Le Genévrier thurifère (*Juniperus thurifera* L.) dans le bassin occidental de la Méditerranée : systématique, écologie, dynamique et gestion

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COMPARATIVE STUDY OF *JUNIPERUS THURIFERA L.* FORMATIONS IN THE BETIC MOUNTAINS (S.E. SPAIN)

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Résumé

Le présent article se penche sur les groupements de Juniperus thurifera *L. des cordillères Bétiques. Les auteurs y ont mis en évidence trois types de groupements. Le premier type : forêt de Genévrier de Phénicie (*Juniperus phoenicea*) et Genévrier thurifère (*Juniperus thurifera*) ; le deuxième type : pinède de Pin Laricio (*Pinus nigra *subsp.* clusiana*) avec Genévrier thurifère ; et, le troisième type : chênaie avec Genévrier thurifère. Tant l'analyse phytosociologique que l'étude comparative avec les autres groupements ibèro-méditerranéens nous montrent que ces trois groupements sont des variantes appauvries où le Genévrier thurifère joue un rôle relictuel.*

Mots clés : Cordillères bétiques* - Juniperus thurifera - *Classification - Aménagement.

Abstract

The Juniperus thurifera *L. communities of the Betic mountain ranges are studied. Three community types are identified; Type 1:* Juniperus phoenicea *and* J. thurifera*; Type 2:* Pinus nigra *subsp.* clusiana *with* Juniperus thurifera*; and Type 3: Holm-oak with* J. thurifera*. Phytosociological analysis and a comparative study with other Ibero-Mediterranean communities demonstrate that the three communities are impoverished variants in which* J. thurifera *plays a relict role.*

Key words : Betic mountains* - Juniperus thurifera - *Classification - Ordination.

Resumen

En el presente trabajo se estudian las comunidades de Juniperus thurifera *L., de las sierras béticas. Se establecen tres comunidades tipo; Tipo 1:* Sabinar de sabina mora *(*Juniperus phoenicea*) y* sabina albar *(*Juniperus thurifera*), Tipo 2: Pinar de pino salgareño (*Pinus nigra *subsp.* clusiana*) con* sabina albar *y Tipo 3: Encinar con sabina albar. Tanto el análisis fitosociológico, como el análisis comparativo con el resto de comunidades ibérico-mediterráneas, nos muestra que las tres comunidades son variantes empobrecidas y donde la sabina albar juega un papel relicto.*

Palabras clave : Sierras béticas* - Juniperus thurifera - *Clasificación - Ordenación.

I - INTRODUCTION

The *Juniperus thurifera* formations present in the Iberian Peninsula are found in xerophytic and continental habitats (Braun Blanquet & O. Bolós, 1957). These characteristics, together with poorly developed soils with rather superficial lithic contact, have enabled this taxon – to which a Tertiary origin is attributed – to have survived with a relatively wide distribution area. Thus, these formations appear in geomorphological-climaticrelicts (Costa Tenorio & col., 1987).

However, in the Betic "cordillera" ranges their presence is somewhat limited. This may be due to several factors: competition with Fagaceae species or other gymnosperms, which benefit more from current conditions; and considerable human impact -- particularly in the Peñón de Alamedilla area in the Province of Granada (these areas, although relatively bleak continental moorland, are not as inhospitable as others in the Iberian Peninsula, which are largely uninhabited; Costa & col., 1990).

