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A phytosociological research in the Belgrad forest

by

F. YALTIRIK, Y. AKMAN and O. KETENOĞLU

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F. YALTIRIK*, Y. AKMAN** and O. KENTEOĞLU**

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ABSTRACT

The Belgrad forest situated within the boundaries of Istanbul was phytosociologically investigated by means of the quadrats laid out by YALTIRIK in 1966. Four different associations were recognized in the forest never investigated from the viewpoint of phytosociology before. The associations were considered in the order Rhododendro-Fagetalia orientalis if the class Querco-Fagetea except for the maquis association which was included in the class Quercetea ilicis.

INTRODUCTION

The floristic analysis of the vegetation of Belgrad forest and the composition of the main stand types were investigated by the work of YALTIRIK in 1966. In the work, the sylvatic vegetation was structurally analyzed in a classical way.

By this paper, we aimed to investigate the phytosociological characteristics of Belgrad forest. The quadrats laid out by YALTIRIK were rearranged and interpreted in a modern sense of Phytosociology and the higher units including the associations were determined. Thus, the phytosociological characteristics which were the main deficiencies of the works carried out in the forest before, were fully explained.

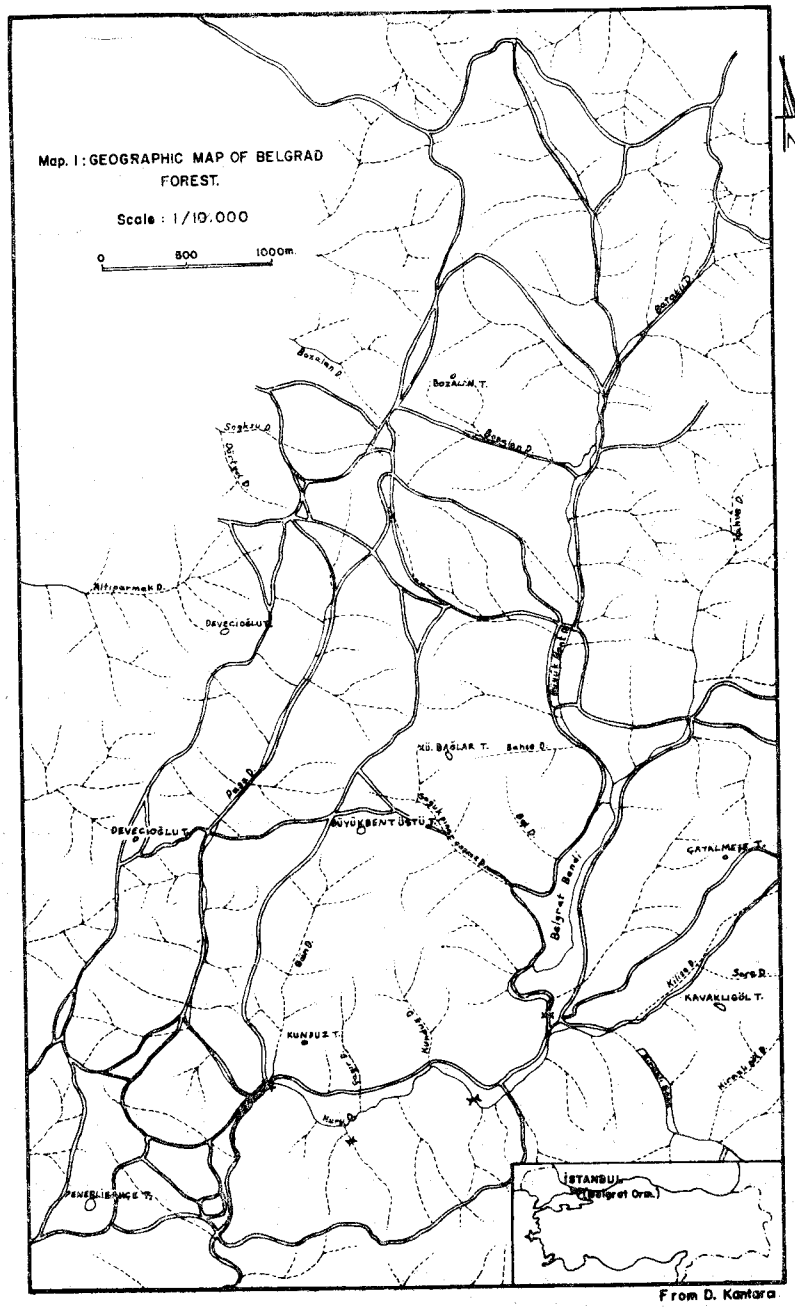
METHODS

The vegetation analysis of the forest and determination of the phytosocoiological units were carried out according to Braun-Blanquet's method. The ecological data were obtained from the previous works in the forest (YALTIRIK, 1966, KANTARCI, 1980).

* Forestry Faculty, University of Istanbul

** Science Faculty, University of Ankara

BRIEF DESCRIPTION OF THE STUDY AREA (Map: 1)



From D. Kantara

The geological structure of the area situated on a peneplain is composed of the schists of Carboniferous, noncalcerous Neogene sediments of Tertiary and the recent alluvia of Quarternary. The noncalcerous Neogene sediments are the most common and the peneplain topography was originated from the Neogene sediments in the area.

