

Phytosociological structure of Nemrut Mountain (Adiyaman/Turkey)

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Abstract: This investigation was carried out between 1996 and 2001 in order to research the vegetation of Nemrut Mountain, one of the most important national historical park of Anatolia, on the south-east Taurus (Adiyaman-Turkey). Vegetation studies have been carried out according to the Braun-Blanquet's method. In this study we determined 7 plant associations, 3 sub associations, and 1 plant community, all of which are syntaxa new to science, in 4 different vegetation types.

Associations and its higher units are as follows:

Quercetea ilicis Br.-Bl. 1947

Qercetalia ilicis Br.-Bl. 1947

Quercion calliprini Zohary 1962

1. *Pistacio khynjuki-Cotinetum coggyriae* ass. nova

Quercetea pubescentis Doingt, Kraft 1955

Quercu-Cedretalia libani Barbero, Loisel & Quézel 1974

2. *Astragalo lamarckii-Quercetum brantii* ass. nova

Quercu-Carpinetalia orientalis Akman, Barbero et Quézel 1980

Quercion frainetto Horvat 1954

3. *Lonicero ibericae-Aceretum cinerascentis* ass. nova

Astragalo-Brometea Quézel 1973

4. *Astragalo compacti-Amygdaletum arabicae* ass. nova

5. *Helichryso aucheri-Thymetum kotschyani* ass. nova

a-) *genisto-acantholimetosum acerosi* subass. nova

b-) *putorio-tanacetetosum amanii* subass. nova

c-) *helichryso-tanacetetosum argentei* subass. nova

6. *Verbasco diversifoliae-Astragaletum cephalotis* ass. nova

7. *Phlomido capitatae-Thymetum migrici* ass. nova

8. *Centranthus longiflorus* community

Key words: East-Mediterranean, Nemrut Mountain, historical-national park, syntaxonomy, vegetation

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Nemrut Dağının (Adıyaman/Türkiye) fitososyolojik yapısı

Özet: Bu araştırma, Güneydoğu Toroslar üzerinde bulunan (Adıyaman-Türkiye) Anadolu'nun en önemli tarihi milli parklarından biri olan Nemrut Dağının fitososyolojik yapısının tespiti için 1996-2001 yılları arasında yürütülmüştür. Vegetasyon çalışmaları Braun-Blanquet metoduna göre yapılmıştır. Bu çalışmada dört farklı vegetasyon tipinde bilim dünyası için yeni olan 7 bitki birliği 3 alt birlik ve 1 bitki topluluğu tanımlanmıştır.

Birlikler ve bağlı oldukları üst kategoriler aşağıdaki gibidir:

Quercetea ilicis Br.-Bl. 1947

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Quercion calliprini Zohary 1962

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Quercion frainetto Horvat 1954

3. *Lonicero ibericae-Aceretum cinerascens* ass. nova

Astragalo-Brometea Quézel 1973

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c-) *helichryso-tanacetetosum argentei* subass. nova

6. *Verbasco diversifoliae-Astragaletum cephalotis* ass. nova

7. *Phlomido capitatae-Thymetum migrici* ass. nova

8. *Centranthus longiflorus* community

Anahtar sözcükler: Doğu Akdeniz, Nemrut dağı, tarihi-milli park, sintaksonomi, vegetasyon

Introduction

Vegetation studies were completed in the European countries, and vegetation maps were defined. In developing and underdeveloped countries, vegetation studies are carried out by scientists from developed countries. Vegetation studies in Turkey were carried out by French scientist Quezel, Barbero, and Gehu. Vegetation studies in Turkey started after 1970s by foreign scientists, and these studies have been carried on by Turkish scientists starting from 1980s. However, the local vegetation studies performed so far are not sufficient for constructing the vegetation map of Turkey. Vegetation map of Turkey can not be established before the local vegetation studies are completed. Knowing the present plant associations in the Nemrut Mountain, one of the most important national historical park of Turkey, is very important for the preparation of Turkish vegetation map.

Nemrut Mountain, selected as the study area, is located on south-east Mediterranean region (south-east

Taurus). Phytogeographically, it falls between the Mediterranean and Irano-Turanian floristic regions. The region was chosen because of the following reasons: a) There is no a phytosociological studies in this area, b) This region is close to a transitional area that is between the Mediterranean and Irano-Turanian phytogeographic regions, and it is close to the Anatolian Diagonal (Davis et al., 1971), and c) The Nemrut Mountain is one of the most important national historical parks of Anatolia. Prior to the present study, no phytosociological study was carried out in the area. However, there are some studies carried out by the other researchers in other parts of Anatolia. Those are studies of Akman (1973) and Quezel (1973) on Amanus mountains; Yurdakulol (1981) in Pos forests; Tatlı (1985) on Gavur mountain; Kılınç (1974) in Kırıkkale-Kalecik; Duman (1995) in Engizek mountain; Varol and Tatlı (2001) in Çimen mountain; Tatlı et al. (2005) in Gümüş mountain; Varol et al. (2006) in Başkonuş mountain; and Hamzaoğlu (2006) on the steppe communities of East Anatolia. The vegetation of the study area is

evaluated considering all the studies that were carried out before in this floristic region (Birand 1960; Quezel 1973; Yurdakulol 1981; Quezel et al. 1992).

Materials and methods

The vegetational studies have been carried out according to the Braun-Blanquet's method (Br.-Bl. 1932). The names of the taxa and their authors were checked and corrected (Davis 1965-1985; Davis et al. 1988; Güner et al. 2000; Özhatay et al. 2009). In this study, the climatic data of Adıyaman Meteorological station were used for obtaining detailed climatic knowledge (DMİ, 1974; 2000). The prevailing climate in the area is a light-rainy (W. Sp. A. Sm.) and mild-winter variant of the Mediterranean climate (Akman, 1982). Rainfall is least in summer; the precipitation regime is therefore; "Winter-Spring-Summer-Autumn". The climatic data are given in Tables 1a and 1b.

For the determination of the plant associations, sample plots were obtained from each plant formation, in sufficient numbers and suitable sizes. Thus, the floristic compositions of the associations, dominance, and constancy of the species were determined. In total, 71 sample plots were obtained, and 7 plant associations, 3 subassociations, and 1 plant community were distinguished by the analyses of these plots. The vegetational studies were carried

out according to the Braun-Blanquet's method (Br.-Bl., 1932). In order to compare associations, we used Sørensen's (1948) index of similarity. Some soil samples were taken from various sample plots representing different plant associations. These soil samples were analyzed by the Soil and Fertilizer Research Institute. The distributions of the associations in the investigation area, and their brief ecologies are given under the title of vegetation.

In this study, we aimed to determine the vegetation of Nemrut Mountain. The study area is within the boundary of Adıyaman (Turkey) city. It is in square C₇, according to the grid system of Davis P.H. (1965). It is surrounded by the Sincik district in the north-west, Tepehan and Pötürge (Malatya-Turkey) in the north, Kâhta district in the south, Gerger district in the east, and Çelikhan district in the west. Nemrut Mountain consists of the following major hills: Zülüktaş 2208 m, Gedik 1607 m, Gölberan 1567 m, and Kurreş 1400 m (Figure).

Results

Four different vegetation types are observed in the area: (a) the forest vegetation, (b) the shrub vegetation, (c) the steppe vegetation, and (d) rock vegetation. Associations and their higher syntaxa are as follows:

Table 1a. The average and extreme climatic values of Adıyaman (669 m).

