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HYDROECOLOGY OF THE PLANT COMMUNITIES AT THE MIDDLE TISZA-VALLEY I. AGROPYRO-RUMICION

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Abstract

From the grazing- and treading-tolerant semi-ruderal Plantaginetea grasslands, the clarification of the composition and hydroecological relations of the Agropyro-Rumicion pasture communities exposed to periodical inundations was firstly the objective, at the area and environs of the prospective four thousand hectares large Tisza-Alpár Storage Tank belonging to the central region of the Hungarian Tisza-valley. During the course of this the species components of 7 associations: *Rumici-Alopecuretum geniculati, Rorippo sylvestri-Agrostetum, Trifolio fragiferi-Agrostetum stoloniferae, Lolio-Potentilletum anserinae, Lolio-Alopecuretum pratensis, Rorrippo austriacae-Agropyretum* and the *Lolio-Festucetum pseudovinae* as well as their units within association were classed among 24 subgroups within 8 hydroecological categories, taking their soilecological relations into consideration. Their diagrams drawn on the basis of their total covering quota are suitable for revealing the relationships. Possibility was also present for comparison with study results from other areas

Introduction

The nitrophilous ruderal vegetation stands of the treading-and grazing-tolerant Plantaginetea (Tx. et PRSG. 50) grouped into the cenosystematic unit have long since been the scenes of phytocenological, synecological studies throughout Europe: TÜXEN und PREISING (1942, 1950), TÜXEN (1950, 1970), OBERDORFER (1954), ELLENBERG (1963), GUTTE (1966), SISSINGH (1969), MÜLLER und GÖRS (1969), PHILIPPI (1971), EHRENDORFER (1973), BORNKAMM (1974), LOHMEYER (1975), GUTTE und HILBIG (1975) and others. The Agrostietalia OBERD. et al. 67: Agropyro-Rumicion NORDHAG. 40 pasture communities among river-bed, littoral and other humid site relations are known all over Europe (MÜLLER 1961, ELLENBERG 1963, KRIPPELOVA 1969, MARKOVIĆ 1969, 1973, 1978).

In the Hungarian relation FELFÖLDY (1942) excelled in the comparative succession analysis of the humid-soiled grasses at the Great Hungarian Plain: Debrecen and Transdanubia, resp.: Mór, Tihany; UBRIZSY (1950), mainly the river-bed grasses at the Körös regions. From territories falling closer to the area studied by us, the reports of RAPAICS (1927) from the Maros—Tisza and Körös valleys are of value for us. Later on reports were published by UJVÁROSI (1940), TÍMÁR (1947, 1950), TÍMÁR and BODROGKÖZY (1959), in the recent years by BODROGKÖZY (1982) from the Mártély Environmental Protection Area alongside the Tisza river, by BAGI and BODROGKÖZY (1984) and BAGI (1985) from the Körös-valley. In respect to the Danube basin, the relevant results of KÁRPÁTI—V. KÁRPÁTI (1963, 1965) gave good comparative ground.

The present studies expanded to the Tiszaalpár-basin located North to Csongrád, the dead channels in the environs and the periodically inundated pastures along the banks of the living river. The majority of the basin is taken up by the planned four thousand hectares large Alpár Storage Tank, receiving about 150 million m^3 of water. The inflow of the Danube—Tisza main canal is also planned here, which will considerably contribute to the ensured water supply of the Storage Tank. Therefore, the exploration and recording of the basin's biocenoses could not be postponed.

The developed site relations here are extremely manifold. The Northern section of the Basin belongs to the Kiskunság National Park, and is given variety by fenwoods, marsh-meadows and plough lands. However, the middle, Tiszaalpár section is irrigation-like meadow ground and at the same time the Southern area in the region of the village Bokros has meadow ground of slightly alkalinizing sub-soil. Although the river-bed of the Tisza has so far been blocked up by dam of temporary character, the Basin served as a relief waterreservoir on occasions of critically high water level. Complex studies on the area's ecosystems and environmental-biological, firstly hydrological hydrobiological relations have been performed regularly in seasonal dynamic regard as well since 1982. Prior to this, similar complex studies were carried out in the long run with the same objective at the Mártély Environment Protection Area of the Tisza. Reports on the study results in this regard appeared in Volume XVII. (1982) of the Tiscia.

Materials and Methods

During the course of the biogeocenological studies at the Tiszaalpár Basin and its environs, investigations were conducted between 1982—1984 on the semi-ruderal communities recruited from species components well enduring treading and grazing, exposed to periodical inundations by the river; thus covered by water for longer-shorter periods. The main task was the clarification of the cenological-, soil and hydroecological relations, resp., of their phytocenoses found at this area. In the course of the cenosystematic analysis of their cenological relations their character- and differential species were also defined. Their curve of moisture demand was also drawn in the interest of both the more detailed determination of the moisture demand of the species components of the various pasture communities and the definition of their classification into sub-groups within the different hydroecological categories. On the figures, the farther the minimum point(s) of the curve are from each other and the more categories they comprise, the wider the adaptability is of the relevant species and species group, resp. As a consequence their culmination point (s) also show low percental values. The "F" value appearing in the flora handbook of Soó as well as the "W" value determined by Zólyomi et *al.* (1967) are also indicated in the Tables referring to the various associations. The data of covering quotas appear on the basis of the averages of 5-5 recordings.

For the generalization of the regularities revealed at our area the comparative analysis and graphic representation of the data referring to the Agropyro-Rumicion communities reported from alongside the Danube and the Sava were also achieved. Since the moisture demand of the various plant species is in tight connection with the physical and chemical composition of their soil, the soil profile explorations and laboratory analyses of the various associations were continued at the Tiszaalpár Basin, too. During this course six soil fractions could be distinguished using hydrometric method. For determining the moisture supply of the explored soil profiles, parallel with the definition of the weight-percentage of the humid and dry soils, the value of the litre water/dm^3 soil could also be concluded with the help of the undisturbed sample. At the studied area the accumulation of sodium salts in different layers of the soil had to be taken into consideration at places, too. Their amount could be determined on the basis of their electric conductivity. Their percental value, as well as the amount of $CaCO_3$ and organic matter content were also specified. Just as in the case of the previous reports, it was expedient to draw complex diagrams for the sake of the complex lucidity of the obtained study results.

Discussion

The cenosystematic order of the treaded and grazed humidsoiled grass communities processed at the middle section of the Tisza-valley, compiled on the basis of the Soó-system:

AGROPYRO-RUMICION NORDH. 40.

1. *Rumici — Alopecuretum geniculati* TX. (37) 50

(Syn.: *Ranunculus repens — Alopecurus geniculatus* ass. TX. 37
Rumex crispus — Alopecurus geniculatus ass. TX. (37) 50
Alopecuretum aequalis Soó 47)

— — *alopecuretosum geniculati* (typicum)
— — *echinochloëtosum*
— — *agrostetosum stoloniferae*

2. *Rorippo sylvestris — Agrostetum stoloniferae* (MOOR 58) OBERD. et TH. MÜLL. 61

(Syn.: *Rorippo (sylvestris) — Agrostetum albae* (MOOR. 58) OBERD. et TH MÜLL. 61)

— — *agrostetosum stoloniferae*
— — *rorippetosum sylvestris* (typicum)
— — — *Mentha pulegium* fac.

3. *Trifolio fragiferi — Agrostetum stoloniferae* MARK. 73

(Syn.: *Trifolio — Agrostetum stoloniferae* MARK. 73)

— — *potentilletosum anserinae*
— — — *Heleochloa schoenoides* fac.
— — *agrostetosum stoloniferae*
— — *trifolietosum fragiferi* (typicum) MARK. 73
— — *trifolietosum repentis*

4. *Lolio — Potentilletum anserinae* KNAPP 46

(Syn.: *Potentilla anserina* ass. RAPCS. 27
Potentilletum anserinae FELF. 42
Juncus bufonius — Potentilla anserina ass. FELF. 42
Lolietum perennis plantaginosum UBR. 49)

— — *potentilletosum anserinae*
— — *trifolietosum fragiferi*
— — *lolietosum* (typicum)
— — *poëtosum angustifoliae*

5. *Lolio — Alopecuretum pratensis* BODRK. 62

(Syn.: *Alopecuretum pratensis*)
— — *agrostetosum stoloniferae*
— — *plantaginetosum lanceolati*
— — — *Plantago major* fac.
— — *lolietosum perennis* (typicum)
— — *cynodonetosum*

6. *Rorippo austriacae — Agropyretum repentis* (Tim. 46) Tx. 50

— — *agrostetosum stoloniferae*
— — *heleochloëtosum alopecuroidis*
— — *rorippetosum austriacae*

7. *Lolio — Festucetum pseudovinae* nom. nov.

— — *lolietosum perennis*
— — *plantaginetosum lanceolati*
— — *festucetosum pseudovinae*

Characteristics, biogeocenological and hydroecological relations of the studied pasture communities

1. *Rumici — Alopecuretum geniculati* Tx. (37) 50

Occurence. It is of zonal appearance at the deeper reaches alongside the river and backwater at the Tiszaalpár Basin. At the Southern section of the Basin, however, at the area of the village Bokros, it showed mosaic-like arrangement along the stagnant-watered dips of flood remains. It is not a frequent pasture community.

Cenological relations. It is of similar species composition as those found alongside the Hungarian Middle-Danube I. Kárpáti and Vera Kárpáti (1963) and as can be concluded from the description of the stands found along the Sava in Yugoslavia (Marković 1978).

1.1. *Ru.—A. g. alopecuretosum geniculati* (typicum)

The species forms the cenogeni systematic unit within this association at the basin-like dips filled with long-standing stagnant water, which are located further from the river and backwaters. Its differential species are the *Rorippa amphibia, Elatine triandra, Alopecurus geniculatus, Ranunculus sardous, Xanthium italicum.* Its stands are somewhat similar to the grass stands of the so-called saved flood solonetz irrigation ground dips found farth erat the Tisza-valley; for the *Alopecurus geniculatus* of dominant character also endures well the presence of sodium salts under humid site conditions. It is charactristic of its cenological relations that in the initial stage of its frequently short vegetation period mainly annual old species, then apart from the denominator, the *Agrostis stolonifera* became of more significant covering quota. The *Rorippa sylvestris* which too, can be regarded as Agropyro-Rumicion species, also increased, practically forming a transition towards the next 2 associations (Table 1.1).

Hydroecology

On the basis of their total covering quota the dominant species are the hydatohelophyton. The culmination point of their drawn curve appeared at *hhg2.* With the late Summer expansion of the *Rorippa sylvestris* and with the association of the *Ranunculus repens* and *R. sardous* the total value of the *hg2* species is also significant (Figs. 1, 3). Comparing it with the data originating from the Sava-valley, it shows similarity to the *Ru. —A. g. trifolietosum* described at that area (Fig. 2).

1.2. *Ru.—A. g. echinochloëtosum*

This appeared under similar ecological conditions as were for the development of the previous species described under 1.1. Its development can be attributed as the consequence of the more enhanced devastating effect of the more intensive treading of the grazing cattle herds. In the cracks of the broken up grass cover cut by the

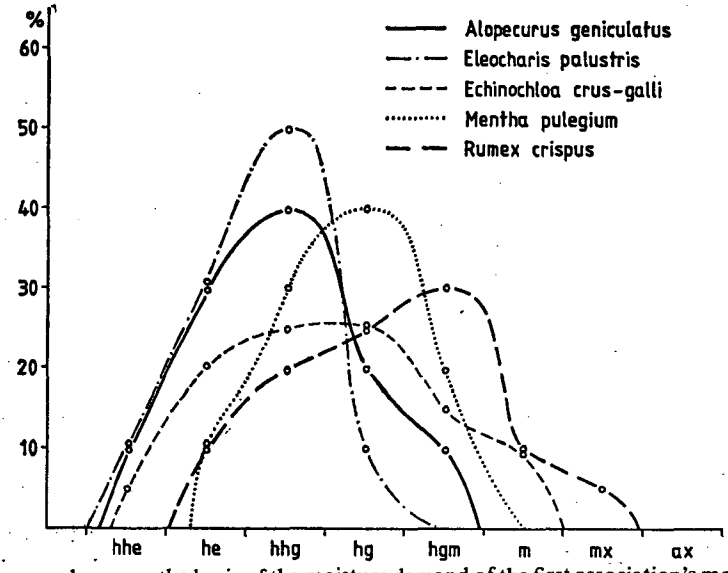

Fig. 1. The curves drawn on the basis of the moisture demand of the first association's more important species

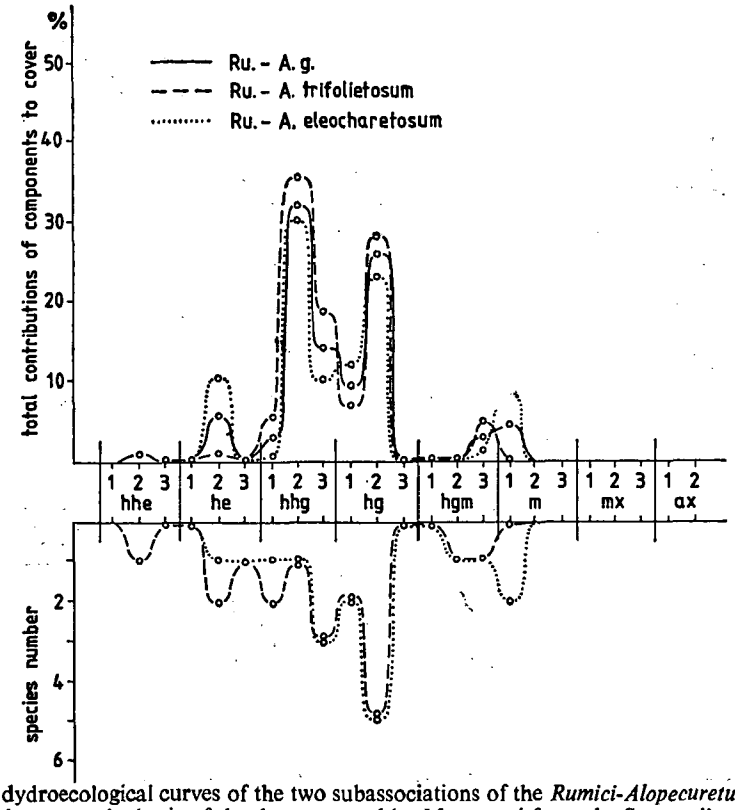

Fig. 2. The dydroecological curves of the two subassociations of the *Rumici-Alopecuretum geniculati* drawn on the basis of the data reported by MARKOVIĆ from the Sava-valley

treads Nanocyperion as well as Bidention species also multiplied besides the *Echinochloa crus-galli* of wide ecological adaptability.

Differential species

Gnaphalium uliginosum, Eleocharis acicularis, Bidens tripartita, Potentilla supina.

Hydroecology

Compared to the general view of the *Rumici-Alopecuretum* the quota of the hhel and *hhe3* sub-groups of the hydato-helophyton showed deviation. Regarding the distribution of its species components it showed consistently downward tendency towards the hygro-mesophytons.

1.3. *Ru.—A.g. agrostetosum stoloniferae*

Spreading

In respect to its development it firstly appeared at the intensively grazed littoral zone of the Basin's backwaters. It most frequently developed through the degradation of the *Caricetum vulpinae* and the *Agrostio-Alopecuretum,* but at a somewhat higher relief than the previous two sub-associations. By this means it formed the third zone within the association.

Cenological relations

From cenosystematic point of view the Molinio-Juncetea, Molinietalia, in slighter degree the representatives of Molinio-Arrhenatherea dominated and played role, resp., in its stands, besides the Agropyro-Rumicion species.