On the Carboniferous schists, brown and greybrown forest soils with a shallow and stony texture were developed, while deep and nonstony greybrown forest soils and pseudoglays due to the stagnant water on the Neogene sediments.

For determination of the climatic characters of the area, the data of 21 years (1948-1968) of Bahçeköy meterorological station were evaluated.

A humid type of climate prevails in Belgrad forest according to Erinç's precipitation effectiveness index. According to Thornthwaite, the type of the climate in the forest is an oceanic one with the characters of humid, moderate hot and waterlack in summer.

In the region having a total rainfall of 1069.4 mm, the mean temperature is 13.0 °C. The mean maximum temperature of the hottest month August, is 27.1 °C while the mean minimum one of the coldest month, February, is 1.4 °C. It is also observed from the meteorological data that the area is under the influence of a transitory type of oceanic climate.

VEGETATION

Belgrad forest exhibits a complex structure from the viewpoint of vegetation. According to the conclusions of several authors, flora of the area is composed of Euxinian elements along with the Mediterranean and European ones.

Of the woody species seen in the forest *Fagus orientalis*, *Carpinus betulus* and the essential trees of the forest, *Quercus petraea* subsp. *iberica*, *Q. polycarpa*, *Q. frainetto* and *Q. pedunculiflora* form large stands.

The forest still keeps its original form in spite of the biotic interferences. The floristic composition of the forest varies according to the water economy of the sites.

Carpinus betulus and the evergreen species of maquis occupy the dry and changeable humid habitats while the others could not be seen in dry habitats. As to the oaks, they occur in various habitats.

The vegetation was analyzed in the quadrats of 400 m^2, however the size of the quadrats laid out on the valley bottoms which were occupied by the tress of *Carpinus betulus*, were estimated as 300 m^2 and for *Erica arborea* association as 100 m^2.

In the present work, four different associations were recognized by means of the quadrats taken in the forest before;

1– *Carpinus betulus-Acer campestre* association

2– *Fagus orientalis-Ilex aquifolia* association

3– *Quercus petraea* subsp. *iberica-Lathyrus niger* association

4– *Erica arborea-E. verticillata* association

1– *Carpinus betulus-Acer campestre association*

(Table no: 1)

Carpinus betulus forming stands usually on the southwest and western slopes of Belgrad forest, is widespread on the soils with loamy and clayey loamy texture. The pH values of the soils range between 4.8-6.4. Although the type species, *Carpinus betulus* forms pure stands on the valey bottoms of the forest, it is associated with the oaks such as *Quercus petraea* subsp. *iberica*, *Q. frainetto* and *Q. pedunculiflora* on the slopes near the ridges and the slopes near the valley bottom with an inclination of 10-25 %.

The association has a dense canopy where it occurs on the valley bottoms. However, on the slopes, the density of the canopy is lessened and the association exhibits two layers due to accompanying of various oaks. Then the crown density of understory increases. The floristic composition of the association is rich and the coverage of herbaceous layer reaches to 80 %.

Acer campestre, *Symphytum tuberosum* and *Carex pendula* were chosen as characteristic species which seperate the association from the others.

Table no: 1 – Carpinus betulus – Acer campestre association.