Meteorological elements	Observation periods (years)	Months												Annual
		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XI	
Mean temp. (°C)	31	4.1	5.7	9.7	14.9	20.3	26.4	30.7	30.1	25.7	18.6	11.5	6.3	17.0
Max. Mean temp.	31	19.9	21.7	24.7	31.8	36.0	40.0	45.2	43.5	40.0	35.0	26.2	20.3	45.2
Min. Mean. temp.	31	-14.6	-10.0	-7.0	-2.0	6.0	10.6	16.7	15.8	10.2	2.2	-3.5	-6.4	-14.6
Total rainfall (mm)	66	162.0	113.1	107.7	73.4	46.0	6.3	1.4	0.7	3.2	33.6	79.2	139.6	771.2
Mean rel. humidity %	38	67	61	62	63	49	35	31	32	37	45	56	68	51

Table 1b. Seasonal distribution of rainfall.

Station	Observation period (years)	Spring		Summer		Autumn		Winter		Annual (mm)
		total (mm)	%	total (mm)	%	total (mm)	%	total (mm)	%	
Adıyaman 669 m	66	232.1	30.1	8.4	1.04	116	15.04	414.7	53.8	771.2

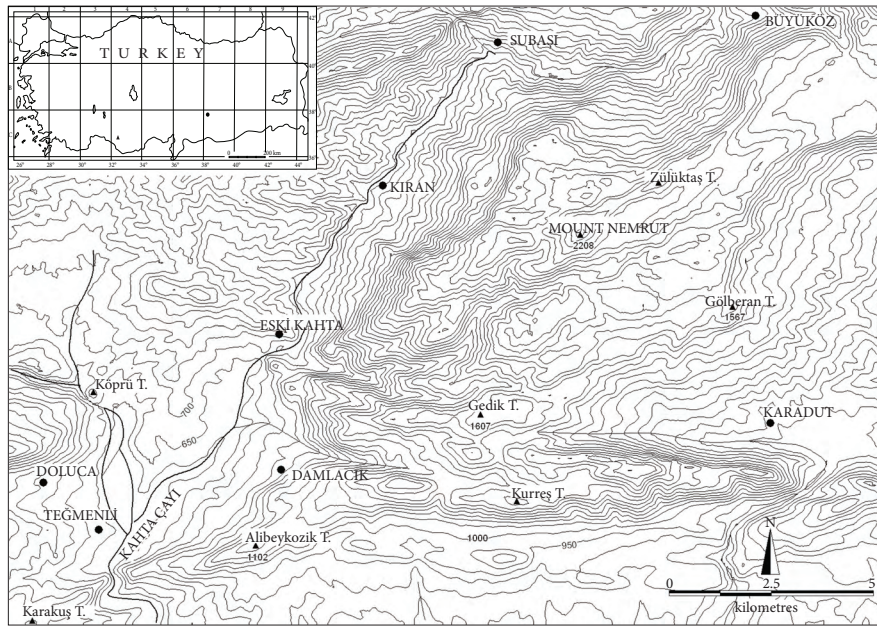


Figure. Map of the study area.

Associations of forest and shrub vegetation

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Querco-Carpinetalia orientalis Akman, Barbero et Quézel 1980

Quercion frainetto Horvat 1954

3. *Lonicero ibericae-Aceretum cinerascentis* ass. nova

Associations of steppe vegetation

Astragalo-Brometea Quézel 1973

4. *Astragalo compacti-Amygdaletum arabicae* ass. nova

5. *Helichryso aucheri- Thymetum kotschyani* ass. nova

a-) *genisto-acantholimetosum acerosi* subass. nova

b-) *putorio-tanacetetosum amanii* subass. nova

c-) *helichryso-tanacetetosum argentei* subass. nova

6. *Verbasco diversifoliae-Astragaletum cephalotis* ass. nova

7. *Phlomido capitatae-Thymetum migrici* ass. nova

Community of rock vegetation

8. *Centranthus longiflorus* community

Forest and shrub vegetation

The forest and shrub vegetation is represented by 3 plant associations in the study area. The forest vegetation in all parts of the area had been destroyed, and in some areas shrub and steppe vegetation replaced it.

1. *Pistacio khynjuki-Cotinetum coggyriae* Tel, Tatlı & Varol, ass. nova (Table 2).

This association occurs on the brown forest soil, which is formed by calcareous bedding rock. The soil of the association has a basic character pH 7.8, organic

matter of 3.65%. This association shows a 2-layered structure. The coverage of shrub layer is between 50%-90% and the height is 3 m. The coverage of herb layer is between 5%-70% and is 10–100 cm in height. The life forms of association are as follows: 39.1% of Hemicryptophyte, 32.7% of Phanerophyte 23.9% of Therophyte, and 4.3% of Chamaphyte.

The association is characterized by *Cotinus coggyria* Scop., *Nerium oleander* L., and *Pistacia khynjuk* Stocks. The association is described by 12 sample plots quadrats and cites as follows:

Table 2. Plant diversity in the *Pistacio khynjuki-Cotinetum coggyriae* Tel, Tatlı & Varol. *Typus: Quadrat 17

Quadrat no	15	16	17	18	19	20	21	22	23	24	25	26	
Area (m ²)×10	20	20	20	20	20	20	20	20	20	20	20	20	P
Altitude (m)×10	76	77	77	77	77	76	77	78	79	80	80	90	r
Exposure	N	NW	NW	N	N	W	W	W	W	W	W	NW	e
Inclination(°)	30	50	45	50	40	15	15	15	15	15	20	40	s
Tree cover (%)	-	-	-	-	-	-	-	-	-	-	-	-	e
Shrub cover (%)	50	50	60	50	70	60	90	70	70	60	80	90	n
Herb cover (%)	20	70	40	30	15	10	10	5	10	10	5	40	c
Parent rock				L	i	m	e	s	t	o	n	e	e
Characteristic species of association													
<i>Cotinus coggyria</i>	22	33	32	32	12	+2	.	+2	+2	+2	22	12	VI
<i>Nerium oleander</i>	12	.	+2	.	+2	33	44	33	33	33	.	.	IV
<i>Pistacia khynjuk</i>	.	12	12	+2	22	12	.	.	+2	+2	.	22	IV
Characteristic species of <i>Quercion calliprini</i>													
<i>Fontanesia philliraoides</i> subsp. <i>philliraoides</i>	12	.	22	+2	22	+2	22	12	22	12	22	33	V
Characteristic species of <i>Quercetalia(-etalia)-Ilicis</i>													
<i>Quercus infectoria</i> subsp.													
<i>boissieri</i>	+2	12	+2	22	12	.	12	12	+2	.	22	+2	V
<i>Jasminum fruticans</i>	+2	+2	+2	+2	.	.	.	.	.	+2	+2	+2	III
<i>Juniperus oxycedrus</i> subsp.													
<i>oxycedrus</i>	12	+2	+2	+2	+2	+2	.	.	.	.	+2	.	III
<i>Putoria calabrica</i>	.	.	.	.	.	.	+1	.	11	11	+1	+1	III
Characteristic species of <i>Astragalo-Brometea</i>													
<i>Teucrium polium</i>	.	.	.	.	.	+2	.	.	.	.	.	.	I
<i>Centaurea virgata</i>	.	.	.	.	.	+1	.	.	.	.	.	.	I
Companions													
<i>Aegilops cylindrica</i>	.	+1	11	.	11	11	11	.	+2	11	+1	11	IV
<i>Anthemis wiedemanniana</i>	.	+1	.	+1	+1	+1	.	.	+1	.	.	+1	III
<i>Bromus japonicus</i>	.	.	+1	+1	.	+1	+1	.	.	.	.	11	III
<i>Centaurea iberica</i>	.	.	.	.	.	+1	+1	+1	+1	+1	.	.	III
<i>Dactylis glomerata</i>	+1	+2	.	+2	+2	.	.	.	.	.	.	.	II
<i>Setaria verticillata</i>	11	11	11	11	.	+1	.	.	.	.	.	.	II
<i>Rubus sanctus</i>	.	.	.	.	.	+2	12	12	.	+2	.	.	II
<i>Salix triandra</i> subsp.													
<i>bornmuelleri</i>	.	.	.	.	.	12	22	+2	.	+2	.	.	II
<i>Tamarix smyrnensis</i>	.	.	.	.	.	+2	22	.	+2	+2	.	.	II
<i>Stipa bromoides</i>	+2	+2	.	+2	+2	.	.	.	.	.	.	.	II
<i>Prunus divericata</i>	+2	.	+2	.	.	.	.	.	.	+2	.	.	II
<i>Paliurus spina-christi</i>	.	.	+2	+2	.	.	.	+2	.	.	.	+2	II
<i>Lonicera etrusca</i>	.	+2	.	.	.	.	.	.	.	.	.	.	I
<i>Chardinia orientalis</i>	.	.	.	.	.	.	.	.	.	.	+1	.	I

