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Biodiversity of *Hordeion leporini* in Portugal: a phytosociological and edaphic analysis

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Abstract.- This paper deals with the biodiversity of the *Hordeum leporinum* communities in Portugal. The sampling of the communities was carried out in a region which extends from the Alentejo to Castelo-Branco. In this region the *Hordeum leporinum* communities grow on the neutro-basic substrates of decarbonated soils with pH-values close to 7. Our research concentrates on three associations of the *Hordeion leporini*: *Anacyclo radiati-Hordeetum leporini*, *Ancyclo radiati-Chrysanthemetum coronarii* and *Anacyclo radiati-Papaveretum rhoeadis*. The survey studies their respective floristic composition, structure and ecology. The results of the phytosociological study, as shown in a synthetic table and analysed by means of a statistical cluster analysis, have not only revealed the *status novo* character of the *Anacyclo-Chrysanthemetum*, but also led us to suggest the new *Anacyclo-Papaveretum rhoeadis* association. The research also included an edaphic analysis of the sampled plots. However, these results revealed that there were no significant differences between the associations as far as the edaphic attributes under study were concerned.

Key words : association - edaphic parameters - biodiversity - grassland.

Résumé.- Nous avons fait un échantillonage des communautés à *Hordeum leporinum* du Portugal, dans la région qui s'étend de l'Alentejo à Castelo-Branco, sur des substrats neutro-basiques avec un pH voisin de 7. Nous avons fait nos recherches sur trois associations de l'*Hordeion leporini* : *Anacyclo radiati-Hordeetum leporini*, *Anacyclo radiati-Chrysanthemetum coronarii*, *Anacyclo radiati-Papaveretum rhoeadis*, dont nous avons étudié la composition floristique, la structure et l'écologie. Les résultats de l'étude phytosociologique, présentés dans un tableau synthétique et analysés avec l'aide de la technique statistique des conglomérats, ont démontré le caractère de *status novo* de l'*Anacyclo-Chrysanthemetum*, ainsi que la proposition de nouvelle association *Anacyclo-Papaveretum rhoeadis*. Nous avons aussi mené une analyse édaphique des aires échantillonnées. Les résultats montrent qu'il n'y a peu de différences entre les associations pour les attributs édaphiques.

Mots clés : association - paramètres édaphiques - biodiversité - pâturages.

I. INTRODUCTION

The phytosociology of the *Hordeion leporini* alliance has been thoroughly studied in Spain and in the south of Portugal (Rivas-Martínez, 1978). In the Portuguese regions where the *Hordeion leporini* alliance has been sampled, the grasslands are dominated by the species *Hordeum leporinum, Chrysanthemum coronarium* or *Papaver rhoeas*. The communities belonging to this alliance tend to grow on soils formed by decarbonated substrates. The ombroclimate, of a dry-subhumid character, belongs to the Mesomediterranean basophilous series peculiar to the holm oak woods of *Lonicero implexae-Quercetum rotundifoliae* (Pinto-Gomes & Lazare, 2002). The previous studies carried out by Rivas-Martínez (1978) and by Rivas-Martínez *et al.* (2001) included the communities found in the following syntaxa: *Anacyclo radiati-Hordeetum leporini* Rivas-Martínez 1978 and *Anacyclo radiati-Hordeetum leporini* subass. *chrysanthemetosum coronarii* Rivas-Martínez 1978. However, the community dominated by *Papaver rhoeas* had never been included in any association belonging to *Hordeion leporini* (Rivas-Martínez *et al.*, 2001). In addition, we could not find any previous information on the edaphic parameters characteristic of the soils on which this alliance occurs. Consequently, the main aim of this research is to provide a phytosociological and edaphic analysis of the *Hordeion leporini* alliance in Portugal in order to describe the communities which had already been located with the purpose of defining the syntaxon to which they belong.

II. MATERIAL AND METHODS

In order to study the *Hordeion leporini* communities in Portugal we chose as the sampling area the geographical region encompassing the Alentejo, Beixa and Castelo Branco (Fig. 1). To support our phytosociological analysis, 61 floristic relevés were made in plots of a minimum area of 4 m^2 in all cases. For the naming of the taxa the following sources were used: *Flora Ibérica, Flora Europea, Flora Andalucía Occidental* and, in particular, Pereira's *Flora* (1939). A synthetic table shows the floristic variability. A soil sample was taken in all the plots under study and the following edaphic features were recorded: cationic interchange capacity, carbonates, calcium, assimilable phosphorus, magnesium, oxidable organic matter, nitrogen, pH, potassium, salinity and texture. In order to find possible differences between the communities previously described and those we had located, an edaphic analysis was also applied to the associations *Bromo scoparii-Hordeetum leporini* Rivas-Martínez 1978 and *Resedo albae-Chrysanthemetum coronarii* O. Bolòs & Molinier 1958, which were previously sampled in Spain. The phytosociological method used was that of Braun-Blanquet (1979) and the syntaxonomic ascription was made following Rivas-Martínez *et al.* (2001). To detect possible differences between the associations a statistical cluster analysis was also implemented.

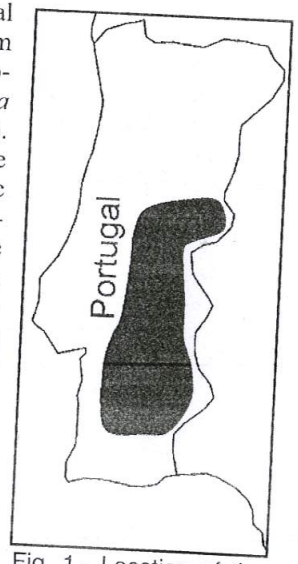


Fig. 1.- Location of the area under study.
Fig. 1.- Localisation de l'aire d'étude.

III. RESULTS AND DISCUSSION

A. Edaphic and phytosociological analysis

The phytosociological analysis revealed the occurrence of several types of communities. We have recorded the association *Anacyclo radiati-Hordeetum leporini* O. Bolòs & Rivas-Martínez *in* Rivas-Martínez 1978, previously described in ruderal environments such as along the sides of roads and paths in the southwest of the Peninsula. It is worth mentioning that Rivas-Martínez (1978) suggested that the subassociation *chrysanthemetosum coronoarii* be included in this association for limestone and vertic soils. This grassland is dominated by *Anacyclus radiatus* and *Chrysanthemum coronarium* var. *concolor*, two taxa which act as differential species with regard to *Resedo albae-Chrysanthemetum coronarii* O. Bolós & Moliner. There are also biogeographical differences between the two communities, since the *Resedo-Chrysanthemetum* grasslands are described as belonging to Levantine and Balearic territories, whereas our suggested grassland is not only located in territories in Portugal and Extremadura, but also grows on neutral pH substrates with a high content of organic matter. Taking into consideration that this latter also presents floristic, edaphological and structural differences with regard to *Anacyclo-Hordeetum leporini* (CPN, article 27; Weber *et al.*, 2000), we, therefore, suggest the promotion of the subassociation *chrysanthemetosum coronarii*, dominated by *Chrysanthemum coronarium* var. *discolor* and var. *concolor* and *Ancyclus radiatus*, to the rank of association. Although the new association suggested here derives from *Anacyclo radiati-Hordeetum leporini* from a dynamical point of view, it is also ecologically different: the soils on which *Anacyclo-Chrysanthemetum* grows exhibit medium edaphic values, that is usually higher than those peculiar to the soils on which the association *Anacyclo radiati-Hordeetum leporini* occurs (Table V). The characteristic species for the suggested association are *Anacyclus radiatus, Hordeum leporinum, Avena fatua, Lactuca serriola, Beta vulgaris* subsp. *maritima* and *Chrysanthemum coronarium* var. *discolor* and var. *concolor*. For the association *Anacyclo radiati-Chrysanthemetum coronarii* (Rivas-Martínez 1978) *status novo* (Table I), we maintain the typus published by Rivas-Martínez, 1978, Table V, rel. 5

The association *Anacyclo radiati-Hordeetum leporini* O. Bolós & Rivas-Martínez *in* Rivas-Martínez 1978 presents a western thermo-Mediterranean character and grows frequently in ruderal environments, such as along the sides of roads or paths and around old houses and tips. Described for the centre and south of Portugal and the southwest of Andalusia (Spain), it is dominated by *Hordeum leporinum* and *Anacyclus radiatus*. Since this last species prefers neutro-basic soils (Table VI) and thermophilous environments, it is not found in the High Guadalquivir and is, therefore, an association restricted to the southwest of the Iberian Peninsula (Rivas-Martínez, 1978, Table II).

Finally, the association *Anacyclo radiati-Papaveretum rhoeadis nova* is a ruderal grassland group of plants peculiar to lower thermo-Mesomediterranean territories and shows a dry-subhumid ombrotype. As compared to *Anacyclo radiati-Hordeetum leporini*, the community formed by *Papaver rhoeas* and *Anacyclus radiatus* tends to grow on more cultivated soils and with a lower content of organic matter. The presence of thermophilous elements makes this community different from *Papaveri rhoeadis-Diplotaxietum virgatae* Rivas-Martínez 1978, which is of a more clearly continental character and has already been described for the centre of the Iberian Peninsula (Rivas-Martínez, 1978, Table IV). Consequently, we suggest the association *Anacyclo radiati-Papaveretum rhoeadis nova*, dominated by the species *Papaver rhoeas, P. dubium, P. hybridum, Lolium rigidum, Anacyclus radiatus* and *Medicago polymorpha* (Table III, rel. 1 to 18, typus rel. 2), which

Table I, Tableau I.- *Anacyclo radiati-Chrysanthemetum coronarii* (Rivas-Martínez 1978) *status novo*.