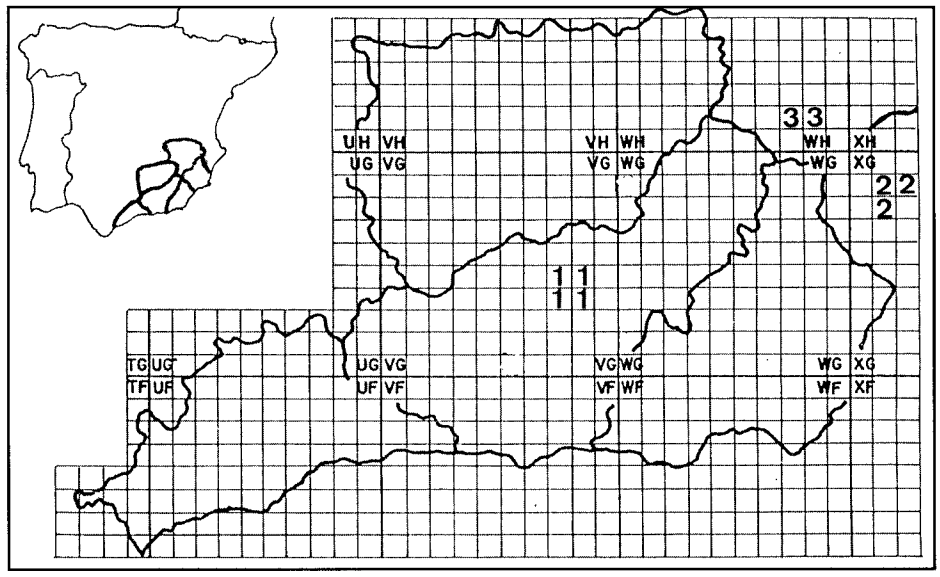
II - MATERIAL AND METHODS

II.1 - Study area

The first task was to study the relevant literature in order to locate the most significant populations of this species in the Betic "cordilleras". The main papers consulted were Velallos, Castilla y Gamarra, (1991a,

1991b, 1992); Ruiz de la Torre, (1992); and Velallos & Castilla, (1993). Three locations were selected (figure 1): Site 1 (Peñón de Alamedilla, Province of Granada), Site 2 (Sierra de Moratalla, Province of Murcia), and Site 3 (Nerpio, Sierra de Segura, Province of Albacete).

Figure 1 - ***Localization of surveyed area:***



1: Peñón de Alamedilla, Granada.
2: Sierra de Moratalla, Murcia. 3: Nerpio, Sierra de Segura, Albacete.

Three clearly distinguishable community types were identified for sampling purposes:
✓ Site 1: *Juniperus phoenicea* and *J. thurifera* (**Type I**).
✓ Site 2: *Pinus nigra* subsp. *clusiana* with *Juniperus thurifera* (**Type II**).
✓ Sites 2 and 3: *Quercus rotundifolia* with *Juniperus thurifera* (**Type III**).

II.2 - Physical environment

From a geological viewpoint, Site 1 belongs to the Quaternary deposits of the Baza basin, mainly composed of loams and loamy limestones, whereas Sites 2 and 3 are made up of sub-Betic limestones. The soils are calcaric regosols at Site 1, and mollic leptosols at Sites 2 and 3. The sites fall within the following phytogeographical units (Rivas Martínez & col., 1997 ; Sánchez-Gómez & col., 1994):
✓ Site 1: Guadiciano-Baztetano District, Guadiciano-Bacense Sector, Betic Province.
✓ Sites 2 and 3: Sub-Betic-Murcian District, Sub-Betic Sector, Betic Province.

The sites can be characterised bioclimatically (see Rivas-Martínez, 1994) as follows (Sanchéz-Gómez & col. *op. cit.*):
✓ Site 1: bioclimate: Pluvi-seasonal continental Mediterranean
thermotype: Meso-Mediterranean
ombrotypo: dry (topographically semi-arid)

✓ Sites 2 and 3: bioclimate: Pluvi-seasonal continental Mediterranean
thermotype: Supra-Mediterranean
ombrotype: dry/subhumid

II.3 - Vegetation data

Vegetation inventories were made of the predetermined community types, following the abundance-dominance indices of Braun Blanquet (1979), (Table 1). A table was then devised from the inventories (Table 2), in which the species are distinguished according to the phytosociological classes to which they belong.

