EurAsian Journal of BioSciences
Eurasia J Biosci 5, 54-63 (2011)
DOI:10.5053/ejobios.2011.5.0.7

Research Note

Floristic properties of lowland meadows in Central Black Sea Region of Turkey

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Abstract
The flora of the grazed and ungrazed alluvial meadows in central the Black Sea Region of Turkey was investigated between 2001 and 2003. The study area is situated along the coast of the central Black Sea Region of Turkey. This area floristically belongs to the Euxine province of the Euro-Siberian phytogeographical region. The studied meadows are used as rangeland. The flora of the study area consists of 29 families, 84 genera, and 122 species and subspecies or varieties. With 19.66% of the plants belonging to, the Euro-Siberian Region, 11.46% are of the Mediterranean floristic region, with 68.85%, of the pluriregional or unknown. The life-form spectrum consists of 69.67% Hemicryptophytes, 22.13% Therophytes, 5.73% Chamaephytes, and 2.45% Geophytes, respectively. The aim of this paper is to define the floristic composition of the natural alluvial meadows in the central Black Sea Region of Turkey. The Flora of Turkey and the East Aegean Islands and The Flora Europea were mainly used to identify the specimens.
Keywords: Black Sea, flora, grazing, meadow, Turkey.

Yalcin E, Kilinc M, Kutbay HG, Bilgin A, Korkmaz H (2011) Floristic properties of lowland meadows in Central Black Sea Region of Turkey. Eurasia J Biosci 5: 54-63. DOI:10.5053/ejobios.2011.5.0.7

INTRODUCTION

Meadows play an important role in cleansing the atmosphere of pollution from urban and industrial centers. While they are not as effective as forests in this regard, meadows do filter polluted air and cleanse it of toxic substances and particles. What is even more important, the vegetation in pastures and meadows produce through photosynthesis a large amount of oxygen, which is released into the atmosphere. Turkey has 21,754,690 hectares meadows and pastures constitute 28.3% of this area. Of this total, 644,373 hectares are meadows and the remaining areas are pastures (Anonymous 1989). In recent years coastal areas have gained an important conservation interest in Europe. For example, in the Pori region (Finland) a Life-Nature Project has been started on the seashore meadows for avifauna. At the same time the effects of grazing on the plant and insect species have been studied (Jutila 1999).

Grazing comprises both biological factors (destruction of biomass, fertilization by feces) and physical ones (trampling, digging). Thus it is important how the disturbance factor affects the composition and structure of the plant communities (Grime 2001). Grazing appears to increase diversity in some cases, and to reduce it in others, depending on the intensity of grazing as well as on the relationship between the palatability and competitive ability of the plants (Pyšek and Šrutek 1989). Primary factors explaining the changes in plant species, composition, and diversity across gradients in grazing intensity are an evolutionary history of grazing and productivity-moisture conditions, but other environmental variables, even annual weather fluctuations are often important (Jutila 1999). Although, the alluvial meadow vegetation of the Black Sea Region of Turkey has not been investigated, there were a few studies (Kilinc

Received: May 2011
Accepted: July 2011
Printed: September 2011

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and Karakaya 1992, Rehder et al. 1994, Vural 1996) on the meadow vegetation in Turkey. These studies were carried out on the meadow vegetation of the alpine and subalpine regions of Turkey.

In this study the flora of grazed and ungrazed alluvial meadows of the Central Black Sea Region of Turkey was studied. These meadows are influenced by uncontrolled grazing which affects the floristic composition. This paper gives a description of the vegetation regarding its floristical composition. The aim of this paper is to identify the flora of the natural alluvial meadows of the Central Black Sea Region in Turkey. This study could give important clues to plant community development before an initial rehabilitation effort.

MATERIAL AND METHODS

The material of this study includes the vascular plant specimens collected between January 2002 to December 2003. Nonvascular plant specimens were omitted. Plant specimens were identified and listed according to the "Flora of Turkey and the East Aegean Islands" (Davis 1965-1985, Davis et al. 1988, Güner et al. 2000) and the other related literature (Tutin et al. 1964-1980). For the plant specimens that difficult to identify the opinions of the specialists were taken into account and they were also controlled at the "Herbarium of the Faculty of the Arts-Sciences of Ondokuz Mayis University" (OMUB). After the name of every species in the list, the station number of collected plant specimens, collection date, collection number, phytogeographical regions, endemism, and life form are given. Author abbreviations of species names are given according to Brummit and Powell (1992). Our floristic results were not compared with those carried out in nearby regions. The plants listed in the text and some abbreviations used in the text are given below. All plant samples were preserved at the OMUB.

