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Chorological, coenological and ecological characteristics of *Trifolium diffusum* EHRH. in Vojvodina

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ABSTRACT: The species *Trifolium diffusum* EHRH. has been recorded only at one locality in Vojvodina in the Fruška gora so far. Occurrence of this species at the northern slopes of the Titel Plateau completes its global distribution in this region. Phytocoenological records of stands with *Trifolium diffusum* point to the fact that they represent the stands of relict association *Agropyro-Kochietum prostratae* ZÓLYOMI 1958. This association is characterized not only by steppe, but also semidesert features. It develops on sloping, convex, higher parts of Titel plateau. According to the biological spectrum, the stands in which *Trifolium diffusum* grows are of thero-hemicryptophytic character while in spectrum of geographical elements of flora of the Pontic-Central Asian group dominate.

KEYWORDS: *Trifolium diffusum*, relict association, biological spectrum, distribution, element of flora.

Introduction

The geographical range of *Trifolium diffusum* includes south and southeast Europe, Mediterranean, Caucasus and Asia Minor, reaching Hungary in north (KOŽUHAROV 1976).

In Serbia it was found around Kladovo, on the Rtanj Mountain (PANČIĆ 1976), on hills around Prokuplje, in the Vranje surroundings (Čoška), near the Kurvin-grad, around Babušnica and Vlasotince (CINCOVIĆ 1972). According to personal communication of DRAGIŠA SAVIĆ, it also grows on Stara planina near Pirot - Zavojsko jezero (Fig. 4). This Pontic-Submediterranean plant (GAJIĆ 1980) survives in the climate conditions typical for these region.

As characteristic plant for the associations *Aceri tatarico-Quericon* ZÓLYOMI & JAKUCS (1957) and *Festucion rupicolae* SOÓ (1940, 1980), representing climatic-zonal vegetation of plain Vojvodina region, it is to be expected that this plant has wider distribution in this region. However, in numerous floristical and vegetational investigations, until now it was found only in Srem, at one locality in the Fruška gora near Čerević - Katanske livade (OBRADOVIĆ 1966), and is therefore belongs to the category of rare plants in flora of Vojvodina.

This paper represents a new findings of *Trifolium diffusum* in Vojvodina (Bačka - Titel Plateau near Tisza), which contributes to the picture of its distribution in Serbia. Having in mind that this species is characteristic of climatic zonal vegetation of Vojvodina, it is important to investigate its dispersion in more details, especially in this area. Therefore, in adition to the new findings, particular coenological and ecological characteristics of *Trifolium diffusum* were also pointed out.

General character of the investigated area

The Titel Plateau is specific geomorphological location in the lower Tisza area (southeastern Bačka). It is sharply edged loess plateau, elipsoidally shaped, at the altitude of 111-130 m, with 94 km^2 area. Eastern and southeastern slopes of the hill are steep over right Tisza bank, giving special character to this mostly lowland river. Close proximity of the rives considerably influences general climatic conditions of the investigated area, moderating climatic extremes.

In several years' average annual sum of precipitation is 602 mm, and the average annual temperature is 10.9°C. Moderate arid period occurs during summer and at the beginning of fall (KATIĆ et al. 1979).

The Titel Plateau is geologicaly founded on typical loess. Pedological cover is mostly young soil or loess (sirozem), with different varieties of chernozem (noncarbonated, eroded and carbonated) (ŽIVKOVIĆ et al. 1972). These conditions affected the formation of specific flora and vegetation of the Titel Plateau.

Methods

Collected plants were determined on the basis of CINCOVIC (1972) and JÁVORKA & CSAPODY (1975). Phytocoenological samples were taken according to the method of Swiss-French phytocoenological school (BRAUN-BLANQUET 1921, according to JANKOVIC 1966). Ecological indices of plant species are given according to LANDOLDT (1977) and SOO (1980). Life forms are given according to SOO (1980), and flora elements according to GAJIĆ (1980).