Table 1 - ***Phytosociological relevés and analysis of the three community-type***

TYPE	I	I	I	I	I	I	I	I	II	II	II	II	II	II	III	III	III	III	III	III	III
N° Rel	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Alt (m)	810	820	840	810	830	850	875	800	1350	1300	1250	1450	1470	1650	1300	1300	1350	1150	1500	1250	1450
EXP.	N	NE	NW	NW	W	N	NW	N	N	NE	NW	-	N	NE	N	N	N	O	S	N	O
Incl.	40	45	40	30	30	25	30	35	10	15	20	-	20	10	15	20	15	20	20	15	20
Cover	70	70	80	70	65	75	70	75	70	90	90	80	80	80	80	90	95	70	80	90	80
Area	100	150	100	100	150	150	100	160	100	200	100	200	100	150	200	300	200	150	150	200	150
Characteristics of *Pino-Juniperetea*:																					
Juniperus thurifera	1	2	1	1	1	1	2	2	2	4	1	2	1	1	.	+	+	2	+	1	+
Juniperus phoenicea	3	2	2	1	1	3	2	3	1	3	1	1	1	1	+	3	1	.	1	1	.
Pinus nigra subsp. clusiana	.	.	.	.	.	.	.	.	3	1	+	3	3	3	.	2	1	.	.	1	.
Pinus Pinaster	.	.	.	.	.	.	.	.	.	2	4	.	.	.	.	.	.	.	.	.	.
Arctostaphyllos uva-ursi subsp. crassifolia	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	1
Characteristics of *Quercetea ilicis*:																					
Juniperus oxycedrus	1	3	3	.	3	2	1	.	2	2	1	+	1	1	+	1	+	1	+	2	+
Quercus rotundifolia	.	+	1	.	1	.	0.2	.	.	.	.	.	.	+	5	4	5	4	5	5	5
Pinus halepensis	.	.	1	2	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Rhamnus lycioides	.	.	1	.	1	1	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.
Paeonia broteroi	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	1	.	.	2	.
Rubia peregrina	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	1	.	.	+	1
Daphne gnidium	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.
Characteristics of Querco-Fagetea:																					
Hedera helix	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	+	.
Berberis vulgaris subsp. australis	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	2	1	.	1
Geum sylvaticum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	+	.
Helleborus foetidus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	2	.
Daphne laureola subsp. latifolia	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	+	.	.
Characteristics of Rosmarinetea officinalis:																					
Rosmarinus officinalis	1	2	2	.	2	+	.	1	.	1	1	.	.	.	.	.	.	.	.	.	.
Genista scorpius	1	.	+	2	1	1	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.
Sedum sediforme	+	.	.	.	.	.	1	.	.	.	+	.	.	.	.	+	+	.	.	.	+
Ononis fruticosa	.	.	1	.	2	.	1	+	.	.	.	+	.	.	.	.	.	.	.	.	.
Teucrium webbianum	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	1	+	.	.
Lavandula latifolia	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	+	.	.
Bupleurum fruticescens	+	+	+	+	1	1	1	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Genista mugronensis	2	2	3	3	2	2	2	1	.	.	.	.	.	.	.	.	.	.	.	.	.
Thymus oropedanus	1	2	2	2	1	1	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Sideritis leucantha	+	1	2	.	1	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Teucrium gnaphalodes	+	1	1	.	1	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Linum suffruticosum	1	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Characteristics of *Lygeo-Stipetea*:																					
Brachypodium retusum	1	1	2	1	1	1	+	1	.	1	.	1	.	1	.	+	.	1	.	.	.
Avenula bromoides	1	+	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Dactylis glomerata	1	1	1	.	1	1	+	+	.	.	+	.	+	.	.	.	.	+	.	.	.
Helictotrichon filifolium	1	1	1	.	1	+	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.
Koeleria vallesiana	1	.	.	1	1	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Phlomis lychnitis	1	+	1	1	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Stipa tenacissima	.	+	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Other species:																					
Artemisia herba-alba	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Carex distachya	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	+
Chronanthus biflorus	.	+	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Cytisus scoparius subsp. reverchonii	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.	.	+	.
Festuca capillifolia	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	+	.	.	+
Festuca hystrix	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.
Festuca nevadensis	.	.	.	.	.	.	.	.	1	.	.	.	.	.	1	.	.	.	.	.	.
Helianthemum violaceum	1	1	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Moricandia moricandioides subsp. moricandioides	.	+	.	.	1	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Silene mellifera	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	1	.	+	.	.

