

The association *Conyzo-Cynodontetum dactyloni* in western Slovakia, Czechoslovakia

Asociácia *Conyzo-Cynodontetum dactyloni* na západnom Slovensku, Československo

Pavol Eliáš

Dedicated to Professor Dr. J. Futák on his 65th birthday

ELIÁŠ P. (1979): The association *Conyzo-Cynodontetum dactyloni* in western Slovakia, Czechoslovakia. — Preslia, Praha, 51 : 349–362.

The association *Conyzo-Cynodontetum dactyloni* (FELFÖLDY 1942) ELIÁŠ 1978 includes non-trodden stands dominated by *Cynodon dactylon* in artificial dry habitats (road-side and railway areas, abandoned vineyards and fields) within the whole Pannonian region. It represents a pioneer semi-ruderal community of the class *Agropyreteea repentis*. Symmorphology, synecology, syndynamics, synchronology as well as syntaxonomy of the association is described. A new alliance, the *Convolvulo-Cynodontion dactyloni* ELIÁŠ 1979, is suggested to include non-trodden, thermophilous initial communities dominated by *Cynodon dactylon* on pervious, disturbed habitats of Europe.

Institute of Experimental Biology and Ecology, Slovak Academy of Sciences, Dúbravská cesta 26, 885 34 Bratislava, Czechoslovakia.

Cynodon dactylon (L.) PERS. is an enormously variable perennial grass and has become a truly cosmopolitan weed of disturbed habitats. It exhibits a wide ecological tolerance which is due to its great plasticity under different conditions. It is capable of growing in different soil types under varied climatic conditions. *Cynodon dactylon* is now distributed everywhere in the warmer regions of temperate and tropical zones of both hemispheres.

Several biotypes (ROCHECOUSTE 1962), ecological races or "edaphic ecotypes" (RAMAKRISHNAM et SINGH 1966) and botanical varieties (HARLAN et DE WET 1969) have been described, differing in ecology, morphology, cytology and geographical distribution. The variation within *Cynodon dactylon* was studied by HARLAN et DE WET (1969) in detail and six botanical varieties have been recognized. Only one variety, *Cynodon dactylon* var. *dactylon*, is widespread; the others are either narrow endemic or have restricted distributions.

In Czechoslovakia, only plants belonging to *Cynodon dactylon* var. *dactylon* occur. The variety is cosmopolitan. Its variation is enormous, ranging from very small, fine turfgrasses suitable for putting greens to large, leafy, robust types cut for hay and used for pasture (HARLAN et DE WET 1969). It is known from every country in Africa, America, Asia except Mongolia and Tibet, Australia and Europe. It is found in islands in the Atlantic, Pacific, East and West Indies, but also in all the Mediterranean islands. It extends approximately to 53° N and in Nepal up to over 3000 m elevation.

The available evidence suggests that this variety was a Eurasian grass until recent times (HARLAN et DE WET l.c., HARLAN et al. 1970). A centre of evolutionary activity has been identified in the area from West Pakistan to Turkey and it seems likely that the aggressive weedy races have emerged from that centre. At any rate, the variety provides an important forage resource from India to S. Europe. Throughout this region it serves primarily as a grass of village grazing grounds where it tolerates very heavy use and considerable abuse. It is also important in controlling erosion and as turfgrass, but is almost never cut for hay (cf. HARLAN 1970).

HARLAN et DE WET (1969) divided *Cynodon dactylon* var. *dactylon* into three major races that are reasonably distinct, for the most part, but that blend and hybridize too freely to be established as botanical varieties. In Czechoslovakia, the typical and well-developed specimens of temperate race occur. In southwestern Slovakia, reduced secludus-temperate specimens also occur (cf. HARLAN et al. 1970).

Cynodon dactylon var. *dactylon* thrives only under extreme disturbance and does usually not invade natural grasslands or forest vegetation. It may occur in arable lands, along roadsides, drainage ditches, rice dykes and canal banks, pathways, village streets and in lawns of cities and towns and is very troublesome as a weed in many crops. *Cynodon dactylon* has a wide range of tolerance to a number of herbicides (cf. e.g. THOMAS et MURRAY 1978).

In disturbed habitats, *Cynodon dactylon* occurs as dominant or more abundant species in several communities within the warmer regions of both hemispheres. These communities, at present, are poorly known. They have been studied only in Europe (cf. e.g. TÜXEN 1950) and partly in South America (GUTTE 1978a, b). In Europe, *Cynodon dactylon* occurs in communities of the class *Chenopodietea*, of alliance *Polygonion avicularis* (*Plantaginetea*) and in various types of "grasslands" (*Cynosurion*, *Festucion vallesiaceae*) as well as of the class *Agropyreteae repentis*. Within the large spectrum of the communities it is distributed frequently in southern and southeastern Europe (cf. HORVAT et al. 1974). *Cynodon dactylon* is considered by TÜXEN (1950) as a differential species of the various thermophilous nitrophilous weed communities in the European-Siberian region of Europe. GUTTE (1978a), studying the communities of *Cynodon dactylon* in Peru, suggested a new south-american alliance *Cynodontion dactyli* which includes trodden communities in roadsides belonging to the class *Plantaginetea*.

In the Pannonian region, several communities dominated by *Cynodon dactylon* were described. In a review of the Pannonian communities, Soó (1971) gives the following syntaxa:

A. *Festucetalia vallesiaceae* BR.-BL. et TX. 1953

- I. *Festucion rupicolae* ("sulcatae") Soó (1929 nom. n.) 1940 corr. Soó 1964 [Syn.: *Festucion vallesiaceae* KLIKA (1931) 1939 p.p.]