	Qdrat no	26	44	100	25	23	24	171	14	110	49	64	43	50	45	133	154	108	147	155	
	Aa of the quadrat (m²)	300	400	300	300	300	300	400	300	400	400	400	400	400	400	400	400	400	400	400	
	lection	–	SW	–	E	W	E	SW	–	W	SW	SW	SW	SW	NW	NW	W	W	SW	W	
	lination (%)	–	10	–	3	5	5	20	–	20	15	25	20	20	15	25	10	15	10	15	Presence
Characteric and differential species:																					
Carpinus tulus		44	43	45	45	44	44	34	44	33	44	22	45	54	55	44	43	45	32	33	V
Acer campestre		14	.	+1	+1	+1	.	+1	11	.	+1	+1	.	.	.	.	.	.	.	.	III
Symphytu tuberosum subsp.nodosum		11	+1	.	.	+1	+1	.	+1	.	.	.	+1	.	.	.	+1	.	.	.	II
Carex pendula		13	.	12	.	13	.	.	+1	.	.	.	.	.	.	.	.	.	.	.	II
Characteristics of the order RHODODENDRO- FAGETALİA ORİENTALİS																					
Trachystemon orientale		33	22	22	+1	32	32	13	23	44	33	24	++	++	.	.	.	++	.	.	IV
Daphne pontica		21	22	12	21	.	.	+1	+1	14	11	.	32	12	+1	.	11	13	11	.	IV
Rubus hirtus		33	21	23	33	34	23	13	32	.	22	23	+1	+1	+1	11	.	.	.	.	IV
Epimedium pubigerum		12	44	11	32	+1	.	+1	.	22	33	23	.	43	.	.	.	33	44	.	IV
Smilax excelsa		33	14	+1	12	.	.	.	.	.	+1	.	13	+1	+1	+1	.	.	+1	+1	III
Quercus pontraea subsp.iberica		.	32	.	.	.	.	.	.	22	+1	.	21	31	32	11	+1	22	.	21	III
Ruscus hypoglossum		+1	.	+1	.	.	.	++	+1	+1	.	+1	.	.	.	.	.	.	++	.	II
Fagus orientalis		.	+1	.	.	.	.	+1	.	+1	+1	.	.	.	.	.	.	.	.	+1	II
Salvia forskahlei		.	+1	.	.	.	.	11	.	.	.	.	.	.	11	.	+1	+1	.	.	II
Castanea sativa		.	.	.	.	.	.	.	.	.	.	+1	+1	+1	+1	.	.	.	.	.	II
Characteristics of the class QUERCO-FAGETE and the order FAGETALIA SYLVATICEA*																					
Carex sylvatica		45	22	23	33	33	32	33	23	13	13	23	.	.	.	11	+1	.	.	.	IV
Galeobdolon luteum subsp,luteum		33	.	44	44	34	35	+1	44	23	44	23	.	.	.	.	.	.	.	.	III
Stellaria holostea		.	.	+1	.	.	.	.	.	.	++	.	++	++	+1	++	.	.	.	.	II
* Cardamine bulbifera		11	.	+1	+1	21	21	.	11	.	.	.	.	.	.	.	.	.	.	.	II
Crataegus monogyna		+1	.	.	.	.	.	.	.	++	++	.	++	+1	.	.	.	.	.	.	II
* Lilium martagon		.	.	.	.	+1	21	.	.	.	.	.	.	.	.	.	.	.	.	.	I
The characteristics of the order QUERCO-CARPINETALIA and the alliance CARPINO-ACERION*																					
Viola sieberana		21	11	11	+1	+1	11	+1	31	.	11	.	.	.	.	.	.	.	.	.	III
Geranium asphodeloides		+1	11	+1	.	+1	11	.	.	+1	.	+1	.	.	.	.	.	.	.	.	II
Mespilus germanica		.	+1	.	.	.	.	.	.	.	++	.	++	.	.	+1	.	.	.	.	II
* Cyclamen coum		.	.	.	+1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
The characteristics of the class QUERCETEA-ILICIS																					
Ruscus aculeatus		.	13	22	11	+1	23	.	24	13	.	+1	.	.	.	.	++	+1	.	.	III
The characteristics of the order POPULETALIA																					
Alnus glutinosa		+1	.	+1	+1	21	11	.	.	.	.	.	.	.	.	.	.	.	.	.	II
Humulus lupulus		.	.	+1	.	.	+1	.	.	.	.	.	.	.	.	.	.	.	.	.	I
The characteristics of the class QUERCETEA PUBESCENTİS																					
Primula vulgaris var-.sibthorpii		32	.	21	23	.	.	+1	+22	21	+1	.	11	+1	.	+1	++	.	.	++	IV
Ligustrum vulgare		11	+1	+1	+1	+1	11	13	13	+1	.	21	.	.	.	.	.	.	++	.	III
Quercus cainetto		.	.	.	.	.	.	21	.	+1	.	+1	+1	.	.	.	22	+1	21	.	II
Sorbus torminalis		.	.	.	+1	.	.	.	.	.	.	.	+1	++	+1	+1	.	+1	.	.	II
Mercurialis perennis		+1	.	.	22	21	+1	.	34	.	.	.	.	.	.	.	.	.	.	.	II
Melica uniflora		.	12	.	.	.	.	+1	.	+1	+1	.	.	.	.	.	.	.	.	.	II
Scilla bifolia		+1	.	.	+1	11	21	.	.	.	.	.	.	.	.	.	.	.	.	.	II
The characteristics of the superclass QUERCO-FAGEA																					
Hedera helix		33	13	32	33	34	22	21	33	34	34	44	33	21	22	23	+1	21	+1	11	V
Brachypodium sylvaticum		23	13	23	+1	21	.	+1	11	+1	.	23	.	.	.	.	.	.	.	.	III
Corylus avellana		+1	.	11	11	14	+1	13	.	+1	+1	.	.	.	.	.	.	.	.	.	III
Ajuga reptans		+1	+1	.	+1	11	.	11	+1	.	+1	.	.	.	.	.	.	.	.	.	II
Luzula luteri		44	21	+1	.	.	+1	.	44	.	.	11	.	.	.	.	.	.	+1	.	II
Euphorbia amygdaloides		.	.	+1	12	.	+1	.	21	+1	+1	.	.	.	.	.	.	.	.	.	II
Fragaria vesca		21	.	31	+1	31	11	.	+1	.	.	.	.	.	.	.	.	.	.	.	II
Sanicula europaea		+1	.	+1	++	.	+1	.	+1	.	.	.	.	.	.	.	.	.	.	.	II
Platanthera bifolia		.	.	.	.	.	.	+1	.	.	.	.	.	+1	++	.	.	.	.	.	I
Euonymus europaeus		+1	.	+1	.	.	.	.	+1	.	.	.	.	.	.	.	.	.	.	.	I
Potentilla micrantha		.	+1	.	.	.	.	.	.	.	.	.	.	.	.	.	+1	.	.	.	I
Circea lutiana		.	.	.	.	+1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Lapsana communis		.	21	.	.	.	.	+1	.	.	.	.	.	.	.	.	.	.	+1	.	I
Companions:																					
Polystichum aculeatum		+1	12	+1	+1	13	12	.	+1	+1	+1	14	.	.	.	.	.	.	.	.	III
Festuca andinacea		.	32	.	.	+1	+1	22	.	.	13	22	.	+1	.	+1	.	.	.	.	III
Pteridium aquilinum		.	11	.	.	.	.	11	.	.	++	.	+1	+1	+1	++	++	.	.	.	III
Quercus pubur subsp.robur		11	+1	+1	+1	.	.	+1	.	.	21	21	.	.	.	.	.	.	.	.	II
Ornithogalum longipes		31	+1	.	.	11	21	.	+1	+1	.	.	.	.	.	.	.	.	.	.	II
Ranunculus constantinoplitanus		+1	+1	.	.	+1	+1	.	.	.	.	+1	.	.	.	.	.	.	.	.	II
Arum italicum var.byzantinum		11	.	21	.	+1	32	.	+1	.	.	.	.	.	.	.	.	.	.	.	II
Ranunculus ficarioides		13	.	+1	+1	11	21	.	.	.	.	.	.	.	.	.	.	.	.	.	II
Poa trivialis		.	11	.	.	.	.	22	.	.	.	+1	.	.	+1	+1	.	.	.	++	II
Carex glauca		.	.	.	.	.	.	.	.	.	.	.	+1	+1	12	.	.	11	.	.	II
Galium rotundifolium		.	+1	.	.	.	.	.	.	.	.	+1	.	.	.	++	.	.	.	.	I
Viola odorata		.	21	.	.	.	.	.	.	+1	.	.	+1	.	.	.	.	.	.	.	I
Dactylis glomerata		.	.	.	.	.	.	.	.	+1	++	+1	.	.	.	.	.	.	.	.	I
Galanthus byzantinus		.	.	+1	.	.	.	.	33	.	.	.	.	.	.	.	.	.	.	.	I
Campanula persicifolia		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	++	.	.	.	I
Equisetum maxima		.	.	.	+1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Fritillaria pontica		.	.	.	.	.	+1	.	.	.	.	.	.	.	.	.	.	.	.	.	I

