

The Vegetation of Çimen Mountain (Kahramanmaraş)

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Abstract: This investigation was carried out between 1995 and 1996 in order to research the vegetation of Çimen Mountain (Kahramanmaraş). The research area is situated at about 20 km to the south-west of Kahramanmaraş. Vegetation studies were carried out according to the Braun-Blanquet method. The authors determined 10 plant associations, all of which are new syntaxa to science, in three different vegetation types. Vegetation tables are given in an appendix.

Key Words: Vegetation, Syntaxonomy, Mediterranean, Kahramanmaraş, Turkey.

Çimen Dağı (Kahramanmaraş) Vejetasyonu

Özet: Bu çalışma 1995-1996 yılları arasında Çimen dağının (Kahramanmaraş) vejetasyonunu araştırmak üzere yapılmıştır. Araştırma sahası Kahramanmaraş il sınırları içerisinde ve il merkezinin 20 km güney-batısında bulunmaktadır. Vejetasyon çalışmaları Braun-Blanquet metoduna göre yürütüldü. Yazarlar üç farklı vejetasyon tipine ait 10 yeni bitki birliği tespit ettiler. Vejetasyon tabloları ekte verilmiştir.

Anahtar Sözcükler: Vejetasyon, Sintaksonomi, Akdeniz, Kahramanmaraş, Türkiye.

Introduction

In this study, our aim was to determine the vegetation of Çimen Mountain. The study area is within the boundary of Kahramanmaraş city. It is surrounded by the Sır dam and Ceyhan River in the north-west, Başkonuş Mountain in the north, Türkoğlu district in the south, and Kahramanmaraş city in the north-east. Çimen Mountain consists of the following major hills: Ziyaret Hill (2259 m), which is the highest point in the area, Çilmezar Hill (1886 m) and Çatalkaya Hill (1800 m) (Figure 1).

The Mediterranean region of Turkey is quite well-known from the floristic and vegetational points of view. No phytosociological study has previously been carried out in this area. However, some studies have been carried out by other researchers in areas which are near to the area considered in the present study. Those include the studies of Akman (1973) and Quezel (1973) on the Amanus Mountains; of Yurdakulol (1981) in Pos forests and of Duman (1995) in Engizek Mountain. The

vegetation of the study area was evaluated by considering all the studies carried out in this floristic region, namely, Birand (1960), Quezel (1973), Quezel et al. (1992), Yurdakulol (1981), Akman (1973; 1976), Akman et al. (1978; 1979a; 1979b; 1996), Çetik (1976; 1982), Uslu (1977) and Ketenoğlu (1983). Ten plant associations were determined in the area.

Materials and Methods

This paper is based on a PhD thesis. The vegetational studies were carried out according to Braun-Blanquet's method (Br.-Bl., 1932). The climatic data of Kahramanmaraş Meteorological station were used (DMİ, 1974; 1984). The prevailing climate in the area is a less rainy and winter milder (W. Sp. A. Sm.) variant of the Mediterranean climate (Akman, 1982). Rainfall is lowest in summer; the precipitation regime is therefore "winter-spring-autumn - summer". The climatic data are given in Tables 1a and b.

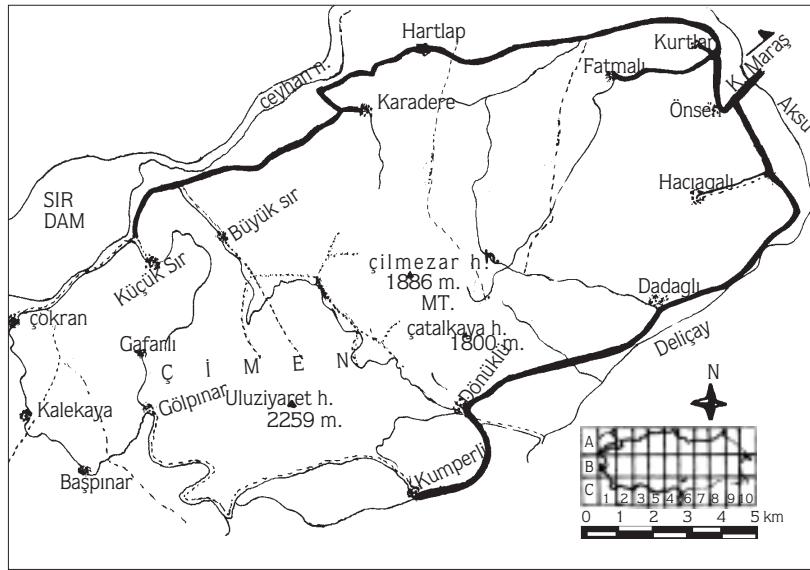


Figure 1. Location of the studied area.

Table 1a. The average and extreme climatic values of K. Maraş from 1931 to 1995.

Meteorological elements	Observation periods (years)	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Annual
Mean temperature (°C)	64	4.3	6.1	10.4	14.9	19.9	24.7	27.8	27.8	24.8	19.0	12.0	6.5	16.5
Max. Mean temp.	64	9.2	10.5	15.3	20.8	26.4	32.0	35.3	35.9	32.0	26.6	18.7	10.9	22.8
Min. Mean. temp.	64	1.2	2.4	5.2	9.1	13.4	18.0	20.6	20.4	17.5	12.1	7.1	3.9	10.8
Total rainfall (mm)	64	133.1	110.1	90.4	68.7	35.0	7.0	0.9	1.2	4.8	31.7	60.1	119.4	662.2
Mean rel. humidity %	13	72	73	64	57	56	48	49	48	45	52	62	74	58

Table 1b. Seasonal distribution of rainfall

Station	Observation period (years)	Spring total (mm)	%	Summer total (mm)	%	Autumn total (mm)	%	Winter total (mm)	%	Annual (mm)
K.Maraş	64	194.1	29.4	9.1	1.3	96.6	14.5	362.7	54.7	662.2

Walter’s climatic diagram presents the Mediterranean climates perfectly (Figure 2).

Climatic diagrams of Kahramanmaraş show higher winter rainfall and a long period of summer drought. The arid season includes 5 months; it begins during the first half of May and ends in October. Absolute frosty months are absent, as shown in the diagram (Figure 2).

For the determination of the plant associations, sample plots were taken from each plant formation, in sufficient number and in suitable size. Thus, the floristic compositions of the associations, and the dominance and constancy of the species were determined. In total, 83

sample plots were taken, and 10 plant associations were distinguished by the analyses of these plots. In order to compare associations, we used Sorensen’s index of similarity. Some soil samples were taken from various sample plots representing the different plant formations. These soil samples were analyzed by the Soil and Fertilizer Research Institute. The results of the soil analyses are shown in Table 2 in order to give comparative details about the soils where the plant associations have developed. The distributions of the associations in the investigation area, and their brief ecologies are given in the section entitled Vegetation.

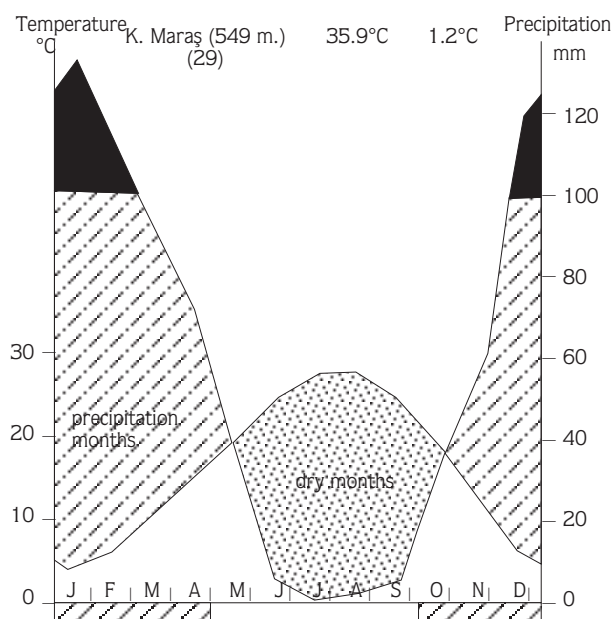


Figure 2. Climatic diagram of Kahramanmaraş.

Vegetation

The vegetation of Çimen Mountain belongs to both the Eu-Mediterranean belt and the Supra-Mediterranean belt. The highest point of this area is Ziyaret Hill (2259 m). Three different vegetation types are observed in the area: (a) forest vegetation mainly consisting of *Pinus brutia* Ten., *Quercus cerris* L., *Quercus petraea* (Mattuschka) Liebl. subsp. *pinnatiloba* (C.Koch) Menitsky, *Populus tremula* L., *Fagus orientalis* Lipsky, *Abies cilicica* (Ant. & Kotschy) Carr. subsp. *cilicica* and *Cedrus libani* A.Rich forests; (b) steppe vegetation; and (c) shrub vegetation. Associations and their higher syntaxa are as follows:

Forest Vegetation

Quercetea ilicis Br.-Bl. 1947

Quercetalia ilicis Br.-Bl. 1947

Quercion ilicis Br.-Bl.(1931) 1936

1. *Centaureo lycopifoliae-Pinetum brutiae* ass. nova
- Quercetea pubescentis* Doingt Kraft 1955

Table 2. Soil analysis of associations.

	Quadrat No	Soil Depth cm.	Saturation %	Total Salt %	pH in Saturated Soil	CaCO ₃ %	Organic Matter %	Phosphorus P ₂ O ₅	Sand %	Silt %	Clay %	Texture
<i>Centaureo lycopifoliae-Pinetum brutiae</i>	51	0-5 5-30	55 56	0.037 0.04	6.76 7.15	Absent Absent	5.0 3.5	10.0 15.8	37.1	35.4	27.5	CL
<i>Lagoecio cuminoidis-Styracetum officinalii</i>	11	0-30	55	0.04	7.30	Absent	1.7	3.1	38.8	22.1	39.1	CL
<i>Galio ibicini-Quercetum pinnatilobae</i>	20	0-5 5-30	57 41	0.033 0.01	6.53 6.35	Absent Absent	5.0 2.3	18.6 8.8	52.8	23.3	23.9	SCL
<i>Galio tenuissimi-Quercetum cerridis</i>	31	0-5 5-30	114 57	0.039 0.04	6.84 6.87	Absent Absent	6.0 2.3	2.0 2.0	19.0	38.8	42.2	C
<i>Potentillo crantzii-Fagetum orientalis</i>	39	0-5 5-30	115 59	0.025 0.02	6.56 6.40	Absent Absent	2.3 3.5	57.87 18.6	36.2	36.7	27.1	CL
<i>Thlaspio microstyli-Cedretum libani</i>	72	0-5 5-30	119 55	0.010 0.02	6.78 6.57	Absent Absent	8.8 3.2	63.8 34.8	47.9	25.6	26.5	SCL
<i>Dorcynio hirsuti-Populetum tremulae</i>	29	0-30	51	0.02	6.85	Absent	2.3	19.4	53.5	30.5	16.0	SL
<i>Achilleo grandifoliae-Micromerietum brachycalicii</i>	47	0-30	55	0.02	6.73	Absent	2.6	37.9	42.5	30.7	26.8	L
<i>Astragalo cuspidulati-Acantholimetum acerosi</i>	67	0-30	85	0.10	7.23	Absent	4.4	31.9	17.8	58.0	24.2	SL
<i>Phlomo lineari-Astragaletum kurdicii</i>	87	0-30	61	0.02	6.50	Absent	4.1	4.2	42.9	29.8	27.3	CL

C: Clayey, L: Loamy, S: Sandy

Quercus-Carpinetalia orientalis Akman, Barbero et Quézel 1980

Cisto laurifolii - Pinion pallasianae Akman, Barbero et Quézel 1978

2. *Dorcynio hirsuti-Populetum tremulae* ass. nova

Quercus-Cedretalia libani Barbero, Loisel & Quézel 1974

3. *Galio tenuissimi-Quercetum cerridis* ass. nova

4. *Potentillo crantzii-Fagetum orientalis* ass. nova

5. *Galio ibicini-Quercetum pinnatilobae* ass. nova

6. *Lagoecio cuminoides-Sytracetum officinalii* ass. nova

Abieto cilicicae-Cedron libani Quézel, Barbero & Akman 1978

7. *Thlaspio microstyli-Cedretum libani* ass. nova

Steppe Vegetation

Astragalo-Brometea Quézel 1973

8. *Astragalo cuspidipulati-Acantholimetum acerosi* ass. nova

9. *Achilleo grandifoliae-Micromerietum brachycalicii* ass. nova

Onobrychido armenae-Thymetalia leucostomi Akman, Ketenoğlu, Quézel & Demirörs 1984

10. *Phlomo lineari-Astragaletum kurdicii* ass. nova

Forest Vegetation

The forest vegetation is the dominant plant formation in the study area and is represented by six plant associations. The dominant species of each are *Pinus brutia*, *Cedrus libani*, *Fagus orientalis*, *Quercus cerris*, *Quercus petraea* and *Populus tremula*. The first of them is the *Centaureo lycopifoliae-Pinetum brutiae* association, which is formed by *Pinus brutia*. This association is particularly well represented around Çokran village. The second association of this coniferous forest formation is *Thlaspio microstyli-Cedretum libani*. The dominant trees of this association are *Cedrus libani* and *Abies cilicica*, which are spread around Çatalkaya Hill.