Cynodonto-Festucion (*rupicolae-pseudovinae*) Soó 1971

1. *Potentillo-Festucetum pseudovinae* Soó (ex ASZÓD 1936) 1950 *poetosum bulbosae* (Syn.: *Poëto bulbosae-Cynodontetum dactyli* CSÜROS et al. 1967).
2. *Cynodonto-Festucetum pseudovinae* (KLIKA 1937 p.p.) Soó 1957 (Syn.: auch *Cynodon-Lolium-Andropogon* ASS. Soó 1932 p.p., *Cynodon-Lolium* ass. Soó 1928, 1945).
3. *Cynodonto-Poëtum angustifoliae* (RAPAICS 1926) Soó 1957 *cynodontetosum et lolietosum* (RAPAICS 1927) Soó 1971 (Syn.: *Lolietum perennis* auct., *Cynodon* ass. FÉLFÖLDY 1942, *Cynodonti-Lolietum* MÁTHÉ 1956, KÁRPÁTI I. 1959, *Lolio-Cynosuretum Lolium-Cynodon* Subass. SLAVNÍČ 1948).

B. *Eragrostietalia* J. TX. 1961 emend. Soó 1968

- II. *Consolido-Eragrostion poaeoidis* Soó et TIMÁR 1957

4. *Convolvulo-Portulacetum* UBRIZSY (1949) 1967 *cynodontetosum* Soó 1971 (Syn.: *Convolvulo-Cynodontetum* UBRIZSY 1967).

C. *Plantaginetalia majoris* TX. (1947) 1950

- III. *Polygonion avicularis* BR.-BL. 1931 emend. TX. 1950

5. *Lolio-Plantaginetum majoris* (LINKOLA 1921) BEGER 1930 *cynodontetosum* TX. 1950.

- IV. *Agropyro-Rumicion crispi* NORDH. 1940

6. *Lolio-Potentilletum anserinae* (RAPAICS 1927) KNAPP 1946 *cynodontetosum* KÁRPÁTI I. 1965.
7. *Trifolio fragifero-Cynodontetum* BR.-BL. et BOLÓS 1958 *cynodontetosum et lolietosum*.

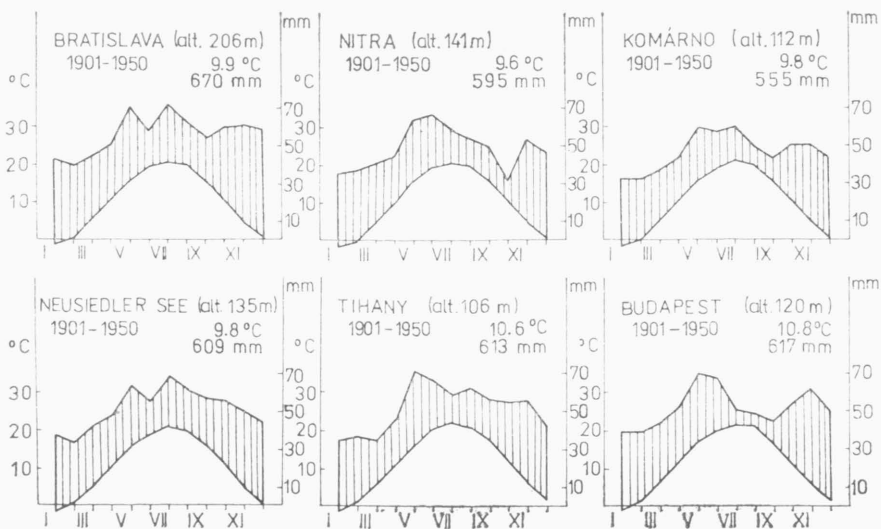


Fig. 1. — Climadiagrams of some meteorological stations situated within the distribution area of *Cynodon dactylon* (L.) PERS. var. *dactylon* in the Pannonian floristic region (Czechoslovakia, Austria, Hungary).

In Czechoslovakia, communities with *Cynodon dactylon* were studied in several regions but phytocoenological materials were published only from southwestern Slovakia. KRIPPELOVÁ (1972) has found the *Cynodon dactylon* stands in ruderal, trodden habitats within the town Malacky (Záhorská nížina region, W. Slovakia) and classified them as *Cynodono-Plantaginietum* GAMS 1927. In railway habitats in Horné Požitavie region, stands of *Cynodon dactylon* occur which have been described by ELIÁŠ (1974) as the community with *Cynodon dactylon*. A widespread community of *Cynodon dactylon* in Czechoslovakia is the *Conyzo-Cynodontetum dactyloni* (FELFÖLDY 1942) ELIÁŠ 1978 described from Trnava town in SW. Slovakia (cf. ELIÁŠ 1978). This paper is concerned with phytocenological characteristics of the association and is chiefly based on phytocoenological material collected and observations made in western Slovakia.

Conyzo-Cynodontetum dactyloni (FELFÖLDY 1942) ELIÁŠ 1978

Syn.: *Cynodontetum dactyloni* FELFÖLDY 1942 em. ELIÁŠ in HEJNÝ et al. 1979. — *Cynodon dactylon*-ass. FELFÖLDY 1942 p.p., non *Cynodontetum dactyli* BOJKO 1933.

Nomenclatural type (lectotype): FELFÖLDY 1942, Table 6, relevé No. 4.

SYNMORPHOLOGY

The association includes dense stands of *Cynodon dactylon* in disturbed areas (roadsides, railways, etc.) in the Pannonian region. The physiognomy of the community is determined by *Cynodon dactylon*, a rigorous dominant species covering continuously the area occupied by the community. The area is not usually larger than 7 m², ranging from (1.5) 3 to 4 (6) m². The cover of the area is frequently 100 %, only rarely less (but always above 90 %).