Differential species

Carex vulpina, Gratiola officinalis, Alopecurus pratensis

Hydroecology

The helo-hygrophyton continue to be the dominant species. The *Alopecurus geniculatus* and the *Gratiola officinalis* belonging to the *hhg2* sub-group have outstand-

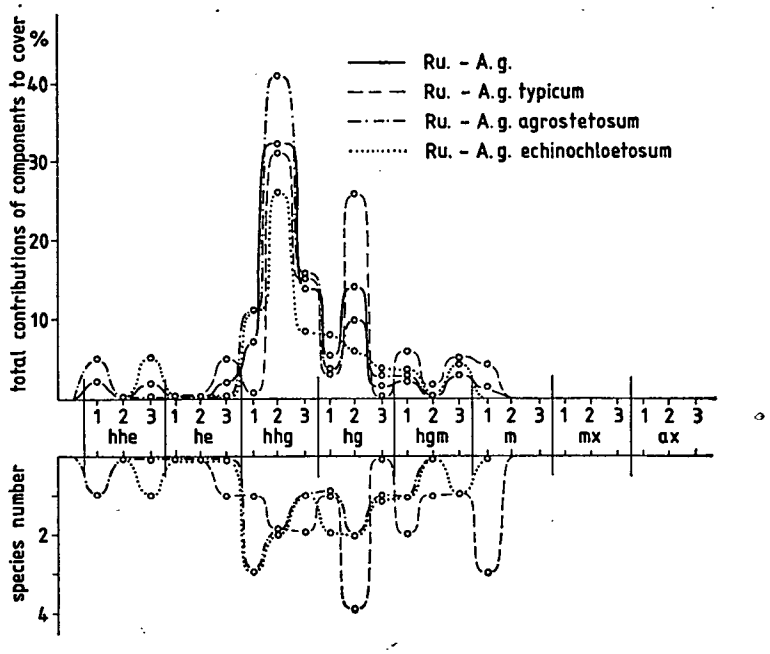

Fig. 3. The curves of the same association prepared on the basis of its three subassociations found at the Middle Tisza flood-plain, and their averages ; taking into consideration their species number

ing total covering quota. From the *hhg3*-s, with the increasing closure of the denominator of the unit within the association — the *Agrostis stolonifera* —, the ephemeral species are squeezed out from its stands: by which means it practically showed a transition towards the *Rorippo-Agrostetum* claiming almost the same moisture demands (Fig. 3).

Soil ecology

Concerning its physical composition its siltable fraction reached 65 per cent, thus it can be regarded as considerably hard irrigation-like meadow soil. Its moisture supply is favourable. In the Spring aspect 0,45 l water content per dm^3 soil was measurable in the root zone. The water seepage into the deeper layers of its soil profile is moderated by its fine matter colloid reaching even 50%. Despite the intensive grazing this Agrostis-varietal grass stand produced such a phytomass that the annual disintegration of this resulted a near to medium organic matter accumulation in the root zone. The accumulation of the harmful salts is not even considerable in the B-level. Further details in this respect are shown in Fig. 4.

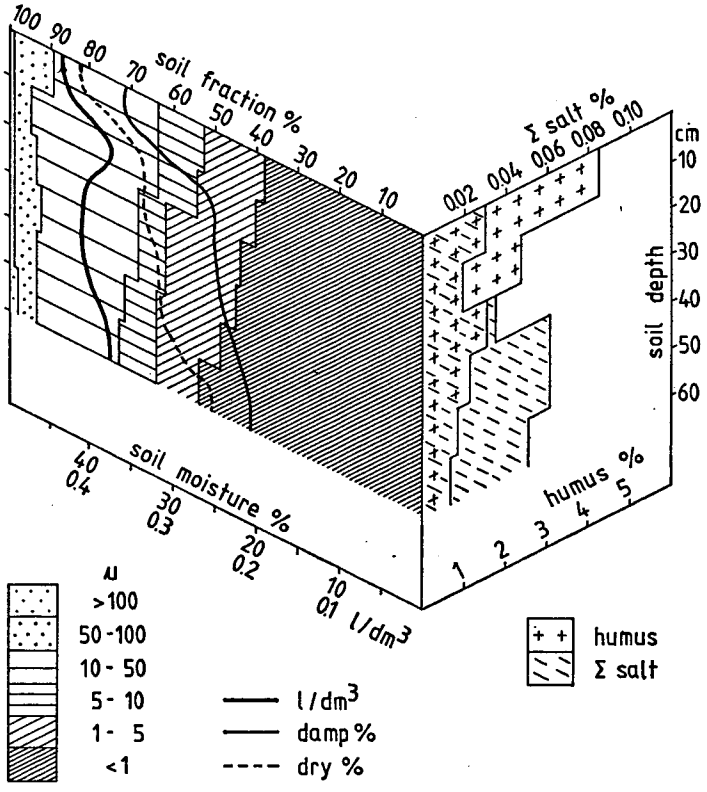

Fig. 4. Complex diagram showing the study results of the soil profile of the *Ru.-Al. agrostetosum* on May 20, 1980 at the limits of the village Bokros

2. *Rorippo sylvestris — Agrostetum stoloniferae* (Moor 58) Oberd. et Müll. 61

If we wish to get an overall view of the zonation system and succesion course of the Agropyro-Rumicion at the Middle Tisza-valley, then its pasture communities form the II. zone. It most frequently developed near the banks of the backwaters

Table 1. *Rumici — Alopecuretum geniculati*
1. alopecuretosum geniculati (typicum) 2. echinochloëtosum 3. agrostetosum stoloniferae

F	W	Subassociation:	1	2	3
		Hydato-helophyta:			
		hhe1			
5	11	*Oenanthe aquatica* (Phragmitetea)			
4—5	.	*Glyceria fluitans* ssp. *poiformis* (Beckmannion)			
		Helophyton:			
		he 1			
4—5	10	*Rorippa amphibia* (Phragmitetea)			
		Helo-hygrophyta:			
		hhg 1			
3—4	9	*Gnaphalium uliginosum* (Nanocyperion)			
4—5	10	*Eleocharis acicularis* (Nanocyperion)			
3—4	8	*Lysimachia nummularia* (Molinio-Juncetea)			
4	9	*Carex vulpina* (Molinio-Juncetea)			
4—5	10	*Eleocharis palustris* (Molinio-Juncetea)			
		hhg 2			
4	9	*Alopecurus geniculatus* (Puccinellietalia)			
4—5	.	*Elatine triandra* (Nanocyperion)			
4	2	*Gratiola officinalis* (Molinietalia)			
		hhg 3			
3	8	*Agrostis stolonifera* (Agr.-Rumicion)			
3—4	9	*Bidens tripartita* (Bidentetea)			
5	7	*Potentilla supina* (Nanocyperetalia)			
4—7	.	*Epilobium tetragonum* (Alopecurion pratensis)			
3—4	9	*Echinochloa crus-galli* (Chenopodio-Scleranthea)			
		Hygrophyta:			
		hg 1			
3—4	7	*Carex hirta* (Molinio-Arrhenatherea)			
4	8	*Mentha pulegium* (Agropyro-Rumicion)			
		hg 2			
3—4	8	*Rorippa sylvestris* (Agropyro-Rumicion)			
4—5	8	*Ranunculus repens* (Molinio-Arrhenatherea)			
4—5	8	*Ranunculus sardous* (Agropyro-Rumicion)			
		hg 3			
3—4	9	*Polygonum hydropiper* (Bidentetea)			
		Hygro-mesophyta:			
		hgm 1			
2—3	7	*Plantago major* ssp. *intermedia* (Plantaginetea)			
2—4	.	*Cerastium dubium* (Festuco-Puccinellietea)			
3	8	*Alopecurus pratensis* (Molinio-Arrhenatherea)			
2—3	5	*Rumex crispus* (Agropyro-Rumicion)			
		hgm 2,3			
3	.	*Xanthium italicum* (Bidentetea)			
4—5	8	*Rorippa austriaca* (Agropyro-Rumicion)			
		Mesophyta:			
		m 1			
0	5	*Trifolium repens* (Molinio-Arrhenatherea)			
0	4	*Lotus corniculatus* (Molinio-Arrhenatherea)			
3—4	6	*Inula britannica* (Plantaginetea)			

Symbols (Table 1—7): D value

..... 0,5—1% ——— 5—15%

. . . . . 1—5% ■■■ 15—25%

or in the dips of the flood-plain, following the subsidence of the floods. It often show wed transition towards the previous association.

Comparing the results of KÁRPÁTI et al. (Figs. 6 and 7) from the Middle-Danube and MARKOVIĆ, resp., from the Yugoslavian Sava-valley with the results from

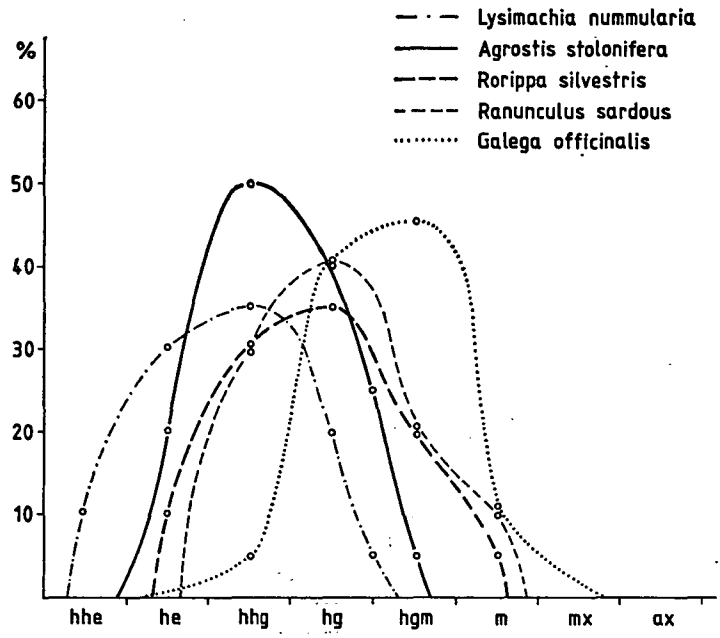

Fig. 5. Curve reflecting the moisture demand of the association's five species

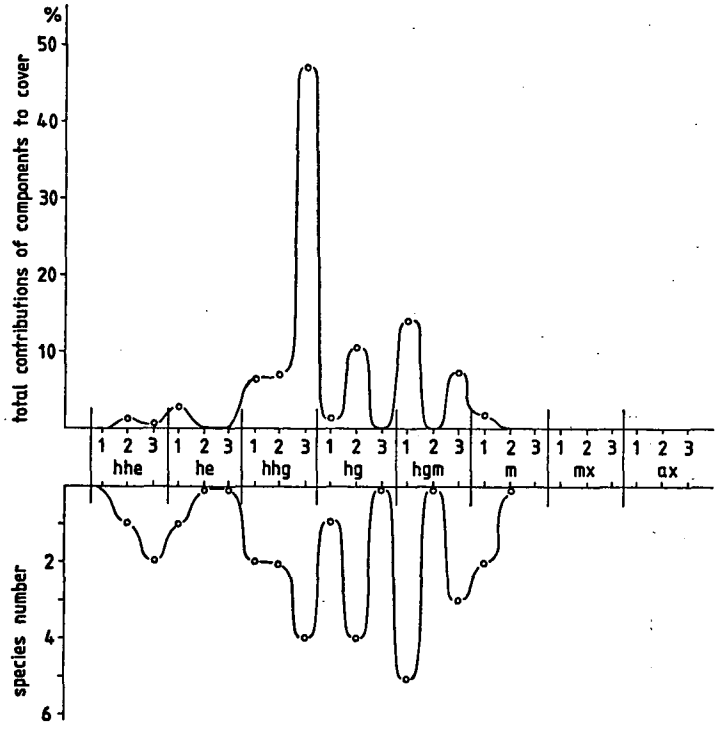

Fig. 6. Curve of the association drawn on the basis of the data reported by KÁRPÁTI et *al.* from the Middle Danube valley

the pastures at the Middle Tisza-valley, many similarities are demonstrable (Fig. 8.) At our area in the Tiszaalpár Basin the influence of the periodical, variant, often long-lasting Tisza floods is of further species-selecting effect.

Analysing the association-composition of the *Rorippo-Agrostetum* three units within association could be distinguished: the *Agrostis stolonifera* and the *Rorippa sylvestris* subassociations as well as the *Mentha pulegium* facies. Apart from their divergence of species composition these can also well be separated in respect to their site relations.

As a general hydroecological characteristic, it could also be determined that the pasture stands of the Danube- and Savavalleys as well as alongside the Tisza river, all belonged to the helo-hydrophyton category. Nevertheless, while the culmination point of the curves for the *Rumici-Alopecuretum* was found in the *hhg2* sub-group in the case of this association it was found in the *hhg3* sub-group reflecting slightly drier moisture demand. The highest percental values appeared on the diagram drawn on the base of the table compiled by MARKOVIĆ (Fig. 7).

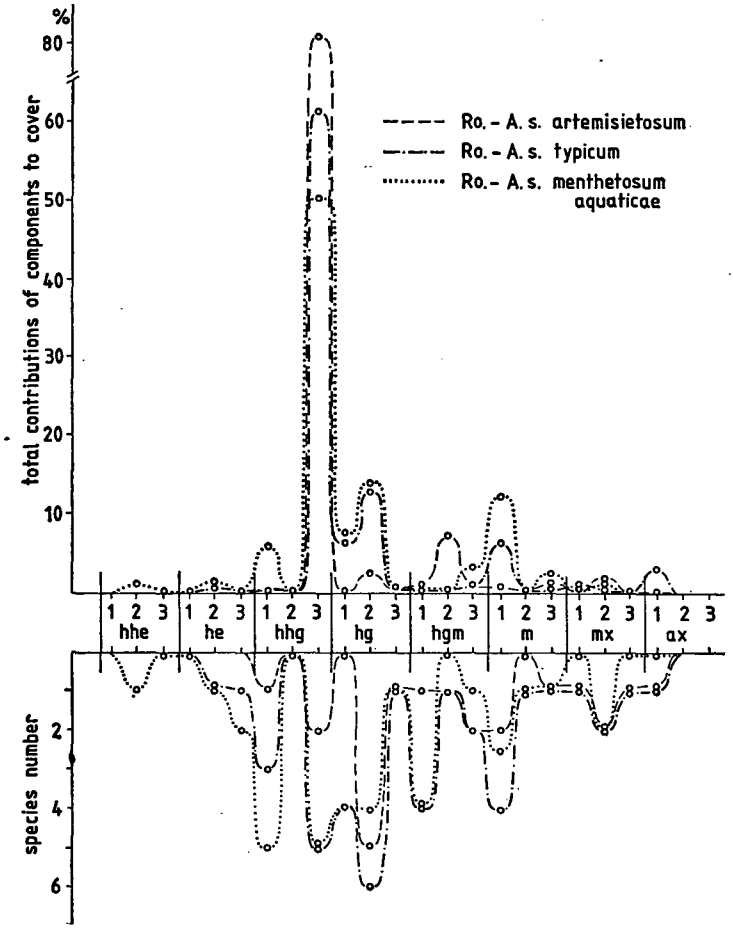

Fig. 7. Curves of the association drawn on the basis of the data by MARKOVIĆ pertinent to the three subassociations found at the Savavalley

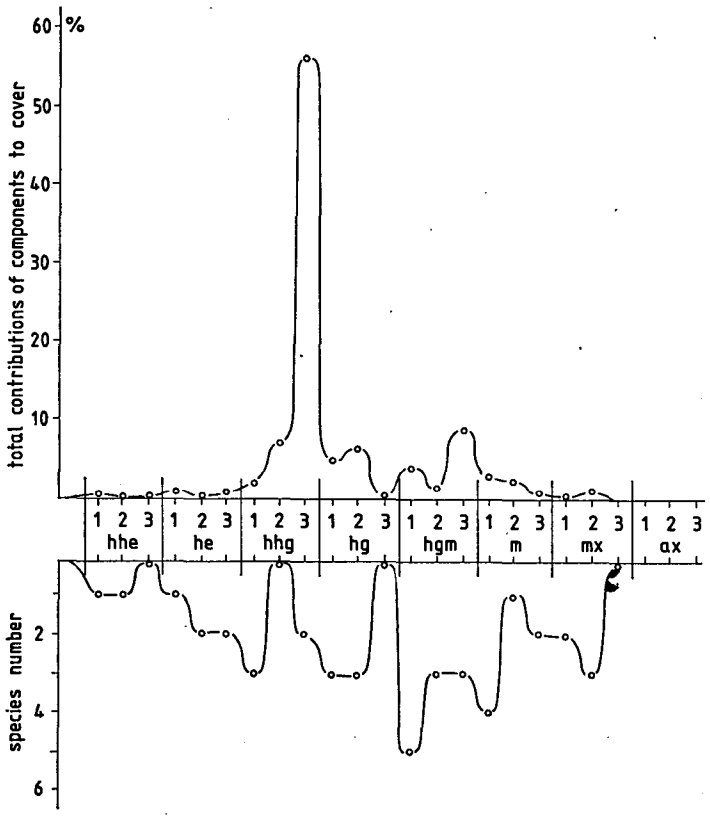

Fig. 8. Curve of the association reflecting its hydroecological condition from the Middle Tisza-valley

2.1. *R.s.—A.s. agrostetosum*

Occurence

This species developed either above the zone of the previous 1. association, or directly at the somewhat higher riverside sector of the backwaters. It was more frequent at the latter.