The associations of other forest formation are broad-leaved deciduous forests, and are as follows: *Quercus petraea* and *Populus tremula* forests are located at the

upper side of Fatmalı town and are represented by *Galio ibicini-Quercetum pinnatilobae* and *Dorcynio hirsuti-Populetum tremulae* associations. As for *Fagus orientalis* and *Quercus cerris* forests, *Fagus orientalis* forest is located in the Akyartepe and Çayırğan district and is represented by the *Potentillo crantzii-Fagetum orientalis* association. *Quercus cerris* forest is located at the upper side of Kumperli village in a wide field and is represented by the *Galio tenuissimi-Quercetum cerridis* association.

1. *Centaureo lycopifoliae-Pinetum brutiae* Varol & Tatlı, ass. nova Table 3.

This association develops around Çokran village and in the Yaylacık district and occurs on the red-brown soils. The soils of the association have a slightly acidic character in 0-5 cm depth, but at 5-30 cm depth are basic. Organic material quantity in the soil, which is clayey-loamy, is quite rich in horizon A. The general coverage of this association varies from 80 to 100%. The association consists of 3 vertical layers: (a) tree layer: coverage 50-100%, height 10-15 m; (b) small tree and shrub layer, coverage 30-70%, height 2-3 m; (c) herb layer, coverage 10-25%, height 15-70 cm.

The life forms of the total species recorded in the stands of the association are as follows: 18.4% therophytes, 47.6% hemicryptophytes, 24.6% phanerophytes, 6.1% cryptophytes and 1.5% geophytes.

Characteristic species of this association are *Pinus brutia*, *Origanum laevigatum*, *Centaurea lycopifolia* and *Asparagus palaestina*. Among these species, *Centaurea lycopifolia* is endemic. Characteristic species of the classes *Quercetea-Pubescentis* and *Quercetea-Ilicis* are found in this association. However, most of the characteristic species of *Quercetea-Ilicis* and *Quercetealia-Ilicis* exist in this association. Therefore, this association should be considered in the alliance *Quercion ilicis* and *Quercetalia-Ilicis* order, which belongs to the *Quercetea-Ilicis* class.

The association is described with 9 quadrats. The records of quadrats are as follows:

Quadrat no : Locality and date:

51-58 : Çokran village, around Yaylacık,
7 vii 1996.

59 : Çokran village, 8 vii 1996.

Holotype: Table 3, quadrat no: 51

Table 3. *Centaureo lycopifoliae-Pinetum brutiae* Varol & Tatli, *ass. nova* *Type: Quadrat 51

2. *Dorcynio hirsuti-Populetum tremulae* Varol & Tatli, *ass. nova* Table 4.

The *Populus tremula* forest in Anatolia develops after the degradation of *Pinus nigra* subsp. *pallasiana* and *Pinus sylvestris* forests (Çetik, 1976). The same situation also exists in this association. This association occurs on the brown forest soil, which is formed by quartz-schist bedrock. The soil of the association is sandy-loamy in texture, is acidic (pH 6.85), and has organic matter of 2.3%. This association shows a tree-layered structure. The coverage of the tree layer is 85-100% and the height is 7-9 m. The coverage of the shrub layer is 0-10% and the height is 2-2.5 m. In this layer, some small trees, such as *Quercus cerris*, *Quercus petraea* and *Juniperus oxycedrus*, exist. The coverage of the herb layer is 5-20% and is 25-70 cm in height. The life forms of association are as follows: 59.5% hemicryptophytes, 14.8% therophytes, 10.6% cryptophytes, 10.6% phanerophytes and 4.2 % geophytes.

The association is characterized by *Populus tremula*, *Dorcynium hirsutum* and *Peltaria angustifolia*. Characteristic species of the alliance *Cisto laurifolii-Pinion pallasianae* of the order *Querco-Carpinetalia orientalis* and class *Quercetea-Pubescentis* are found in this association. Therefore, this association is included in the alliance *Cisto laurifolii-Pinion pallasianae* of the order *Querco-Carpinetalia orientalis*.

The association is described by 5 sample plot quadrats and sites as follows:

Quadrat no : Locality and date:

28-30 : The upper side of Fatmalı town,
5 vii 1996.

40-41 : Yeşildere road, around Maraşgedigi,
6 vii 1996.

Holotype: Table 4, quadrat no: 29

Table 4. *Dorcynio hirsuti-Populetum tremulae* Varol & Tatli, *ass. nova* *Type: Quadrat 29

3. *Galio tenuissimi-Quercetum cerridis* Varol & Tatli, *ass. nova* Table 5.

This association is at 1000-1400 m, at the upper side of Kumperli village and covers quite a large area. The

association is found on the red-brown forest soil which is formed by non-calcareous bedrock. This soil has a clayey structure, the pH is 6.84-6.87 and the organic matter quantity is 6.0- 2.3%. The dominant species of the association, which consists of three vertical layers, is *Quercus cerridis*. The shrub layer is 2-2.5 m. The herb layer's coverage varies from 15 to 30%. The life forms of the association are as follows: 38.4% therophytes, 28.8% hemicryptophytes, 15.3% cryptophytes, 13.4% phanerophytes, and 3.8% geophytes. The association is characterized by *Quercus cerris* var. *cerris*, *Galium tenuissimum* subsp. *teniusimum* and *Allium wendelboanum*. Of these species, *Allium wendelboanum* is endemic. Because of the characteristic species of the association included in the order *Querco-Cedretalia libani* of the class *Quercetea-Pubescentis*, it should be considered in the syntaxa cited above. This association has not been included in any alliance. The sites of the quadrats of the association are as follows:

Quadrat no : Locality and date:

31-37 : The upper side of Kumperli village,
5 vii 1996.

49-50 : “ “ , 6 vii 1996.

Holotype: Table 5, quadrat no: 31

Table 5. *Galio tenuissimi-Quercetum cerridis* Varol & Tatli, *ass. nova* *Type: Quadrat 31

4. *Potentillo crantzii-Fagetum orientalis* Varol & Tatli, *ass. nova* Table 6.

The presence of the *Fagus orientalis* association may be due to the local microclima of the study area. *Fagus orientalis*, having migrated south by means of the Anatolian Diagonal in the Glacial Age of the Pleistocene Age, reveal the humid climatic conditions in the research area (Davis et al., 1971). The association consists of two vertical layers, and has a closed tree layer with the height of 7-11 m. The dominant species is *Fagus orientalis*. The herb layer on the ground has coverage of up to 20%.

This association occurs on the non-calcareous brown forest soils in Akyar Hill and Çayırhan. This soil has a clayey-loamy structure, pH 6.4-6.5, and organic matter between 2.3 and 3.5%. The life forms of the association are as follows: 44.4% hemicryptophytes, 25.9% therophytes, 16.6% phanerophytes, 9.2% cryptophytes

and 2.1% geophytes. The following species characterize the association: *Fagus orientalis*, *Ostrya carpinifolia*, *Tanacetum parthenium* and *Potentilla crantzii* var. *crantzii*. The records of the localities and dates of the 9 sample plots representing *Potentillo crantzii-Fagetum orientalis* are as follows:

Quadrat no : Locality and date:

38-39 : The upper side of Kumperli village,
6 vii 1996

60-65,71 : Yeşildere road, around Çayırğan,
10 vii 1996

Holotype: Table 6, quadrat no: 39

Table 6. *Potentillo crantzii-Fagetum orientalis* Varol & Tatlı, ass. nova *Type: 39

5. *Galio ibicini-Quercetum pinnatilobae* Varol & Tatlı, ass. nova Table 7.

This association occurs on the brown forest soils on the upper side of Fatmalı in a large field. These soils are of acidic character, sandy and clayey-loamy texture, and pH 6.3-6.5%, and have organic matter between 2.3 and 5.0%. This association has two layers; the upper layer consists of small trees and shrubs. The coverage of this layer varies from 60 to 100%. The lower layer has a coverage of 15-60% and a height of 30-100 cm. The important plants of this layer are *Vicia cracca*, *Poa bulbosa*, *Dactylis glomerata* and *Teucrium polium*. The floristic composition of the association is rich.

The life forms of the total species recorded in the stands of the association are as follows: 36.1% hemicryptophytes, 33.3% therophytes, 13.8% cryptophytes, 8.3% phanerophytes and 8.3% geophytes. The following species characterize the association: *Quercus petrea* subsp. *pinnatiloba*, *Galium spurium* subsp. *ibicinum*, *Quercus libani* and *Allium pallens*. Among these species, *Quercus petrea* subsp. *pinnatiloba* is endemic. This association contains characteristic species of the orders *Querco cerridis-Carpinetalia orientalis* and *Querco-Cedretalia libani*, which belong *Quercetea-Pubescentis*. Therefore, this association is included in the order *Querco-Cedretalia libani* of the class *Quercetea-Pubescentis*. But, because the association is not well represented at the level of alliance, it has not been included in any alliance. This association is named *Galio*

ibicini-Quercetum pinnatilobae and is represented by 10 sample plots. All the quadrats of this association were taken from the upper side of Fatmalı town on 4th July 1996.

Holotype: Table 8, quadrat no: 20

Table 7. *Galio ibicini-Quercetum pinnatilobae* Varol & Tatlı, ass. nova *Type: Quadrat 20

6. *Lagoecio cuminoidis-Sytracetum officinalii* Varol & Tatlı, ass. nova Table 8.

This vegetation type is represented by one plant association which lies on quartz-schist bedrock only around Dadağlı. The soil of the associations is clayey-loamy in texture, and has a slightly basic character. Organic matter is 2.6%. This shrub vegetation has a structure of two vertical layers. The upper layer is formed by shrubs (2.5-3) and the coverage of them is 60-70%. The coverage of herb layer is 40-80% and is 90-130 cm in height.

The life forms of the association are as follows: 55.9% therophytes, 18.6% hemicryptophytes, 10.1% phanerophytes, 8.4% cryptophytes and 6.7% geophytes. The following species characterize the association: *Sytrax officinalis*, *Asphodelus aestivus*, *Trifolium pauciflorum*, *Parentucellia latifolia* subsp. *flaviflora*, *Helianthemum ledifolium* var. *lasiocarpum*, *Lagoecia cuminoides* and *Nigella unguicularis*. In terms of repetition and dominance, the characteristic species of the classes *Quercetea-Ilicis* and *Cisto-Micromerietea*, the order *Querco-Cedretalia libani* and the alliance *Geranio-Cedrion* are fewer in this association. The presence of characteristic species of the class *Cisto-Micromerietea* in the association shows us that this association suffers from heavy anthropogenic impact. This association is included in the order *Querco-Cedretalia* of the class *Quercetea-Pubescentis*. The association is represented by 8 sample plots taken from the upper side of Dadağlı on 3rd July 1996.

Holotype: Table 9, quadrat no: 11

Table 8. *Lagoecio cuminoides-Styracetum officinalii* Varol & Tatlı, ass. nova *Type 11

7. *Thlaspio microstyli-Cedretum libani* Varol & Tatlı, ass. nova Table 9.

This association develops on the brown forest soils which lie on Andesite bedrock around Çilmezar Hill. The soils of the association are sandy and clayey-loamy in texture, and have a slightly acidic character (pH 6.53-6.78), and organic matter of 3.2-8.8%. This association shows a tree-layered structure. The coverage of tree layer is 90-100% and the height is 12-17 m. The dominant species of this layer are *Cedrus libani* and *Abies cilicica*. The shrub layer has a coverage 0-30% and a height of 2-3 m. The coverage of the herb layer varies from 20 to 40%, and 30 to 130 cm. Some constant species of this layer are *Vicia cracca* subsp. *stenophylla*, *Achillea setacea*, *Hypericum scabrum* and *Poa bulbosa*. The floristic composition of the association is rich.

The life forms of the association are as follows: 43.7% hemicryptophytes, 26.2% therophytes, 16.2% cryptophytes, 8.7% phanerophytes and 5.0% geophytes. The association is characterized by *Cedrus libani*, *Abies cilicica* subsp. *cilicica*, *Thlaspi microstylum*, *Rubus discolor*, *Pilosella xmacrotricha*, *Potentilla detommassii*, *Astragalus fraxinifolius* and *Onosma sieheanum*, which is endemic. Characteristic species of the alliance *Abieto-Cedrion libani* of the order *Quercu-Cedretalia* and class *Quercetea-Pubescentis* in the association are present. Therefore, this association is connected with the syntaxa cited above. This association of *Thlaspio microstyli-Cedretum libani* is represented by 10 quadrats which were taken from Çilmezar Hill on 11th July 1996.

