

II. CONSERVATION OF BIOLOGICAL DIVERSITY

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***PRUNETUM TENELLAE* SOÓ 1951 *VINCETOSUM HERBACEAE*
PÎNZARU SUBASS. NOVA (*PRUNION FRUTICOSAE* R. TX. 1952)
IN THE CLIFF VEGETATION OF THE REPUBLIC OF MOLDOVA**

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Abstract: This article presents the characterization of the phytocoenoses dominated by *Amygdalus nana* that occur in the cliff area of the Dniester river basin, Republic of Moldova, which have been grouped in a new sub-association – *vincetosum hederaceae* Pînzaru subass. nova, in the association *Prunetum tenellae* Soó 1951. This sub-association includes xerophilous, thermophilic, western-Pontic phytocoenoses, occurring on sandy clays or on rendzina soils, on the limestone hills of the Dniester river basin, at altitudes of 60-150 m. The floristic composition of these phytocoenoses is dominated by the Eurasian elements (50%), followed by the European (10%), the Pontic-Mediterranean (9,6%) and the Central European elements (5,2%). The subassociation *Prunetum tenellae* Soó 1951 *vincetosum herbaceae* Pînzaru is of high value in terms of biodiversity conservation and deserves to be included in the *List of Protected Plant Associations of the Republic of Moldova*.

Keywords: *Prunetum tenellae* Soó 1951 *vincetosum herbaceae* subass. nova, characteristics of phytocoenoses, ecology, Republic of Moldova.

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Rezumat: În această lucrare se prezintă caracteristica fitocenozelor dominate de *Amygdalus nana*, din zona de stâncării a bazinului fluviului Nistru, Republicii Moldova, care sunt grupate într-o subasociație nouă – *vincetosum hederaceae* Pînzaru subass. nov. în cadrul asociației *Prunetum tenellae* Soó 1951. Această subasociație prezintă fitocenoze xerofile, termofile, vest-pontice, formate pe argile nisipoase sau pe soluri rendzinice, de pe colinele calcaroase ale bazinului fluviului Nistru, la altitudini de 60-150 m. În compoziția floristică a fitocenozelor predomină elementele eurasiatice (50%), urmate de cele europene (10%), pont-mediteraneene (9,6%) și central-europene (5,2%). Subasociația *Prunetum tenellae* Soó 1951 *vincetosum herbaceae* Pînzaru, cu valoare conservativă mare, prezintă habitate rare și se propune a fi inclusă în *Lista asociațiilor vegetale ocrotite din Republica Moldova*.

Cuvinte-cheie: *Prunetum tenellae* Soó 1951 *vincetosum herbaceae* subass. nova, caracteristica fitocenozelor, ecologia, Republica Moldova.

INTRODUCTION

Amygdalus nana L. (= *Prunus tenella* Batsch.) is an Eurasian (continental), xeromesophilous species, occurring in steppe and forest steppe areas from Central, South-Eastern and Eastern Europe, Transcaucasia, West and Central Asia to Western Siberia

(south) [2, 23]. The phytocoenoses with *Amygdalus nana*, in its range, are grouped in several associations, thus, those from Romania [4, 5, 10, 11, 14], the Czech Republic [6] and Bulgaria [18] are included in the association *Prunetum tenellae* Soó 1951, those from Macedonia [16, 22] – in the association *Ephedro-Prunetum tenellae* Em, from Serbia [19] – in the association *Artemisio camphoratae-Prunetum tenellae* B. Jovanović 1955, from Ukraine [7, 25] – in the associations *Amygdalo-Caraganetum* Fitsailo 2006, *Amygdalo nanae-Spiraeetum hypericifoliae* Fitsailo 2008, and those from Russia [21, 26] – in the associations *Spiraeo hypericifolia-Amygdaletum nanae* Solomeesch et al. 1994 and *Stipo pennatae-Amygdaletum nanae* Yamalov et Sultangareeva 2010.

Although the presence of the species *Amygdalus nana* L. in the territory of the Republic of Moldova was indicated long ago by A. Meyer [24], any phytosociological research on plant communities formed by this species has not been carried out until now. A brief characterization of these phytocoenoses in the cliff area, without providing the synthetic table, was published only in 2016, when they were included in the association *Prunetum tenellae* Soó (1927 em. 1947) 1959 [12]. Then, new phytosociological descriptions were done (rel. no. 1, 4, 7 10-15), in some relevés the phytosociological descriptions were repeated (in spring and autumn).