The data of the Samsun state meteorological station, the Bafra, Çarsamba, and Terme State Water Service (DSI) meteorogical stations were used to explain the climatic properties. Ombrothermic diagrams were drawn according to Walter's method (1956). The climate of the study area was evaluated by the precipitation formula of Erinç (1965) (im = P/Tom; im: precipitation affect, P: Mean annual precipitation; Tom: Mean annual maximum temperature) and for the determination of the arid period the Emberger (1952) formula (S = PE/M; S: Aridity indice PE: Summer precipitation, M: maximum mean temperature of the hottest month) was used.

Two precipitation regimes were observed in the study area. The first precipitation regime is Autumn, Winter, Spring, Summer and belongs to the Eastern Mediterranean, and the second precipitation regime is Autumn, Winter, Summer, Spring and belongs to the Oceanic marine type 1 (Table 1).

The study area belongs to Mediterranean bioclimate because of the S value (<5) according to Emberger (1952). Q and m values were found as 100.0 and 4.1 for Samsun, 85.4 and 3.4 for Bafra (Gelemagara), and 121.3 and 2.1 for Çarsamba respectively. Terme was not calculated bacause of the lack of the temperature observations. Precipitation effectiveness was found as im = 22.3 for Bafra (Gelemagara), 25.0 for Samsun, and 32.5 for Çarsamba respectively and belongs to the semi humid type region (Erinc 1965) (Table 2).

The mean annual temperature is not below 0°C during the annual cycle. The maximum mean annual temperature was found in August (30.1°C) in Bafra (Gelemagara), while the lowest mean annual temperature was found in January (2.1°C) in Çarsamba.

The arid period appears between July and September in the Western part of the study area, but there is no arid period in the Eastern part of the study area (Figs. 1a, 1b, 1c).

Brief description of the study area

The study area is situated on the coast of the Central Black Sea Region in the north of Turkey (Fig. 2). This area floristically belongs to the Euxine province of the Euro-Siberian phytogeographical region. The studied grasslands are used as rangeland. The study

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Table 1. Annual precipitation separated to the seasons and precipitation regime in the study area.

Stations	Obs. time (year)	Winter mm	Spring mm	Summer mm	Autumn mm	Total mm	Precipitation regime
Samsun	28	180.7	161.2	111.6	215.4	668.9	Au.Wi.Sp.Su. East Mediterranean
Bafra (Gelemagara)	37	195.1	127.9	105.0	244.3	672.4	Au.Wi.Sp.Su. East Mediterranean
Çarsamba (Kizilot)	38	271.1	185.6	152.2	286.2	885.2	Au.Wi.Sp.Su. East Mediterranean
Terme (Merkez)	34	256.2	191.8	195.5	278.5	922.1	Au.Wi.Su.Sp. Oceanic marine type 1

Au.: Autumn, Wi.: Winter, Sp.: Spring, Su.: Summer

Table 2. Bioclimate in the study area.

Stations	Elev. (m)	P	PE	M	m	S	Q	im	The bioclimate according to Q value	The bioclimate according to m value
Samsun	4	668.9	111.6	26.7	3.5	4.1	100.0	25.0	Mediterranean	Rainy warmish
Bafra (Gelemagara)	4	672.4	105.0	30.1	2.9	3.4	85.4	22.3	Mediterranean	Little Rainy cool
Çarsamba (Kizilot)	10	885.2	152.2	27.7	2.1	5.4	121.3	32.5	Mediterranean	Rainy cool