Type I: Community of *Juniperus phoenicea* and *Juniperus thurifera*.
Type II: Community of *Pinus nigra* subp. *clusiana* and *Juniperus thurifera*.
Type III: Community of *Quercus rotundifolia* with *Juniperus thurifera*.

*Table 2 - **Most diferential taxa of the six OSU - Frequency of taxa in the OSU***

Number of OSU	I	II	III	IV	V	VI
Characteristicsof *Pino-Juniperetea:*						
Juniperus thurifera	5	5	4	5	2	5
Juniperus phoenicea	5	5	3	0	0	2
Pinus nigra subsp. clusiana	0	5	3	1	3	0
Arctostaphylos uva-ursi subsp crassifolia	0	0	0	2	2	0
Juniperus communis subsp hemisphaerica	0	0	0	5	0	0
Juniperus sabina	0	0	0	3	0	0
Characteristicsof *Quercetea ilicis*:						
Quercus rotundifolia	2	1	5	2	5	0
Juniperus oxycedrus	4	5	5	1	3	0
Rubia peregrina	0	0	3	0	5	0
Berberis vulgaris subsp. australis	0	1	2	2	0	0
Pinus halepensis	3	0	0	0	1	1
Rhamnus lycioides	3	0	0	0	0	3
Asparagus acutifolius	1	0	0	0	0	4
Paeonia broteroi	0	0	3	0	0	0
Other species:						
Dactylis glomerata subsp. hispanica	5	2	1	2	0	3
Brachypodium retusum	5	3	2	0	3	4
Genista scorpius	4	1	0	2	0	5
Rosmarinus officinalis	4	2	0	0	0	3
Sedum sediforme	1	1	3	0	3	0
Leuzea conifera	0	0	0	1	0	3
Festuca rubra trichophylla	0	0	0	4	0	0
Festuca capillifolia	0	0	2	0	1	0
Koeleria vallesiana	3	0	0	0	0	3
Helianthemum violaceum	0	0	2	0	0	2
Avenula bromoides	1	0	0	0	0	2
Linum suffruticosum	2	0	0	0	0	3
Thymus vulgaris	0	0	0	0	0	4
Stipa parviflora	0	0	0	0	0	3
Teucrium gnaphalodes	3	0	0	0	0	2
Bupleurum fruticescens	5	0	0	0	0	0
Genista mugronensis	5	0	0	0	0	0
Ononis fruticosa	3	1	0	0	0	0
Phlomis lychnitis	3	0	0	0	0	0
Sideritis leucantha	3	0	0	0	0	0
Silene mellifera	0	0	3	0	0	0
Thymus orospedanus	5	0	0	0	0	0

I: Community of *Juniperus phoenicea* and *Juniperus thurifera*.
II: Community of *Pinus nigra* subp. *clusiana* and *Juniperus thurifera*.
III: Community of *Quercus rotundifolia* with Juniperus thurifera.
IV: *Juniperetum hemisphaerico-thuriferae*.
V: *Junipero thuriferae-Quercetum rotundifoliae*.
VI: *Juniperetum phoeniceo-thuriferae*.

Species occurring
5: in 81-100 % of the relevés
4: in 61-80 % of the relevés
3: in 41-60 % of the relevés
2: in 21-40 % of the relevés
1: in 1-20 % of the relevés

Nomenclature used for the taxa follows *Flora Iberica* (Castroviejo & col., 1986-1997) for published groups; otherwise *Flora Europaea* (Tutin & col., 1964-1980) was followed.

II.4 - Numerical analysis

For this analysis the three *Juniperus thurifera* communities described for the Mediterranean region of the Iberian Peninsula (Table 3) were used, in order to contextualize the study communities. Using data from tables from a number of sources (see Appendix 1) a table was devised together with the three Betic community types, using constancy values of 1-5 (Braun Blanquet, 1979), as used in previously published numerical taxonomy papers (Mucina, 1989; Mucina & van Tongeren, 1989; Escudero & Pajarón, 1994). The least representative taxa (i.e., those with constancy values of 1 or 2,

present in only one community) were excluded from the numerical processing. Each table must contain more than four inventories in order to be considered as an "operational syntaxonomical unit" (OSU; Török & col., 1989).