This article presents the characterization of phytocoenoses dominated by *Amygdalus nana*, from the cliff area of the Dniester river basin, Republic of Moldova, which have been grouped in a new subassociation – *vincetosum hederaceae* Pînzaru subass. nova [incl. *Prunetum tenellae*: Pînzaru, Ruschuk, (2016)] in the association *Prunetum tenellae* Soó 1951.

MATERIALS AND METHODS

The phytosociological research was conducted according to the methods of the Central-European school [1]. The description of the association was based on 15 relevés. The area of the relevés, depending on the area of the phytocoenoses, varied from 30 to 100 m². The phytosociological research in the field was conducted in 1997, 2009, 2011, 2015, 2017 and 2018. The list of the species was presented according to the monograph P. Pînzaru & T. Sîrbu [13]. The rare species protected by the state – according to the Law LP1538/1998 (Republic of Moldova, Parliament 1998) [8]. The soil was described according to A. Ursu [20]. The average annual air temperature and the average amount of precipitation – according to the Atlas of Climatic Resources of the Republic of Moldova [9]. The geomorphological units – according to G. Sârodoev et E. Mițul [15].

RESULTS AND DISCUSSIONS

The association *Prunetum tenellae* Soó 1951 consists of small shrubs (up to 1 m tall), xerophilous-xeromesophilous, thermophilic, found in steppe and forest steppe areas in Romania, the Czech Republic and Bulgaria, at various altitudes, from (200) 380-750 m in Romania [10] up to 900-1100 m in Bulgaria [18]. The general vegetation cover varies between 80 and 100%. The characteristic species of the association is *Amygdalus nana* (= *Prunus tenella*). Constant accompanying species: *Elymus hispidus*, *Festuca*

valesiaca, *Melica transsilvanica*, *Salvia nemorosa*, *Teucrium chamaedrys*, *Thalictrum minus* var. *minus*. The phytocoenoses with *Amygdalus nana* (*Prunus tenella*), in Romania, are grouped in two subassociations: **typicum** (56 relevés., tab. 2, col. 1a, 380-750 m altitude) and **phleetosum montanae** Oprea in Coldea et al. 2015 (13 rel., tab. 2, col 1b, 500-530 m altitude, differential species: *Phleum montanum* – 92%, *Verbascum lychnitis* – 85%, *Alyssum murale* – 46%, *Heliantemum nummularium* subsp. *obscurum* – 46%) [10]. In Bulgaria, the phytocoenoses with *Amygdalus nana* are grouped in the association *Prunetum tenellae bulgaricum* Soó 1957 (5 rel., tab., pp. 237, 900-1100 m altitude) [18]; in the author's opinion, these phytocoenoses could be grouped in a separate subassociation – **astragaletosum angustifolii**, having the following differential species: *Astragalus angustifolius* (IV), *Alyssum rhodopense* [= *Alyssum corymbosoides*] (III), *Rosa spinosissima* (III), *Satureja hungarica* [= *Clinopodium alpinum* subsp. *hungaricum*] (III) *Sedum hispanicum* (III). The phytocoenoses with *Amygdalus nana* occurring in the Czech Republic (Moravia) included in the association *Prunetum tenellae* Soó 1951 (6 rel., tab.3, ass. 2) [6] could be grouped in a sub association – **brometosum inermis**, having the following differential species: *Bromus inermis* (100%), *Carduus acanthoides* (67%), *Silene latifolia* (67).

The phytocoenoses dominated by *Amygdalus nana* L. from the cliff area of the Republic of Moldova spread fragmentarily over areas of 30-300 m², at the edge of arid forests and scrubs or on sunny hills with steppe vegetation. The small height of the shrubs and the considerable contact with the steppe vegetation favour the penetration of a large number of species characteristic of steppes, but the high abundance of the shrubs does not allow the compact development of the herbaceous layer. These plant communities occur at lower altitudes, between 60 and 150 m, they grow on sandy clays or on rendzina soils, and their differential species are *Vinca herbacea*, *Thymus marschallianus* and *Caragana frutex*.