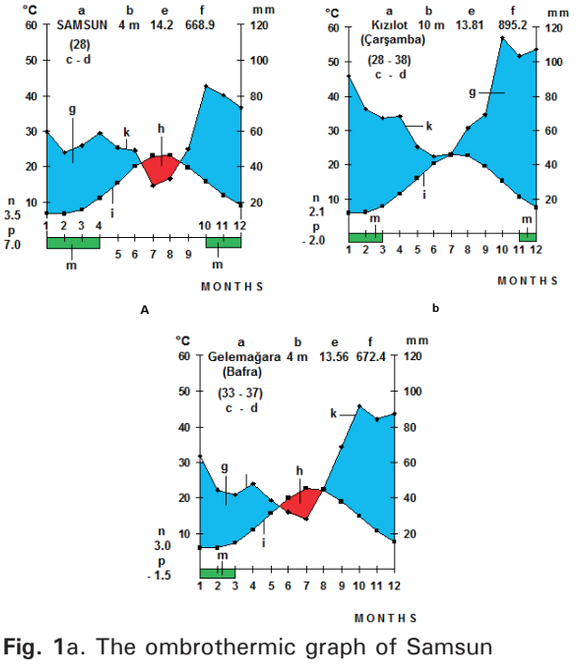


Fig. 1a. The ombrothermic graph of Samsun meteorological station.
1b. The ombrothermic graph of Çarsamba meteorological station.
1c. The ombrothermic graph of Bafra meteorological station.

a. Name of meteorological station, b. Altitude of meteorological station, c. Duration of temperature measurement, d. Duration of rain measurement, e. Annual average of temperature, f. Annual avearage of rain, g. Rainy period, h. Arid period, i. Temperature curve, k. Rain curve, m. Probable freezing month

area consists of alluvial sediment soils along the Kizilirmak and Yesilirmak rivers. The mean annual temperatures in the Kizilirmak and Yesilirmak deltas are 13.6°C and 15.1°C

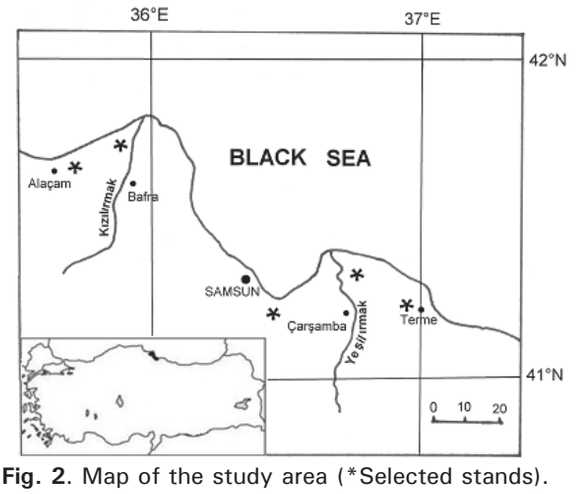


Fig. 2. Map of the study area (*Selected stands).

respectively. The annual rainfall is 672.4 and 922.1 mm in the Kizilirmak and Yesilirmak deltas respectively (Anonymous 1994).

The study area is situated along the A5 and A6 squares according to the grid system of Davis (1965-1985). The natural alluvial grasslands in the Central Black Sea Region exist adjacent to the flooding rivers of Kizilirmak and Yesilirmak, respectively. These large areas traditionally have been grazed and mown since 1900's, but there hasn't been any management or conservation of the area. The vegetation in the study area is strongly affected by long- term and extensive grazing. The study area is one of the main routes for bird migration, so it has a particular ecological interest and was declared as a protected area mainly for preparing a management plan to secure proper conservation (Yarar and Magnin 1997).

The location of the stations of the collected plant specimens

1. Samsun: Tekkeköy, Asagiçinik town meadows, 1-2 m 41° 11' 32.06" N; 36° 28' 54.43" E

2. Samsun: Terme, Ahmetbey village meadows, 1-2 m 41° 11' 26.41" N; 36° 59' 58.07" E

3. Samsun: Bafra, Fener village meadows, 1-2 m 41° 41' 16.33" N; 35° 53' 53.39" E

4. Samsun: Çarsamba, Akçatarla village meadows, 1-2 m 41° 17' 33.42 N; 36° 46' 19.42" E

5. Samsun: Alaçam, Doyran village

meadows, 1-2 m 41° 38' 41.55" N; 35° 42' 07.93" E

Abbreviations used

H: Hemicryptophyte
G: Geophyte
T: Therophyte
Ch: Chamaephyte
Obs.: Observation
Elev.: Elevation

RESULTS AND DISCUSSION

The list of the vascular plant species found in the Lowland Meadows of the Central Black Sea Region are given below. The sequence of families, genera and species in the following list is according to the system in the "Flora of Turkey and the East Aegean Islands" (Davis 1965-1985, Davis et al. 1988, Güner et al. 2000).