Holotype: Table 7, quadrat no: 72

Table 9. *Thlaspio microstyli-Cedretum libani* Varol & Tatlı, ass. nova *Type: 72

Steppe Vegetation

This vegetation is represented by 3 plant associations which belong to the class *Astragalo-Brometea*.

8. *Astragalo cuspidipulati-Acantholimetum acerosi* Varol & Tatlı, ass. nova Table 10.

This steppe association is found a *Fagus orientalis* clearing 1650 m in the Çayırğan district. This association develops on the non-calcerous brown forest soil which originates from quartz-schist bedrock. The texture of this soil is silt-clayey, its pH is 7.23 and organic matter is 4.4%. This association has one layer and total coverage is 90-100%; the height is 20 cm.

The life forms of the association are as follows: 60% hemicryptophytes, 20% therophytes, 16% cryptophytes and 4% geophytes. This association is characterized by the presence of *Acantholimon acerosum* var. *acerosum*, *Astragalus cuspidipulatus*, *Veronica macrostachya* var. *macrostachya*, *Asperula stricta*, *Arenaria drypidea* and *Allium brevicaule*. Of these species, *Astragalus cuspidipulatus*, *Asperula stricta*, *Arenaria drypidea* and *Allium brevicaule* are endemic. This association, which occurs at about 1650 m in the study area, contains characteristic species of the class *Astragalo-Brometea*. But the association has not been considered to be within the order or alliance in the light of the latest work. All the quadrats were taken from Çayırğan on 10th July 1996.

Holotype: Table 10, quadrat no: 67

Table 10. *Astragalo cuspidipulati-Acantholimetum acerosi* Varol & Tatlı, ass. nova *Type: 67

9. *Phlomo linearis-Astragaletum kurdicii* Varol & Tatlı, ass. nova Table 11.

This steppe association develops between 1990-2050 m on the Mediterranean Mountain belt. This association has a richer floristic composition than that of other steppe associations, and is represented by 12 sample plots. This association has one layer total coverage is 70-100% and the height is 10-40 cm. The dominant plant is *Astragalus kurdicus* var. *kurdicus*. Some other constant species are *Marrubium globosum* var. *globosum*, *Phlomis linearis*, *Acantholimon acerosum* var. *acerosum* and *Thymus kotschyanus* var. *glabrescens*.

The life forms of the total species recorded in the stands of the association are as follows: 42% hemicryptophytes, 28% cryptophytes, 24% therophytes and 6% geophytes. The following species characterize the association: *Astragalus kurdicus* var. *kurdicus*, *Phlomis linearis*, *Marrubium globosum* var. *globosum*, *Thymus kotschyanus* (var. *kotschyanus*, var. *glabrescens*, var. *eriophorus*), *Allium frigidum*, *Thlaspi densiflorum* and *Scorzonera lasiocarpa*. Among these species, *Phlomis linearis*, *Marrubium globosum* var. *globosum*, *Thlaspi densiflorum* and *Scorzonera lasiocarpa* are endemic. This association is not well represented at the level of alliance. But characteristic species of the order *Onobrychido armeni-Thymetalia leucostomi* of the class *Astragalo-Brometea* are found in the association. Therefore, the association is included in the syntaxa cited above. All quadrats were taken from Ziyaret Hill on 14th July 1996.

Holotype: Table 11, quadrat no: 87

Table 11. *Phlomo lineari-Astragaletum kurdicii* Varol & Tatlı, *ass. nova* *Type: 87

10. *Achilleo grandifoliae-Micromerietum brachycalicii* Varol & Tatlı, *ass. nova* Table 12.

This association exists around Elencikçeşmesi district and develops as a secondary association after the destruction of *Cedrus libani* forest. This association occurs on the non-calcareous brown forest soil which is formed by quartz-schist bedrock. The soils of the association are loamy in texture, and have acidic character (pH 6.73); organic matter is 2.6%. This steppe vegetation exhibits a structure of two vertical layers. The upper layer is formed by shrubs (0.4-2 m) and the coverage is 5%. The coverage of the herb layer is 90% and it is 30 cm in height.

The life forms of the association are as follows: 38.7% hemicryptophytes, 25.8% cryptophytes, 19.3% therophytes, 12.9% phanerophytes and 3.2% geophytes. This association is characterized by the presence of *Micromeria fruticosa* subsp. *brachcalyx*, *Achillea grandifolia*, *Potentilla thuringiaca*, *Anarrhinum orientale* and *Scrophularia xanthoglossa* var. *decipiens*. The association, which contains characteristic species of the class *Astragalo-Brometea*, is not well represented at the level of alliance or order. Therefore, this association is only included in the class *Astragalo-Brometea*.

This association is named *Achilleo grandifoliae-Micromerietum brachycalicii* and is represented by 7 sample plots. All quadrats of this association were taken from Elencikçeşmesi on 6th July 1996.

Holotype: Table 12, quadrat no: 47

Table 12. *Achilleo grandifoliae-Micromerietum brachycalicii* Varol & Tatlı, *ass. nova* *Type 47

Conclusion and Comments

In the study area, 10 plant associations belonging to forest, shrub and steppe vegetation types have been determined. Six of them belong to forest, one of them belongs to shrub and three of them belong to steppe. These associations are classified and named according to the code of phytosociological nomenclature (Barkman et

al., 1986). The structure and brief ecologies of the associations are mentioned in the Vegetation section. This research area covers associations in the Eu-Mediterranean belt, Supra-Mediterranean belt and Mediterranean Mountain belt. Among these associations, the Euro-Siberian elements is noteworthy. The presence of these elements in the study area may be due to the local microclimate, and these taxa having migrated south by means of the Anatolian Diagonal in the Glacial Age of the Pleistocene Age reveals the humid climatic conditions in the area (Davis et al., 1971). *Pinus brutia* forests in Turkey are very widespread. From the bioclimate point of view, these forests exist in the semiarid, rainy and mostly rainy layer of the Mediterranean climate, which are warm, cool and cold type (Akman, 1995). The expansion of *Pinus brutia* is mostly observed over marl and marl-limestone, as well as on the ophiolitic rocks in the Taurus and Amanus Mountains. *Pinus brutia* associations spread in different places as a result of climatic and edaphic factors. Therefore, these associations have been included in different syntaxa units to date. *Pinus brutia* forests of Thermo or Eu-Mediterranean are included in the class of *Quercetalia-Ilicis*. These forests of the supra-Mediterranean and Mountain-Mediterranean layers are included in the orders *Quercu-Cedretalia libani* and *Quercu-Carpinetalia orientalis*. For example, Akman and Ekim (1988) have suggested that these associations be included in the class *Quercetea-Ilicis*. In addition, Gemici (1988) included *Pinus brutia* associations in the orders *Quercu-Cedretalia libani* and *Quercu-Carpinetalia orientalis*. Ekim and Akman (1991) in Sündiken Mountain and Yurdakulol (1981) in Pos forests considered *Pinus brutia* associations in the class *Quercetea-Pubescentis*. Serin and Eyce (1994) suggested that these associations be included in the order *Quercu-Cedretalia* and the class *Quercetea-Pubescentis*. The *Centaureo lycopifoliae-Pinetum brutiae* association, which is under the effects of Mediterranean climate (winter-cold and less rainy), is scattered at heights of 600-1050 m in our study area. The syntaxonomic explanation of this association is quite difficult because of its presence in the transitional areas. Both characteristic species of the classes *Quercetea-Ilicis* and *Quercetea-Pubescentis* are found under *Pinus brutia* forest in our research area. However, the class *Quercetea(etalia)-Ilicis* and the alliance *Quercion-ilicis* are well represented. Therefore, this association should be considered in the syntaxa cited above.

Syntaxonomical classification of the association is as follows:

Class: QUERCETEA-ILICIS Br.-Bl. 1947

Order: QUERCETALIA-ILICIS Br.-Bl. 1947

Alliance: QUERCION-ILICIS Br.-Bl. (1931) 1936

Association: *Centaureo lycopifoliae-Pinetum brutiae* Varol & Tatlı, *ass. nov.*

Populus tremula forms associations with different species and in different areas (Çetik and Vural, 1979; Tatlı, 1985; Adigüzel, 1995). The *Populetum tremula* association, which is described in Gavur Mountain (Erzurum), is included in the alliance *Quercion anatoliae* of the order *Quercetalia-Pubescentis*, which belongs to *Quercetea-Pubescentis* (Tatlı, 1985). When the characteristic species of the association are taken into consideration, the newly described association could be included in the syntaxa as follows:

Class: QUERCETEA-PUBESCENTIS Doingt Kraft 1955

Order: QUERCO-CARPINETALIA ORIENTALIS Akman, Barbero et Quézel 1980

Alliance: CISTO-PINION PALLASIANAE Akman, Barbero et Quézel 1978

Association: *Dorcynio hirsuti-Populetum tremulae* Varol & Tatlı, *ass. nov.*

In the Aegean and north-western Mediterranean, broad-leaved deciduous forests of the upper Mediterranean layer are included in the alliance *Carpinio-Acerion* of the order *Querco-Carpinetalia*, which belongs to the class *Quercetea-Pubescentis* (Akman, Quézel, Barbero, 1979; Ekim and Akman, 1991). *Quercus cerris* var. *cerris* forests in the Taurus and Amanus mountains can be included in the alliance *Abieto-Cedrion* or *Ostryo-Quercion* of the order *Querco-Cedretalia libani* (Akman, 1995). *Quercus cerris* associations were described by Düzenli (1976) in Hasandağ, by Çetik (1982) in Erciyes, by Ocakverdi and Çetik (1982) in Sultandağ, by Vural et al. (1985) around Afyon, by Ekim and Akman (1991) in Sündiken Mountain, by Tatlı et al. (1994) in Kızılören Mountain and by Özen and Kılınc (1995) around Alaçam. The *Quercus cerris* association, which was described in middle Anatolian, is included in the orders *Querco-Carpinetalia* and *Querco-Cedretalia libani* (Çetik, 1982; Ocakverdi, 1982; Tatlı et al., 1994). Consequently, the

Galio-Quercetum cerridis association in our study area is represented at the level of order and class. It has not been included in any alliance because it is under heavy destruction. The presence of many characteristic species of the class *Astragalo-Brometea* in the association indicates destruction. The syntaxonomical structure of the association is as follows:

Class: QUERCETEA-PUBESCENTIS Doingt Kraft 1955

Order: QUERCO-CEDRETALIA LIBANI Barbero, Loisel & Quézel 1974

Association: *Galio tenuissimi-Quercetum cerridis* Varol & Tatlı, *ass. nov.*

The main distribution area of *Fagus orientalis* is in the Black Sea region and it forms different associations in the region cited above (Akman, 1995). In southern regions, *Fagus orientalis* is found in the Amanus and east Taurus Mountains. *Fagus orientalis*, which exists at altitudes between 1000 and 1400 m in the Amanus Mountains is a member of the upper Mediterranean layer (Akman, 1973-1995). The associations of *Fagus orientalis* in the Amanus Mountains mostly contain characteristic species of the alliance *Ostryo-Quercion*, the orders *Rhododendro-Fagetalia*, *Fagetalia sylvaticae* and *Querco-Cedretalia libani*, and the class *Quercetea-Pubescentis*. The *Fagus orientalis* association in our research area contains fewer characteristic species of the order *Querco-Cedretalia libani* of the class *Quercetea-Pubescentis*. Therefore, this association is included in the syntaxa cited above. The association is not included in the alliances *Abieto-Cedrion libani* or *Cistion laurifoli* because these alliances are not well represented in the association. Syntaxonomical classification of the association is as follows:

Class: QUERCETEA-PUBESCENTIS Doingt Kraft 1955

Order: QUERCO-CEDRETALIA LIBANI Barbero, Loisel & Quézel 1974

Association: *Potentillo crantzii-Fagetum orientalis* Varol & Tatlı, *ass. nov.*

The *Galio-Quercetum pinnatiloba* association is characterized by *Quercus petrea* subsp. *pinnatiloba* and *Quercus libani*. Characteristic species of the class *Astragalo-Brometea*, which characterize a steppic area, are found in the association. Zohary evaluates this type of forest, which contains characteristic species of class

Astragalo-Brometea, as Irano-Turanian steppic forest and it is included in *Quercetea brantii* (Zohary, 1973). Zohary performed studies on the *Quercus forests* (*Q. brantii*, *Q. libani*, *Q. infectoria* subsp. *boissieri* and *Q. cerris*) which occur in the east and south-east region of Turkey. However, as Zohary did not present his findings in tables, it is not possible to compare our studies with Zohary's. In Kahramanmaraş province, *Quercus infectoria* and *Quercus cerris* mixed forests, which formed an association and subassociation, are included in the alliance *Geranio-Cedrion libani* of the order *Quercu-Cedretalia libani* of the class *Quercetea-Pubescentis* (Duman, 1995). The *Quercetum pinnatilobae* association, which is determined by us, only contains one species of the alliance *Geranio-Cedrion*. The association is not well represented at the alliance level. Therefore, this association is only included in the order *Quercu-Cedretalia libani* of the class *Quercetea-Pubescentis*. Syntaxonomical classification of the association is as follows:

Class: QUERCETEA-PUBESCENTIS Doingt Kraft 1955

Order: QUERCO-CEDRETALIA LIBANI Barbero, Loisel & Quézel 1974

Association: Galio ibicini-Quercetum pinnatilobae Varol & Tatlı, ass. nov.