Quadrat no: Locality

15-26: Around Damlacik village, 1. km north and slope of valley.

Holotypus: Table 2, quadrat no: 17.

2. *Astragalo lamarckii-Quercetum brantii* Tel, Tatlı & Varol, ass. nova (Table 3).

This association develops around Karadut locale, around Damlacik village, and in the Arsemia district, and occurs on the brown soils. The soils of the association have a slightly basic character pH 7.6. The association consists of 3 vertical layers: (a) tree layer: coverage 30%–40%, height 5–10 m; (b) small tree and shrub layer, coverage 40%–80%, height 3–4 m; (c) herb layer, coverage 5%–40%, height 5–80 cm.

The life forms of the total species recorded in the stands of the association are as follows: 39.2% of Hemicryptophyte, 24.1% of Therophyte, 17.7% of Chamaphyte, 16.4% of Phanerophyte, 1.3% of Geophyte, and 1.3% of Parazite.

Characteristic species of this association are *Quercus brantii* Lindley, *Fraxinus angustifolia* Vahl subsp. *angustifolia*, and *Astragalus lamarcki* Boiss. Among these species, *Astragalus lamarcki* is endemic.

The association is described with 14 quadrats. The records of quadrats are as follows:

Quadrat no: Locality

1-5: Karadut locale.

6-9: Around Damlacik village.

10-14: Arsemia locale.

Holotypus: Table 3, quadrat no: 12.

3. *Lonicero ibericae-Aceretum cinerascens* Tel, Tatlı & Varol, ass. nova (Table 4).

The association is found on the brown forest soil that is formed by calcareous bedding rock. The soil of the association have basic character (pH 7.3), organic matter of 4.63%. This association shows a 2-layered structure. The coverage of the shrub layer is between 30% and 50%, and the height is 3 m. The herb layer's coverage changes between 30% and 60%, and the height 10–75 cm. The life forms of association are as follows: 46.1% of Hemicryptophyte, 23.1% of Chamaphyte, 15.4% of Therophyte, 12.3% of Phanerophyte, and 3.1% of the Geophyte. The

association is characterized by *Lonicera iberica* Bieb., *Artemisia herba-alba* Asso and *Silene swertifolia* Boiss. All the quadrats of this association were taken from west slope of summit.

Holotypus: Table 4, quadrat no: 30.

Steppe vegetation

This vegetation is represented by 4 plant associations belonging to *Astragalo-Brometea* class.

4. *Astragalo compacti-Amygdaletum arabicae* Tel, Tatlı & Varol, ass. nova (Table 5).

This association occurs on the brown forest soils on the slopes from Eskikahta to Kıran village in a large field. These soils are of basic character (pH 8) and have 1.2% organic matter. This association has 2 layers, whose upper layer consists of shrubs. The coverage of this layer varies between 30% and 40%. The lower layer (herb) has coverage of 5%–15% and a height of 10–70 cm.

The life forms of the total species recorded in the stands of the association are as follows: 42.3% of Hemicryptophyte, 26.9% of Chamaphyte, 19.2% of Therophyte, and 11.6% of Phanerophyte. The following species characterize the association: *Amygdalus arabica* Oliv., *Amygdalus orientalis* Miller, and *Astragalus compactus* Lam.. Among these species, *Astragalus compactus* is endemic. All the quadrats of this association were taken from Eskikahta to Kıran village in fields.

Holotypus: Table 5, quadrat no: 39.

Table 5. Plant diversity in the *Astragalo compacti-Amygdaletum arabicae* Tel, Tatlı & Varol.

*Typus: Quadrat 39

5. *Helichryso aucheri-Thymetum kotschyani* Tel, Tatlı & Varol, ass. nova (Table 6).

This association develops between 1700 and 2150 m on the red-Mediterranean soils and is represented by 16 sample plots. The soil of the association have basic character (pH 7.7), and 4.63% organic matter. This association has 1 layer. Total coverage is 40%–80% and the height is 50–75 cm. The characteristic species of association are *Thymus kotschyanus* Boiss. & Hohen. var. *kotschyanus* and *Helichrysum arenarium* (L.) Moench subsp. *aucheri* (Boiss.) Davis & Kupicha, which is endemic. The life forms of the

Table 3. Plant diversity in the *Astragalo lamarckii-Quercetum brantii* Tel, Tatlı & Varol. *Typus: Quadrat 12