The flora of the study area consists of 29 families, 84 genera, and 122 species and subspecies or varieties. It was found that 19.66% of these plants belong to the Euro-Siberian Region, 11.46% to the Mediterranean floristic region, and 68.85% to the pluriregional or unknown (Fig. 3). The biological spectrum includes hemicryptophytes 69.87%, therophytes 22.13%, chamaephytes with 5.73%, and geophytes 2.45% (Fig. 4). The families that had the highest species number are the Poaceae 18.85%, Fabaceae 12.29% and Asteraceae 11.47%, respectively (Fig. 5).

List of vascular plant species found in the study area

Ranunculaceae

Helleborus orientalis Lam., 1, 19.04.2001, Yalçin 94, H.

Ranunculus neopolitanus Ten., 1, 27.04.2000, Yalçin 26, H.

R. repens L., 2, 27.04.2000, Yalçin 12, H.

R. muricatus L., 2, 27.04.2000, Yalçin 38, H.

R. ophioglossifolius Vill., 2, 27.04.2000, Yalçin 36, H.

Cruciferae (Brassicaceae)

Thlaspi perfoliatum L., 3, 20.03.2002, Yalçin 176, T.

Capsella bursa-pastoris (L.) Medik., 3, 30.04.2002, Yalçin 198, H.

C. rubella Reut., 3, 30.04.2002, Yalçin 199, T., Medit. el.

Andrzeiowskia cardaminifolia (DC) Prantl., 3, 30.04.2002, Yalçin 196, T.

Cardamine hirsuta L., 3, 20.03.2002, Yalçin 172, T.

Sisymbrium altissimum L., 2, 04.07.2001, Yalçin 152, H.

Violaceae

Viola sieheana W. Becker, 1, 19.04.2001, Yalçin 89, H.

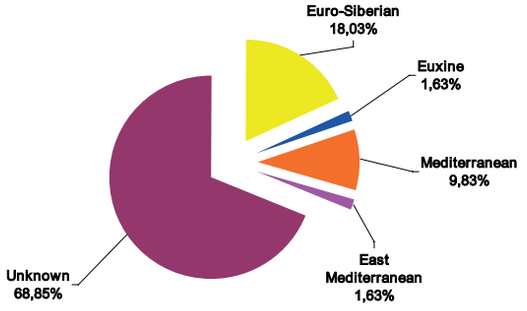


Fig. 3. The distribution of species according to phytogeographic region.

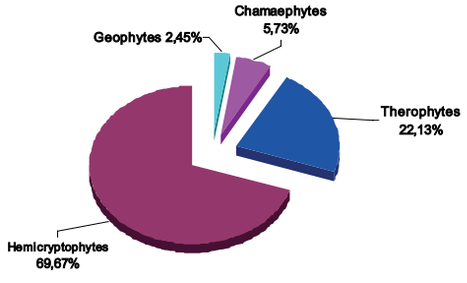


Fig. 4. The biological spectrum of study area.

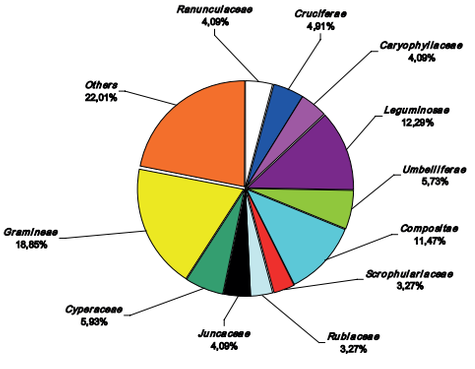


Fig. 5. The family proportions in the study area.

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Caryophyllaceae

Stellaria media (L.) Vill. subsp. *pallida* (Dumort.) Asch. & Graebener, 3, 20.03.2002, Yalçin 175, T.

Holosteum umbellatum L. var. *glutinosum* (M. Bieb.) Gay., 1, 2, 27.04.2000, Yalçin 3,7,14, T.

Spergularia media (L.) C. Presl., 3, 20.03.2002, Yalçin 178, T.

S. marina (L.) Griseb, 3, 12.11.2001, Yalçin 171, T.

Silene odontopetala Fenzl, 4, 31.05.2002, Yalçin 186, T.

Geraniaceae

Geranium rotundifolium L., 3, 23.05.2002, Yalçin 221, T.

