PHYTOCENOSES SPECIFIC TO THE VEGETATION OF DOBROGEA

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The authors present two associations on Tulcea Hills, *Teucrio capitatae-Convolvuletum lineatae* association, which has already been described in specialized literature, and the second, built by *Tanacetum millefolium*, is referred to as *Agropyro pectinatae –Tanacetum millefoliae*.

Key words: Tulcea Hills, *Teucrio capitatae-Convolvuletum lineatae, Agropyro pectinatae – Tanacetum millefoliae.*

INTRODUCTION

Tulcea Hills run along the Danube from Tulcea to Dunavăţ. To the West, they are bordered by Niculiţelului Plane, along Teliţei Valley and to the South the same valley cuts them off from Nălbant – Mihail Kogălniceanu depression. In the East, the border is formed by Dranov Isle and Razim Lake.

The relief is made up either by low telltale signs of erosion (Dunavăţ, Somova, Beştepe Hills) or by sharp summits (Mahmudia, Pietros Hills).

The maximum heights are reached in Deniz Tepe (273 m) and Beştepe (247 m).

MATERIAL AND METHODS

Research was carried out between 2005 and 2008, consisting in ground surveys performed according to the principles of J. Braun-Blanquet School [1]. The terminology, the biological forms and the phyto-geographical elements are those used by Ciocârlan [5]. Regarding the cenosystem, the framings in T. Chifu[4] have been used.

RESULTS AND DISCUSSION

Two associations included in the cenosystem shall be described:

Cl. Festuco- Brometea Br.-Bl. et R.Tx. in Br-Bl 1949

Ord. Festucetalia valesiacae Br.-Bl. et R.Tx. in B.r-Bl 1944

Al. Festucion valesiacae Klika 1931

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Subal. Jurineo arachnoideae-Euphorbinenion nicaeensis Dobrescu et Kovacs,1971 corr. Sârbu, Coldea, Chifu 1993:

1. Ass. Teucrio capitatae-Convolvuletum lineatae ass. nova

2. Ass. Agropyro pectinatae –Tanacetum millefoliae (Şerbănescu 1970) nom. novum.

1. Ass. Teucrio capitatae-Convolvuletum lineatae ass. novum

The association is widespread in the area of study (Beiului, Agighiol Hills), developing especially on Beştepe, Stânca Mare (The Big Rock) Hills and Tulcea Forest.

The phytocenoses develop on carbonaceous chernozem or litho soils, with calciferous underlayer (Beştepe) or on Triassic limestone (Stânca Mare), at the average height of 146 m, mostly oriented towards the South and the North and with an average slope of 14°.

The association presents a rich floral composition, made up of over 90 species and an average of 27 species on each survey (Table 1).

The syntaxons of class *Festuco- Brometea* are best represented, making up a percentage of 62%, most of the species belonging to *Festucion valesiacae* alliance and *Jurineo arachnoideae-Euphorbinenion nicaeensis* sub-alliance.

One can also notice the presence of species characteristic to *Pimpinello-Thymion zygioides (Koeleria lobata, Festuca callieri, Thymus zygioides, Dianthus nardiformis, Sedum caespitosum, etc.)* alliance.

The presence of species belonging to *Festucetalia vaginatae (Alyssum desertorum, Bromus squarrosus, B. tectorum, Silene conica, etc.)* order proves the existence of the flinty underlayer, and the species from *Quercetea pubescentis* and *Rhamno-Prunetea* (*Crataegus monogyna, Carpinus orientalis, Ligustrum vulgare, Asparagus verticillatus, Paeonia peregrina*) classes point to the fact that the region was covered by pedunculate oak forests in the past.

The floral composition also includes species from *Artemisetea* and *Stellarietea mediae* classes, in percentages of 7.7% and 10%, proving ruderalized to a certain extent.

Convolvulus lineatus, Eryngium campestre, Festuca valesiaca, Potentilla argentea, P. recta, Poa bulbosa and *Teucrium polium var. capitatum* counts among the species with the most constant presence (IV and V).

The spectrum of the bioforms points to the fact that the hemicryptophytes and the therophytes are dominant, being present in almost equal percentages, of 43%, respectively 42%, followed by the geophytes with 8%, chamaephytes 7% and phanerophytes 4%.