Tab. 1. — *Conyzo-Cynodontetum dactyli* in Bratislava (SW. Slovakia)

Relevé	1	2	3	4	5	6	7	8	9	10	11	12	O
Plot area (m ²)	2.4	6	13	4.5	16	8	12	4	2.5	4	5	4	
Cover (%)	90	100	100	100	100	100	100	100	100	100	100	100	
Number of species	5	7	9	10	10	10	11	13	16	16	16	21	
<i>Cynodon dactylon</i>	5.5	4.5	4.5	5.5	5.5	5.5	5.5	5.5	5.5	4.5	4.4	5.5	V
<i>Conyza canadensis</i>	.	.	1.1	+	+	1.1	+	+	r	+	.	.	IV
<i>Convolvulus arvensis</i>	+	.	+	+	+	.	r	1.1	+	.	+	1.1	IV
<i>Falcaria vulgaris</i>	.	1.3	.	.	+	.	.	.	.	+	.	1.1	II
<i>Chondrilla juncea</i>	.	+	.	.	r	.	.	.	.	(r)	.	.	I
<i>Pastinaca sativa</i>	.	.	r	.	.	.	.	.	.	1.1	.	.	I
<i>Lepidium draba</i>	.	.	r	.	.	.	.	.	.	.	r	.	I
<i>Agropyron repens</i>	.	+	.	.	.	.	.	.	.	.	.	.	I
<i>Poa compressa</i>	.	.	.	.	.	.	.	.	+	.	.	.	I
<i>Setaria glauca</i>	.	.	r	.	r	+	.	.	.	.	r	1.1	II
<i>Sonchus oleraceus</i>	(r)	.	.	+	r	.	r	.	.	+	.	.	II
<i>Digitaria sanguinalis</i>	.	.	+	.	.	1.1	+	.	.	.	.	.	II
<i>Cirsium arvense</i>	.	+	.	.	.	.	.	.	.	r	.	r	II
<i>Setaria verticillata</i>	r	.	.	.	r	.	+	.	.	.	.	.	II
<i>Panicum capillare</i>	.	.	.	.	+	.	.	.	r	.	.	r	II
<i>Atriplex tatarica</i>	.	.	.	+	+	.	.	.	.	(r)	.	.	II
<i>Setaria viridis</i>	.	.	.	+	.	.	.	.	r	.	.	.	I
<i>Chenopodium album</i>	.	.	.	.	.	.	.	r	.	.	.	+	I
<i>Tripleurospermum inodorum</i>	.	.	.	.	.	.	.	r	.	r	.	.	I
<i>Lolium perenne</i>	1.3	.	.	(r)	.	+	.	+	+	1.3	.	.	III
<i>Cichorium intybus</i>	.	.	r	.	.	.	.	.	+ .2	.	r	+ .2	II
<i>Lepidium rudemale</i>	r	.	.	r	.	.	r	r	.	.	.	.	II
<i>Polygonum aviculare</i>	.	.	.	.	.	.	+	+	.	.	.	.	I
<i>Plantago major</i>	.	.	.	.	.	(r)	(r)	.	.	.	.	.	I
<i>Artemisia vulgaris</i>	.	1.1	.	r	.	r	.	.	(r)	r	+	+	III
<i>Linaria vulgaris</i>	.	.	.	.	.	+	.	.	+	.	.	r	II

<i>Taraxacum officinale</i>	.	.	.	.	.	.	.	.	+	.	+	.	I
<i>Achillea millefolium</i>	.	.	.	.	.	.	.	.	+	.	+	.	I
<i>Reseda lutea</i>	.	.	.	.	.	.	.	.	.	.	+	+	I
<i>Silene alba</i>	.	.	.	.	.	.	.	.	+	.	r	.	I
<i>Medicago lupulina</i>	.	.	.	.	.	.	.	r	+	.	.	.	I
<i>Carex hirta</i>	.	.	2.1	.	.	.	.	.	.	+.2	.	.	I
<i>Ballota nigra</i>	.	.	.	.	.	.	.	.	.	+	.	r	I
<i>Atriplex oblongifolia</i>	.	.	.	.	.	r	.	.	.	+	.	.	I
<i>Echium vulgare</i>	.	.	.	.	.	.	.	.	(r)	.	+	.	I

Companion species occurring in one relevé only: 1: *Lycopersicum esculentum* r, *Polygonum persicaria* r; 2: *Humulus lupulus* r; 4: *Amaranthus retroflexus* r; 6: *Daucus carota* +, *Melilotus officinalis* r; 7: *Plantago lanceolata*; 10: *Stenactis* sp. r; 11: *Arrhenatherum elatius* 1.1, *Berteroa incana* r — +, *Euphorbia cyparissias* +, *Tragopogon dubius* +; 12: *Calamagrostis epigeios* +, *Dactylis glomerata* r, *Equisetum ramosissimum* r, *Fallopia convolvulus* r, *Lactuca serriola* r, *Plantago indica* r, *Mercurialis annua* +, *Stellaria media* +.