Elatinaceae

Elatine macropoda Guss., 4, 31.05.2002, Yalçin 180, T.

Polygonaceae

Polygonum salicifolium Brouss. Ex Willd., 2, 15.11.2001, Yalçin 169, H.

Rumex acetosella L., 1, 2, 26.05.2000, Yalçin 41,53, H.

Oxalidaceae

Oxalis corniculata L., 4, 02.05.2001, Yalçin 109, H.

Leguminosae

Subfam. Papilionoideae (Fabaceae)

Psoralea bituminosa L., 1, 06.07.2000, Yalçin 74, H.

Vicia laxiflora Brot., 3, 23.05.2002, Yalçin 189, H., Medit. el.

V. sativa L. subsp. *sativa*, 3, 23.05.2002, Yalçin 187, H.

Lathyrus aphaca L. var. *biflorus* Post., 3, 23.05.2002, Yalçin 188, T.

Trifolium uniflorum L., 4, 02.05.2001, Yalçin 110, T. Medit. el.

T. hybridum L. var. *anatolicum* (Boiss.) Boiss., 1, 2, 26.05.2000, Yalçin 27,48, H.

T. nigrescens Viv. subsp. *petrisavii* (Clem.) Homboe., 5, 22.07.2002, Yalçin 242, H.

T. fragiferum L. var. *pulchellum*, 4, 04.07.2001, Yalçin 151, H.

T. physodes F. Stevens ex M. Bieb. var. *physodes*, 1, 4, 26.05.2000, Yalçin 44,51, H., Medit. el.

T. tomentosum L., 5, 22.07.2002, Yalçin 238, H.

Medicago lupulina L., 3, 07.06.2002, Yalçin 206, T.

M. minima (L.) W. Bartram var. *minima*, 4, 3, 02.05.2001, Yalçin 106,114, H.

M. disciformis DC, 3, 07.06.2002, Yalçin 210, H. Medit el.

Lotus corniculatus L. var. *corniculatus*, 1, 4, 06.07.2000, Yalçin 75,142, T.

Coronilla varia L. subsp. *varia*, 4, 3, 02.05.2001, Yalçin 106,114, T.

Rosaceae

Potentilla reptans L., 4, 3, 21.05.2002, Yalçin 194, H.

Umbelliferae (Apiaceae)

Eryngium creticum Lam., 1, 06.07.2000, Yalçin 69, H. E. Medit. el.

Bunium microcarpum (Boiss.) Freyn subsp. *microcarpum*, 4, 04.07.2001, Yalçin 144, H., E. Medit. el.

Berula erecta (Huds.) J. Coville, 3, 07.06.2002, Yalçin 200, H.

Bupleurum odontites L., 5, 25.09.2002, Yalçin 259, H.

Oenanthe pimpinelloides L., 3, 07.06.2002, Yalçin 201, H.

Torilis nodosa (L.) Gaertn., 3, 23.05.2002, Yalçin 190, H.

Daucus carota L., 1, 04.07.2001, Yalçin 47, H.

Compositae (Asteraceae)

Bellis perennis L., 1, 4, 13.04.2000, Yalçin 6,31, H., Euro-Sib. el.

Helminthotheca echioides (L.) Holub., 4, 14.09.2001, Yalçin 141, H., Euro-Sib. el.

Tanacetum armenum (DC) Sch. Bip., 1, 19.04.2001, Yalçin 100, H.

Matricaria chamomilla L. var. *chamomilla*, 2, 14.07.2002, Yalçin 256, H.

Artemisia absinthium L., 2, 15.11.2001, Yalçin 168, H.

A. santonicum L., 3, 25.08.2002, Yalçin 261, H.

Cirsium arvense (L.) Scop. subsp. *vestitum*, 4, 03.08.2001, Yalçin 162, H.

Centaurea urvillei DC subsp. *armata* Wagenitz, 1, 4, 2, 06.07.2000, Yalçin 37,48,63, H.

Scorzonera cana (C.A. Mey.) Hoffm. var. *cana*, 5, 23.05.2002, Yalçin 235, H.

Tragopogon pusillus M. Bieb., 3,

07.06.2002, Yalçin 237, H.

Lapsana communis L. subsp. *intermedia* (M. Bieb) Hayek, 3, 23.05.2002, Yalçin 219, H.