The spectrum of floral elements is dominated by Eurasian elements (39%), Pontic elements (22%), followed by the European ones with 18%, Balkan 10%, Sub-Mediterranean 3%, Cosmopolite 2%, Circumpolar 2%, Mediterranean and Pannonic, each 1%.

Table 1

Ass. Teucrio capitatae-Convolvuletum lineatae ass. novum

Relevé number	1	2	3	4	5	6	7♦	8	9	10	K
Altitude (m.s.m.)	150	175	180	170	40	40	190	185	180	150	
Exposition	V	SE	S	S	V	V	S	S	N	SV	
Slope(degrees)	10	5	2	5	10	10	30	30	5	30	
Vegetation cover (%)	90	85	95	90	80	80	95	90	80	80	
Relevé area (s.m.)	100	100	100	100	100	80	100	100	100	80	
Number of species	22	29	20	22	28	26	45	26	26	32	
				Charact. of as.							
Teucrium polium ssp. capitatum	-	+	-	+	+	+	+	+	+	-	IV
				Jurineo arachnoideae-Euphorbinenion							
Achillea coarctata	-	+	+	+	-	-	-	+	-	-	II
Achillea nobilis ssp. neilreichii	+	-	-	+	-	+	+	-	+	-	III
Crupina vulgaris	-	-	-	-	-	+	-	-	+	-	I
Digitalis lanata	-	-	-	-	-	-	+	-	1	+	II
Eryngum campestre	+	+	+	+	+	+	+	+	+	+	V
Erysimum odoratum	-	+	-	-	+	-	-	-	-	-	I
Euphorbia glareosa ssp. dobrogensis	-	+	-	-	+	+	+	1	-	+	III
Jurinea arachnoidea	-	-	-	-	-	-	+	+	-	-	I
Stipa ucrainica	+	-	-	-	-	-	+	+	-	-	II
				Festucion valesiacae							
Ajuga chamaephytis	+	-	+	+	+	-	+	-	-	-	III
Allium sphecrocephalon	-	-	+	+	+	+	+	-	-	-	III
Artemisia austriaca	+	-	-	+	-	-	+	+	-	-	II

Table 1 (continued)

Asperula cynanchica	-	-	-	-	-	-	+	-	+	+	II
Chondrilla juncea	-	-	-	-	-	+	+	-	+	-	II
Dichantium ischaemum	-	-	-	-	+	2	-	-	-	-	I
Linaria genistifolia	-	-	-	-	-	+	-	+	-	-	I
Medicago minima	+	-	+	-	+	-	+	+	-	-	III
Potentilla recta	+	+	-	+	+	-	+	+	+	+	IV
Sanguisorba minor	+	+	-	+	-	-	+	-	-	+	III
Teucrium chamaedrys	-	-	+	-	-	-	+	+	-	+	II
Pimpinello-Thymion zygioides											
Dianthus nardiformis	-	-	-	-	-	-	+	+	+	+	II
Festuca callieri	-	-	+	+	-	-	+	-	-	-	II
Koeleria lobata	+	+	-	-	-	-	+	-	-	-	II
Sedum caespitosum	-	-	-	-	-	-	-	-	+	-	II
Thymus zygioides	-	-	-	+	+	+	2	-	+	+	III
Festucetalia valesiacae											
Cerastium semidecandrum	-	-	-	-	-	-	-	-	-	+	II
Convolvulus lineatus	5	4	5	5	4	3	4	5	4	4	V
Cruciata pedemontana	+	+	-	-	+	+	+	-	-	-	III
Festuca valesiaca	+	+	-	+	1	+	+	+	+	+	V
Linum austriacum	-	-	+	+	-	-	+	-	-	-	II
Muscari comosum	-	-	-	-	-	+	-	-	-	-	I
Orlaya grandiflora	-	+	+	+	+	-	+	+	+	-	IV
Ornithogalum sibthorpii	-	-	-	-	-	+	+	-	-	+	II
Phleum phleoides	-	-	+	+	-	-	-	+	-	-	II
Siderites montana	+	-	-	-	-	-	-	+	-	-	I
Trifolium campestre	-	1	+	-	-	-	-	-	-	-	I

Table 1 (continued)

