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CONTRIBUTIONS TO HALOPHILIC FLORA AND VEGETATION IN OLTENIA (ROMANIA)

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Abstract

The halophilic flora from Oltenia is known only from few localities: Gighera, Seaca de Câmp, Bratovoiești, Sadova, Tâmburești, Piscu Sadovei, Murta, Dobrești, Afumați (Dolj County), Ocnele Mari - Ocnița (Vâlcea County), Osica de Sus, Gura Padinii (Olt County).
By identification of new surfaces with halophilic plant species inside Oltenia region (Rastu Vechi - Dolj County) are brought important contributions regarding the chorology of these plant species, associations and habitats. The halophilic vegetation is fragmentary present near springs and small streams with salt water. From the habitats with halophilic vegetation in Romania on the area investigated by us we find: R1511 West-Pontic communities with Crypsis aculeata, R1514 West-Pontic communities with Trifolium fragiferum, Cynodon dactylon and Ranunculus sardous, R1521 Pontic-Sarmatic communities with Puccinellia limosa and Plantago maritima, R1529 Pontic-Pannonian meadows with Hordeum hystrix and R1507 Pontic-Pannonian meadows with Carex distans, Taraxacum bessarabicum and Aster tripolium ssp. pannonicus. Some of these habitats have a high conservative value (ex. R1521) while others do not know area in this country side (ex. R1507).

Key words: *flora, Oltenia, Romania, salty area, vegetation.*

INTRODUCTION

The origin of the salty fields from Oltenia are either from salt deposits (in case of those from Ocnele Mari - Ocnița area - Vâlcea County) or climate consequences, in which the efflorescence processes or slightly soluble salt exudation, predominates over leaching processes (Țopa, 1954).
The salty lands are easily distinguished from distance by the lighter color compared to the normal soil in that area. The most widespread salty lands in our area belong to solonceac or soloneț types without sodium carbonate (Țopa, 1954; Popescu et al., 2000).
The presence of salty lands lacking vegetation is due to missing air from soil.
The classification of halophilic plant species is different realized from one author to another. Some herbalists (Țopa, 1954; Popescu et al., 2000) are grouping the plant species in 4 big categories: mandatory, preferably, tolerant and accidental, others (Prodan, 1939) in first category, second and third.

Following the consultation of specialty literature which has as study object the halophilic flora and vegetation inside Oltenia area (Buia et al., 1959, 1960, 1961; Șerbănescu, 1963; Păun et al. 1971; Popescu et al., 2000; Răduțoiu, 2013, 2014) and from country (Doltu et al., 1979; Mihai, 1969; Pop, 1968; Prodan, 1922; Sanda and Ciobanu, 1967; Șerbănescu, 1963; Țopa, 1939, 1954, 1965; Dihoru, 1990) we found out that in this side of country are few data (Popescu et al., 2000; Răduțoiu, 2013, 2014, 2017).
Almost 40 years ago, Al. Buia et al. (1961), reported in this area, in the meadows, on low salty soils, numerous species such as: *Trifolium ornithopodioides, T. subterraneum, T. echinatum, T. angulatum, Medicago arabica, M. hispida* and *Scorzonera cana* (*Podospermum canum*).
However, in the consulted research papers, were not found any data regarding the halophilic flora and vegetation from south part of country between Rastu Vechi and Rastu Nou localities. In the IX volume from Romania Flora is mentioned a point for *Aster tripolium*

L. ssp. *pannonicus* (Jacq.) Soó (between Negoiu and Catanele) (Morariu and Nyárády, 1964 in Săvulescu et al.). The identification of appreciable surfaces with this type of vegetation made us to take in study this for having a real situation and to propose the protection of these places being known that the surfaces occupied by this kind of flora and vegetation in Oltenia region are very few.

The territory with halophilic vegetation between Rastu Vechi and Rastu Nou is near the Danube (N43º54'690"; E23º17'161", Alt. 52 m.s.m.). We can say that is placed on the upper terraces of the Danube. It is a flat field with a length of almost 1875 m and a variable width, between 3.75 m and 40 m, totaling over 4 ha.

MATERIALS AND METHODS

For making this study were made numerous field trips starting from 2006, when these salty fields appeared for the first time, after the catastrophic floods from the spring of same year to the present. The collected data were analyzed and compared with those already present from other stations with halophilic vegetation from Oltenia.

