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THE CHARACTERIZATION OF SOME VEGETAL ASSOCIATIONS FROM BAHLUI BASIN ON THE BASIS OF ECOLOGIC INDICES (II)

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Key-words : vegetal associations, ecology, Bahlui basin river.

Résumé: La composition floristique des associations halophytes démontre le caractère aride, de sylvosteppe, prononcé de la végétation, fait prouvé aussi par les éléments méditerrranéens assez bien représentés. L'analyse synécologique évidence la spécificité de la flore et de la végétation et son caractère prépondérant de sylvosteppe. D'un point de vue qualitatif, l'analyse des pourcentages des bioformes montre le fait que la grande majorité des plantes des associations halophytes du bassin de Bahlui sont pérennes (hémi-cryptophytes, plus de 50 %), fait qui assure la stabilité des phytocénoses actuelles. La forte influence anthropique sur la flore et la végétation se reflète aussi dans le grand nombre de terrophytes (20-60 %). A partir de l'analyse du spectre phytogéographique on peut observer que les espèces euro-asiatiques sont les plus nombreuses, ce qui démontre l'appartenance du territoire étudié à la région euro-sibérienne. Le pourcentage relativement important des éléments européens et centre-européens montre le fait que la partie ouest du bassin appartient à la province centre-européenne orientale-capathique. La présence des espèces cosmopolites peut être expliquée par le caractère agricultural de la région et la forte influence anthropique.

1. Introduction

The vegetation from the Bahlui basin belongs most of its part to the silvosteppe area, and to a lesser extent to the forested area. In the silvosteppe area the herbaceous vegetation occupies the territories around the hill forests and the glades inside these areas, being constituted of a xerophytes flora that contains numerous pontic and Mediterranean elements.

The halophyte meadows are frequently met on the inclined slopes, with a declivity of $5\text{-}15^0$ or along the silvosteppe valleys, as smaller or larger areas. The salinized surfaces from the studied area have a higher differentiation degree under the aspect of the salt concentration. As a consequence, the cenosis diversity is high,

being identified more than 25 halophyte associations, representing 12 % of the total number of associations from the basin. The semiarid climate, the substratum generally poor in nutritive elements, with large surfaces affected by salinization processes, favors the maintenance of these vegetal associations.

The main halophyte vegetal associations identified in the Bahlui basin and sinecologically analyzed in this paper are the following:

PUCCINELLIO-SALICORNIETEA Ţopa 1939

PUCCINELLIETALIA Soó 1940

PUCCINELLION LIMOSAE Soó 1933

1. As. *Atriplecetum litoralis* Wi. Christ. 1933) Tx., 1937

2. Fitocenoze cu *Aster tripolium*

PUCCINELLION PEISONIS Wendelbg. 1943 corr. Soó 1957

3. As. *Lepidio crassifolii-Puccinellietum limosae* Soó (1947) 1957

CYPERO-SPERGULARION SALINAE Slavnic 1948

4. As. *Heleochloetum schoenoidis* (Soó 1933) Ţopa 1939

(syn.: *Crypsidetum schoenoides)*

5. As. *Spergularietum salinae* Tx. Et Volk 1973

FESTUCO-BROMETEA Br.-Bl. et Tx. 1943
FESTUCETALIA VALESIACAE Br.-Bl. et Tx. Et Br.-Bl. 1949
FESTUCION VALESIACAE Klika 1931
(syn.: *FESTUCION RUPICOLAE* Soó (1929n.n.) 1940 corr. Soó 1964

6. As. *Artemisio austriacae-Poëtum bulbosae* I.Pop 1979

PLANTAGINETEA MAJORIS Tx. Et Prsg. 1950
PLANTAGINETALIA MAJORIS Tx. (1947) 1950
POLYGONION AVICULARIS Br.-Bl. 1931 emend. Tx.1950

7. As. *Trifolio fragifero-Cynodontetum* Br.-Bl. et Bolos 1958
(syn.: *Trifolietum fragiferi* Morariu 1969)

2. Materials and methods

This paper is part of a complex study of the halophyte associations from the Bahlui basin. In this paper we have in detail described the phytocenoses, the association table, the bioformes and the phytogeographic elements. For the sinecologic study we have used the method of the ecologic spectra, that takes into account the criteria of the presence of the species in association and the ecologic indices of humidity, temperature, soil reaction of each of the species (after Sanda et al., 1983). We have thus evidenced the distribution of the ecologic categories in the

phytocenoses of the analyzed associations, represented by the real presence of the species.

