

SPECIFICITIES IN THE VEGETATION OF UNPROTECTED BAND OF RIVER TISZA

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Abstract. This paper contains data obtained by following the changes in floristic composition of the association *Thymo-Chrysopogonetum grylli* Stojanovic (1981) 1983 (subass. *stipetosum capillatae*) on the slopes and the clefts of Titel plateau, near river Tisza. Five new species were found in the structure of this steppe phytocenosis. Two of them were found for the first time on Titel plateau: *Prunus tenella*, which exists only on a few localities in Vojvodina and east Serbia, and *Ornithogalum refractum*, which is spread in Serbia, but was recorded in Vojvodina only in three localities. In this paper, new data are given about two forms of low iris: *Iris pumila*. Our examinations point out to wider spreading of *Adonis vernalis*, *Vinca herbacea*, *Iris pumila* f. *pumila* and f. *lutea* in the flora of Titel plateau and their high density within the alleged association. These results complete the review of floristic composition of the association *Thymo-Chrysopogonetum grylli*, indicate the habitat's synecological conditions and are important because all species, except of *Ornithogalum refractum*, are protected as natural rarities and are on the list for Red data book of the flora in Serbia.

Keywords: flora, Red book, Titel plateau, vegetation

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Introduction

The steppe vegetation is represented with the alliance *Festucion rupicolae* Soó 1940 developing on the steep slopes and in the clefts of Titel plateau and is a specificity of the unprotected Tisza band. Titel plateau is a loess plateau in southern Backa. Bukurov (1953) divides it into two altitude entities: the western lower part (110-120 m) and the eastern one, closer to River Tisza, with the approximate altitude of 130 m. The eastern and the northeastern parts of Titel plateau near Tisza have more or less deep chernozem soil, where influence of basic rock is more expressed. Because of the high CaCO₃ content in the soil, deep underground waters, periodical torrents and permanent foundation sapping by Tisza water, the process of loess erosion is expressed, producing different geomorphological forms: the slopes and the cliffs of a height 30-50 m, the loess pyramids, the "shelves" and the clefts.

Very steep, sometimes even vertical cliffs and clefts, descending to River Tisza, are the most

unaccessible parts of Titel plateau and because of that they are mostly out of human and zoogenic influence, which made possible the survival of the original vegetation. On these terrains, there were followed the changes in floristic composition of the subassociation *Thymo-Chrysopogonetum grylli stipetosum capillatae* which, as well as the association itself, was distinguished and described by Stojanovic (1981; 1983).

The association *Thymo-Chrysopogonetum grylli* is the basic steppe community of Titel plateau. It develops on more or less level or more inclining slopes, at the altitude of 111 to 130 m, mostly on the sites close to the plateau itself, on chernozem soil. Compared with other steppe communities, it is characterized by the following species: *Euphorbia glareosa* var. *lasiocarpa*, *Thymus marshallianus*, *Festuca rupicola*, *Allium rotundum* ssp. *waldsteinii*, *Falcaria vulgaris*, and *Convolvulus cantabricus*. Furthermore, it is characterized by a complex stratified structure, high density, and pronounced seasonal dynamics. It incorporates highly variable floral elements. The dominant species are the representatives of the Pontic-

Central Asian group, including the Pannonian endemics *Centaurea scabiosa* ssp. *sadleriana* and *Dianthus pontederiae*, as well as the representatives of the Pontic-Pannonian group including character species of the association (*Euphorbia glareosa* var. *lasiocarpa*, *Thymus marshallianus*, *Allium rotundum* ssp. *waldsteinii*, *Convolvulus cantabricus*) which give the community the Pannonian appearance (Stojanovic, 1983).

The association includes two subassociations: *Thymo-Chrysopogonetum grylli typicum* and *Thymo-Chrysopogonetum stipetosum capillatae*. The elements of the former subassociation develop in favourable condition on the horizontal or slightly inclining hillsides, at the altitude of 111 to 125 m, in the western, northwestern, and southwestern parts of Titel plateau. The soil is a deep and well-developed chernozem soil.

The later subassociation develops on the sharply inclined, in some cases almost vertical, slopes exposed to the sun, at the altitude of 117 to 130 m, on a shallow or eroded chernozem. It is then not surprising that these sites host a number of pronouncedly xerothermic plant species: *Stipa capillata*, *Festuca valesiaca*, *Potentilla arenaria*, *Xeranthemum annuum*, *Petrorhagia saxifraga*, *Verbascum lychnitis*, *Erysium diffusum* and *Echium italicum*. These are also the differential species of the subassociation (Stojanovic, 1983).

Material and methods

The phytocenological analyses took place during 1990 and 1991 on Titel plateau, after Swiss-French methods of Braun-Blanquet (1921).