Appendix 1 - ***Names of the operational syntaxonomical units (OSUs) and references of the publications from which the phytosociological tables were taken***

Name	N_{rel}	Reference
IV *Juniperetum hemisphaerico-thurifera*	33	Rivas Martínez (1969). P. Inst. Biol. Apl. 46: 18. Table 4
V *Junipero thuriferae-Quercetum rotundifoliae*	3	Alcaraz (1984). Fl. y Veg. del NE de Murcia. Ser. Publ. Univer. Murcia : 327. Table 76.
VI *Juniperetum phoeniceo-thuriferae*	13	Br. Bl. & O. Bolós 1957. Anal. Est. Exp. Aula Dei. 5.

N_{rel} = Number of relevés in the table.

An exponential transformation was applied to the matrix of raw data in order to enhance the highest constancy values and reduce the significance of the lowest ones. For the numerical processing of the data NTSYS-pc, ver. 1.80 (Rohlf, 1980) software was used as follows:

A Classification: For the classification of the OSUs three SHAN (sequential, agglomerative, hierarchical and non-overlapping) techniques were used, following Sneath & Sokal (1973) and Podani (1989), which have proved to be of considerable value in phytosociology (Podani, *op. cit.*): CL = complete linkage clustering; UPGMA = unweighted average clustering; WPGMA = weighted average clustering. "Chord distance" (Orlóci, 1967 ; 1978) was used as a similarity function, to be applied when over 50% of the data table features double zeros.

B Ordination: The results were compared with those obtained by means of the "non-metric multidimensional scaling" (MDS) technique (Griffin, 1990), combined with a "minimum spanning tree" (MST), in order to reveal and hidden differences similarities that might not otherwise be apparent (Escudero & col., 1994).

III - Results and discussion

III.1 - Phytosociological analysis

Types I and II contain elements that are rich in *Pino-Juniperetea*, with high coverage-abundance values; Type III presents fewer of these characteristics. Types I and III contain a number of *Quercetea ilicis* species, whereas in Type II they are very scarce. Type I differs from the other two community types in that it contains a number of characteristic species of *Rosmarinetea officinalis* Rivas-Martínez & col. (1991), and – to a lesser extent – *Lygeo-Stipetea* Rivas Martínez (1978). This is due to the more open nature of these formations.