The descriptions of the associations are followed by the comparative sinecologic analysis for the evidentiation of the exigencies of each association in relation to the main ecologic factors (humidity, temperature, soil reaction).

2. Results and discutions

2.1. As. Atriplecetum littoralis (Wi. Christ. 1933) Tx., 1937

The phytocenoses of these associations are met on weakly chloride and sulphatic salinized surfaces and have pretty large ecologic exigencies. In the analyzed area these have been identified on the Bahlui's floodplain at Uricani and Valea Lupului. In this phytocenoses dominate the species of weak or low salinity, but are met and high salinity species (*Camphorosma annua, Podospermum canum, Leuzea salina, Puccinelia limosa*) (Table 1).

The bioformes analysis indicates high values for the hemi-cryptophytes (47.06%) and therophytes (35,2%), the camephytes, geophytes and tero-hemi-cryptophytes each presenting values of 5,8%. Between the phytogeographic elements dominate the euro-Asian species (Eua+Eua cont. = 41.18%); quite high frequencies have the Mediterranean species (Med+Eua.med+Euc.med = 29.42%), circumpolar and ponto-Mediterranean (each with 11.77%). The ponto-Panonic and ponto-balcanic species are present in proportions of 5.8 each.

The analysis of the ecologic spectra indicates the dominance of the mesophytes species (53%) (Fig.1), mezothermal (41.18%) (Fig.2) and neutro-basic ones (35.5%); and the category of the euriionic is well represented (23.53%) (Fig.3).

Table 1

1. As. *Lepidio crassifolii-Puccinellietum limosae* Soó (1947) 1957

The continuance indices of the species from the analyzed halophyte associations

2. As. *Atriplecetum littoralis* (Wi. Christ. 1933) Tx., 1937.
3. Phytocenoses with *Aster tripolium*
4. As. *Heleochloetum schoenoidis* Ţopa 1939

(syn.: *Crypsidetum schoenoidis*)

5. As. *Spergularietum salinae* Tx. Et Volk 1973
6. As. *Artemisio austriacae-Poëtum bulbosae* I.Pop 1979
7. As. *Trifolio fragifero-Cynodontetum* Br.-Bl. et Bolos 1958

(syn.: *Trifolietum fragiferi* Morariu 1969)

Species Associations:	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Achillea millefolium		II					I

Agropyron repens	V				I		I
Agrostis stolonifera							IV
Arenaria serpylifolia						I	
Artemisia absinthium		III					
Artemisia austriaca						V	
Artemisia maritima ssp. salina	V	II		V			
Artemisia vulgaris		II					
Asperula humifusa							I
Aster oleifolius			I				
Aster tripolium	I	V					
Aster villosus						I	
Atriplex hastata	I				V		
Atriplex litoralis	V			V	I		
Atriplex patula		I					
Atriplex tatarica					I		
Bassia sedoides						I	
Beckmania eruciformis		I					
Bidens tripartita		III					
Bromus mollis						I	I
Bupleurum tenuissinum		I					
Cardaria draba					I		
Camphorosma annuua	I		I				
Carduus acanthoides							I
Cerastium dubium	V			V		IV	III
Chenopodium album					I		
Chenopodium glaucum					I		
Ch. Ubicum					I		
Convolvulus arvensis		I					
Cichorium intybus		IV					I
Cirsium lanceolatum							I
Cleistogene serotina ssp.bulgarica						I	
Crepis biennis							I
Cynodon dactylon		I			I		
Daucus carota		V					I
Echinochloa crus-galli					I		
Erigeron annuus		III					
Eryngium planum		I					
Euphorbia platyphyllos							I
Festuca pseudovina						I	
Festuca pratensis							I
Halimione verrucifera			V				
Heleochloa schoenoides				V			
H. alopecuroides				V			
Hibiscus trionum		II					
Inula britanica		V					III
Juncus gerardi		IV		V			