Styrax officinalis, which is a member of maquis, is spread in the Marmara, Aegean, Mediterranean and some regions of inner Anatolia (Davis, 1965). In the middle Taurus, *Styrax officinalis* forms an association with *Genista unvolucrata* at altitudes between 900 and 1050 m and it is included in the order *Quercu-Cedretalia libani* of the class *Quercetea-Pubescentis* (Serin, 1990). It forms a subassociation, which is presented within *Astragalo-Quercetum cocciferae*, at altitudes between 1000 and 1100 m around Isparta and this subassociation is considered to be in the order *Quercetalia-Ilicis* of the class *Quercetea-Ilicis*. Moreover, *Styrax officinalis* associations, determined by Barbero-Akman (1978), Akman et al. (1978-1979) and Akman-Ekim (1988), are included in the order *Quercetalia-Pubescentis*, which belongs to the class *Quercetea-Pubescentis*. The *Lagoecio cuminoidis-Styracetum officinalii* association in our study area is not well represented at the level of alliance and it, for the present, should be considered to be in the order *Quercu-Cedretalia libani* of the class *Quercetea-Pubescentis*.

Syntaxonomical classification of the association is as follows:

Class: QUERCETEA-PUBESCENTIS Doingt Kraft 1955

Order: QUERCO- CEDRETALIA LIBANI Barbero, Loisel & Quézel 1974

Association: Lagoecio cuminoidis-Styracetum officinalii Varol & Tatlı, ass. nov.

Cedrus libani forests in Turkey are mostly scattered in the Taurus Mountain region (Davis, 1965). *Cedrus libani* forests in the Amanus Mountains occupy the southern slopes at altitudes between 1400 and 1800 m (Akman, 1973). It forms an association with the following: a-) *Pinus nigra*, which exists at altitudes between 1600 and 1800 m on the northern slopes of the Dedegöl Mountains (Serin, 1996), b-) *Abies cilicica* subsp. *cilicica*, which exists at altitudes between 1600 and 1800 m in Seydişehir (Ocakverdi, 1987), c-) *Abies cilicica* subsp. *isaurica*, which exists at altitudes between 1350 and 1550 m in Hadim and its surroundings. Furthermore, it forms pure association on limestone parent rock at altitudes between 1700 and 1750 m in the Taurus Mountains (Serin and Eyce, 1994). *Cedrus libani* forests in our study area, which has a less rainy and cool Mediterranean climate, forms an association with *Abies cilicica* subsp. *cilicica*, which exists at altitudes between 1450 and 1650 m. In terms of physiognomy, *Cedrus libani* forest is firstly categorized by Çetik (1976). It was included in the alliance *Abieto-Cedrion libani* of the order *Quercu-Cedretalia libani* of the class *Quercetea-Pubescentis* by Akman, Barbero and Quézel (1978). The *Thlaspo microstyli-Cedretum libani* association which is found in our study area contains characteristic species of same upper syntaxa category. Accordingly, this association is included in the syntaxa cited above. The syntaxonomical structure of the association is as follows:

Class: QUERCETEA-PUBESCENTIS Doingt Kraft 1955

Order: QUERCO- CEDRETALIA LIBANI Barbero, Loisel & Quézel 1974

Alliance: ABIETO-CEDRION LIBANI Barbero, Quézel & Akman 1978

Association: Thlaspio microstyli-Cedretum libani Varol & Tatlı, ass. nov.

Both the *Astragalo-Acantholimetum acerosi* and *Achillo-Micromerietum brachycalicii* associations contain characteristic species of the class *Astragalo-Brometea*. Therefore, these two associations were included in the class *Astragalo-Brometea*. After the vegetation structure of the high Mountain steppe areas in the east and south-east of Turkey is determined, new alliances and orders can be formed.

Syntaxonomical classifications of these associations are as follows:

Class: ASTRAGALO-BROMETEA Quezel 1973

Association: Astragalo cuspidipulati-Acantholimetum acerosi Varol & Tatlı, **ass. nov.**

Association: Achilleo grandifoliae-Micromerietum brachycalicii Varol & Tatlı, **ass. nov.**

Astragalus kurdicus, which is one of species characteristic of the *Phlomo-Astragaletum kurdicii* association, forms different associations with different species and in places which are close to our study area. Characteristic species of the class *Astragalo-Brometea*, besides the order *Quercu-Cedretalia libani*, are present in the association. This result shows us that this association has developed as a secondary association after the destruction of forest vegetation. The association is not represented at the level of alliance. However, it is

included in the order *Onobrychido armenae-Thymetalia leucostomi* of the class *Astragalo-Brometea*. Syntaxonomical classification of the association is as follows:

Class: ASTRAGALO-BROMETEA Quezel 1973

Order: ONOBRYCHIDO ARMENAE-THYMETALIA LEUCOSTOMI Akman, Ketenoğlu, Quézel & Demirörs 1984

Association: Phlomo linearis-Astragaletum kurdicii Varol & Tatlı, **ass. nov.**

As a result of this study, the following associations were found: one forest association belonging to the class *QERCETEA-ILICIS*, five forest associations and one shrub association belonging to the class *QUERCETEA-PUBESCENTIS*, and three steppe associations belonging to the class *ASTRAGALO-BROMETEA*.

We hope that this study will contribute to vegetational studies in Turkey.

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Appendix

Table 3. *Centaureo lycopifoliae-Pinetum brutiae* Varol & Tatlı, *ass. nova* *Type: Quadrat 51

Quadrat No	51	52	57	58	53	54	55	56	59	
Size of quadrat (m ²)	900	900	900	900	900	900	900	900	900	
Altitude (m) x10	101	95	65	60	95	85	75	75	105	
Exposure (°)	NW	N	W	W	NW	N	SW	N	N	
Inclination (°)	50	60	40	60	50	30	60	60	40	
Coverage total (%)	100	100	100	100	100	100	100	100	80	P
Coverage of trees (%)	100	90	90	100	70	50	90	90	60	R
Height of trees (m)	13	15	13	15	15	10	13	13	13	E
Coverage of shrubs (%)	60	40	60	60	30	70	50	70	40	S
Height of shrubs (m)	3	2	3	3	2.5	3	3	3	2.5	E
Coverage of herbs (%)	10	10	10	15	10	20	15	10	25	N
Height of herbs (cm)	15	70	20	60	40	40	20	40	40	C
Parent rock (Quartz-schist)	Q-S	Q-S	Q-S	Q-S	Q-S	Q-S	Q-S	Q-S	Q-S	E
Charasteristic species of association										
<i>Pinus brutia</i>	55	55	55	55	44	33	55	55	44	V
<i>Origanum laevigatum</i>	11	11	+2	+2	+1	+2	+2	+1	12	V
<i>Centaurea lycopifolia</i>	12	12	12	12	+2	.	12	12	12	V
<i>Asparagus palaestinus</i>	11	+1	+1	+1	.	+1	.	.	.	III
Characteristic species of <i>Quercion ilcis</i>										
<i>Quercus coccifera</i>	23	12	13	12	+2	12	.	.	.	IV
<i>Viola alba</i> subsp. <i>dehnhardtii</i>	+1	11	.	.	.	.	.	.	.	II
Characteristic species of <i>Quercetalia ilicis</i>										
<i>Ruscus aculeatus</i>	+2	+1	+1	+1	+2	.	+1	.	+2	IV
<i>Eryngium falcatum</i>	.	+1	.	.	.	+1	.	.	+1	II
<i>Cercis siliquastrum</i> subsp. <i>siliquastrum</i>	.	.	.	.	.	12	.	.	.	I
Characteristic species of <i>Quercetea ilicis</i>										
<i>Arbutus unedo</i>	12	12	22	23	13	13	+2	23	.	V
<i>Juniperus oxycedrus</i> subsp. <i>oxycedrus</i>	23	12	.	12	+2	12	.	13	+2	IV
<i>Pistacia terebinthus</i> subsp. <i>palaestina</i>	+2	12	22	12	.	.	23	.	22	IV
<i>Smilax aspera</i>	+2	.	+1	.	.	.	+1	+2	.	III
Characteristic species of <i>Quercetea-Pubescentis</i>										
<i>Quercus cerris</i>	23	+2	.	.	12	22	23	22	.	IV
<i>Styrax officinalis</i>	12	23	.	22	.	11	.	22	23	IV
<i>Fraxinus ornus</i> subsp. <i>cilicica</i>	.	+2	23	.	12	23	.	12	.	III
<i>Cephalanthera rubra</i>	+1	+1	.	.	11	.	+1	.	.	III
<i>Vicia cracca</i> subsp. <i>stenophylla</i>	.	+2	.	+1	12	.	.	.	22	III
<i>Ostrya carpinifolia</i>	.	.	+2	.	12	.	.	.	.	II
<i>Cotinus coggyria</i>	.	.	+2	.	.	.	.	+2	.	II
<i>Turritis laxa</i>	.	.	.	.	+1	.	.	.	.	I
Characteristic species of <i>Cisto-Micromerietea</i>										
<i>Cistus creticus</i>	.	.	.	.	.	+2	.	.	+2	II
<i>Calicotome villosa</i>	.	.	.	.	.	.	+1	.	.	I
<i>Hypericum olympicum</i>	.	.	.	.	.	.	.	.	+1	I
<i>Erica manipuliflora</i>	.	.	.	.	.	.	+2	.	.	I
Characteristic species of <i>Astragalo-Brometea</i>										
<i>Teucrium polium</i>	.	+1	.	.	.	.	+2	.	.	II
<i>Pilosella piloselloides</i>	.	.	.	.	.	.	.	.	+2	I
Companions										
<i>Milium pedicellare</i>	12	+2	+2	+2	.	.	+2	+2	+2	IV
<i>Dactylis glomerata</i>	+2	+1	.	+2	+1	.	+2	.	+2	IV
<i>Chrysopogon gryllus</i>	.	+2	+2	12	.	.	+2	+2	.	III
<i>Ştıpa bromoides</i>	12	+2	.	.	+2	+2	.	.	+2	III

The species of double frequency:

Bromus sterilis: + 1(53), 12 (59); *Catapodium rigidum* subsp. *rigidum* var. *rigidum*: +2 (53),+2 (54); *Coronilla emerus*: +1(57), +1(54); *Dorcynium hirsutum*: +1(52), 11(59); *Eremopoa capillaris*: +1(54), +2(59); *Phlomis viscosa*: +2(52), +2(55); *Rubus discolor*: +1(52), +1(54); *Torilis tenella*: +1(54), +1(59).

The species of single frequency:

Achillea grandifolia: 11(53); *Centaureum erythrae* subsp. *turcicum*: +1(54); *Clinopodium vulgare* subsp. *arundanum*: +2(54); *Crataegus meyeri*: +2(51); *Crucianella exasperata*: +1(54); *Cynosurus echinatus*: +2(54); *Dianthus balanse*: +2(59); *Galium incanum* subsp. *pseudocornigerum*: +2(59); *Galium tricornutum*: +1(52); *Myosotis alpestris* subsp. *alpestris*: +1(59); *Peucedanum depauperatum*: +1(55); *Phelypaea coccinea* +1(51); *Piptatherum coerulescens*: +2(53); *Poa bulbosa*: +2(59); *Stachys iberica* subsp. *stenostachya*: 12(58); *Thesium bergeri*: 11(59); *Trifolium campestre*: +1(54); *Trifolium canescens*: +2(59); *Trifolium echinatum*: +1(54); *Trifolium speciosum*: +1(59); *Salvia tomentosa*: +2(58); *Satujera cilicica*: 22(59); *Sedum caespitosum*: +1(54); *Vulpia myuros*: +1(54).