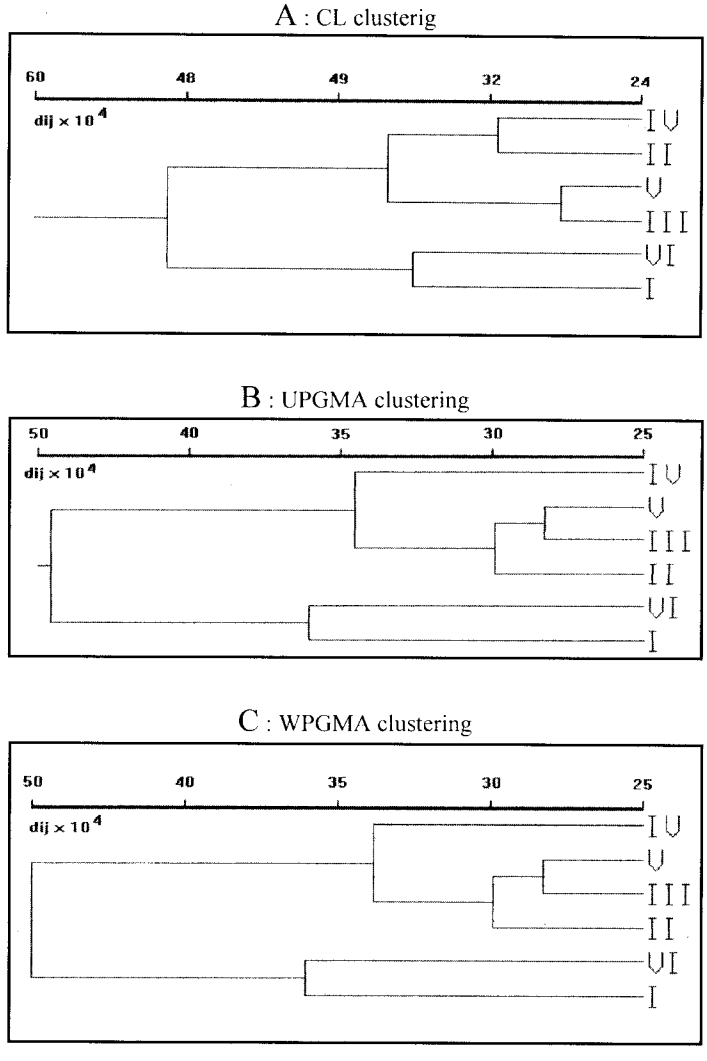
III.2 - Comparative numerical analysis

In all the cluster analyses carried out (figure 2) the group composed of I and VI is seen to be independent and clearly differentiated from the other elements. This group relates the Baza Basin (Site 1) formations with the communities initially described for the semi-arid areas of the Ebro Valley (*Juniperetum phoeniceo-thuriferae*), thus adding weight to the hypothesis that a migratory route used to link these areas with the semi-arid areas of La Mancha, reaching the Baza Basin. This hypothesis is mainly based on the current of such interesting disjunctions as *Eurotia ceratioides* and *Microcnemum coralloides.*

The group composed of V and III links the holm-oak communities with *Juniperus thurifera* and sites 2 and 3 with the continental Castellano-Maestrazgo-Manchego holm-oak communities. In this case, there are few elements present that would enable the two formations to be distinguished, although the scarce presence of certain Betic elements (*Paeonia broteroi* and *Cytisus scoparius* subsp. *reverchonii*) would suggest transitory formations between the typically Betic holm-oak communities and those of La Mancha.

The remaining group makes a problem: the CLC (figure 2A) shows a group composed of II and IV, whereas in the other types of analysis carried out (figures 2A and 2B) IV appears as an independent unit, while II is linked to III and V (albeit with relatively little similarity between them). In this case formation III is a Pine and *Juniperus* community, presenting little affinity with any of the formations included in the analysis, although it does share certain elements with them.

Figure 2 - ***Distinct SHAN techniques applied to the six OSU***



I : Community of *Juniperus phoenicea* and *Juniperus thurifera.*
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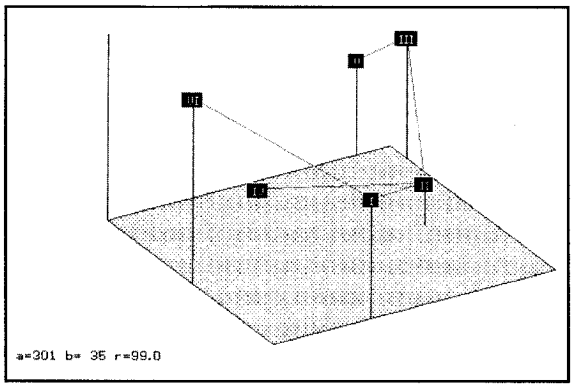
V : *Junipero thuriferae-Quercetum rotundifoliae.*
VI : *Juniperetum phoeniceo-thuriferae.*

In the MDS analysis (figure 3) the lines formed by the least expanded tree show that II is linked to both IV and III – i.e., it may be included in either one group or the other, according to the type of cluster analysis carried out. There is also a link between II and I, although it is not as close as that between II and III or between II and IV. This phenomenon highlights the usefulness of such analysis for spotting relationships that are hidden in the topography of different cluster analyses. We therefore conclude that formation II should be considered as being independent.

Figure 3 - 3D-model of the MDS with the MST superimposed applied of the six OSU.