Relevé n°	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Slope %	5	15	0	6	3	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0
Exposure	W	SE	-	SW	E	S	-	NW	-	-	-	-	-	-	-	-	-	-	-	-
Cover %	90	80	80	95	80	100	95	100	100	100	90	80	80	90	90	100	80	80	90	90
Area m^2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Altitude (m)	205	289	284	218	245	227	180	177	159	217	202	195	197	207	206	180	120	79	74	95
Veg. average height (m)	0,4	0,6	0,5	0,6	0,6	0,5	0,7	0,7	0,7	0,5	0,5	0,4	0,4	0,3	0,4	0,5	0,4	0,4	0,5	0,4
Veg. average height (m)	0,45	0,7	0,6	0,8	0,8	0,7	0,8	0,8	0,9	0,6	0,6	0,5	0,5	0,4	0,5	0,7	0,5	0,5	0,6	0,5
Characteristic species																				
Anacyclus radiatus	1	2	1	3	1	2	2	2	1	2	4	1		3	4	2	4	4	4	2
Chrysanthemum coronarium var. *discolor*	4	2	4	4	4	4	5	5	5			4	4	4	2	5	3	3	4	5
Hordeum leporinum		1	+	1		1	+	+		1	1	1	1	1	+	1	1	1	1	+
Avena fatua	1		1	1	1	2	1	+	1	2		1	1	+		+	1	1	2	+
Lactuca serriola		1	+	+		+	1	+	+	1	+	+			+	+	1	1	1	+
Beta vulgaris subsp. *maritima*		1	+			+	+	1		1		2	+	2	2	2	1	+	1	1
Papaver rhoeas	2	+	2		+	+	1	+				+			+	+		+	+	+
Lavatera cretica		1		1	1		1		+	+	+	1	1		1	1	1		+	
Echium plantagineum		1		2		1	1			+	+	+			+	+	+		+	1
Convolvulus arvensis		1			1					+	+	+	1	+	1	+	+		+	
Sisymbrium officinale	1	1		+	1	1	+			+	1			+						
Crepis vesicaria	1		1	+	1	1			1		+	+			+					
Calendula arvensis			1	+	1		2	1		+		+					+	+		
Bromus rigidus			1	+			1	+					1			+		+	1	
Sisymbrium runcinatum												2	1	+	2	2	1			1
Plantago lagopus				1	1		1						+				1		1	1
Lolium rigidum		+	1			1		+	1	1									+	
Hedypnois cretica	1			1	1		1	+		+							1			
Vulpia geniculata		1	1	+		1			1											+
Medicago polymorpha	+	+		2		2			1	+										
Holcus setiglumis					+	+	+	+	+											
Sonchus asper		+	1		+			+	+											
Diplotaxis viminea				+	+	+		+	+											
Bromus madritensis					1	1						+			+			+		
Tordylium maximum									+	+						+				
Galactites tomentosa			+			1							+		+					+
Andryala laxiflora		+				+	1				+									
Aegilops triuncialis			1	1					+		+									
Urospermum picroides									+				+		+					
Sonchus oleraceus												+			+					+
Raphanus raphanistrum subsp. *microcarpus*				1		1	2													
Papaver hybridum			+					+		1										
Papaver dubium			1		+															+
Chrysanthemum coronarium		4								5	3									
Bromus sterilis			1					+	1											
Borago officinalis					+							+			+					
Aegilops geniculata				2		1			1											
Vicia sativa subsp. *nigra*					1			+												
Trifolium tomentosum										+	+									
Silene gallica										+		+								
Raphanus raphanistrum											+									
Leontodon taraxacoides		+			1														+	
Erodium cicutarium							+			+										
Diplotaxis catholica		+								+										
Chenopodium album																	1	2		
Chamaemelum mixtum						1				+										
Bromus rubens										+	+									

Senecio integrifolia				1																
Trifolium stellatum					1							1								
Trifolium scabrum			+																	
Companion species																				
Cynodon dactylon			+	3	1	2	1	1	1	+		+	+							
Silybum marianum	1	1				+	+	+	+	1		+		+	+	+				
Echium intybus		+	+		+					1	+	+	+	1			+			
Trifolium perenne	2										1		1	1	1		1			
Carduus nutans subsp. *vulgare*																				
Galactites tomentosa			+	+		+		+	+	+			+	+			+		1	
Centaurea calcitrapa	+	1	+	+	+	1				+			+		+					
Centaurea melitensis		+			1	+		1		+										
Convolvulus althaeoides				2	+		1	+	+								+			
Aegilops geniculata	1				+	+														
Scandix pecten-veneris subsp. *hispanica*			+				+											+		
Anacyclus clavatus	+							+	1							+				
Lactuca viminea						+		+	+											
Hyoseris radiata		+							1											
Trifolium cherleri			+																	
Campanula erinus																				
Linaria coerulescens																				
Lamarckia aurea					+		1													

Localities (and coordinates X x Y in m) - rel 1. Finca de Baraona, cercanías al embalse de Monte nuevo (614054 x 4267791); 2. Redondo (626632 x 4279084); 3. Sousel (614650 x 4311238); 4. 10 km al sur de Campo Mayor (664151 x 4316925); 5. Campo Mayor (666243 x 4319167); 6. Cercanías castillo Campo Mior (666766 x 4319412); 7. Entre Retiro y Godina (cercanías a Campo Mayor 665712 x 4312925); 8. Elvas (664794 x 4309269); 9. 3 km al norte de Elvas (663769 x 4308302); 10. Montoito (622341 x 4262675); 11. Requengos (627287 x 4254555); 12. Safara (656004 x 4219280); 13. Moura (636687 x 4221512); 14. Moura (636277 x 4221916); 15. Pias (633466 x 4209765); 16. Serpas (623263 x 4201046); 17. Salida de Ferreira (577291 x 4213659); 18. Contornos Odivera (575077 x 4224511); 19. Cercanías Odivera (575058 x 4224547); 20. Entrada a Torito (567838 x 4223317).

Mean cover in association *Anacyclo radiati-Chrysanthemetum coronarii* (Rivas-Martínez 1978) *status novo*

Characteristic - *Vicia lutea* + (rel 3), *Trifolium scabrum* + (rel 4), *T. lappaceum* + (rel 1), *T. cherleri* + (rel 4), *T. campestre* + (rel 1), *T. angustifolium* + (rel 1), *Tolpis umbellata* + (rel 15), *Stegia trimestris* var. *trimestris* + (rel 1), *Sinapis alba* subsp. *mairei* + (rel 14), *Sherardia arvensis* + (rel 1), *Salvia verbenaca* + (rel 8), *Rostraria cristata* + (rel 5), *Rhagadiolus stellatus* + (rel 9), *Rapistrum rugosum* 1 (rel 9), *Plantago lanceolata* 1 (rel 8), *Picris echioides* + (rel 9), *Ononis repens* 1 (rel 3), *Misopates orontium* + (rel 12), *Medicago orbicularis* + (rel 1), *M. doliata* var. *doliata* 1 (rel 9), *Malva parviflora* 1 (rel 8), *Lupinus luteus* + (rel 1), *Lolium multiflorum* 1 (rel 19), *Leontodon longirrostris* + (rel 1), *Kickxia lavigera* 1 (rel 1), *Hordeum murinum* 1 (rel 5), *H. marinum* 1 (rel 9), *Fumaria rupestres* + (rel 18), *Euphorbia helioscopia* + (rel 8), *Diplotaxis virgata* 1 (rel 1), *Conyza canadensis* + (rel 19), *Cerinthe major* 1 (rel 13), *Bromus hordeaceus* 1 (rel 3), *B. diandrus* + (rel 2), *Avena sterilis* 1 (rel 20), *Astragalus lusitanicus* + (rel 4), *Anthemis arvensis* + (rel 2), *Anagallis coerulea* + (rel 1), *Anacyclus clavatus* 1 (rel 13).

Companions - *Verbena officinalis* + (rel 17), *Tragopogon porrifolius* subsp. *australis* + (rel 4), *Scorpiurus muricatus* 1 (rel 1), *Scabiosa atropurpurea* 1 (rel 13), *Rumex pulcher* + (rel 19), *Plantago afra* 1 (rel 5), *Picnomon acarna* + (rel 1), *Oryzopsis miliacea* subsp. *thomasii* + (rel 10), *Herniaria lusitanica* + (rel 2), *Euphorbia falcata* + (rel 12), *Eryngium campestre* + (rel 6), *Echinops strigosus* + (rel 9), *Daucus crinitus* + (rel 3), *Carlina racemosa* 1 (rel 1), *Campanula erinus* + (rel 12).

Table I, Tableau I.- *Anacyclo radiati-Chrysanthemetum coronarii* (Rivas-Martínez 1978) *status novo*.