As a result of the phytosociological research, conducted in the field and the study of information from the literature, the phytocoenoses dominated by *Amygdalus nana* found in the cliff area of the Dniester river basin, Republic of Moldova, have been grouped in a new subassociation – **vinctetosum herbaceae** Pînzaru subass. nova, which is described below.

***Prunetum tenellae* Soó 1951 *vinctetosum herbaceae* Pînzaru, subass. nova, hoc loco**

Relevé type h. l.: Table 1, rel.1., alt. 78-80 m, 48°00.911' lt. North, 28°31.698' lg. East. (Figure 1).

Synthetic table h. l.: Table 1, 15 relevés.

Syn.: *Prunetum tenellae* auct. non Soó (1927 em. 1947) 1959: Pînzaru & Ruschuk, 2016.

Locations: Altitude 60-150 m. Relief: the Dniester Plateau, Central Moldavian Plateau, the southern slope of the Podolian Upland, in the upper part of the limestone slopes of the Dniester Valley and of its right tributaries Răut and Ichel. The slope exposure – south, southeast and west, the inclination – about 5-30°. Climate – temperate-continental, the average annual temperature is 9.5-10.0°, the average annual precipitation varies between 500 and 550 mm. Bedrock: Sarmatian limestones or Quaternary clays. Soils: rendzina or sandy clays.



Figure 1. Ass. *Prunetum tenellae* Soó 1951 *vincetosum herbaceae* subass. nova (type), Tîrgul-Vertiujeni commune, Floreşti district, 29.IV.2009.

Characteristic species: *Amygdalus nana* (V), *Vinca herbacea* (IV), *Thymus marschallianus* (IV), *Caragana frutex* s. str. (III).

Constant species: *Festuca valesiaca* (V), *Marrubium peregrinum* (IV), *Medicago falcata* (IV), *Teucrium chamaedrys* (IV), *Thalictrum minus* var. *minus* (III).

Rare species: *Orchis purpurea* [Critically Endangered (CR)] included in the Red Book of Moldova (2015) and Nearly Threatened (NT) species (Law...1998): *Adonis vernalis*, *Amygdalus nana*, *Asparagus officinalis*, *A. verticillatus*, *Crocus reticulatus*, *Hyacinthella leucophaea*, *Iris aphylla*, *Stipa lessingiana*, *S. pennata*, *S. pulcherrima*, *Teucrium montanum* var. *montanum* [3, 8].

Phytosociological composition. In the 15 studied relevés, 174 species of vascular plants have been identified: 33 species are characteristic of the coenotaxa of the class CRATAEGO-PRUNETEA, 21 – cl. TRIFOLIO-GERANIETEA, 98 – cl. FESTUCO-BROMETEA and 22 – *Variae syntaxa*. The number of species in a relevé varies from 22 to 60 species. Although there is a large number of species in the FESTUCO-BROMETEA class, the majority of these species are of low coenotic importance, being represented by few specimens and having low constancy (I-II).

Structure: The general vegetation cover is 100% (Figure 1, 2, 3); 1-2 layers are observed in the vertical structure of the phytocoenoses. The upper layer, with a height of 60-70 or 80-95 cm, with a general coverage of (60) 70-90%, is formed by the dominant species *Amygdalus nana* (abundance + dominance 4-5), accompanied in some places by *Caragana frutex* and *Rosa spinosissima* and with an insignificant participation of tall herbaceous species: *Stipa capillata*, *Marrubium peregrinum*, *Medicago falcata*, *Salvia nutans*, *S. nemorosa*, *Thalictrum minus*. Tall shrubs: *Crataegus monogyna*, *Rosa canina*, *Prunus spinosa*, *Cotinus coggygria*, *Rhamnus cathartica*, *Viburnum lantana* etc. occur

rarely, are represented by few specimens and do not form a distinct layer. The inferior layer, up to ± 25 cm, with a cover of 15-40%, consists of *Vinca herbacea*, *Teucrium chamaedrys*, *Thymus marschallianus*, *Festuca valesiaca*, *Asperula cynanchica* etc.



Figure 2. Ass. *Prunetum tenellae* Soó 1951 *vincetosum herbaceae*, Delacău commune, Anenii Noi district, 24.IV.2015



Figure 3. Ass. *Prunetum tenellae* Soó 1951 *vincetosum herbaceae*, Butor commune, Grigoriopol district, 21.VII.2018

The range of life forms contains hemicriptophytes (H) = 55,4%, therophytes (Th) = 14,0%, geophytes (G) = 11,0%, nanophanerophytes (Phn) = 9,0%, chamaephytes (Ch) = 6,0%, biennial plants (TH) = 3,6% and mesophanerophytes (Phm) = 1,0%.