The samples that cannot be identified in the field were collected using special material, specific to this study and subsequent identified using the specialty work papers from our country and abroad (Beldie, 1977, 1979; Ciocârlan, 2009; Sârbu et al., 2013; Săvulescu et al., 1952-1976; Tutin et al., 1964-1980). After identification, the material was preserved in the botanical lab to be included in the herbarium from University of Craiova (CRA).

The authors' abbreviations were done according to Brummitt and Powell (1992).

After establishing the existing vegetation type in the research area was made also a framing of it to the Romania habitats (Doniță et al., 2005; Gafta and Mountford, 2008).

The coordinates were noticed using a Garmin etrex 30 GPS.

RESULTS AND DISCUSSIONS

Following analysis of the surfaces occupied by this type of vegetation in the research territory, we can say that the salty lands from here are interesting not only because of plant species but also by the aesthetics given by the color of these plant species flowers. In the lilac sea offered by *Aster tripolium* ssp. *pannonicus* (Figure 1) we find a yellow winding carpet given by *Lotus tenuis* to which fixation participates species like *Trifolium fragiferum* ssp. *bonannii* and *T. repens*, being speckled by their reddish and white flowers.

Figure 1. *Aster tripolium* ssp. *pannonicus* between Rastu Vechi and Rastu Nou localities

On the background of these colors we meet clusters of grasses which diversifies the chromaticity of the place (*Puccinellia limosa*, *Crypsis aculeata*, *C. schoenoides* etc.).

The floral list of salty lands from Rastu Vechi-Rastu Nou area totals a number of 71 taxa:

Phylum Spermatophyta, Magnoliopsida Class, Ranunculaceae Family: *Ranunculus sardous* Cr., *R. sceleratus* L., *Consolida regalis* S.F. Gray, Caryophyllaceae Family: *Cerastium dubium* (Bast.) Guépin, *Gypsophila muralis* L., *Spergularia rubra* (L.) J&C Presl., Chenopodiaceae Family: *Atriplex patula* (L.), *A. prostrata* Boucher ex DC., *A. tatarica* L., *Chenopodium glaucum* L. Polygonaceae Family: *Polygonum aviculare* L., *P. arenastrum* Boreau, *Rumex conglomeratus* Murray, *R. crispus* L. Rosaceae Family: *Potentilla reptans* L., Fabaceae Family: *Lotus tenuis* Waldst. & Kit., *Medicago lupulina* L., *Melilotus albus* Medik., *M. dentatus* (Waldst. & Kit.) Pers., *Trifolium fragiferum* L. subsp. *bonannii* (C. Presl) Soják, *T. repens* L. Lythraceae Family: *Lythrum virgatum* L., Apiaceae Family: *Bupleurum tenuissimum* L., *Peucedanum latifolium* (Bieb.) DC., Malvaceae Family: *Althaea officinalis* L., Brassicaceae Family: *Cardaria draba* (L.) Desv., *Diplotaxis muralis* (L.) DC., *Lepidium perfoliatum* L., *L.*

ruderale L., *Rorippa austriaca* (Cr.) Bess., *R. sylvestris* (L.) Bess. ssp. *kerneri* (Menyh.) Soó, *Sisymbrium polymorphum* (Murray) Roth, Gentianaceae Family: *Centaurium pulchellum* (Sw.) Druce, Boraginaceae Family: *Heliotropium supinum* L., Scrophulariaceae Family: *Gratiola officinalis* L., *Verbascum blattaria* L., Lamiaceae Family: *Mentha pulegium* L., Plantaginaceae Family: *Plantago cornuti* Gouan, *P. uliginosa* F.W. Schmidt, Asteraceae Family: *Achillea collina* Becker ex Rchb., *Aster tripolium* L. ssp. *pannonicus* (Jacq.) Soó, *Bidens cernua* L., *Inula britannica* L., *Lactuca saligna* L., *Matricaria recutita* L., *Pulicaria vulgaris* Gaertn, *Scorzonera cana* (C.A. Mey.) Griseb., *Sonchus arvensis* L. ssp. *uliginosus* (M. Bieb.) Nyman, *Taraxacum bessarabicum* (Hornem.) Hand.-Mazz., Liliopsida Class, Butomaceae Family: *Butomus umbellatus* L., Juncaceae Family: *Juncus bufonius* L., *J. compressus* Jacq., Cyperaceae Family: *Bolboschoenus maritimus* (L.) Palla, *Carex distans* L., *C. divisa* Huds., Poaceae Family: *Agrostis stolonifera* L., *Alopecurus pratensis* L., *Bromus commutatus* Schrader, *Crypsis aculeata* (L.) Aiton, *C. alopecuroides* (Pill. & Mitterp.) Schrad., *C. schoenoides* (L.) Lam., *Cynodon dactylon* (L.) Pers., *Elymus repens* (L.) Gould, *Festuca arundinacea* Schreb., *F. pulchra* Schur, *Hordeum geniculatum* All., *Lolium perenne* L. *Phragmites australis* (Cav.) Steudel ssp. *humilis* (De Not.) Asch. et Graebn., *Poa bulbosa* L., *Puccinellia limosa* (Schur) Holmb., *P. convoluta* (Horrnem.) Hayek ssp. *pseudobulbosa* (E.I. Nyárády) Borza.