Quadrat no	1	2	3	4	5	6	7	8	9	10	11	12*	13	14	
Area (m ²)×10	40	40	40	40	40	40	40	40	40	40	40	40	40	40	P
Altitude (m)×10	150	143	139	140	137	93	94	95	93	119	120	121	122	123	r
Inclination(°)	50	50	50	50	15	50	60	60	50	60	50	50	60	50	e
Exposure	SW	SW	E	E	NW	SW	SW	W	W	N	N	N	N	N	s
Tree cover (%)	-	-	-	-	-	30	40	40	-	30	-	40	-	-	e
Shrub cover (%)	70	50	80	40	40	40	50	40	80	40	60	40	80	70	n
Herb cover (%)	40	30	15	10	15	10	10	5	10	10	40	40	30	30	c
Parent rock				L	i	m	e	s	t	o	n	e			e
Characteristic species of association															
<i>Quercus brantii</i>	33	33	44	33	22	12	12	22	22	22	22	22	22	22	V
<i>Astragalus lamarcki</i>	+2	.	.	+2	.	.	.	.	.	.	+2	+2	+2	+2	III
<i>Fraxinus angustifolia</i> subsp. <i>syriaca</i>	.	.	.	.	.	.	12	.	+1	.	.	+2	.	+2	II
Characteristic species of Quercus-Cedretalia libani															
<i>Quercus infectoria</i> subsp. <i>boissieri</i>	.	.	.	+2	.	22	12	12	22	.	22	22	22	22	IV
<i>Jasminum fruticans</i>	.	.	.	.	.	+2	.	+2	+2	+2	+2	+2	.	.	III
<i>Quercus cerris</i> var. <i>cerris</i>	.	.	.	.	.	.	.	.	.	+2	12	.	+2	12	II
<i>Cotoneaster nummularia</i>	+2	+2	.	.	.	.	.	.	.	.	+2	.	.	+2	II
<i>Vicia cracca</i> subsp. <i>stenophylla</i>	.	+1	.	.	+1	.	.	.	+1	+1	.	.	.	.	II
<i>Berberis crataegina</i>	.	+1	+2	+2	+2	.	.	.	.	.	.	.	.	.	II
<i>Milium vernale</i> subsp. <i>vernale</i>	+2	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Characteristic species of Quercetia-Pubescentis															
<i>Prunus divericata</i>	.	.	.	+1	+2	+2	+2	+2	+2	.	+2	+2	+2	+2	IV
<i>Juniperus oxycedrus</i> subsp. <i>oxycedrus</i>	12	+2	.	.	.	.	.	.	.	.	+2	+2	+2	22	III
<i>Paliurus spina-christi</i>	.	+2	+2	+2	.	.	.	.	+2	.	.	.	.	.	II
<i>Crataegus monogyna</i> subsp. <i>Monogyna</i>	.	.	.	.	.	+2	.	.	.	.	+2	+2	.	.	II
<i>Teucrium chamaedrys</i> subsp. <i>tauricum</i>	.	.	.	.	.	.	.	.	.	.	.	+2	12	+2	II
<i>Lonicera etrusca</i>	.	.	.	.	.	.	.	.	.	.	+1	.	.	+2	I
<i>Cotinus coggyria</i>	.	.	.	.	.	.	.	.	.	+2	.	.	.	.	I
Characteristic species of Astragalo-Brometia															
<i>Teucrium polium</i>	+2	+2	.	+2	+2	.	.	.	.	.	.	.	+2	+2	III
<i>Chardina orientalis</i>	+1	.	.	+1	+1	.	.	.	.	.	+2	+2	.	.	II
<i>Bromus tomentollus</i>	+2	.	.	.	.	.	.	.	.	.	+2	+2	+2	+2	II
<i>Koeleria cristata</i>	+2	.	.	.	.	.	.	.	.	.	+2	.	+2	.	I
<i>Hypericum scabrum</i>	.	.	.	.	.	.	.	.	.	.	+1	+1	+1	.	I
<i>Centaurea virgata</i>	+1	.	.	+1	.	.	.	.	.	.	.	.	.	.	I
<i>Cruciata taurica</i>	.	.	.	.	.	.	.	.	.	.	.	+2	.	+2	I
<i>Veronica orientalis</i>	.	.	.	.	.	.	.	.	.	.	.	.	+2	+2	I
<i>Anthemis cretica</i> subsp. <i>anatolica</i>	+2	.	.	.	.	.	.	.	.	.	.	.	+2	.	I
<i>Bromus tectorum</i>	.	.	.	.	.	.	.	.	.	22	.	.	.	.	I
<i>Euphorbia macroclada</i>	+2	.	.	.	.	.	.	.	.	.	.	.	.	.	I
<i>Anthemis tinctoria</i> subsp. <i>tinctoria</i>	.	.	.	.	.	.	.	.	.	.	.	.	+2	.	I
Companions															
<i>Poa bulbosa</i>	.	11	.	+1	+1	+1	11	.	.	.	11	12	12	12	IV
<i>Aegilops cylindrica</i>	.	.	.	+1	+1	11	.	+1	.	11	11	11	.	.	III
<i>Bromus japonicus</i>	.	+1	+1	.	+1	+1	11	.	.	.	.	+1	.	.	III
<i>Hordeum bulbosum</i>	+1	+1	+1	+1	+1	.	+2	.	.	.	.	.	.	.	III
<i>Salvia multicaulis</i>	22	.	.	.	.	.	.	.	.	.	+2	12	12	12	II
<i>Dacylis glomerata</i>	+2	.	.	.	+1	.	.	.	+2	.	.	.	+2	.	II
<i>Galium aperina</i>	.	.	+1	+1	.	.	+1	+1	.	.	.	.	.	.	II
<i>Putoria calabrica</i>	.	.	.	.	.	12	.	+1	.	.	.	+2	.	+2	II
<i>Anthemis wiedemanniana</i>	+1	.	.	+1	+1	.	.	.	+1	.	.	.	.	.	II
<i>Thymus leucotrychus</i> var. <i>leucotrychus</i>	.	.	.	.	.	.	.	.	.	.	12	22	+2	.	II
<i>Verbascum varians</i> var. <i>varians</i>	.	.	.	.	.	+1	.	+1	+1	.	.	.	.	.	II

Table 4. Plant diversity in the *Lonicera ibericae-Aceretum cinerascens* Tel, Tatlı & Varol. *Typus: Quadrat 30

Quadrat no	27	28	29	30*	31	32	
Area (m ²)×10	40	40	40	40	40	40	P
Altitude (m)×10	178	167	167	168	168	169	r
Exposure	S	S	S	SE	E	E	e
Inclination(°)	60	30	50	50	50	50	s
Tree cover (%)	-	-	-	-	-	-	e
Shrub cover (%)	30	40	50	50	40	50	n
Herb cover (%)	30	60	60	60	40	40	c
Parent rock	L	i	m	e	s	t	o
							n
							e
Characteristic species of association							
<i>Lonicera iberica</i>	22	22	22	22	22	22	V
<i>Artemisia herba-alba</i>	12	+2	+2	+2	+2	22	V
<i>Silene swertifolia</i>	+2	+2	+2	+2	+2	+2	V
Characteristic species of <i>Quercion frainetto</i>							
<i>Quercus cerris</i>	.	12	12	22	22	22	V
Characteristic species of <i>Quercetea pubescentis</i> and <i>Querco-Carpinetalia</i>							
<i>Acer monspessulanum</i> subsp. <i>cinerascens</i>	22	22	22	22	22	22	V
Characteristic species of <i>Astragalus-Brometea</i> and <i>Astragalo-Brometalia</i>							
<i>Centaurea virgata</i>	+2	.	+2	+2	+2	+2	V
<i>Phlomis armeniaca</i>	.	+2	.	22	.	.	II
<i>Bromus tomentellus</i>	.	.	.	+2	+2	.	II
<i>Veronica orientalis</i>	+2	.	+2	.	.	.	II
<i>Koeleria cristata</i>	.	.	.	.	+2	.	I
<i>Scutellaria orientalis</i>	12	.	.	.	.	.	I
<i>Cruciata taurica</i>	.	.	+1	.	.	.	I
Companions							
<i>Helichrysum arenarium</i> subsp. <i>aucheri</i>	+2	+2	+2	+2	+2	+2	V
<i>Prunus prostrata</i>	+1	+2	12	+2	12	12	V
<i>Hordeum bulbosum</i>	+2	+1	+1	+1	+1	+1	V
<i>Poa bulbosa</i>	.	+2	12	11	12	12	V
<i>Salvia multicaulis</i>	+2	+2	+2	12	.	22	V
<i>Bromus japonicus</i>	+1	+1	+1	+1	+1	.	V
<i>Acantholimon armenum</i> var. <i>balansae</i>	.	+2	22	+2	+2	.	III
<i>Astragalus campylosema</i> subsp. <i>nigripilus</i>	.	.	+2	+2	+2	+2	III
<i>Crucianella gilanic</i> subsp. <i>kotschy</i>	.	+2	.	+2	+2	+2	III
<i>Fibigia eriocarpa</i>	+2	+2	.	+2	+2	.	III
<i>Rumex tuberosus</i> subsp. <i>kuberosus</i>	.	.	+1	+1	+1	+1	III
<i>Stipa ehrenbergiana</i>	.	+2	+2	.	.	+2	III
<i>Sedum subulatum</i>	+1	.	.	.	+2	+1	III
<i>Solenanthes stamineus</i>	+1	.	+1	.	.	+1	III
<i>Cotoneaster nummularia</i>	+2	+2	.	.	+2	.	III
<i>Genista albida</i>	.	22	.	.	.	22	II
<i>Cerasus mahalep</i>	.	+2	.	+2	.	.	II
<i>Dactylis glomerata</i>	.	.	+2	+2	.	.	II
<i>Chrysophthalmum montanum</i>	.	.	+1	.	+2	.	II
<i>Melica persica</i> subsp. <i>inaequiglumis</i>	+2	.	.	+2	.	.	II
<i>Thesium tauricum</i>	.	.	.	.	+2	+2	II
<i>Bupleurum kurdicum</i>	.	+1	.	+1	.	.	II
<i>Isatis tinctoria</i> subsp. <i>corymbosa</i>	+1	+1	.	.	.	.	II
<i>Pimpinella tragi</i> subsp. <i>lithophila</i>	.	.	.	+1	+1	.	II
<i>Salvia trichoclada</i>	.	.	+1	.	.	+1	II
<i>Ziziphora capitata</i>	.	+1	+1	.	.	.	II
<i>Alysum contemptum</i>	+1	.	.	.	.	.	I