Localities of relevés of the *Conyzo-Cynodontetum dactyloni* recorded in Bratislava town (Tab. 1):

- 1, 4, 5, 8 — railway station Bratislava-filiálka, 17. 9. 1974
- 2 — railway station Bratislava-hlavná stanica, 19. 9. 1974
- 3, 10 — railways station Bratislava-Rača, 23. 9. 1974
- 6 — railway station Bratislava-Nové Mesto, 19. 9. 1974
- 7, 9 — railway Bratislava-Nivy, 17. 9. 1974
- 11 — railway areas at Bratislava-Rača-odbočka, 23. 9. 1974
- 12 — railway station Bratislava-Východ, 3. 10. 1974

In the most cases, the community is formed by moderately tall and frequently prostrate plants of *Cynodon dactylon*. The height of the stands varied between 25—30—40 cm, rarely more. These *Cynodon dactylon* plants should belong to the *seleucidus* race described by HARLAN et DE WET (1969) within *Cynodon dactylon* var. *dactylon*. However, plants of the temperate race appear to occur also in the community.

The number of species per relevé ranged from 4 to 21. In the community many species of the nitrophilous weed and ruderal communities of the classes *Chenopodietea*, *Artemisietea*, *Agropyretea*, but also *Plantaginetea* are present. The following species frequently occur within high constancy classes (see Table 3): *Cynodon dactylon*, *Conyza canadensis*, *Convolvulus arvensis*, *Artemisia vulgaris*, *Taraxacum officinale* and *Lolium perenne*. In the constancy class III *Achillea millefolium*, *Atriplex tatarica*, *Pastinaca sativa*, *Chenopodium album* and *Setaria viridis* have been also present at least once. Some differences exist among sets of relevés from various localities within western Slovakia (cf. Table 1, 2, 3). Floristically simplest stands of the association were found in Nové Zámky railway station (cf. Table 3, column c).

Within the association two groups of coenoses may be distinguished by the presence of *Lolium perenne*. The first group with the species absent should be designated as *C.-C.* var. *typica* ELIÁŠ, var. *nova* and the second one with *Lolium perenne* present as *C.-C.* var. *Lolium perenne* ELIÁŠ var. *nova* (the nomenclatural type: Table 1, relevé No. 8). Later coenoses occur in contact with trodden habitats at pathways within roadside and railway areas. The trampling effect on *Cynodon dactylon* stands and habitats is negligible and, therefore, the occurrence of the species of trodden habitats (class *Plantaginetea*) is not frequent. Their values of dominance are very low.

For comparison, the phytocoenological material collected in western Slovakia and some from Hungary is given in Table 3. The similarity between the relevés and sets of relevés is very high and indicates a relative homogeneity of the phytocoenological material used.

SYNECOLOGY

The stands of the association occur usually in non-trodden, artificial, anthropogenic habitats with pervious, insolic, drying substrata. Favourable sites of *Conyzo-Cynodontetum* are strongly insolated roadside and railway areas, but it occupies also open sites in non-cultivated, abandoned vineyards or fields on sandy soils.

Within the railway areas it grows in railway yards and adjacent storage areas, in upper parts of embankments close to the rails, less frequently between the tracks. Such habitats, of substratum formed mainly of stones, dross and sand, are extremely dry (arid) and strongly insolated. Substratum containing very little humus and organic matters is poor or moderately rich in nutritive substances.

The habitats in roadside areas exhibit similar features. They are warm as a result of very strong insolation. The substratum is usually dry, due to large content of skeletal parts. It usually consists of a mixture of stones, loam, sand, dross, and is therefore moderately rich in nitrogen and humus. The content of loam and dross or impurities is higher than in railway substratum and is, therefore, richer in nutritive substances. The community occupying open sites at roads formed fringes along roadsides.

In the Záhorská nížina region it occurs in sand dunes within settlements (cf. KRIPPELOVÁ 1972). The habitats containing many skeletal parts and sand

belong to the most dry substrata of the ruderal communities. The water and humus contents in soil were found to be lower than 3 and 1 per cent, respectively (KRIPPELOVÁ, l.c.). In sandy soils, the content of humus and organic matter is very low, they are, therefore, extremely poor in nitrogen and other nutritive substances. Ecological features of the sandy soils in Hungarian vineyards are very similar to the soils of sandy dunes in the Záhorská nížina region.

SYNDYNAMICS

Cynodon dactylon is considered as one of the most dynamic, aggressive, and cosmopolitan species of the world (HARLAN et DE WET 1969). It spreads by means of seeds being frequently infertile and by well-developed system of stolons and rhizoms. Vegetative spread by runners is very effective. Owing to the rapid extension growth of its overground and underground parts, which rapidly produce shoots and roots in the nodes, it forms a dense sod in a relative short time (ROCHECOUSTE 1962). The species is very tolerant to the density of the stand. RAMKRISHNAM et KUMAR (1971) found that the species responded to increasing density by extreme plasticity and there was no density-induced mortality.

Conyzo-Cynodontetum develops as initial association in disturbed anthropogenic substrata at railway and roadside areas. The community, however, is perennial and relatively stable. Under favourable conditions it survives in the same site even several years. Such stability is mainly due to the prevalence and dominance of geophytes and hemicryptophytes (*Cynodon dactylon*, *Convolvulus arvensis*) in the association. As a pioneer community of the disturbed, dry habitats with pervious, frequently sandy substrata, the *Conyzo-Cynodontetum* is very similar to the other communities of the class *Agropyretea repentis* and has also similar functions in the environment.

In the warmest areas of the Pannonian region, *Cynodon dactylon* occurs also as weed in vineyards (cf. TIMÁR 1957, UBRIZSY 1967). In non-cultivated and abandoned vineyards on sandy soils it rapidly spreads and *Conyzo-Cynodontetum dactyloni* develops (see the succession scheme in UBRIZSY 1967). The following community in succession may be *Cynodonto-poëtum angustifoliae* (RAPAICS 1926) Soó 1957.

