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A Phytosociological Research on the Forest Vegetation of Yandağ (Isparta-Turkey)

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Abstract: This phytosociological study deals with the vegetation of Yandağ (situated at the borders of Gelendost and Şarkikaraağaç, Isparta province), 4 communities that belong to forest vegetation types were distinguished. Associations and their higher syntaxa are Quercetea pubescentis (Oberd, 1948) Doing Kraft, 1955; Querco-Cedretalia libani Barbero, Loisel et Quézel, 1974; 1-*Querco vulcanicae-Juniperetum excelsae* Kargıoğlu; Pino-Cistion laurifolii Quézel, Barbero et Akman, 1977; 2-*Astragalo oxytropifolii-Pinetum caramanicae* Kargıoğlu; *Carpino-Acerion* Quézel, Barbero et Akman, 1978; 3-*Quercetum trojano-macrolepidis* Kargıoğlu; 4-*Onobrychido pisidicae-Quercetum pubescentis* Kargıoğlu

Key words: Forest vegetation, Mediterranean region, phytosociology, Turkey

INTRODUCTION

The study area lies within the borders of Şarkikaraağaç and Gelendost, two provincial towns of Isparta. It is surrounded by Şarkikaraağaç to the east, Lake Eğirdir to the west, the road to Isparta to the north and the Dedegöl Mountains to the south. Stretching from the east to the west in the region, Yandağ and its neighbourhood cover an about area of approximately 612.56 km^2. The elevation of the area ranges from 950 to 2347 m. Mount Namazgah (2347 m), about 2 km south of Yenicekale village, boasts the highest peak in the study area. Forests of *Pinus nigra* J.F.Arnold. ssp. *nigra* var. *caramanica* (Loudon) Rehder, *Juniperus excelsa* M. Bieb., *Quercus ithaburensis* Decne ssp. *macrolepis* (Kotschy) Hedge et Yalt. and *Quercus pubescens* Willd. cover the largest area in Turkey. The distribution of four associations in the area of the study and in Turkey are illustrated in the Fig. 1. So far, neither a floristic nor a phytosociological research was done in the study area, which phytogeographically lies in the Mediterranean and Irano-Turanian transition belt. However, the vegetation of some neighbouring areas has been investigated by various researchers[1-8]. The Mediterranean region of Turkey is quite well known from the floristic and vegetational point of view. The vegetation of the study area is evaluated by considering all the studies which were carried out in this floristic region by Quézel[9], Quézel *et al.*[10], Akman *et al.*[11,12], Kurt *et al.*[13], Ocakverdi and Oflas[14], Vural *et al.*[15].

The majority of the streams are seasonal and dry out in the summer. They serve as runnels for the rains and melt waters into the Lakes Eğirdir and Beyşehir. Climatically, the area falls into the Mediterranean region. Due to different elevations and directions, it is highly likely to observe sundry types of the Mediterranean climate. With the utilization of the data from the three meteorological stations Eğirdir, Şarkikaraağaç and Gelendost, a climatic assessment of the area has been supplied. Mean annual precipitation is 723.4 mm in Eğirdir, 578.7 mm in Gelendost and 454.3 mm in Şarkikaraağaç (Table 1A). On the whole, there occurs very little rainfall during the months June, July, August and September. Nevertheless, a noticeable amount of precipitation falls in January - April and in December.

The climatic data obtained from the relevant stations have been processed with reference to Emberger's Summer Drought index and Q2 formulae. According to Emberger's Summer Drought index (S), the PE/ME (PE: Total summer precipitation; ME: Maximum temperature mean of summer months) values have been determined. The values are 1.5 for Eğirdir, 1.8 for Gelendost and 2.0 for Şarkikaraağaç and are lower than 7.0 (Table 1B). On account of the fact that summer months receive the least rainfall, which is lower than 200 mm, the three stations are indicative of the Mediterranean climate influence[16,17]. The Q2 values are 89.6 for Eğirdir, 63.3 for Gelendost and 48.7 for Şarkikaraağaç. Therefore, Eğirdir is under the influence of cool-type, slightly rainy; Gelendost cold-type slightly rainy and Şarkikaraağaç very cold-type semi-arid Mediterranean climate[18]. The precipitation regimes of the three locations have a sequence of winter spring autumn summer and fall into the first type of the East Mediterranean rainfall regime[19].

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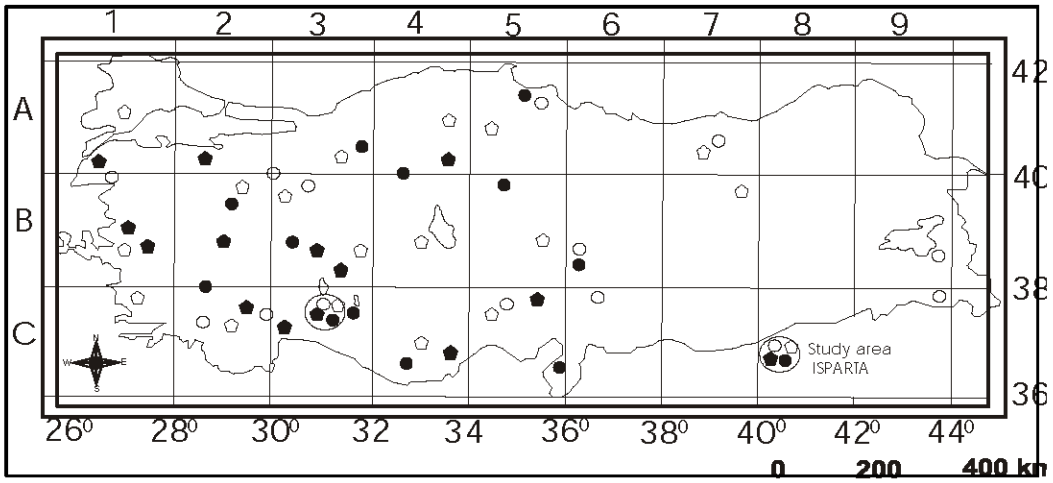

Fig. 1: Distribution of ● *Pinus nigra* J.F. Arnold ssp. *nigra* var.*caramanica* (Loudon) Rehder, ○ *Juniperus excelsa* M. Bieb., ⬟ *Quercus ithaburensis* Decne ssp. *macrolepis* (Kotschy) Hedge and Yalt. and ✿ *Quercus pubescens* Willd. in Turkey and study area

Table 1A: The average and extreme climatic values belonging to Eğirdir, Gelendost and Şarkikaraağaç 1939 to 1990.