Table 5. Plant diversity in the *Astragalo compacti*-*Amygdaletum arabicae* Tel, Tatlı & Varol. *Typus: Quadrat 39

Quadrat no	33	34	35	36	37	38	39*	
Area (m ²)	100	100	100	100	100	100	100	P
Altitude (m)	930	910	910	910	890	880	1000	r
Exposure	S	S	S	SW	S	S	NW	e
Inclination(°)	60	60	60	60	60	40	50	s
Tree cover (%)	-	-	-	-	-	-	-	e
Shrub cover (%)	40	30	30	40	40	40	40	n
Herb cover (%)	15	5	10	10	5	15	10	c
Parent rock	S	e	r	p	e	n	t	i
								n
								e
Characteristic species of association								
<i>Amygdalus arabica</i>	22	22	22	22	22	22	22	V
<i>Amygdalus orientalis</i>	+2	12	12	+2	+2	+2	+2	V
<i>Astragalus compactus</i>	+2	+2	+2	.	+2	+2	+2	V
Characteristic species of <i>Astragalo-Brometea</i> and <i>Astragalo-Brometalia</i>								
<i>Centaurea virgata</i>	+2	+2	+2	+2	+2	+2	+2	V
<i>Teucrium polium</i>	.	.	.	.	+2	+2	+2	III
Companions								
<i>Aegilops cylindrica</i>	+1	+1	+1	+1	+1	+1	+1	V
<i>Anthemis wiedemanniana</i>	+1	+1	+1	+1	+1	+1	+1	V
<i>Bromus japonicus</i>	.	+1	+1	.	+1	.	.	III
<i>Linaria sp.</i>	.	.	+2	.	+2	.	+2	III
<i>Prunus divericata</i>	.	+2	.	+2	.	+2	+2	III
<i>Alysum murale</i>	+2	+2	.	.	.	.	.	II
<i>Asperula xylorrhisa</i>	.	.	+2	.	+2	.	.	II
<i>Setaria verticillata</i>	+1	.	.	.	.	.	+1	II
<i>Salvia multicaulis</i>	.	.	.	.	.	.	+2	I
<i>Convolvulus betonicifolius</i>	.	.	+2	.	.	.	.	I
<i>Trichodesma incanum</i>	.	.	.	.	.	.	+2	I
<i>Alkanna hirsutissima</i>	.	.	.	+1	.	.	.	I
<i>Galium galiopsis</i>	.	.	.	.	.	+1	.	I
<i>Onosma rascheyanum</i>	.	.	.	+1	.	.	.	I
<i>Poa bulbosa</i>	.	.	.	.	.	.	+1	I
<i>Morina persica</i>	.	.	.	.	.	.	11	I
<i>Gundelia tourneforti</i> var. <i>armata</i>	.	.	+1	.	.	.	.	I

total species recorded in the stands of the association are as follows: 45.2% of Hemicryptophyte, 37% of Chamaphyte, 12.3% of Therophyte, 2.8% of Phanerophyte, and 2.7% of Geophyte.

The sites of the quadrats of the association are as follows:

Quadrat no: Locality

40-45 : 1 km to top of Nemrut Mountain, N and NW slopes (1700-1750 m).

46-50 : Summit of Nemrut Mountain (2100-2150 m).

51-55 : Road junction of Malatya province (1790-1820 m).

Holotypus subassociation: *genisto-acantholimetosum acerosi* subass. nova (Table 6, quadrat no: 40-45).

This association separated into *genisto-acantholimetosum acerosi* subassociation, *putoriotanacetetosum amanii* subassociation, and *helicryso-tanacetetosum argentii* subassociation.

a. *genisto-acantholimetosum acerosi* subass. nova (Table 6, quadrat 40-45).

Holotypus: Table 6, quadrat no: 42.

This subassociation is develops between 1700–1750 m in 1 km to east of Nemrut Mountain. The characteristic species of this subassociation are:

Table 6. Plant diversity in the *Helichryso aucheri*- *Thymetum kotschyani*- Tel, Tatlı & Varol.* Typus subassociation: *genisto-acantholimetosum acerosi* (Quadrat 40-45).