Table 4. *Dorcynio hirsuti*-*Populetum tremulae* Varol & Tatlı, *ass. nova* *Type: Quadrat 29

Quadrat No	28	29	30	40	41	
Size of quadrat (m ²)	400	400	400	400	400	
Altitude (m) x10	125	125	122	165	165	
Exposure (°)	N	NE	NE	N	N	
Inclination (°)	30	30	30	20	20	
Coverage total (%)	100	100	100	100	100	P
Coverage of trees (%)	85	100	100	100	100	R
Height of trees (m)	7	8	8	9	8	E
Coverage of shrubs (%)	5	10	5	—	5	S
Height of shrubs (m)	2	2.5	2	—	2	E
Coverage of herbs (%)	20	20	20	5	10	N
Height of herbs (cm)	70	60	70	30	25	C
Parent rock (Quartz-schist)	Q-S	Q-S	Q-S	Q-S	Q-S	E
Characteristic species of association						
<i>Populus tremula</i>	55	55	55	55	55	V
<i>Dorcynium hirsutum</i>	22	22	22	12	12	V
<i>Peltaria angustifolia</i>	11	+1	+1	.	.	III
Characteristic species of <i>Cisto laurifolii</i>-<i>Pinion pallasianae</i>						
<i>Pinus nigra</i>	+2	+2	+2	+2	.	IV
<i>Hypericum montbretii</i>	+2	+1	+1	.	.	III
Characteristic species of <i>Quercus cerridis</i>-<i>Carpinetalia orientalis</i>						
<i>Achillea grandifolia</i>	21	21	.	.	.	II
<i>Quercus cerris</i>	.	.	.	.	11	I
Characteristic species of <i>Quercetea pubescentis</i> and <i>Quercus cerridis</i>-<i>Cedretalia libani</i>						
<i>Vicia cracca</i> subsp. <i>stenophylla</i>	23	23	22	.	12	IV
<i>Quercus petraea</i> subsp. <i>pinnatifolia</i>	12	12	13	.	.	III
<i>Myosotis alpestris</i> subsp. <i>alpestris</i>	.	.	.	.	+2	I
<i>Lapsana communis</i> subsp. <i>intermedia</i>	.	+1	.	.	.	I
Characteristic species of <i>Quercetea ilicis</i>						
<i>Juniperus oxycedrus</i> subsp. <i>oxycedrus</i>	.	12	.	.	.	I
Characteristic species of <i>Astragalo</i>-<i>Brometea</i>						
<i>Helicrysum arenarium</i> subsp. <i>aucherii</i>	.	+1	+1	12	12	IV
<i>Cruciata taurica</i>	.	.	.	+1	11	II
<i>Pilosella piloselloides</i>	.	.	.	+1	+1	II
<i>Teucrium polium</i>	.	.	.	+2	.	I
<i>Erysimum smyrnaeum</i>	.	.	.	.	+1	I
Companions						
<i>Anthemis kotschyana</i> var. <i>discoidea</i>	.	+2	+2	+2	12	IV
<i>Eremopoa capillaris</i>	+1	+1	+1	.	.	III
<i>Dactylis glomerata</i>	+2	+2	+2	.	.	III
<i>Trifolium aintabense</i>	.	+2	+2	+1	.	III
<i>Silene caramanica</i>	12	+2	+2	.	.	III
<i>Potentilla thuringiaca</i>	.	.	.	+1	+2	II
<i>Poa bulbosa</i>	.	+2	+2	.	.	II
<i>Achillea setacea</i>	.	.	.	12	12	II
<i>Hypericum scabrum</i>	.	.	.	+1	+1	II
<i>Alyssum strictum</i>	.	.	+1	.	+1	II
<i>Veronica macrostachya</i> subsp. <i>mardinensis</i>	12	+2	.	.	.	II
<i>Ranunculus arvensis</i>	.	+1	+1	.	.	II
<i>Cephalanthera kotschyana</i>	.	+1	+1	.	.	II
<i>Scale anatolicum</i>	+2	+2	.	.	.	II
<i>Teucrium polium</i>	.	+2	.	+1	.	II

The species of single frequency:

Allium pallens: +1(29); *Arrhenatherum elatius*: 12(30); *Bromus japonicus*: +2(30); *Dianthus calocephalus*: +2(30); *Elymus panormitanus*: +2(30); *Epilobium minutiflorum*: +1(41); *Galium spurium* subsp. *ibicinum*: +1(29); *Grammosciadium daucoides*: +1(30); *Petrorrhagia alpina* subsp. *olympica*: +1(40); *Potentilla calycina*: +2(41); *Thlaspi microstylum*: +1(41); *Thymus kotschyanus* var. *glabrescens*: +2(40); *Trogopogon longirostis* var. *longirostis*: +1(30); *Turrutis glabra*: +1(30); *Verbascum infidelium*: +1(41).

Table 5. *Galio tenuissimi-Quercetum cerridis* Varol & Tatli, *ass. nova* *Type: Quadrat 31

Quadrat No	31	50	33	34	35	37	49	36	32	
Size of quadrat (m ²)	400	400	400	400	400	400	400	400	400	
Altitude (m) x10	115	140	125	125	125	130	140	130	115	
Exposure (°)	NE	E	S	S	N	NW	S	SE	NW	
Inclination (°)	10	15	30	20	15	10	30	20	30	
Coverage total (%)	90	80	100	100	100	100	100	100	100	P
Coverage of trees (%)	70	70	70	70	60	70	70	70	70	R
Height of trees (m)	6	3	5	5	4	6	3	6	6	E
Coverage of shrubs (%)	20	10	20	25	20	—	10	30	15	S
Height of shrubs (m)	2	2	2.5	2	2	2	2	2	2	E
Coverage of herbs (%)	15	30	30	30	30	30	20	25	20	N
Height of herbs (cm)	20	20	30	30	20	25	20	20	30	C
Parent rock (Diabase)	Di.	Di.	Di.	Di.	Di.	Di.	Di.	Di.	Di.	E
Characteristic species of association										
<i>Quercus cerris</i> var. <i>cerris</i>	44	44	44	44	44	44	44	44	44	V
<i>Galium tenuissimum</i> subsp. <i>tenuissimum</i>	+1	+1	+1	+1	.	+1	+1	.	.	IV
<i>Allium wendelboanum</i>	+1	+1	.	.	+1	.	.	.	.	II
Characteristic species of <i>Quercus-Cedretalia libani</i>										
<i>Vicia cracca</i> subsp. <i>stenophylla</i>	+2	.	23	23	22	22	22	.	12	V
<i>Cerastium brachypetalum</i> subsp. <i>roeseri</i>	11	.	+1	+1	.	+1	+1	.	.	III
<i>Lecokia cretica</i>	.	.	.	.	.	.	.	+1	.	I
Characteristic species of <i>Quercetea pubescentis</i> and <i>Quercus-Carpinetalia orientalis</i>										
<i>Sytrax officinalis</i>	22	.	22	22	22	.	.	22	22	IV
<i>Achillea grandifolia</i>	11	.	12	.	.	.	.	.	22	II
<i>Ostrya carpinifolia</i>	.	.	.	.	.	.	22	.	.	I
Characteristic species of <i>Quercetea ilicis</i>										
<i>Juniperus oxycedrus</i> subsp. <i>oxycedrus</i>	.	11	.	12	+2	.	.	22	.	III
<i>Anarrhinum orientale</i>	.	.	.	+2	.	.	.	.	.	I
Characteristic species of <i>Astragalo-Brometea</i>										
<i>Helichrysum arenarium</i> subsp. <i>aucheri</i>	.	22	+2	+1	12	+2	+1	+2	+2	V
<i>Teucrium polium</i>	+2	22	+2	.	12	.	.	12	+2	IV
<i>Cruciata taurica</i>	.	+1	.	.	+2	.	+1	.	+1	III
<i>Erysimum smyrnaeum</i>	.	.	+1	.	.	.	.	+1	.	II
<i>Pilosella piloselloides</i>	.	+1	.	.	.	.	.	.	+1	II
<i>Helichrysum plicatum</i> subsp. <i>plicatum</i>	.	.	.	.	+2	.	.	.	.	I
<i>Stachys cretica</i>	.	.	+2	.	.	.	.	.	.	I
Companions										
<i>Trifolium arvense</i>	11	+1	+1	+1	+1	+1	+1	+1	+1	V
<i>Logfia arvensis</i>	11	+1	+1	+1	+1	+1	+1	11	+1	V
<i>Poa bulbosa</i>	12	12	12	+2	12	.	+2	12	.1	V
<i>Ziziphora capitata</i>	11	11	+1	+1	+	11	+1	.	+1	V
<i>Eremopoa capillaris</i>	+1	.	+1	+1	+1	+1	+1	+1	+1	V
<i>Asperula arvensis</i>	11	+1	+1	.	+1	.	+1	.	+1	IV
<i>Torilis leptophylla</i>	.	.	+1	+1	.	+1	+1	+1	+1	IV
<i>Rubus canescens</i>	.	+1	.	11	+2	12	+1	12	.	IV
<i>Veronica orientalis</i> subsp. <i>orientalis</i>	+1	+1	+1	+1	.	+1	+1	.	.	IV
<i>Crucianella angustifolia</i>	+1	+1	.	11	.	+1	.	+1	.	III
<i>Picnemon acarna</i>	.	.	11	+1	.	+1	+1	+1	.	III
<i>Achillea setacea</i>	.	.	.	22	22	21	.	22	.	III
<i>Hypericum scabrum</i>	.	.	.	+1	+1	+1	.	+1	.	III
<i>Cynosurus echinatus</i>	+1	+1	+1	.	.	.	.	+1	.	III
<i>Veronica balanse</i>	.	.	.	+1	+1	.	.	+1	+1	III
<i>Minuartia hybrida</i>	.	+1	+1	.	.	.	.	.	+1	II
<i>Alyssum strictum</i>	+1	+1	+1	.	.	.	.	.	.	II
<i>Ranunculus arvensis</i>	+1	.	.	.	.	+1	.	.	+1	II
<i>Bromus japonicus</i>	+2	.	.	.	.	+1	+2	.	.	II

The species of double frequency:

Coronilla orientalis: +1(33), +1(37); *Dianthus polycladus*: +2(49), +2(50); *Grammosciadum daucooides*: 11(31), +1(35); *Milium pedicellare*: +1(34), +1(50); *Potentilla pannosa*: +1(36), +1(50); *Rubus discolor*: +2(32), +2(33); *Trifolium campestre*: +1(31), +1(50); *Thlaspi microstylum*: +1(49), +1(50).

The species of single frequency:

Crataegus meyeri: +2(49); *Dorcynium hirsutum*: +1(49); *Galium spurium* subsp. *ibicinum*: +1(32); *Rumex acetocella*: +1(34); *Scutellaria rubicunda* subsp. *subvelutina*: +2(50); *Ventanata dubia*: 11(31); *Veronica macrostachya* subsp. *mardinensis*: 11(31).

Table 6. **Potentillo crantzii-Fagetum orientalis** Varol & Tatlı, **ass. nova** *Type: 39