	Months													
Station	Obs. Dur. (Year)	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Mean
Eğirdir (950 m)														
Mean temperature (°C)	16	2.4	3.6	7.2	11.3	16.6	21.1	24.4	24.0	20.3	14.9	9.5	4.8	13.3
The highest temperature (°C)	17	13.0	17.9	21.8	25.6	29.6	34.4	36.2	34.2	32.5	27.5	22.2	14.8	36.2
The lowest temperature (°C)	27	-10.6	-11.3	-14.2	-2.0	1.7	6.3	8.9	8.2	5.2	1.3	-6.0	-8.2	-14.2
Mean rainfall (mm)	24	139.3	99.5	73.7	61.1	47.2	25.3	6.7	7.9	23.7	50.2	53.1	135.6	723.4
Gelendost (950 m)														
Mean temperature (°C)	5	2.9	2.8	5.6	10.9	15.6	19.4	23.3	22.7	19.7	12.6	7.3	3.2	12.2
The highest temperature (°C)	6	15.5	16.0	22.0	29.0	30.0	33.0	35.5	37.0	34.2	31.5	22.5	16.5	37.0
The lowest temperature (°C)	6	-13.0	-13.5	-13.0	-2.0	1.5	7.0	7.0	8.0	1.5	-2.5	-8.2	-16.0	-16.0
Mean rainfall (mm)	25	88.9	70.6	63.1	63.6	45.3	31.3	10.8	9.1	17.0	43.6	52.6	82.7	578.7
Şarkikaraağaç (1180 m)														
Mean temperature (°C)	25	0.2	1.1	5.0	9.7	14.2	18.3	21.6	21.4	17.5	11.6	5.9	1.9	10.7
The highest temperature (°C)	27	17.0	18.0	24.0	27.0	30.0	33.5	36.0	38.8	33.5	29.8	25.0	19.5	38.8
The lowest temperature (°C)	27	-21.4	-20.0	-18.8	-5.0	-2.0	1.6	5.0	5.1	1.0	-4.0	-10.6	-20.0	-21.4
Mean rainfall (mm)	51	58.8	46.2	48.3	47.3	43.9	36.3	11.8	6.9	16.5	32.9	42.7	62.7	454.3

Table 1B: Climatic data from Eğirdir, Gelendost and Şarkikaraağaç stations.

Stations	Altitude (m)	P (mm)	M	M	Q_2	PE	S	Prec. regime	Bioclimate
Eğirdir	950	723.4	28.5	0.4	89.6	39.9	1.5	W.Sp.A.Sm.	Slightly rainy cool
Gelendost	950	578.7	30.4	-1.4	63.3	51.2	1.8	W.Sp.A.Sm.	Slightly rainy cold
Şarkikaraağaç	1180	454.3	28.7	-4.0	48.7	55.0	2.0	W.Sp.A.Sm.	Semidry very cold

MATERIALS AND METHODS

The vegetation in the study area were investigated in accordance with the Braun-Blanquet Method[20]. 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 composition of the associations and the dominancy and constancy of the species were determined. In order to compare associations, we used Sorensen's index of similarity. Some soil samples were taken from various sample plots reperesenting the different plant formations. These soil samples were analyzed by the Soil and Fertiliser Research Institute. The distributions of the associations in the investigation area and their brief ecologies are given in the section entitled vegetation. Plant associations were named according to phytosocilogical nomenclature[21]. Nomenclature for vascular plants follows Davis[22] and Güner *et al.*[23]. Author abbreviations follow Brummit and Powell[24]. After being supplied from the archives of the General Directorate of Meteorology, climatic features of the study area and climatic data of the meteorologial

stations of the region Eğirdir, Gelendost and Şarkikaraağaç have been evaluated[25].

Vegetation of the area: Forest vegetation occupies the largest area. Forests of *P. nigra* ssp. *nigra* var. *caramanica, Juniperus excelsa* M. Bieb., *Quercus ithaburensis* Decne ssp. *macrolepis* (Kotschy) Hedge et Yalt. and *Quercus pubescens* Willd, respectively prevail in the area.

***Astragalo oxytropifolii-Pinetum caramanicae* ass:** This community, which displays a tremendous distribution in Turkey, is widespread in the subject area between the altitudes 1300-1700 m, on slopes with 5-20% inclination. *Pinus nigra* ssp. *nigra* var. *caramanica*, the basic constituent of the association, forms an expansive cover on the Mediterranean mountain layer. The other characteristic species of the association is *Astragalus oxytropifolius* Boiss. This association, sampled in twelve plots, grow on calcareous bedrocks and brown forest soils. Results for the physical and chemical analysis of the soils related with associations are given at Table 2.

Astragalo oxytropifolii - Pinetum caramanicae association is composed of three vegetation layers; the tree, shrub and herbaceous layers. Besides featuring the dominant species of the tree layer, *Pinus nigra* ssp. *nigra* var. *caramanica* also remains the characteristic plant distinguishing the association. The general cover of the tree layer ranges from 60 to 80% and their heights from 8 to l5 m. The shrub stratum is comprised of the species of *Juniperus oxycedrus* L. ssp. *oxycedrus*, *Quercus pubescens*, *Berberis crataegina* DC., *Cistus laurifolius* L. and *Cotoneaster nummularia* Fisch. and C.A. Mey. *Juniperus oxycedrus* ssp. *oxycedrus*, 0.5-1 m in height and covering 15 and 25% of the vegetation, stands the dominant species of the shrub layer. The general cover of the herb layer is between 10-20%, 20-35 cm in height and the ratio of steppe plants on this stratum is relatively high (Table 3).

Characteristic species of the alliance *Pino-Cistion laurifolii* of the order *Querco-Cedretalia libani* and class *Quercetea pubescentis* are found in this association. Therefore, this association is placed into the above mentioned upper divisions.

Table 2: Physical and chemical properties of the soils from the associations' plots

Plant associations	No. of quadr.	Sand (%)	Silt (%)	Clay (%)	Text.	$CaCO_3$ (%)	K_2O (kg dk^{-1})	P_2O_5 (kg dk^{-1})	Total salinity (%)	pH	Org. mat.
A. oxytropifolii - P. caramanicae	90	39.0	30.2	30.8	CL	43.9	13.5	1.7	0.04	7.8	1.8
	93	34.6	33.6	32.2	CL	42.6	62.6	4.6	0.05	7.6	3.6
	94	57.0	22.0	21.0	C	46.4	79.0	2.3	0.06	7.8	3.2
	105	88.6	08.0	03.4	CL	51.7	00.4	2.3	0.01	7.8	3.2
	107	42.6	26.0	31.4	CL	53.3	36.4	1.7	0.05	7.8	2.4
Q. vulcanicae - J. excelsae	73	49.2	30.0	20.8	C	49.8	29.8	1.7	0.06	7.6	3.4
	69	31.0	28.2	40.0	C	46.2	62.6	1.7	0.04	7.8	1.0
Q. trojano - Macrolepidis	2	38.6	27.2	34.2	CL	18.6	82.3	4.4	0.08	7.5	3.3
	9	45.2	24.4	30.4	CL	40.8	62.6	1.7	0.06	7.7	0.7
	12	40.2	23.0	36.2	CL	36.2	69.2	6.2	00.1	7.5	1.8
O. pisidicae-Q. pubescentis	13	39.0	26.0	35.0	CL	40.8	26.6	0.5	0.08	7.8	0.6
	15	33.0	24.0	43.0	CL	42.9	59.3	1.7	0.01	7.7	1.3
	19	34.6	23.6	42.2	C	28.8	49.5	3.4	0.06	7.6	0.6