Quadrat no	40	41	42	43	44	45	46	47*	48	49	50	51	52	53	54	55*	P
Area (m ²)	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	r
Altitude (m)×10	170	173	174	175	175	174	215	215	214	215	210	182	181	180	179	178	e
Exposure	N	NW	N	N	W	W	N	NW	N	E	S	SW	NW	W	W	W	s
Inclination(°)	40	50	40	40	40	50	30	15	60	30	40	30	30	30	25	3	e
Herb cover (%)	70	60	60	50	70	40	50	40	60	50	60	70	80	80	70	80	n
Parent rock			L	i	m	e	s	t	o	n	e						c
																	e
Characteristic species of association																	
<i>Thymus kotschyanus</i> var. <i>kotschyanus</i>	22	22	22	12	22	12	12	+2	+2	12	12	22	22	22	22	22	V
<i>Helichrysum arenarium</i> subsp. <i>aucheri</i>	+2	+2	+2	+2	+2	+2	+2	+2	+2	+2	+2	.	.	.	.	.	IV
Characteristic species of subassociation																	
<i>genisto-acantholimetosum acerosi</i> (typus subassociation)	12	22	22	22	22	22	22	.	.	.	.	.	.	.	.	.	II
<i>Acantholimon acerosum</i> var. <i>acerosum</i>	22	22	22	+2	22	12	.	.	.	.	.	.	.	.	.	.	II
<i>Genista albida</i>	+1	.	+1	.	+1	.	.	.	.	.	.	.	.	.	.	.	I
Characteristic species of subassociation																	
<i>putorio-tanacetetosum amanii</i>	.	.	.	.	.	.	.	33	33	33	33	.	.	.	.	.	III
<i>Tanacetum densum</i> subsp. <i>amiani</i>	.	.	.	.	.	.	.	+2	+2	+2	+2	.	.	.	.	.	III
<i>Putoria calabrica</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	III
Characteristic species of subassociation																	
<i>helichryso-tanacetetosum argentei</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	III
<i>Tanacetum argenteum</i> subsp. <i>argenteum</i>	.	.	.	.	.	.	.	.	.	.	.	33	33	33	33	33	III
<i>Helichrysum plicatum</i>	.	.	.	.	.	.	.	.	.	.	.	+2	.	+2	+2	+2	II
Characteristic species of Astragalo-Brometea and Astragalo-Brometalia																	
<i>Bromus tomentellus</i>	+2	+2	+2	+2	+2	+2	.	+2	.	+2	+2	.	.	.	.	.	III
<i>Anthemis cretica</i> subsp. <i>anatolica</i>	+1	+1	+2	+2	+2	+2	.	+2	.	.	+2	.	.	.	.	.	III
<i>Teucrium polium</i>	.	.	+2	.	.	.	.	.	.	.	.	.	+2	+2	.	.	II
<i>Veronica orientalis</i>	.	.	.	.	.	.	+2	+2	+2	+2	.	.	.	.	.	.	II

Table 6. (Continued).

<i>Koeleria cristata</i>	+2	+2	+2	.	+2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	
<i>Phlomis armeniaca</i>	.	.	.	.	.	.	.	.	+2	+2	+2	.	.	.	.	.	.	.	.	II	
<i>Marrubium astracanicum</i> subsp.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II	
<i>Stipa holosericea</i>	.	.	.	.	.	.	.	.	.	.	+2	+2	.	.	.	.	.	.	.	I	
<i>Globularia trichosantha</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	
<i>Cruciata taurica</i>	+2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I	
<i>Centaurea triumfetti</i>	.	.	.	.	.	.	.	.	.	.	+1	.	.	.	.	.	.	.	.	I	
Companions																					
<i>Poa bulbosa</i>	11	11	11	11	11	11	11	11	12	12	12	12	12	12	12	12	12	12	12	V	
<i>Euphorbia cheiradenta</i>	+2	+2	+1	.	+1	+2	.	.	.	.	+2	+2	.	+1	+1	+1	+1	+1	+1	IV	
<i>Bupleurum cappadocicum</i>	+1	+1	+1	.	+1	+1	+1	+1	+1	.	.	.	.	.	.	.	.	.	.	.	III
<i>Hypericum scabrum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	III
<i>Gundelia tournefortii</i> var. <i>armata</i>	+1	.	+1	+1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	III
<i>Teucrium chamaedry</i>																					
ssp. <i>tauricolum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	III
<i>Asperula laxiflora</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II
<i>Halimium umbellatum</i>	+2	+2	+2	.	+2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II
<i>Salvia multicaulis</i>	12	12	.	.	22	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II
<i>Onosma procerum</i>	+1	.	+2	.	+2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II
<i>Alysum filiforme</i>	+2	+2	.	+2	+2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II
<i>Bromus japonicus</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II
<i>Hypericum armenum</i>	+1	+2	.	.	+1	.	+1	.	.	.	.	.	.	.	.	.	.	.	.	.	II
<i>Onosma rascheyanum</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II
<i>Allium aucheri</i>	.	.	.	.	+1	+1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	II
<i>Chardinia orientalis</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
<i>Asyneuma lobelioides</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
<i>Stachys lavandulifolia</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I

Acantholimon acerosum (Willd.) Boiss. var. *acerosum*, *Genista albida* Willd., and *Isatis aucheri* Boiss.. The subassociation has 1 layer. Total coverage is 40%–70% and the height is 5–75 cm. At the same time, this subassociation is holotype of *Thymo kotschyani*-*Helichrysetum aucheri* association.

b. *putorio-tanacetetosum amanii* subass. nova (Table 6, quadrat 46-50).

Holotypus: Table 6, quadrat no: 47

This subassociation develops between 2100 and 2150 m in summit of Nemrut Mountain. The characteristic species of this subassociation are: *Tanacetum densum* (Lab.) Schultz Bip. subsp. *amani* Heywood and *Putoria calabrica* (L.) DC. The subassociation has 1 layer. Total coverage is 40%–60% and the height is 50–75 cm.

c. *helichryso-tanacetetosum argentei* subass. nova (Table 6, quadrat 51-55).

Holotypus: Table 6, quadrat no: 55.

This subassociation develops between 1790 and 1820 m in road junction of Malatya province on Nemrut Mountain. The characteristic species of this subassociation are: *Tanacetum argenteum* (Lam.) Willd. subsp. *argenteum* and *Helichrysum plicatum* DC. The subassociation has 1 layer. Total coverage is 70%–80% and the height is 50–60 cm.

6. *Verbasco diversifoliae*-*Astragaletum cephalotis* Tel, Tatlı & Varol, ass. nova (Table 7).

This steppe association is found at 1170–1210 m between Kıran village-Subaşı village. The association develops on the red-Mediterranean soil, which is formed by serpentine bedding rock. The soil of the association have basic character (pH 8), and 1.69% organic matter. The association has 1 layer. Total coverage is 40%–70% and height is 50–60 cm. The life forms of the association are as follows: 43.4% of

Table 7. Plant diversity in the *Verbasco diversifoliae*-*Astragaletum cephalotis* Tel, Tatlı & Varol. *Typus: Quadrat 58

Quadrat no	56	57	58*	59	60	P
Area (m ²)	50	50	50	50	50	r
Altitude (m)×10	117	117	119	120	121	e
Exposure	W	W	NW	W	W	s
Inclination(°)	60	60	50	50	40	e
Herbcover (%)	40	40	60	70	60	n
Parent rock	S e r p e n t i n e					c e
Characteristic species of association						
<i>Astragalus cephalotes</i>	22	22	33	33	33	V
<i>Verbasco diversifolium</i>	.	.	+1	+1	+1	III
Characteristic species of <i>Astragalo-Brometea</i>						
<i>Centaurea virgata</i>	+2	+2	+2	+2	+2	V
<i>Alyssum pateri</i>	+2	+2	+2	.	.	III
<i>Stipa holosericea</i>	.	.	+2	+2	+2	III
Companions						
<i>Bromus tectorum</i>	11	11	11	.	+2	V
<i>Morina persica</i>	+1	+1	+1	+1	+1	V
<i>Euphorbia denticulata</i>	.	+1	+1	+1	+1	V
<i>Euphorbia sp.</i>	.	.	+1	+1	+1	III
<i>Atrophaxis billardi</i> var. <i>billardi</i>	+2	+2	.	.	.	II
<i>Cerastium dicotomum</i>	+1	+1	.	.	.	II
<i>Scandix pecten-veneris</i>	.	.	+1	+1	.	II
<i>Prunus divaricata</i> subsp. <i>divaricata</i>	+2	+2	.	.	.	II
<i>Chardinia orientalis</i>	.	+1	.	.	.	I
<i>Gundelia tournefortii</i> var. <i>armata</i>	+1	+1	+1	+1	+1	I

Hemicryptophyte, 34.8% of Therophyte, 17.4% of Chamaphyte, and 4.4% of Phanerophyte. Characteristic species of this association are *Astragalus cephalotes* Banks & Sol. and *Verbascum diversifolium* Hochst., which is endemic.