Results and discussion

Trifolium diffusum was found on the northern slopes of the Titel Plateau, near the village Mošorin - Potisje (Fig. 4). Individuals of this species mostly grow on rim parts of plateau (120-125 m altitude), sometimes descending to steep northeastern slopes. Soil is eroded chernozem and geological foundation is typical loess (ŽIVKOVIĆ et al. 1972). These habitats are covered with vegetation of steppe character.

Tab.1. Phytocenological records of stands with Trifolium diffusum EHRH.

Locality:			Titelski breg-Mošorin (Potisje)		
		Date:	10.06.1993.		
		Altiude:	125	120	125
		Exposition:	E	0	E
		Cover of herb leyer:	90	80	100
		Area size in m²:	25	25	25
		N°. of record:	1	2	3
floral elements	life form				
		Agropyro-Kochietum prostratae ZÓLYOMI 1958			
		Artemisio-Kochion SOÓ 1959			
Subj.sib.	Ch-N	*Kochia prostrata* (L.) SCHRAD.	1.2	2.2	2.1
Evr.	H	*Agropyrum cristatum* (SCHREB.) P.B.	1.2	2.2	3.2
		Festucetalia valesiacae BR.-BL. et TX. 1943			
Subpont.	H	*Achillea millefolium L.* subsp. *pannonica* (SCHELE) HAYEK	1.1	2.2	1.1
Subm.	Th	*Bromus squarrosus* L.	+.1	3.3	.
Subpont.ca.subm.	H	*Stipa capillata* L.	2.2	.	+.2
Pont.pan.	Ch	*Thymus marchallianus* WILLD.	.	.	1.2
Pont.	H	*Melica transsilvanica* SCHUR.	1.1	.	+.2
Subpan.	H	*Dianthus pentederae* KERNER	+.1	+.1	+.1
Subevr.	Th-TH	*Silene alba* (MILL.) KRAUSE	+.1	.	.
Subp.subm.	TH	*Verbascum phlomoides* L.	+.1	.	.
Se.	H	*Silene nemoralis* W. et K.	.	+.1	.
Subpont.ca.	H	*Astragalus onobrychis* L.	.	+.2	+.1
Subpont.	H	*Asperula glauca* (L.) BESS.	+.1	.	+.1
Pont.pan.	TH-H	*Centaurea stoebe* L. subsp. *micranthos* (GMEL.) HAY.	+.1	+.1	+.1
Pont.ca.subm.	G	*Allium flavum* L.	+.1	.	+.1
Subp.subc.subm.	H	*Achilea nobilis* L.	.	.	+.1
Evr.	H	*Sedum telephium* (L.) subsp. *maximum* (L.) KROCKE	+.1	.	+.1
		Festuco-Brometea BR.-BL. et TX. 1943			
Subp.subm.	H	*Eryngium campestre* L.	+.1	+.1	2.1