C: Clayish, CL: Clayish loam

Table 3: *Astragalo oxytropifolii - Pinetum caramanicae* ass. *Type: Quadrat 93

Quadrat No.	104	107	105	108	90	*93	101	95	97	94	99	96	
Area (m^2)	1000	1000	1000	1000	100	1000	1000	1000	1000	1000	1000	1000	
Altitude (m)	1700	1700	1700	1700	1300	1400	1600	1600	1600	1400	1600	1500	
Inclination (%)	20	20	20	20	20	5	5	5	10	5	5	10	
Exposure	S	SW	NW	S	SW	SW	SW	SW	S	S	SW	SW	
Cover of the trees(%)	80	80	60	70	80	80	80	80	60	80	60	80	
Cover of the shrubs (%)	15	25	15	25	25	25	15	25	25	25	25	25	
Cover of the herbs (%)	20	20	20	20	20	20	20	20	10	10	20	20	
Bedrock	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	
Characteristic species of association	The degree of covering and sociability in the sample plots of species												
Pinus nigra ssp. *nigra* var.*caramanica*	3/4	3/4	4/4	3/4	3/4	3/4	3/4	3/4	3/4	4/4	3/4	3/4	V
Astragalus oxytropifolius	.	.	.	.	+/1	+/1	+/1	+/1	.	+/1	+/1	.	III
Characteristic species of the alliance *Pino-Cistion laurifolii*													
Chamaecytisus pygmaeus	+/1	+/1	+/1	+/1	.	+/1	+/1	+/1	+/1	.	+/1	+/1	V
Cistus laurifolius	+/1	.	.	+/1	.	+/1	.	.	.	.	+/1	.	II
Characteristic species of the alliance *Carpino-Acerion*													
Lathyrus laxiflorus ssp. *laxiflorus*	.	+/1	+/1	.	.	+/1	.	.	+/1	.	+/1	+/1	III

Table 3: (Continued)

Quadrat No.	104	107	105	108	90	*93	101	95	97	94	99	96	
Characteristic species of the order *Querco-Cedretalia libani* and the class *Quercetea pubescentis*													
Juniperus oxycedrus ssp. *oxycedrus*	1/.2	1/.2	1/.2	1/.2	2/.3	2/.2	1/.2	1/.2	+/2	1/.2	2/2	1/.2	V
Cotoneaster nummularia	+/2	+/2	+/2	+/2	+/2	+/2	+/2	+/2	.	+/2	+/2	+/2	V
Berberis crataegina	+/2	+/2	+/2	+/2	.	+/2	+/2	+/2	+/2	+/2	+/2	+/2	V
Teucrium chamaedrys ssp. *tauricolum*	+/1	+/1	+/1	+/1	+/1	+/1	+/1	+/1	+/1	+/1	.	+/1	V
Briza humilis	+/1	+/1	+/1	+/1	+/1	+/1	+/1	.	+/1	+/1	+/1	+/1	V
Cerastium fragillimum	+/1	.	+/1	+/1	.	+/1	.	+/1	.	+/1	+/1	.	III
Silene italica	.	+/1	.	+/1	.	.	.	+/1	.	.	+/1	.	II
Quercus pubescens	.	.	.	.	+/2	+/2	.	.	.	+/2	.	.	II
Turritis laxa	+/1	.	.	.	.	+/1	.	+/1	.	.	.	.	II
Digitalis ferruginea ssp. *ferruginea*	.	+/1	.	.	.	.	+/1	.	.	.	.	+/1	II
Lathyrus digitatis	.	.	+/1	.	+/1	.	.	.	.	.	+/1	.	II
Trifolium speciosum	+/1	.	.	.	.	+/1	.	.	+/1	.	.	.	II
Myosotis alpestris	+/1	.	.	.	.	.	.	.	.	.	.	.	I
Characteristic species of the class *Cisto-Micromerietea*													
Salvia tomentosa	+/1	+/1	.	+/1	.	+/1	.	.	.	.	.	.	II
Characteristic species of the order *Onobrychido-Thymetalia leucostomi* and the class *Astragalo-Brometea*													
Alyssum pateri ssp. *pateri*	+/1	+/1	.	+/1	.	+/1	+/1	.	+/1	.	.	+/1	III
Minuartia hamata	.	+/1	.	+/1	.	.	+/1	.	+/1	.	+/1	.	III
Helianthemum canum	.	+/1	.	.	.	.	+/1	.	.	+/1	+/1	+/1	III
Bungea trifida	.	.	+/1	.	.	+/1	+/1	+/1	.	.	+/1	.	III
Scorzonera eriophora	+/1	+/1	.	.	.	.	.	.	+/1	+/1	.	+/1	III
Globularia trichosantha	.	.	.	.	.	+/1	.	.	.	+/1	+/1	+/1	II
Anthyllis vulneraria var. *pulchella*	+/1	.	.	+/1	.	.	.	.	.	.	+/1	.	II
Euphorbia myrsinites	.	+/1	+/1	.	+/1	.	.	.	.	.	.	.	II
Sanguisorba minor ssp. *muricata*	.	.	.	.	.	.	.	.	+/1	+/1	.	.	I
Aethionema cordatum	.	.	+/1	+/1	.	.	.	.	.	.	.	.	I
Jurinea consanguinea	.	.	.	.	+/1	.	.	.	.	.	.	+/1	I
Characteristic species of the class and order *Daphno-Festucetalia* (*ea*)													
Daphne oleoides ssp. *oleoides*	+/1	+/1	.	+/1	.	.	+/1	+/1	.	+/1	.	+/1	III
Thymus zygioides var.*lycaonicus*	.	.	.	+/1	.	.	.	.	.	.	+/1	.	I
Others													
Pilosella echioides ssp. *procera*	.	+/1	.	.	.	+/1	+/1	+/1	.	.	+/1	.	III
Ornithogalum ulophyllum	+/1	.	.	.	.	.	+/1	+/1	+/1	.	.	+/1	III
Ononis pusilla	.	.	.	.	+/1	.	+/1	.	+/1	+/1	+/1	.	III
Alyssum contemtum	.	.	.	.	.	+/1	+/1	.	+/1	.	+/1	+/1	III
Pilosella piloselloides	+/1	.	+/1	.	.	.	.	.	+/1	+/1	.	.	II
Scorzonera cana var. *cana*	+/1	.	+/1	.	.	+/1	+/1	.	.	.	.	.	II
Sedum acre	+/1	+/1	.	+/1	.	.	.	.	.	.	+/1	.	II
Saponaria mesogitana	.	+/1	+/1	.	.	.	.	.	+/1	+/1	.	.	II
Ornithogalum oligophyllum	.	+/1	.	+/1	.	.	.	.	.	.	.	.	I
Orchis mascula ssp. *pinetorum*	+/1	.	.	+/1	.	.	.	.	.	.	.	.	I
Hieracium pannosum	.	.	.	.	.	+/1	.	.	.	.	.	.	I
Thesium billardieri	.	.	.	.	+/1	.	.	.	.	.	.	.	I

I= Species is present in the 1-20% of sample plots, II= Species is present in the 20-40% of sample plots, III= Species is present in the 40-60% of sample plots, IV= Species is present in the 60-80% of sample plots, V= Species is present in the 80-100% of sample plots

+ = Covering degree is very low in the sample plots of species, . = This species is not present in the sample plots

Sample plots at the table were made at Örenköy, on Balcıtaşı hill and on Kaletepe, Söbüova.