Under strong trampling conditions, the association is gradually transformed into the *Cynodonto-Plantaginetum* BRUN-HOOL 1962 or into other trodden communities. *Cynodon dactylon* tolerates trampling and adapts by forming trodden growth forms. In trodden habitats it forms low and dense stands. The variant with *Lolium perenne* of the association *Conyzo-Cynodontetum* may be most frequently change into the trodden community. Under trampling conditions, the species tolerating trampling are capable of growth better than other, non-tolerant species. They may prevail and the original community changes into another one.

Cynodon dactylon is a thermophilous species. In the temperate zone, it winters in the form of undergrowth organs (rhizomes). It is considered as a hemicryptophyte or geophyte. In south Slovakia, aerial shoots emerge from rhizome buds in early summer, frequently in June. They grow vigorously and usually produce some roots in the basal nodes in contact with the soil. From

Tab. 2. — *Conyzo-Cynodontetum dactyli* in western Slovakia

Relevé	1	2	3	4	5	6	6	8	9	10	11	12	C
Plot area (m ²)	12	5.3	6	4	7	0.6	5.4	1.5	4	5	9	5	
Cover (%)	100	100	100	100	100	100	95	100	100	100	90	100	
Number of species	5	5	5	10	9	11	12	13	11	13	14	18	
<i>Cynodon dactylon</i>	5.5	4.5	5.5	4.5	5.5	5.5	5.5	4.5	5.5	5.5	4.5	4.5	V
<i>Conyza canadensis</i>	+	.	1.1	+	.	.	+	.	1.1	.	+	r	III
<i>Convolvulus arvensis</i>	1.1	2.2	.	+	1.1	+	.	1.1	.	.	.	1.1	III
<i>Falcaria vulgaris</i>	.	.	.	+	.	.	.	.	.	.	.	.	I
<i>Poa angustifolia</i>	.	.	.	.	.	.	.	.	+	.	.	.	I
<i>Atriplex tatarica</i>	+	+	.	r	.	.	+	.	.	.	+	r	III
<i>Chenopodium album</i>	.	.	.	.	r	+	.	.	.	r	1.1	r	II
<i>Sonchus oleraceus</i>	.	.	.	.	+	r	r	.	r	.	.	.	II
<i>Atriplex patula</i>	.	.	.	.	+	.	.	.	r	+	.	.	II
<i>Amaranthus retroflexus</i>	.	.	+	.	.	+	.	.	.	.	r	.	II
<i>Tripleurospermum inodorum</i>	.	.	.	.	.	.	.	r	.	.	r	r	II
<i>Setaria viridis</i>	.	.	.	.	.	.	1.1	r	.	.	.	.	I
<i>Setaria glauca</i>	.	.	+2	.	.	+	.	.	.	.	.	.	I
<i>Stellaria media</i>	.	.	.	.	.	r	.	.	.	+	.	.	I
<i>Capsella bursa-pastoris</i>	.	.	.	.	.	.	.	r	.	.	.	r	I
<i>Fallopia convolvulus</i>	.	.	.	.	.	.	.	r	.	.	.	r	I
<i>Lactuca serriola</i>	.	.	.	.	.	r	.	.	.	r	.	.	I
<i>Lolium perenne</i>	.	1.2	.	1.2	.	.	r	2.2	.	r	(r)	+2	III
<i>Polygonum aviculare</i>	.	.	.	.	.	+	r	+	.	.	+	+	II
<i>Lepidium ruderae</i>	.	.	.	.	.	.	+	+	.	.	.	.	I
<i>Artemisia vulgaris</i>	.	.	.	.	+	.	r	+	1.1	+	r	+	III
<i>Taraxacum officinale</i>	.	r	.	.	r	.	r	.	r	r	r	+	III
<i>Achillea millefolium</i>	.	.	.	.	+	.	r	.	r	+	.	r	II
<i>Plantago lanceolata</i>	.	.	.	.	.	.	.	r	.	.	.	r	I
<i>Diptotaxis muralis</i>	.	.	.	.	.	.	.	.	r	.	.	r	I

Companion species occurring in one relevé only — Sprievodné druhy vyskytujúce sa iba v jednom zápise: 3: *Reseda lutea* +2; 4: *Atriplex oblongifolia* r, *Dactylis glomerata* 1.2, *Lathyrus tuberosus* +, *Rubus caesius* 1.3; 5: *Acer negundo* juv. r; 6: *Arrhenatherum elatius* +, *Cirsium arvense* r +; 7: *Amaranthus albus* r; 8: *Daucus carota* r, *Trifolium repens* r; 9: *Berteroa incana* r, *Galium aparine* r; 10: *Agrimonia eupatoria* r, *Carduus acanthoides* r, *Pimpinella saxifraga* +, *Potentilla reptans* +; 11: *Eragrostis minor* +3, *Plantago major* r, (*Bromus tectorum*, *Hordeum murinum*); 12: *Rumex crispus*.