Collected plants were determined after Flora SR Srbije (1970-1986) and Jávorka (1925, 1934) and, in controversial cases, on the basis of the diagnosis after Soó (1964-1980). Syntaxonomic status of the species, as well as some ecological indices, are given after Soó (1964-1980). The majority of the ecological demands were taken from Landolt (1977). The nomenclature was quoted after Flora SR Srbije (1970-1986).

Results and discussion

Our investigation shows that in the stands of the subassociation *Thymo-Chrysopogonetum grylli* Stojanovic (1981) 1983 there are even five new species: *Adonis vernalis*, *Vinca herbacea*, *Iris pumila*, *Prunus tenella*, and *Ornithogalum refractum*.

Adonis vernalis L.

This species is a Pontic-Central Asian floral element. It is a remnant of the steppe vegetation from the xerothermic period of the Postglacial (Boreal). The transformation of the steppe soil (chernozem) into the cultivated soil, the erosion of the loess clefts near River Tisza (and also Danube), the spreading of the human settlements reduced the habitats of this plant on fragments. Although this species appears on several localities in Serbia and Vojvodina with a disperse areal, it is vulnerable because its habitats are endangered. This species is protected in Serbia and is on the list for Red data book of the flora of Serbia.

First report about the appearance of *Adonis vernalis* into the flora of this plateau, on the unaccessible loess slope near Titel settlement, was given by Stanojevic and Boza (1984). These authors reported a limited dispersal of this species. Today, *Adonis vernalis* appears north from Titel to Perkovic cleft near River Tisza and around the clefts Zmijnjak, Dukatar, Makaricev cleft and Keljin cleft with a density of about twenty stems per locality. Exceptionally dense populations, with about a hundred stems were discovered between Keljin cleft and Dukatar cleft (see the map on which the size of the circle is adequate to the size of the population).

Vinca herbacea W. et K.

First report about the presence of *Vinca herbacea* in Titel plateau was given by Stanojevic and Boza (1984). They found this plant in the surroundings of Titel. Our investigations confirm those data (see Fig. 1.). The additional data about spreading of this species are related to the stands of the gentle slopes of Titel plateau, between Makaricev cleft and Demljakov cleft, Lacov and Rogulicev clefts and around the cleft Dukatar. This species is a Pontic-Pannonian floral element and is a Boreal relict. This species is protected by law in Serbia as a natural rarity and is on the list for the Red data book of the flora in Serbia as a relict. This plant is a distinctive species of the steppe vegetation of the alliance *Festucion rupicolae* on the sand and the loess. In Vojvodina this species appears in a dispersed areal (Subotica-Horgos sandy plain, high eastern loess bank of Ludas, Rimski sanac, Titel plateau, Sajkas-Kovilj, Fruska gora and Deliblat sandy plain). This species was found in the surroundings of Beograd (Kosutnjak, Visnjicka kosa) and Kragujevac, on Rujan mountain (southern Serbia) and on a few localities in southern Serbia.