J. conglomeratus		II					
J.inflexus							I
Kokia prostrata						I	
Lactuca saligna	I						
Lathyrus tuberosus		I					
Lepidium cartilagineum ssp. crassifolium		V					
Lepidium rudereale				V	I	III	I
Leuzea salina	I		I			I	
Limonium gmelini	V	II	V			IV	
Linaria vulgaris		II					
Lolium perenne							V
Lotus corniculatus		V					IV
L. tenuis	V						
Matricaria recutita						III	
Matricharia chamomilla	I			V	I		
Melilotus officinale		II					
Mentha arvensis							I
M. pulegium		II					
Muscari racemosus						I	
Myosoton aquaticus							I
Myosurus minimus	I						
Petrosimonia triandra						I	
Plantago lanceolata		I				I	
Plantago major							I
P. media							III
P. schwarzenbergiana	I					III	
P. tenuiflora		I					
Poa bulbosa						III	
P. pratensis							I
Podospermum canum	V	I		I		IV	
Poligonum aviculare		III			I		
Potentilla anserina							I
Puccinellia distans	V					I	
P. limosa			V			IV	
Ranunculus repens							I
Ranunculus sardous							I
R. sceleratus		I					
Rorippa sylvestris ssp. kerneri							I
Rumex sanguineus							III
Senecio jacobaea		II					
Setaria glauca		IV			I		
Spergularia marina	I			V	I		
Tanacetum vulgare		I					
Taraxacum bessarabicum						I	
T. officinale		IV			I		III
Trifolium fragiferum	I	III					V

T. pratense		III					
T. repens		II					IV
T. hybridum		IV					
Tripleurospermum inodorum		IV					
Urtica dioica							I
Verbascum blataria							I
Verbena officinalis							I
Xanthium italicumx		V					I

2.2. Phytocenoses with Aster tripolium

We have identified phytocenoses with *Aster tripolium* at Tomeşti and Valea Lupului on wet and saline surfaces. The floristic inventory includes 40 species in the floristic composition (Table 1), the highest continuance index being detained by the following species: *Juncus gerardi, Inula britanica, Taraxacum officinale, Lotus corniculatus, Xantium italicum, Setaria glauca, Cichorium intybus, Trifolium hybridum, Daucus carota, Tripleurospermum inodorum*. The cover realized by the phytocenoses varies between 40 and 100%, the dominant species having a covering degree between 2 and 5.

The spectrum of the bioformes evidences the dominance of the hemi-cryptophytes that participate with 37.5%, followed by the therophytes with 28% and tero-hemi-cryptophytes with 17.8%.

The spectra of the floristic elements shows maximum frequencies for the euro-Asian (Eua – 37.5%; Eua Med – 17.5%; Eua Cont – 7.5%) circumboreal (12.5%) and 10% cosmopolite species.

The analysis of the ecologic spectra shows the main ecologic groups for the environmental factors: xero-mesophyte (37.5%) (Fig.1), mezothermal (55%) (Fig.2) and amfi-tolerant to soil reaction (50%) (Fig.3).