Localities of relevés of the *Conyzo-Cynodontetum dactyloni* recorded in western Slovakia (Tab. 2):

- 1 — Dunajská Streda, railway station, 31. 5. 1974
 - 2, 11, 12 — Šurany, railway station, 9. 10. 1974
 - 3, 4 — Šaľa, railway station, 9. 10. 1974
 - 5 — Trnava, Seredská cesta, roadside, 4. 9. 1977
 - 6 — Báb, Alexandrov dvor, roadside, 23. 9. 1977
 - 7 — Sered, railway station, 13. 9. 1974
 - 8 — Nitra, railway station, in the contact with the pathway, 25. 9. 1974
 - 9 — Myslenice, railways station, 27. 10. 1978
 - 10 — Lužianky, roadside to Alekšince, 4. 10. 1974
- a: FÉLFÖLDY (1942), Table 6, Hungary, sub. *Cynodon dactylon*-ass. IV: *Silene alba*; III: *Poa pratensis*; II: *Verbena officinalis*, *Lycium halimifolium*; I: *Artemisia campestris*, *Astragalus glycyphyllos*, *Bromus arvensis*, *B. mollis*, *Cannabis sativa*, *Centaurea rhenana*, *Crepis setosa*, *C. tectorum*, *Equisetum ramosissimum*, *Erodium cicutarium*, *Euphorbia cyparissias*, *Festuca pratensis*, *Galium verum*, *Linaria vulgaris*, *Oenothera biennis*, *Physalis alkekengi*, *Pimpinella saxifraga*, *Plantago indica*, *Poa annua*, *Portulaca oleracea*, *Picris hieracioides*, *Potentilla anserina*, *P. argentea*, *Rumex acetosa*, *Salvia nemorosa*, *Silene otites*, *Thymus serpyllum*, *Torilis anthriscus*, *Tragopogon orientalis*, *Trifolium arvense*, *T. campestre*, *T. fragiferum*.
- b: ELIÁŠ (1978), Table 10, Trnava (W. Slovakia)
III: *Rubus caesius*; I: *Ailanthus glandulosa* juv., *Atriplex patula*, *Centaurea stoebe*, *C. jacea*, *Diplotaxis tenuifolia*, *Eryngium campestre*, *Geum urbanum*, *Linum usitatissimum*, *Medicago falcata*, *Robinia pseudo-acacia*, *Sambucus ebulus*, *Saponaria officinalis*.
- c: KRIPPELOVÁ (1972), Table 19, Relevés No. 1—8, Malačy (W. Slovakia, Záhorská nížina region), sub. *Cynodono-Plantagininetum* GAMS 1927.
I: *Descurainia sophia*, *Fumaria officinalis*, *Geranium pusillum*, *Galinsoga parviflora*, *Malva neglecta*, *Poa annua*, *P. pratensis*, *Potentilla anserina*, *P. argentea*, *Rumex acetosella*, *Trifolium arvense*.
- d: Table 1 in this paper, railway areas in Bratislava (W. Slovakia).
II: *Linaria vulgaris*, *Panicum capillare*; I: *Arrhenatherum elatius*, *Centaurea stoebe*, *Equisetum ramosissimum*, *Euphorbia cyparissias*, *Fallopia convolvulus*, *Humulus lupulus*, *Lycopersicon esculentum*, *Melilotus officinalis*, *Mercurialis annua*, *Plantago indica*, *Poa compressa*, *Polygonum persicaria*, *Silene alba*, *Stellaria media*, *Stenactis* sp., *Tragopogon dubius*.
- e: ELIÁŠ (unpublished data), railway station Bratislava-Petržalka (W. Slovakia).
I: *Bromus inermis*, *Calamagrostis epigeios*, *Carex* sp., *Equisetum arvense*, *Pimpinella major*.
- f: Table 2 in this paper, West Slovakia.
II: *Atriplex patula*; I: *Acer negundo* juv., *Agrimonia eupatoria*, *Amaranthus albus*, *Arrhenatherum elatius*, *Diplotaxis muralis*, *Fallopia convolvulus*, *Galium aparine*, *Lathyrus tuberosus*, *Melilotus officinalis*, *Pimpinella saxifraga*, *Poa angustifolia*, *Potentilla reptans*, *Rubus caesius*, *Rumex crispus*, *Stellaria media*.
- g: ELIÁŠ (unpublished data, September 1974), railway station Nové Zámky (SW.Slovakia).
I: *Eryngium campestre*, *Picris hieracioides*.
- h: *Convolvulo-Cynodontetum dactyli* UBRIZSY 1967, Table 7 in UBRIZSY (1967), Hungarian vineyards.
V: *Echinochloa crus-galli* IV: *Portulaca oleracea*, *Solanum nigrum*; II: *Stellaria media*; I: *Amaranthus albus*, *Diplotaxis muralis*, *Euphorbia helioscopia*, *Lactuca saligna*, *Lamium amplexicaule*, *L. purpurea*, *Malva neglecta*, *Raphanus raphanistrum*, *Senecio vulgaris*, *Sinapis arvensis*, *Stachys annua*, *Stellaria media*, *Tragopogon orientalis*.

the nodes in contact with the soil surface stolons are formed. A large number of the aerial shoots produced remain vegetative throughout the growing season. Inflorescences are produced in August and seed development continues during September. Seeds in late flowering plants appear to be not fully developed; they are, therefore, not able to germinate.

SYNCHOROLOGY

The association *Conyzo-Cynodontetum* is considered as a semiruderal pioneer termophilous community with the distribution centre within the Pannonian region. It also occurs in southeastern Europe, e.g. in Romania

Tab. 3. — Comparison of phytocoenological material of *Conyzo-Cynodontetum dactyli* collected in various localities and habitats within the Pannonian region (SW. Slovakia, partly Hungary). A different weed community of *Cynodon dactylon* from Hungarian vineyards is given in column h.