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III: Community of *Quercus rotundifolia* with *Juniperus thurifera.*
IV: *Juniperetum hemisphaerico-thuriferae.*
V: *Junipero thuriferae-Quercetum rotundifoliae.*
VI: *Juniperetum phoeniceo-thuriferae.*

IV - CONCLUSIONS

In the light of the results obtained for the various Betic communities, we may draw the following conclusions:

TYPE I: The presence of *Quercetea ilicis* and *Pino-Juniperetea* elements afford these communities an intermediate character. This coincides with the observations of other authors for the *Juniperetum phoeniceo-thuriferae* (Braun Blanquet & Bolós, 1957; Rivas Martínez, 1987) association, with which it is most closely related in the analyses made. We therefore consider this community to be a Betic race of the association *Juniperetum phoeniceo-thuriferae*, with certain differential elements, particularly insofar as the associated "matorral" scrub vegetation is concerned.

TYPE II: This community presents few characteristics of *Quercetea ilicis*, and there can be no doubt (owing to its flora-poor nature) that it is to be included within *Pino-Juniperetea.* This community has been considered in other papers (Alcaraz & col., 1991) as a subassociation of *Juniperetum phoeniceo-thuriferae*, although – if we apply the current concept of subassociations as biogeographical variants – it lacks strong Betic biogeographical differentials. Analysis of the floristic composition reveals the absence of such species as *Pinus halepensis*, *Rhamnus lycioides*, *Rosmarinus officinalis, Genista scorpius*, etc. Based on the Pine-*Juniperus* physiognomy of *Pinus nigra* subsp. *clusiana*, and taking a phytogeographical approach that includes this area within the Betic "ranges" (Sánchez Gómez & col., 1994), we consider that this formation may be included within the *Junipero phoeniceae-Pinetum salzmannii* (Valle & col, 1988), as an impoverished continental variant, with a bordering character of this topographical pine and *Juniperus* community.

TYPE III: There are close links between this holm-oak community and the *Junipero thuriferae-Quercetum rotundifoliae,* partly owing to the low number of elements in these communities. Previous authors (Alcaraz & col., *op. cit.*) have considered this holm-oak community as a subassociation of the *Berberido-Quercetum rotundifoliae*, based on the presence of certain Betic elements. Although these elements support identification as Betic holm-oak communities, they cannot be used to distinguish this as a subassociation of the typical holm-oak community. The presence of *Juniperus thurifer* therefore merely indicates a continental variant.

The relict character of this species in the betic "ranges" is clear, as indicated by both its distribution, which is limited to the northeastern areas of the Cazorla Massif and the Baza Basin (approx. 27 Km^2), and the role it plays in these communities, where the most abundant species are *Fagaceae* (Type III) or other gymnosperms (Types I and II). In all the formations we observe low generation of this species and a relatively advanced age of the individuals present.

V - PROPOSED SYNTAXONOMIC POSITIONING

+ *Pino-Juniperetea* Rivas-Martínez 1964
- *Pino-Juniperetalia* Rivas-Martínez 1964
* *Juniperion thuriferae* Rivas-Martínez 1969
Juniperetum phoeniceo-thuriferae Br. Bl. & Bolós 1957 **Betic race = TYPE I.**
Junipero phoeniceae-Pinetum salzmannii Valle, Mota & Gómez Mercado 1988 **var. with *Juniperus thurifera* = TYPE II.** (=*Juniperetum phoeniceo-thuriferae pinetosum clusianae* Sánchez Gómez & Alcaraz, in press).
+ *Quercetea ilicis* Br. Bl. In Br. Bl. & col. 1952
- *Quercetalia ilicis* Br. Bl. ex Molinier 1934 *in* Rivas-Martínez 1975
* *Quercion ilicis* Br. Bl. ex Molinier 1934 *in* Rivas-Martínez 1975
** *Paeonio broteroi-Quercenion rotundifoliae* Rivas-Martínez *in* Rivas Martínez, Costa & Izco 1986.
Berberido hispanicae-Quercetum rotundifoliae Rivas Martínez 1987 **var. with *Juniperus thurifera* TYPE III** (= *Berberido hispanicae-Quercetum rotundifoliae juniperetosum thuriferae* Sánchez Gómez & Alcaraz, in press).

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