Table no: 2- Fagus orientalis- Ilex aquifolia association

Quadrat no	57	34	40	39	33	52	141	31	143	54	53	37	126	2	179	156	Presence
Area of the quadrat (m^2)	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	
Direction	NW	NW	NW	WE	NW	N	NW	N	NW	NW	NE	N	N	N	NW	NE	
Inclination (%)	25	15	20	25	25	20	20	40	20	30	25	30	20	40	25	25	
Characteristic and differential species of the association:																	
Fagus orientalis	23	45	55	55	55	55	44	55	44	55	55	55	55	55	55	45	V
Ilex aquifolia	.	24	.	.	11	.	.	.	.	+1	.	.	.	.	.	.	I
Polypodium vulgare	14	.	+1	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Characteristics of the order RHODODENDRO-FAGETALIA ORIENTALIS																	
Epimedium pubigerum	23	23	31	22	23	22	33	12	.	23	33	21	33	11	11	21	V
Daphne pontica	14	12	13	+1	.	14	+1	11	+1	12	.	+1	+1	+1	+1	.	IV
Trachystemon orientale	32	+1	33	++	++	++	31	+1	.	++	22	12	21	+1	.	.	IV
Smilax excelsa	.	13	+1	12	.	+1	.	.	.	.	.	+1	+1	+1	.	.	II
Rubus hirtus	22	22	.	.	23	.	+1	.	+1	.	.	.	.	.	.	.	II
Ruscus hypoglossum	.	+1	.	.	+1	.	+1	.	+1	.	.	.	.	.	.	.	I
Laurocerasus officinalis	.	.	.	.	.	.	.	++	+1	.	.	.	.	.	.	.	I
Hypericum calycinum	+1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Characteristics of the class QUERCO-FAGETEA																	
Galeobdolon luteum subsp.luteum	33	34	32	31	33	34	44	.	33	.	23	21	.	.	.	.	III
Carex sylvatica	33	33	22	23	23	32	.	+1	.	+1	.	.	21	+1	.	.	III
Crataegus monogyna	+1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Characteristics of the order QUERCO-CARPINETALIA and the alliance CARPINO-ACERION*																	
Viola sieheana	+1	11	11	.	21	.	.	+1	.	.	+1	.	.	.	.	.	II
* Carpinus betulus	+1	.	+1	.	+1	.	+1	.	.	.	.	.	.	.	.	.	I
Mespilus germanica	.	.	++	.	++	.	.	.	.	.	.	.	.	.	.	.	I
Geranium asphodeloides	+1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Characteristics of the class QUERCETEA PUBESCENTIS																	
Scilla bifolia	.	.	32	21	.	11	+1	31	+1	21	.	.	.	.	.	.	II
Sorbus torminalis	++	++	.	++	.	++	.	.	.	.	.	.	.	.	.	.	I
Melica uniflora	.	+1	.	.	21	.	.	.	.	+1	.	.	.	.	.	.	I
Characteristics of the class QUERCETEA ILLICIS																	
Ruscus aculeatus	.	23	.	.	22	.	21	.	11	.	.	.	+1	.	+1	.	II
Characteristics of the superclass QUERCO - FAGEA																	
Hedera helix	.	.	44	12	22	+1	.	+1	+1	+1	+1	+1	+1	+1	+1	12	IV
Primula vulgaris subsp.sibthorpii	23	21	.	++	+1	.	.	.	.	.	.	.	.	.	.	+1	II
Potentilla micrantha	21	11	.	+1	.	+1	.	.	.	.	.	.	.	+1	.	.	II
Euphorbia amygdaloides	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+1	I
Luzula fosrteri	21	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Companions																	
Polystichum aculeatum	+1	+1	11	23	.	23	11	.	22	+1	14	+1	.	+1	+1	.	IV
Festuca arundinacea	.	23	33	.	.	.	+1	33	13	+1	22	22	.	22	13	.	III
Ornithogalum longipes	+1	.	+1	21	.	+1	.	+1	+1	.	+1	.	.	.	.	.	II
Pteridium aquilinum	11	.	++	++	.	.	.	.	.	.	.	.	++	.	.	+1	II
Campanula persicifolia	14	.	.	.	.	.	.	.	.	.	.	.	++	.	.	.	I
Viola odorata	.	.	.	.	.	.	.	.	.	.	++	+1	.	.	.	.	I
Ranunculus constantinopolitanus	+1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Lathyrus hirsutus	+1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Carex glauca	14	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Dactylis glomerata	11	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Sesleria argentea	++	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I