Column	a	b	c	d	e	f	g	h
Number of relevés	5	9	8	12	8	12	7	5
Number of species (mean)	?	12	7.7	12	10.4	10.5	6	11
Number of species (range)	?	9—16	4—12	5—21	4—18	5—18	4—11	7—21
<i>Cynodon dactylon</i>	V3-5	V4-5	V4-5	V4-5	V4-5	V4-5	V4-5	V1-4
<i>Conyza canadensis</i>	III	III	V	IV	II	III	IV	.
<i>Convolvulus arvensis</i>	IV	V	.	IV	V	III	IV	V
<i>Falcaria vulgaris</i>	.	I	.	II	I	I	II	I
<i>Chondrilla juncea</i>	r	II	.	I	.	.	I	.
<i>Agropyron repens</i>	I	I	.	I	I	.	.	.
<i>Lepidium draba</i>	.	I	.	I	.	.	I	I
<i>Amaranthus retroflexus</i>	r	I	III	I	II	II	II	V
<i>Setaria viridis</i>	r	II	I	I	.	I	IV	III
<i>Chenopodium album</i>	IV	II	I	I	.	II	.	III
<i>Atriplex tatarica</i>	II	II	.	II	III	III	II	.
<i>Digitaria sanguinalis</i>	r	I	I	II	I	.	II	.
<i>Setaria glauca</i>	r	I	.	II	I	I	I	.
<i>Sonchus oleraceus</i>	.	I	.	II	I	II	I	.
<i>Cirsium arvense</i>	.	I	.	I	II	I	.	.
<i>Tripleurospermum inodorum</i>	.	I	I	I	.	II	.	.
<i>Lactuca serriola</i>	.	I	.	I	.	I	.	.
<i>Setaria verticillata</i>	.	I	.	II	.	.	I	.
<i>Hordeum murinum</i>	IV	.	I	.	.	(I)	.	.
<i>Capsella bursa-pastoris</i>	.	.	I	.	.	I	.	I
<i>Bromus tectorum</i>	r	.	.	.	.	(I)	.	I
<i>Lolium perenne</i>	IV	II	I	III	IV	III	.	.
<i>Polygonum aviculare</i>	IV	II	.	I	I	II	.	.
<i>Plantago major</i>	r	I	I	I	.	I	.	.
<i>Lepidium rudemale</i>	.	.	III	II	.	I	.	.
<i>Eragrostis minor</i>	.	.	I	.	.	I	.	I
<i>Artemisia vulgaris</i>	II	III	I	III	I	III	I	.
<i>Taraxacum officinale</i>	IV	IV	I	I	III	III	.	.
<i>Achillea millefolium</i>	III	II	I	I	III	II	.	.
<i>Plantago lanceolata</i>	IV	I	II	I	II	I	.	.
<i>Daucus carota</i>	r	I	I	I	I	I	.	.
<i>Dactylis glomerata</i>	II	.	I	I	II	I	.	.
<i>Cichorium intybus</i>	III	I	.	II	II	.	.	.
<i>Carduus acanthoides</i>	r	I	.	.	.	I	.	II
<i>Reseda lutea</i>	.	I	.	I	.	I	.	II
<i>Berteroa incana</i>	I	.	II	I	.	I	.	.
<i>Trifolium repens</i>	r	.	I	.	I	I	.	.
<i>Atriplex oblongifolia</i>	r	.	.	I	I	I	.	.
<i>Pastinaca sativa</i>	.	I	.	I	III	.	.	.
<i>Echium vulgare</i>	r	I	.	I	.	.	.	.
<i>Ballota nigra</i>	II	.	I	I	.	.	.	.
<i>Apera spica-venti</i>	II	.	I	I	.	.	.	.
<i>Anchussa officinalis</i>	II	.	.	I	I	.	.	.
<i>Medicago lupulina</i>	r	.	.	I	.	I	.	.
<i>Carex hirta</i>	.	.	.	I	I	.	I	.

(MORARIU 1967) and penetrates into other countries of Europe, mainly central. In literature it was frequently referred to as "*Cynodontetum*".

In Czechoslovakia, the association occurs mainly in south Moravia and south Slovakia. The distribution of *Conyzo-Cynodontetum* in Slovakia is illustrated in Fig. 2. It was constructed from the data on the distribution of



Fig. 2. — Distribution of the association *Conyzo-Cynodontetum dactylon* in Slovakia (eastern part of Czechoslovakia). Localities of relevés recorded in western Slovakia are designated by black circles.

Cynodon dactylon in Slovakia (HENDRYCH 1968; present author's unpublished data). The association occurs predominantly within the warmer regions of the southern, southwestern and southeastern Slovakia. The phytocoenological material used was recorded in southwestern Slovakia (see Fig. 2).

The spread of the association in Czechoslovakia appears to be limited by the production of fertile seeds of *Cynodon dactylon* capable of germination. In Prague, as it was pointed out by LHOTSKÁ (1974), *Cynodon dactylon* did not form fully developed seeds. The plants occur in the site, spread by vegetative means forming a large monocoenosis, but their spreading to new localities was not observed. In Slovakia, the species also forms only low number of fully developed (fertile) seeds.

SYNTAXONOMIC REMARKS

The association *Conyzo-Cynodontetum dactylon* was described by ELLÁŠ (1978) on the basis of phytocoenological material from Trnava town (western Slovakia). The author re-evaluated the *Cynodon dactylon*-ass. introduced by FELFÖLDY (1942) because it is different from *Cynodontetum dactyli* BOJKO 1933 and other communities designated as "*Cynodontetum*" by several authors. BOJKO (1933, 1934) included into his association the coenosis dominated by *Cynodon dactylon* in sandy soils at Neusiedler-See in northeastern