Differential species

The cenosis compiled on the basis of 10 recordings, forming the 1. column of Table 2 is segregated by the following species: *Butomus umbellatus, Alisma lanceolatum, Eleocharis palustris.*

Hydroecology

Even hydato-helophyton and helophyton species — like the Phragmitetea — were capable of survival at the grasses near the riverside. It could be concluded from this that this subassociation developed from various Magnocaricion associations prior to the water regulation of the Basin, as the consequence of devastating effects. Accordingly, the *Carex melanostachya* of *hhg2* character could be regarded as a relic species. Regarding their total dovering quota the dominant species components were the Molinio-Arrhenatherea from the *hhg3* sub-group as well as the Agrostion representative *Agrostis stolonifera* and the *Rorippa sylvestris.*

From the hygrophyton components the *Potentilla reptans* playing leading role is more significant not only here, but also in units within other associations. From the hygro-mesophytons only the *Polygonum amphibium* var. *terrestris* and the *Alopecurus pratensis* from the *hgm1* sub-group, having wider adaptability were capable of enduring the moisture conditions dominating here.

2.2. *R.s.—A.s. rorippetosum sylvestris* (typicum)

Occurence

This species occupied the 2. zone within the association's area of spreading. It came on dry ground sooner than the 2.1. after the subsiding floods, and even grazing starts earlier.

Cenological relations

From cenosystematic viewpoint the Agropyro-Rumicion elements are dominant, beside which the Molinio-Arrhenatherea, Molinietalia species had greater significance.

Differential species

Trifolium fragiferum, Rorippa austriaca, R. austriaca x *sylvestris*

Hydroecology

The hydato-helophyton representatives did not have time to develop, thus here, too, the helo-hygrophytons became dominant, mainly those of the *hhg3* sub-group. However, the covering quota of the *Agrostis stolonifera* decreased. At the same time the hygro-mesophytons, first of all the hgm1 species obtained role. In the zone having habitat somewhat drier than the 2.1., however, certain mesophytons also came into prominence besides some *hgm3* species, like the *Rorippa austriaca, Polygonum lapathifolium* (Table 2/2).

2.2. — — *Mentha pulegium* facies

At the sections of the Rorippo-Agrostetum reaching dry ground the soonest, mostly quantitative differences appeared. Nevertheless, it should be noted that certain Molinio-Juncetea representatives could not find their essential conditions. The considerable decrease in species number is detectable on Table 2/3 prepared on the basis of the 5 recordings; in comparison with the other two Tables.

These pastures show similarity to the *Artemisia vulgaris* subassociation of the association along the Drava reported by MARKOVIĆ.

Table 2. *Rorippo sylvestris — Agrostetum stoloniferae*
1. *agrostetosum stoloniferae*, 2. *rorippetosum sylvestris* (typicum), 3. *Mentha pulegium fac*

F	W	Subassociation:	1	2	3
		Hydato-helophyta: *hhe 3*			
5	10	*Butomus umbellatus* (Phragmitetea)	----------		
5	10	*Alisma lanceolatum* (Phragmitetea)	----------		
4—5	10	*Iris pseudacorus* (Phragmitetea)	———		
		Helophyton: *he 1*			
4—5	10	*Rorippa amphibia* (Phragmitetea)	———	———	
		Helo-hygrophyta: *hhg 1*			
4—5	10	*Eleocharis palustris* (Molinio-Juncetea)	———		
3—4	8	*Lysimachia nummularia* (Molinio-Juncetea)	———	———	
		hhg 2			
4	.	*Carex melanostachya* (Caricion gracilis)	———	———	
4—5	7	*Potentilla anserina* (Plantaginetea)	----------	———	

F	W	Subassociation:	1	2	3
		hhg 3			
3	8	*Agrostis stolonifera* (Molinio-Arrhenatherea)			
3—4	9	*Bidens tripartita* (Bidentetea)			
4	7	*Leucojum aestivum* (Salicion albae)			
		Hygrophyta:			
		hg 1,2			
3—4	.	*Rorippa sylvestris* (Agrostion)			
4	8	*Mentha pulegium* (Agropyro-Rumicion)			
3	.	*Rumex obtusifolius* ssp. *transiens* (Calystegion)			
3—4	6	*Potentilla reptans* (Molinio-Arrhenatherea)			
4—5	8	*Ranunculus sardous* (Agropyro-Rumicion)			
3—4	9	*Echinochloa crus-galli* (Chenopodio-Scleranthea)			
		Hygro-mesophyta:			
		hgm 1			
3—5	8	*Polygonum amphibium* var. *terrestris* (Agropyro-Rumicion)			
3	8	*Alopecurus pratensis* (Molinio-Arrhenatherea)			
3—4	7	*Trifolium fragiferum* (Festuco-Puccinellietalia)			
3—4	8	*Galega officinalis* (Molinietalia)			
		hgm 3			
4—5	8	*Rorippa austriaca* (Agropyro-Rumicion)			
4—5	8	*Rorippa austriaca* x *sylvestris* (Agropyro-Rumucion)			
3—4	9	*Polygonum lapathifolium* (Bidentetalia)			
		Mesophyta:			
		m 1			
2—3	5	*Taraxacum officinale* (Molinio-Arrhenatherea)			
3—4	6	*Inula britannica* (Plantaginetea)			

Hydroecology

From the viewpoint of moisture demand it showed variation from the 2.1. and the 2.2. in that the place of the *hhg1* and *hhg2* was filled by the expansion of the *Inula britannica* and the *Taraxacum officinale m1* species. Further details are shown in column 3 of Table 2; Fig. 9 demonstrates the soil relations.

3. *Trifolio fragiferi — Agrostetum stoloniferae* MARK. 78

A pasture community developing at the Tiszaalpár Basin in the case of varying soil conditions from flat meadow ground to irrigation-like meadow grounds, but on identical biogenic effect. Till now it was mostly known from the Sava-valley (MARKOVIĆ 1978) (Fig. 12), it is of frequent occurrence at the Hungarian Tisza-valley, too. At our area, we were successful in clarifying both its cenological as well as environmental biological relations. By means of analysing its pasture stands well separable units within association can be distinguished.

3.1. *T.f.—A.s. potentilletosum anserinae*

Spreading

It can firstly be found at meadow- and irrigation-like meadow grounds being considerably hard, thus having high siltable fraction. Its expansion was the most frequent at the fresh grounds of the Tisza flood-plain's basin-like dips eroded by inundations.

Cenological relations

Mostly Agropyro-Rumicion and Molinio-Arrhenatherea species, resp., are dominating. Examples for the former are the *Potentilla anserina* and the *Trifolium fragiferum;* and the *Carex hirta, Potentilla reptans, Trifolium repens* for the latter.

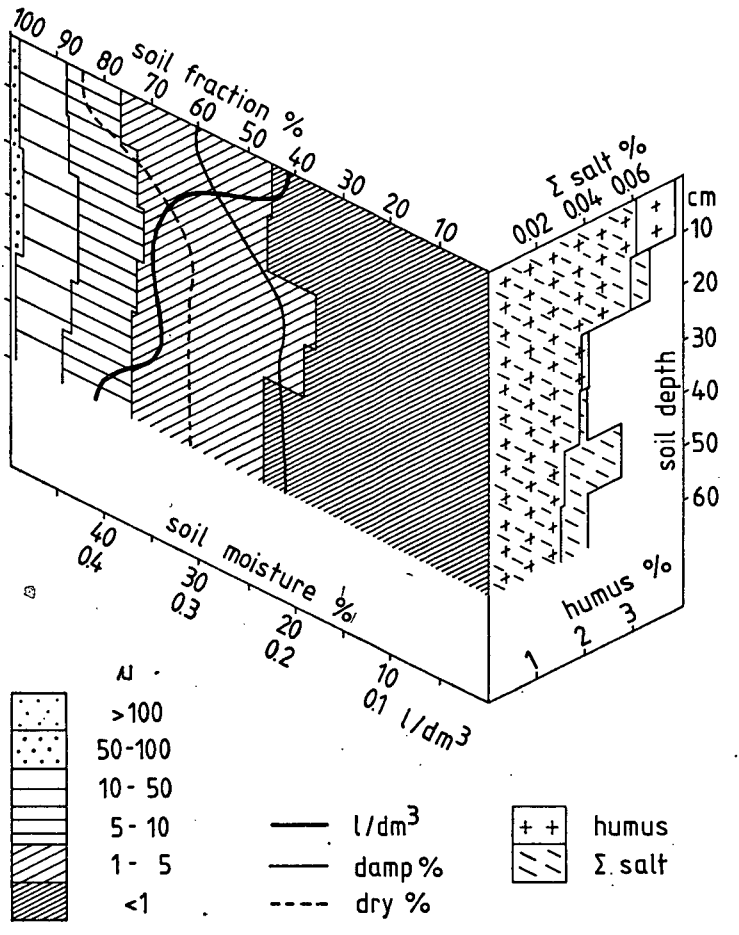

Fig. 9. The soil profile of the stand explored on June 5, 1981

Differential species

Potentilla anserina, Mentha aquatica, Vicia cracca, Juncus atratus.

Hydroecology

From the viewpoint of water demand the species components of the subassociation show transition towards the *Rorippo-Agrostetum.* The covering quota of the helo-hygrophytons is significant, namely the *hhg2* Potentilla anserina and the *hhg3 Agrostis stolonifera.* However, from the viewpoint of both species number and covering quota, those belonging to the hygrophyton category came into the foreground. Accordingly, the *hg1 Carex hirta* and the *hg2 Potentilla reptans* are worthy of note. The mesophytons had only appeared in blades (Fig. 11). Further details are found in Table 3.

3.1.1. — — *Heleochloa schoenoides* fac.

The moderately sodium salt-tolerant *Heleochloa schoenoides* regarded as a Cyperio-Spergularion species, as well as the *Bidens tripartita* as Bidentetea representative, frequently appeared and multiplied at the stagnant water sections of the

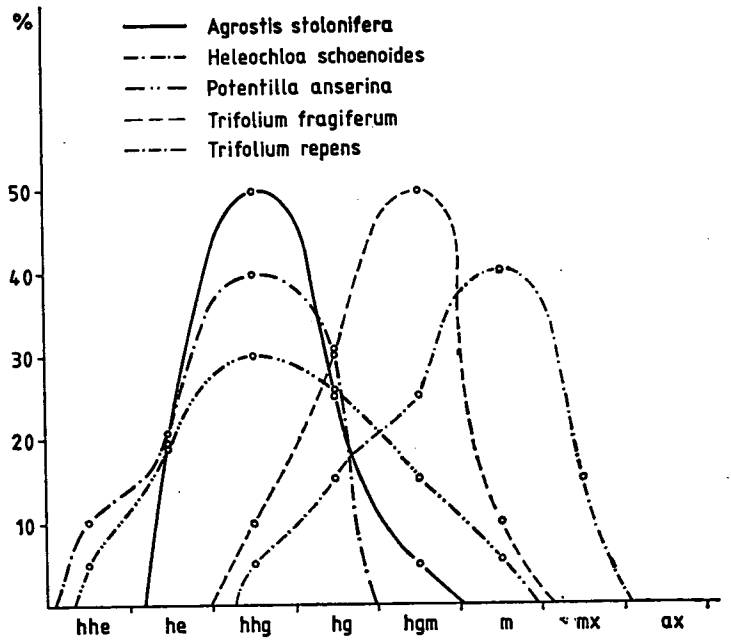

Fig. 10. Diagram representing the moisture demand of the more important species components of the *Trifolio-Agrostetum*

Potentilla anserina stands. Both belong to the *hhg3* sub-group of the hydato-helophyton category.

3.2. *T.f.—A.s. agrostetosum stoloniferae*

Similarly to the previous ones, its stands appeared at the zone of deeper relief. At our area these are meadows which have become degraded after the drainage of the earlier marshmeadows found at the Western part of the Basin, in the neighbourhood of the village Alpár. Their marsh-ground has turned into flat meadow ground through the oxidation of rapid course. Their organic matter content in the A-level has reached 6% even nowadays. Although the sodium salts could be demonstrated, their amount was not found to surpass the lowest level (0,01%) of the alkalinity degree even in the root zone. Its water supply was favourable in the Summer aspect, too, despite the high stagnant water content of its segment (Fig. 13).

Differential species

Lythrum virgatum, Lotus tenuis, Lysimachia vulgaris,

Cenological relations

The high covering quota of the *Agrostis stolonifera, Xanthium italicum, Trifolium repens, T. fragiferum* is characteristic (Table 3.3).

Hydroecology

The distribution of the species components from the viewpoint of moisture demand is similar to those reported in the case of 3.1. Accordingly, the total covering quota of the helohygrophyton species, mainly the high percental value of the *hhg3 Agrostis stolonifera* showed similarity to that of the hygro-mesophytons. In the case of the latter the *Trifolium fragiferum* of the hgml sub-group continues to play the leading role. The *Xanthium italicum* of the *hg2* sub-group, which could be regarded

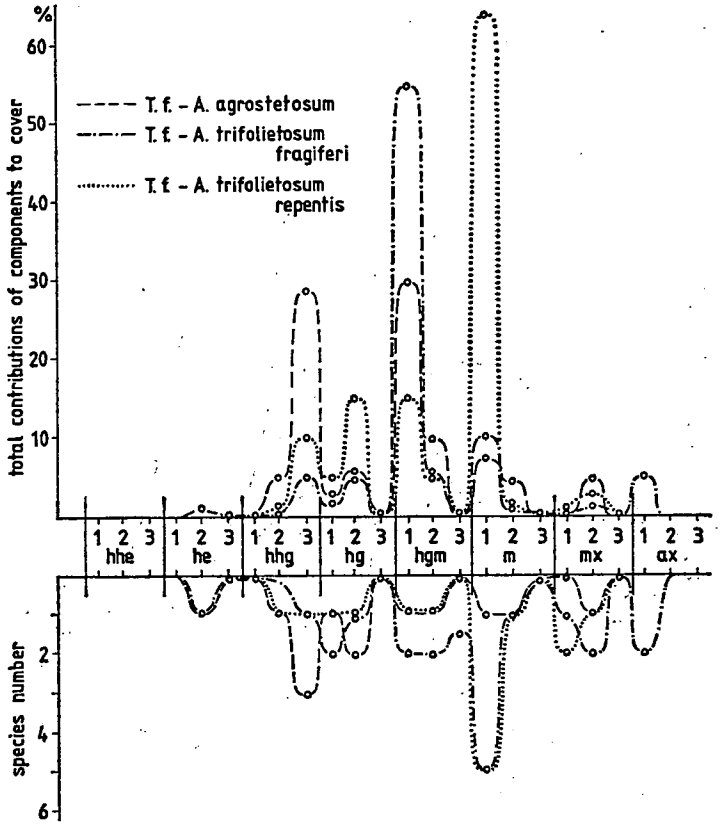

Fig. 11. Hydroecological curves of the three subassociations of the *Tr.-Agr.* drawn on the basis of their data from the Middle Tisza-valley

as a Bidentetalia species, became systematically inhabited into the grass stands pouched up by the animals during grazing (Fig. 11).

The previously discussed three units within association of the *Trifolio fragiferi-Agrostetum* occupied the more humid zone-section, where these do not have to reckon with scarcity of water even in the Summer aspect.