Quadrat No	60	61	38	39	71	62	63	65	64	
Size of quadrat (m ²)	90	90	90	90	90	90	90	90	90	
Altitude (m) x10	160	160	150	150	150	165	155	155	160	
Exposure (°)	N	N	N	NE	N	NW	N	N	NW	P
Inclination (°)	20	20	40	50	30	40	30	25	20	R
Coverage total (%)	100	100	100	90	70	100	100	100	100	E
Coverage of trees (%)	90	90	90	100	100	90	100	100	100	S
Height of trees (m)	9	7	7	9	7	7	11	9	9	E
Coverage of herbs (%)	5	5	20	20	15	2	2	—	—	N
Height of herbs (cm)	15	10	20	20	20	15	15	15	—	C
Parent rock (Quartz-schist)	Q-S	Q-S	Q-S	Q-S	Q-S	Q-S	Q-S	Q-S	Q-S	E
Characteristic species of association										
<i>Fagus orientalis</i>	55	44	44	33	44	55	55	55	55	V
<i>Tanacetum parthenium</i>	11	+1	.	.	.	+1	+1	.	.	III
<i>Ostrya carpinifolia</i>	.	.	33	44	33	.	.	.	.	II
<i>Potentilla crantzii</i> var. <i>crantzii</i>	+1	+1	.	.	.	.	.	+1	.	II
Characteristic species of <i>Quercus-Cedretalia libani</i>										
<i>Turritia laxa</i>	+1	+1	+1	+1	.	+1	.	.	.	III
<i>Vicia cracca</i> subsp. <i>stenophylla</i>	.	+1	.	.	.	+1	.	.	.	II
<i>Populus tremula</i>	.	.	.	+2	.	.	12	.	.	II
<i>Lekocia cretia</i>	.	.	+1	.	.	.	.	.	.	I
<i>Cotoneaster nummularia</i>	.	.	.	.	.	.	.	+2	.	I
<i>Quercus petrea</i> subsp. <i>pinnatiloba</i>	.	.	.	.	+2	.	.	.	.	I
<i>Brunnera orientalis</i>	.	.	.	.	.	.	+1	.	.	I
Characteristic species of <i>Quercetea pubescentis</i>										
<i>Pinus nigra</i>	.	21	.	+2	21	.	+1	.	.	III
<i>Myosotis alpestris</i> subsp. <i>alpestris</i>	+1	+1	+1	+1	+1	.	.	.	.	III
<i>Quercus cerris</i> var. <i>cerris</i>	.	.	+2	+2	.	.	.	.	.	II
<i>Clinopodium vulgare</i>	.	.	12	+1	.	.	.	.	.	II
<i>Silene italica</i>	.	.	.	+1	.	.	.	.	.	I
Characteristic species of <i>Quercetea ilicis</i>										
<i>Juniperus oxycedrus</i> subsp. <i>oxycedrus</i>	.	+2	.	.	.	.	.	.	.	I
Characteristic species of <i>Astragalo-Brometea</i>										
<i>Helicrysum arenarium</i> subsp. <i>aucheri</i>	+1	+1	.	.	+2	.	.	.	.	II
<i>Asperula stricta</i>	.	.	.	.	+1	.	.	.	.	I
Companions										
<i>Galium heldreichii</i>	.	+2	+1	+1	+2	.	.	.	+1	III
<i>Sedum acre</i>	+2	.	+2	.	+2	.	11	.	+1	III
<i>Poa bulbosa</i>	+1	.	12	+2	.	+2	.	.	.	III
<i>Achillea setacea</i>	.	+2	22	22	.	.	.	.	+1	III
<i>Anthemis kotschyana</i> var. <i>discoidea</i>	.	.	+2	+2	+1	.	.	.	+2	III
<i>Tanacetum parthenium</i>	21	+1	.	.	.	+1	+1	.	.	III
<i>Ziziphora capitata</i>	.	.	+1	+1	11	.	.	.	.	II
<i>Dactylis glomerata</i>	.	.	+2	+2	+2	.	.	.	.	II
<i>Bromus japonicus</i>	.	+2	12	.	+2	.	.	.	.	II
<i>Poa angustifolia</i>	12	+2	.	.	12	.	.	.	.	II
<i>Dorcyinium hirsutum</i>	.	.	.	.	11	.	+1	.	.	II
<i>Hypericum scabrum</i>	.	.	12	22	.	.	.	.	.	II
<i>Logfia arvensis</i>	.	.	+1	+1	.	.	.	.	.	II
<i>Scutellaria salviifolia</i>	.	.	.	+2	+2	.	.	.	.	II
<i>Veronica macrostachya</i> subsp. <i>mardinensis</i>	+1	.	+1	.	.	.	.	.	.	II
<i>Petrorhagia alpina</i> subsp. <i>olympica</i>	+1	.	.	.	11	.	.	.	.	II
<i>Coronilla orientalis</i>	.	.	+1	+1	.	.	.	.	.	II
<i>Cephalanthera orientalis</i>	.	+1	.	.	.	.	11	.	.	II
<i>Vicia alpestris</i> subsp. <i>alpestris</i>	+1	+1	.	.	.	.	.	.	.	II

The species of single frequency:

Arabis caucasica: +2(39); *Asperula arvensis*: +1(38); *Convolvulus siculus*: +1(38); *Dianthus balanse*: +2(39); *Eremopoa capillaris*: +1(38); *Erysimum crassipes*: +2(38); *Mentha longifolia* subsp. *longifolia*: +1(71); *Minuartia meyeri*: +1(38); *Picnomon acarna*: +1(38); *Salvia tomentosa*: +2(39); *Scobiasa columbalaria* subsp. *columbalaria* var. *columbalaria*: 12(38); *Silene caramanica*: 12(71); *Silene vulgaris*: +2(61); *Sorbus umbellata* var. *umbellata*: +2(71); *Thlaspi microstylum*: +1(71).

Table 7. *Galio ibicini-Quercetum pinnatilobae* Varol & Tatlı, *ass. nova* *Type: Quadrat 20

Quadrat No	19	20	21	22	24	25	27	18	23	26	
Size of quadrat (m ²)	400	400	400	400	400	400	400	400	400	400	
Altitude (m) x10	110	110	110	115	127	127	120	105	120	125	
Exposure (°)	NW	N	N	NE	N	N	NE	NW	NW	NE	P
Inclination (°)	40	50	50	50	40	40	25	40	50	10	R
Coverage total (%)	100	100	100	100	90	70	100	80	90	90	E
Coverage of shrubs (%)	100	90	90	90	80	60	80	60	70	80	S
Height of shrubs (m)	3.5	4	2.5	2.5	2.5	2	2.5	2.5	3	2.5	E
Coverage of herbs (%)	30	15	20	20	50	50	20	60	20	15	N
Height of herbs (cm)	80	100	60	60	80	70	60	75	30	60	C
Parent rock (Quartz-schist)	Q-S	Q-S	Q-S	Q-S	Q-S	Q-S	Q-S	Q-S	Q-S	Q-S	E
Characteristic species of association											
<i>Quercus petrea</i> subsp. <i>pinnatiloba</i>	55	55	55	55	44	44	55	33	44	44	V
<i>Galium spurium</i> subsp. <i>ibicinum</i>	+1	21	+1	21	.	+1	+1	.	.	.	III
<i>Quercus libani</i>	23	+2	+2	+2	+2	+2	.	.	.	.	III
<i>Allium pallens</i>	+1	+1	.	.	+1	.	.	.	.	.	II
Characteristic species of <i>Quercus-Cedretalia libani</i>											
<i>Vicia cracca</i> subsp. <i>stenophylla</i>	12	13	12	22	23	.	23	22	23	13	V
<i>Quercus cerris</i> var. <i>cerris</i>	.	.	.	.	+2	.	.	13	.	23	II
<i>Cerastium brachypetalum</i> subsp. <i>roeseri</i>	.	.	+1	+1	.	.	.	11	.	.	II
<i>Bunium paucifolium</i> var. <i>junceum</i>	.	+1	.	.	.	.	.	.	.	.	I
<i>Lekocia cretica</i>	.	.	.	.	.	.	.	.	+1	.	I
<i>Ranunculus reuterianus</i>	.	.	.	.	.	.	.	+1	.	.	I
Characteristic species of <i>Quercetea pubescentis</i> and <i>Quercus cerridis-Carpinetalia orientalis</i>											
<i>Achillea grandifolia</i>	.	+1	11	11	.	.	.	.	11	.	II
<i>Sytrax officinalis</i>	+2	+2	.	.	.	.	.	12	.	.	II
<i>Hypericum montbretii</i>	.	.	.	.	+2	.	.	.	.	.	I
<i>Silene italica</i>	.	.	+1	.	.	.	.	.	.	.	I
Characteristic species of <i>Quercetea ilicis</i>											
<i>Juniperus oxycedrus</i> subsp. <i>oxycedrus</i>	.	+2	.	+2	+2	+2	.	+1	+2	.	III
<i>Anarrhinum orientale</i>	12	.	.	.	.	.	.	.	.	.	I
Characteristic species of Astragalo-Brometea											
<i>Teucrium polium</i>	12	12	.	+2	+2	12	.	12	+1	12	IV
<i>Helichrysum arenarium</i> subsp. <i>aucheri</i>	.	+2	+2	.	.	.	.	.	+1	.	II
<i>Erysimum smyrnaeum</i>	.	.	.	.	+1	+1	.	.	.	+1	II
<i>Cruciata taurica</i>	.	+1	.	.	.	.	.	.	.	.	I
Characteristic species of <i>Cisto-Micromerietea</i>											
<i>Trifolium arvense</i>	11	+1	.	12	+1	11	.	11	+1	+1	IV
<i>Trifolium cherleri</i>	.	.	.	.	.	+1	.	+1	.	.	I
Companions											
<i>Poa bulbosa</i>	12	12	12	12	13	22	12	22	+2	22	V
<i>Dactylis glomerata</i>	12	+2	12	.	+2	12	12	12	+2	12	V
<i>Ziziphora capitata</i>	11	11	.	+1	11	11	.	+1	+1	.	IV
<i>Eremopoa capillaris</i>	12	12	+2	+2	.	.	+1	11	+2	+1	IV
<i>Grammosciadum daucooides</i>	.	.	+1	+1	+1	+1	11	.	+1	11	IV
<i>Asperula arvensis</i>	+1	.	.	+1	+1	11	+1	+1	.	.	III
<i>Torilis leptophylla</i>	11	+1	.	.	+1	.	+1	11	.	+1	III
<i>Bromus sterilis</i>	+2	+2	.	+2	.	.	.	12	.	+2	III
<i>Taeniatherum caput-medusae</i> subsp. <i>crinitum</i>	12	.	.	.	12	12	.	12	.	12	III
<i>Scabiosa rotata</i>	11	+1	.	.	.	+1	.	+1	.	11	III
<i>Hypericum scabrum</i>	.	.	.	.	12	+2	.	+1	.	+2	II

Table 7 (continued)

<i>Logfia arvensis</i>	.	.	+1	.	+1	+1	.	+1	.	.	II
<i>Cynosurus echinatus</i>	12	.	.	.	12	12	.	+2	.	.	II
<i>Trifolium campestre</i>	+1	.	.	.	+1	+1	.	+1	.	.	II
<i>Milium pedicellare</i>	+2	.	.	.	+2	.	+1	+2	.	.	II
<i>Stipa bromoides</i>	+2	.	.	.	12	12	.	.	+2	.	II
<i>Alyssum strictum</i>	+1	+1	.	.	.	.	.	+1	.	12	II
<i>Crupina crupinastrum</i>	+1	.	.	+1	+1	+1	.	.	.	.	II
<i>Linaria sp.</i>	.	.	+2	+2	.	+2	.	.	+2	.	II

The species of triple frequency:

Centaurea aggregata subsp. *aggregata*: +1(22), +1(24), 12(25); *Crucianella angustifolia*: +1(24), +1(25), +1(26); *Dianthus polycladus*: +1(24), +1(25), +2(26); *Ranunculus arvensis*: 1(20), +1(25), +1(27); *Salvia tomentosa*: 12(18), 12(19), 12(20); *Silene caramanica*: +1(23), +2(26), +2(27); *Trifolium aintabense*: +1(19), +2(25), +2(26); *Trifolium purpureum* var. *laxiusculum*: +1(18), +1(19), +1(20); *Veronica balanse*: 11(18), +1(22), +1(26).

The species of double frequency:

Alcea digitata: +1(18), +1(19); *Anthemis kotschyana* var. *discoidea*: +2(21), 12(23); *Bromus japonicus*: +2(19), 12(25); *Cerastium dichotomum*: 12(24), 11(26); *Dianthus calocephalus*: +2(25), +2(26); *Fibigia macrocarpa*: +2(18), +2(19); *Papaver stylatum*: +1(18), +2(19); *Scutellaria rubicunda* subsp. *subvelutina*: +2(18), +2(20); *Thlaspi perfoliatum*: +1(18), +1(19).

The species of single frequency:

Arrhenatherum palaestinum: +1(19); *Bromus scoporius*: 12(18); *Bunium pauciflorum* var. *junceum*: +1(20); *Elymus panorminatus*: +2(26); *Helleborus vesicarius*: +2(14); *Hesperis aintabica*: +1(21); *Myosotis lazicus*: +1(22); *Potentilla calycina*: 11(27); *Rubus canescens*: 12(20); *Sedum caespitosum*: +1(18); *Verbascum macrosepalum*: +1(22); *Veronica macrostachya* subsp. *mardinensis*: +1(18).