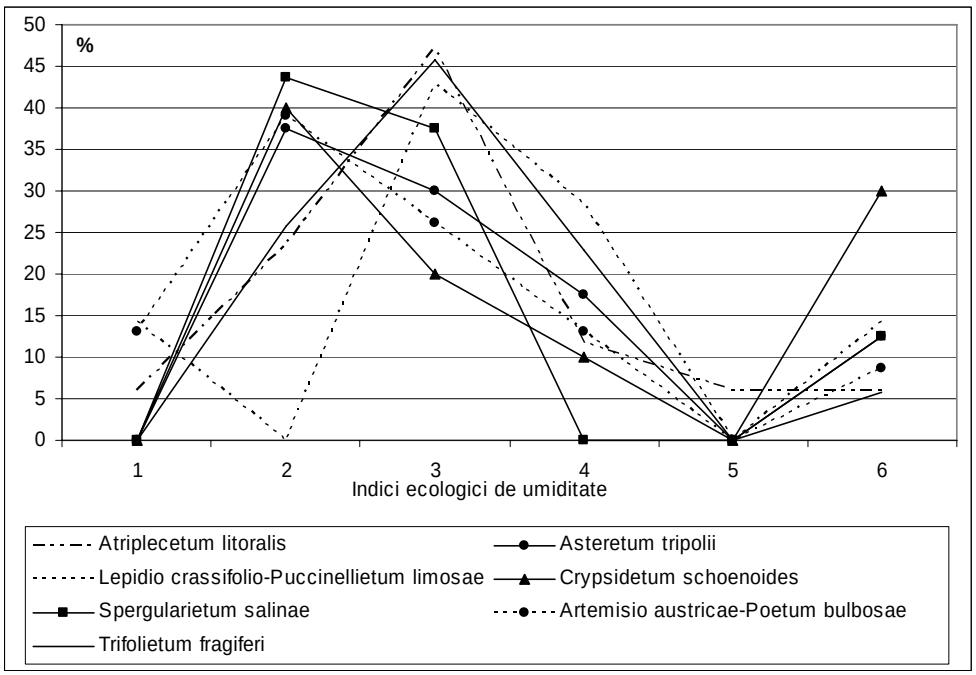

Fig.1. The comparative ecologic spectrum of the analyzed association for the humidity factor

2. 3. As. Lepidio crassifolio-Puccinellietum limosae (Rapaics 1927), Soó 1957

The phytocenoses of this association have been signaled by E. Ţopa (1939) as being part of the saline surfaces from the north of the country. The association is linked to the sodium carbonate saline soils met in general on the old valleys and high plateaus (V. Sanda et al., 1997). The saline surfaces with cress and *Puccinela* occupy small surfaces of 2-3 m^2, on microrelief forms with strongly saline soils, with salt efflorescence; in our area the phytocenoses of this association are rare and have been identified at Valea Ilenei.

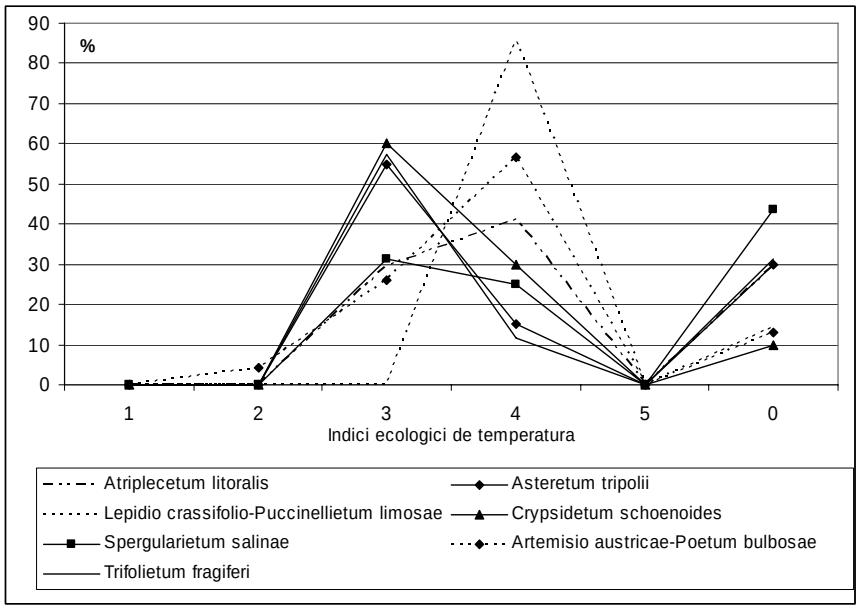

Fig.2. The comparative ecologic spectrum of the analyzed association for the temperature factor