The following geoelements predominate: Eurasian (Eua) = 50,0%, European (Eur) = 10,0%, Pontic-Mediterranean (P-M) = 9,6%, Central-European (Euc) = 5,2%, Pontic-Pannonian (P-P) = 4,2%, Pontic-Pannonian-Balkan (P-P-B) = 3,6%, other geoelements are represented by 1 to 4 species.

Distribution (Figure. 4). The phytocoenoses of the given subassociation occur in the districts: Floresti (Țîrgul-Vertiujeni commune), Rezina (Țipova village), Orhei (Trebujeni commune), Anenii Noi (Delacău commune), Camenca (Hrușca commune and Iantarnoe village), Rîbnița (Molochișul Mare commune), Grigoriopol (Butor commune) and Chișinău municipality (Cricova town and Făurești village).

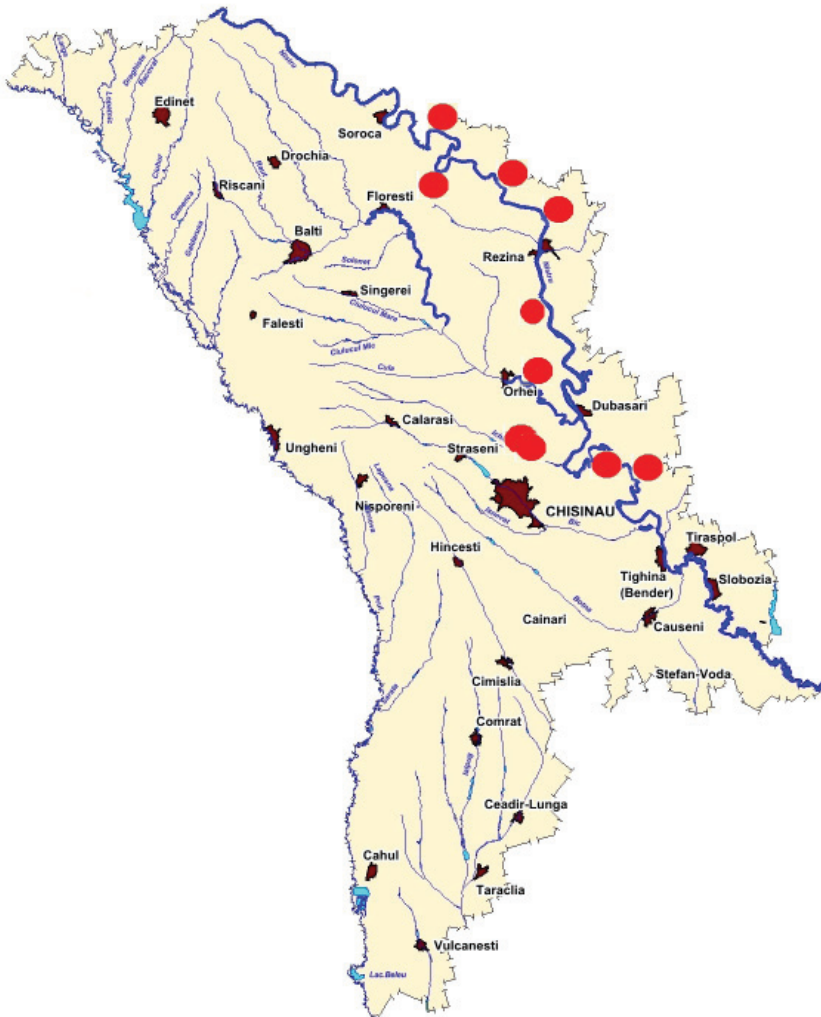


Figure 4. Locations of the subassociation *vincetosum herbaceae* subass. nova in the Republic of Moldova