***Querco vulcanicae - Juniperetum excelsae* ass:** This community spreads on calcareous bedrocks and brown forest soils in the study area. Physical and chemical properties of the soils have been presented at Table 2. This plant community has been described in five sample quadrats. The elevations of these plots vary between 1300-1600 m and their gradients between 5-20%.

It consists of three strata: The tree layer, the shrub layer and the herb layer. Not only do *Juniperus excelsa* and *Quercus vulcanica* (Boiss. and Heldr.ex) Kotschy characterize the association, but they also stand dominant on the tree layer. Varying between 4-6 m in height, the tree layer holds a general cover of 60 to 80% (Table 4).

The shrub stratum, the dominant species of which are *Cotoneaster nummularia*, *Juniperus oxycedrus* ssp. *oxycedrus*, *Coronilla emerus* L. ssp. *emeroides* (Boiss. and Sprun) Hrabétova and *Berberis crataegina*, reaches a height of 1-1.5 m and a cover of 5-10%.

The herb layer is 20-30 cm in height, with a 15-20% general cover. This layer sustains a great number of annual and perennial plants. In the association, there exist

Table 4: *Querco vulcanicae - Juniperetum excelsae* ass. *Type: Quadrat 68

Quadrat No.	66	*68	69	71	73	
Area (m^2)	300	300	300	300	300	
Altitude (m)	1300	1550	1550	1500	1600	
Inclination (%)	5	20	20	20	20	
Exposure	N	NW	NW	N	NW	
Cover of the trees(%)	80	80	80	80	60	
Cover of the shrubs (%)	10	10	10	5	5	
Cover of the herbs (%)	20	20	15	20	20	
Bedrock	Calc	Calc	Calc	Calc	Calc	
Characteristic species of association	The degree of covering and sociability in the sample plots of species					
Juniperus excelsa	3/4	3/4	¾	3/4	3/3	V
Quercus vulcanica	+/1	+/1	+/1	+/1	+/1	V
Characteristic species of the alliance *Carpino-Acerion*						
Lathyrus laxiflorus ssp. *laxiflorus*	.	+/1	.	+/1	.	II
Characteristic species of the order *Querco-Cedretalia libani* and the class *Quercetea pubescentis*						
Cotoneaster nummularia	+/2	+/2	+/2	+/2	+/2	V
Melica ciliata ssp. *ciliata*	+/2	+/2	+/2	+/2	+/2	V
Briza humilis	.	+/1	+/1	+/1	+/1	IV
Juniperus oxycedrus ssp. *oxycedrus*	+/2	+/2	+/2	+/2	.	IV
Quercus pubescens	.	+/2	.	+/2	+/2	III
Trifolium speciosum	+/1	+/1	.	.	+/1	III
Silene italica	.	+/1	.	+/1	+/1	III
Cerastium fragillimum	+/1	.	.	+/1	+/1	III
Coronilla emerus ssp. *emeroides*	+/1	+/1	.	.	+/1	III
Vicia cracca ssp. *stenophylla*		+/1	+/1	.	+/1	III
Berberis crataegina	.	+/1	.	+/1	+/1	III
Myosotis alpestris	.	+/1	.	.	.	I
Myosotis stricta	+/1	.	.	.	.	I
Characteristic species of the class *Onobrychido-Thymetalia leucostomi* and the class *Astragalo-Brometea*						
Anthemis tinctoria var. *tinctoria*	.	+/2	+/2	+/2	+/2	IV
Scutellaria orientalis ssp. *pinnatifida*	.	+/1	+/1	+/1	+/1	IV
Erysimum crassipes	+/1	+/1	+/1	.	.	III
Minuartia hamata	+/1	.	.	+/1	+/1	III
Onosma aucheranum	.	+/1	+/1	.	+/1	III
Anthyllis vulneraria ssp. *pulchella*	.	+/1	+/1	.	.	II
Aethionema cordatum	.	.	.	+/1	+/1	II
Papaver apokrinomenon	.	+/1	+/1	.	.	II
Characteristic species of the order and the class *Daphno-Festucetalia* (ea)						
Euphorbia kotschyana	.	+/1	+/1	+/1	.	III
Daphne oleoides ssp. *oleoides*	.	.	.	+/2	+/2	II
Marrubium astracanicum	.	.	.	+/1	+/1	II
Galium floribundum ssp. *floribundum*	+/1	+/1	.	.	.	II
Thymus zygioides var. *lycaonicus*	.	.	.	+/1	.	I
Others						
Thlaspi perfoliatum	+/1	+/1	+/1	+/1	.	V
Sedum acre	.	+/1	+/1	+/1	+/1	IV
Paronychia carica	.	+/1	+/1	+/1	+/1	IV
Minuartia pestalozzae	.	+/2	+/2	+/2	+/2	IV
Rhamnus oleoides ssp. *graecus*	+/1	+/1	.	.	+/1	III
Bolanthus minuartioides	.	.	+/1	+/1	+/1	III
Muscari comosum	+/1	.	.	+/1	.	II
Potentilla recta	.	+/1	+/1	.	.	II
Alyssum strigosum ssp. *strigosum*	+/1	+/1	.	.	.	II
Alyssum stribny	.	+/1	+/1	.	.	II
Cerastium banaticum	.	.	+/1	+/1	.	II
Silene vulgaris	.	+/1	+/1	.	.	II
Conringia perfoliata	+/1	.	+/1	.	.	II

many species belonging to order *Querco-Cedretalia libani* and class *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 (Table 4).

Sample quadrats at the table were made on the northern slopes of Namazgah hill.

***Quercetum trojano-Macrolepidis* ass:** This association develops on calcareous bedrocks and brown forest soils. Physical and chemical properties of the related soils have been given at Table 2. This plant association has been described in twelve sample quadrats.

Structurally, the association is composed of three strata. As well as being dominant species of the tree layer, *Quercus ithaburensis* ssp. *macrolepis* and *Quercus trojana* P.B. Webb appear to be the community's typical and distinguishing species. The tree stratum varies between 4-6 m in height and 60-90% in general cover.

The shrub layer forms a height of 0.5-1 m with a cover of 5-10%. The herb layer consists of herbaceous plants, whose heights range from 20 to 40 cm and general cover from 10 to 25%.

In the association, the class *Quercetea pubescentis* the order *Querco-Cedretalia libani* and the alliance *Carpino-acerion* are represented by many species. Therefore, this association is placed into the above mentioned upper divisions (Table 5).

Sample plots at the table were established on Katmercibaşı hill, about 500 m from Yakaköy village.