Subse.	Th	*Trifolium arvense* L.	2.1	2.3	.
Subpont.ca	Ch	*Artemisia campestris* L.	1.1	+.1	+.1
Subm.	H	*Perorhagia saxifraga* (L.) LINK.	+.1	+.1	1.1
Subse.	Th	*Vicia angustifolia* L.	+.1	+.1	+.1
Subpont. ca.	H	*Potentilla recta* L.	+.1	+.1	.
Subpont.ca	H	*Potentilla argentea* L.	+.1	+.1	.
Subevr.	TH (Th)	*Carduus nutans* L.	+.1	+.1	.
Pont.pan.	H	*Linaria genistifolia* (L.) MILL.	.	+.1	.
Subpont.	H	*Coronilla varia* L.	.	1.2	.
Evr.	Th	*Arenaria serpilifolia* L.	.	+.1	.
Subse.	Th (TH)	*Trifolium campestre* SCHREB.		.	+.1
Subse.	Th-TH (H)	*Alyssum alyssoides* (L.) L.	.	+.1	1.1
Pont.ca.	H	*Scabiosa ochroleuca* L.	.	+.1	.
Cirk.	H	*Koeleria gracilis* PERS.	.	+.2	.
Evr.	H	*Plantago media* L. var. *urvilleana* RAPIN.	.	+.2	+.2
		Festucion rupicolae SOÓ 1940			
Pont. sub.	Th-TH	*Trifolium diffusum* EHRH.	3.3	1.2	1.1
Pont pan.	H(Ch)	*Marrubium peregrinum* L.	2.3	.	+.1
Pont.ca.	Th-TH	*Falcaria vulgaris* BERNH.	1.1	+.1	.
Evr.	H	*Festuca rupicola* HEUF.	1.2	+.2	1.2
Pont.pan.	H	*Euphorbia glareosa* M.B. var *lasiocarpa* BOISS.	+.1	.	+.1
Subm.	Th	*Orlaya grandiflora* (L.) HOFFM.	+.1	.	+.1
		Other species			
Pont.Subm.	Th	*Xeranthemum annuum* L.	2.1	+.1	2.1
Subj.sib.	Th	*Artemisia annua* L.	1.1	+.1	+.1
Balk.-pred.az.	G	*Allium atroviolaceum* Boiss.	2.1	.	+.1
Evr.	Th	*Vicia hirsuta* (L.) GRAY.	+.1	.	.
Subpont.	H	*Salvia nemorosa* L.	.	+.1	1.1
Submed.	Th	*Calepina irregularis* (ASSO) THELL.	+.1	+.1	+.1
Subpont.ca.	Th-TH	*Berteroa incana* (L.) DC.	+.1	+.1	.
Pont. ca. subm.	(Th) TH	*Centaurea solstitialis* L.	+.1	.	+.1
Subev.	Th-TH-H	*Medicago lupulina* L.	.	+.1	.
Kosm.	(Th) TH-H-Ch	*Cerastium caespitosum* GILIB	.	.	1.1
Adv.	Th	*Stenactis annua* (L.) NEES.	.	+.1	.
Subp. subm.	Th	*Nigella arvensis* L.	.	+.1	.
Subev.	Th	*Papaver rhoeas* L.	+.1	.	.
Subev.	Th	*Descurania sophia* (L.) WEBB.	1.1	.	.
Evr.	Th	*Geranium columbinum* L.	+.1	.	.

