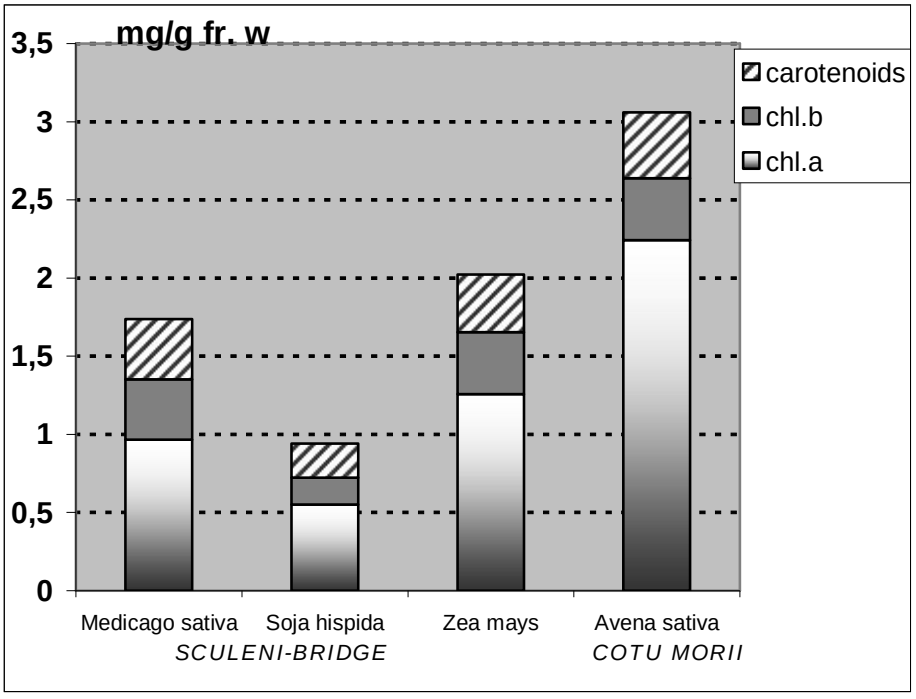

Figura 2 **Variation of photosynthetic parameters in cultivated plants from Middle Prut Meadow**

Analysis of the photosynthetic pigments at crop plants from stations of Middle Prut Meadow was shown that **chlorophyll a** is greater in *Avena sativa*(2,243 mg/g fr.w, from Cotu Morii station) followed by *Zea mays*(1,2583 mg/g fr.w., from Sculeni bridge), both species are gramineous plants. *Soja hispida* registered the lower value of **chlorophyll a**(0,551 mg/g fr.w), from Sculeni-bridge station (*fig. 2*).

Chlorophyll b varied between 0,3943 mg/g fr.w (*Avena sativa, Zea mays*) until 0,1723 mg/g fr.w (*Soja hispida)*. **Carotenoid pigments** varied between 0.4229 mg/g fr.w(*Avena sativa*) until 0,2175 mg/g fr.w (*Soja hispida*).

Generally, speaking from the *figure 2* are observed that highest values of chlorophylls and carotenoid pigments are observed in *Avena sativa*- Cotu Morii and lowest in *Soja hispida*, Sculeni-bridge station. *Avena sativa* is in phenophasis of flowering and grain formation which explained the great values of biophotosynthetic pigments.

From the analyzed station, *Soja hispida* and also, *Medicago sativa* and *Zea mays* found better condition of growth and develop in stations of Moldavian Plain. As it concerning Middle Prut Meadow, the better conditions of optimum synthesis of chlorophylls are found by the *Avena sativa* as it were shown in *fig 1* and *2*.

Tabel 1

Variation of chllorophyll parameters in cultivated plants from Moldavian Plain and Middle Prut Meadow

Stations		Species	Total pigments (chlorophyll +carotenoids)	a/b	a+b/c
Moldavian Plain	Zaboloteni	*Medicago sativa*	3.2187	3.2187	4.9228
		Zea mays	3.0283	3.0283	5.3281
	Dămideni	*Soja hispida*	4.2701	4.2701	5.5135
	Răuseni	*M. sativa*	2.1248	2.1247	4.1861
		Z. mays	2.2399	2.2398	4.2705
Middle Prut Meadow	Sculeni-bridge	*M. sativa*	1.7381	2.5168	3.4947
		Z. mays	2.0233	3.1906	4.4597
		S. hispida	0.9411	3.1992	3.3267
	Cotu Morii	*Avena sativa*	3.0606	5.6880	6.2364

From the table above, crop plants registered the higher values of total content of chlorophylls and carotenoids in species cultivated in agroecosystems from Moldavian Plain. The pedoclimatic conditions offered by the stations of Moldavian Plain are more humid and soil moisture has a better fertility than one of Middle Prut Meadow.