Austria. Several species of the natural dry habitats are present in the association, e.g. *Achillea millefolium*, *Lotus corniculatus* and *Ononis spinosa* as well as *Dactylis glomerata* within the constancy class IV, *Brachypodium pin-natum*, *Centaurea jacea*, *Euphorbia gerardiana*, *Globularia willkommii*, *Plantago lanceolata*, *Potentilla arenaria* (all within the class III) and many other psammophilous and termophilous species in the lower constancy classes. Nitrophilous weed or ruderal species are usually absent in the relevés. On the other hand, within the Felföldy's *Cynodontetum* many nitrophilous species are present. It is evident that *Cynodontetum dactyli* BOJKO 1933 is not identical with *Cynodontetum dactyli* FELFÖLDY 1942. The original Felföldy's name "*Cynodon dactylon*-ass." is invalid from the viewpoint of phytocoenological nomenclature, being a later synonym. ELIÁŠ (1978), distinguishing the phytocoenosis of the Felföldy's type, suggested a new name *Conyzo-Cynodontetum dactyloni* (FELFÖLDY 1942) ELIÁŠ 1978 for the association which included semi-ruderal, non-trodden stands of *Cynodon dactylon* in anthropogenic, disturbed habitats (roadsides, railways, abandoned vineyards and fields) within the Pannonian floristic region. The author excludes trodden or partly trodden stands with a high abundance or dominance of the species of *Plantaginetea* which may be classified as *Cynodonto-Plantaginietum* (GAMS 1927) BRUN-HOOL 1962 or other trodden communities.

In Hungarian vineyards, UBRIZSY (1967) described the association *Convolvulo-Cynodontetum dactyli* which differed from *Conyzo-Cynodontetum* by the presence many weeds of the *Chenopodietea* syntaxa (see Table 3, column h). The following species occur within the high constancy classes: *Portulaca oleracea*, *Echinochloa crus-galli*, *Solanum nigrum*, *Amaranthus retroflexus*, *Chenopodium album* and *Setaria viridis*. Soó (1971) included this weed association into the *Convolvulo-Portulacetum* UBRIZSY (1949) 1967 as a new subassociation *C.-P. cynodontetosum*.

ELIÁŠ (1978) classified the *Conyzo-Cynodontetum* as a community of the alliance *Convolvulo-Agropyrion repentis* GÖRS 1966 within the class *Agropyreteae repentis* OBERD., Th. MÜLLER et GÖRS apud OBERD. et al. 1967. The class contains "initiale halbruderale Trocken- und Halbtrockenrasen mit Kriechpionieren" on loamy and clay soils. Within the relevés of *Conyzo-Cynodontetum* the following species, considered as character or indication species of the class and its low syntaxa, were present: *Convolvulus arvensis* (constancy usually IV or V), *Chondrilla juncea*, *Falcaria vulgaris*, *Agropyron repens*, *Lepidium draba*, *Poa compressa*, *Pastinaca sativa*, *Cichorium intybus*, *Poa pratensis* s.l., *Eryngium campestre* and some others. *Cynodon dactylon* is also considered by some authors (e.g. COSTE 1975) as a character species of the *Agropyreteae*.

Since *Conyzo-Cynodontetum* occupies pervious, usually sandy substrata it is the warmest variant of the communities of the class *Agropyreteae* in ruderal and semiruderal dry habitats. The community must be distinguished from other communities of the class and included within separate alliance. We suggested, therefore, a new alliance ***Convolvulo-Cynodontion dactyloni*** to include non-trodden thermophilous pioneer communities of *Cynodon dactylon* in pervious, dry, disturbed habitats of Europe. The association *Conyzo-Cynodontetum dactyloni* is chosen as a nomenclatural type of the alliance.

SUMMARY

The paper contains characteristics of the synmorphology, synecology, syndynamics as well as synchronology of the association *Conyzo-Cynodontetum dactyloni* (FELFÖLDY 1942) ELIÁŠ 1978. It is chiefly based on the phytocoenological material recorded and observations made in western Slovakia.

The association represents dense stands of *Cynodon dactylon* in disturbed, anthropogenic, insolic habitats on pervious, dry substrata. Its typical habitats are railway and roadside bare areas as well as abandoned vineyards on sandy soils. It occurs mainly in the Pannonian floristic region, but penetrates into other warmer regions of Europe.

The association is an initial semi-ruderal community of the class *Agropyretea repentis*. It is a thermophilous, relatively stable community occurring during warm period of the year from early summer up to late autumn.

A new alliance, *Convolvulo-Cynodontion dactyloni*, is suggested to include initial thermophilous communities of *Cynodon dactylon* on pervious dry substrata. It represents warm variant of communities of the class *Agropyretea repentis*.

SŮHRN

Asociácia *Conyzo-Cynodontetum dactyloni* (FELFÖLDY 1942) ELIÁŠ 1978 obsahuje nezošlapané porasty druhu *Cynodon dactylon* na priepustných, suchých alebo vysychajúcich substrátoch v oblastiach železníc a okrajov ciest, ale i v opustených vinohradoch a úhoroch na piesočnatých až piesočnato-hlinitých pôdach. Ako pionierske poloruderálne spoločenstvo narušených plôch je zaradené do triedy *Agropyretea repentis*. V článku sa charakterizuje synmorfológia, synekológia, syndynamika a synchorológia spoločenstva. Je to spoločenstvo panónskeho charakteru, ktoré sa však vyskytuje aj v iných teplejších oblastiach Európy. Na Slovensku sa vyskytuje v planárnom a kolínnom stupni v najteplejších oblastiach republiky. Pre teplomilné pionierske poloruderálne spoločenstvá s významnou účasťou druhu *Cynodon dactylon* na priepustných substrátoch sa ustanovuje nový zväz *Convolvulo-Cynodontion dactyloni* ELIÁŠ 1979. Zväz predstavuje najteplejších variant spoločenstiev triedy *Agropyretea repentis* na priepustných substrátoch.

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