The highlighting of ecological particularities of all plant species from the research area allows us to determine the ecological specificity of vegetation in accordance with the complex of local pedoclimatic factors.

The analysis was based on the moisture index because it is the only climatic factor that could be observed and appreciated in the field.

From its analysis it can be observed that first place is occupied by the mesohigrophilic plant species (Table 1, Figure 2) with almost 40%. If we add also the plant species that have an index of moisture close to that one specific to mesohigrophilic species, we can realize that these salty lands belong to the category of those with high humidity. The presence of some xerophilic and mesophilic species can be explained by the periods of drought present in this territory during the summer.

Table 1. The analysis of moisture index

Nr. crt.	Scale for moisture	Nr. taxa
	Mezohigr.	27
1.	Mez.	8
2.	Xeromez.	7
3.	Mezohigr.-higr.	6
4.	Higr.	6
5.	Mez.-mezohigr.	3
6.	Xeromez.-mez.	3
7.	Xeromez.-mezohigr.	2
8.	Mezoxer.	2
9.	Mez.-higr.	2
10.	Eurif.	2
11.	Higr.-hidr..	1
12.	Xer.-xeromez.	1
13.	Xer.	1

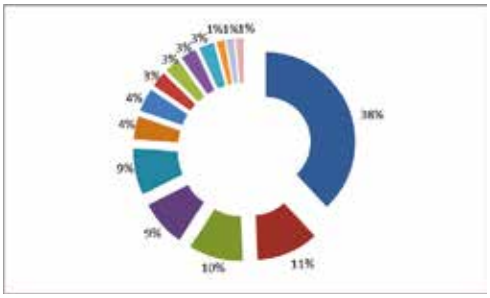

Figure 2. The ecological spectrum of salty lands plant species from the research area

As a general observation on these salty lands, is the lack of the typical species for salty lands: *Camphorosma annua* Pall. *Salicornia europaea* L. and *Suaeda maritima* (L.) Dumort., aspect mentioned also on the salty lands from Seaca de Câmp (Popescu et al., 2000).

From the habitats with halophilic vegetation in Romania on the territory researched by us we find: R1507 Pontic-sarmatic meadows of *Carex distans*, *Taraxacum bessarabicum* and *Aster tripolium* ssp. *pannonicus*, R1511 West-Pontic communities with *Crypsis aculeata*, R1514 West-Pontic communities with *Trifolium fragiferum*, *Cynodon dactylon* and *Ranunculus sardous*, R1521 Pontic-sarmatic communities with *Puccinellia limosa* and *Plantago maritima*, R1529 Pontic-Pannonian meadows of *Hordeum hystrix*.

The vegetation characteristic of these habitats is framed to the next associations: *Taraxaco bessarabici*, *Caricetum distantis* Wendelberger 1943; *Crypsidetum aculeatae* (Bojko 1932)

Ţopa, 1939; *Trifolio fragifero - Cynodontetum* Br.-Bl. et Balas 1958; *Puccinellietum limosae* Rapaics ex Soó 1933, 1936 and *Hordeetum hystricis* (Soó 1933) Wendelberger 1943.

Taraxaco bessarabici, *Caricetum distantis* Wendelberger 1943

This is the association to which the phytocoenosis are enlightened by the caespitose plant species called *Carex distans*.