All the quadrats of this association were taken from Kiran village to Subaşı village from the north slope of the roadside.

Holotypus: Table 7, quadrat no: 58.

7. *Phlomidio capitatae-Thymetum migrici* Tel, Tatlı & Varol, ass. nova (Table 8).

This association exists around Karadut village and around hotels from Karadut to summit 8 km. This association occurs on the red-Mediterranean soil, which is formed by calcareous bedrock. The soils of the association have basic character (pH 7.7); organic matter is 4.34%. This association has 1 layer and total coverage is 50%–80%; the height is 50–60 cm. The life forms of the association are as follows: 40.4% of Hemicryptophyte, 32.7% of Therophyte, 23.1% of Chamaphyte, 1.9% of Phanerophyte, and 1.9% of Geophyte. Characteristic species of this association are *Thymus migricus* Klokov & Shost., *Astragalus tauricolus* Boiss., *Genista albida*, and *Phlomis capitata* Boiss.. Among these species *Astragalus tauricolus* and *Phlomis capitata* are local endemic.

All the quadrats of this association were taken from around Karadut village and around hotels from Karadut to summit 8 km.

Holotypus: Table 8, quadrat no: 66.

Rock Vegetation

This vegetation is represented by 1 plant community in the study area.

8. *Centranthus longiflorus* community Tel, Tatlı & Varol (Table 9).

This rock community was found at 1290–1310 m between Subaşı village and Büyüköz village. The association develops on unstable rubble. This community has 1 layer and total coverage is 30%–40%; the height is 75 cm. The life forms of the community are as follows: 78.6% of Hemicryptophyte, 14.3% of Geophyte, and 7.1% of Therophyte. Dominant species of this community are *Centranthus longiflorus* Ste., *Allium orientale* Boiss., *Ricotia aucheri*

(Boiss.) B.L. Burt, and *Asperula laxiflora* Boiss. All the quadrats of this community were taken from between Subaşı village and Büyüköz village.

Discussion

In the study area, 8 plant associations and 3 subassociations belonging to forest, shrub, steppe, and rock vegetation types were determined. Four associations belong to forest and shrub, 3 associations and 3 subassociations belong to steppe, and 1 association belongs to rock. These associations are classified and named according to the code of phytosociological nomenclature (Weber et al. 2000). The structure and brief ecologies of the associations are discussed in the vegetation title.

The *Pistacio khynjuki-Cotinetum coggyriae* association is characterized by *Cotinus coggyria*, *Nerium oleander*, and *Pistacia khynjuk*. *Cotinetum coggyriae* association, determined by Kaya (1996), is included in the order *Quercetalia pubescentis*, which belongs to the class *Quercetea pubescentis*. Similarity between this association and *Pistacio khynjuki-Cotinetum coggyriae* was 11%. *Pistacio-Cotinetum coggyriae* is well represented in the alliance level. Therefore, this association is included in the alliance *Quercion calliprini* of order *Quercetalia ilicis* of class *Quercetea ilicis*. Syntaxonomical classification of the association is as follows:

Class: *Quercetea ilicis* Br.-Bl. 1947

Order: *Quercetalia ilicis* Br.-Bl. 1947

Alliance: *Quercion calliprini* Zohary 1962

Association: *Pistacio khynjuki-Cotinetum coggyriae* Tel, Tatlı & Varol, ass. nova

The *Astragalo lamarckii-Quercetum brantii* association is characterized by *Quercus brantii*, *Fraxinus angustifolia* subsp. *angustifolia*, and *Astragalus lamarcki*. Characteristic species of class *Astragalo-Brometea*, which is characterized as a steppic area, is found in the association. Zohary evaluates this type forest, which contains characteristic species of the class *Astragalo-Brometea*, as steppic forest of Irano-Turanian and this type forests are included to the class *Quercetea brantii* by Zohary (Zohary 1973). There are Zohary's studies on the *Quercus* forests (*Q. brantii*, *Q. libani*, *Q. infectoria*

Table 8. Plant diversity in the *Phlomido capitatae-Thymetum migrici* Tel, Tatlı & Varol. *Typus: Quadrat 66

Quadrat no	61	62	63	64	65	66*	P	
Area (m ²)	50	50	50	50	50	50	r	
Altitude (m)×10	139	140	141	142	146	147	e	
Exposure	E	E	E	NE	NE	E	s	
Inclination(°)	40	30	40	45	30	50	e	
Herb cover (%)	50	80	60	50	60	50	n	
Parent rock	L	i	m	e	s	t	o	n
							e	
Characteristic species of association								
<i>Thymus migricus</i>	22	22	22	22	22	22	V	
<i>Astragalus tauricolus</i>	+1	+2	+2	+2	+2	+2	V	
<i>Genista albida</i>	+2	+2	+2	+2	+2	+2	V	
<i>Phlomis capitata</i>	+2	+2	22	+2	.	+2	V	
Characteristic species of <i>Astragalo-Brometea</i>								
<i>Phlomis armeniaca</i>	22	22	22	22	22	22	V	
<i>Centaurea virgata</i>	+2	.	+2	+2	+1	+2	V	
<i>Bromus tomentellus</i>	+2	+2	.	+2	+2	+2	V	
<i>Teucrium polium</i>	+2	.	.	.	+2	+2	III	
<i>Koeleria cristata</i>	.	.	.	.	22	+2	II
<i>Helianthemum nummularium</i> subsp. <i>lycaonicum</i>	.	.	+2	.	.	.	I	
Companions								
<i>Salvia multicaulis</i>	22	22	12	22	22	22	V	
<i>Gundelia tournefortii</i> var. <i>armata</i>	+1	+1	+1	+1	+1	+1	V	
<i>Aegilops biuncialis</i>	+1	22	11	11	11	11	V	
<i>Poa bulbosa</i>	11	+2	+2	+1	+2	+1	V	
<i>Anthemis wiedemanniana</i>	+1	+1	+1	+1	+1	+1	V	
<i>Stipa ehrenbergiana</i>	+2	+2	+2	+2	.	+2	V	
<i>Minuartia recurva</i> subsp. <i>oreina</i>	+1	+1	+1	11	+1	.	V	
<i>Torilis leptophylla</i>	+1	.	+1	+1	+1	+1	V	
<i>Melica persica</i> subsp. <i>inaequiglunis</i>	.	+2	.	+2	+2	+2	IV	
<i>Picnemon acarna</i>	+1	+1	+1	.	.	+1	IV	
<i>Astragalus kurdicus</i>	.	.	+2	+2	+2	.	III	
<i>Chardinia orientalis</i>	+2	.	.	.	+2	+2	III	
<i>Helichrysum arenarium</i> subsp. <i>aucheri</i>	+2	+2	.	.	.	+2	III	
<i>Paracaryum cristatum</i> subsp. <i>cristatum</i>	.	.	.	+2	+1	+2	III	
<i>Bromus danthoniae</i>	11	+1	.	.	+1	.	III	
<i>Iflago spicata</i>	11	+1	.	+1	.	.	III	
<i>Knautia integrifolia</i>	+1	.	+1	+1	.	.		
<i>Allium callidictylon</i>	+1	.	.	+1	.	+1	III	
<i>Silene arguta</i>	.	+2	+2	.	.	.	II	
<i>Hordeum bulbosum</i>	+2	.	.	+1	.	.	II	
<i>Scleranthus annuus</i>	.	+1	+1	.	.	.	II	
<i>Crupina crupinastrum</i>	+1	.	+	.	.	.	II	
<i>Setaria verticillata</i> var. <i>verticillata</i>	+1	.	.	.	+1	.	II	
<i>Zizphora capitata</i>	+1	.	.	.	.	+1	II

Table 9. Plant diversity in the *Centranthus longiflorus* community Tel, Tatlı & Varol.