3.3. *T.f.—A.s. trifolietosum fragiferi* (typicum)

Occurrence

It most often develops at hard irrigation-meadow grounds of massive structure, with colloid-like fine granular fraction reaching 50%. Its zone is the pasture community located within the expansion of the association, one degree higher than the previous 3.2. The treading prints of the animals doing harm in its confined stands were rapidly covered up by the expansion of the *Agrostis.*

Differential species: *Rumex crispus, Daucus carota, Plantago major* ssp. *intermedia.*

Cenological relations

From cenosystematic viewpoint it is similar to the previous species with the difference that Chenopodietea and Festuco-Bromea representatives may also appear. The leading role was played by the *Trifolium fragiferum* which can be regarded as an Agropyro-Rumicion species. This could be determined on the basis of the pro-

Table 3. *Trifolio fragiferi — Agrostetum stoloniferae*
1. *potentilletosum anserinae* 2. *Heleochloa schoenoides* fac. 3. *agrostetosum stoloniferae*
4. *trifolietosum fragiferi* (typicum) 5. *trifolietosum repentis*

F	W	Subassociation	1	2	3	4	5
		Hydato-helophyton:					
		hh 3					
4—5	10	*Iris pseudacorus* (Phragmitetea)	.....	.....			
		Helophyta:					
		he 3					
3—4	9	*Lysimachia vulgaris* (Phragmitetea)			—	—	
4	9	*Cirsium palustre* (Phragmitetea)	—				
4—5	9	*Mentha aquatica* (Molinio-Arrhenatherea)	—	—			
		Helo-hygrophyta:					
		hhg 1,2					
4—5	7	*Potentilla anserina* (Agropyro-Rumicion	■		—		
2—4		*Heleochloa schoenoides* (Cyperio-Spergularion)	—	■			
4	8	*Juncus atratus* (Molinietalia)	.....	—			
		hhg 3					
3	8	*Agrostis stolonifera* (Agropyro-Rumicion)	■	■	■	—	■
4	8	*Lythrum virgatum* (Alopecurion pratensis)			—		
3—4	9	*Bidens tripartita* (Bidentetea)		—	.....		
		Hygrophyta:					
		hg 1					
3—4	7	*Carex hirta* (Molinio-Arrhenatherea)	■			—	—
2—3		*Lotus tenuis* (Festuco-Puccinellietea)	—	—	—		
4	8	*Mentha pulegium* (Agropyro-Rumicion)	—	—		—	
		hg 2					
3—4	6	*Potentilla reptans* (Molinio-Arrhenatherea)	■	■	—	—	■
4—5	8	*Ranunculus repens* (Molinio-Arrhenatherea)	—		—		
3—4	5	*Sonchus arvensis* ssp. *uliginomus* (Calystegion)		—			
		hg 3					
2—4	4	*Vicia cracca* (Molinio-Arrhenatherea)	—				
		Hygro-mesophyta:					
		hgm 1					
3—4	7	*Trifolium fragiferum* (Agropyro-Rumicion)	■	■	■	■	—
2—3	7	*Plantago major* ssp. *intermedia* (Plantaginetalia)				—	
		hgm 2,3					
3	.	*Xanthium italicum* (Bidentetalia)			■		—
3	8	*Alopecurus pratensis* (Molinio-Arrhenatherea)	—			.....	—
3—4	6	*Prunella vulgaris* (Plantaginetea)	—			—	
2—3	5	*Rumex crispus* (Agropyro-Rumicion)	—			.....	
		Mesophyta:					
		m 1					
0	5	*Trifolium repens* (Molinio-Arrhenatherea)	.....	—			■
2—3	5	*Taraxacum officinale* (Molinio-Arrhenatherea)		—	—	—	—
3—4	6	*Inula britannica* (Plantaginetea)					
2—3	6	*Centaurea pannonica* (Molinio-Arrhenatherea)				—	—

F	W	Subassociation	1	2	3	4	5
2—3	5	*Centaurium erythraea* (Molinio-Arrhenatherea)					
		m 2,3					
2—3		*Lolium perenne* (Plantaginetea)					
0	6	*Trifolium pratense* (Molinio-Arrhenatherea)					
0	5	*Daucus carota* (Molinio-Arrhenatherea)					
		Meso-xerophyta:					
		mx 1					
2—3	4	*Polygonum aviculare* (Chenopodio-Scleranthea)					
0	5	*Cichorium intybus* (Molinio-Arrhenatherea)					
		mx 2					
2—3		*Ambrosia elatior* (Chenopodietea)					
2—3	4	*Plantago lanceolata* (Festuco-Bromea)					
1—2	.	*Cuscuta epithymum* (Festuco-Brometea)					
2—3	3	*Carduus acanthoides* (Festuco-Brometea)					
		Asteno-xerophyton:					
		ax 1					
2	3	*Cynodon dactylon* (Chenopodio-Scleranthea)					

cessed 10 cenological recordings (Table 3.4) On the light-absorptive effect of the leaf-rosettes of the individuals spreading on the ground the *Agrostis* also fell into the background to a certain degree, together with most of the species components.

Hydroecology

On the basis of the average values of its studied pasture stands, compared to the previous ones, a significant change could be detected. The covering quota of the hygro-mesophyton species increased by leaps. The culmination point of their drawn curves surpassed 50%, despite their low species number. On the contrary the species number of the mesophytons was significant, however, judging from their quota they were still not competitive, as opposed to the previous ones. Naturally the *Trifolium fragiferum* of the *hg1* sub-group played the leading role (Fig. 11).

3.4. *T.f.—A.s. trifolietosum repentis*

Compared to the previous species, this occurred at drier zone-sectors of the hard, irrigation-like meadow grounds, firstly at the more shallow parts of the basin-like dips eroded by the flood-plain overflows at Tiszaalpár. Its site is also treaded and grazed to a greater extent, therefore more significant grade differences within its various stands did not occur here, either. The various aspect differences also became indistinct. This mostly took place in the flood periods when the area occupied by this grass stand was covered by stagnant water for longer-shorter periods.

Species composition

In this regard, from the Molinio-Arrhenatherea components having wider environmental-biological adaptability, the *Trifolium repens* which could be considered as an Agropyro-Rumision species, is also characteristic, apart from the denominator species of the association. Furthermore, the *Taraxacum officinale* and the *Centaurea pannonica* also multiplied — overwhelmingly the Molinio-Arrhenatherea representatives.

Differential species

Trifolium repens, Cuscuta epithymum, Trifolium pratense, Alopecurus pratensis (Table 3.5).

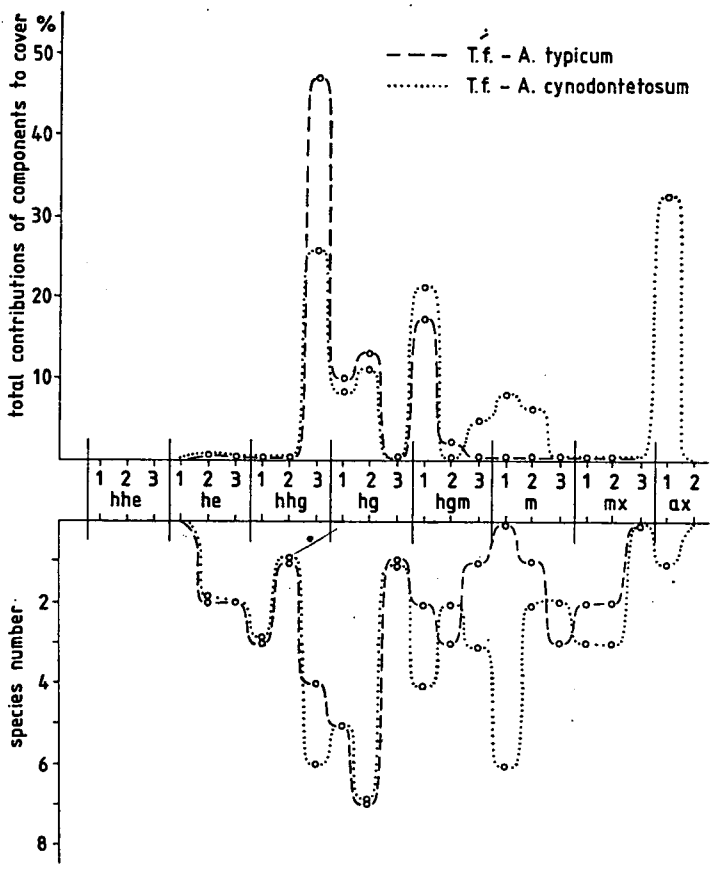

Fig. 12. The diagram of the association drawn on the basis of the data by MARKOVIĆ reported from the Sava-valley

Hydroecology

Since its occupied area is exposed to shorter periods of floods, regarding the total covering quota of the species components, they showed mesophyton character. The culmination point of their drawn curve appeared at the value above 60%. At the same time the *Cares distans, Potentilla reptans, Xanthium italicum* having moisture site demands, but with wider adaptability continued to be the components of these pasture grasses.

The *Polygonum aviculare* of mxl character as well as the *Cynodon dactylon* of axl character also increased at the sectors most intensively exposed to treading, in the direct neighbourhood of the village Tiszaalpár, mainly along the resting place of the animals. This, however, is not reflected on the global chart prepared according to the values averaged on the base of 10 recordings (Fig. 11).

4. *Lolio — Potentilletum anserinae Knapp* 46

This developed at the flood-plain of the Tisza-valley periodically exposed to inundations at a somewhat higher relief compared to the previous three pasture associations. It occupies a wider territory at this area — mainly at the Basin's Sout-

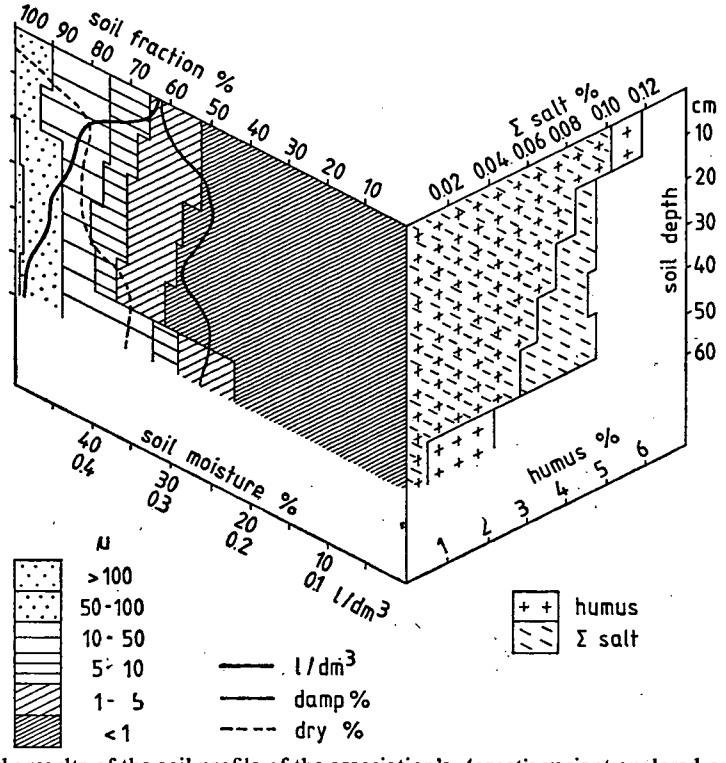

Fig. 13. Study results of the soil profile of the association's *Agrostis* variant explored on August 13, 1980 from the regions of the village Alpár

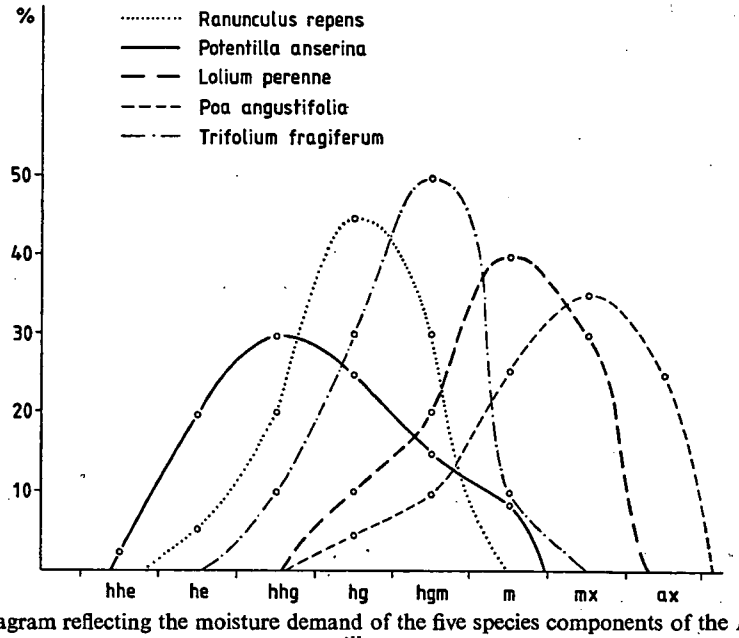

Fig. 14. Diagram reflecting the moisture demand of the five species components of the *Lolio-Potentilletum*

hern section, at the confines of the village Bokros. Its grass stands are of extremely varied species composition and the species components showed considerable differences in covering quota. This variedness is firstly caused by the varied mosaic state and heterogeneous hydrographic fundamentals of the floodplain ground, besides the consideration of the degree of pasturing and treading.

Regarding its expansion, apart from the Tisza-valley, it is mostly known from the Middle Danube-valley (KÁRPÁTI 1963) and the valley of the Danube's Yugoslavian tributary, the Sava (MARKOVIĆ 1978) (Fig. 15. A. B.).

4.1. *L.—P.a. potentilletosum anserinae*

Spreading

At the Tisza-valley it occupied the lowest, so-called transitional-like zone of the area ruled by the association. By this means it mostly joined to the grass stands of the *Trifolio fragiferi-Agrostetum stoloniferae*. Several transitions were demonstrable betweeen the two. Regarding its emergence it developed from the *Lolio-Alope-*

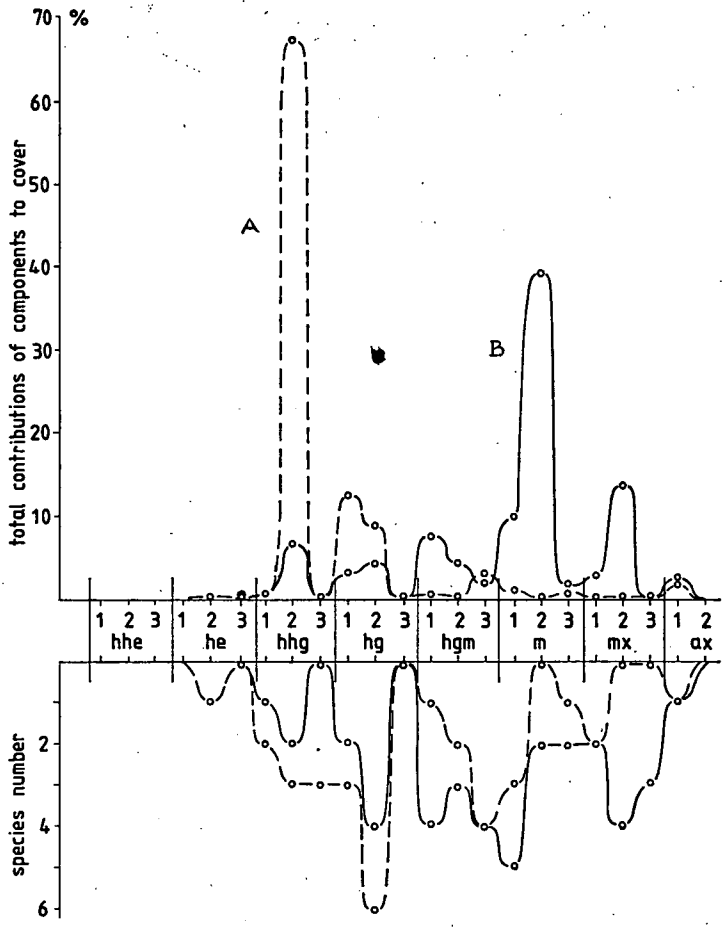

Fig. 15. The comparative hydroecological diagrams of the association drawn on the basis of the data by MARKOVIĆ from the Sava-valley (A) and KÁRPÁTI et *al.* from the Middle Danube-valley (B)

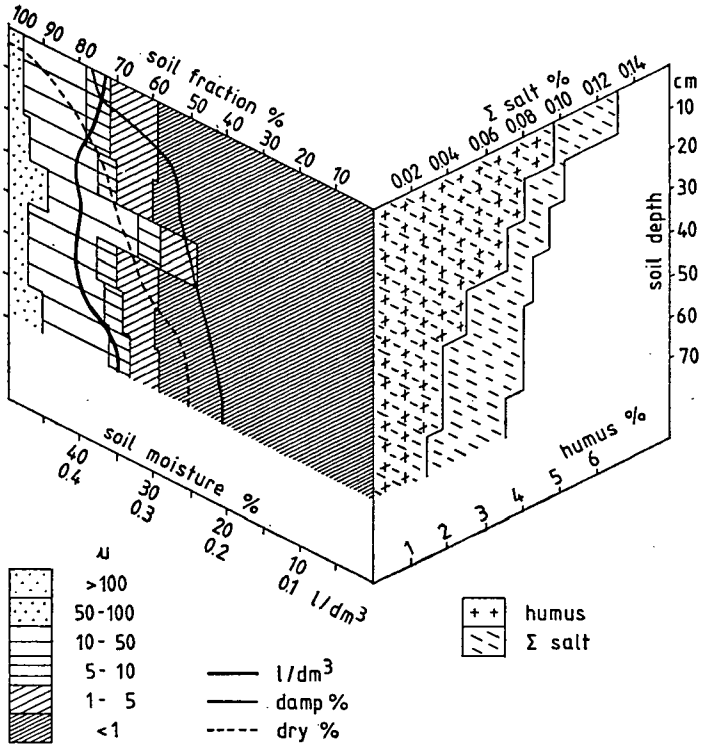

Fig. 16. Study results of the soil profile of the association's *Potentilla anserina* variant explored on May 28, 1980 at the limits of the village Alpár

curetum stands on the effect of the more enhanced treading and the stagnant waters occasionally lasting for longer periods.

Cenological relations

The Phragmitetea, Molinio-Juncetea as well as the Molinietalia elements, like the *Mentha aquatica, Lysimachia nummularia* have more significant covering quota.

Differential species

Eleocharis palustris, Mentha aquatica, Echinochloa crus-galli.