Trifolium pannonicum	-	+	-	-	-	-	+	-	-	+	II
Verbascum banaticum	+	+	-	-	-	-	+	-	-	+	II
Verbascum chaixii	-	-	+	-	-	-	-	-	-	+	I
Festucetalia vaginatae											
Allium gutattum	-	-	-	-	-	-	-	-	-	+	I
Alyssum desertorum	+	-	-	-	+	-	-	-	-	+	II
Bromus squarrosus	-	+	+	+	+	+	+	+	+	+	V
Bromus tectorum	-	-	-	-	-	-	+	+	-	+	II
Silene conica	+	-	-	-	-	-	-	-	-	-	I
Brometalia erecti											
Thesium linophyllon	-	-	+	-	-	-	-	-	-	-	I
Tragopogon pratensis ssp.orientalis	-	-	-	-	-	+	-	-	-	-	I
Festuco brometea											
Acinos suaveolens	-	-	-	-	-	-	+	+	+	+	II
Centaurea diffusa	+	-	-	+	-	-	+	-	+	-	II
Crepis foetida ssp. rhoaedifolia	-	-	-	-	+	+	-	+	-	+	II
Echium italicum	-	-	+	+	-	-	+	-	-	-	II
Herniaria incana	-	-	-	-	-	-	-	-	-	+	I
Kohlrauschia prolifera	-	-	+	-	-	-	-	-	-	-	I
Poa angustifolia	-	+	-	-	-	-	+	+	I	I	III
Poa bulbosa	+	+	1	1	+	-	+	+	-	-	IV
Potentilla argentea	+	+	-	-	+	+	+	-	+	-	III
Koelerio - Corynephoretea											
Alysum alyssoises	-	2	-	-	+	+	+	+	+	-	III
Arenaria serpyllifolia	1	1	-	+	2	+	+	-	-	+	IV
Crepis capillaris	-	-	-	-	-	-	+	-	-	-	I

Table 1 (continued)

Filago arvensis	-	+	-	-	+	-	+	-	-	+	II
Rumex acetosella	-	-	+	-	-	-	-	-	+	-	I
Sedum acre	-	-	-	-	+	-	-	-	-	-	I
Trifolium arvense	+	1	-	-	-	-	+	+	-	-	II
Artemisetea											
Carduus crispus	-	+	-	-	-	+	-	-	-	-	I
Erodium cicutarium	+	+	-	-	+	+	+	-	+	-	III
Lappula squarrosa	-	-	-	-	+	-	-	-	-	-	I
Marrubium peregrinum	+	-	-	-	-	-	-	-	-	-	I
Reseda lutea	-	-	-	-	-	-	+	-	-	-	I
Tragopogon dubius	-	-	-	-	-	-	-	+	+	-	I
Verbascum phlomoides	-	-	-	-	-	-	-	-	-	+	I
Stellarietea mediae											
Adonis aestivalis	-	-	-	-	+	-	+	-	-	-	I
Althaea hirsuta	+	-	-	-	-	-	+	-	-	-	I
Holosteum umbellatum	-	-	-	-	-	+	-	-	-	-	I
Lepidium ruderale	-	-	-	-	-	-	-	-	-	+	I
Phleum paniculatum	-	-	-	-	-	-	-	+	-	-	I
Scleranthus annuus	+	+	-	-	-	-	-	-	-	-	I
Senecio vernalis	-	+	-	-	+	-	-	-	-	-	I
Valerianella lasiocapa	-	-	+	-	-	-	-	-	-	-	I
Viola arvensis	+	+	-	+	-	-	-	-	-	-	II
Quercetea pubescentis et Rhamno - Prunetea											
Asparagus verticillatus	-	-	-	-	-	-	-	-	-	+	I
Carpinus orientalis	-	-	-	-	-	-	-	-	-	+	I
Clinopodium vulgare	-	-	+	+	-	-	-	-	-	+	II
Crataegus monogyna	-	-	-	-	-	-	-	+	-	+	I

Table 1 (continued)