***Onobrychido pisidicae-Quercetum pubescentis* ass:** This association develops in the vicinity of Yanıkçayır, between the villages Bahtiyar and Madenli. The altitude of the lands ranges between 1100-1150 m and the inclination between 5-20%. In Turkey, this association has come into being as a result of the destruction of *Pinus nigra* ssp. *nigra* var. *caramanica* forests, which are common in steppe-forest transition belts. In the region, likewise, it has developed on calcareous bedrocks and brown forest soils. Results of the physical and chemical analysis of the soils have been given at Table 2. It is shaped by three strata: The tree layer, the shrub layer and the herb layer. *Quercus pubescens*, 3-5 m in height, with a cover of 60-80%, is the dominant species of the tree layer. Three species, *Crataegus monogyna* Jacq. ssp. *monogyna, Berberis crataegina* and *Juniperus oxycedrus* ssp. *oxycedrus* make up the shrub layer and are 0.5-1 m tall, with a vegetation cover of 5%. The herb layer occupies a general cover of 5-15%, with a height of 20-30 cm.

The association is characterized by *Quercus pubescens*, *Onobrychis pisidica* Boiss. and *Alkanna tubulosa* Boiss. The association is described by ten sample plots. Sample plots at the table were established in the vicinity of Yanıkçayır district south of the villages Madenli and Bahtiyar. In the association, the class *Quercetea pubescentis*, the order *Querco-Cedretalia libani* and the alliance *Carpino - Acerion* are represented by many species. Therefore, this association is included into the above mentioned upper divisions (Table 6).

Sample plots at the table were established in the vicinity of Yanıkçayır mevkii, south of the villages Madenli and Bahtiyar.

Table 5: Quercetum trojano-Macrolepidis ass. *Type: Quadrat 4

Quadrat No.	1	2	3	*4	5	6	7	8	9	10	11	12	
Area (m^2)	300	300	300	300	300	300	300	300	300	300	300	300	
Altitude (m)	1100	1000	1000	1050	1000	1000	1000	1000	1100	1100	1000	1000	
Inclination (%)	5	5	10	5	10	5	5	10	10	5	10	10	
Exposure	SW	W	SW	SW	SW	SE	SW	NE	NE	NE	N	N	
Cover of the trees(%)	80	60	80	90	80	80	80	90	80	90	80	80	
Cover of the shrubs (%)	10	5	10	10	10	10	10	10	10	10	5	5	
Cover of the herbs (%)	25	25	25	25	10	10	10	25	25	25	25	25	
Bedrock	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	
Characteristic species of association	The degree of covering and sociability in the sample plots of species												
Quercus ithaburensis ssp. *macrolepis*	3/4	3/4	¾	3/4	3/4	3/4	3/4	3/4	3/3	3/4	3/3	3/3	V
Quercus trojana	½	+/2	½	2/3	½	2/3	+/2	2/2	½	2/3	½	+/1	V
Characteristic species of the alliance *Carpino-Acerion*													
Asperula involucrata	.	+/1	.	+/1	.	+/1	.	.	.	+/1	.	.	II
Lathyrus laxiflorus ssp. *laxiflorus*	+/1	.	.	+/1	.	.	.	.	+/1	.	.	+/1	II
Characteristic species of the order *Querco-Cedretalia libani* and the class *Quercetea pubescentis*													
Briza humilis	+/1	+/1	+/1	+/1	+/1	+/1	+/1	+/1	+/1	+/1	+/1	+/1	V
Melica ciliata ssp. *ciliata*	+/1	.	+/1	+/1	+/1	+/1	+/1	+/1	+/1	.	+/1	+/1	V
Vicia cracca ssp. *stenophylla*	+/1	+/1	.	+/1	+/1	+/1	.	+/1	.	+/1	+/1	+/1	IV
Juniperus oxycedrus ssp. *oxycedrus*	+/2	+/2	+/2	+/2	+/2	+/2	.	+/2	+/2	.	.	+/2	IV
Cerastium fragillimum	+/1	+/1	.	+/1	.	+/1	+/1	+/1	+/1	.	.	.	III
Quercus pubescens	.	+/1	+/1	.	+/1	.	.	.	.	+/1	.	+/1	III
Quercus cerris var. *cerris*	.	.	+/1	.	.	.	+/1	.	.	+/1	.	+/1	II
Coronilla varia ssp. *varia*	+/1	.	.	+/1	.	.		+/1	.	.	+/1	.	II
Cephalanthera kurdica	+/1	.	.	.	.	+/1	+/1	+/1	.	.	.	.	II
Teucrium chamaedrys ssp. *tauricolum*	.	.	.	+/1	+/1	.	+/1	.	+/1	.	.	.	II

Table 5: (Continued)

