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Floristic Features of *Pinus pinea* Forests in Kahramanmaraş (Eastern-Mediterranean Region of Turkey)

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Abstract

Pinus pinea (Stone pine) forests are not widespread in the world. The spread area of stone pine around the world indicates that it is a taxon localized in the Mediterranean Basin. In this study the floristic features of *P. pinea* forests in the Eastern-Mediterranean region of Turkey was investigated. 130 taxon belonging to 109 genera and 34 families were identified in the study area. Distribution numbers and rates of the taxon in terms of phytogeographic regions are as follows: Mediterranean elements 34 (26.15%), Irano-Turanian 16 (12.30%) and Euro-Siberian elements 3 (2.30%). The numbers of endemic taxa are 5 and the rate of endemism is 3.84%.

Keywords: *Eastern-Mediterranean, floristic composition, Kahramanmaraş, Pinus pinea, Türkiye.*

Kahramanmaraş Bölgesindeki *Pinus pinea* Ormanlarının Floristik Özellikleri (Türkiye-Doğu Akdeniz Bölgesi)

Özet

Pinus pinea (fıstık çamı) ormanları dünyada geniş bir yayılışa sahip değildir. Fıstık çamının dünyadaki yayılış alanları onun Akdeniz havzasına lokalize olmuş bir tür olduğuna işaret etmektedir. Bu çalışmada Türkiye'nin doğu Akdeniz bölgesindeki fıstık çamı ormanlarının floristik özellikleri incelenmiştir. Çalışma alanında 34 familyaya ait 109 cins ve 130 tür tespit edilmiştir. Türlerin fitocoğrafik bölgelere göre dağılımları, sayı ve oranları aşağıdaki gibidir: Akdeniz elementleri 34 (%26,15), İran-Turan elementleri 16 (%12,30), Avrupa-Sibirya elementleri 3 (%2,30). Endemik bitki sayısı 5 ve endemizm oranında %3,84'dür.

Anahtar Kelimeler: *Doğu Akdeniz, floristik kompozisyon, Kahramanmaraş, Pinus pinea, Türkiye.*

INTRODUCTION

Pinus pinea L. (Stone pine) is an important taxon both economically and ecologically. There is an ongoing debate on the source of origin of the stone pine. People have cultivated stone pine, which is used as a nutrient source, in different regions around the world through out history. Stone pine requires a specific type main rock for growing. Since stone pine does not grow everywhere and it is not widely distributed around the world. The spread area of stone pine around the world indicates that it is a plant taxon belonging to the Mediterranean Basin (Davis 1965). Stone pine is not wide spread in Turkey, and is only found in Bergama-Kozak, Aydın-Koçanlı, Antalya-Side, around the Marmara Sea, the coast of the Gemlik Gulf, Önsen and Hacıağalı Villages in Kahramanmaraş, Artvin and Trabzon in the Black Sea Region. According to Zohary (1973), stone pine in the Black Sea Region is a Mediterranean relict. The total area of stone pine in Turkey is 30-35 thousand ha. Moreover, due to

the economic advantage and the utility of stone pine, plantations have hugely increased in Turkey. In addition to this, stone pine has been used for fixing sand-dunes in regions where agricultural plants are grown. In order to protect these plants from sea winds, stone pine has been widely used in Italy (Selçuk 1964). Although there are phytosociological studies in this research area (Varol and Tatlı 2002), there are no detailed floristic studies.

In this study, the aim was to assess the floristical structure of *P. pinea* forests which are naturally distributed in the Kahramanmaraş province.

Description of the Study Area

The study area is within the boundary of Kahramanmaraş province in the Önsen-Hacıağalı Town. The research area lies within the C6 square of the grid system adopted by Davis (1965-1988), and it is on the point of the Anatolian Diagonal where it is separated into two parts in the South. It is surrounded by the Aksu river border to the east,

and the Deliçay border to the south-east. The area has a rough topography and ranges in altitude from 600 to 1000 m. The study area consists of two hills: Cankurtaran Hill (1078 m), which is the highest point in the area, and Buzağılık Hill (895 m) (Figure 1).