Photosynthetic efficiency reflected by the chlorophyll a/chlorophyll b ratio is closer in analyzed species from the both landscape, Moldavian Plain and Middle Prut Meadow which showed mostly the same conditions of illumination in these agroecosystems of Northeastern Romania. Chlorophyll/ carotenoids ratio had higher values in species *Avena sativa* (Middle Prut Meadow) and respectively, in *Soja hispida* and *Zea mays*(Moldavian Plain) showed in these species the increased a photosynthetic activity.

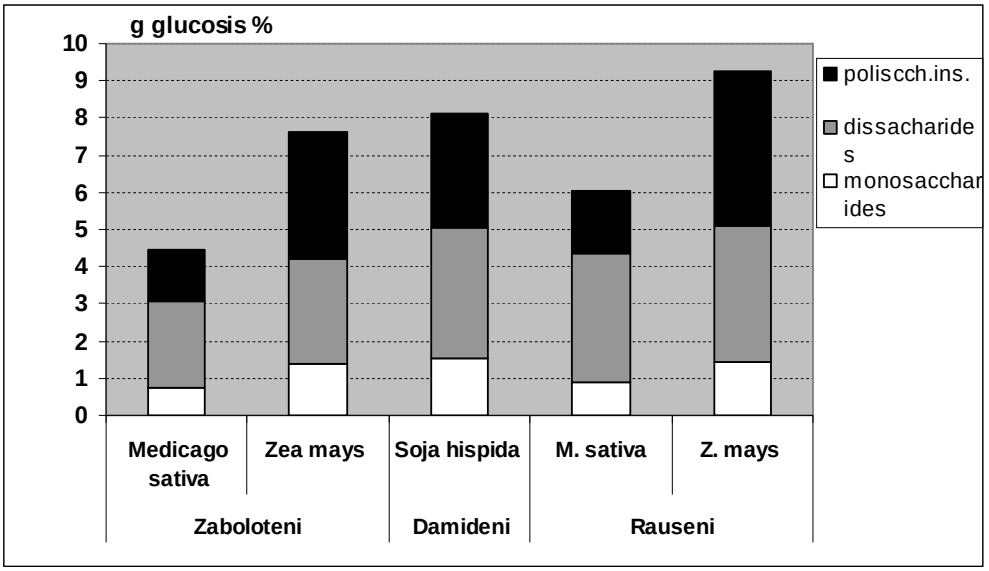

Figura 3 **The values of sugars metabolism in crop plants at different agroecosystems from Moldavian Plain**

From the *figure 3,* it could be observed the parameters analyzed of sugars metabolism were monosaccharides, disaccharides and insoluble polysaccharides.

Monosaccharides registered the values between 1.549 g glucosis % (*Soja hispida*, Dămideni station) until 0.74 g glucosis % (*Medicago sativa*, Zaboloteni station), **disaccharides** between 3.65 and 3.55 g glucosis % (*Zea mays* and respectively, *M.sativa*, Răuseni station) until 2.31 g glucosis %(*Medicago sativa*, Zaboloteni station) and **insoluble polysaccharides** varied between 4.16 g glucosis % (*Zea mays*, Răuseni station) until 1.40 g glucosis % (*Medicago sativa*, Zaboloteni station).

Generally, the greater accumulations of sugars it were registered in annual crop plants (*Zea mays* and *Soja hispida*) because of the allocation of the assimilated as starch, in grains what assured the greater productivity of them.

Some researches in Middle Prut meadow in easy saline soils showed a accumulation of sugars in leaves of crop plants (*Helianthus annus* and *Zea mays*) from 20-50 g % which would supposed to be greater that ones registered leaves from Moldavian Plain [*4*]. This phenomenon is happening because of the concentration of ions in soil solution and also consequently in plants and growth of the osmotic pressure [*1*].

In Moldavian Plain, sugars in crop plant leaves from investigated agroecosystems are comparable with values registered in leaves of dominant species from herbaceous ecosystems, naturals such as hay fields and anthropized ones such as pastures [*2, 3*].

CONCLUSIONS

Average of the photosynthetic pigments of crop plants registered the higher values than values of the same parameters not only in dominant species in studied hay fields and pastures from Moldavian Plain, but also are higher than same cultivated species in agroecosystems from Middle Prut Meadow.

At analyzed station of Northeastern Romania, *Soja hispida* and also, *Medicago sativa* and *Zea mays* found better condition of growth and develop in stations of Moldavian Plain. As it concerning Middle Prut Meadow, the better conditions of optimum synthesis of chlorophylls are found by the *Avena sativa* followed by the *Zea mays* and *Medicago sativa*.

The greater accumulations of sugars it was registered in annual crop plants of Moldavian Plain (*Zea mays* and *Soja hispida*) because of the allocation of the assimilated as starch, in grains what assured the greater productivity of them.

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