In the association characterized by *Lathyrus niger* and *Asperula involucrata*; *Quercus frainetto* forms a subassociation differentiated by *Lathyrus hirsutus* var. *glabratus* and *Rubus* fruticosus.

In the association, in which the two syntaxonomic units, Quercetea pubescentis and Querco-Fagetea are aqually represented, the species of the class Quercetea ilicis which includes the maquis communities are quite abundant.

It is convenient to consider the association in the order Rhododendro-Fagetalia orientalis, the representation ratio of which along with the characteristic species is increased.

4– *Erica arborea-Erica verticillata association*
(Table no: 4)

In Belgrad forest, the evergreen species of maquis formation occur the forest as well as in its surroundings and establish a pseudomaquis mixing with some decidious species. The association occupies the loamy soils which is acidie in character. The pH values pf the soils vary between 4.6-5.6. In the forest, it develops well on the southern slopes of 5-25 % inclination.

The harbeceous layer, the coverage of which is about 70-100 % is composed of Mediterranean and Euxinian elements.

Erica arborea, *E. verticilllata*, *Cistus creticus* and *Lavandula cariensis* were chosen as characteristic species of the association.

From the phytosociological point of view, the species in the association usually belong to the classes, Quercetea ilicis and Cisto-Micromerietea which include the maquis communities in the Mediterranean basin. The association is different in composition from the typical Mediterranean maquis formations due to participitation of the species of decidious Euxinian forest. Thus, the classes Querco-Fagetea and Quercetea pubescentis and some orders of them were represented in the association.

As seen from the phytosociological table no: 4, the association in the type of pseudomaquis should be considered in the class Quercetea ilicis due to the majority of the species which is the characteristics of the class.

From the viewpoint of phytosociology, the majority of the species forming the floristic composition of the association are the characteristics of the order Rhododendro-Fagetalia orientalis of the class Querco-Fagetea. Therefore, the association should be considered in this order and class. The order, Querco-Carpinetalia and the class Quercetea pubescentis are not represented well in the association.

2- *Fagus orientalis-Ilex aquifolia association*

(Table no: 2)

Fagus orientalis, after which the association is named, forms pure stands in the changeable humid habitats. It usually occupies the northwest and western slopes with an incliation of 10-40 %, and is spread on the sandy loamy and loamy soils, the pH values of which vary from 4.4 to 5.8.

In the association having a denser canopy, the coverage of the herbaceous layer ranges between 10-70 %. The floristic composition usually formed from the hygrophilous Euxinian species is not so rich. The characteristic and differential species of the association are established by *Ilex aquifolia* and *Polypodium vulgare.*

A great deal of the species composing the association belong to the order Rhododendro-Fagetalia orientalis. The order and the class Querco-Fagetea are well represented in the association than the other phytosociological units. Therefore, the association should be considered in these units mentioned here.

3- *Quercus petraea subsp. iberica-Lathyrus niger association*

(Table no: 3)

The association is common on the loamy soils, the pH values of which varies between 4.7-5.8 and prefers the solpes facing south with 5-10 % inclination.

The association comprises of two vegetational layers of trees and herbs. The tree layer composed of *Quercus petraea* subsp. *iberica* and *Q. frainetto* forms a denser canopy. The percentage of coverage within the herbaceous layer varies between 40-100 %.