Next to it, a good representation has *Aster tripolium* ssp. *pannonicus*. The cortege of species is completed by *Taraxacum bessarabicum*, *Festuca pulchra*, *Atriplex hastata*, *Trifolium repens*, *Trifolium fragiferum* ssp. *bonannii*, *Medicago lupulina* and *Cynodon dactylon*.

The vegetation framed to this association is characteristic to the R1507 habitat and has a moderate conservative value.

Crypsidetum aculeatae (Bojko 1932) Ţopa 1939

The phytocoenosis of these association have small plant species in composition. Next to the dominant one (*Crypsis aculeata* - Figure 3) we meet *Aster tripolium* ssp. *pannonicus*, *Taraxacum bessarabicum*, *Crypsis schoenoides*, *Trifolium fragiferum* ssp. *bonannii*, *Cynodon dactylon* etc.

Figure 3. *Crypsidetum aculeatae* from area investigated

These characterize the vegetation of R1511 habitat, that at national level has a moderate conservative value.

Puccinellietum limosae Rapaics ex Soó 1933, 1936 (Figure 4) - is found in those places with higher moisture. The most frequent halophilic plant species in these phytocoenosis are: *Lotus tenuis*, *Hordeum geniculatum*, *Trifolium fragiferum* ssp. *bonannii* and *Carex distans*.

Figure 4. *Puccinellietum limosae* - autumnal aspect

This is the vegetation characteristic to R1521 habitat, that at national level has a high conservative value (Doniţă et al., 2005).

Trifolio fragifero - Cynodontetum Br.-Bl. et Balas 1958

Is characteristic to R1514 habitat. Is recognized through the nucleus of subhalophilic species: *Cynodon dactylon*, *Lolium perenne*, *Gypsophila muralis*, *Ranunculus sardous*, *Consolida regalis* and *Atriplex prostrata*.

Has a low conservative value.

Hordeetum hystricis (Soó 1933) Wendelberger 1943

The surfaces occupied by the phytocoenosis of this association are small (few m^2) and placed in area that become dry during the summer. Next to the dominant species we find: *Cerastium dubium*, *Gypsophila muralis*, *Plantago uliginosa*, *Matricaria recutita*, *Lepidium ruderale*, *Achillea collina* and rare specimens of *Puccinellia limosa*.

It is characteristic to the R1529 habitat and has a moderate conservative value.

In the territory researched by us the salty vegetation in near the one framed to *Phragmitetea australis* because is placed close to a water channel flowing from Seaca de Câmp to Negoi, settlements neighboring to those in between are placed the researched salty lands.

To the west part of the land are present numerous specimens of *Phragmites australis* ssp. *humilis* what makes a cover of 60-70% (Figure 5). This thing let us to think that in the next future will be formed phytocoenosis of the association called *Astero tripolii - Phragmitetum humilis* Krisch (1972) 1974 association that characterizes the R5311 habitat. West-Pontic communities with

Phragmites australis ssp. *humilis* and *Aster tripolium*.

Figure 5. Areas where *Phragmites australis* ssp. *humilis* has a good representation

CONCLUSIONS

Comparing the flora from the territory researched by us with the one of salty lands from other areas from Oltenia region, we can say that the one from other stations is richer in species of *Trifolium* (ex. *T. angulatum*, *T. campestre*, *T. dubium*, *T. echinatum*, *T. hybridum*, *T. ornithopodioides*, *T. pratense*, *T. retusum*, *T. resupinatum* and *T. striatum*).

The influence of zoo-anthropogenic factor is visible on the salty lands vegetation from Rastu Vechi-Rastu Nou area by: their location in the vicinity of agricultural fields, collecting of some plant species by the locals (ex. *Taraxacum bessarabicum*) or by irrational grazing with sheep or goats (rarely horses), that affects the appreciated feed plant species: *Trifolium fragiferum*, *Lotus tenuis*, *Puccinellia limosa*, *Crypsis aculeata*, *C. schoenoides*, *Aster tripolium* ssp. *pannonicus*.

The need for protection of these surfaces with halophilic vegetation in Oltenia is justified not only by the reduced area in Oltenia, but also by the presence of some new habitats for this part of country (R1507) or with high conservative value (R1521).

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