Soil

This is the relief of the Tiszaalpár Basin where it was able to bring about the accumulation of a certain amount of sodium salts at the flood-plain, by means of the water movement of the inundations (overrun-drying up). Its surface-near accumulation — although it had only just surpassed the lowest level of the alkalinity degree (0,13%) — indicated the initial stage of the process of turning into solonchak. This was referred to by the fact that the *Lotus tenuis,* which could be considered as a Puccinellietalia representative, had appeared and remained constant subsequently (Table 4.1).

The significant organic matter content, which reached 5% in the root zone, compensated the unfavourable physiological effect of the harmful salts. Despite the presence of the high colloid-containing fine matter fraction its water supply could be regarded as being favourableseen at the end of the Spring aspect (Fig. 16).

Hydroecology

In respect to the shaping of the total covering quota of its species components the culmination point of its drawn curve was detectable at *hhg2*, at the value of 20%, and referred to their wide adaptability. The decrease was steady from the *hhg2* towards the drier categories and their sub-groups, resp. (Fig. 18). The relationships in connection with the distribution of species number are also shown on this Figure. Regarding the distribution of the various species within the hydroecological categories, from the hygrophytons the components belonging to the hgl and 2 sub-groups are also significant, besides the dominating character of the *Potentilla anserina* and the *Agrostis stolonifera* of the *hhg2*, 3 sub-groups (Table 4).

4.2. *L.—P.a. trifolietosum fragiferi*

Spreading

This species preferred the farther section of the flood-plain rather than the littoral zone of the backwaters, where it occupied the flat lands which are eroded but get free of the stagnant waters sooner. Regarding its development this, too, can be interpreted as the degradation of the *Lolio-Alpecuretum* pastures. The species may also form a transition towards the *Trifolio fragiferi — Agrostetum.*

Cenological relations

The covering quota of the Agropyro-Rumicion and Plantaginetea representatives showed an increase, which fact in its major features is also characteristic to the association. The process of degradation of the *Lolio-Alopecuretum* can well be followed (Table 4.3).

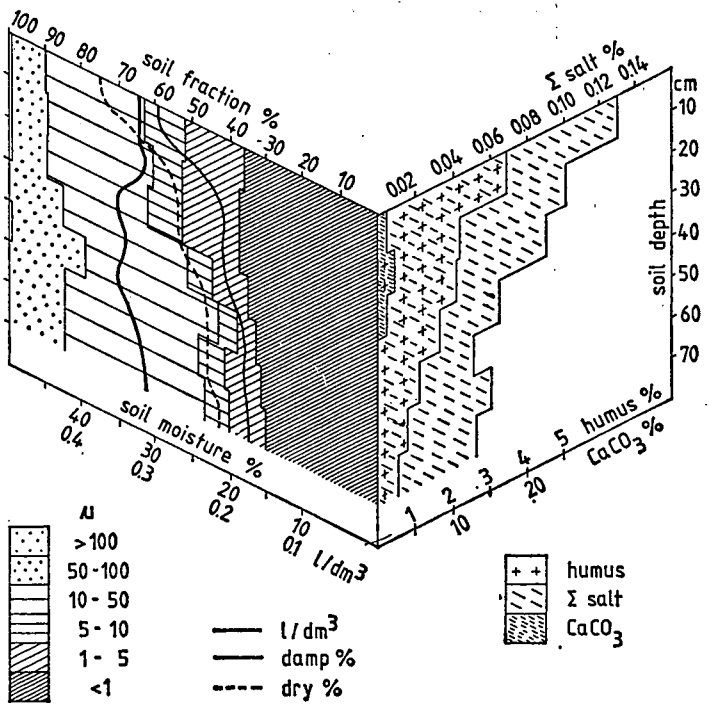

Fig. 17. Soil profile of the association's *Trifolium fragiferum* variant explored at the same time and place as in Fig. 16

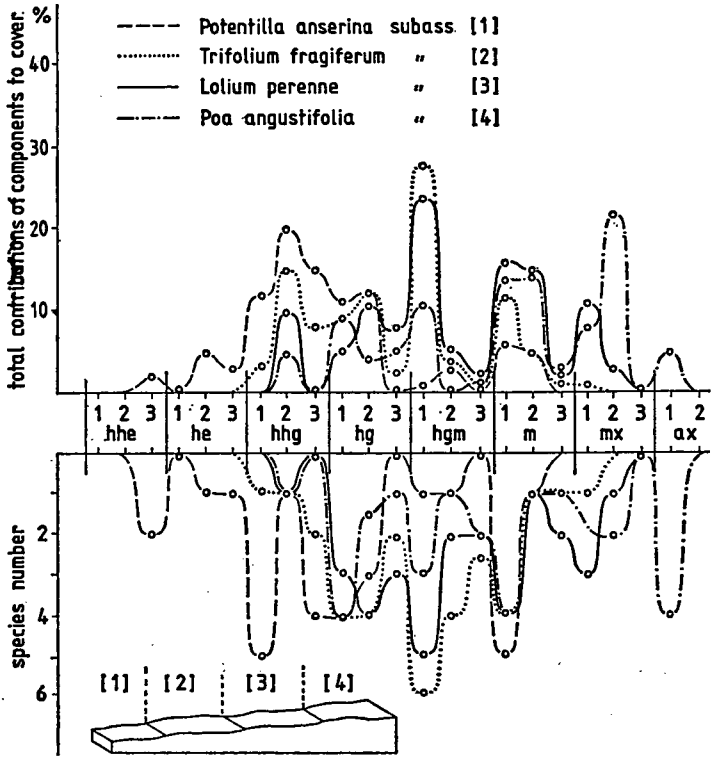

Fig. 18. The hydroecological curves of the four subassociations of the *Lo.-Pot.*, reflected in the changes in their species numbers

Differential species

Cerastium dubium, Alopecurus pratensis

Soil

Compared to the previous 4.1. the harmful salt-dynamic of its explored and investigated soil-profile can be regarded as being almost identical. At the same time it has essentially lower organic matter content. It is of loose structure from agrophysical point of view; its water supply is still favourable. The decrease in siltable fraction can be explained by the fact that the grass stand is situated at higher relief, for it is covered by inundations for shorter periods and there is shorter time at disposal for the deposition of the colloids (Fig. 17).

Hydroecology

It was manifest during the course of drawing their diagrams reflecting the moisture demand of the species components that the deviation was significant compared to the previous subassociation. While the culmination point appeared at *hhg2* in the case of the latter, it was found here overleaping a category *(hg)* at the *hgm1* sub-unit of the hygro-mesophyton. At the same time, however, the *Potentilla anserina* of the *hg2* sub-group, having wider adaptability, continued to show considerable covering quota. The quota of the representatives belonging to the mesophyton category significantly increased, first of all by means of the trifolium repens belonging to the *m1* sub-group (Fig. 18).

4.3. *L.—P.a. lolietosum (typicum)*

Spreading

Along the middle-Tisza this species was located at a one grade higher relief within the area possessed by the association, compared to the previous ones. Its degradation is also traceable through the *Lolio-Alopecuretum* pastures till the *Agrostio-Alopecuretum* marsh-wood grass-lands, depending on the intensity of treading and grazing.

Cenological relations

The greater the effect of the environmental conditions was on the *Lolium perenne* and the Plantaginetea and Agropyro-Rumicion elements, resp., the higher the ratio was of the total covering quota. Accordingly, the *Prunella vulgaris* and *Medicago lupulina* could be regarded as differential species. The cenological relations of the *Lolio-Potentilletum anserinae* could simultaneously also be characterized by this pasture type.

Character species

Potentilla anserina, Lotus tenuis, Ranunculus sardous, Plantago major ssp. *intermedia, Trifolium repens.*

Table 4. *Lolio-Potentilletum anserinae* 1. *potentilletosum anserinae* 2. *trifolietosum fragiferi* 3. *lolietosum* 4. *poëtosum angustifoliae*

F	W	Subassociation	1	2	3	4
		Hydato-helophyta: *hhe 3*				
4—5	10	*Iris pseudacorus* (Phragmitetea)	———			
5	11	*Alisma plantago-aquatica* (Phragmitetea)	- - - - -			
5	10	*Stachys palustris* (Phragmitetea)	- - - - -			
		Helophyta: *he 2,3*				
4—5	9	*Mentha aquatica* (Molinio-Arrhenatherea)	▬▬			
4—5	9	*Lycopus exaltatus* (Phragmitetea)	———			
		Helo-hygrophyta: *hhg 1*				
3—4	8	*Lysimachia nummularia* (Molinio-Juncetea)	▬▬	———		
4—5	10	*Eleocharis palustris* (Molinio-Juncetea)	▬▬			
4	9	*Lythrum salicaria* (Phragmitetea)	- - - - -			
4	8	*Juncus atratus* (Molinietalia)	- - - - -			
		hhg 2,3				
4—5	7	*Potentilla anserina* (Plantaginetea majoris)	▬▬	▬▬	▬▬	———
3	8	*Agrostis stolonifera* (Agropyro-Rumicion)	▬▬	———		
4	9	*Juncus compressus* (Agrostion)	———			
3—4	9	*Bidens tripartita* (Bidentetea)	———			
3	8	*Myosoton aquaticum* (Calystegion)	———			
		Hygrophyta: *hg 1*				
2—3	.	*Lotus tenuis* (Puccinellietalia)	▬▬	▬▬	———	———
3—4		*Glycyrrhiza echinata* (Calystegion)	———	———	———	———
4	8	*Mentha pulegium* (Agropyro-Rumicion)	———	———	———	
3—4	7	*Carex hirta* (Molinio-Arrhenatherea)	———	———		
		hg 2				
4—5	8	*Ranunculus repens* (Agropyro-Rumicion)	▬▬	▬▬	———	
3—4	6	*Potentilla reptans* (Agropyro-Rumicion)	▬▬	———	▬▬	
3		*Rorippa sylvestris* (Agropyro-Rumicion)	———	▬▬	———	
4—5	8	*Ranunculus sardous* (Agropyro-rumicion)	———	———	———	———
3—4	5	*Sonchus arvensis* ssp. *uliginosus* (Calystegion)		- - - - -	- - - - -	- - - - -
3—4	9	*Echinochloa crus-galli* (Chenopodio-Scleranthea)	———			

F	W		1	2	3	4
		hg 3				
3—4	9	*Poa trivialis* (Molinio-Arrhenatherea)				
2—4	4	*Vicia cracca* (Molinio-Arrhenatherea)				
3—7	7	*Festuca pratensis* (Molinio-Arrhenatherea)				
		Hygro-mesophyta:				
		hgm 1				
2—3	7	*Plantago major ssp. intermedia* (Plantaginetea majoris)				
3—4	7	*Trifolium fragiferum* ssp. *bonnanini* (Agropyro-Rumicion)				
3—5	8	*Polygonum amphibium* v. *terrestris* (Agropyro-Rumicion)				
3	8	*Alopecurus pratensis* (Molinio-Arrhenatherea)				
4	5	*Althaea officinalis* (Agrostion)				
2—5	.	*Cerastium dubium* (Agropyro-Rumicion)				
		hgm 2				
3	.	*Xanthium italicum* (Bidentetea)				
3—4	6	*Prunella vulgaris* (Plantaginetea)				
0	6	*Matricaria maritima* ssp. *inodora* (Chenopodietea)				
		hgm 3				
2—3	5	*Rumex crispus* (Agropyro-Rumicion)				
4—5	8	*Rorippa austriaca* (Agropyro-Rumicion)				
		Mesophyta:				
		m 1				
0	5	*Trifolium repens* (Plantaginetea majoris)				
2—3	5	*Taraxacum officinale* (Molinio-Arrhenatherea)				
3—4	6	*Inula britannica* (Pantaginetea majoris)				
2—3	5	*Centaurium erythraea* (Nanocyperion)				
2—3	6	*Centaurea pannonica* (Molinio-Arrhenatherea)				
		m 2, 3				
2—3	.	*Lolium perenne* (Plantaginetea)				
0	5	*Chenopodium album* (Chenopodio-Scleranthea)				
0	5	*Daucus carota* (Arrhenatherion)				
		Meso-xerophyta:				
		mx 1				
2—4	6	*Medicago lupulina* (Plantaginetea)				
0	5	*Cichorium intybus* (Polygonion avicularis)				
2—3	4	*Polygonum aviculare* (Chenopodio-Scleranthea)				
		mx 2				
1—2	.	*Cuscuta epithymum* (Festuco-Brometea)				
2	3	*Poa angustifolia* (Festuco-Brometea)				
2—3	4	*Plantago lanceolata* ssp. *sphaerostachya* (Festuco-Bromea)				
2—3	.	*Ambrosia elatior* (Chenopodio-Scleranthea)				
		Asteno-xerophyta:				
		ax 1				
2	3	*Cynodon dactylon* (Chenopodio-Scleranthea)				
0	.	*Atriplex tatarica* (Chenopodio-Scleranthea)				
1	.	*Trifolium micranthum* (Festucion pseudovinae)				
		ax 3				
2	1	*Carex stenophylla* (Festuco-Puccinellietea)				

Soil

Its explored and investigated profile did not show a considerable change as compared to the previous one.

Hydroecology

The shaping of its drawn curve differed in that the total covering quota of the mesophyton and mainly the meso-xerophyton species components rose to nearly similar

degree as the total covering quota of the species belonging to the *hhg, hg* and *hgm* categories decreased. Thus, the multiplication of the *Lolium* of the *m2* sub-group, the *Medicago lupulina* of the *mx1* subgroup and the *Polygonum aviculare* at the sections exposed to extreme treading was observable (Table 4.3).

4.4. *L.—P.a. poëtosum angustifoliae*

Spreading

This forms the fourth zone of the inner flood-plain pastures occupied by the association, situated farther from the backwaters and the river-water, although it also frequently formed mosaic complexes. It developed at the sections which were covered by water during the course of the Tisza inundations for even shorter period than the previous ones. Nevertheless, it still had favourable site conditions for the development of this variant of humid-soiled pastures.

Cenological relations

The Molinio-Arrhenatherea is also dominant to a certain degree, besides the Agropyro-Rumicion and Plantaginetea species. However, some Festuco-Bromea and Chenopodio-Scleranthea representatives, resp., also obtained significant role. Nevertheless the Molinio-Juncetea's Agrostion., Bidentetea species were forced out from the cenosis. It was this sub-association which later expanded towards the drying out-soiled pasture type of the *Lolio -Festucetum pseudovinae.*

Differential species

Poa angustifolia, Plantago lanceolata ssp. *sphaerostachya, Cynodon dactylon.*

Hydroecology

During the analysis of such tendency of its cenoses it became evident that following the series of categories, its curve reflecting moisture demand ran a rather wide scope. Accordingly it was followable from the helophytons till the astenoxerophytons, although in varying quota (Fig. 18).

5. *Lolio — Alopecuretum pratensis* Bodrk. 62

This community was first described at the Tisza-valley, where at places it forms extensive flood-plain pastures equally at the Hungarian Upper-, Middle- and Lower--Tisza regions (Bodrogközy 1963). It is presumed to occur at other humid areas along rivers as well (Soó 1973). In respect to its zonation system it occupied a relief zone close to similar to the previous 4. association, where the stagnant water covering following the river's inundations is of average duration. This is also reflected in the development of its species composition. Considerable differences in grass associations were resulted even by the smaller relief variances at the extensive area possessed by its stands. It could be determined, however, that these units within association regularly recur even in the range of twenty years.

5.1. *L.—A.p. agrostetosum stoloniferae*

Spreading

There were currents developing as the consequence of inundations even at the area occupied by the association. Areas of periodical stagnant water also reminaed at places here at its eroded flat-lands. These were mostly frequent at the village Bokros.

Cenological relations

Although in general the Molinio-Arrhenatherea, Agropyro-Rumicion elements are charasterictic of the association, certain treading-tolerant Molinio-Juncetea representatives, like the *Eleocharis palustris, Juncus articulatus,* are also found. Its stands can be traced back to the cenoses of the *Agrostio-Alopecuretum* hayfield meadows of irrigation-meadow ground (Table 5.1).

Differential species

Agrostis stolonifera, Alopecurus geniculatus, Juncus compressus

Hydroecology

The helophytons are missing from its species components by now, nevertheless, from the helo-hygrophytons the *Eleocharis palustris, Juncus articulatus* which could be considered as members of the *hhg1* sub-group; the *Potentilla anserina* of the *hhg2* sub-group, as well as the *Agrostis stolonifera* of the *hhg3* sub-group showing significant covering quota, all reflect well the state of water-supply of these flat-lands (Fig. 19). From the hygro-mesophytons the *Alopecurus pratensis* of the *hgm1* sub-group is significant. The mesophytons were represented by the *Lolium perenne* of the *m2* sub-group, although with lower covering quota. The species claiming drier hydroecological demands were at best only represented in blades (Table 5).