Table no: 3- Quercus petraea subsp. iberica - Lathyrus niger association

Quadrat no	105	63	131	61	106	102	104	25	153	103	162	122	123	125	121	124	132	1	12	26	148	151	144	152	130	Presence
Area of the quadrat (m^2)	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	
Direction	SE	SW	SE	SW	SE	S	SE	S	SW	SE	SW	SW	SE	SW	SE	SE	SE	S	SE	S	SE	SE	S	SE	SE	
Inclination (%)	20	10	20	10	10	5	15	15	10	8	5	10	10	15	15	10	15	10	10	10	15	15	10	15	20	
Characteristics of the association																										
Quercus petreaa subsp.iberica	44	34	33	44	21	44	44	55	45	21	23	44	44	44	44	55	.	23	22	55	.	.	+1	.	22	V
Lathyrus niger	+1	.	+1	+1	.	.	13	+1	+1	.	.	.	.	.	.	.	+1	+1	14	+1	+1	+1	+1	.	.	III
Asperula involucrata	.	.	+1	.	.	.	.	.	13	.	.	+1	+1	.	+1	.	.	+1	12	.	.	11	.	.	.	II
Differential species of the subassociation																										
Quercus frainetto	.	.	.	.	.	.	.	.	.	.	.	+1	.	.	11	.	44	21	11	34	34	43	44	21	+1	III
Lathyrus hirsutus var.glabratus	+1	.	+1	13	.	.	.	.	12	.	.	.	.	.	.	.	.	12	22	.	+1	.	+1	.	+1	II
Rubus fruticosus	.	.	.	.	.	.	.	11	.	.	.	.	.	.	.	.	.	+1	+1	+1	+1	.	+1	.	.	II
Characteristics of the order RHODODENDRO-FAGETALIA ORIENTALIS:																										
Hypericum calycinum	+1	23	32	22	33	22	+1	11	21	33	21	11	21	22	31	44	21	+1	12	+1	34	32	24	11	+1	V
Daphne pontica	13	14	11	+1	13	23	33	+1	12	.	+1	13	13	.	14	.	.	12	13	.	+1	11	.	.	++	IV
Epimedium pubigerum	34	33	34	34	21	44	33	34	.	.	44	.	.	.	.	.	44	12	23	23	32	44	32	21	32	IV
Smilax excelsa	.	.	+1	+1	13	.	.	+1	+1	.	11	23	.	.	.	.	+1	23	.	11	.	+1	+1	23	+1	III
Castanea sativa	.	.	.	.	+1	.	+1	+1	.	+1	.	.	.	.	.	.	.	+1	+1	.	.	.	.	.	.	II
Salvia forskahlei	.	.	.	31	.	.	+1	.	.	.	.	+1	.	.	.	.	.	.	.	21	.	+1	21	.	.	II
Fagus orientalis	.	.	.	.	.	.	+1	.	.	.	.	.	.	.	.	.	.	+1	.	.	.	.	.	.	.	I
Characteristics of the class QUERCO-FAGETEA and the order PINO-PICEETALIA ORIENTALIS*																										
Lapsana communis	21	+1	+1	11	33	31	11	.	11	31	31	.	11	+1	.	+1	+1	12	.	+1	+1	21	+1	.	+1	IV
Stellaria holostea	+1	33	+1	.	33	33	11	23	.	24	33	.	.	++	.	.	+1	11	22	24	+1	31	+1	.	32	IV
Crataegus monogyna	.	.	.	.	.	.	.	+1	++	.	.	+1	.	.	++	++	.	+1	11	11	.	+1	.	.	.	II
* Hypericum bithynicum	+1	+1	.	+1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+1	I
Characteristics of the class QUERCETEA PUBESCENTIS																										
Brachypodium pinnatum	+1	44	.	24	33	.	21	.	22	44	32	.	.	.	.	.	+1	.	.	.	+1	33	32	45	23	III
Sorbus torminalis	+1	.	+1	+1	.	.	.	.	.	.	.	.	.	++	.	.	+1	+1	+1	+1	.	+1	.	+1	+1	III
Primula vulgaris subsp.sibthorpii	21	+1	11	.	.	.	.	21	.	.	+1	.	.	.	.	.	+1	33	.	.	+1	.	+1	.	+1	II
Doronicum orientale	+1	.	11	.	.	++	33	23	22	.	.	.	.	.	.	.	+1	24	33	11	.	.	.	.	.	II
Mespilus germanica	.	.	.	.	.	.	.	+1	+1	.	.	.	.	.	.	.	+1	.	+1	+1	+1	+1	++	+1	.	II
Carpinus betulus	.	.	.	+1	.	.	.	.	+1	+1	.	.	+1	.	.	.	+1	+1	+1	.	+1	.	.	.	+1	II
Lathyrus hirsutus	+1	+1	21	.	.	.	.	.	.	.	.	+1	11	.	.	.	.	.	.	.	.	.	.	.	.	I
Genista tinctoria	.	+1	.	.	+1	+1	++	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	I
Characteristics of the class QUERCETEA ILLICIS																										
Erica arborea	++	21	+1	22	21	+1	+1	.	23	+1	.	++	+1	+1	+1	11	+1	+1	++	.	+1	.	23	34	+1	V
Rubia peregrina	.	.	.	.	14	.	.	.	.	.	+1	++	.	.	.	.	+1	.	14	.	31	13	+1	.	.	II
Arbutus unedo	.	.	.	.	+1	+1	.	.	.	.	11	.	.	.	.	.	++	.	.	.	.	+1	+1	.	.	II
Ruscus aculeatus	+1	+1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+1	++	++	.	.	.	.	.	I
Cistus creticus	.	.	.	.	.	.	.	.	.	.	++	.	.	.	.	.	.	.	.	.	.	.	.	+1	++	I
Phillyrea latifolia	.	.	.	.	.	.	.	.	.	.	++	.	.	.	.	.	.	.	.	.	.	.	.	.	++	I
Companions:																										
Dactylis glomerata	.	22	+1	21	11	21	+1	.	21	+1	+1	.	11	+1	+1	+1	22	+1	21	11	21	21	22	23	+1	V
Pteridium aquilinum	11	44	34	.	44	34	34	21	44	21	44	.	++	.	++	.	21	.	24	+1	33	21	33	21	.	IV
Carex glauca	11	23	23	32	33	43	.	.	22	34	23	.	.	33	.	.	.	22	22	23	32	22	+1	23	+1	IV
Campanula persicifolia	+1	+1	11	11	.	.	.	.	+1	.	.	.	.	.	.	.	+1	21	.	21	+1	11	.	.	+1	III
Galium verum	.	31	.	.	+1	21	.	.	++	.	.	.	.	.	.	.	++	.	++	++	.	+1	11	.	+1	II
Viola odorata	+1	11	.	.	.	.	+1	.	.	++	.	.	.	.	.	+1	+1	21	+1	.	+1	+1	.	.	.	II
Poa trivialis	+1	+1	11	.	.	.	.	23	21	.	.	33	23	.	.	22	.	.	.	.	.	.	.	.	.	II
Galium paschale	11	.	11	+1	.	.	.	21	.	.	.	.	+1	.	.	11	.	.	.	.	.	11	.	.	.	II
Luzula campestris	21	.	33	34	.	.	.	.	21	.	+1	.	.	.	.	.	.	.	.	21	.	.	33	.	.	.	II
Briza media	.	11	.	21	21	.	.	.	.	+1	+1	.	.	.	.	11	.	.	.	.	.	.	.	.	.	II
Genista carinalis	.	.	.	.	.	.	.	.	.	+1	14	.	.	.	.	.	.	.	.	.	.	+1	.	+1	23	I
Calluna vulgaris	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	++	.	.	.	.	.	.	I