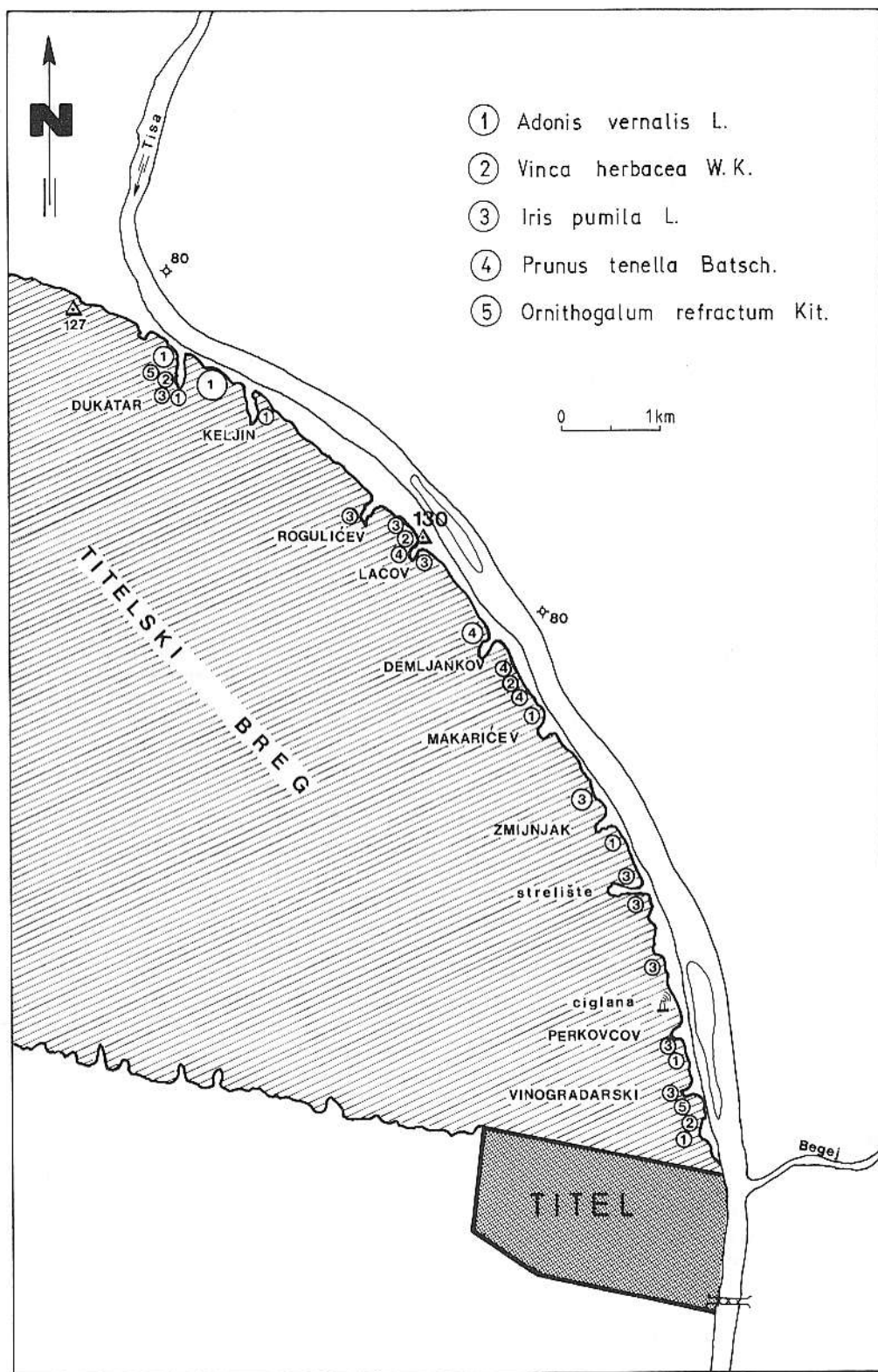


Fig. 1. Research area along river Tisza.

Iris pumila L.

Only a typical subspecies of *Iris pumila* appears in our country, the *ssp. pumila*. Appearance of this species in the vegetation of Titel plateau was observed by Obradovic and Budak (1980) on only one locality near Titel. These authors recorded the matter about *Iris pumila ssp. pumila* and *var. pumila* with its forms: *pumila* which characterized by the violet flowers, and *lutea* which characterized by the bright-yellow to cream-yellow flowers. The appearance of only these subspecies was confirmed by Igić (1988). The result of our investigations is the discovery of two new forms in the flora of Titel plateau: *f. flaviflora*, with dark-yellow flowers, and *f. atrovioleacea*, with dark-violet to almost black flowers. All forms appeared in relatively dense populations. Except of the plateau, the forms of this species appear on the almost vertical cliffs descending to River Tisza and on the sides of the clefts faced toward the South. The forms of this species were present in the plant cover of all clefts descending to River Tisza, except Makaricev, Demljankov and Keljin cleft.

Like the previous two species, this one is also protected as a nature rarity and listed for Red data book of the flora in Serbia, as vulnerable.

In Serbia, *Iris pumila* appears on Suva mountain and in the surrounding of Aleksinac (Leskovik), whereas in Vojvodina its areal is disjunctive. In comparison with *Vinca herbacea* this species is wider spread. It appears on adequate sites of Fruska gora, Deliblat sandy plain, Subotica sandy plain, Titel plateau, Vrsac mountain, Telecka but also on the poor sodic soil of the lowland. This species is, in the phytogeographic sense, the Pontic-Central Asian floral element, belongs to the group of the steppe and meadow-steppe plants. It is indicator of the dry continental climate and the xerophytic character of the vegetation.

Ornithogalum refractum Kit.

This newly found species grows on pastures, in forest clearing and on uncultivated soil of hills. *Ornithogalum refractum* is wider spread in Serbia and because of this it is not a natural rarity for this territory, but in Vojvodina this species is listed as rare. On the basis of the literary data (Obradovic, 1966) this species was found toward the last century in the surroundings of Zemun, and in the middle of this century on only one locality in Fruska gora (Cerevic). The data of this author point out, that it is a Balkan-Caucasian species according to Soó and Jávorka (1951). According to Gajic (1980), this species is a Pontic floral element,

but according to Soó (1973) it is a Southeastern European floral element.

Our findings of this species in the vegetation of Vinogradar cleft are first data about the appearance of *Ornithogalum refractum* in the flora of Titel plateau and first description of this species in the structure of the subassociation *Thymochrysopogonetum grylli stipetosum capillatae*.