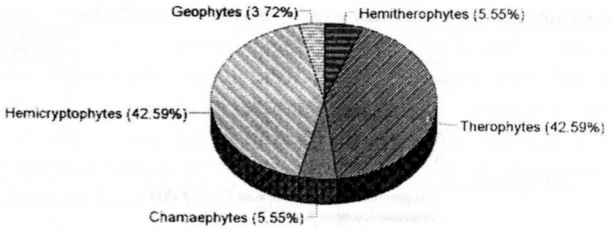


Fig. 1. Biological spectrum of species growing with *Trifolium diffusum*.

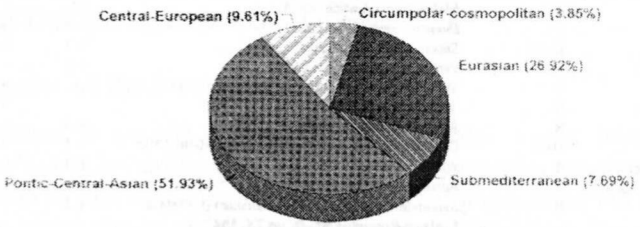


Fig. 2. Arealtypes spectrum of species growing with *Trifolium diffusum*.

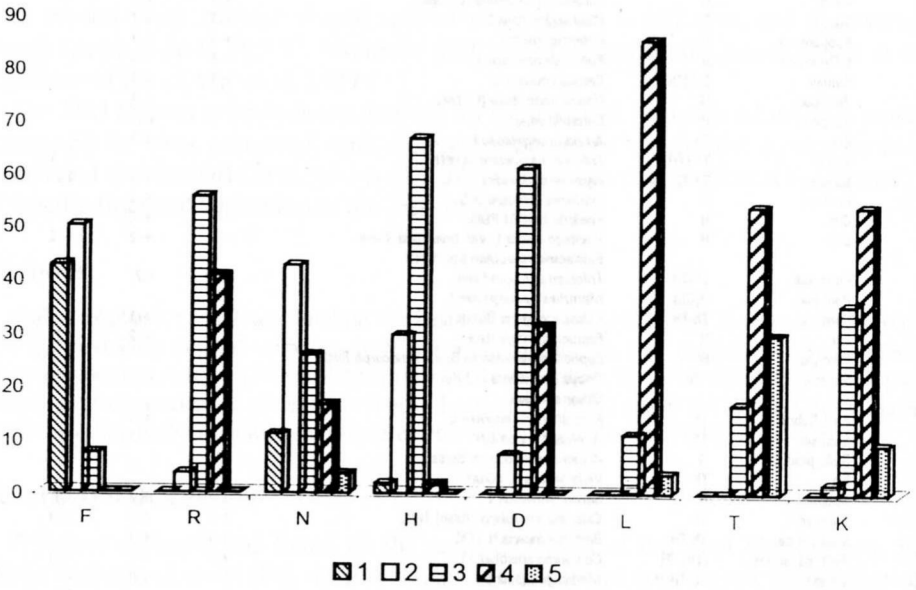


Fig. 3. Values of ecological indices of habitats (1-5) with *Trifolium diffusum*. (F- humidity, R - soil reaction, N - nutrients, H - humus, D - mechanical composition, L - light regime, T - temperature, K - continentality).

Phytocoenological samples (Tab. 1), taken in stands where individuals of *Trifolium diffusum* were found, show that the stands belong to ass. *Agropyro-Kochietum prostratae* ZÓLYOMI 1958 (alliance *Artemisio-Kochion* SOÓ 1959, ordo *Festucetalia valesiaceae* BR.-BL. et TX. 1943 and classis *Festuco-Brometea* BR.-BL. et TX. 1943).

In these stands, a certain number of plant species were found belonging to alliance *Festucion rupicolae* SOÓ (1940), as: *Trifolium diffusum, Marrubium peregrinum, Falcaria vulgaris, Festuca rupicola, Euphorbia glareosa* var. *lasiocarpa* etc. Presence of these plant species illustrates succession toward the stands of ass. *Thymo-Chrysopogonetum grylli* STOJANOVIĆ 1980, i.e. to vegetation of alliance *Festucion rupicolae* (STOJANOVIĆ 1983).

According to participation of certain life forms in biological spectrum (Fig. 1), stands with *Trifolium diffusum* are of thero-hemicryptophytic character.

Among the types of geographical distribution (Fig. 2), representatives of Pontic-Central-Asian group of floristic elements (51.93%) dominate, and among them 11.5% belongs to Pontic-Pannonian and Subpannonian species, which clearly indicates steppe character of stands with *Trifolium diffusum*.

By using ecological indices (LANDOLDT 1977; SOÓ 1980), actual ecological conditions were found for habitats where populations of *Trifolium diffusum* develop (Fig. 3). Indices for humidity (F) and temperature (T) are emphasizing xerothermic conditions of habitat. Soil reaction (R) is neutral to alkaline, which is in accordance to characteristics of eroded chernozem, having high carbonates in surface layers. Soil is relatively poor in nutrients (N) and humus (H), with lighter mechanical composition (D). Light regime (L) is favorable, because this is open, insolated and illuminated habitat. Continentality index (K) illustrates steppe character of stands with *Trifolium diffusum*.

These habitat conditions are in accordance with ecological requirements of *Trifolium diffusum*. As a plant of arid, warm, sunny and poor habitats, it finds appropriate conditions in steppe vegetation of the Titel Plateau.

Conclusion

- The paper deals with chorological, coenological and ecological characteristics of *Trifolium diffusum*, a rare plant in Serbian flora.
- It points to the first finding of this species in the Bačka - Titel Plateau (Potisje).
- *Trifolium diffusum* develops in steppe vegetation, as a part of stands of alliance *Agropyro-Kochietum prostratae*.
- According to the biological spectrum, stands in which investigated species grows are of thero-hemicryptophytic character.
- From the plant geographic distribution, elements of Pontic-Central-Asian group dominate.
- Ecological analysis of stands with *Trifolium diffusum* shows that its populations develop on arid, warm, sunny and poor habitats.