Relevé nº	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Slope %	5	15	0	6	3	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0
Exposure	W	SE	-	SW	E	S	-	NW	-	-	-	-	-	-	-	-	-	-	-	-
Cover %	90	80	80	95	80	100	95	100	100	100	90	80	80	90	90	100	80	80	90	90
Area m²	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Altitude (m)	205	289	284	218	245	227	180	177	159	217	202	195	197	207	206	180	120	79	74	95
Veg. average height (m)	0,4	0,6	0,5	0,6	0,6	0,5	0,7	0,7	0,7	0,5	0,5	0,4	0,4	0,3	0,4	0,5	0,4	0,4	0,5	0,4
Veg. average height (m)	0,45	0,7	0,6	0,8	0,8	0,7	0,8	0,8	0,9	0,6	0,6	0,5	0,5	0,4	0,5	0,7	0,5	0,5	0,6	0,5
Characteristic species																				
Anacyclus radiatus	1	2	1	3	1	2	2	2	1	2	4	1		3	4	2	4	4	4	2
Chrysanthemum coronarium var. *discolor*	4	2	4	4	4	4	5	5	5			4	4	4	2	5	3	3	4	5
Hordeum leporinum		1	+	1		1	+	+		1	1	1	1	1	+	1	1	1	1	+
Avena fatua	1		1	1	1	2	1	+	1	2		1	1	+		+	1	1	2	+
Lactuca serriola		1	+	+		+	1	+	+	1	+	+			+	+	1	1	1	+
Beta vulgaris subsp. *maritima*		1	+			+	+	1		1		2	+	2	2	2	1	+	1	1
Papaver rhoeas	2	+	2		+	+	1	+				+			+	+		+	+	+
Lavatera cretica		1		1	1		1		+	+	+	1	1		1	1	1		+	
Echium plantagineum		1		2		1	1			+	+	+			+	+	+			+
Convolvulus arvensis		1			1					+	+	+	1	+	1	+	+		+	1
Sisymbrium officinale	1	1		+	1	1	+			+	1			+						
Crepis vesicaria	1		1	+	1	1			1		+	+			+					
Calendula arvensis			1	+	1		2	1		+		+				+		+		
Bromus rigidus			1	+			1	+					1			+		+	1	
Sisymbrium runcinatum												2	1	+	2	2	1			1
Plantago lagopus				1	1		1						+				1		1	1
Lolium rigidum		+	1			1		+	1	1									+	
Hedypnois cretica	1			1	1		1	+		+							1			
Vulpia geniculata		1	1	+		1			1											+
Medicago polymorpha	+	+		2		2			1	+										
Holcus setiglumis					+	+	+	+	+											
Sonchus asper		+	1		+			+	+											
Diplotaxis viminea				+	+	+		+	+											
Bromus madritensis					1	1						+			+			+		
Tordylium maximum									+	+						+				
Galactites tomentosa			+			1							+		+					+
Andryala laxiflora		+				+	1				+									
Aegilops triuncialis			1	1					+		+									
Urospermum picroides									+											
Sonchus oleraceus												+								+
Raphanus raphanistrum subsp. *microcarpus*				1		1	2													
Papaver hybridum			+					+		1										
Papaver dubium			1		+															
Chrysanthemum coronarium		4								5	3									+
Bromus sterilis			1					+	1											
Borago officinalis					+															
Aegilops geniculata				2		1			1											
Vicia sativa subsp. *nigra*					1			+												
Trifolium tomentosum										+	+									
Silene gallica										+		+								
Raphanus raphanistrum											+									
Leomtodon taraxacoides		+			1															+
Erodium cicutarium							+													
Diplotaxis catholica		+								+										
Chenopodium album										+										
Chamaemelum mixtum						1			+								1	2		
Bromus rubens									+	+										

[illegible] integrifolia				1																
[illegible] italica					1							1								
[illegible] aurea			+																	1
Companion species																				
[illegible] dactylon			+	3	1	2	1	1	1	+		+	+							
[illegible] marianum	1	1				+	+	+	+	1		+			+	+				1
[illegible] intybus		+	+		+					1	+	+	+	1			+			
[illegible] perenne	2										1		1	1	1		1			
[illegible] album vulgare																				
[illegible] piperitum			+	+		+		+	+	+			+	+			+		1	
[illegible] bourgaeanus	+	1	+	+	+	1				+			+		+					
[illegible] juncea		+		1	+		1			+										
[illegible] coronopus					+	+	+					+					1			1
[illegible] althaeoides				2	+		1	+	+								+			
[illegible] capillaris	1				+	+														
[illegible] hispanicus			+				+										+			
[illegible] syriaca	+							+	1							+				
[illegible] endivia						+		+	+											
[illegible] lanatus		+				+			1											
[illegible] conglomeratus			+																	
[illegible] bellardii																			+	
[illegible] coerulescens																			+	+
[illegible] aurea					+		1												1	1

Localities (and coordinates X x Y in m) - rel 1. Finca de Baraona, cercanías al embalse de Monte nuevo (614054 x 4267791); 2. Redondo (626632 x 4279084); 3. Sousel (614650 x 4311238); 4. 10 km al sur de Campo Mayor (664151 x 4316925); 5. Campo Mayor (666243 x 4319167); 6. Cercanías castillo Campo Mior (666766 x 4319412); 7. Entre Retiro y Godina (cercanías a Campo Mayor 665712 x 4312925); 8. Elvas (664794 x 4309269); 9. 3 km al norte de Elvas (663769 x 4308302); 10. Montoito (622341 x 4302675); 11. Requengos (627287 x 4254555); 12. Safara (656004 x 4219280); 13. Moura (636687 x 4221512); 14. Moura (636277 x 4221916); 15. Pias (633466 x 4209765); 16. Serpas (623263 x 4201046); 17. Salida de Ferreira (577291 x 4213659); 18. Contornos Odivera (575077 x 4224511); 19. Cercanías Odivera (575058 x 4224547); 20. Entrada a Torito (567838 x 4233317).

Mean cover in association *Anacyclo radiati-Chrysanthemetum coronarii* (Rivas-Martínez 1978) *status novo*

Characteristic - *Vicia lutea* + (rel 3), *Trifolium scabrum* + (rel 4), *T. lappaceum* + (rel 1), *T. cherleri* + (rel 4), *T. campestre* + (rel 1), *T. angustifolium* + (rel 1), *Tolpis umbellata* + (rel 15), *Stegia trimestris* var. *trimestris* + (rel 1), *Sinapis alba* subsp. *mairei* + (rel 14), *Sherardia arvensis* + (rel 1), *Salvia verbenaca* + (rel 8), *Rostraria cristata* + (rel 5), *Rhagadiolus stellatus* + (rel 9), *Rapistrum rugosum* 1 (rel 9), *Plantago lanceolata* 1 (rel 8), *Picris echioides* + (rel 9), *Ononis repens* 1 (rel 3), *Misopates orontium* + (rel 12), *Medicago orbicularis* + (rel 1), *M. doliata* var. *doliata* 1 (rel 9), *Malva parviflora* 1 (rel 8), *Lupinus luteus* + (rel 1), *Lolium multiflorum* 1 (rel 19), *Leontodon longirrostris* + (rel 1), *Kickxia lavigera* 1 (rel 1), *Hordeum murinum* 1 (rel 5), *H. marinum* 1 (rel 9), *Fumaria rupestres* + (rel 18), *Euphorbia helioscopia* + (rel 8), *Diplotaxis virgata* 1 (rel 1), *Conyza canadensis* + (rel 19), *Cerinthe major* 1 (rel 13), *Bromus hordeaceus* 1 (rel 3), *B. diandrus* + (rel 2), *Avena sterilis* 1 (rel 20), *Astragalus lusitanosus* + (rel 4), *Anthemis arvensis* + (rel 2), *Anagallis coerulea* + (rel 1), *Anacyclus clavatus* 1 (rel 13).

Companions - *Verbena officinalis* + (rel 17), *Tragopogon porrifolius* subsp. *australis* + (rel 4), *Scorpiurus muricatus* 1 (rel 1), *Scabiosa atropurpurea* 1 (rel 13), *Rumex pulcher* + (rel 19), *Plantago afra* 1 (rel 5), *Picnomon acarna* + (rel 1), *Oryzopsis miliacea* subsp. *thomasii* + (rel 10), *Herniaria lusitanica* + (rel 2), *Euphorbia falcata* + (rel 12), *Eryngium campestre* + (rel 6), *Echinops strigosus* + (rel 9), *Daucus crinitus* + (rel 3), *Carlina racemosa* 1 (rel 1), *Campanula erinus* + (rel 12).

Table II, Tableau II.- *Anacyclo radiati-Hordeetum leporini* Rivas-Martínez 1978.

Relevé n°	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Slope %	5	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exposure	NE	SE	-	-	-	-	-	-	-	-	-	-	-	-					-	-	-
Cover %	60	90	100	70	95	80	100	90	80	95	100	100	100	95	80	100	100	100	85	70	95
Area m^2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Altitude (m)	246	199	383	333	344	347	318	233	216	324	308	300	280	291	266	423	429	435	443	435	182
Veg. average height (m)	0,3	0,35	0,4	0,5	0,5	0,2	0,4	0,6	0,3	0,4	0,3	0,35	0,45	0,3	0,3	0,7	0,4	0,3	0,25	0,25	0,4
Veg. average height (m)	0,4	0,45	0,5	0,6	0,6	0,3	0,5	0,7	0,4	0,5	0,4	0,45	0,6	0,4	0,4	0,9	0,5	0,4	0,3	0,3	0,5
Characteristic species																					
Hordeum leporinum	2	5	4	2	2	2	1	2	2	2	4	2	4	5	4	2	2	5	3	3	5
Anacyclus radiatus	3	+	2	3	4	4	4	4	4	4	5	5	5	3	3	5	5	3	4	3	2
Plantago lagopus	+	1	2	1	1			1	1	2	1		1		+	+	1	1	1	2	1
Echium plantagineum	+	+		+	2	+	2	2		+	2	2	+	+	2			1	+	1	2
Avena fatua		1		1	1		+	2	1	1	+	+	1	1	2	1			2	+	
Lavatera cretica	+		1	1		+	+	+			+		+	+	+	1	+	1			1
Bromus rigidus			1	1		+	+	1	+	1			2	1	1		1	1		1	+
Hedypnois cretica		+	1	1	2		1	1	1	2	+						+	1		1	1
Crepis vesicaria subsp. *haenseleri*	1	+	2	1	1		+	1	+		+		1					1	+	+	
Vulpia geniculata	1			1	2		1	1	+	1	+			+		1	1	1			
Sonchus asper	+	1		1	+		1	+	+	1				+	+		+	+			
Medicago polymorpha		+	1	1	1					1		+	1	+	+	1	2	2			
Cichorium intybus	+	2	1				+	+	+			1		1				+	1		
Lolium rigidum	1			+		1			1		+		1				1	2			+
Convolvulus arvensis	1				1		+	+			1		+	+	+			+			
Chamaemelum mixtum		+		+	+		+	+	+			3			+						+
Sisymbrium officinale		1					1	1	1		+	1				1	+				
Beta vulgaris subsp. *maritima*			2				+	1				1		+		2		2		2	
Scabiosa atropurpurea					+	1		+	+								+		+	1	
Calendula arvensis				+		1	1				+		+						1	1	
Raphanus raphanistrum subsp. *microcarpus*				+	2		1	+		2											1
Papaver rhoeas		1							+			+		+			+			+	
Lactuca serriola	+	1		+											1			+			+
Andryala integrifolia	+			+	+		+			+										+	
Urospermum picroides	+	+	1				+									+					
Centaurea pullata				+		+	+						1	1							
Bromus sterilis			1	+	1	+	1														
Aegilops geniculata								+								+	1		1	2	
Vicia sativa subsp. *angustifolia*			1		+		1	1													
Silene vulgaris			1						+									+		+	
Silene gallica	+			+						+		+									
Raphanus raphanistrum	+								+		+		+								
Lupinus angustifolius				1	1	+				+											
Lathyrus clymenum				1	+	+	1														
Trifolium stellatum																	+		1	1	
Tragopogon porrifolius subsp. *australis*																+		+	+		
Sisymbrium irio			–								1		1								
Sherardia arvensis								+									+	+			
Galactites tomentosa				+	+				+												
Diplotaxis catholica	2							+							+						
Crepis capillaris	1	1								+											
Bromus madritensis	1		2						1												
Bromus hordeaceus	1				1										1						
Aegilops triuncialis		+											3				+				
Trisetaria panicea															+	+					
Trifolium angustifolium	+		2																		
Spergularia rubra												+			+						