Cruciata laevipes	-	-	-	-	-	-	-	-	-	+	I
Ligustrum vulgare	-	-	-	-	-	-	-	-	-	+	I
Melica altissima	-	-	-	-	-	-	-	-	-	+	I
Paeonia peregrina	-	-	-	-	-	-	-	-	-	+	I
Prunus spinosa	-	-	-	-	-	-	-	-	-	+	I
Variae sintaxa											
Hieracium cymosum	-	-	-	-	-	-	-	-	-	+	I
Stellaria nemorum	-	-	-	-	-	-	-	-	-	+	I

♦ = terminology survey

Relevés site and date

1. Stânca Mare Hill 1.06.2008; 2, 3, 4. Beştepe Hill 31.05.2008; 5,6. Tulcea Forest 31.05.2008; 7, 8, 9. Beştepe Hill 25.05.2007; 10. Beiului Hill 19.05.2007.

Table 2

Ass. Agropyro pectinatae - Tanacetum millefoliae (Şerbănescu 1970) nom. novum

Relevé number	1	2	3	4	5	6♦	7	8	9	10	K
Altitude (m.s.m.)	170	140	160	140	175	150	115	160	150	140	
Exposition	NV	S	N	NV	SV	NE	SV	N	N	NE	
Slope(degrees)	30	25	-	-	15	10	15	40	40	20	
Vegetation cover (%)	100	90	95	85	95	95	100	100	95	80	
Relevé area (s.m.)	10	10	20	10	20	25	10	10	10	5	
Number of species	19	17	18	17	22	33	17	18	16	15	
Charact. of as.											
Agropyron cristatum ssp. pectinatum	+	+	-	+	-	+	-	-	+	-	III

Table 2 (continued)

Jurineo arachnoideae-Euphorbinenion											
Achillea nobilis ssp. neilreichii	-	-	-	-	-	+	-	-	-	-	I
Allysum hirsutum	-	-	-	+	+	+	-	-	-	-	II
Centaurea marschalliana	-	-	-	-	-	+	-	-	-	-	I
Crocus reticulatus	-	-	-	-	-	-	-	-	-	+	I
Digitalis lanata	-	-	-	-	-	-	+	-	-	-	I
Eryngium campestre	+	+	-	-	-	+	+	-	-	+	III
Euphorbia glareosa ssp. dobrogensis	-	-	-	-	-	+	-	+	-	-	I
Jurinea arachnoidea	-	-	-	+	-	-	-	-	+	-	I
Muscari tenuiflorum	-	-	+	-	-	-	-	-	-	-	I
Phlomis pungens	+	+	-	-	-	-	-	-	-	-	I
Rosa gallica	-	-	+	-	-	-	-	-	-	-	I
Salvia nemorosa ssp. tesquicola	-	-	-	+	-	+	-	-	-	-	I
Seseli tortuosum	-	-	-	-	-	-	-	+	-	-	I
Tanacetum millefolium	5	5	4	3	5	5	3	3	5	4	V
Taraxacum serotinum	-	-	-	-	-	+	-	-	-	-	I
Festucion valesiacae											
Chondrilla juncea	-	-	-	-	-	+	-	-	+	-	I
Colchicum triphyllum	-	-	-	-	-	-	-	-	-	+	I
Falcaria vulgaris	-	-	-	-	-	-	-	+	-	-	I
Medicago minima	-	+	-	-	-	+	-	-	-	-	I
Stachys recta	-	-	+	-	+	+	-	+	-	-	II
Teucrium chamaedrys	+	-	+	-	+	+	+	+	-	-	III
Teucrium polium ssp. capitatum	-	-	-	+	+	+	2	-	-	-	II
Stipion lessingianae											
Convolvulus lineatus	-	+	1	-	+	+	+	-	-	+	III

Table 2 (continued)