The meteorological climatic data was obtained from the Turkish State Meteorological Service (Anonymous 2001). The study area has a Mediterranean climate, the main characteristics of which are: dry summers and warm and rainy winters. The seasonal precipitation regime during the year is as: winter, spring, autumn and summer. This is a typical first variant of the Eastern Mediterranean climate (Akman 1990). In the research area, the annual mean temperature is 16.5°C. The maximum mean temperature (M) is 35.9°C in August. The minimum mean temperature (m) is 1.2°C in January.

A Brief Description of the Vegetation

The studied area lies in the Mediterranean Region of Eastern Anatolia, therefore it is dominated by the Mediterranean elements. The presence of therophyte plants are abundant in the

study area while dominant taxon are *P. pinea* as tree, *Cistus creticus* L., *Calicotome villosa* (Poir.) Link, *Pistacia terebinthus* L. subsp. *palaestina* (Boiss.) Engler, *Sytrax officinalis* L. *Juniperus oxycedrus* L. subsp. *oxycedrus* are present as shrubs. Stone pine forest forms an unmixed community in the research area. However, *Pinus brutia* Ten. have penetrated the floristic structure in the heterogeneous fields. Stone pine forests occur on slopes with an inclination of 10-30% between 600-1000 m elevations in the study area (Varol and Tatlı 2002).

MATERIAL AND METHODS

The materials of this investigation are comprised of plant specimens collected (Kahramanmaraş province) in the *Pinus pinea* L. forests during a vegetational study between 1995 and 1998. The majority of the specimens were identified by using The Flora of Turkey and the East Aegean Islands (Davis 1965-1985, Davis et al. 1988). In cases of uncertainty, Flora Europaea (Heywood and Tutin 1964-1981) was used as well. The plants are listed in the appendix according to the Davis system (1965-1988). The geographical location (the area lies entirely within C6 Kahramanmaraş-Önsen-Hacıağalı, which is omitted from the station), collection date, the name of the collector and the collection number were given after the name of every taxon in the list. The authors name of every taxon was written according to the Authors of Plant Names (Brummitt and Powell 1992).

The plant specimens prepared for herbarium collection have been stored in the Department of Biology, Faculty of Science & Art, Muğla University.

RESULT AND DISCUSSION

Stone pine forests in the Kahramanmaraş province has a floristic structure which consists of trees, shrubs and herbs. The distributions of the taxa according to life forms are as follows: 46.2% therophytes, 25.9% hemicryptophytes, 14.8% phanerophytes, 7.4% geophytes and 5.5% cryptophytes. The taxa such as *Quercus petraea* (Mattuschka) Lield. subsp. *pinnatiloba* (C.Koch) Menitsky, *Cistus creticus* L., *Calicotome villosa* (Poir.) Link and *P. terebinthus* subsp. *palaestina* are dominant in the shrub level whilst *Gastridium ventricosum* (Gouan) Schinz & Thell., *Trifolium arvense* L., *Cynosurus echinatus* L., *Briza maxima* L., *Asperula arvensis* L., *Poa bulbosa* L. and *Taeniatherum caput-medusae* (L.) Nevski subsp. *crinitum* (Schreber) Melderis are dominant in the herb level. The stone pine forests distributed in the Kahramanmaraş province occurs in the Haplic Luvisol soils

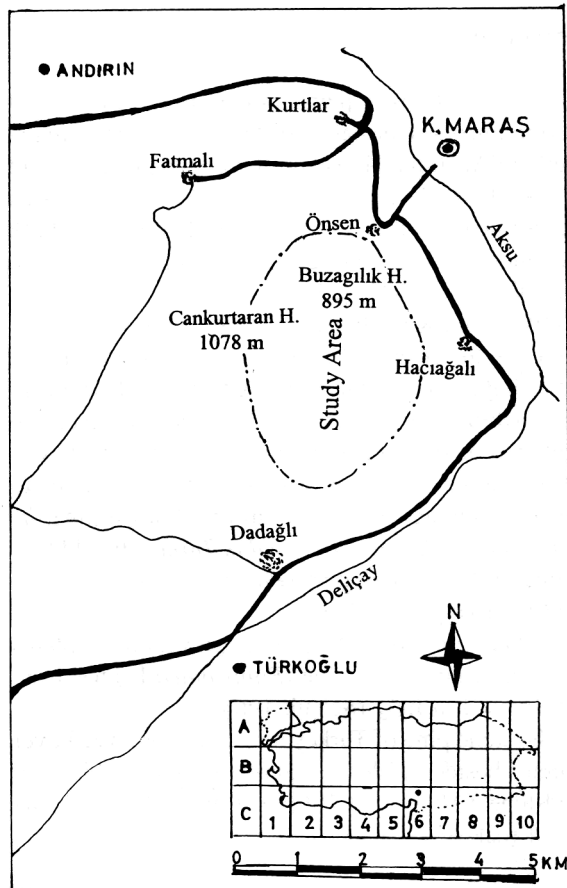


Figure 1. Geographical map of the study area.