Table 8. **Lagoecio cuminoidis-Styracetum officinalii** Varol & Tatli. *ass. nova* *Type 11

Quadrat No	10	11	15	14	16	12	13	17	
Size of quadrat (m ²)	400	400	400	400	400	400	400	400	
Altitude (m) x10	95	98	90	90	90	95	95	93	
Exposure (°)	SE	SE	S	SW	SE	SE	SE	S	P
Inclination (°)	20	20	-	5	5	20	15	25	R
Coverage total (%)	90	90	90	80	90	90	90	90	E
Coverage of shrubs (%)	70	70	60	70	70	70	70	70	S
Height of shrubs (m)	3	3	3	3	3	3	3	2.5	E
Coverage of herbs (%)	40	70	80	70	40	70	70	60	N
Height of herbs (cm)	100	120	130	130	90	100	100	90	C
Parent rock (Quartz-schist)	Q-S.	Q-S	Q-S	Q-S	Q-S	Q-S	Q-S	Q-S	E
Characteristic species of association									
<i>Sytrax officinalis</i>	44	44	33	44	44	44	44	44	V
<i>Asphodelus aestivus</i>	12	12	12	12	+2	12	12	.	V
<i>Trifolium pauciflorum</i>	+1	11	21	.	21	21	11	11	V
<i>Parentucellia latifolia</i> subsp. <i>flaviflora</i>	11	11	+1	.	11	11	11	+1	V
<i>Helianthemum ledifolium</i> var. <i>lasiocarpum</i>	+1	21	+1	+1	+1	+1	.	.	IV
<i>Lagoecia cuminoides</i>	11	11	21	11	11	.	11	.	IV
<i>Nigella unguicularis</i>	+1	+1	.	+1	.	.	.	.	II
Characteristic species of <i>Quercus-Cedretalia libani</i>									
<i>Quercus cerris</i> var. <i>cerris</i>	.	.	+1	.	+1	.	.	.	II
<i>Cerastium brachypetalum</i> subsp. <i>roeseri</i>	.	.	.	.	+1	.	.	+1	II
Characteristic species of <i>Quercetia ilicis</i>									
<i>Juniperus oxycedrus</i> subsp. <i>oxycedrus</i>	.	.	+1	.	+1	+1	.	.	II
<i>Pistacia terebinthus</i> subsp. <i>palaestina</i>	.	.	+1	.	.	.	.	.	I
Characteristic species of <i>Cisto-Micromerietea</i>									
<i>Trifolium arvense</i>	+1	+1	11	.	.	11	.	.	III
<i>Cistus creticus</i>	.	.	.	.	.	.	+2	.	I
<i>Micromeria myrtifolia</i>	+2	.	.	.	.	.	.	.	I
Companions									
<i>Logfia arvensis</i>	11	+1	11	11	12	+1	+1	11	V
<i>Dianthus polycladus</i>	+1	+1	11	+1	+1	+1	+1	+1	V
<i>Trifolium campestre</i>	11	21	21	21	11	21	21	.	V
<i>Teucrium polium</i>	.	12	12	12	12	+2	12	.	IV
<i>Poa bulbosa</i>	12	.	12	12	.	12	22	22	IV
<i>Ziziphora capitata</i>	+1	.	+1	+1	.	+1	11	+1	IV
<i>Bromus japonicus</i>	+1	+2	+1	.	+2	12	.	+2	IV
<i>Aegilops triuncialis</i>	+1	22	22	.	22	22	.	22	IV
<i>Crepis feotida</i> subsp. <i>rheoadifolia</i>	11	11	11	+1	11	.	11	.	IV
<i>Alyssum hirsutum</i> var. <i>hirsutum</i>	11	11	+1	+1	.	.	.	+1	IV
<i>Bromus sterilis</i>	.	.	22	12	.	22	12	22	IV
<i>Dactylis glomerata</i>	+2	.	+2	.	.	+2	+2	+2	IV
<i>Torilis leptophylla</i>	11	+1	.	.	.	11	+1	11	IV
<i>Cynosurus echinatus</i>	.	.	+1	+2	+1	+2	12	.	IV
<i>Trifolium purpureum</i> var. <i>laxiusculum</i>	+2	+1	.	.	11	+2	12	.	IV
<i>Minuartia hybrida</i>	+1	.	.	+1	.	+1	+1	+1	IV
<i>Euphorbia falcata</i> subsp. <i>falcata</i> var. <i>falcata</i>	+1	.	+1	+1	+1	.	+1	.	IV
<i>Helleborus vesicarius</i>	+2	+2	.	+2	+2	.	.	.	III
<i>Avena eriantha</i>	+2	+2	.	.	+2	.	.	+2	III
<i>Gundelia tournefortii</i> var. <i>armata</i>	+1	+2	.	.	.	+2	.	+2	III
<i>Trifolium aintabense</i>	.	+2	+1	.	.	.	12	+1	III
<i>Taeniatherum caput-medusae</i> subsp. <i>crinitum</i>	22	.	.	22	.	.	22	.	II
<i>Stipa bromoides</i>	+2	.	.	11	.	.	.	12	II
<i>Hordeum bulbosum</i>	.	22	.	.	.	22	22	.	II
<i>Bromus scoporius</i>	22	.	.	+2	+2	.	.	.	II
<i>Achillea biebersteinii</i>	+1	.	.	21	.	+1	.	.	II
<i>Galium cassium</i>	+1	.	.	+1	.	.	.	+1	II
<i>Phleum pratense</i>	+2	+2	.	.	.	.	.	+1	II

The species of double frequency: *Asperula arvensis*: +1(10), +1(12); *Eremopoa capillaris*: +1(13), +1(16); *Scabiosa rotata*: +1(12), +1(16); *Thlaspi perfoliatum*: +1(12), +1(13); *Valezia rigida*: +1(10), +1(13)

The species of single frequency: *Allium flavum* subsp. *tauricum* var. *tauricum*: +1(12); *Arum* sp.: +1(10); *Briza maxima*: +1(10); *Crataegus meyeri*: +2(11); *Crucianella exasperata*: +1(14); *Daucus guttatus*: +1(15); *Potentilla adscharica*: +1(13); *Rhagadiolus stellatus*: +1(10); *Sideritis syriaca* subsp. *nusariensis*: +1(11); *Turgenia latifolia*: +1(14); *Veronica balanse*: +1(12).

Table 9. *Thlaspio microstyli-Cedretum libani* Varol & Tatlı, ass. nova *Type: 72

Quadrat No	74	75	72	76	73	80	81	77	79	78	
Size of quadrat (m ²)	900	900	900	900	900	900	900	900	900	900	
Altitude (m) x10	160	160	145	165	145	160	160	160	165	165	
Exposure (°)	E	E	NW	N	NW	N	N	NE	N	N	
Inclination (°)	10	20	20	15	30	20	20	15	20	20	
Coverage total (%)	100	100	100	100	100	100	100	100	100	100	P
Coverage of trees (%)	90	90	90	90	90	90	100	90	90	90	R
Height of trees (m)	15	15	12	15	12	15	17	15	17	17	E
Coverage of shrubs (%)	—	—	20	—	20	20	15	—	—	—	S
Height of shrubs (m)	2.5	3	2	3	2	2	2	2	2	2	E
Coverage of herbs (%)	40	30	30	30	30	40	30	30	30	20	N
Height of herbs (cm)	100	120	100	30	110	90	70	90	50	130	C
Parent rock (Andesite)	And	And	And	And	And	And	And	And	And	And	E
Characteristic species of association											
<i>Cedrus libani</i>	34	34	44	34	44	55	44	55	44	55	V
<i>Abies cilicica</i> subsp. <i>cilicica</i>	34	34	34	44	34	23	34	+2	33	23	V
<i>Thlaspi microstylium</i>	11	11	11	11	12	+2	+1	+1	.	.	IV
<i>Pilosella xmacrotricha</i>	+1	+1	+1	11	+1	11	12	.	11	.	IV
<i>Rubus discolor</i>	23	22	11	+1	21	.	.	11	.	12	IV
<i>Potentilla detommasii</i>	+1	+1	+1	.	.	+1	+1	.	+1	11	IV
<i>Astragalus fraxinifolius</i>	12	+1	.	+1	.	+1	.	+1	+1	.	III
<i>Onosma sieheanum</i>	12	12	+2	+2	+2	.	.	.	.	.	III
Characteristic species of Abieto-Cedrion											
<i>Quercus petrea</i> subsp. <i>pinnatiloba</i>	.	.	22	.	22	22	22	.	.	.	II
<i>Brunnera orientalis</i>	+1	+1	.	.	.	.	.	.	.	+1	II
Characteristic species of Quercu-Cedretalia libani											
<i>Vicia cracca</i> subsp. <i>stenophylla</i>	23	33	12	12	+2	23	33	12	22	22	V
<i>Bunium pauciflorum</i> var. <i>junceum</i>	+1	+1	.	11	.	11	11	+1	11	+1	IV
<i>Pinus nigra</i>	.	.	+2	+2	+2	+2	23	.	.	.	III
<i>Ranunculus reuterianus</i>	.	.	+1	.	.	.	.	.	.	.	I
Characteristic species of Quercerteo pubescentis and Quercu-Carpinetalia orientalis											
<i>Myosotis alpestris</i> subsp. <i>alpestris</i>	+1	11	.	+1	.	12	11	+1	+1	+1	IV
<i>Lapsana communis</i> subsp. <i>intermedia</i>	.	.	.	.	+1	.	.	.	.	.	I
<i>Coronilla emerus</i> subsp. <i>emeroides</i>	.	.	+2	.	.	.	.	.	.	.	I
Characteristic species of Astragalo-Brometea											
<i>Cruciata taurica</i>	+2	12	12	.	12	+2	.	12	+1	+1	IV
<i>Helichrysum arenarium</i> subsp. <i>aucheri</i>	+2	12	+1	+2	.	.	+2	.	.	.	III
<i>Teucrium polium</i>	.	.	+2	.	.	.	.	+2	.	.	I
<i>Bromus cappadocicus</i>	.	.	.	.	.	.	.	.	12	.	I
Companions											
<i>Achillea setacea</i>	12	12	.	+2	+2	12	22	22	22	+2	V
<i>Hypericum scabrum</i>	+2	+2	+2	.	12	+2	+2	+2	+2	+1	V
<i>Poa bulbosa</i>	12	12	22	+2	22	12	.	12	12	12	V
<i>Ziziphora capitata</i>	11	11	21	.	11	11	11	.	+1	11	IV
<i>Bunium pauciflorum</i> var. <i>junceum</i>	+1	+1	.	11	.	11	11	+1	11	+1	IV
<i>Rumex acetosella</i>	11	11	+1	.	.	12	+1	.	11	.	III
<i>Micromeria fruticosa</i>	.	+2	.	.	12	.	+1	22	.	+2	III
<i>Milium pedicellare</i>	.	.	.	+1	+1	.	.	+1	+2	+1	III
<i>Petrorhagia alpina</i> subsp. <i>olympica</i>	.	+1	.	+1	.	11	11	.	+1	.	III
<i>Galium heldreichii</i>	.	12	.	.	.	+1	.	.	+2	+1	III

Table 9 (continued)

<i>Veronica balanse</i>	.	.	+1	.	11	.	.	.	+1	+1	II
<i>Erysimum crassipes</i>	.	.	+1	+1	+1	+1	.	.	.	.	II
<i>Rosa canina</i>	.	+1	.	.	.	+2	.	+1	.	23	II
<i>Senecio doriiformis</i> subsp. <i>orientalis</i>	.	.	.	.	.	+1	.	22	22	23	II
<i>Anthemis kotschyana</i> var. <i>discoidea</i>	.	12	.	+2	.	.	+2	.	.	.	II
<i>Cerastium dichotomum</i>	.	.	11	.	.	.	.	+1	.	+1	II
<i>Arrhenatherum elatius</i>	.	+2	12	.	.	+2	.	.	.	.	II
<i>Ajuga orientalis</i>	+2	.	.	.	+1	.	.	+1	.	.	II
<i>Linaria genistifolia</i> subsp. <i>linifolia</i>	+2	.	.	.	+2	.	.	+2	.	.	II
<i>Epilobium minutiflorum</i>	.	11	.	.	11	.	.	+1	.	.	II
<i>Verbascum teneu</i>	.	.	.	+1	+1	.	.	+1	.	.	II

The species of double frequency:

Ajuga relict: 33 (74), 12(75); *Alyssum strictum*: +1(72), 11(73); *Artemisia absinthium*: 22(77), 22(78); *Astragalus amblelepis*: +2(72), +1(77); *Bromus japonicus*: 12(73), +2(76); *Cynosurus echinatus*: +1(72), +2(73); *Dianthus polycladus*: 12(72), +1(73); *Dorcynium hirsutum*: +1(75), +1(78); *Minuartia meyeri*: +1(77), +1(79); *Nepeta cilicica*: 11(78), +2(79); *Potentilla calycina*: +2(72), +2(75); *Rumex nepalensis*: +1(77), +1(78); *Salvia tomentosa*: +2(72), +2(73); *Scutellaria salviifolia*: +1(77), +1(79); *Sedum acre*: 12(74), 12(76); *Torilis leptophylla*: +1(72), 11(73); *Veronica orientalis* subsp. *orientalis*: +2(80), +1(81).

The species of single frequency:

Achillea biebersteinii: 12(77); *Allium frigidum*: +1(81); *Anarrhinum orientale*: +2(72); *Arenaria leptoclados*: +2(77); *Asperula arvensis*: 11(73); *Bromus scoparius*: +2(78); *Bromus sterilis*: +2(73); *Crupina crupinastrum*: 11(73); *Dactylis glomerata*: +2(72); *Dianthus balanse*: +2(75); *Euphorbia macrocarpa*: 12(75); *Erysimum diffusum*: +1(77); *Logfia arvensis*: +1(73); *Minuartia hybrida*: +2(78); *Potentilla thuringiaca*: 11(76); *Scale anaticum*: +2(78); *Stellaria media* subsp. *pallida*: +1(77); *Sympyrum barchycalyx*: +1(76); *Taeniatherum caput-medusae* subsp. *crinitum*: +2(73); *Thymus kotschyanus* var. *glabrescens*: 23(78).