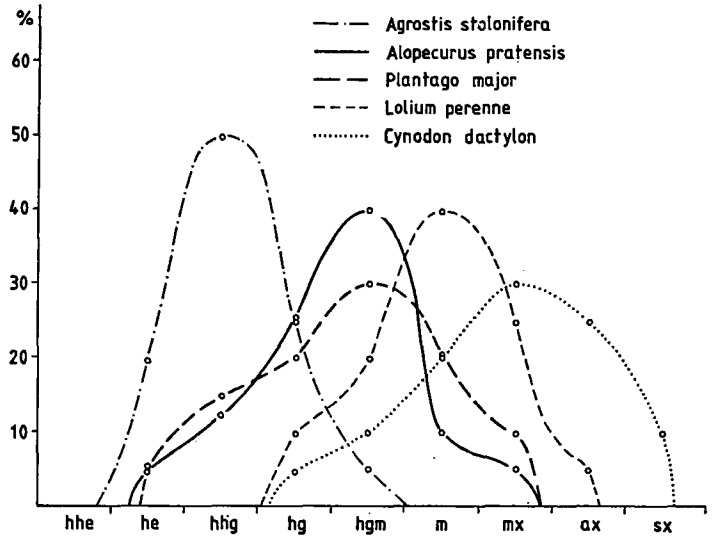

Fig. 19. The curve of the five species components of the *Lolio-Alopecuretum* drawn on the basis of their moisture demand

5.2. *L.—A.p. plantaginetosum lanceolati Plantago major* Fac.

Spreading

At that section of the area occupied by the association where the duration of stagnant water covering was shorter, significant changes took place in the pasture's site conditions. Accordingly essential difference was observable in the composition of the grass stand, too, in the same manner as those reported previously from the Hungarian Upper-Tisza valley.

Cenological relations

At our area it was not the characteristic *Plantago lanceolata* subassociation that was found, which is firstly characterized by the Festuco-Bromea species, but the *Plantago major* ssp., *intermedia*-produced facies of this. The Molinio-Juncetea, Calystegion and the Agrostion representatives were missing, however, the total covering quota of the Agropyro-Rumicion elements increased. Further comparative details are shown on Table 5.

Hydroecology

As the consequence of the change in the degree of water supply no helo-hygrophyton species were further found. Mainly the hygro-mesophytons dominated, first of all the *Alopecurus pratensis* of the *hgm1* sub-group and the *Plantago major* ssp. *intermedia.* From the mesophytons, there was an increase in the covering quota of the *Lolium perenne* of the *m2* sub-group, besides that of the *Trifolium repens* and *Taraxacum officinale* of the *m1* sub-group. The meso-xerophyton species components were also present, although their total covering quota was not considerable yet (Fig. 20). Further details are observable on Table 5.

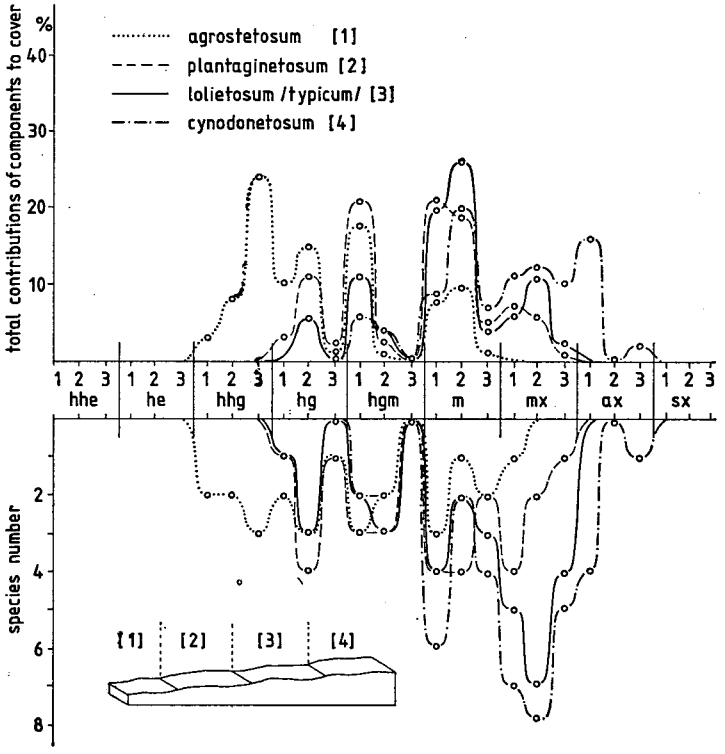

Fig. 20. Diagram illustrating the hydroecological state and changes in species number of the association's four smaller units

Owing to its location at higher relief the colloids of the stagnant waters were only able to depose at a slighter degree, as the consequence of the water covering of short duration. This explains the value around 60% its soil-profile's siltable fraction (the two substance- and the two silt-fractions).

Regarding water supply, the amount measured in the Summer aspect was half that of the Spring aspect. The accumulation of the sodium salts was not significant, their value in the explored soil profile did not reach the lowest level of the alkalinity degree (Figs. 21 and 22).

Hydroecology

It differs from the 5.2. in that the degree of decrease for the quota of the hygro-

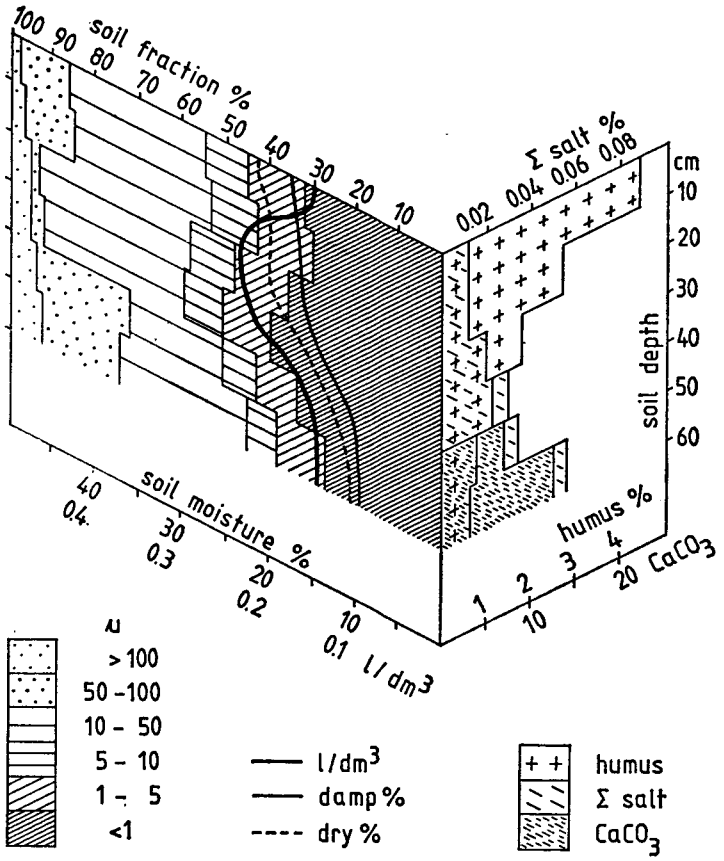

Fig. 21. Study results of the soil profile of the association's Achillea facies explored on November 8 1983 at the limits of the village Bokros

phytons was proportional with the degree of increase of the quota of the meso-xerophytons (Fig. 20).

5.3. *L.—A. p. lolietosum* (=normale) typicum

Spreading

Apart from the Tiszaalpár Basin, this species had been reported from the Tokaj region and the Environment Protection Area of the Tisza-valley at Mártély (BODROGKÖZY 1962, 1982). From the varieties of the association it was of largest expansion at our area. Its species composition became impoverished coming near the resting place of the animals.

Differential species

Ononis arvensis, Cerastium glomeratum

Soil

5.4. *L.—A.p. cynodonetosum*

Spreading

It appeared where the marsh-wood hayfields of the *Poo angustifoliae- Alopecuretum* were exposed to grazing and treading.

Table 5. *Lolio — Alopecuretum pratensis*
1. *agrostetosum* 2. *plantaginetosum lanceolati* 3. *typicum* 4. *cynodonetosum*

F	W	Subassociation:	1	2	3	4
		Helo-hygrophyta:				
		hhg 1				
4—5	10	*Eleocharis palustris* (Molinio-Juncea)				
4	10	*Juncus articulatus* (Molinio-Juncetea)				
		hhg 2				
4—5	7	*Potentilla anserina* (Plantaginetalia)				
4	9	*Alopecurus geniculatus* (Plantaginetea majoris)				
		hhg 3				
3	8	*Agrostis stolonifera* (Agropyro-Rumicion)				
3	8	*Myosoton aquaticum* (Calystegion)				
4	9	*Juncus compressus* (Agrostion)				
		Hygrophyta:				
		hg 1				
4	8	*Mentha pulegium* (Agropyro-Rumicion)				
3—4	7	*Carex hirta* (Molinio-Arrhenatherea)				
		hg 2				
4—5	8	*Ranunculus repens* (Agropyro-Rumicion)				
3	.	*Rorippa sylvestris* ssp. *kerneri* (Agropryo-Rumicion)				
3—4	6	Potentilla reptans (Agropyro-Rumicion)				
4—5	8	*Ranunculus sardous* (Agropyro-Rumicion)				
		hg 3				
3—4	9	*Poa trivialis* (Molinio-Arrhenatherea)				
3—4	7	*Festuca pratensis* (Molinio-Arrhenatherea)				
		Hygro-mesophyta:				
		hgm 1				
3	8	*Alopecurus pratensis* (Molinio-Arrhenatherea)				
2—3	7	*Plantago major* ssp. *intermedia* (Plantaginetea majoris)				
4	8	*Trifolium hybridum* (Molinio-Arrhenatherea)				
		hg 2, 3				
2—3	5	*Rumex crispus* (Molinio-Arrhenatherea)				
4—5	8	*Rorippa austriaca* (Agropyro-Rumicion)				
2—3	4	*Artemisia vulgaris* (Plantaginetea majoris)				
		Mesophyta:				
		m 1				
0	5	*Trifolium repens* (Molinio-Arrhenatherea)				
2—3	5	*Taraxacum officinale* (Molinio-Arrhenatherea)				
0	3	*Convolvulus arvensis* (Chenopodio-Scleranthea)				
3—4	6	*Inula britannica* (Plantaginetea majoris)				
0	4	*Cirsium arvense* v. *horridum* (Chenopodietea)				
2—4	2	*Rumex acetosa* (Molinio-Arrhenatherea)				
		m 2				
2—3	.	*Lolium perenne* (Plantaginetalia)				
2—3	.	*Geranium pusillum* (Chenopodietea)				
0	6	*Trifolium pratense* (Molinio-Arrhenatherea)				
3	0	*Veronica arvensis* (Secalietea)				
		m 3				
0	5	*Daucus carota* (Arrhenatherion)				
2—3	3	*Agropyron repens* (Agropyro-Rumicion)				
0	5	*Capsella bnrsa-pastoris* (Chenopodio-Scleranthea)				
3	.	*Ononis arvensis* (Molinio-Arrhenatherea)				
2—3	3	*Euphorbia virgata* (Chenopodio-Scleranthea)				
		Meso-xerophyta:				
		mx 1				
2—4	6	*Medicago lupulina* (Plantaginetea majoris)				
40	4	*Trifolium campestre* (Festuco-Brometea)				

F	W	Subassociation:	1	2	3	4
2—3	4	*Polygonum aviculare* (Chenopodio-Scleranthea)				
0	5	*Cichorium intybus* (Polygonion avicularis)				
1—2	3	*Medicago falcata* (Festuco-Brometea)				
2—3	3	*Bromus mollis* (Festuco-Brometea)				
2—3	3	*Silene vulgaris* (Molinio-Arrhenatherea)				
3	0	*Cerastium glomeratum* (Polygono-Chenopodion)				
		mx 2				
2	3	*Poa angustifolia* (Festuco-Brometea)				
2—3	4	*Plantago lanceolata* (Festuco-Bromea)				
0	4	*Lotus corniculatus* ssp. *hirsutus*				
		(Molinio-Arrhenatherea)				
1	2	*Eryngium campestre* (Festuco-Brometea)				
2—3	.	*Verbascum phlomoides* (Festuco-Bromea)				
1—2	3	*Achillea collina* (Festuco-Bromea)				
1	7	*Cerastium arvense* (Festuco-Bromea)				
2—3	2	*Carduus nutans* ssp. *macrolepis* (Festuco-Brometea)				
1—2	.	*Cynoglossum officinale* (Polygonion avicularis)				
2	3	*Echium vulgare* (Festuco-Brometea)				
2—3	3	*Ononis spinosa* (Festuco-Brometea)				
		mx 3				
1—2	3	*Erodium cicutarium* (Festuco-Bromea)				
2—3	4	*Erigeron canadense* (Chenopodio-Scleranthea)				
1—2	2	*Potentilla argentea* (Festuco-Brometea)				
2—3	1	*Arenaria serpyllifolia* (Chenopodio-Scleranthea)				
2—3	3	*Carex praecox* (Festuco-Bromea)				
		Asteno-xerophyta:				
		ax 1				
2	3	*Cynodon dactylon* (Festuco-Bromea)				
2	2	*Festuca pseudovina* (Festuco-Puccinellietea)				
2	3	*Cerastium semidecandrum* (Festuco-Brometea)				
1	.	*Trifolium striatum* (Festucion pseudovinae)				
		ax 3				
1—2	.	*Limonium gmelinii* (Festucion pseudovinae)				

Cenological relations

The composition of its cenoses follows from its development; besides the Molinio-Arrhenatherea and the Plantaginetea the Festuco-Bromea and Chenopodio-Scleranthea species multiplied, due to the water-covering of shorter duration (Table 5.4).

Differential species

Festuca pseudovina, Carex praecox.

Hydroecology

The repression of species having greater water demand is characteristic to this grass community filling out the area of highest relief within the *Lolio-Alopecuretum,* while the hygrophytons still found in the stands of the 5.3. were completely missing here. Therefore, the species with highest covering quota belonged to the mesophyton category. The leading role is played by the excellently treading-tolerant and well accommodating *Lolium perenne* of the *m2* sub-group. Compared to the previous subassociation a rising tendency was demonstrable within the meso-xerophyton category, from the viewpoint of both species- and covering quota. Furthermore, asteno xerophytons also stepped into certain cenoses. The species of outstandingly high value was the *Cynodon dactylon* of the *mx3* and *ax1* sub-groups, resp. (Fig. 20).

6. *Rorippo austriacae — Agropyretum* (Tim. 47) Tx 50

Spreading

This is also a pasture community first described from along the Tisza river

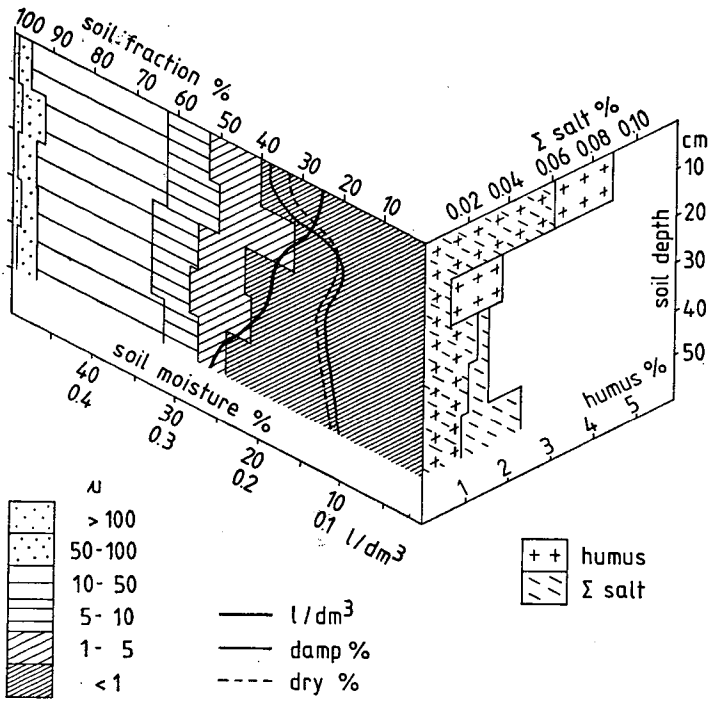

Fig. 22. Soil profile of the association's *Lolium* variant explored on August 15, 1980 at the same area as in Fig. 21

(TIMÁR 1947). In the Tiszaalpár Basin it proved to be of less frequent occurrence. Earlier some of its stands were known as facies (TIMÁR 1950): *Rorippa austriaca* fac. and *Agropyron repens* fac., resp. Although it appears at higher relief at the Tisza flood-plain, its double-level grass stands are of variegated appearance as the result of the varied nature of the area.

Cenological relations

They showed a wide range from cenosystematic viewpoint. The Polygono-Chenopodion, Chenopodio-Scleranthea species multiplied, besides the Molinio-Arrhenatherea, Agropyro-Rumicion representatives, and on occasions even the Festuco-Brometea species played role.