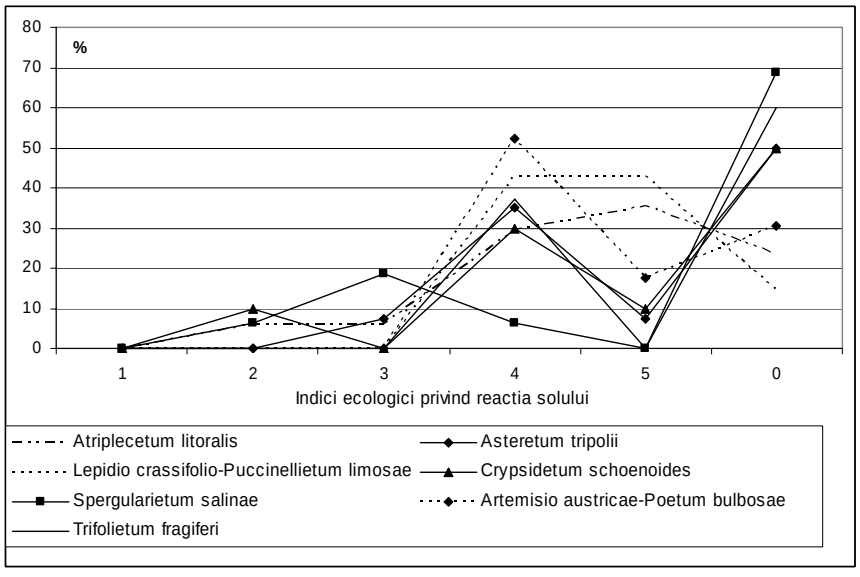

Fig.3. The comparative ecologic spectrum of the analyzed association for the soil reaction factor

The analysis of the bioformes indicates the high percentage of the hemi-cryptophytes that participate to the spectrum with 71.4%; while the geophytes and the annual therophytes participate each with 14.2 %.

The analysis of the floristic elements shows that the continental species are dominant, reaching values of 57.1%, followed by the Panonic, ponto-balcanic and ponto-panonic species each with 14.2%.

The analysis of the ecologic spectra indicates the main ecologic groups in relation to the main factors (Fig.1, 2, 3): mesophytes (43%), moderately thermophyle (86%), weakly acid neutral and neutral-basic (each with 43%).

2. 4. As. Heleochloetum schoenoidis Ţopa 1939

This association installs on floodplain saline surfaces, in depression areas flooded in spring and bare towards the autumn. It is specific for the bottoms of the dried lakes (V.Sanda et al. 1997). In the Bahlui basin it is met on recent alluvia, in alternance with phytocenoses of *Crypsidetum aculeatae*, yet on surfaces of wetter and sandier soils; it has been identified on the Bogonos and Ilenei valleys.

The spectrum of the bioformes evidences the dominance of the therophytes that participate with 70%, followed by the camephytes, geophytes and tero-hemi-cryptophytes that participate each with 10%.

The spectrum of the floristic elements indicates the following composition: 40% euro-Asian species, 20% each continental and ponto-Mediterranean species and 10% each circumpolar, boreal and Mediterranean species.

The analysis of the ecologic spectra evidences the fact that in this association dominate the xero-mesophytes (40%) (Fig.1), mezothermal (70%) (Fig.2) and reaction amfi-tolerant species (50%) (Fig3).

2. 5. As. Spergularietum salinae Tx. Et Volk 1937

The phytocenoses of this vegetal association grow on weakly saline soils and have been identified on the banks of the ponds from Podu Iloaiei where they have been previously described by the authors. In the present the phytocenoses present differences in relation to those described initially (1973). These cover small surfaces of 20-60 m^2.

The spectrum of the bioformes evidences the dominance of the therophytes that participate to the biologic spectrum with 68.75%, being followed by hemi-cryptophytes with 12.5% and geophytes, geo-hemi-cryptophytes with 6.2% each.

The spectrum of the floristic elements indicates the dominance of the euro-Asian and cosmopolite species each with 31.25%, followed by the continental and Mediterranean species with proportions that do not exceed 20%.

The analysis of the ecologic spectra indicates a majority of the xero-mesophytes category (44%) (Fig.1), of the mesothermal (31.25%) (Fig.2) that are found in balance with the eurithermal and the euriionic species (68.75%) (Fig.3).