Table 10. *Astragalo cuspidulati-Acantholimetum acerosi* Varol, Tatli, ass. nova *Type: 67

Quadrat No	66	67	68	69	
Size of quadrat (m ²)	50	50	50	50	P
Altitude (m) x10	165	165	165	165	R
Exposure (°)	NE	NW	NW	S	E
Inclination (°)	10	10	10	10	S
Coverage total (%)	90	90	100	100	E
Coverage of herbs (%)	90	90	100	100	N
Height of herbs (cm)	20	20	20	20	C
Parent rock (Quartz-schist)	Q-S	Q-S	Q-S	Q-S	E
Characteristic species of association					
<i>Acantholimon acerosum</i> var. <i>acerosum</i>	33	33	33	33	V
<i>Astragalus cuspidulatus</i>	12	22	23	13	V
<i>Veronica macrostachya</i> var. <i>macrostachya</i>	11	11	11	+1	V
<i>Asperula stricta</i>	12	+1	+2	+2	V
<i>Arenaria drypidea</i>	12	12	12	.	IV
<i>Allium brevicaule</i>	+1	+1	.	.	III
Characteristic species of <i>Astragalo-Brometea</i>					
<i>Teucrium polium</i>	12	12	22	23	V
<i>Helichrysum plicatum</i> subsp. <i>plicatum</i>	12	11	+2	.	IV
<i>Pilosella piloselloides</i>	+1	+1	.	.	III
<i>Teucrium chamaedrys</i> subsp. <i>lydium</i>	.	12	+2	.	III
Companions					
<i>Achillea setacea</i>	12	12	22	23	V
<i>Thymus kotschyanus</i> var. <i>glabrescens</i>	43	43	44	44	V
<i>Poa bulbosa</i>	+2	+2	.	+2	IV
<i>Hypericum scabrum</i>	+1	+1	.	+2	IV
<i>Grammosciadum daucooides</i>	+1	11	11	.	IV
<i>Leontodon crispus</i> subsp. <i>asper</i> var. <i>asper</i>	.	+1	+1	.	III
<i>Galium spurium</i> subsp. <i>ibicinum</i>	+1	.	.	.	I
<i>Potentilla thuringiaca</i>	.	.	+1	.	I
<i>Torilis leptophylla</i>	+1	.	.	.	I
<i>Alyssum strictum</i>	.	.	+1	.	I
<i>Scutellaria salviifolia</i>	.	.	+1	.	I
<i>Sedum acre</i>	.	+2	.	.	I
<i>Onosma trepezunteum</i>	+2	.	.	.	I
<i>Sanguisorba minor</i> subsp. <i>lasiocarpa</i>	+1	.	.	.	I
<i>Marrubium globosum</i> subsp. <i>globosum</i>	.	.	.	12	I

Table 11. *Phlomo lineari-Astragaletum kurdicii* Varol & Tatli, *ass. nova* *Type: 87

Quadrat No	82	85	87	93	83	86	90	91	84	89	92	88	
Size of quadrat (m ²)	100	100	100	100	100	100	100	100	100	100	100	100	P
Altitude (m) x10	205	205	205	200	205	205	199	199	205	200	199	200	R
Exposure (°)	N	NW	NW	W	N	S	NE	W	NW	N	NW	N	E
Inclination (°)	30	20	15	15	30	30	10	20	20	15	15	10	S
Coverage total (%)	80	90	95	80	80	90	70	95	80	90	70	80	E
Coverage of herbs (%)	80	90	95	80	80	90	70	95	80	90	70	80	N
Height of herbs (cm)	30	30	30	30	30	40	10	20	30	30	30	30	C
Parent rock (Quartz-schist)	Q-S	Q-S	Q-S	Q-S	Q-S	Q-S	Q-S	Q-S	Q-S	Q-S	Q-S	Q-S	E
Characteristic species of association													
<i>Astragalus kurdicus</i> var. <i>kurdicus</i>	33	34	23	33	32	33	34	33	34	34	32	34	V
<i>Phlomis linearis</i>	23	34	34	12	22	33	+2	33	22	22	22	22	V
<i>Marrubium globosum</i> var. <i>globosum</i>	33	22	23	33	33	+2	+2	22	33	+2	32	22	V
<i>Thymus kotschyanus</i> var. <i>glabrescens</i>	12	22	22	22	22	22	33	22	12	22	22	33	V
<i>Thymus kotschyanus</i> var. <i>eriphorus</i>	12	12	.	.	12	.	.	.	12	12	12	22	III
<i>Thymus kotschyanus</i> var. <i>kotschyanus</i>	22	22	+2	.	12	22	.	.	12	.	.	.	III
<i>Allium frigidum</i>	+1	+1	.	+1	+1	.	+1	.	.	.	.	.	III
<i>Thlaspi densiflorum</i>	+1	+1	+1	+1	.	.	.	+1	.	.	.	.	III
<i>Scorzonera lasiocarpa</i>	+1	+1	+1	.	.	+1	.	.	.	.	.	.	II
Characteristic species of													
<i>Onobrychido armeni-Thymetalia leucostomi</i>													
<i>Cerasus prostrata</i> subsp. <i>prostrata</i>	12	.	+2	.	+2	12	.	+2	12	.	+2	.	III
<i>Bromus cappodocicus</i>	12	.	.	.	+2	.	12	.	.	+2	.	12	III
<i>Noaea mucronata</i>	.	.	.	.	.	+2	+2	.	.	.	+2	.	II
Characteristic species of Astragalo-Brometea													
<i>Acantholimon acerosum</i> var. <i>acerosum</i>	23	22	34	33	32	34	33	33	34	33	33	12	V
<i>Helicrhysum plicatum</i> subsp. <i>plicatum</i>	+2	+2	12	12	.	12	12	12	+2	12	12	12	V
<i>Teucrium polium</i>	.	.	+2	22	.	.	12	+2	.	.	+2	.	III
<i>Campanula stricta</i>	.	.	.	.	.	.	+1	+1	.	+1	.	.	II
<i>Cruciata taurica</i>	.	.	.	.	+1	.	.	.	.	.	+1	.	I
<i>Pilosella hoppeana</i> subsp. <i>troica</i>	.	.	.	.	.	.	.	.	.	22	.	+1	I
Characteristic species of													
<i>Quercu-Cedretalia libani</i>													
<i>Myosotis alpestris</i> subsp. <i>alpestris</i>	+1	+1	.	+1	+1	+1	.	.	+1	.	+1	.	III
<i>Cerastium brachypetalum</i> subsp. <i>roeseri</i>	+1	.	.	+1	.	+1	.	.	.	.	+1	.	II
<i>Geranium tuberosum</i>	.	.	+1	+1	.	+1	.	.	.	.	.	.	II
<i>Crataegus orientalis</i>	.	.	.	.	.	+2	+2	.	.	.	+2	.	II
Companions													
<i>Achillea setacea</i>	12	+2	12	12	+2	12	+2	12	+2	12	12	12	V
<i>Veronica macrostachya</i> var. <i>macrostachya</i>	+1	+1	+1	+2	+1	.	+1	11	+1	+1	+1	+1	V
<i>Alepecurus gerardii</i>	+2	+2	.	12	+2	.	12	12	.	12	.	12	IV
<i>Sideritis syriaca</i> subsp. <i>mersinaea</i>	23	22	.	12	23	12	.	12	.	22	12	.	IV
<i>Silene arguta</i>	+1	11	.	+1	.	.	12	+2	.	12	.	+1	III
<i>Galium heldreichii</i>	+1	+1	.	+1	+1	.	+1	+1	.	.	.	.	III
<i>Gundelia tournefortii</i> var. <i>armata</i>	+2	.	+2	.	.	+2	.	+2	+2	.	+1	.	III
<i>Alyssum minus</i> var. <i>minus</i>	+1	+1	+1	+1	+1	.	.	.	.	.	+1	.	III
<i>Alyssum filiforme</i>	.	.	.	+2	.	.	12	+2	.	+1	+1	11	III
<i>Minuartia hybrida</i>	+1	.	.	+2	.	.	12	+2	.	.	12	.	III
<i>Scutellaria salviifolia</i>	.	.	+2	+2	+1	.	.	.	.	12	.	+2	III
<i>Poa bulbosa</i>	.	.	.	+2	.	+2	+2	+2	.	.	.	.	III
<i>Rosa pulverulenta</i>	+1	.	.	.	.	.	12	+1	.	.	.	+2	II
<i>Anthemis kotschyana</i> var. <i>discoidea</i>	+1	.	.	.	+1	.	.	+2	.	.	.	.	II

The species of double frequency:

Minuartia recurva subsp. *oreina*: 12(88), 12(89); *Peucedanum depauperatum*: 11(82), +2(87); *Rumex acetosella*: +1(88), +1(90); *Thesium billardieri*: +1(84), +1(87); *Ziziphora capitata*: 11(82), +1(93); *Asperula sitricta*: +1(89), 12(88).

The species of single frequency:

Allium guttatum subsp. *sardoum*: +1(92); *Bromus japonicus*: 12(93); *Leontodon crispus* subsp. *asper* var. *asper*: +1(87); *Minuartia leucocephaloides*: +2(83); *Scabiosa columbaria* subsp. *columbaria* var. *columbaria*: +2(90); *Stipa ehrenbergiana*: +2(84); *Verbascum cheiranthifolium* var. *obtusiusculum*: +1(93).

Table 12. *Achilleo grandifoliae-Micromerietum brachycalicii* Varol & Tatlı, *ass. nova* *Type 47

Quadrat No	46	47	42	43	44	45	48	
Size of quadrat (m ²)	100	100	100	100	100	100	100	
Altitude (m) x10	160	165	160	160	160	160	165	
Exposure (°)	S	S	SE	NE	E	S	S	P
Inclination (°)	20	30	15	15	15	15	30	R
Coverage total (%)	90	90	90	90	90	95	90	E
Coverage of shrubs (%)	-	-	5	-	5	5	-	S
Height of shrubs (m)	-	-	2	-	0.4	2	-	E
Coverage of herbs (%)	90	90	90	90	90	90	90	N
Height of herbs (cm)	30	30	30	30	30	30	30	C
Parent rock (Quartz-schist)	Q-S	Q-S	Q-S	Q-S	Q-S	Q-S	Q-S	E
Characteristic species of association								
<i>Micromeria fruticosa</i> subsp. <i>brachycalyx</i>	44	44	44	44	44	44	44	V
<i>Achillea grandifolia</i>	22	22	22	22	22	22	22	V
<i>Potentilla thuringiaca</i>	+1	+1	12	12	+1	+1	+1	V
<i>Anarrhinum orientale</i>	12	+2	+2	.	+2	12	+2	V
<i>Scrophularia xanthoglossa</i> var. <i>decipiens</i>	+2	+2	.	+2	.	.	.	III
Characteristic species of <i>Astragalo-Brometea</i>								
<i>Helichrysum arenarium</i> subsp. <i>aucheri</i>	+2	+2	23	23	.	12	22	V
<i>Erysimum smyrnaeum</i>	+1	+1	+1	+1	+1	.	.	IV
<i>Cruciata taurica</i>	+1	+1	+1	.	+1	+1	.	IV
<i>Acantholimon acerosum</i> var. <i>acerosum</i>	+2	+2	.	.	.	.	.	II
<i>Teucrium polium</i>	.	.	.	.	+2	+2	.	II
<i>Pilosella piloselloides</i>	.	+2	.	.	.	.	.	I
<i>Teucrium chamaedrys</i>	.	.	.	+1	.	.	.	I
Characteristic species of <i>Quercetea pubescentis</i>								
<i>Vicia cracca</i> subsp. <i>stenophylla</i>	.	+1	.	.	.	+2	.	II
<i>Cotoneaster nummularia</i>	.	.	.	.	+2	.	.	I
<i>Cedrus libani</i>	.	.	+2	.	.	.	.	I
Companions								
<i>Hypericum scabrum</i>	+1	+1	+1	+1	+1	.	11	V
<i>Rumex acetosella</i>	+1	.	+1	+1	+1	+1	+1	V
<i>Bromus japonicus</i>	+1	+1	+1	.	.	+1	+1	IV
<i>Helleborus vesicarius</i>	+2	.	.	12	.	+2	+2	III
<i>Poa bulbosa</i>	.	+1	.	.	+1	+1	+1	III
<i>Veronica macrostachya</i> subsp. <i>mardinensis</i>	.	.	+1	.	+1	+1	.	III
<i>Galium spurium</i> subsp. <i>ibicinum</i>	.	.	.	+1	.	.	+1	II
<i>Trifolium arvense</i>	.	.	.	.	.	+1	+1	II
<i>Juniperus oxycedrus</i> subsp. <i>oxycedrus</i>	.	.	.	.	+2	+2	.	II
<i>Alyssum strictum</i>	.	.	.	.	.	+1	.	I
<i>Scutellaria Salviifolia</i>	.	+1	.	.	.	.	.	I
<i>Crataegus meyeri</i>	.	.	.	.	.	+2	.	I
<i>Leontodon crispus</i> subsp. <i>asper</i> var. <i>asper</i>	.	.	.	.	.	.	+1	I
<i>Achillea coarctata</i>	.	.	.	.	.	+1	.	I
<i>Galium tenuissimum</i>	.	.	.	.	.	+1	.	I
<i>Torilis leptophylla</i>	.	.	.	.	.	+1	.	I