Sinapis alba subsp. *mairei*								+	+												
Silene disticha					+			1													
Scorpiurus muricatus			+																	1	
Kickxia lanigera		+														2					
Erodium malacoides									+										1		
Cynosurus echinatus								+				+									
Avena sterilis		1	1																		
Astragalus hamosus																			1		
Anthemis praecox																	+	+			
Andryala laxiflora	+																	+			
Aira caryophyllea	+																		1		
Companion species																					
Cynodon dactylon					+	1				1	1	2	+	+	2	+	+	1		1	1
Carduus bourgaeanus			1			1	1				1	+			+	+		+	1	1	
Lolium perenne		2										1			2	+	2		1		1
Foeniculum vulgare subsp. *piperitum*				+		+	+	+	+	+	+									1	1
Plantago coronopus					+	+	+			+		+	1						+		
Scolymus hispanicus			+	1						1											
Chondrilla juncea										1	1	1									
Tordylium maximum	+				+												+		1		
Carthamus lanatus			+							1						+					
Verbascum sinuatum			+							+	+										
Daucus carota subsp. *maximus*				+					+	+											
Daucus carota	+											+					+				
Dactylis glomerata subsp. *lusitanica*								+			1										
Conyza canadensis																+		+	+		
Convolvulus althaeoides											+										
Trifolium tomentosum												1									
Silybum marianum		1																	1		
Rumex pulcher			+																1		
Rumex crispus	+	1																			
Polygonum aviculare																+		1			
Phalaris minor	1																+				
Phalaris aquatica																			1	1	
Paronychia argentea																					
Pallenis spinosa											1										
Oryzopsis miliacea subsp. *thomasii*																	+		1		
Ornithopus compressus						1						+									
Holcus setiglumis																				1	

Localities (and coordinates X x Y in m) - rel 1. NE de Señora de Machete (608268 x 4270858); 2. Quinta de Barahona [illegible] el envalse del Monte Nuevo (614039 x 4267746); 3. Bencatel (634347 x 4290295); 4. Salida Evora dirección Arraiolos (6[illegible] 4272319); 5. Entre el cruce de Valeira y Craça do Divor (587132 x 4277755); 6. Entre Graça do Divora Localização [illegible] Arraiolos (588239 x 4279893); 7. Arraiolos (588285 x 4285971); 8. Vimieiro (601090 x 4298619); 9. Cano (6031[illegible] 16. Alphalao (618703 x 4364894); 11. Evora (593095 x 4269771); 12. Evora (593655 x 4270339); 13. Limites Evora (6[illegible] 4270576); 14. Limites Evora (594677 x 4270560); 15. Salida Evora (594919 x 4270898); 16. Estremoz (62[illegible] Salida Estemoz-Porta Legre (623230 x 4301743); 18. Monpacão (625541 x 4300822); 19. Salida Estremoz Elvas ([illegible] 4299463); 20. Borba-Estremoz (631622 x 4297682); 21. Entre Retiro y Gomina (665687 x 4312896).

Abercover in association *Anacyclo radiati-Hordeetum leporini*
Characteristic - *Vulpia bromoides* + (rel 9), *Vicia sativa* + (rel 10), *V. lutea* + (rel 7), *Trifolium scabrum* 2 (rel 19), [illegible] (rel 15), *T. glomeratum* + (rel 1), *T. arvense* + (rel 15), *Tragopogon crocifolius* + (rel 9), *Stegia trimestris* var. *[illegible]* (rel [illegible] *Spergularia purpurea* + (rel 21), *Silene apetala* 1 (rel 17), *Salvia verbenaca* 1 (rel 19), *Reseda luteola* + (rel 16), *Rumex [illegible] muricatus* + (rel 1), *Plantago lanceolata* + (rel 10), *Picris echioides* + (rel 1), *Petrorhagia nanteuilii* + (rel 17), *Nonea [illegible]* (rel 6), *Melilotus alba* + (rel 12), *Medicago orbicularis* 1 (rel 17), *M. minima* + (rel 12), *M. littoralis* + (rel 1), *M. [illegible] ciliata* + (rel 13), *Malva hispanica* + (rel 1), *Lolium multiflorum* 2 (rel 15), *Fumaria officinalis* + (rel 4), *Cynoch[illegible]* (rel 20), *Chrysanthemum segetum* + (rel 5), *C. coronarium* + (rel 2), *Chamaemelum nobile* + (rel 1), *Briza maxima* + (rel [illegible] *Bromus hypodium distachyum* 1 (rel 7), *Borago officinalis* + (rel 13), *Anagallis monelli* + (rel 9), *A. foemina* + (rel 6)
Companion - *Trifolium subterraneum* + (rel 4), *Rumex conglomeratus* 1 (rel 10), *Polygonum bellardii* + (rel 1), *Oncon[illegible]* (rel 17), *Mentha suaveolens* 1 (rel 18), *Holcus mollis* + (rel 10), *Eryngium campestre* + (rel 19), *Dactylis glomerata* + (rel 1[illegible]

Table III, Tableau III.- *Anacyclo radiati-Papaveretum rhoeadis ass. nova.*

Relevé n°	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Slope %	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
Exposure	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NE	-	-
Cover %	80	95	90	90	70	70	85	95	80	80	80	100	100	80	100	100	90	90	100	95
Area m²	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Altitude (m)	212	324	385	381	391	395	405	407	256	421	446	421	450	442	452	220	181	202	240	209
Veg. average height (m)	0,4	0,4	0,3	0,3	0,3	0,35	0,4	0,4	0,3	0,3	0,25	0,5	0,5	0,3	0,4	0,6	0,6	0,6	0,8	0,6
Veg. average height (m)	0,5	0,5	0,4	0,4	0,4	0,4	0,45	0,42	0,4	0,4	0,35	0,6	0,6	0,4	0,5	0,7	0,8	0,8	1,0	0,7
Characteristic species																				
Papaver rhoeas	4	4	5	4	4	3	4	4	4	4	4	5	5	4	5	3	4	4	5	5
Papaver dubium	1	2	2	2	1	1	2	2		1	1	1	3	2	1	1	1	+	1	1
Anacyclus radiatus			2	4	3	2	+	1	+			2	2		+	4	2	3	2	3
Papaver hybridum	1	1			2	1	1	2		2	2	2		2	2		3	3		2
Medicago polymorpha	1			+		+			1	2	1	1	+	+	1	1			2	1
Hordeum leporinum	1	1		+		+		+	1	+		+		2	2	+		+	1	
Plantago lagopus		1	+	1		+	1	2		1		1	+	2		2			2	
Sonchus asper	+	1		+	1		+						+		1	1		+	1	1
Lavatera cretica			+		1	+				1		+	1	+	1		+	+	+	
Bromus rigidus		1		+			+	+		1		+			1	1	1	1		1
Avena fatua	1	1								2		1	1		2	2	1	1	+	+
Vulpia geniculata	+			+	1		2	3	1	+	1				1	1				
Lactuca serriola				+	1	+			+				+		+	1	+		1	+
Hedypnois cretica	1	1	1	1		2		2	+	1	1				1					
Convolvulus arvensis					+				+	+		+	+	+	+	1	1			2
Calendula arvensis	1	1	+	+		+				1			1		2			1		
Crepis vesicaria			+		1		1		+		+	+			+			1		
Chamaemelum mixtum	1		1	1			+	1		1	+			+						
Beta vulgaris subsp. *maritima*		1	2	2		1				1			2				1			+
Sisymbrium officinale	1		+		+	+					+						2	1		
Reseda luteola					2		1	+		+				+		1		+		
Urospermum picroides		+	+		+				+	1	+									
Trifolium stellatum		+	+		+		1	1			1									
Sisymbrium runcinatum										+	+	1	1	2	+					
Silene vulgaris		1					1				+	+		+				+		
Cichorium intybus	+	+							2		+		+	+						
Bromus hordeaceus							+	+	+							+		+	+	
Avena sterilis			+	2	1		1		+		+									
Silene gallica					1		1				+					1				+
Sherardia arvensis							+	1		+				1	1					
Medicago orbicularis					+				+	1	+		+							
Galactites tomentosa							1	+		+					+	1				
Echium plantagineum			+	+								+	+			+				
Crepis capillaris				+	1		+		1			+								
Vicia sativa subsp. *nigra*																+	+		1	+
Scolymus hispanicus			+	+			+			+										
Raphanus raphanistrum										+	1			+	+					
Medicago minima			1	1		+		2												
Filago lutescens					+			+	+							+				
Diplotaxis viminea																	+	1	+	1
Anagallis foemina					1											+		1		+
Aegilops geniculata	+						1	1						1						
Vicia benghalensis		+	+																	1
Trifolium campestre								+		2					+					
Trifolium angustifolium				+	1					+										
Medicago doliata var. *muricata*	+		+	1																
Holcus setiglumis										+					+				+	
Euphorbia helioscopia	+	1							1											
Erodium malacoides	1														+					
Chrysanthemum segetum				+	1															
Centaurea pullata								1			1			1						
Bromus madritensis				+		+										1				
Astragalus hamosus				+										+				1		
Anthemis arvensis	1								+										+	
Vicia sativa subsp. *cordata*			+	+																
Trifolium subterraneum												1			+					