Prunus tenella Batsch.

(*P. nana* Stokes, *Amygdalus nana* L.)

This species was not known in the flora of Titel plateau till our discovery. The low bushes of Russian almond cover almost completely the sides of Demjankov cleft painting them pink when they are in bloom, in spring. This species was found on the plateau between Demjankov cleft and Makaricev cleft as well as in Lacov cleft.

In Vojvodina this species has a dispersed areal (a few localities on Deliblat sandy plain, on Fruska gora only near Beska, on Rimski sanac and now on Titel plateau). *Prunus tenella* is a Pontic-Central Asian floral element. In Serbia except the mentioned localities in Vojvodina, it appears in the shrubberies with steppe elements (ass. *Artemisio-Prunetum* Jov.) on limestone massifs of eastern Serbia. Like other species, survival of which is endangered, the species is on the list for Red data book of the flora in Serbia, in the category of the vulnerable species. It is protected as a natural rarity which spontaneously vanishes.

Ecological characteristics of species

Common for all five species is that they are indicators of the very dry and the dry grounds. Namely, the humidity index (F - after Landolt, 1977) is from 1 to 2. These species are the bioindicators of oligotrophic soils (N 1-2) with a strong basic reaction (R 5). Regarding the temperature regime, these species are the indicators of moderately thermophilic (T3) and thermophilic (4) habitats. This is in accordance with the expressive climatic extremes on the steppe loess cliffs facing the River Tisza and in the moderated micro- and mesoclimatic conditions in the clefts of Titel plateau. The syntaxonomic and the phytogeographic relations belonging to the analyzed species point to the character of *Thymochrysopogonetum grylli stipetosum capillatae* stands. The species of the alliance *Festucion rupicolae* are: *Ornithogalum refractum* and *Vinca herbacea*. *Ornithogalum refractum* is a Pontic floral element whereas *Vinca herbacea* is a Pontic-Pannonian floral element. The species: *Adonis*

vernalis, *Iris pumila* and *Prunus tenella* are Pontic-Central Asian floral elements. *Adonis vernalis* and *Iris pumila* are the characteristic species of the ordo *Festucetalia valesiaca* but *Prunus tenella* is the species of the shrubbery (the ordo *Prunetalia*) and, in the same time, the species of the authentic forest vegetation of the alliance *Aceri tatarico-Quercion*. Beside this nanophanerophytes, the characteristic species of this alliance are the herbaceous plants: *Adonis vernalis* and *Vinca herbacea*.

All these data are important elements for the recognition of the structure of analyzed Titel plateau steppe associations, the addition to flora of Titel plateau, Vojvodina and Serbia and basic data for Red data book of the flora in Serbia.

Conclusion

In the vegetation of Titel plateau, the meadow steppe flora is especially important as a witness of historical florogenesis process. It was maintained in a more or less original form at the most unaccessible spots of this loess plateau near River Tisza. These isolated loess cliffs, the loess pyramids and the clefts are geomorphological products where the steppe vegetation is represented by the association *Thymo-Chrysopogonetum grylli* Stojanovic (1981) 1983 of the alliance *Festucion rupicolae*. The stands of the same subassociation *stipetosum capillatae* described by the same author, are indicators of the synecological conditions on the mentioned geomorphological forms. Our investigations point out to a more complex floristic composition, because we found five new species: *Prunus tenella*, *Ornithogalum refractum*, *Adonis vernalis*, *Vinca herbacea* and *Iris pumila* (*subsp.* and *var. pumila* with four forms: *pumila*, *atroviolacea*, *lutea* and *flaviflora*). Our discovery of *Prunus tenella* and *Ornithogalum refractum* are first data about appearance of these species in the flora of Titel plateau. For the other three species, a wider spreading was noted on Titel sandy plain (on the unprotected band of River Tisza) and denser populations than those recorded in the literature.

The fact that it is the matter about the species with a dispersed areal, not only in Vojvodina but also in all Serbia (except *Ornithogalum refractum*)

confirms that these discoveries have not a local character. All mentioned species, except *Ornithogalum refractum*, are protected by the law as natural rarities and are on the list of Red data book of the Serbian flora. They are categorized as endangered species by the classification of IUCN. In such a way *Vinca herbacea* is characterized as rare species (R). The species *Adonis vernalis*, *Iris pumila* and *Prunus tenella* are classified as vulnerable species (V), but it is considered that in the near future these species will be classified as endangered species, because of the fact that their still numerous populations and sites are exposed to negative influences in all their area.

It can be concluded that this paper is a support for the species habitat protection because protection of a single species and its genofond is not possible without the protection of its habitats.

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