2. 6. As. Artemisio austriacae-Poëtum bulbosae Pop 1970

The pastures of *Artemisio austriacae-Poëtum bulbosae* usually occur as a consequence of erosion or extensive grazing on the pastures of *Festuca valesiaca*. *Poa bulbosa* uses the nutritive resources from the superficial soil cover, and *Artemisia austriaca* those from the depth. From a nutritive point of view these pastures have a low value that progressively decreases with the grazing period (V. Sanda et al. 1997). The phytocenoses of this association are met at Valea lui David, Valea Ilenii, on the Bahlui floodplain at Uricani and south of Vulturi –Popricani.

The spectrum of the bioformes evidences the dominance of the hemi-cryptophytes that participate with 43.8% at the association's floristic componence, followed by the therophytes with 30.44%, geophytes with 8.7% and camephites, geo-hemi-cryptophytes and tero-hemi-cryptophytes each with 4.35%.

The analysis of the phytogeographic elements evidences high frequencies for the continental (Eua Cont -52.18%; Eua – 13.05%) and Mediterranean species (Pont Med – 13.5%; Eua Med – 4.35 and Euc Med – 4.35%), followed by the pontic (Mediterranean, balcanic, pontic) and circumpolar boreal species, each with 4.7%.

The analysis of the ecologic spectra indicates that in this association dominate the xerophytes species (52.18%) (Fig.1), the moderately termophyle ones (56.53%) (Fig.2) and the weakly acid neutral (along 40%) (Fig.3).

2.7. As. Trifolio fragifero-Cynodontetum Br.-Bl. et Bolos 1958 (syn.: Trifolietum fragiferi Morariu 1969)

The phytocenoses of *Trifolietum fragiferi* reveal an association rich in species characteristic to the classes *Plantaginetea, Chenopodietea, Puccinellio-Salicornietea* and *Festuco-Brometea*. The group is known as a halophyte – mesophyte plants association. The phytocenoses are usually met on small negative relief forms with mesophyle or weakly halophyte soils (V.Sanda, A.Popescu, N.Barabaş, 1997). In the analyzed area these have been identified between Târgu Frumos and Strunga, north of Deleni on the floodplain of the Gurguiata stream and on the Bogonos valley.

The spectrum of the bioformes evidences the dominance of the hemi-cryptophytes that participate with 48.4% of the floristic composition of the association, followed by the therophytes with 40.1% (Th-14.29; Th-H 2.86; TH-8.58; TH-H 8.58 and Th-TH 5.72), the smallest percentage being that of the geophytes (G–2.86% and HG -8.58%).

The analysis of the phytogeographic elements evidences high frequencies for the euro-Asian (Eua – 34.29%; Eua Med – 22.86%) and Mediterranean species; still are present and the other categories (Eur, Pont.Med, Pont.Balc, Circ bor, Adv.).

The comparative sinecologic analysis reveals high percentages of the mesophytes (47%) (Fig.1), mesothermal (56%) (Fig.2) and soil reaction amfi-tolerant species (60%) (Fig.3).

In ***conclusion*****,** the floristic composition of the halophyte associations proves the pronounced arid, silvosteppe character of the vegetation, fact supported and by the Mediterranean elements pretty well represented. The sinecologic analysis evidences the specificity of the flora and vegetation, and its mainly silvosteppic character.

From a qualitative point of view, the percentage analysis of the bioformes reveals the fact that the high majority of the plant species that go into the halophyte associations from the area of the Bahlui basin are perennial (hemi-cryptophytes, over 50%), fact that gives stability to the present phytocenoses. The strong anthropic influence on the flora and the vegetation is reflected and in the high number of therophytes that have a percentage of 20-60%.

From the analysis of the spectrum of the phytogeographic elements we may observe the fact that the euro-Asian species have the highest percentage, fact that confirms the belonging of the studied territory to the Euro-Siberian region. The relatively high percentage of European and central-European elements demonstrates the belonging of the western part of the basin to the central-European eastern-Carpathic province. The presence of the cosmopolite species may be explained by the dominant agricultural character of the area and through the strong anthropic influence.

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