Lolium arvense						+											+			
Hordeum nodosa									1				+							
Asperugularia purpurea						+			+											
Trifolium tirio							1	2												
Sinapis alba subsp. *mairei*																		1		1
Salvia verbenaca								+				1								
Rapistrum rugosum	3																		1	
Raphanus raphanistrum subsp. *microcarpus*						+												1		
Papaver argemone							+		1											
Nigella damascena								1	1											
Misopates orontium							+												+	
Melilotus indica																	+			+
Leontodon longirrostris			1					1												
Campanula erinus								+									+			
Bellardia trixago			+	+																
Andryala integrifolia						+					+									
Anchusa italica																			+	+
Anchusa azurea			+	+																
Anacyclus clavatus												2				2				
Companion species																				
Lolium rigidum	1	1	+	2	1	+	+	+	1	1		+	+	1	1			1	1	1
Carduus bourgaeanus	1		1	+	1	+		+		+	1		+	1	+					
Leontodon taraxacoides	+				1		+	1	+		1		+							
Foeniculum vulgare subsp. *piperitum*		+								+				+	+	1	+		+	
Cynodon dactylon							+	1	1				1			1		1		2
Scorpiurus muricatus			+	+	1	1									2					
Eryngium campestre				+	+	+					+	+								
Verbascum sinuatum		+					2	2				+								
Cichorium endivia																	1	+	+	+
Silybum marianum																		+	+	+
Notobasis syriaca	+																		+	+
Marrubium vulgare		+					+	+												
Convolvulus althaeoides		+																	+	+
Chondrilla juncea		1														+		+		
Carthamus lanatus						+		+											+	
Scorpiurus vermiculatus					+						+									
Rumex pulcher									+									+		
Phalaris minor									2											+
Pallenis spinosa									+										+	
Mantisalca salmantica												+				+				
Euphorbia exigua								+	+											
Allium ampeloprasum	+	+																		

Localities (and coordinates X x Y in m) - rel 1. Cano (603162 x 4311043); 2. Entre Cano y Sousel (605785 x 4312686); 3. Bencatel (634362 x 4290296); 4. Bencatel (634336 x 4290285); 5. Carretera de Nora (632235 x 4292425); 6. Carretera de Nora (632257 x 4292397); 7. Cercanias Nora (629181 x 4294487); 8. Cercanias Nora (629192 x 4294463); 9. Salida de Cano (608777 x 4312502); 10. Salida Estremoz-Porta Legre (623243 x 4301739); 11. Orada-Santo Aleixo (Estremoz) (627202 x 4300072); 12. Monpacão (625907 x 4301078); 13. Mohínos (630735 x 4296438); 14. Arcos-Estremoz (626353 x 4300094); 15. Arcos-Estremoz (624941 x 4300520); 16. Finca de Gomina (667321 x 4316796); 17. Entre Retiro y Gomina (665684 x 4312872); 18. 10km al norte de Elvas (665328 x 4311329); 19. 2 km al norte de Elvas (663304 x 4308105); 20. Elvas (661531 x 4306104).

Moreover in association *Anacyclo radiati-Papaveretum rhoeadis ass. nov.*
Characteristic - *Vaccaria hispanica* 1 (rel 18), *Trisetaria panicea* 1 (rel 12), *Trifolium tomentosum* + (rel 10), *T. scabrum* + (rel 4), *T. repens* + (rel 10), *T. cherleri* + (rel 5), *Tragopogon crocifolius* 1 (rel 2), *Tolpis umbellata* + (rel 11), *Stachys arvensis* + (rel 5), *Sonchus oleraceus* + (rel 12), *Silene scabriflora* + (rel 7), *Silene nocturna* 1 (rel 20), *S. apetala* 1 (rel 10), *Rapistrum rugosum* subsp. *linnaeanum* 2 (rel 2), *Plantago afra* + (rel 8), *Picris echioides* 1 (rel 9), *Petrorhagia nanteuilii* 2 (rel 11), *Parentucellia viscosa* + (rel 3), *Papaver pinnatifidum* + (rel 5), *Ornithopus compressus* + (rel 5), *Medicago aculeata* 3 (rel 20), *Lupinus luteus* + (rel 5), *Lathyrus clymenum* + (rel 16), *L. cicera* + (rel 10), *Lamium amplexicaule* + (rel 1), *Kickxia manigera* + (rel 1), *Galium verrucosum* + (rel 13), *G. parisiense* + (rel 5), *Fumaria reuteri* + (rel 17), *F. muralis* 2 (rel 5), *F. bastardii* + (rel 9), *Diplotaxis cathólica* 1 (rel 16), *Cynosurus echinatus* + (rel 19), *Cynoglossum creticum* + (rel 20), *Centranthus calcitrapa* + (rel 7), *Centaurea melitensis* + (rel 18), *Bromus tectorum* + (rel 18), *Borago officinalis* + (rel 13), *Anthemis praecox* 1 (rel 1), *Andryala laxiflora* + (rel 16), *Anagallis monelli* + (rel 7), *Anagallis coerulea* 1 (rel 7).
Companion - *Sanguisorba minor* subsp. *verrucosa* + (rel 2), *Ruta montana* + (rel 8), *Rumex crispus* + (rel 3), *R. bucephalophorus* + (rel 11), *Ranunculus muricatus* 1 (rel 9), *Polypogon monspeliensis* + (rel 9), *Polygonum aviculare* + (rel 20), *Plantago coronopus* + (rel 16), *Oxalis pes-caprae* + (rel 1), *Oryzopsis miliacea* + (rel 19), *Ornithogalum narbonense* + (rel 19), *Muscari comosum* + (rel 8), *Mentha suaveolens* + (rel 10), *Lolium perenne* 1 (rel 11), *Lamarckia aurea* + (rel 5), *Herniaria lusitanica* + (rel 5), *Dactylis glomerata* subsp. *lusitanica* + (rel 15), *Chamaemelum nobile* + (rel 13), *Carlina racemosa* + (rel 16), *Allium scorzonerifolium* + (rel 15).

Table IV.- Synthetic table of the *Hordeion leporini* associations under study. 1.1. *Bromo scoparii-Hordeetum leporini* Rivas-Martínez 1978 (Rivas-Martínez, 1978, Table I, rel. 1-17). 1.2. id. *sisymbrietosum officinalis* Rivas-Martínez 1978 (Rivas-Martínez, 1978, Table I, rel. 18-27). 1.3. id. *diplotaxietosum catholicae* Rivas-Martínez 1978 (Rivas-Martínez, 1978 Table I, rel. 28-35). 2.1. *Papaveri rhoeadi-Diplotaxietum virgatae* Rivas-Martínez 1978 (Rivas-Martínez, 1978, Table II rel. 1-16). 2.2. id. var. with *Sisymbrium runcinatum* (Rivas-Martínez, 1978, Table II, rel. 12-16). 2.3. id. *erucetosum vesicariae* Rivas-Martínez 1978 (Rivas-Martínez, 1978, Table II, rel. 17-18). 2.4. id. *sisymbrietosum contorti* Rivas-Martínez 1978 (Rivas-Martínez, 1978, Table II, rel. 19-20). 3.1. *Anacyclo radiati-Hordeetum leporini* Rivas-Martínez 1978 (Rivas-Martínez, 1978, Table V, rel. 1-4). 3.2. id. *chrysanthemetosum coronarii* Rivas-Martínez 1978 (Rivas-Martínez, 1978, Table V, rel. 5-9). 3.3. id. *arctothecetosum calendulae* Rivas-Martínez 1978 (Rivas-Martínez, 1978, Table V, rel. 10-13). 4. *Resedo albae-Chrysanthemetum coronarii* O. Bolòs & Molinier 1958 (rel. 1-20, self-made). 5. *Anacyclo radiati-Papaveretum rhoeadis* nov. (rel. 1-20, self-made). 6. *Anacyclo radiati-Chrysanthemetum coronarii* (Rivas-Martínez 1978) st. nov. (rel. 1-20, self-made). 7. *Anacyclo radiati-Hordeetum leporini* Rivas-Martínez 1978 (rel. 1-20, self-made).

Tableau IV.- Tableau synthétique des associations de l'*Hordeion leporini* étudiées.