G	Euc	<i>Gagea pratensis</i>	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	I	
H	Eua	<i>Galatella linosyris</i>	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	I	
H	Eua	<i>Galatella villosa</i>	1	-	-	-	-	-	-	-	-	-	-	-	+	1	-	I	
H	Euc	<i>Hierochloë australis</i>	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	I	
G	P-B	<i>Hyacinthella leucophaea</i>	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	I	
H	Eua	<i>Hypericum elegans</i>	-	-	-	-	-	-	-	r	-	-	-	-	+	-	-	I	
H	Eua	<i>Hypericum perforatum</i>	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	I	
G	P-P-B	<i>Iris pumila</i>	-	-	-	-	-	-	-	-	+	-	-	-	-	-	+	I	
H	Pont	<i>Jurinea ledebourii</i>	-	-	r	-	-	-	-	-	-	-	-	-	+	-	-	I	
H	Eur	<i>Koeleria pyramidata</i>	-	-	-	-	-	-	-	+	-	+	-	+	-	-	-	I	
G	Eur	<i>Leopoldia comosa</i>	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	I	
H	Eua	<i>Linum perenne</i>	-	-	-	1	+	+	-	-	-	-	-	-	+	-	-	I	
G	P-Sm	<i>Muscari neglectum</i>	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	I	
Ch	P-B	<i>Odontarrhena muralis</i>	-	-	+	-	-	+	+	-	-	-	-	-	-	-	-	I	
TH	P-P-B	<i>Onosma visianii</i>	-	-	-	-	-	-	-	-	-	r	-	-	-	-	-	I	
H	P-B-Ca	<i>Peucedanum ruthenicum</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	+	r	I	
H	Eua	<i>Phleum phleoides</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	I	
		<i>Phlomis herba-venti</i>																	
H	P-M	var. <i>pungens</i>	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	+	I
H	Eua	<i>Pilosella echiioides</i>	-	-	-	-	-	-	-	-	-	-	-	-	r	-	-	I	
H	Eua	<i>Pimpinella saxifraga</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	r	-	r	I
H	Eua	<i>Poa angustifolia</i>	-	2	-	-	-	-	-	1	-	-	-	-	-	-	-	-	I
H	Eua	<i>Potentilla recta</i>	r	-	-	-	-	r	r	-	-	-	-	-	-	-	-	-	I
H	Pont	<i>Psephellus marschallianus</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	I
G	P-M	<i>Ranunculus illyricus</i>	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	I
H	P-P	<i>Salvia austriaca</i>	-	-	-	-	-	-	-	-	r	-	-	-	+	-	-	+	I
H	P-P	<i>Salvia nutans</i>	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	I
H	Eua	<i>Sanguisorba minor</i>	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	I
Ch	Eua	<i>Sedum acre</i>	-	-	-	-	-	-	-	-	-	+	-	-	-	1	-	-	I
H	Eua	<i>Senecio jacobaea</i>	-	-	-	-	r	-	-	-	-	-	-	-	-	-	-	-	I
Th	Eua	<i>Sideritis montana</i>	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	I
TH	EurS	<i>Silene otites</i>	+	-	-	-	-	r	-	-	-	-	-	-	-	r	-	-	I
H	Pont	<i>Stipa lessingiana</i>	-	-	+	-	+	-	-	-	-	-	-	-	-	-	-	-	I
H	Eua	<i>Stipa pennata</i>	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	I
		<i>Teucrium montanum</i> var.																	
Ch	P-M	<i>montanum</i>	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	I
H	Sm	<i>Teucrium capitatum</i>	-	-	-	1	-	+	-	-	-	-	-	-	-	-	-	-	I
Th	Eua	<i>Thlaspi perfoliatum</i>	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	I
TH	Euc-M	<i>Tragopogon dubius</i>	r	-	r	-	-	-	-	-	-	-	-	-	-	-	-	-	I
Th	Eur	<i>Valerianella dentata</i>	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	I
H	Eua	<i>Verbascum phoeniceum</i>	+	-	-	-	+	-	-	r	-	-	-	-	-	-	-	-	I
Ch	Eua	<i>Veronica prostrata</i>	-	+	-	-	-	-	-	-	-	-	-	-	-	-	r	-	I
H	Eua	<i>Veronica spicata</i>	-	-	-	r	r	-	-	-	-	-	-	-	-	-	r	-	I
Th	Eua	<i>Veronica verna</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	I
H	P-P	<i>Viola ambigua</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	I