Table no: 4 – Erica arborea – Erica verticillata association.

Quadrat no	28	37	23	40	35	33	23	20	32	29	
Area of the quadrat (m^2)	100	100	100	100	100	100	100	100	100	100	
Direction	S	S	E	E	E	SW	SE	S	S	S	
Inclination %	10	15	10	20	25	10	15	5	10	20	Presence
Characteristic and differential species of the association:											
Erica arborea	22	22	44	33	23	33	11	+1	44	33	V
Erica verticillata	44	.	22	14	13	24	54	55	24	.	IV
Cistus creticus	23	+1	+1	11	+1	.	+1	.	.	.	III
Lavandula cariensis	+1	.	.	.	.	+1	+1	13	12	.	III
Characteristics of the class QUERCETEA ILLICIS											
Arbutus unedo	.	33	.	33	32	34	32	+1	32	11	IV
Phillyrea latifolia	11	11	+1	11	+1	.	11	.	.	+1	IV
Osyris alba	+1	13	.	13	+1	.	.	+1	.	+1	III
Juniperus oxycedrus	.	.	+1	++	11	+1	.	.	.	+1	III
Rubia peregrina	.	+1	.	.	+1	+1	.	.	.	+1	II
Asparagus acutifolius	.	.	+1	.	.	.	.	.	.	+1	I
Quercus coccifera	+1	.	.	.	.	.	.	.	.	.	I
Calicotome villosa	.	.	11	.	.	.	.	.	.	.	I
Characteristics of the CISTO-MICROMERIETEA											
Cistus salviifolius	33	+1	33	33	23	22	11	23	33	23	V
Spartium junceum	.	.	+1	+1	.	+1	.	.	.	21	II
Origanum vulgare	.	.	.	.	+1	.	.	.	.	+1	I
Genista carinalis	.	+1	.	+1	.	.	.	.	.	.	I
Characteristics of the class QUERCO-FAGETEA and the order RHODODENDRO-FAGETALIA ORIENTALIS*											
Hypericum calycinum	.	22	13	22	22	+1	.	+1	33	44	IV
Stellaria holostea	23	+1	33	23	+1	+1	+1	.	+1	.	IV
Crataegus monogyna	11	11	.	11	.	+1	.	+1	.	+1	III
* Daphne pontica	++	+1	++	++	++	+1	.	.	.	.	III
* Quercus petraea subsp.iberica	.	+1	.	21	+1	.	.	.	+1	.	II
* Epimedium pubigerum	.	++	.	.	+1	.	.	.	.	.	I
* Smilax excelsa	.	.	.	.	.	+1	+1	.	.	.	I
Characteristics of the order QUERCO-CARPINETALIA and the alliance CARPINO – ACERION*											
Chamaecytisus pygmaeus	+1	.	+1	+1	+1	33	32	+1	21	.	IV
Dorycnium graecum	.	11	.	+1	.	+1	+1	+1	21	+1	IV
Pyracantha coccinea	.	+1	.	.	+1	+1	.	+1	+1	.	III
Mespilus germanica	.	+1	.	11	.	.	.	.	+1	.	II
* Cornus sanguinea subsp.australis	.	+1	.	+1	.	.	.	.	.	.	I
Characteristics of the class QUERCETEA PUBESCENTIS											
Brachypodium pinnatum	11	+1	+1	+1	.	23	22	23	+1	21	V
Quercus frainetto	+1	22	22	+1	22	23	.	.	.	.	III
Genista tinctoria	.	+1	.	.	.	+1	.	.	+1	+1	II
Sorbus torminalis	.	+1	.	+1	.	+1	.	.	.	.	II
Pyrus eleagnifolia	.	.	.	+1	+1	.	+1	.	.	.	II
Ligustrum vulgare	.	+1	.	11	.	.	.	.	.	13	II
Agrimonia eupatorium	.	.	.	+1	+1	.	.	.	.	.	I
Vicia cracca	.	11	.	.	+1	.	.	.	.	.	I
Characteristics of the superclass QUERCO-FAGEA											
Potentilla micrantha	.	+1	.	.	.	.	11	.	.	+1	II
Tamus communis	+1	.	.	.	.	.	.	.	.	.	I
Companions:											
Dactylis glomerata	23	33	23	23	21	21	21	11	+1	21	V
Pteridium aquilinum	44	23	33	33	23	31	+1	11	54	11	V
Galium verum	+1	+1	+1	+1	+1	+1	.	+1	+1	+1	V
Calluna vulgaris	.	+1	.	+1	+1	23	22	32	11	.	IV
Briza maxima	+1	.	.	21	+1	11	13	.	+1	+1	IV
Sesleria argentea	32	+1	.	23	+1	33	22	.	55	.	IV
Carex glauca	.	23	.	44	22	23	33	.	32	.	III
Cynosorus cristatus	11	.	+1	.	13	+1	+1	.	.	.	III
Trifolium stellatum	11	.	+1	.	13	+1	+1	.	.	.	III
Crocus pulchella	31	21	.	.	31	.	.	11	.	31	III
Malus sylvestris	.	+1	.	+1	+1	.	.	.	.	.	II
Odontites rubra	.	+1	.	13	.	.	.	.	.	+1	II
Carlina vulgaris	+1	.	.	.	.	.	.	.	+1	11	II
Trifolium arvense	32	.	.	+1	.	+1	.	.	.	.	II
Filago vulgaris	.	+1	+1	.	+1	.	.	.	.	.	II
Linum angustifolium	+1	.	.	+1	.	+1	.	.	.	.	II
Holcus lanatus	+1	.	.	.	.	11	.	.	+1	.	II
Petrorhagia prolifera	+1	.	+1	.	.	.	.	.	.	.	I
Dorycnium pentaphyllum subsp.herbaceum	.	.	.	+1	.	.	.	.	.	+1	I
Prunus spinosa	.	+1	.	.	.	.	.	.	.	.	I