	1.1	1.2	1.3	2.1	2.2	2.3	2.4	3.1	3.2	3.3	4	5	6	7
Hordeum leporinum	V	V	V	V	V	V	V	V	V	V	II	III	IV	V
Bromus scoparius	V	V	V	.	.	.	.	.	.	.	.	.	.	.
Anacyclus clavatus	III	III	V	V	V	V	V	II	I	V	.	.	.	.
Hirschfeldia incana	III	II	III	III	III	V	V	.	.	.	.	.	.	.
Koeleria phleoides	II	II	II	I	I	V	II	I	I	IV	.	.	.	.
Rumex pulcher	I	II	II	.	.	.	.	.	.	.	.	.	.	.
Crepis foetida	I	I	II	II	I	I	.	V	.	.	.	.	.	.
Scorzonera laciniata	.	.	.	III	.	.	.	.	.	.	.	.	.	.
Plantago lagopus	I	.	.	.	.	.	.	.	.	.	.	.	.	.
Sisymbrium officinale	.	V	.	.	.	.	.	.	.	.	.	II	II	IV
Diplotaxis cathólica	.	.	V	.	.	.	.	.	.	.	.	I	II	III
Bromus rubens	V	III	I	V	III	V	V	I	I	.	II	.	II	.
Bromus madritensis	I	III	III	.	.	.	.	V	IV	III	.	.	.	.
Bromus hordeaceus	I	III	III	.	.	.	.	II	II	.	.	I	I	I
Bromus tectorum	II	II	I	IV	I	II	V	.	.	.	.	I	.	I
Bromus diandrus	I	II	I	.	.	.	.	II	II	I	III	.	.	.
Lolium rigidum	I	I	II	.	II	.	.	II	III	.	I	III	II	II
Avena barbata	I	I	.	.	.	.	.	II	II	.	.	.	.	.
Echium plantagineum	.	I	II	.	.	.	.	III	III	.	II	.	I	IV
Capsella bursa-pastoris	I	IV	IV	III	III	II	V	.	.	.	.	.	.	.
Geranium molle	.	III	I	.	.	.	.	.	.	.	.	.	.	.
Malva parviflora	I	.	III	.	II	.	II	.	.	.	II	.	.	.
Senecio vulgaris	I	I	.	V	I	.	.	.	.	.	.	.	.	.
Erodium cicutarium	.	I	.	.	.	.	.	.	.	.	.	.	.	.
Diplotaxis virgata	.	.	.	V	V	V	V	.	.	.	.	.	.	.
Sisymbrium runcinatum	.	.	.	.	V	II	.	.	.	.	.	.	.	.
Eruca vesicaria	.	.	.	.	.	V	.	.	.	.	.	II	.	.
Sisymbrium contortum	.	.	.	.	.	.	V	.	.	.	.	.	.	.
Vicia villosa	.	.	.	.	.	.	V	.	.	.	.	.	.	.
Papaver rhoeas	.	.	.	V	V	V	III	.	.	.	I	V	III	II
Sonchus oleraceus	.	.	.	II	.	.	.	.	.	.	.	.	I	.
Anacyclus radiatus	.	.	.	.	.	.	.	V	V	V	.	IV	V	V
Erodium moschatum	.	.	.	.	.	.	.	II	IV	II	.	.	.	.
Carduus pycnocephalus	.	.	.	.	.	.	.	II	II	I	.	.	.	.
Chrysanthemum coronarium var. *discolor*	.	.	.	.	.	.	.	.	V	.	V	.	III	.
Arctotheca calendula	.	.	.	.	.	.	.	.	.	V	.	.	.	.
Lolium parabolicae	.	.	.	.	.	.	.	.	.	V	.	.	.	.
Medicago polymorpha	.	.	.	.	.	.	.	V	III	II	II	III	I	III
Bromus rigidus	.	.	.	.	.	.	.	I	I	II	.	II	II	IV
Avena sterilis	.	.	.	.	.	.	.	I	III	.	.	I	.	.
Raphanus raphanistrum	.	.	.	.	.	.	.	III	.	.	.	.	.	I
Hedypnois cretica	.	.	.	.	.	.	.	I	II	.	.	II	II	III
Vulpia alopecuros	.	.	.	.	.	.	.	.	I	.	.	.	.	.
Silene scabriflora	.	.	.	.	.	.	.	.	.	III	.	.	.	.
Erodium malacoides	.	.	.	.	.	.	.	I	I	.	III	.	.	.
Trisetaria panicea	.	.	.	.	.	.	.	I	I	.	.	.	.	.
Scorpiurus muricatus	.	.	.	.	.	.	.	.	I	.	.	I	.	.
Lavatera cretica	.	.	.	.	.	.	.	I	I	.	.	II	III	III
Calendula arvensis	.	.	.	.	.	.	.	.	.	.	II	II	III	II
Malva neglecta	.	.	.	.	.	.	.	.	.	.	II	.	.	.
Lactuca serriola	.	.	.	.	.	.	.	.	.	.	II	II	II	I

Lolium temulentum	.	.	.	.	.	.	.	.	.	.	.	II	.	.
Lamarckia aurea	.	.	.	.	.	.	.	.	.	.	.	I	.	.
Veronica hederifolia	.	.	.	.	.	.	.	.	.	.	.	.	II	I
Sonchus tenerrimus	.	.	.	.	.	.	.	.	.	.	.	.	I	I
Sonchus asper	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Silene vulgaris	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Avena longiglumis	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Crepis vesicaria subsp. *haenseleri*	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Rumex conglomeratus	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Anagallis arvensis	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Galium parisiense	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Lonicera sativa subsp. *longirostris*	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Sonchus bourgaeanus	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Silybum marianum	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Geniculum vulgare	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Urospermum picroides	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Astragalus hamosus	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Medicago orbicularis	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Centaurea pullata subsp. *baetica*	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Galactites tomentosa	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Sherardia arvensis	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Vicia sativa subsp. *nigra*	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Cynodon dactylon	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Papaver hybridum	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Carthamus lanatus	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Vulpia geniculata	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Trifolium campestre	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Leontodon taraxacoides	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Trifolium cherleri	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Convolvulus arvensis	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Filago lutescens	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Medicago minima	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Avena fatua	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Eryngium campestre	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Crepis capillaris	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Trifolium stellatum	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Chamaemelum mixtum	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Aegilops geniculata	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Verbascum sinuatum	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Scolymus hispanicus	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Beta vulgaris subsp. *maritima*	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Anagallis foemina	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Papaver dubium	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Reseda luteola	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Diplotaxis viminea	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Cichorium endivia	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Convolvulus althaeoides	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Piptatherum miliaceum	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Holcus setiglumis	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Bromus sterilis	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Tordylium maximum	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Plantago coronopus	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Andryala laxiflora	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Cichorium intybus	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Aegilops triuncialis	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Notobasis syriaca	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Chrysanthemum coronarium var. *concolor*	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Chondrilla juncea	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Medicago doliata	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Lathyrus clymenum	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Lupinus angustifolius	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Silene gallica	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Daucus carota	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Andryala integrifolia	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Dactylis lusitanica	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Kickxia lanigera	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Aegilops triuncialis	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Scabiosa atropurpurea	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Sisymbrium irio	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Tragopogon porrifolius	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Table V, Tableau V.- *Anacyclo radiati-Chrysanthemetum coronarii.*

Relevé n°	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
C.I.C (meq/100 g)	16.52	6.96	16.956	9.57	11.74	9.57	7.391	16.09	23.91	6.72	9.57	7.39	13.91	14.35	8.26	9.57	15.65	13.91	14.78	13.75
Carbonates (%)	12.7	1	0.7	43	9.7	3.1	1.8	17.1	15.3	3.6	1.8	2.7	13.5	3.6	2.7	11.1	3.6	0.9	1	1.7
Ca (meq/100 g)					47.66	33.3	22.26			24.3	45.5	21.5		57.12	36.7		42.2	25.87	22.16	28.02
Assimilable P (p.p.m)	7	34	20	12	16	18	33	18	8	48	19	58	29	49	8	31	22	33	45	30
Mg (meq/100 g)	1.961	0.85	3.183	1.55	1.077	3.13	1.201	2.019	1.85	1.6	3.2	1.6	2.068	2.052	1.34	2.39	1.994	4.663	2.718	2.167
M.O.O. (%)	1.63	0.81	2.04	1.35	1.76	0.43	0.76	1.9	1.92	1.25	0.44	1.96	3.01	2.95	0.55	1.43	3.33	2.05	1.05	1.82
N (%)	0.132	0.08	0.115	0.09	0.113	0.04	0.05	0.123	0.131	0.08	0.04	0.13	0.203	0.179	0.03	0.09	0.177	0.116	0.077	0.102
pH 1/2,5	8.2	8.2	7.8	8.1	8	8	7.4	7.7	7.8	7.5	7.8	7.7	7.5	7.5	7.8	7.9	7.6	7.4	7.8	7.7
K (meq/100 g)	0.253	0.06	0.107	0.61	0.409	0.18	0.215	1.944	0.818	0.56	0.14	1.28	0.921	2.609	0.17	0.51	0.614	0.614	1.483	0.46
pF 1/3 atm (%)	23.18	15.8	25.86	28.7	21.82	18.2	11.97	31.86	39.48	11.3	14	12.4	24.74	24.87	12.1	13.6	16.89	20.16	18.36	16.42
pF 15 atm (%)	15.76	6.23	13.03	16.1	11.12	8.7	6.5	19.63	23.69	6.72	9.35	6.93	15.66	18.59	7.03	8.36	12.42	12.77	10.7	10.18
Tx clay (%)	18.15	19.9	37.9	18.6	17.4	16.9	10	29.45	40.75	13.5	14.3	9.5	26.15	30.1	12.1	13.7	15.15	20.65	16.1	15.1
Tx sand (%)	49.07	55.8	29.99	44.4	51.7	60.5	74.05	45.48	23.18	66.6	71.3	67.8	38.65	38.73	73.4	67.7	64.62	55.87	70.25	67.5
Tx mud (%)	32.8	24.3	32.11	37.1	30.9	22.7	15.95	25.07	36.07	19.9	14.5	22.7	35.2	31.17	14.5	18.6	20.23	23.48	13.65	17.4
Sieve 2 mm (%)	25.05	30.4	34.4	36.8	48	43.7	26.66	62.61	56.19	4.31	38.2	40.9	60.14	46.61	50.3	35.2	32.52	43.59	36.94	33.31
Salinity (mmhos/cm)	0.12	0.13	0.12	0.21	0.21	0.14	0.15	0.25	0.22	0.18	0.19	0.3	0.25	0.33	0.18	0.21	0.19	0.17	0.15	0.16