(Anonymous 1989) which are formed by granite bedrock. These soils of the stone pine forests in the study area are sandy and loamy in texture (SL), and have a slightly acidic characteristic. Organic matter is in the mid-level (Akgül and Yılmaz 1991).

This floristic study was carried out with approximately 300 plant specimens collected over a period of three years. As a result of the identification of the plant specimens, 34 families, 109 genera, 130 taxon were determined. Five of the collected taxa are endemic. Three of the 130 taxon are in Gymnospermae whilst 127 are Angiospermae. Of these, 98 taxon belong to the class Dicotyledones, while the other 29 belong to the Monocotyledones. The threat categories of endemic and non endemic species was evaluated according to IUCN (Anonymous 2001) risk categories. The results are summarized in Table 1.

The taxon of the study area, categorized according to phytogeographical regions, can be listed as follows: Mediterranean elements 34 (26.15%), Irano-Turanian elements 16 (12.30%), Euro-Siberian elements 3 (2.30%) and the remaining 77 (59.23%) taxon are multi-regional. The results of the studies conducted in similar areas, together with the endemic and phytogeographical distribution are presented in Table 2.

This study was carried out in the Mediterranean phytogeographic region and the number of Mediterranean elements is naturally higher than that of the elements of other regions. Compared with the results of the research in the flora of Muğla (Varol 2003), approximately the same proportion of Mediterranean elements were collected. However, the proportion of Euro-Siberian elements in the Trabzon-Artvin study area (Karaer et al. 1998) is rather high. The number of the Irano-Turanian elements in our study area is high, because, this region is close to the transitional area between the Mediterranean and Irano-Turanian phytogeographic regions. The rate of endemism in our research area and other studies are very low (3.84-5.18%), when compare with the endemism ratio in the total Flora of Turkey (33%). This ratio may not seem to be high, but, when we focus on the flora in Turkey, it is observed that 85% of the endemic taxon grow between 1000-2000 m. In this case, plains at lower altitudes are poor in terms of endemics.

The largest six families according to number of species in our study and the studies mentioned above are compared in Table 3. The Fabaceae, Poaceae and Asteraceae families in the

Table 1. The floristic evaluation and the red list data of *Pinus pinea* forests in Kahramanmaraş.

	Gymnospermae	Dicotyledones	Monocotyledones	Total
Family	2	27	5	34
Genera	2	81	26	109
Taxon	3	98	29	130
VU	-	3	-	3
LR(cd)	-	1	-	1
LR(nt)	-	1	-	1
LR(lc)	-	3	-	1

Table 2. Comparison of the endemic and phytogeographical elements.

Research Area	Kahramanmaraş		Muğla (Varol 2003)		Trabzon and Artvin (Karaer et al. 1998)	
	Number	%	Number	%	Number	%
Mediterranean	34	26.15	81	38.75	14	8.80
Irano-Turanian	16	12.30	6	2.83	9	5.66
Euro-Siberian	3	4.36	4	1.88	44	27.67
Multi-regional	77	59.23	121	57.07	92	57.86
Endemic taxon	5	3.84	11	5.18	8	5.03

Table 3. Comparison of the largest families in Kahramanmaraş and other studies.

Research Area	Kahramanmaraş		Muğla (Varol 2003)		Trabzon and Artvin (Karaer et al. 1998)	
	Number	%	Number	%	Number	%
Fabaceae	19	14.61	24	11.32	17	10.69
Poaceae	18	13.84	26	12.26	7	4.40
Asteraceae	12	9.23	21	9.9	17	10.69
Caryophyllaceae	7	5.38	15	7.07	-	-
Liliaceae	6	4.61	12	5.66	-	-
Rubiaceae	6	4.61	-	-	-	-
Lamiaceae	-	-	12	5.66	15	9.43
Rosaceae	-	-	-	-	7	4.40
Boraginaceae	-	-	-	-	7	4.40

Kahramanmaraş and Muğla studies area are among the first three families, according to their representative taxon number. The Boraginaceae family in the Trabzon-Artvin study area is among the first three families. The ordering of the largest families slightly varies between studies.