Character species

Rorippa austriaca, Rumex crispus, Tanacetum vulgare.

Units within association:

6.1. *R.a.—A.r. agrostetosum stoloniferae*

Spreading

Where the higher area sections of the flood-plain were situated directly in the neighbourhood of the backwaters a variant of transitional character developed. By this means they formed the lowest zone of the association.

Cenological relations

In consequence of its transitional character, Phragmitetea, Magnocaricion and Molinion species also occurred in blades. More significant quota, however, was

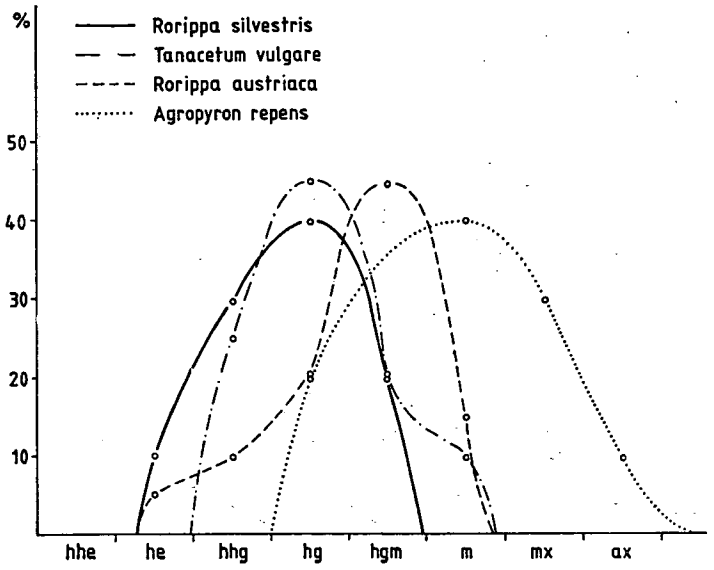

Fig. 23. Diagram showing the hydroecological demand of the four characteristic species of the *Rorippo-Agropyretum*

reached by the Molinio-Juncetea, Molinio-Arrhenatherea representatives, like the *Agrostis stolonifera* and the *Agropyron repens* having wider adaptability (Table 6.1).

Differential species

Lysimachia nummularia, Carex hirta, Chenopodium urbicum.

Hydroecology

Regarding the various categories reflecting moisture demand, its curve drawn on the basis of the subassociation's covering quota is protracted. Thus it is followable from the helohygrophytons till the meso-xerophytons. On the basis of their quota the value surpassing the line of 20% is touched at two places, in the case of the *hhg3* and the *m3* sub-groups. The leading role was played by the *Agrostis stolonifera* species components at the former and by the *Agropyron repens* at the latter.

6.2. *R.a.—A.r. heleochloëtosum*

Spreading

The stagnant waters gathered for shorter-longer periods in the smaller dips of the area occupied by the association changed the composition of the typical pasture stand to a certain degree. The deeper cattle prints in the watery soil disrupted the contiguous grass cover, thus making possible the entry of one year old mud vegetation. Its expansion, however, is not considerable at our area.

Cenological relations

Compared to the composition of its typical grass stands, the dominant species is the *Heleochloa alopecuroides* regarded as a Cyperio-Spergularion, besides the *Bidens tripartita, Lycopus europaeus, Xanthium italicum* belonging to the Bidentetea group. These species can simultaneously also be regarded as differential species (Table 6.2).

Hydroecology

The course of its drawn curve differs from the previous one in that its point reaching or surpassing the total covering quota of 20% appeared at three places:

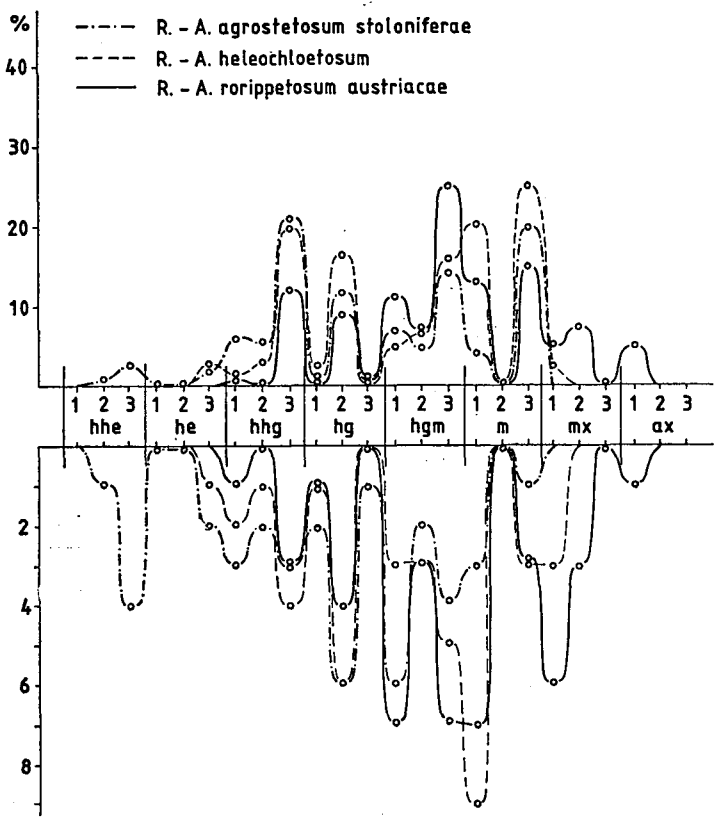

Fig. 24. Hydroecological relations of the association's smaller units

at *hhg3* the *Heleochloa alopecuroides,* at *m1* the *Trifolium repens* and at *m3* henceforward the *Agropyron repens* were the components with prominent quota (Fig. 24).

6.3. *R.a.—A.r. rorippetosum austriacae (typicum)*

Spreading

It is this subassociation which could be regarded as being typical at the Alpár section of the Tisza flood-plain, since it was probably of greater expansion at other reaches, too (TIMÁR 1950). As it formed the upper, extensive zone of the association it reached dry surface sooner following the inundations, therefore grazing was started earlier here and thus it was burdened in an increased degree.

Cenological relations

The number of the Festuco-Brometea and the Chenopodio-Scleranthea species increased on the effect of the environmental conditions which had become drier. The *Poa angustifolia* had a more considerable covering quota. From the Agropyro-Rumicion species the *Rorippa sylvestris* had a more significant quota here (Table 6.3).

Differential species

Matricaria maritima ssp. *inodora, Poa angustifolia, Medicago lupulina, Cynodon dactylon.*

Hydroecology

Owing to the species of wide hydroecological adaptability, the curve drawn on

Table 6. *Rorippo-Agropyretum repentis*
1. *agrostetosum stoloniferae* 2. *heleochloëtosum alopecuroidis*
3. *rorippetosum austriacae* (typicum)

F	W	Subassociation:	1	2	3
		Hydato-helophyta:			
		hhe 2, 3			
3	10	*Typhoides arundinacea* (Magnocaricion)			
4	10	*Bolboschoenus maritimus* (Phragmitetea)			
5	11	*Alisma plantago-aquatica* (Phragmitetea)			
4—5	10	*Iris pseudacorus* (Phragmitetea)			
5	10	*Stachys palustris* (Phragmitetea)			
		Helophyta:			
		he 3			
4—5	9	*Lycopus exaltatus* (Phragmitetea)			
4	9	*Euphorbia lucida* (Molinion)			
		Helo-hygrophyta:			
		hhg 1			
4—5	9	*Lycopus europaeus* (Bidentetea)			
3	.	*Rumex stenophyllus* (Bidentetea)			
4—5	10	*Eleocharis palustris* (Molinio-Juncetea)			
3—4	8	*Lysimachia nummularia* (Molinio-Juncetea)			
5	7	*Potentilla supina* (Nanocyperion)			
		hhg 2			
4—5	7	*Potentilla anserina* (Molinietalia)			
4	8	Gratiola officinalis (Magnocaricion)			
		hhg 3			
3—4	.	*Rorippa sylvestris* (Agropyro-Rumicion)			
3	8	*Agrostis stolonifera* (Molinio-Juncetea)			
2—4	.	*Heleochloa alopecuroides* (Cyperio-Spergularion)			
4	9	*Juncus compressus* (Agrostion)			
3—4	9	*Bidens tripartita* (Bidentetea)			
4	8	*Lythrum virgatum* (Agrostion)			
		Hygrophyton:			
		hg 1			
3—4	.	*Clycyrrhiza echinata* (Calystegion)			
3—4	7	*Carex hirta* (Molinio-Arrhenatheretea)			
4—5	8	*Symphytum officinale* (Molinion)			
		hg 2			
2—3	7	*Tanacetum vulgare* (Calystegion)			
3—4	9	*Echinochloa crus-galli* (Chenopodietea)			
4—5	8	*Ranunculus repens* (Molinietalia)			
3—4	6	*Potentilla reptans* (Agropyro-Rumicion)			
3	.	*Rumex obtusifolius* (Calystegion)			
4	9	*Calystegia sepium* (Calystegion)			
		hg 3			
3—4	8	*Thalictrum lucidum* (Molinietalia)			
		Hygro-mesophyta:			
		hgm 1			
.	8	*Equisetum arvense* (Secalietea)			
2—3	7	*Glechoma hederacea* (Molinio-Arrhenatherea)			
3—5	8	*Polygonum amphibium* f. *terrestris* (Agropyro-Rumicion)			
2—3	7	*Plantago major* ssp. *intermedia* (Plantaginetea)			
3	8	*Alopecurus pratensis* (Molinio-Arrhenatheretea)			
4	5	*Althaea officinalis* (Molinio-Arrhenatheretea)			
3—4	.	*Chenopodium urbicum* (Chenopodio-Scleranthea)			
3—4	5	*Mentha arvensis* (Molinietalia)			
		hgm 2			
3	.	*Xanthium italicum* (Bidentetea)			
3—4	6	*Prunella vulgaris* (Bidentetea)			
0	6	*Matricaria maritima* ssp. *inodora* (Chenopodietea)			

F	W	Subassociation	1	2	3
		hgm 3			
2—3	5	*Rumex crispus* (Agropyro-Rumicion)			
4—5	8	*Rorippa austriaca* (Agropyro-Rumicion)			
3	4	*Aristolochia clematitis* (Calystegion)			
3—4	9	*Polygonum lapathifolium* (Bidentetea)			
2—3	3	*Galium mollugo* (Festuco-Brometea)			
3	6	*Eryngium planum* (Molinio-Arrhenatherea)			
2—3	·	*Verbena officinalis* (Chenopodietea)			
		Mesophyta			
		m 1			
2—3	5	*Taraxacum officinale* (Molinio-Arrhenatherea)			
0	5	*Trifolium repens* (Molinio-Arrhenatherea)			
2—3	·	*Sonchus asper* (Polygono-Chenopodion)			
0	3	*Convolvulus arvensis* (Chenopodio-Scleranthea)			
0	6	*Xanthium strumarium* (Bidentetea)			
0	4	*Cirsium arvense* (Chenopodio-Scleranthea)			
3—4	6	*Inula britannica* (Agropyro-Rumicion)			
0	4	*Lotus corniculatus* (Plantaginetea)			
2—3	2	*Lactuca serriola* (Chenopodio-Scleranthea)			
		m 3			
2—3	3	*Agropyron repens* (Molinio-Arrhenatherea)			
2—3	3	*Lythyrus tuberosus* (Secalietea)			
0	5	*Daucus carota* (Arrhenatherion)			
		Meso-xerophyta:			
		mx 1			
2—3	6	*Centaurea pannonica* (Molinio-Arrhenatherea)			
0	3	*Vicia angustifolia* (Festuco-Brometea)			
2—4	6	*Medicago lupulina* (Molinio-Arrhenatherea)			
2—3	4	*Polygonum aviculare* (Chenopodio-Scleranthea)			
0	4	*Trifolium campestre* (Festuco-Brometea)			
0	5	*Cichorium intybus* (Molinio-Arrhenatherea)			
		mx 2			
2	3	*Poa angustifolia* (Festuco-Brometea)			
2—3	4	*Plantago lanceolata* (Festuco-Brometea)			
1—2	3	*Achillea collina* (Chenopodio-Scleranthea)			
		Asteno-xerophyton:			
		ax 1			
1—2	3	*Cynodon dactylon* (Chenopodio-Scleranthea)			

the basis of the moisture demand of the subassociation's species components had an expanded course. This explains why the value of the total covering quota expressed in percentage only surpassed 20% on one occasion, namely in the case of the *hgm3* sub-group. Referring to the species of extreme appearance, partly the *Rorippa sylvestris* of the *hhg3* sub-group, partly the *Cynodon dactylon* of the *ax1* sub-group could be mentioned as examples. Figure 24 demonstrates the distribution according to subassociations of the species numbercovering quota within the various hydro-ecological categories.

7. *Lolio — Festucetum pseudovinae* (n. n.)

These are stands of highest relief at the flood-plain humid areas of the Tiszaalpár Basin, generally appearing in the form of islands. They frequently remained till our days in the neighbourhood of agriculturally cultivated hoed cultures, by evading tillage.

It is characteristic to its cenological relations that compared to the previous association, there was a further increase in the number and even the covering quota

of the Festuco-Bromea, Festucion pseudovinae species — by now capable of enduring shorter periods of floods. In the consequence of the wavy character of the terrain, the association is not uniform here either, as even the site conditions varying to a slighter degree differentiated well separable units within association.

The character species of the *Lolio-Festucetum pseudovinae* were the *Daucus carota, Festuca pseudovina, Lolium perenne, Trifolium campestre.*

7.1. *L.—F.p. lolietosum*

Spreading

It developed at the Southern section of our area, in the region of the village Bokros at the sections being flater than typical, where its irrigation-like meadow not becoming salinous had fresh surface for longer periods, but the grass covering did not sustain discontinuities on the effect of the animal treadings.

Cenological relations

Apart from the species characteristic to the association, the Molinio-Arrhenatherea representatives also conceivable as differential species — like the *Potentilla reptans, Trifolium repens* and the *Stenactis annua belonging* to the Calystegion group — are the characteristic species components. These, however, did not influence the leading role played by the total covering quota of the *Lolium perenne* belonging to the predominant Plantaginetea class of the meadow, as well as the *Festuca pseudovina* classed among the Festucion pseudovinae group.

Hydroecology

From the association's three well separable sub-units, its drawn curve has the widest range. Although its differential species belong to the hygrophyta category, the culmination point of its curve — surpassing the value of 30% — appeared at the *m2* sub-group within the mesophytons (Fig. 26). By means of the *Festuca pseudovina,* however, the quota of the astenoxerophytons is also significant (Table 7.1).

7.2. *L.—F.p. plantaginetosum lanceolati*

Spreading

Such stands of this species developed which were similar to the type to a certain extent, but which were also well separable from that. The area occupied by its cenoses continuously decreases as the consequence of the flowing grass-tillage.

Cenological relations

The place of the previous Molinio-Arrhenatherea species is occupied by the Festuco-Bromea elements. Therefore, this subassociation formed a transition towards the type. The appearing *Podospermum canum* — although thought to be Festuco-Puccinellietea — could only be regarded as a pseudohalophyton species. The sodium salt content reaching the lowest level of the alkalinity degree could not be demonstrated in its explored and studied soil profile.

Differential species

Achillea setacea, Plantago lanceolata, Podospermum canum.

Hydroecology

The tracing of its drawn curve became narrowed down compared to the various hydroecological categories. Only the meso-, meso-xerophyton representatives took share in its cenoses. Two maximum-points appeared within the different categories and both reached the value of 30% (Fig. 36). In the case of the *m2* sub-group the *Lolium perenne,* and in that of the *mx2* the *Poa angustifolia* species components played the leading role.

7.3. *L.—F.p. festucetosum pseudovinae (typicum)*

Spreading

This is a pasture stand occupied by the association, at places ruling the highest

relief of the Tisza flood-plain. Owing to the increasing expansion of the tillage area its cenoses incessantly decrease. Disregarding small patches, its elimination can be counted upon in the future.

Cenological relations

The Festuco-Bromea and the Festucion pseudovinae representatives became dominant. This is particularly valid for the Chenopodio-Scleranthea species having wider adaptability, like the *Cynodon dactylon, Eryngium campestre.* At the same time the more resistant Molinio-Arrhenatherea elements — although they played subordinate role — continued to be members of these grasses (Table 7.3).