Quadrat no	67	68	69	70	71	P
Area (m ²)	50	50	50	50	50	r
Altitude (m)×10	129	130	131	132	131	e
Exposure	W	W	W	W	SW	s
Inclination(°)	70	70	70	60	70	e
Herb cover (%)	40	30	30	40	40	n
Parent rock	L i m e s t o n e					c e
<hr/>						
<i>Centranthus longiflorus</i> community						
<i>Centranthus longiflorus</i>	22	22	12	22	22	V
<i>Allium orientale</i>	11	11	11	11	11	V
<i>Ricotia aucheri</i>	+1	+2	+2	+2	+2	V
<i>Asperula laxiflora</i>	+2	+2	+2	+2	+2	V
<i>Isatis glauca</i> subsp. <i>incana</i>	.	+1	+1	+1	.	III
<i>Rumex scutatus</i>	.	.	12	+2	.	III
<i>Scrophularia cryptophylla</i>	.	+1	.	+2	.	III
<i>Silene odontopetala</i>	+1	+1	.	.	.	III
<i>Gundelia tourneforti</i> var. <i>armata</i>	.	+1	.	.	.	I
<i>Koeleria cristata</i>	.	+2	.	.	.	I
<i>Poa bulbosa</i>	.	.	.	.	11	I
<i>Sedum album</i>	.	.	.	.	+1	I

subsp. *boissieri*, and *Q. cerris*), which occur in east and south-east Turkey. However, as Zohary did not present these studies in tables, it is not possible to compare our study with Zohary's studies. The association is not represented in 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: *Quercu-Cedretalia libani* Barbero, Loisel & Quézel 1974

Association: *Astragalo lamarckii-Quercetum brantii* Tel, Tatlı & Varol, ass. nova

The *Lonicero ibericae-Aceretum cinerascens* association is characterized by *Acer monspessulanum* subsp. *cinerascens*, *Artemisia herba-alba*, *Lonicera iberica*, and *Silene swertifolia*. There is no such an association characterized by these species in Anatolia. This association is reported in this study for the first time. Syntaxonomical classification of the association is as follows:

Class: *Quercetea pubescentis* Doingt, Kraft 1955

Order: *Quercu-Carpinetalia orientalis* Akman, Barbero et Quézel 1980

Alliance: *Quercion frainetto* Horvat 1954

Association: *Lonicero ibericae-Aceretum cinerascens* Tel, Tatlı & Varol, ass. nova

The *Astragalo compacti-Amygdaletum arabicae* association is characterized by *Amygdalus arabica*, *Amygdalus orientalis* and *Astragalus compactus*. *Amygdalus orientalis* forms associations with different species in different areas (Ocakverdi & Çetik 1987). The similarity rate is 12%–13% between the associations of the research area defined by us and those of other areas defined by others. In these associations, some characteristic species of *Astragalo-Brometea* class, such as *Centaurea virgata* Lam. and *Teucrium polium* L., demonstrate the anthropogenic effects of over-grazing. Syntaxonomical classification of *Astragalo-Amygdaletum arabicae* association, for this reason, is very difficult. Syntaxonomical classification of the association is as follows:

Class: *Astragalo-Brometea* Quézel 1973

Association: *Astragalo compacti-Amygdaletum arabicae* Tel, Tatlı & Varol, ass. nova

The *Helichryso aucheri-Thymetum kotschyani* association is characterized by *Thymus kotschyanus* var. *kotschyanus* and *Helichrysum arenarium* subsp. *aucheri*. *T. kotschyanus* var. *kotschyanus* is Irano-Turanian element and it forms associations with different species in east and south-east Anatolia (Duman 1995; Behçet & Ünal 1999; Özgökçe & Behçet 2005). The similarity rate is 6%–25.4% between the associations of the research area defined by us and those of other areas defined by others. The association is not well represented in the alliance and ordo level. Syntaxonomical classification of the association is as follows:

Class: *Astragalo-Brometea* Quézel 1973

Association: *Helichryso aucheri-Thymetum kotschyani* Tel, Tatlı & Varol, ass. nova

The *Verbascum diversifoliae-Astragaletum cephalotis* association is characterized by *Astragalus cephalotes* and *Verbascum diversifolium*. *Astragalus* is largest genus of the flora of Turkey. It is mostly especially scattered in steppic areas of Anatolia and, it forms associations with different species and different areas (Düzenli 1976; Yurdakulol 1981; Gümüş 1991; Ocakverdi 1994; Duman 1995; Behçet 1999; Şanda & Küçüködük 2000; Varol & Tatlı 2001). The similarity rate is 7.2%–16.3% between the associations of the research area defined by us and those of other areas defined by others. The association is not well represented in the alliance and order level. *Verbascum-Astragaletum cephalotis* association contains characteristic species of the class *Astragalo-Brometea*. Syntaxonomical classification of the association is as follows:

Class: *Astragalo-Brometea* Quézel 1973

Association: *Verbascum diversifoliae-Astragaletum cephalotis* Tel, Tatlı & Varol, ass. nova

The *Phlomido capitatae-Thymetum migrici* association is characterized by *Thymus migricus*, *Astragalus tauricolus*, *Genista albida*, and *Phlomis capitata*. The similarity rate is 8%-23% between the associations of the research area defined by us and those of other areas defined by others (Akman & Ketenoğlu 1976; Behçet & Tatlı 1989; Behçet 1990; Ocakverdi & Ünal 1991; Behçet 1999). The association is not well represented in the alliance and order level. *Verbascum-Astragaletum cephalotis* association contains characteristic species of the class *Astragalo-Brometea*. Therefore, this association is included in the upper cited syntaxon. Syntaxonomical classification of the association is as follows:

Class: *Astragalo-Brometea* Quézel 1973

Association: *Phlomido capitatae-Thymetum migrici* Tel, Tatlı & Varol, ass. nova

For the time being, it is difficult to find out the phytosociological classification of the *Centranthus longiflorus* community. We need the further investigations for a better explanation. Today, *Centranthus longiflorus*, *Allium orientale*, and *Ricotia aucheri* are determined as the probable dominant species of the community. *Silene odontopetala* Fenzl, *Silene chlorifolia* Sm., *Hypericum scabrum* L., and *Koeleria cristata* (L.) Bertol. could be identified as the probable characteristic species of the higher units in the classification.

Community: *Centranthus longiflorus* Tel, Tatlı & Varol

The results associated with this investigation are presented in Tables 2-8.

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