I hope that the study will contribute to the identification of the floristic structure of *P. pinea* forests in Anatolia.

Abbreviations

- Euro-Sib. el.: Euro-Siberian element,
- Ir.-Tur. el.: Irano-Turanian element,
- Medit. el.: Mediterranean element,
- E. Medit. el.: East Mediterranean element,
- End.: Endemic,
- VU: Vulnerable,
- LR (cd): Lower risk (conservation dependent),
- LR (nt): Lower risk (near threatened),
- LR (lc): Lower risk (least concern).

APPENDIX

The Floristic List

Division: **SPERMATOPHYTA**

Subdivision: **GYMNOSPERMAE**1. **Pinaceae**

1. *Pinus brutia* Ten.; 700 m, 07.07.1996, Varol 1790.

2. *P. pinea* L.; 600-1000 m, 21.05.1996, Varol 1507.

2. **Cupressaceae**

3. *Juniperus oxycedrus* L. subsp. *oxycedrus*; 700 m, 21.05.1996, Varol 1495.

Subdivision: **ANGIOSPERMAE**Class: **MAGNOLIOPSIDA/****DICOTYLEDONEAE**3. **Ranunculaceae**

4. *Helleborus vesicarius* Aucher; 850-950 m, 16.04.1998, Varol 1998, End., E. Medit. el.,

LR (nt).

5. *Anemone coronaria* L.; 850-950 m, 16.04.1998, Varol 1990, Medit. el.

4. **Papaveraceae**

6. *Papaver gracile* Boiss.; 650-800 m, 16.04.1998, Varol 1974, E. Medit. el.

7. *Fumaria kralikii* Jordan; 850-950 m, 16.04.1998, Varol 1993.

5. **Brassicaceae/Cruciferae**

8. *Raphanus raphanistrum* L.; 600-750 m, 16.04.1998, Varol 1944.

9. *Thlaspi perfoliatum* L.; 650-800 m, 16.04.1998, Varol 1977.

10. *T. elegans* Boiss.; 600-750 m, 16.04.1998, Varol 1932, E. Medit. el.

11. *Capsella bursa-pastoris* (L.) Medik; 600-750 m, 16.04.1998, Varol 1929.

12. *Alyssum hirsutum* Bieb. var. *hirsutum*; 600-750 m, 16.04.1998, Varol 1942.

13. *Clypeola jonthlaspi* L.; 650-750 m, 16.04.1998, Varol 1922.

14. *Erophila verna* (L.) Chevall. subsp. *verna*; 850-950 m, 16.04.1998, Varol 1992.

15. *Arabis nova* Vill.; 650-800 m, 16.04.1998, Varol 1951.

16. *Cardamine hirsuta* L.; 850-950 m, 16.04.1998, Varol 1991.

17. *Erysimum goniocaulon* Boiss.; 750-900 m, 06.05.1998, Varol 2173.

18. *Arabidopsis parvula* (Schrenk) Schulz; 600-750 m, 16.04.1998, Varol 1925, VU

19. *Aethionema oppositifolium* (Pers.) Hedge; 650-800 m, 16.04.1998, Varol 1960.

20. *Lepidium spinosum* Ard.; 650-800 m, 16.04.1998, Varol 1947.

6. **Cistaceae**

21. *Cistus creticus* L.; 700 m, 27.06.1996, Varol 1755, Medit. el.

22. *Helianthemum kotschyannum* Boiss.; 600-750 m, 16.04.1998, Varol 1928, Ir.-Tur. el.

23. *Tuberaria guttata* (L.) Fourr. var. *plantaginea* (Willd.) Gross.; 600-750 m, 16.04.1998, Varol 1937.

7. **Caryophyllaceae**

24. *Minuartia mesogitana* (Boiss.) Hand.-Mazz. subsp. *kotschyana* (Boiss.) McNeill.; 850-950 m, 16.04.1998, Varol 1994, E. Medit. el.

25. *Cerastium brachypetalum* Pers. subsp. *roeseri* (Boiss. & Heldr.) Nyman; 600-750 m, 16.04.1998, Varol 1931.