Th	P-M	<i>Viola kitaibeliana</i>	+	-	-	-	-	-	+	-	-	-	-	-	-	-	-	I
Th	P-M	<i>Xeranthemum annuum</i>	-	-	-	+	-	+	+	-	-	-	-	-	-	-	-	I
		<u>Variæ syntaxa</u>																
Ch	Eua	<i>Artemisia campestris</i>	-	-	-	r	-	-	-	-	-	+	+	-	+	+	-	II
Th	Eua	<i>Daucus carota</i>	+	-	-	-	-	r	r	-	-	-	-	+	-	-	-	II
G	Circ	<i>Elymus repens</i>	2	-	-	-	-	-	1	-	-	-	1	+	-	-	-	II
H	Eua	<i>Cardaria draba</i>	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	I
H	Eua	<i>Cichorium intybus</i>	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	I
Th	Eur	<i>Consolida regalis</i>	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	I
Th	Eua	<i>Crepis tectorum</i>	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	I
H	Eua	<i>Falcaria vulgaris</i>	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	I
H	Eua	<i>Galium mollugo</i>	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	I
Th	Eua	<i>Holosteum umbellatum</i>	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	I
Th	Eua	<i>Lamium amplexicaule</i>	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	I
TH	Eua	<i>Melilotus officinalis</i>	+	-	-	+	-	-	-	-	-	-	-	-	-	-	-	I
Th	Eur	<i>Papaver dubium</i>	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	I
H	Eua	<i>Plantago lanceolata</i>	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	I
H	Eua	<i>Reseda lutea</i>	-	-	r	-	-	-	-	-	-	r	-	-	-	r	-	I
Th	Eua	<i>Senecio vernalis</i>	+	-	-	-	-	-	r	-	-	-	-	-	-	-	-	I
Th	Eua	<i>Thlaspi arvense</i>	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	I
Th	Euc	<i>Torilis arvensis</i>	r	-	-	-	-	-	-	-	-	-	-	-	-	-	-	I
H	Eua	<i>Verbascum nigrum</i>	-	-	-	-	-	-	-	r	-	-	-	-	-	-	r	I
Th	Eua	<i>Veronica arvensis</i>	+	-	+	-	-	-	-	-	-	-	-	-	-	-	-	I
Th	Eua	<i>Veronica hederifolia</i>	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	I
Th	Cosm	<i>Viola arvensis</i>	+	+	-	-	-	-	+	-	-	-	-	-	-	-	-	I

Place and date of the relevés:

- *1(type), Țîrgul-Vertiujeni commune, Florești district, 29.IV.2009; 25. VIII.2018;
- 2-3, Țîpova village, Rezina district, 14.V.2011;
- 4, Cricova town, Chișinău municipality, 04.VII.2009, 15. VI.2017;
- 5-6, Făurești village, Chișinău municipality, 18.VII.2015;
- 7, Trebujeni commune, Orhei district, 11.VI.2015, 23. IV.2018;
- 8, Delacău commune, Anenii Noi district, 05.VI.2015;
- 9, Hrușca commune, Camenca district, 06.VI.1997;
- 10-11, Rașcov x Iantarnoe village, Camenca district, 02.X.1997, 19.VIII.2018;
- 12, Molochișul Mare commune, Rîbnița district, 07.V.2017;
- 13-15, Butor x Teiu commune, Grigoriopol district, 16.VII.1995, 21.VIII.2018

CONCLUSIONS

The subassociation *vinceotosum herbaceae* Pinzaru subass. nova of the association *Prunetum tenellae* Soó 1951 includes xerophilous, thermophilic, western-Pontic phytocoenoses, occurring on sandy clays or on rendzina soils, on the limestone hills of the Dniester river basin, at altitudes of 60-150 m.

In the floristic composition of the phytocoenoses, the following geoelements predominate: Eurasian (50,0%), followed by the European (10,0%), Pontic-Mediterranean (9,6%) and the Central-European ones (5,2%).

The subassociation *Prunetum tenellae* Soó 1951 *vinctosum herbaceae* Pînzaru is of high conservation value, includes rare habitats and deserves to be included in the *List of Protected Plant Associations of the Republic of Moldova*.

The association *Prunetum tenellae* Soó 1951 includes *Amygdalus nana* scrubs in Pontic-Pannonian-Balkan, xerophilous-xeromesophilous, thermophilic phytocoenoses and rare habitats included in the Emerald Network.

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