Table 7. *Lolio-Festucetum pseudovinae*
1. *lolietosum perennis* 2. *plantaginetosum lanceolati* 3. *festucetosum pseudovinae*

F	W	Subassociation	1	2	3
		Hygrophyta:			
		hg 1, 2, 3			
3—4	6	*Potentilla reptans* (Molinio-Arrhenatheretea)			
2—3	.	*Lotus tenuis* (Festuco-Puecinellietea)			
2—4	8	*Stenactis annua* (Calystegion)			
		Mesophyta:			
		m 1			
2—3	5	*Taraxacum officinale* (Molinio-Arrhenatherea)			
0	3	*Convolvulus arvensis* (Chenopodio-Scleranthea)			
0	5	*Trifolium repens* (Molinio-Arrhenatheretea)			
		m 2			
2—3	5	*Lolium perenne* (Plantaginetea majoris)			
2—3	6	*Trifolium pratense* (Molinio-Arrhenatheretea)			
3	.	*Veronica arvensis* (Secalietea)			
		m 3			
0	5	*Daucus carota* (Molinio-Arrhenatheretea)			
0	6	*Leontodon hispidus* ssp. *hastilis* (Molinio-Arrhenatherea)			
		Meso-xerophyta:			
		mx 1			
0	4	*Trifolium campestre* (Festuco-Brometea)			
0	3	*Galium verum* (Festuco-Bromea)			
2—3	6	*Medicago lupulina* (Molinio-Arrhenatherea)			
		mx 2			
2	3	*Poa angustifolia* (Festuco-Bromea)			
0	4	*Lotus corniculatus* v. *hirsutus* (Molinio-Arrhenatherea)			
2—3	3	*Ononis spinosa* ssp. *austriaca* (Festuco-Bromea)			
1	2	*Eryngium campestre* (Chenopodio-Scleranthea)			
2—3	2	*Carduus nutans* ssp. *macrolepis* (Festuco-Bromea)			
0	4	*Plantago lanceolata* (Festuco-Bromea)			
2	2	*Achillea setacea* (Festucion pseudovinae)			
2	3	*Echium vulgare* (Festuco-Bromea)			
		mx 3			
1—2	3	*Erodium cicutarium* (Festuco-Bromea)			
2—3	1	*Hieracium pilosella* (Festuco-Bromea)			
1—2	2	*Trifolium arvense* (Festuco-Bromea)			
1—2	3	*Euphorbia cyparissias* (Festuco-Bromea)			
2—4	5	*Podospermum canum* (Festuco-Puccinellietea)			
2	3	*Fragaria viridis* (Festucetalia valesiacae)			
1—2	2	*Potentilla argentea* (Festuco-Bromea)			
		Asteno-xerophyta:			
		ax 1			
2	2	*Festuca pseudovina* (Festucion pseudovinae)			
2	3	*Cynodon dactylon* (Chenopodio-Scleranthea)			
2	3	*Cerastium semidecandrum* (Festuco-Bromea)			
1	2	*Trifolium striatum* (Festucion pseudovinae)			
2	2	*Gypsophila muralis* (Bidentetea)			

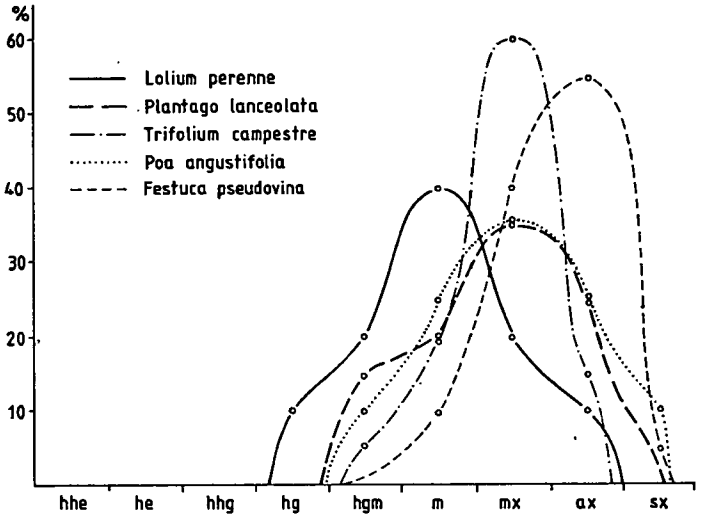

Fig. 25. Moisture demand of the five species components of the *Lolio-Festucetum pseudovinae*

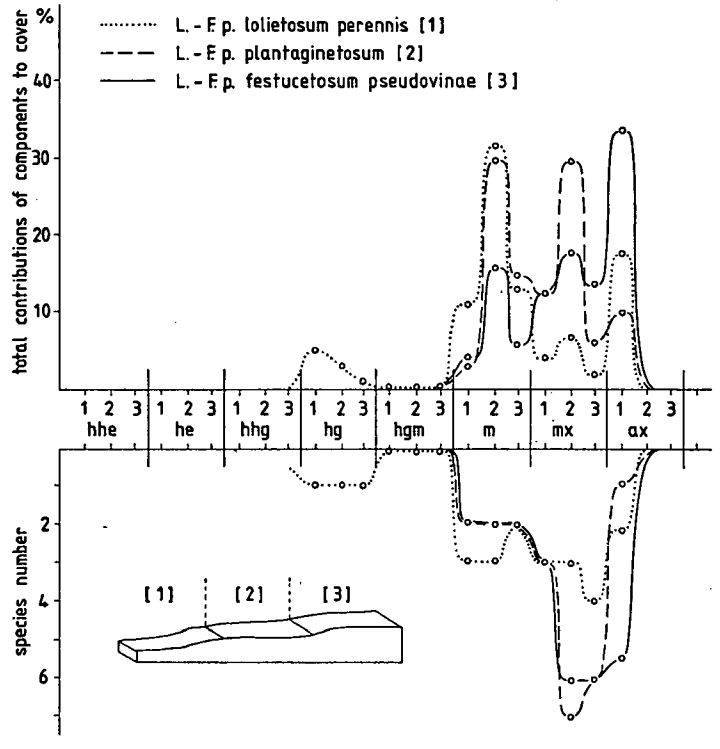

Fig. 26. The position of the three subassociations of the *Lo.-Fe. p.* and of their distribution according to species number

Differential species

Potentilla argentea, Carduus nutans ssp. *macrolepis, Cynodon dactylon.*

Hydroecology

Similarly to the previous, the species components of this subassociation were distributed among the mesophyton mesoxerophyton and asteno-xerophyton categories. Its drawn curve showed steady rise towards the latter (Fig. 36). From the mesophytons the species playing leading role were the *Lolium* of the *m2* sub-group, the *Poa angustifolia* of the *mx2,* and the *Festuca pseudovina* as well as the *Cynodon dactylon* of the *ax1*-s. The relationship between their species number- and total covering quota is detectable on Fig 26. Further details are shown on Table.

In conclusion it could be determined that the Lolio-Festucetum pseudovinae, the Poo angustifoliae-Alopecuretum and the Cynodonto-Poetum angustifoliae grass resp., can be regarded as pasture grasses which have become degraded on the effect of treading and grazing.

References

BAGI, I. (1985): Studies on the vegetation dynamics of Nanocyperion communities. I. Characteristic indicator values and classification and ordination of stands. — Tiscia (Szeged) *20,*

BAGI, I. and BODROGKÖZY, GY. (1984): Seasonal dynamics of the succession series at the Körös floodplain leading to the association of the *Echinochloo-Heleochloetum alopecuroidis* (RAPCS. 27) BODRK. 82 — Tiscia (Szeged) *19,* 113—136.

BODROGKÖZY, GY. (1982): Ten-year changes in community structure, soil and dydroecological conditions of the vegetation in the protection area at Mártély. — Tiscia (Szeged) *17,* 89—130.

BORNKAMM, R. (1974): Die Unkrautvegetation im Bereich der Stadt Köln. I. Die Pflanzengesellschaften. — Decheniana *126,* 267—306.

EHRENDORFER, F. (1973): Liste der Gefässpflanzen Mitteleuropas — Stuttgart.

ELLENBERG, H. (1963): Vegetation Mitteleuropas mit den Alpen. — Stuttgart.

FELFÖLDY, L. (1942): Szociológiai vizsgálatok a pannóniai flóraterület gyomvegetációján (Soziologische Untersuchungen in der Unkrautvegetation des Pannonischen Florengebiets). — Acta Geobot. Hung. *5,* 87—140.

GUTTE, P. (1966): Die Verbreitung einer Ruderalpflanzen-gesellschaften in der weiteren Umgebung von Leipzig. — Wiss. Z. Univ. Halle *15,* 937—1010.

GUTTE, P. und HILBIG, W. (1975): Übersicht über die Pflanzengesellschaften des südlichen Teiles der DDR. XI. Die Ruderalvegetation. — Hercynia (Leipzig) *12,* 1—39.

KÁRPÁTI, I.—KÁRPÁTI, VERA (1963): A Duna-ártér félruderális gyepjeinek cönológiai és ökológiai értékelése (Zönologische und ökologische Wertung der halbruderalen Rasen der Donauauen). Bot. Közlem. *50,* 21—33.

KÁRPÁTI, I.—KÁRPÁTI, VERA: (1965): Periodische Dynamik der zu Agropyro-Rumicion crispi gehörenden Gesellschaften des Donau-Überschwemmungsgebiets zwischen Vác und Budapest im Jahren 1963. — Acta Bot. Hung. *11,* 165—196.

KRIPPELOVA, T. (1967): Vegetácia Zitného ostrova. — Biologické prace *13,* 1—108.

LOHMEYER, W. (1975): Über flussbegleitende nitrophile Hochstaudenfluren am Mittel-und Niederrhein. — Schr. R. Vegetationskde 8,79—98.

MARKOVIĆ, LJERKA (1969): O vegetaciji sveze Agropyro-Rumicion na području sjeverozapadne Hrvatske. III. Kongr. biol. Knjiga plenarnih referatov in povzetkov 171.

MARKOVIĆ, LJERKA (1973): Die Flutrasengesellschaften in der Umgebung von Zagreb. — Ber. d Geobot Inst. ETH St. Rübel, Zürich *51,* 198—205.

MARKOVIĆ, LJERKA (1978): Travnjačka vegetacija sveze Agropyro-Rumicion u obalnom pojasu Save u Hrvatskoj (Die Kriechrasengesellschaften des Agropyro-Rumicion Verbandes im Überschemmungsgebiet der Save in Kroatien). — Acta Bot. Croat. *37,* 107—130.

MÜLLER, T. (1961): Einige für Süddeutschland neue Pflanzengesellschaften — Beitr. naturk. Forsch. Südwestdeutschland *20,* 15—21.

OBERDORFER, E. (1954): Unkrautgesellschaften der Balkanhalbinsel. — Vegetatio *4,* 379—411.

PHILIPPI, G. (1971): Zur Kenntnis einiger Ruderalgesellschaften der norbdadischen Flugsandgebiete um Mannheim und Schwetzingen. — Beitr. naturkundl. Forsch. Südwestdeutschl. *30,* 113—131.

RAPAICS R. (1927): A Közép-Tiszavidek szikes talajok növényszövetkezeti (Plant communities of alkali soils in the region of Middle Tisza). — Debreceni Szemle *1,* 104—119.

SISSINGH, G. (1969): Über die systematische Gliederung von Trittpflanzen-Gesellschaften. — Mitt. flor.-soz. Arbeitsgem. *14,* 179—192.

Soó, R.: (1964—1980): A magyar flóra és vegetáció rendszertani-növényföldrajzi kézikönyve (Synopsis systematico-geobotanica florae vegetationisque Hungariae I—VI). — Budapest.
Timár, L. (1947): Les associations végétales de lit de la Tisza de Szolnok à Szeged. — Acta Geobot. Hung. *1*, 70—82.
Timár, L. (1950): A Tiszameder növényzete Szolnok és Szeged között. (Die Vegetation des Flutraumes der Tiszazwischen Szolnok und Szeged). — Ann. Biol. Univ. Debrecen. — *1*, 72—145.
Timár, L. und Bodrogközy, Gy. (1959): Die pflanzengeographische Karte von Tiszazug. — Acta. Bot. Hung. *5*, 203—232.
Tüxen, R. (1950): Grundriss einer Systematik der nitrophilen Unkrautgesellschaften in der Eurosibirischen Region Europas. — Mitt. flor.-soz. Arbeitgem. *2*, 94—175.
Tüxen, R. (1970): Zur Syntaxonomie des europäischen Wirtschaft-Grünlandes (Wiesen, Weiden, Tritt- und Flutrasen) — Ber. Naturhist. Ges. Hannover *114*, 77—85.
Tüxen, R. und Preising, E. (1942): Grundbegriffe und Methoden zum Studium der Wasser und Sumpfplanzen-Gesellschaften. — Deutsche Wasserwirtschaft *37*, 10—17; 57—69.
Ubrizsy, G. (1950): Magyarország ruderális gyomnövényszövetkezetei tekintettel a mezőgazdasági vonatkozásokra. (Les associations de mauvaises herbes rudérales de la Hongrie, en égard aux rapports agriculturels). — Acta Agr. Hung. *1*, 87—123.
Újvárosi, M. (1940): Növényszociológiai tanulmányok a Tisza mentén (Pflanzensoziologische Studien an der Theiss). — Acta Geobot. Hung. *3*, 30—42.
Zólyomi, B. et *al.* (1967): Einreichung von 1400 Arten der ungarischen Flora in ökologische Gruppen nach TWR-Zahlen. — Fragmenta Bot. *4*, 101—142.

A Közép-Tiszavölgy Növénytársulásainak hidroökológiája I. Agropyro-Rumicion

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Kivonat

A magyarországi Tiszavölgy középső tájegységének a leendő 4000 ha kiterjedésű Alpári tározó területén és környékén a taposást és legeltetést tűrő félruderális Plantaginetea gyeptársulások közül az időnkénti vízelárasztásnak kitett Agropyro-Rumicion legelő-társulások összetételének és hidroökológiai viszonyainak tisztázása volt elsősorban a feladat. Ennek során 7 asszociáció: *Rumici-Alopecuretum geniculati, Rorippo sylvestris — Agrostetum. Trifolio fragiferi- Agrostetum stoloniferae, Lolio-Potentilletum anserinae, Lolio-Alopecuretum pratensis, Rorippo austriacae-Agropyretum* és a *Lolio-Festucetum pseudovinae,* valamint asszociáció alatti egységeik fajkomponenseinek 8 hidroökológiai kategórián belől 24 alcsoportba történt besorolására került sor, talajökológiai viszonyaik figyelembe vételével. Össz. borítási részesedésük alapján megszerkesztett grafikonjaik alkalmasak az összefüggések feltárására. Lehetőség kínálkozott máshonnan közlésre került vizsgálati eredményekkel való összevetésre is.

Гидроэкология растительных сообществ алпарской котловины долины реки тисы I. Agropyro—Rumicion

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Резюме

Основной задачей работы является ознакомление с гидроэкологическими отношениями луговых сообществ Agropyro—Rumicion образовавшихся под влиянием заливания, затаптывания и выпаса полурудеральных (Plantaginetea) дернистых растительных сообществ в области средней части долины венгерской Тисы, а также на 4 тысяч га территории в окрестности водохпанилища Алпар.

На основании 7 ассоциаций *Rumici—Aloperetum geniculati, Rorippo silvestri—Agrostetum,*

Trifoliofragiferi—Agrostetum stoloniferae, Lolio—Potentilletum anserinae, Lolio—Alopecuretum pratensis, Rorippo austriaae Agrophretum u *Lolio Festucetum pseudovinae* учетом экологических условий почвы, а также в рамках 8 гидроецоплогических компонентов, образовалось 24 подгруппы. Для общего изображения всех приведенных данных исследования сосравлены графики. Полученные данные послужат материалом для сравнения с другими результатами.

Hidroekologija biljnih zajednica basena Alpár u dolini reke Tise. I. Agropyro-Rumicion

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Abstrakt

Istraživanjima su obuhvaćeni sastav i hidroekološki uslovi Agropyro-Rumicion zajednice pod ispašom, koje su povremeno plavljene. Te livade se nalaze na području srednjeg toka reke Tise u Madjarskoj, na budućem području akumulacije Alpár, veličine 4000 ha. Ove livade pripadaju poluruderalnom tipu Plantaginetea sastojina i podnose gaženje is ispašu. Polazeći od ekoloških osobenosti tla, unutar sledećih 7 asocijacija: *Rumici-Alopecuretum geniculati, Rorippo sylvestri-Agrostetum, Trifolio fragiferi-Agrostetum stoloniferae, Lolio-Potentilletum anserinae, Lolio-Alopecuretum pratensis, Rorippo austriacae-Agropyretum* i *Lolio-Festucetum pseudovinae* i sastava vrsta njihovih subasocijacija, u okviru 8 hidroekoloških kategorija, izvršeno je njihovo uvrštanje u 24 subkategorije. Grafički prikazi učešća u ukupnojpo krovnosti, omogućujus agledavanje njihove uslovljenosti, kao i poredjenje dobijenih rezultata sa rezultatima istraživanja sa drugih lokaliteta.