26. *Dianthus polycladus* Boiss.; 700 m, 27.06.1996, Varol 1751, E. Medit. el., VU

27. *Petrorhagia velutina* (Guss.) Ball & Heywood; 750-800 m, 06.05.1998, Varol 2174.

28. *Silene italica* (L.) Pers.; 750 m, 27.06.1996, Varol 1750.

29. *S. aegyptiaca* (L.) L.f. subsp. *aegyptiaca*; 650-800 m, 16.04.1998, Varol 1972.

30. *S. colorata* Poir.; 600-750 m, 16.04.1998, Varol 1926.

8. **Illecebraceae**

31. *Paronychia argentea* Lam. var. *argentea*; 600-750 m, 16.04.1998, Varol 1941.

9. **Polygonaceae**

32. *Rumex acetosella* L.; 750-900 m, 06.05.1998, Varol 2170.

10. **Hypericaceae/Guttiferae**

33. *Hypericum scabrum* L.; 700 m, 27.06.1996, Varol 1754, Ir.-Tur. el.

34. *H. perforatum* L.; 700-900 m, 18.06.1998, Varol 2796.

11. **Geraniaceae**

35. *Geranium molle* L. subsp. *molle*; 600-750 m, 16.04.1998, Varol 1927.

36. *Erodium cicutarium* (L.) L'Herit subsp. *cutarium*; 750 m, 16.04.1998, Varol 1936a.

12. **Anacardiaceae**

37. *Pistacia terebinthus* L. subsp. *palaestina* (Boiss.) Engler; 750 m, 27.06.1996, Varol 1753, Medit. El.

13. **Fabaceae/Leguminosae**

38. *Lupinus angustifolius* L. subsp. *angustifolius*; 650-800 m, 16.04.1998, Varol 1970.

39. *Calicotome villosa* (Poir.) Link; 850-950 m, 16.04.1998, Varol 1999, Medit. el.

40. *Vicia cypria* Kotschy ex Unger & Kotschy; 850-950 m, 16.04.1998, Varol 1996.

41. *V. lathyroides* L.; 600-750 m, 06.05.1998, Varol 2154.