Table VI, Tableau VI.- *Anacyclo radiati-Hordeetum leporini.*

Relevé n°	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
C.I.C (meq/100 g)	12.17	15.7	5.22	9.13	11.3	9.57	8.7	12.6	11.7	4.78	14.8	9.13	2.61	7.39	10	6.087	6.957	6.975	8.261	5.22	12.17	10	9.57
Carbonates (%)	1.7	22.9	34.6	2	0	0	1.3	1.1	0.4	42.3	31.1	0.4	0	0	2.7	0	0	24	5.3	1	7	6.8	1.8
Ca (meq/100 g)	21.96												5.81	24.3	40.97	18.97	32.28	44.08	25.8	35.9	42.99	31.91	11
Assimilable P (p.p.m)	14	12	6	14	14	2	13	10	9	4	10	15	21	2	45	22	8	17	8	12	7	24	32
Mg (meq/100 g)	3.753	2	0.99	1.183	1.9	1.21	0.66	0.51	3.84	1.98	0.74	0.68	0.23	4.8	1.43	1.628	3.67	3.79	0.97	2.08	1.859	2.052	0.75
M.O.O. (%)	1.01	1.23	1.16	2.39	3.16	2.14	2.68	1.23	0.68	0.64	2.65	3.35	0.59	0.25	2.22	0.38	0.18	0.38	2.76	1.51	1.77	2.52	1
N (%)	0.072	0.12	0.11	0.135	0.19	0.13	0.14	0.07	0.05	0.03	0.16	0.17	0.04	0.02	0.145	0.058	0.026	0.037	0.142	0.11	0.123	0.188	0.07
pH 1/2,5	6.2	8.1	8.3	8	6.8	7.2	7.1	7.8	7.2	8.2	8.1	6.4	5.9	7.4	7.5	7.4	7.8	7.8	7.5	7.8	7.8	7.9	6.7
K (meq/100 g)	0.171	0.19	0.26	0.225	0.22	0.14	0.13	0.56	0.08	0.05	0.67	0.21	0.15	0.09	0.665	0.092	0.107	0.307	0.13	0.18	0.192	0.512	0.56
pF 1/3 atm (%)	22.27	25.5	17.2	5.48	16.8	15.4	10.9	19.5	16.6	16.1	22.9	14.2	6.02	14.4	17.08	12.16	13.89	18.97	14.55	16.1	22.94	18.19	14.9
pF 15 atm (%)	12.06	16.4	7.52	3.54	10.2	7.35	6.12	10.4	8.54	6.54	12.3	7.07	3.2	8.29	9.89	7.75	8.12	8.97	7.13	7.19	13.71	9.27	6.52
Tx clay (%)	35.2	36.7	25.3	19.2	20.1	17.4	16.8	40.1	21.8	22.3	30.8	18.9	4.25	10.6	11.15	11.55	13.75	15.15	13.25	14.8	32.25	15.05	8.65
Tx sand (%)	50.38	44.7	43.3	70.2	69.9	71.1	75.5	36.9	68.9	56.2	35.9	73.5	89.1	73.6	71.68	73.93	74.01	53.01	69.21	63.2	32.02	68.11	71.1
Tx mud (%)	14.4	18.7	31.3	10.6	9.96	11.5	7.68	23	9.31	21.5	33.3	7.64	6.67	15.8	17.18	14.52	12.24	31.84	17.54	22	35.73	16.84	20.3
Sieve 2 mm (%)	26.45	26.3	20.5	35.25	28.5	17.4	49.5	30	26.1	28.8	34.2	26.2	7.59	32.6	33.19	37.09	31.37	44.59	30.44	68.7	36.32	26.31	15
Salinity (mmhos/cm)	0.05	0.14	0.2	0.14	0.08	0.11	0.12	0.12	0.08	0.16	0.15	0.06	0.12	0.1	0.17	0.14	0.13	1.8	0.23	0.22	0.16	0.21	0.12

grows on soils with pH-values close to 8 and with a mostly sandy or muddy texture (Table VII; Cano-Ortiz, 2007; Cano-Ortiz *et al.*, 2007).

B. Statistical analysis

The statistical cluster analysis (Fig. 2) reveals that all the samples of *Anacyclo radiati-Hordeetum leporini* (ArH) taken by us are clearly separated from the *Anacyclo radiati-Chrysanthemetum coronarii* (ArC) group, but close to the original relevés (original ArH) published by Rivas-Martínez (1978) (Fig. 2). At the same time, *Anacyclo radiati-Chrysanthemetum coronarii* (ArC) forms a group different from *Resedo-Chrysanthemetum coronarii* (RC), which we also inventoried in Spain (Jaén). This group includes three relevés (originally numbered as 8, 98, 99) which, although belonging to *Anacyclo radiati-Chrysanthemetum coronarii* (ArC), are apart from the rest of the samples, since they show high values of *Chrysanthemum coronarium* var. *concolor*, whereas the rest of the relevés only have the var. *discolor*. Nevertheless, in our opinion this is not significant enough to suggest two different communities in the same territory, since both varieties grow together in the thermic areas of the southwest of the Peninsula.

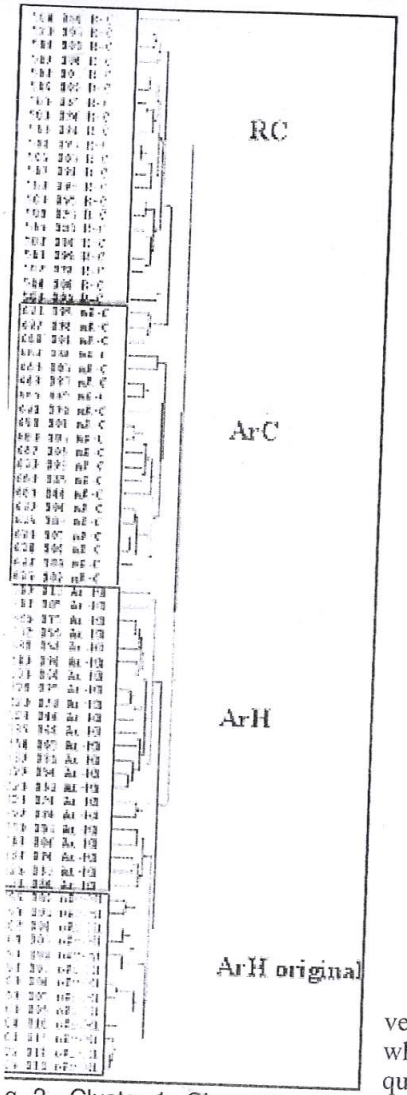
On the other hand, the cluster analysis also proves that the new association suggested as *Anacyclo radiati-Papaveretum rhoeadis* (ArP) remains apart from the *Papaveri-Diplotaxietum virgatae* (PD) group. This is probably due to the fact that the former is a thermophilous vicarious of the second. The relevés taken by us in the colder regions of the Guadalquivir valley tend to group together with the original relevés made in the centre of Spain (original PD). However, as far as the *Papaveri-Diplotaxietum virgatae hispalense* is concerned, a branch which is made up of 5 relevés (numbered 11 to 16) and represents a thermophilous variety of the association, remains apart (Fig. 3).

Table VII, Tableau VII.- *Anacyclo radiati-Papavertum rhoeadis.*

Relevé n°	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
C.I.C (meq/100 g)	7.83	8.696	9.57	10.44	8.26	7.39	17.39	8.26	11.3	10.87	16.96	16.09	6.96	6.96	13.48	13.47	10.87	10.87
Carbonates (%)	1	2	0	1	48.8	63.4	37.8	1.8	1.6	0.6	1.7	1.7	10.2	1.8	1.8	32.34	1.8	13.5
Ca (meq/100 g)								23.4	17.16	33.47	31.71	29.48		12.4	43.17		67.58	
Assimilable P (p.p.m)	20	17	6	22	3	4	22	6	9	45	3	14	4	22	40	10	12	6
Mg (meq/100 g)	0.72	0.972	0.27	0.633	0.94	0.39	4.025	1.48	2.101	1.439	3.343	3.671	4.07	1.62	3.178	1.069	1.9	1.738
M.O.O. (%)	1.17	0.96	0.76	1.14	1.75	1.82	2.51	2.14	2.1	2.1	2.8	4.77	1.81	1	2.71	1.17	0.88	0.86
N (%)	0.12	0.094	0.09	0.102	0.17	0.16	0.166	0.13	0.145	0.143	0.198	0.327	0.14	0.07	0.185	0.083	0.112	0.079
pH 1/2,5	8.1	8.2	6.5	8.1	8.1	8.1	8.4	7.7	6.5	7.7	7.8	7.6	8	6.2	7.4	7.7	7.5	7.8
K (meq/100 g)	0.38	0.409	0.26	0.563	0.1	0.07	0.512	0.2	0.358	0.46	0.87	0.87	0.14	0.17	0.818	0.46	0.563	0.217
pF 1/3 atm (%)	17.5	23.64	20.3	19.46	25.7	22.1	28.35	17.4	24.02	19.65	24.53	24.59	20.6	16.2	24.37	31.59	33.01	18.7
pF 15 atm (%)	11.2	9.96	12.5	13.61	11.7	9.52	14.46	8.5	15.84	10.35	17.89	18.53	7.05	7.54	14.75	19.37	18.91	12.38
Tx clay (%)	39.7	40.7	37.3	35.4	26.8	26.7	16.1	9.6	37.95	20.5	34.7	31.85	4.5	11.3	20.7	26.65	10.95	25.7
Tx sand (%)	35.3	37.7	36.9	32.4	39.7	51	27.94	52.6	30.33	57.54	42.56	41.21	53.5	71.7	47.75	36.51	72.91	54.93
Tx mud (%)	25	21.6	25.8	32.1	33.5	22.3	55.96	37.8	31.71	21.96	22.74	26.95	42	17	31.55	36.84	16.14	19.37
Sieve 2 mm (%)	31.3	39.13	21.8	37	24.1	14.9	25.95	36.4	40.17	3.64	41.85	46.12	15.4	35.6	41.88	46.86	47.96	45.13
Salinity (mmhos/cm)	0.14	0.15	0.08	0.16	0.17	0.2	0.14	0.17	0.12	0.18	0.21	0.25	0.15	0.09	0.18	0.19	0.13	0.2