Salvia nutans	-	-	-	-	-	-	-	-	+	+	I
Stipa lessingiana	-	-	-	-	-	-	-	-	+	-	I
Pimpinello-Thymion zygioides											
Koeleria lobata	+	-	-	-	-	-	-	-	-	-	I
Thymus zygioides	-	-	-	-	-	-	+	+	+	-	II
Festucetalia valesiacae											
Adonis vernalis											
Allium rotundum	-	-	-	-	-	-	+	+	-	-	I
Cruciata pedemontana	+	+	-	-	-	+	-	-	-	-	II
Festuca valesiaca	+	+	-	-	+	+	-	-	+	+	III
Galium verum	+		-	-	-	+	+	-	-	-	II
Orlaya grandiflora	-	+	-	-	-	+	+	-	-	-	II
Ornithogalum orttophyllum ssp. kochii	-	-	-	-	-	-	-	-	+	-	I
Potetilla recta	-	-	-	-	+	+	+	+	-	-	II
Siderites montana	-	-	-	+	+	+	-	-	+	+	III
Silene donetzica	-	-	+	-	-	-	-	+	-	-	I
Stipa pennata	-	-	-	+	-	+	+	-	-	-	II
Thymus pannonicus	-	-	-	+	-	+	-	+	-	-	II
Trifolium campestre	+	-	-	-	-	-	-	-	+	-	I
Verbascum chaixii	-	-	+	-	+	+	+	-	-	-	II
Vinca herbacea	-	-	+	-	-	-	-	-	-	-	I
Festucetalia vaginatae											
Alyssum desertorum	+	-	-	-	-	-	-	-	-	-	I
Bromus tectorum	-	+	-	-	+	+	-	-	-	-	II
Echinops ruthenicus	-	-	-	-	-	-	-	-	-	+	I
Onosma visianii	-	-	-	-	+	-	-	+	-	-	I
Festuco Brometea											
Crepis foetida ssp. rhoaedifolia	-	+	-	-	-	-	-	-	-	-	I
Kohlrauschia prolifera	+	-	-	-	-	-	-	-	-	-	I

Table 2 (continued)

Onobrychis gracilis	-	-	+	-	-	-	-	-	-	+	I
Poa angustifolia	-	-	1	-	+	1	-	2	+	-	III
Poa bulbosa	+	-	-	2	+	+	-	+	-	-	III
Scorzonera mollis	-	-	-	-	-	-	+	-	-	-	I
Artemisetea											
Convolvulus arvensis	-	+	-	-	-	-	-	-	-	-	I
Lappula squarrosa	-	+	-	-	-	-	-	-	-	-	I
Marrubium peregrinum	+	+	-	+	+	+	+	-	+	-	IV
Verbascum phlomoides	-	-	-	-	+	+	-	-	-	-	I
Stellarietea mediae											
Anagallis foemina	-	-	-	-	-	-	-	-	-	+	I
Althaea hirsuta	-	-	-	+	+	-	-	-	-	+	II
Androsace maxima	-	-	-	+	+	-	-	-	+	+	II
Bromus secalinus	-	-	-	-	-	-	-	+	-	-	I
Erodium ciconium	+	-	-	-	-	-	-	-	-	-	I
Glaucium corniculatum	-	-	-	+	-	-	-	+	-	-	I
Holosteum umbellatum	-	-	-	-	+	-	-	-	-	-	I
Lamium amplexicaule	-	-	-	-	+	-	-	-	-	-	I
Senecio vulgaris	-	-	-	-	+	-	-	-	-	-	I
Senecio vernalis	-	-	-	-	-	-	-	-	-	+	I
Sinapis arvensis	-	-	-	-	-	+	-	-	-	-	I
Vicia angustifolia	-	-	-	-	-	-	-	-	-	+	I
Viola arvensis	-	-	-	-	-	-	-	-	-	+	I
Quercetea pubescentis et Rhamno -Prunetea											
Asparagus verticillatus	-	-	+	-	-	+	-	-	+	-	II
Iris variegata	-	-	+	-	-	-	-	+	-	-	I

Table 2 (continued)

Paeonia peregrina	-	-	+	-	-	-	-	+	-	-	I
Paliurus spina - christi	-	-	-	-	-	-	+	-	-	-	I
Prunus spinosa	-	-	+	-	-	-	-	-	-	-	I
Quercus pubescens	-	-	+	-	-	-	-	-	-	-	I
				Variae sintaxa							
Achillea millefolium	-	-	-	-	-	-	+	-	-	-	I
Anthemis tinctoria	-	-	-	+	-	-	-	-	-	-	I
Cerastium pumilum ssp. glutinosum	-	-	-	-	-	-	-	-	-	+	I
Dactylis glomerata	-	-	+	-	-	-	-	-	-	-	I
Erodium cicutarium	-	+	-	-	-	-	-	-	-	-	I
Filago arvensis	-	-	-	-	-	-	-	-	-	+	I
Galium mollugo	-	-	-	+	-	-	-	-	-	-	I
Limonium latifolium	+	-	-	-	-	-	+	-	-	-	I
Trifolium arvense	+	-	+	-	-	-	-	-	-	-	I