Quadrat No.	1	2	3	*4	5	6	7	8	9	10	11	12	
Berberis crataegina	.	.	+/1	+/1	+/1	.	.	.	.	.	+/1	.	II
Dorycnium pentaphyllum ssp. *anatolicum*	+/1	+/1	.	.	.	.	.	.	+/1	.	.	+/1	II
Cotoneaster nummularia	.	.	.	+/1	.	.	.	+/1	.	+/1	+/1	.	II
Crataegus monogyna ssp. *monogyna*	.	.	.	+/2	.	.	.	.	.	.	.	.	I
Characteristic species of the class *Cisto-Micromerietea*													
Teucrium polium	+/1	+/1	+/1	.	+/1	+/1	+/1	.	+/1	.	+/1	.	IV
Characteristic species of the order *Onobrychido-Thymetalia leucostomi* and the class *Astragalo-Brometea*													
Convolvulus holosericeus	+/1	+/1	+/1	+/1	+/1	.	.	.	+/1	+/1	+/1	+/1	IV
Ziziphora tenuior	.	+/1	+/1	+/1	+/1	+/1	+/1	.	.	+/1	+/1	+/1	IV
Onosma aucheranum	+/1	+/1	+/1	+/1	+/1	.	+/1	+/1	.	+/1	+/1	.	IV
Alyssum pateri ssp. *pateri*	.	.	+/1	+/1	+/1	.	.	.	+/1	.	+/1	+/1	III
Ziziphora capitata	.	+/1	+/1	.	.	.	.	+/1	+/1	+/1	.	+/1	III
Minuartia hamata	.	.	.	+/1	.	.	.	.	+/1	+/1	+/1	+/1	III
Jurinea consanguinea	.	.	.	.	.	+/1	+/1	.	.	+/1	+/1	+/1	III
Lotononis genistoides	+/1	.	.	.	+/1	+/1	+/1	.	.	.	.	.	II
Anthemis tinctoria var. *tinctoria*	.	.	.	.	.	.	.	+/1	+/1	+/1	.	.	II
Linum hirsutum ssp. *anatolicum*	+/1	.	.	+/1	.	+/1	.	.	.	.	.	.	II
Hedysarum varium	+/1	.	.	.	.	+/1	.	.	.	.	.	.	I
Cruciata taurica	.	.	.	+/1	.	+/1	.	.	.	.	.	.	I
Sideritis montana ssp. *remota*	.	+/1	.	.	.	.	+/1	.	.	.	.	.	I
Onobrychis hypargyrea	.	.	.	.	.	+/1	.	.	.	+/1	.	.	I
Scutellaria orientalis ssp. *pinnatifida*	.	.	.	.	.	+/1	.	.	.	.	.	.	I
Others													
Linaria chalepensis var. *chalepensis*	+/1	+/1	+/1	+/1	+/1	+/1	+/1	+/1	+/1	+/1	+/1	+/1	V
Coronilla scorpioides	+/1	+/1	+/1	+/1	+/1	.	+/1	+/1	+/1	+/1	+/1	+/1	V
Dactylis glomerata	+/1	+/1	+/1	+/1	+/1	+/1	+/1	+/1	+/1	+/1	.	.	V
Alyssum strigosum ssp. *strigosum*	+/1	+/1	+/1	+/1	+/1	+/1	.	.	+/1	+/1	+/1	+/1	V
Crupina crupinastrum	+/1	.	+/1	+/1	+/1	+/1	+/1	+/1	+/1	+/1	+/1	.	V
Astragalus mesogitanus	.	+/1	+/1	.	.	+/1	+/1	+/1	+/1	+/1	+/1	+/1	IV
Medicago minima var. *minima*	.	+/1	+/1	.	.	+/1	.	+/1	+/1	+/1	+/1	+/1	IV
Logfia arvensis	.	+/1	+/1	.	.	.	.	+/1	+/1	+/1	+/1	+/1	III
Echinaria capitata	.	+/1	+/1	+/1	.	.	.	+/1	.	+/1	.	+/1	III
Trigonella spruneriana var. *spruneriana*	.	+/1	+/1	.	.	.	.	+/1	.	+/1	+/1	+/1	III
Medicago noeana	.	+/1	+/1	.	.	.	.	+/1	+/1	+/1	.	.	III
Inula oculus-christi	.	.	.	.	.	.	.	+/1	+/1	+/1	+/1	+/1	III
Triticum baeoticum ssp. *baeoticum*	.	.	+/1	.	.	.	.	+/1	+/1	.	+/1	+/1	III
Linum nodiflorum	+/1	.	.	+/1	.	+/1	+/1	.	.	.	.	.	II
Thesium billardieri	+/1	.	.	+/1	+/1	+/1	.	.	.	.	.	.	II
Vicia hirsuta	.	+/1	.	.	.	+/1	+/1	.	.	+/1	.	.	II
Ononis pusilla	+/1	.	.	.	+/1	+/1	+/1	.	.	.	.	.	II
Alyssum contemtum	+/1	.	.	+/1	+/1	.	.	.	.	.	.	.	II
Asperula stricta ssp. *stricta*	+/1	.	.	.	.	+/1	+/1	.	.	.	.	.	II
Astragalus macrocephalus	.	.	+/1	.	.	.	.	.	+/1	.	.	+/1	II
Silene otites	+/1	.	.	+/1	.	+/1	.	.	.	.	.	.	II
Vincetoxicum canescens ssp. *canescens*	+.1	.	.	.	.	+/1	+/1	.	.	.	.	.	II
Bupleurum sulphureum	.	.	.	+/1	.	.	.	.	.	.	.	+/1	I
Euphorbia rigida	+/1	.	.	+/1	.	.	.	.	.	.	.	.	I
Malabaila secacul	.	.	.	.	.	.	+/1	.	.	+/1	.	.	I
Muscari armeniacum	.	.	+/1	.	.	.	.	.	+/1	.	.	.	I
Ornithogalum armeniacum	.	+/1	.	.	.	.	.	+/1	.	.	.	.	I
Vincetoxicum fuscatum ssp. *fuscatum*	+/1	.	.	.	.	+/1	.	.	.	.	.	.	I
Aegilops markgrafii	.	.	.	.	.	.	+/1	.	.	.	.	.	I
Hieracium pannosum	.	.	.	.	.	.	.	.	+/1	.	.	.	I
Lathyrus sativus	.	.	+/1	.	.	.	.	.	.	.	.	.	I
Matthiola longipetala ssp. *bicornis*	.	.	.	+/1	.	.	.	.	.	.	.	.	I
Onobrychis armena	.	.	+/1	.	.	.	.	.	.	.	.	.	I
Pilosella echioides ssp. *procera*	.	.	.	.	.	.	.	.	+/1	.	.	.	I
Polygala pruinosa ssp. *megaptera*	.	.	.	.	+/1	.	.	.	.	.	.	.	I
Silene dichotoma ssp. *dichotoma*	.	.	.	.	.	.	.	.	+/1	.	.	.	I
Silene squamigera ssp. *squamigera*	.	.	.	+/1	.	.	.	.	.	.	.	.	I

I= Species is present in the 1-20% of sample plots, II= Species is present in the 20-40% of sample plots, III= Species is present in the 40-60% of sample plots, IV= Species is present in the 60-80% of sample plots, V= Species is present in the 80-100% of sample plots.

+ = Covering degree is very low in the sample plots of species, . = This species is not present in the sample plots.