42. *Lens orientalis* (Boiss.) Hand.-Mazz.; 850-950

- m, 16.04.1998, Varol 1953a.
43. *Lathyrus cicera* L.; 650-800 m, 16.04.1998, Varol 1975a.
44. *L. aphaca* L. var. *biflorus* Post; 650-800 m, 16.04.1998, Varol 1975b.
45. *Trifolium speciosum* Willd.; 650-800 m, 16.04.1998, Varol 1966.
46. *T. campestre* Scrb.; 600 m, 16.04.1998, Varol 1923a.
47. *T. stellatum* L. var. *stellatum*; 650-800 m, 16.04.1998, Varol 1958.
48. *T. cherleri* L.; 650 m, 16.04.1998, Varol 1923b, *Medit. el.*
49. *T. arvense* L. var. *arvense*; 800 m, 16.04.1998, Varol 1973.
50. *T. purpureum* Lois. var. *laxiusculum* (Boiss. & Balansa) Hossain; 850 m, 16.04.1998, Varol 1945b.
51. *T. tomentosum* L.; 600-750 m, 16.04.1998, Varol 1945a.
52. *T. scutatum* Boiss.; 750-900 m, 06.05.1998, Varol 2165, *E. Medit. el.*
53. *Lotus angustissimus* L.; 600-750 m, 16.04.1998, Varol 1934.
54. *L. palustris* Willd.; 700-900 m, 18.06.1998, Varol 2791.
55. *Hymenocarpus circinatus* (L.) Savi; 650-800 m, 16.04.1998, Varol 1953b, *Medit. el.*
56. *Ornithopus compressus* L.; 650-800 m, 16.04.1998, Varol 1957, *Medit. el.*
- 14. Crassulaceae**
57. *Sedum caespitosum* (Cav.) DC.; 850-950 m, 16.04.1998, Varol 1989, *Medit. el?*
- 15. Apiaceae/Umbelliferae**
58. *Lagoecia cuminoides* L.; 750-900 m, 06.05.1998, Varol 2167, *Medit. el.*
59. *Pimpinella kotschyana* Boiss.; 850 m, 18.06.1998, Varol 2790a, *Ir.-Tur. el.*
60. *Malabaila lasiocarpa* Boiss.; 700 m, 06.05.1998, Varol 2145, *End., Ir.-Tur. el., LR (Ic).*
61. *Torilis leptophylla* (L.) Richb.; 750-900 m, 06.05.1998, Varol 2168.
- 16. Rubiaceae**
62. *Sherardia arvensis* L.; 650-800 m, 16.04.1998, Varol 1967., *Medit. el?*
63. *Crucianella exasperata* Fisch. & C.A. Mey.; 700 m, 18.06.1998, Varol 2798, *Ir.-Tur. el.*
64. *Asperula arvensis* L.; 700-900 m, 16.04.1998, Varol 1969, *Medit. el.*
65. *Galium tenuissimum* Bieb. subsp. *tenuissimum*; 700-900 m, 18.06.1998, Varol 2784.
66. *Callipeltis cucullaria* (L.) Steven; 700-900 m, 18.06.1998, Varol 2785, *Ir.-Tur. el.*
67. *Valantia hispida* L.; 600-750 m, 06.05.1998, Varol 2155, *Medit. el.*
- 17. Valerianaceae**
68. *Valeriana sisymbriifolia* Vahl; 850-950 m, 16.04.1998, Varol 1983a.
- 18. Dipsacaceae**
69. *Scabiosa rotata* Bieb.; 850 m, 16.04.1998, Varol 1983b, *Ir.-Tur. el.*
70. *Pteroccephalus plumosus* (L.) Coulter; 750 m, 16.04.1998, Varol 1961.
- 19. Asteraceae/Compositae**
71. *Logfia arvensis* (L.) Holub; 700 m, 16.04.1998, Varol 1936b.
72. *Anthemis kotschyana* Boiss. var. *discoidea* (Bornm.) Grierson; 950 m, 16.04.1998, Varol 1981.
73. *Matricaria chamomilla* L. var. *chamomilla*; 600-750 m, 16.04.1998, Varol 1935.
74. *Tripleurospermum oreades* (Boiss.) Rech.f. var. *tchihatchewii* (Boiss.) E. Hossain; 850-950 m, 16.04.1998, Varol 1995.
75. *Centaurea aggregata* Fisch. & C.A.Mey. ex DC. subsp. *aggregata*; 950 m, 16.04.1998, Varol 1982.
76. *Crupina crupinastrum* (Moris) Vis; 750-900 m, 06.05.1998, Varol 2171.
77. *Carlina oligocephala* Boiss. & Kotschy subsp. *oligocephala*; 850 m, 16.04.1998, Varol 1976, *E. Medit. el.*
78. *Xeranthemum annuum* L.; 850 m, 16.04.1998, Varol 1965.
79. *Tragopogon bupthalmoides* (DC.) Boiss. var. *bupthalmoides*; 650-800 m, 16.04.1998, Varol 1956.
80. *Cephalorrhynchus tuberosus* (Stev.) Schchian; 600-750 m, 06.05.1998, Varol 2152.
81. *Crepis kotschyana* (Boiss.) Boiss.; 750 m, 06.05.1998, Varol 2144, *Ir.-Tur. el.*
82. *C. sancta* (L.) Babcock subsp. *sancta*; 650-800 m, 16.04.1998, Varol 1959.
- 20. Campanulaceae**
83. *Campanula lyrata* Lam. subsp. *lyrata*; 700-900 m, 18.06.1998, Varol 2786, *End., LR (Ic).*
84. *C. strigosa* Banks & Sol.; 600-750 m, 06.05.1998, Varol 2150, *E. Medit. el?*
- 21. Primulaceae**
85. *Anagallis arvensis* L. var. *parviflora* (Hoffmanns. & Link) Ces; 600-750 m, 16.04.1998, Varol 1933.
- 22. Sytracaceae**
86. *Sytrax officinalis* L.; 800 m, 21.07.1997, Varol 1886.
- 23. Gentianaceae**
87. *Centaurium erythraea* Rafn. subsp. *turcicum* (Velen.) Melderis; 700-900 m, 18.06.1998, Varol

2790b.