C. Biodiversity of the associations under study

To calculate the biodiversity of each of the associations under study, we used the Shannon & Weaver (1981)'s index taking into account the group of characteristic, companion and total species. We later applied the phytosociological stability index (Cano-Ortiz *et al.*, 2005). As can be seen, the three associations show a value lower than but also close to 1. This means that although the grassland is not at its optimum level, it is nevertheless



g. 2.- Cluster 1: *Chrysanthemum coronarium* communities.
g. 2.- Cluster 1 : Communautés à *Chrysanthemum coronarium.*

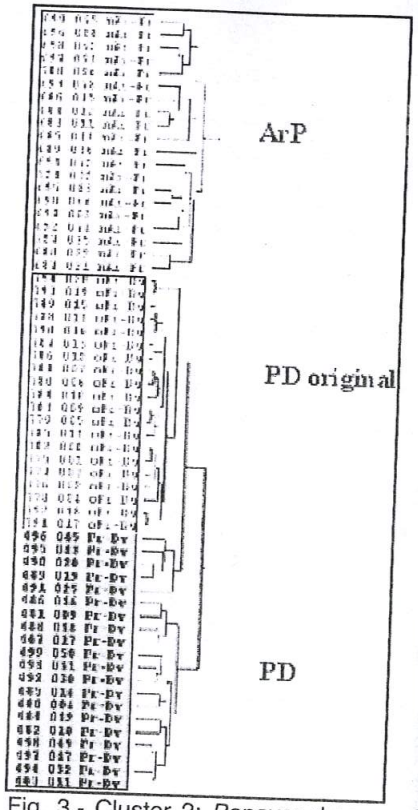


Fig. 3.- Cluster 2: *Papaver rhoeas* grasslands.
Fig. 3.- Cluster 2 : pâturages à *Papaver rhoeas.*

very close to it (the optimum level is only reached when $I_{shca}/I_{sht} = 1$, an ideal stage which very infrequently coincides with real situations). As far as the associations under study are concerned, I_{shca}-values are always higher than I_{shco}. Consequently, it seems reasonable to consider that these communities will remain stable as long as the initial ecological conditions persist.

Anacyclo radiati-Chrysanthemetum coronarii association (phytosociological stability dex, I_{ef})

JM VdM = 1081ca and 283 co, I_{Shca} (pi*Ln(pi)) = 3.731849855; I_{Shco} = 3.015830479, I_{sht} = 4.093887573. Phytosociological stability index $I_{ef} = I_{shc}/I_{sht}$ = 731849855/4.093887573 = 0.9115662 < 1.

Anacyclo radiati-Hordeetum leporini association (phytosociological stability index, I_{ef})

Table VIII.- Average values of the edaphic parameters of the different *Hordeion leporini* associations.
Tableau VIII.- Valeurs moyennes des paramètres édaphiques de différents associations de *Hordeion leporini.*

Anacyclo radiati-Chrysanthemetum coronarii (Rivas-Martínez 1978) st. nov.											
CEC	MOO	Nt	Pa	Mgc	Kc	pF 15 atm	Tx clay	Tx sand	Tx mud	Sa	pH
meq/100 g	%	%	p.p.m	meq/100 g	meq/100 g	%	%	%	%	mmho/cm	
[illegible]	1.622	0.105	26.900	2.131	0.698	11.975	19.763	55.826	24.413	0.193	7.770
Anacyclo radiati-Hordeetum leporini Rivas-Martínez 1978											
CEC	MOO	Nt	Pa	Mgc	Kc	pF 15atm	Tx clay	Tx sand	Tx mud	Sa	pH
meq/100 g	%	%	p.p.m	meq/100 g	meq/100 g	%	%	%	%	mmho/cm	
[illegible]	1.560	0.102	13.957	1.856	0.256	8.613	19.780	62.411	17.803	0.209	7.430
Anacyclo radiati-Papaveretum rhoeadis nov.											
CEC	MOO	Nt	Pa	Mgc	Kc	pF 15atm	Tx clay	Tx sand	Tx mud	Sa	pH
meq/100 g	%	%	p.p.m	meq/100 g	meq/100 g	%	%	%	%	mmho/cm	
[illegible]	1.803	0.140	14.722	1.864	0.412	13.001	25.394	45.694	28.906	0.162	7.633
Bromo scoparii-Hordeetum leporini Rivas-Martínez 1978											
CEC	MOO	Nt	Pa	Mgc	Kc	pF 15atm	Tx clay	Tx sand	Tx mud	Sa	pH
meq/100 g	%	%	p.p.m	meq/100 g	meq/100 g	%	%	%	%	mmho/cm	
[illegible]	1.667	0.133	15.400	1.068	0.375	8.203	14.503	54.254	31.245	0.122	7.475
Resedo albae-Chrysanthemetum coronarii O. Bolòs & Molinier 1958											
CEC	MOO	Nt	Pa	Mgc	Kc	pF 15atm	Tx clay	Tx sand	Tx mud	Sa	pH
meq/100 g	%	%	p.p.m	meq/100 g	meq/100 g	%	%	%	%	mmho/cm	
[illegible]	1.574	0.129	20.952	2.716	1.476	14.238	24.238	37.845	37.940	0.491	7.943

SUM VdM = 1278 ca and 299 co, I_{Shca} (pi*Ln(pi)) = 3.78672403; I_{Shco} = 3.23164507 , I_{sht} = 4.16712396. Phytosociological stability index $I_{ef} = I_{shc}/I_{sht}$ = 3.78672403/4.16712396 = 0.908714 < 1.

Anacyclo radiati-Papaveretum rhoeadis association (phytosociological stability index, I_{ef})

SUM VdM = 1421ca and 286 co I_{Shca} (pi*Ln(pi)) = 4.100495004; I_{Shco} = 3.2332196552, I_{sht} = 4.407159709. Phytosociological stability index $I_{ef} = I_{shca}/I_{sht}$ = 4.100495004/4.407159709 = 0.9304167 < 1.

IV. CONCLUSIONS

Although the edaphic differences between the syntaxa studied are not significant, the communities researched do present differential species as a result of the particular ombrotype and thermotype of the environments in which they grow. Consequently, we suggest a new association and a status change. The biodiversity shown by the associations leads us to believe that these communities will be preserved as long as the current ecological conditions remain stable. This last conclusion derives from the results obtained for the phytosociological stability index: $0.9 < I_{ef} < 1$.

Syntaxonomical scheme

Stellarietea mediae Tüxen, Lohmeyer & Preising ex von Rochw 1951
Chenopodio-Stellarienea Rivas Goday 1956
Sisymbrietalia officinalis J. Tüxen *in* Lohmeyer *et al.* 1962 em. Rivas-Martínez, Báscones, T.E. Díaz, Fernández-González & Loidi 1991

Hordeion leporini Br.-Bl. *in* Br.-Bl., Gajewski, Wraber & Walas 1936 corr. O. Bolòs 1962

Hordeenion leporini Cano Ortiz & Cano *nov.*

Bromo scoparii-Hordeetum leporini Rivas-Martínez 1978

subass. *sisymbrietosum officinalis* Rivas-Martínez 1978

subas. *diplotaxietosum catholicae* Rivas-Martínez 1978

Anacyclo radiati-Hordeetum leporini Rivas-Martínez 1978

subas. *arctothcetosum calendulae* Rivas-Martínez 1978

Papaveri rhoeadi-Diplotaxietum virgatae Rivas-Martínez 1978

subass. *erucetosum vesicariae* Rivas-Martínez 1978

subass. *sisymbrietosum contorti* Rivas-Martínez 1978

var. with *Sisymbrium runcinatum*

var. thermophilous *hispalense*

Anacyclo radiati-Papaveretum rhoeadis nova

Resedo albae-Chrysanthemetum coronarii O. Bolòs & Molinier 1958

Anacyclo radiati-Chrysanthemetum coronarii (Rivas-Martínez 1978) *st. nov.*

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Phytosociologie dynamico-caténale et gestion de la biodiversité

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Résumé.- La disposition caténale des diverses unités de végétation édaphophiles est assurée par un gradient des contraintes écologiques déterminantes. L'analyse comparative du fonctionnement dynamique de quelques exemples nous amène à proposer les concepts de série et de géosérie tronquées pour les séries dont le stade terminal correspond à un groupement végétal pluristratifié chaméphytique ou arbustif. Ces concepts complètent la typologie des unités de la phytosociologie dynamico-caténale, permettant ainsi une analyse universelle du paysage végétal. Étant donné ses fortes propriétés émergentes, le niveau sérial du tapis végétal constitue un niveau fondamental de la biodiversité. Le suivi de la cinétique des limites de tessela des individus de séries tronquées peut permettre de diagnostiquer des modifications écologiques liées à un changement climatique global. Ce niveau sérial s'avère particulièrement pertinent à considérer dans le cadre de la gestion des espaces naturels et notamment lors des opérations de réintégration paysagère réalisées en écologie de la restauration.

Mots clés : biodiversité - curtosigmetum - geocurtosigmetum - phytosociologie dynamico-caténale - science du paysage.

Abstract.- The catenal disposition of various edaphophilous vegetation units is realized by a gradient of determinative ecological constraints. The comparative analysis of the dynamic functioning of some examples leads us to propose the concepts of truncated serie and geoserie for the series of which the terminal stage corresponds to a pluristratified chamephytic or shrubby plant association. These concepts complete the typology of the units of the dynamic-catenal phytosociology thus allowing a universal analysis of the vegetational landscape. Considering its strong emerging properties, the serial level of the vegetation constitutes a fundamental level of the biodiversity. The following of the cinetics of the tessela limits of individues of truncated series allows us to detect ecological modifications linked to a global climatic change. This serial level appears particularly relevant to consider when monitoring natural sites and especially when reintegrating landscape realized in restoration ecology.

Key words : biodiversity - curtosigmetum - dynamic-catenal phytosociology - geocurtosigmetum - landscape science.