Table 6: Onobrychido pisidicae-Quercetum pubescentis ass. *Type: Quadrat 13

Quadrat No.	16	18	22	24	*13	15	19	14	23	17	
Area (m^2) 400	400	400	400	400	400	400	400	400	400		
Altitude (m)	1150	1150	1150	1150	1100	1150	1150	1150	1100	1100	
Inclination (%)	10	10	5	20	5	5	10	10	5	5	
Exposure SE	SW	NW	NE	NE	SW	NW	NW	SE	NE		
Cover of the trees(%)	80	70	80	70	70	70	60	60	70	80	
Cover of the shrubs (%)	5	5	5	5	-	-	-	5	-	5	
Cover of the herbs (%)	5	15	15	5	15	10	10	10	15	10	
Bedrock Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc		
Characteristic species of association	The degree of covering and sociability in the sample plots of species										
Quercus pubescens	3/4	3/4	3/4	3/4	4/4	3/4	3/4	3/4	3/4	3/4	V
Onobrychis pisidica	.	+/2	.	+/2	+/2	+/2	+/2	+/2	+/2	+/2	IV
Alkana tubulosa	+/1	.	+/1	.	+/1	+/1	+/1	+/1	+/1	+/1	IV
Characteristic species of the alliance *Carpino-Acerion*											
Lathyrus laxiflorus ssp. *laxiflorus*	+/1	.	.	.	+/1	+/1	.	+/1	+/1	.	III
Asperula involucrata	+/1	.	+/1	.	+/1	+/1	.	.	.	+/1	III
Characteristic species of the order *Querco-Cedretalia libani* and the class *Quercetea pubescentis*											
Briza humilis	+/1	+/1	+/1	+/1	+/1	+/1	+/1	+/1	+/1	+/1	V
Crataegus monogyna ssp. *monogyna*	+/1	+/1	+/1	.	+/1	.	+/1	+/1	+/1	+/1	IV
Vicia cracca ssp. *stenophylla*	+/1	.	.	+/1	+/1	+/1	+/1	+/1	.	+/1	IV
Coronilla varia var. *varia*	+/1	.	+/1	.	+/1	+/1	+/1	+/1	+/1	.	IV
Teucrium chamaedrys ssp. *tauricolum*	.	+/1	+/1	+/1	.	.	.	+/1	+/1	.	III
Juniperus oxycedrus ssp. *oxycedrus*	.	+/2	.	+/2	+/2	.	.	+/2	.	+/2	III
Trifolium speciosum	+/1	.	.	.	+/1	.	+/1	.	+/1	+/1	III
Cerastium fragillimum	+/1	.	+/1	+/1	+/1	.	+/1	.	.	.	III
Galium peplidifolium	.	+/1	+/1	.	.	.	.	+/1	+/1	+/1	III
Berberis crataegina	+/1	.	.	+/1	+/1	.	.	.	+/1	.	II
Falcaria vulgaris	.	.	.	+/1	+/1	+/1	.	.	.	+/1	II
Characteristic species of the class *Cisto-Micromerietea*											
Salvia tomentosa	.	.	.	+/1	.	+/1	+/1	.	.	.	II
Teucrium polium	+/1	.	.	.	.	.	+/1	.	.	+/1	II
Characteristic species of the order *Onobrychido-Thymetalia leucostomi* and the class *Astragalo-Brometea*											
Anthemis tinctoria var. *tinctoria*	+/1	+/1	+/1	+/1	+/1	+/1	+/1	+/1	+/1	+/1	V
Hedysarum varium	.	.	.	+/1	+/1	+/1	+/1	+/1	+/1	+/1	IV
Leontodon asperrimus	+/1	+/1	+/1	.	+/1	+/1	.	+/1	.	+/1	IV
Stachys cretica ssp. *anatolica*	+/1	+/1	+/1	.	.	.	.	.	.	+/1	II
Onobrychis hypargyrea	+/1	.	.	.	+/1	.	+/1	.	.	+/1	II
Ziziphora capitata	.	.	+/1	.	.	.	+/1	.	.	+/1	II
Euphorbia macroclada	.	.	+/1	+/1	.	.	.	.	.	.	I
Asyneuma limonifolium ssp. *limonifolium*	.	.	.	+/1	.	.	.	+/1	.	.	I
Minuartia hamata	.	.	.	.	+/1	+/1	.	.	.	.	I
Others											
Dactylis glomerata	+/1	+/1	+/1	+/1	+/1	+/1	+/1	+/1	+/1	+/1	V
Crupina crupinastrum	+/1	+/1	+/1	.	+/1	+/1	+/1	+/1	.	+/1	IV
Ononis pusilla	+/1	+/1	+/1	+/1	+/1	.	.	+/1	+/1	+/1	IV
Alyssum strigosum ssp. *strigosum*	+/1	+/1	+/1	.	.	+/1	.	+/1	+/1	+/1	IV
Logfia arvensis	+/1	+/1	.	.	+/1	.	.	+/1	+/1	.	III
Medicago minima var. *minima*	+/1	+/1	+/1	.	.	.	.	+/1	+/1	.	III
Buglossoides arvensis	+/1	.	+/1	.	.	.	.	+/1	+/1	+/1	III
Phlomis pungens var. *hirta*	.	.	.	+/1	.	+/1	+/1	+/1	.	.	II
Medicago rigidula var. *rigidula*	.	.	.	+/1	+/1	+/1	+/1	.	.	.	II
Echinops ritro	.	.	.	.	+/1	+/1	.	.	.	+/1	II
Coronilla scorpioides	.	.	.	+/1	+/1	.	.	+/1	.	.	II
Trigonella spruneriana var. *spruneriana*	.	.	+/1	.	.	.	.	+/1	+/1	.	II
Medicago radiata	.	.	+/1	+/1	.	.	.	+/1	.	.	II
Androsace maxima	+/1	.	+/1	.	.	.	.	.	+/1	.	II
Vincetoxicum fuscatum ssp. *fuscatum*	.	.	.	+/1	.	.	.	+/1	+/1	.	II
Hieracium pannosum	.	.	.	.	+/1	.	.	.	.	+/1	I
Linum nodiflorum	.	.	+/1	.	+/1	.	.	.	.	.	I
Linum hirsutum	+/1	.	.	.	+/1	.	.	.	.	.	I
Medicago noeana	.	.	.	.	.	+/1	+/1	.	.	.	I

Table 6: (Continued)

Quadrat No.	16	18	22	24	*13	15	19	14	23	17	
Scandix stellata	.	.	.	+/1	.	.	.	.	+/1	.	I
Silene otites	+/1	+/1	.	.	.	.	.	.	.	.	I
Sterigmostemum sulphureum	.	.	.	.	.	+/1	.	+/1	.	.	I
Aegilops triuncialis ssp. *triuncialis*	.	.	.	.	.	+/1	.	.	.	.	I
Asperula stricta ssp. *stricta*	+/1	.	.	.	.	.	.	.	.	.	I
Medicago sativa ssp. sativa	.	.	.	+/1	.	.	.	.	.	.	I
Phlomis nissolia	.	.	+/1	.	.	.	.	.	.	.	I
Pilosella echioides ssp. *procera*	+/1	.	.	.	.	.	.	.	.	.	I
Rosa canina	.	+/2	.	.	.	.	.	.	.	.	I
Vicia hirsuta	.	.	.	.	+/1	.	.	.	.	.	I

I= Species is present in the 1-20% of sample plots, II= Species is present in the 20-40% of sample plots, III= Species is present in the 40-60% of sample plots, IV= Species is present in the 60-80% of sample plots, V= Species is present in the 80-100% of sample plots.
+ = Covering degree is very low in the sample plots of species, . = This species is not present in the sample plots

RESULTS AND DISCUSSION

Phytogeographically, the study site falls into the Mediterranean floristic region. In the study area, four plant associations belonging to forest vegetation type has been determined. Plant associations were named according to phytosocilogical nomenclature Weber *et al.*[21]. Climatic data of the meteorological stations in the area have been assessed in relation to the formula Emberger introduced to differentiate Mediterranean bioclimatic types. Correspondingly, the Q2 values have been fixed 89.6 for Eğirdir, 63.3 for Gelendost and 48.7 for Şarkikaraağaç[16]. As can be inferred from the results, Eğirdir and Gelendost are under the influence of low-precipitation and cool type, but Şarkikaraağaç under the semi-arid and very cold type Mediterranean climate. In accordance with the climatic types prevailing in the area, apart from the steppe vegetation, some communities from the forest and vegetation, which can infringe upon the steppe line, also cover the eastern parts of the study area. These communities are *Juniperus excelsa*, *Quercus pubescens*, *Quercus ithaburensis* ssp. *macrolepis*, *Pinus nigra* ssp. *nigra* var. *caramanica*.