24. Boraginaceae

88. *Myosotis lazica* M.Popov; 850-900 m, 16.04.1998, Varol 1986, Euro.-Sib. el., VU

25. Scrophulariaceae

89. *Verbascum macrosepalum* Boiss. & Kotschy ex Murb.; 700-900 m, 18.06.1998, Varol 2788, End. Ir.-Tur. el., LR (cd).

90. *Anarrhinum orientale* Bentham; 700-800 m, 06.05.1998, Varol 2176, Ir.-Tur. el.

91. *Linaria chalepensis* (L.) Miller var. *chalepensis*; 650-800 m, 16.04.1998, Varol 1955, E. Medit. el.

92. *Veronica hispidula* Boiss. & Huet subsp. *hispidula*; 600-750 m, 16.04.1998, Varol 1946.

Ir.-Tur. el.

93. *Parentucellia latifolia* (L.) Caruel subsp. *flaviflora* (Boiss.) Hand.-Mazz.; 650-800 m, 16.04.1998, Varol 1949.

26. Lamiaceae/Labiatae

94. *Lamium amplexicaule* L.; 850-950 m, 16.04.1998, Varol 1984, Euro.-Sib. el.

95. *Stachys cretica* L. subsp. *cassia* (Boiss.) Rech.f.; 700-900 m, 18.06.1998, Varol 2794, E. Medit. el.

96. *S. iberica* Bieb. subsp. *stenostachya* (Boiss.) Rech.f.; 700-900 m, 18.06.1998, Varol 2793, Ir.-Tur. el.

97. *Micromeria myrtifolia* Boiss. & Hohen.; 700-900 m, 18.06.1998, Varol 2795, E. Medit. el.

98. *Ziziphora capitata* L.; 600-750 m, 06.05.1998, Varol 2149, Ir.-Tur. el.

27. Urticaceae

99. *Parietaria judaica* L.; 600-750 m, 06.05.1998, Varol 2142.

28. Fagaceae

100. *Quercus petraea* (Mattuschka) Lield. subsp. *pinnatifida* (C.Koch) Menitsky; 650 m, 12.05.1996, Varol 1446, End., LR (Ic).

29. Salicaceae

101. *Salix fragilis* L.; 700-900 m, 18.06.1998, Varol 2789, Euro.-Sib. el.

Class: **LILIOPSIDA/**

MONOCOTYLEDONEAE**30. Liliaceae**

102. *Asphodelus aestivus* Brot.; 600 m, 30.03.1996, Varol 1203, Medit. el.

103. *Allium hirtovaginum* Cand.; 700-900 m, 18.06.1998, Varol 2783, E. Medit. el.

104. *Ornithogalum comosum* L.; 600-750 m, 06.05.1998, Varol 2161.

105. *Muscari comosum* (L.) Miller; 850-950 m, 16.04.1998, Varol 1987, Medit. el.

106. *M. neglectum* Guss.; 650-800 m, 16.04.1998,

Varol 1964.

107. *Gagea villosa* (Bieb.) Duby var. *villosa*; 650-800 m, 16.04.1998, Varol 1968, Medit. el.

31. Iridaceae

108. *Gynandris sisyrinchium* (L.) Parl.; 600-750 m, 16.04.1998, Varol 1939

109. *Romulea bulbocodium* (L.) Seb. & Mauri var. *crocea* (Boiss. & Heldr.) Baker, 650-800 m, 16.04.1998, Varol 1962, E. Medit. el.

32. Orchidaceae

110. *Orchis anatolica* Boiss.; 850-950 m, 16.04.1998, Varol 1979, E. Medit. el.

33. Cyperaceae

111. *Scirpoides holoschoenus* (L.) Sojak; 700-900 m, 18.06.1998, Varol 2787.

112. *Carex flacca* Schreb. subsp. *serrulata* (Biv.) Greuter; 650-800 m, 16.04.1998, Varol 1952.

34. Poaceae/Gramineae

113. *Trachynia distachya* (L.) Link; 850 m, 11.06.1998, Varol 2771, Medit. el.

114. *Aegilops triuncialis* L. subsp. *triuncialis*; 750 m, 22.06.1996, Varol 1710.

115. *Hordeum bulbosum* L.; 800 m, 06.05.1998, Varol 2157.

116. *Taeniatherum caput-medusae* (L.) Nevski subsp. *crinitum* (Schreber) Melderis; 900 m, 06.04.1996, Varol 1256, Ir.-Tur. el.