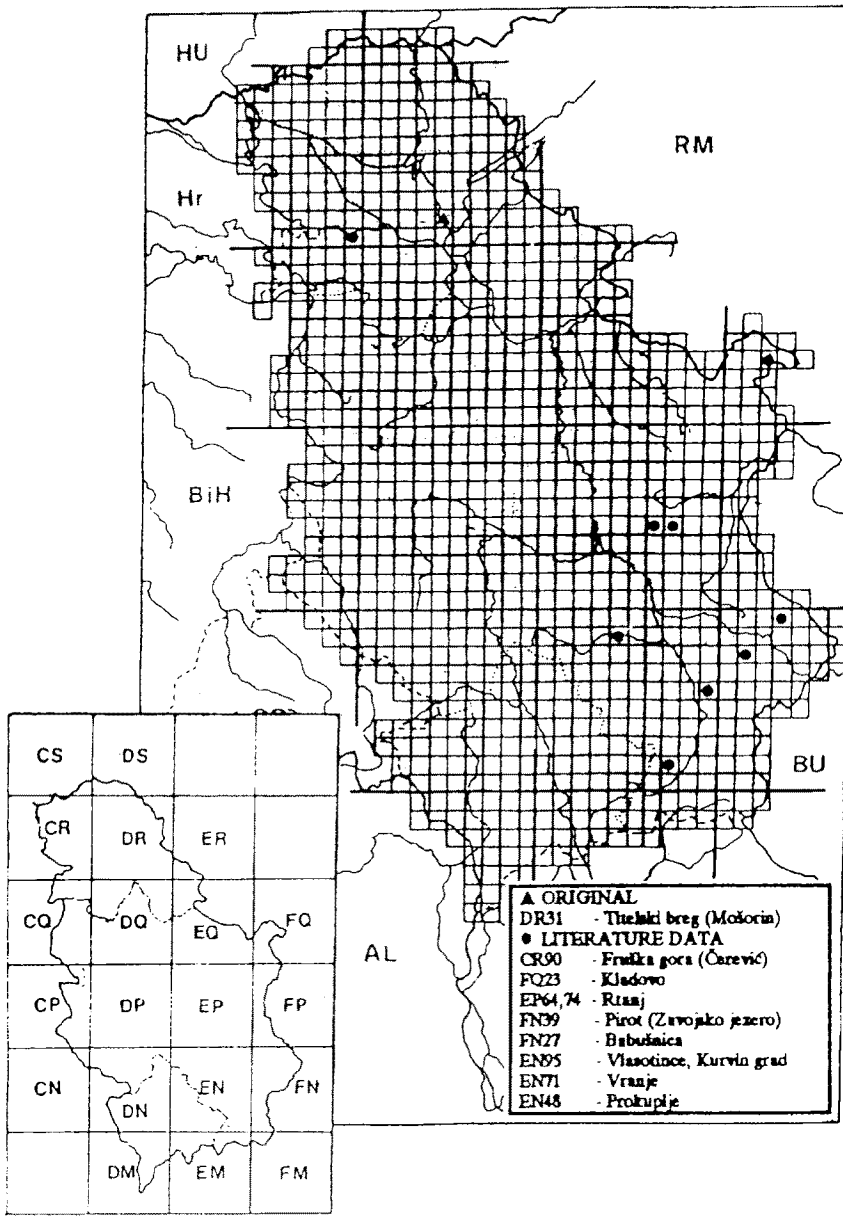


Fig. 4. Distribution of *Trifolium diffusum* in Serbia.

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Abbrevations of elements of flora:

Pont.-Pontic; Pont.pan.-Pontic-Pannonian; Pont.ca.-Pontic-Central-Asian; Pont.ca.subm.-Pontic-Central-Asian-Submediterranean; Pont.subm.-Pontic-Submediterranean; Subpont.-Subpontic; Subpont.ca.-Subpontic-Central-Asian; Subp.subm.-Subpontic-Submediterranean; Subp.ca.subm.-Subpontic-Central-Asian-Submediterranean; Subm.-Submediterranean; Subpan.-Subpannonian; Evr.-European; Se.-Central-European; Subevr.-Subeuropean; Subse.-Subcentral-European; Subj.sib.-Subsouth-Siberian; Cirk.-Circumpolar; Kosm.-Cosmopolitan; Adv.-Adventive.

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