Common plant association don't show any selective or fastidious behavior regarding the bedrocks. It is understood that the soils in the area are not the only influential agent in the formation and distribution of the associations. Because, on the soils which evolved on the same bedrocks, different plant communities appear with the changing altitude, temperature and precipitation.

As indicated, as a consequence of the fact that the area lies in a transition belt, together with some biotic factors, normal structure and floristic composition of the associations from forest and shrub vegetations have been damaged. The result has been that numerous steppe plants and Syntaxa from different vegetation types have emerged on the flora of these association.

Astragalo oxytropifolii-Pinetum caramanicae: Covering a great part of the study area, forests of *Pinus nigra* ssp. *nigra* var. *caramanica* are one the forests with high frequency. Akman *et al.*[11] have phytosociologically categorized Turkey' s *Pinus nigra* ssp. *nigra* var. *caramanica* forests in *Querco-Carpinetalia orientalis* and *Querco-Cedretalia libani* orders into: a) *Pinus nigra* ssp. *nigra* var. *caramanica* forests of the northwestern Anatolia, b) of the western Anatolia, c) of Amanos and Taurus mountains in southern Anatolia.

Pinus nigra ssp. *nigra* var. *caramanica* forests grow in Taurus mountains, where highly varied precipitation occurrences take place. They spread not only on lands with 1000 mm or even 1500 mm precipitation but also on the slopes facing interior Anatolia, whose precipitation is as little as 400-500 mm.

In the study area, they thrive on lands where mean annual precipitation ranges from 578 to 1200 mm. That is to say, they come into being in places where little or moderate precipitation and cold or very cold Mediterranean climate types prevail. Owing to overgrazing and ignorantly felling of the trees, *Pinus nigra* ssp. *nigra* var. *caramanica* forests in the region have perpetually been destructed and ultimately become sparse. Normal structure and floristic composition of this now sparse formation have degraded, the subforest flora having been mainly comprised of steppe plants. Under the forest canopy and in the glades, there are two common shrub species, *Juniperus oxycedrus* ssp. *oxycedrus* and *Cotoneaster nummularia*. Quézel *et al.*[26] placed *Pinus nigra* ssp. *nigra* var. *caramanica* forests, on the basis of their sundry floristic structures, into two orders of class *Quercetea pubescentis*. The orders are *Querco-Cedretalia libani* and *Querco-Carpinetalia orientalis*. To them[11], while *Pinus nigra* ssp. *nigra* var. *caramanica* forests in northern west Anatolia is included in the order of *Querco-Carpinetalia orientalis*, those in Taurus mountains fall into the order of *Querco-Cedretalia libani*. Likewise, in the association that we have described, the order of *Querco-cedretalia libani* has been placed into the above mentioned upper divisions since it includes a considerable amount of characteristic species from class *Quercetea pubescentis*.

The association of *Pinus nigra* ssp. *nigra* var. *caramanica* has been described in many places of Turkey by various researchers. Of the areas close tour study area, it has been sampled in Sultandağları and in Maden district of Seydişehir[2,3], in Afyon Başkomutanlık National Park[4], on Barla[5] and Akdağ[6] mountains and The East Region of Dedegöl (Anamas) Mountain and Kurucuova-Yeşildağ[8].

***Querco vulcanicae - Juniperetum excelsae*:** *Juniperus excelsa*, characteristic of the association, has a high distribution in Anatolia at elevations between 1000-2600 m. In our area, it is conspicuous on the upper Mediterranean stratum and Mediterranean mountain belt, in lands where *Pinus nigra* ssp. *nigra* var. *caramanica* has been subject to destruction. Although *Juniperus excelsa* occurs a dense community on the northern slopes of Kurtyurdu tepe and Namazgah tepe, it is sparsely distributed on Büyüksivri tepe, Katran tepe and on the western ridges of Namazgah tepe. According to Akman *et al.*[11], communities of *Juniperus excelsa* make up an interesting structure in northwestern Anatolia. They spread on calcareous bedrocks, on pebbled or eroded soils at elevations between 200-400 m, with a precipitation of 500 mm. On Taurus mountains, they exhibit extended but sparse associations on calcareous and serpentine bedrocks. On study area, they are widespread on stony and shallow soils on calcareous bedrocks with 578-1200 mm precipitation. Phytosociologically, this community was attributed to two orders by Akman *et al.*[11]: the ones appearing in southern Anatolia to the order of *Querco-Cedretalia libani* and those in northwestern Anatolia to *Quercetalia pubescentis* Doing Kraft 1955.

In the association defined too, there exist many species belonging to order *Querco-Cedretalia libani*, class *Quercetea pubescentis*. Geographical distribution, characteristic and dominant species being considered, this association has been placed into the above mentioned upper divisions.

In regions of immediate vicinity, *Juniperus excelsa* association has been described in places between Bucak and Elmalı[27], on Barladağı[5], in Maden district of Seydişehir[3], on Akdağ[6] and The East Region of Dedegöl (Anamas) Mountain and Kurucuova-Yeşildağ[8].

***Quercetum trojano - Macrolepidis*:** *Quercus ithaburensis* ssp. *macrolepis* is a plant of the eastern Mediterranean origin, spreading in interior and southern Anatolia at level or nearly level grounds with deep soils.

In the area, the association of *Quercus ithaburensis* ssp. *macrolepis*, adjacent to populated localities, has lost its normal floristic composition due to an intensive anthropogenic influence. Therefore, the ground flora is composed, to a great extent, of steppe plants of various upper divisions. An association similar to ours was sampled for the first time by Serin *et al.*[28] on Hacıbaba mountain of Karaman. Then, it was situated in the alliance *Quercion anatolicae* Quezel, Barbero et Akman 1977, from the order *Querco-Carpinetalia Orientalis* Quezel, Barbero et Akman 1980, class *Quercetea pubescentis*. In the association we have distinguished, dominant and characteristic species from the alliance of *Carpino-acerion*, order *Querco-Cedretalia libani* and class *Quercetea pubescentis*, are widespread. So, the association has been inserted into the above named alliance, class and order.

***Onobrychido pisidicae - Quercetum pubescentis*:** *Quercus pubescens* spreads in steppe-forest transition belts in Anatolia. It is one of the associations which emerged as a consequence of the destruction of *Pinus nigra* ssp. *nigra* var. *caramanica* forests. In the study area, they grow at elevations between 1100-1150 m, on low-slant terrain with deep, brown forest soils. Being unable to prosper well because of the destruction, *Quercus pubescens* has been able to reach up to 10 m in preserved lands. Easily noticeable in steppe regions of Anatolia, this oak species is typical of poor precipitation belts. The association spreads on semi-arid strata, with a precipitation no more than 500 mm. In the area, it appears in cool regions with low-precipitation, about 578 mm.

This association has been phytosociologically evaluated into the above mentioned upper divisions because of the dominancy of characteristic species from the alliance of *Carpino-Acerion*, order *Querco-Cedretalia libani* and class *Quercetea pubescentis*.

In nearby regions, this association has been described on Akdağ[6], on Kızılören, Çal and Loras mountains[7] and in Sultandağları[2].

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