117. *Bromus japonicus* Thunb. subsp. *anatolicus* (Boiss. & Heldr.) Penzes; 700 m, 19.06.1995, Varol 846.

118. *B. tectorum* L.; 600-750 m, 16.04.1998, Varol 1943.

119. *B. sterilis* L.; 650-800 m, 16.04.1998, Varol 1963.

120. *Avena eriantha* Durieu; 700 m, 21.05.1996, Varol 1504.

121. *Ventanata dubia* (Lears) Cosson; 1150 m, 20.07.1996, Varol 1831.

122. *Gastridium ventricosum* (Gouan) Schinz & Thell.; 700-950 m, 11.06.1998, Varol 2777, Medit. el.

123. *Milium pedicellare* (Bornm.) Rosev. ex Melderis; 700-900 m, 18.06.1998, Varol 2792, Ir.-Tur. el.

124. *Lolium persicum* Boiss. & Hohen. ex Boiss.; 600-850 m, 11.06.1998, Varol 2770, Ir.-Tur. el.

125. *Poa bulbosa* L.; 650-800 m, 16.04.1998, Varol 1971.

126. *Eremopoa capillaris* R.R.Mill; 600 m, 19.06.1995, Varol 863, E. Medit. el.

127. *Dactylis glomerata* L. subsp. *hispanica* (Roth) Nyman; 700 m, 19.06.1995, Varol 781.

128. *Cynosurus echinatus* L.; 850 m, 21.05.1996, Varol 1501, Medit. el.
 129. *Briza maxima* L.; 700-900 m, 06.05.1998, Varol 2175.
 130. *Stipa bromoides* (L.) Dörfler; 800 m, 20.07.1996, Varol 1834, Medit. el.

REFERENCES

- Akgül ME, Yılmaz A (1991) Türkiye'de Fıstık Çamının Ekolojik Özellikleri. Ormanlık Araştırma Enstitüsü, Bülten No: 215, Ankara.
- Akman Y (1990) İklim ve Biyoiklim. Palme Yayınları, Ankara.
- Anonymous (1989) Soil Map of the World. World Soil Resources Report 60. Rome, ISRIC (International Soil Reference and Information Centre), Wageningen, The Netherlands.
- Anonymous (2001) Ortalama, Ekstrem Sıcaklık ve Yağış Değerleri Bülteni. Devlet Meteoroloji İşleri Genel Müdürlüğü, Ankara.
- Anonymous (2001) IUCN Red List Categories and Criteria. Version 3.1, IUCN species Survival Commission, Gland-Switzerland and Cambridge.
- Brummitt RK, Powell CE (1992) Authors of Plant Names. Royal Botanic Gardens, Kew, U.K.
- Davis PH (ed.) (1965-1985) Flora of Turkey and East Aegean Islands. Vol. I-IX, Edinburgh University Press, Edinburgh.
- Davis PH, Mill R, Tan K (eds.) (1988) Flora of Turkey and the East Aegean Islands. Vol. X, (Suppl.), Edinburgh University Press, Edinburgh.
- Karaer F, Terzioğlu S, Kutbay HG (1998) Karadeniz Bölgesi *Pinus pinea* L. Ormanlarının Floristik ve Fitososyolojik Yapısı. In: XIV. Ulusal Biyoloji Kongresi, 1, 7-10 Eylül 1998, Samsun, 223-239.
- Heywood VH, Tutin GT (1964-1981) Flora Europaea. Vol. I-V., Cambridge University Press, London.
- Selçuk H (1964) Fıstıkçamının (*Pinus pinea* L.) Özellikleri, Ekonomik Değeri ve Yetiştirme, Bakım Tekniği Hakkında Rapor. Orman Genel Müdürlüğü Teknik Haber Bülteni, Sayı 10, Ankara.
- Varol Ö, Tatlı A (2002) Phytosociological Investigation of a *Pinus pinea* L. Forest in the East-Mediterranean Region (K.Maraş). Plant Ecology 158, 2, 223-228.
- Varol Ö (2003) Floristic composition and diversity of a *Pinus pinea* L. forest in the West-Anatolia Region (Muğla-Turkey). Flora Mediterranea 13, 331-346.
- Zohary M (1973) Geobotanical foundations of the Middle East. I-II, Gustav Fischer Verlag, Stuttgart.