♦ = terminology survey

Relevés site and date

1,2. Beştepe Hill 31.05.2008; 3. Agighiol Hill 30.06.2007; 4,5,6,8,9. Stânca Mare (The Big Rock) 02.06.2007; 7. Beştepe Hill 25.05.2007; 10. Uzum Bair Plane 02.06.2008

2. *Ass. Agropyro pectinatae –Tanacetum millefoliae (Şerbănescu 1970) nom. novum*

The association has been identified on Stânca Mare, Beştepe, Pietriş, Agighiol, Găvana Mică Hills and Uzum Bair Plane.

The phytocenoses develop at the average height of 150 m, mainly oriented from North to North-West and from South to South-West, with an average slope of 19.5°.

The floral composition is rich (85 species) and varied, with an average number of 19 species on survey (Table 2), the syntaxons of *Festuco-Brometea* class making up the majority, with a percentage of 61%. Apart from the species of *Festucion valesiacae* alliance and *Jurineo arachnoideae-Euphorbinenion nicaeensis* sub-alliance, which are predominant, there are also species of *Stipion lessingianae* and *Pimpinello-Thymion zygioides* alliances.

As the pastures develop, we also meet species characteristic to *Quercetea pubescentis* and *Rhamno- Prunetea* (*Prunus spinosa, Paliurus spina –christi, Paeonia peregrina,Iris variegata, Quercus pubescens, Asparagus verticillatus, etc.)* classes.

The degree of ruderalization caused by the anthropic activities (grazing) is proved by the presence of species characteristic to *Artemisetea* and *Stellarietea mediae* classes, which make up a total percentage of 20%.

The dominant species are *Tanacetum millefolium* (V), *Convolvulus lineatus* (V), *Marrubium peregrinum* (IV) and *Agropyron cristatum ssp. pectinatum* (III).

The spectrum of the bioforms proves the majority of the hemicryptophytes (65.5%), followed by therophytes (33%), geophytes 12%, chamaephytes 9% and phanerophytes 5%.

The dominant elements are the Pontic (35%) and the Eurasian ones (34%), thus emphasizing the phyto-geographical inclusion of the area in the Pontic-South-Siberian Region, followed by the European ones with 8%, Balkan 6%, Sub-Mediterranean 5%, Mediterranean 4%, Atlantic-Mediterranean 1% and Cosmopolite 5%.

CONCLUSIONS

The previous research carried out in Dobrogea (Istria, Traian, Danube Delta – Grindul Lupilor) [6,9], led to the identification of *Convolvuletum lineatum* association (Morariu 1967) Burduja et Horeanu 1970 [1] , settled on sands. This association is different from *Teucrio capitatae-Convolvuletum lineatae* association, having a less rich and varied floral composition, with a high percentage (over 25%) of the species characteristic to *Festuco-Puccinellietea* class, dominant (over 30%) being the species characteristic to *Artemisetea* and *Stellarietea mediae* classes.

We consider that the phytocenoses built by *Convolvulus lineatus* are constituted in a well individualized association, different from *Convolvuletum lineatum* association, Burduja and Horeanu 1970, named *Teucrio capitatae-Convolvuletum lineatae*.

I. Şerbănescu identifies on the shore of the Black Sea (Năvodari and Eforie) [10] phytocenoses built by *Tanacetum millefolium*, reunited in the *Chrysanthemum millefolium* association.

The floral composition of this association is poorer in species (29), but resembles in a proportion of 40% to the one on Tulcea Hills.

Popescu A. and Sanda V. [6], in their synthesis on the vegetation on the shore of the Black Sea, appreciate the phytocenoses described by I. Şerbănescu as facies of *Chrysanthemum millefolium* (Şerbănescu 1970), Popescu and Sanda 1978, of the *Agropyro pectiniforme* (Prodan 1939) Dihoru 1970 association.

We consider that the phytocenoses built by *Tanacetum millefolium* species make up a well individualized association, named *Agropyro pectinatae – Tanacetum millefoliae*.

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