CONCLUSION

It is difficult to interpret the communities from the viewpoint of phytosociology, for less is known about their phytosociological traits and the works about syntaxonomy in Turkey is deficient. However, the superclass Querco-Fagea were established by the help of the recent works (Zohary, 1973: Akman, Quezel and Barbero, 1977-1980: Raus, 1979-1980). This unit including the communities in the east Mediterranean basin comprise of two classes in Anatolia, Quercetea pubescentis and Querco-Fagetea. It is possible to consider all the plant communities in Anatolia within this superclass, except the class Quercetea ilicis and a local one, Vaccinio-Piceetea.

The class, Quercetea pubescentis begins from the Mediterranean region of Turkey and reaches to the Euro-Siberian region in the north. The other, Querco-Fagetea includes the decidious forests of Euxinian region such as F*agus orientalis* and locally *Carpinus betulus* forests along with the coniferous ones. As to class, Quercetea ilicis, it is composed of the maquis communities which widely occupy the coastal zones of the east Mediterranean basin from Greece to the near east. The degraded communities of maquis formations, called Phrygana form the class Cisto-Micromerietea.

Although the vegetation of the north Anatolia is originally an Euxinian one, sometimes in the southern parts, the effects of the European and Mediterranean vegetation types have been seen. Therefore, among the Euxinian species forming the floristic compositions of communities, the species originated from Europe and Mediterranean basin are encountered.

In Belgrad forest where several studies were carried out in forestry, the phytosociological structure of the vegetation has not been investigated so far. However, the quadrats laid out by YALTIRIK in 1966, were rearranged as associations and were interpreted phytosociologically in order to reduce the deficiency and to contribute to the investigations of vegetation in Turkey.

The following associations and the subassociation were described by means of the rearranged quadrats;

1– *Carpinus betulus-Acer campestre* association

2– *Fagus orientalis-Ilex aquifolia* association

3– *Quercus petraea* subsp. *iberica-Lathyrus niger* association

4– *Erica arborae-E. verticillata* association

As seen from the phytosociological tables, except for maquis association, the communities recognized in Belgrad forest should be considered in the order Rhododendro-Fagetalia orietalis and the class Querco-Fagetea according to informations mentioned above. The maquis association mixed with the Euxinian species should be included in the class Quercetea ilicis.

There have been at least differencies between the associations in Belgrad forest and the ones recognized in the different parts of Turkey by several authors due to the local conditions such as climate, mainrock and soils. Therefore, the similar associations formed by the same species in the different districts were included in different phytosociological units. For example; *Carpinus betulus* and *Quercus petraea* subsp. *iberica* associations recognized before in the southern parts of north Anatolia were included in the class Quercetea pubescentis due to the local conditions, while the same associations in Belgrad forest were represented by the class Querco-Fagetea.

ÖZET

Ormancılık yönünden pek çok araştırmanın yapıldığı Belgrad ormanında vejetasyonun fitososyolojik yapısı bugüne kadar incelenmemiştir. Ancak, bu eksikliği kapatmak, Türkiye vejetasyonunun araştırılmasına katkıda bulunmak amacıyla YALTIRIK tarafından 1966 da gerçekleştirilen örneklik alanlar yeniden birlikler halinde düzenlenerek fitososyolojik açıdan yorumlanmaya çalışıldı. Tanımlanan 4 bitki birliğinden Quercetea ilicis sınıfına bağlanan maki birliği hariç, diğerleri Querco-Fagetea sınıfına ait Rhododendro-Fagetalia orientalis ordosu içinde değerlendirilmiştir.

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