Taraxacum bessarabicum (Hornem.) Hand.-Mazz. subsp. *bessarabicum*, 3, 12.11.2001, Yalçin 172, H.

T. hybernum Steven, 4, 27.04.2000, Yalçin 18, H.

T. macrolepium Schischk., 4, 27.04.2000, Yalçin 17, H.

Primulaceae

Anagallis arvensis L. var. *arvensis*, 3, 5, 30.04.2002, Yalçin 195, H.

Apocynaceae

Vinca herbacea Waldst. & Kit., 1, 19.04.2001, Yalçin 95, H.

Gentianaceae

Centaurium erytraea Rafn. subsp. *erytraea*, 5, 22.07.2002, Yalçin 249, T.

C. pulchellum (Sw.) Druce, 3, 07.06.2002, Yalçin 236, T.

Convolvulaceae

Convolvulus arvensis L., 4, 04.07.2001, Yalçin 150, H.

Boraginaceae

Myosotis arvensis (L.) Hill. subsp. *arvensis*, 1, 3, 23.05.2002, Yalçin 91,192, H., Euro-Sib. el.

M. sicula Guss., 2, 21.05.2002, Yalçin 191, H.

Scrophulariaceae

Kickxia spuria (L.) Dumort. subsp. *integrifolia* (Brot.) R. Fern., 3, 07.06.2002, Yalçin 202, T.

Veronica arvensis L., 4, 24.04.2002, Yalçin 184, T., Euro-Sib. el.

V. anagallis-aquatica L., 2, 04.07.2001, Yalçin 153, H.

V. peduncularis M. Bieb., 3, 20.02.2002, Yalçin 173, T., Euxine el.

Labiatae (Lamiaceae)

Lamium purpureum L. var. *purpureum* Bonnier, 3, 30.04.2002, Yalçin 197, H., Euro-Sib. el.

Prunella vulgaris L., 5, 27.06.2002, Yalçin 250, T.

Mentha pulegium L., 5; 3; 2, 22.07.2002, Yalçin 239, H.

Plantaginaceae

Plantago coronopus L. subsp. *coronopus* Bonnier, 3, 20.02.2002, Yalçin 211, H., Euro-Sib. el.

P. lanceolata L., 4, 1, 3, 07.06.2001, Yalçin 66,73,135, H.

Euphorbiaceae

Euphorbia palustris L., 5, 23.05.2002, Yalçin 223, H.

E. helioscopia L., 2, 30.03.2001, Yalçin 87, H.

Rubiaceae

Sherardia arvensis L., 4, 27.04.2000, Yalçin 23, T., Medit el.

Asperula arvensis L., 4, 31.05.2002, Yalçin 185, T., Medit. el.

Galium verum L. subsp. *verum*, 3, 27.06.2002, Yalçin 253, Ch.

G. tricornutum Dandy, 4, 2, 3, 08.06.2001, Yalçin 121, T., Medit. el.

Butomaceae

Butomus umbellatus L., 2, 06.07.2000, Yalçin 62, H., Euro-Sib. el.

Liliaceae

Smilax excelsa L., 1, 19.04.2001, Yalçin 98, Ch., Euxine el.

Ruscus aculeatus L. var. *aculeatus* Hegi, 1, 19.04.2001, Yalçin 102, Ch.

Iridaceae

Iris pseudacorus L., 3, 03.08.2001, Yalçin 163, G.

I. orientalis C. Mill., 3, 07.06.2002, Yalçin 213, G., Medit. el.

Romulea ramiflora Ten. subsp. *ramiflora*, 3, 22.03.2001, Yalçin 82, G., Medit el.

Juncaceae

Juncus acutus L., 3, 03.08.2001, Yalçin 161, Ch.

J. littoralis C.A. Mey., 3, 27.06.2002, Yalçin 254, Ch.

J. conglomeratus L., 1, 19.04.2001, Yalçin 101, Ch., Euro-Sib. el.

J. articulatus L., 2, 04.07.2001, Yalçin 154, Ch., Euro-Sib. el.

Luzula forsteri (Sm.) DC, 1, 19.04.2001, Yalçin 90, H.

Cyperaceae

Cyperus longus L., 3, 27.06.2001, Yalçin 251, H.

C. rotundus L., 2, 25.09.2002, Yalçin

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260, H.

Eleocharis palustris (L.) Roem. & Schult., 1, 19.04.2001, Yalçin 92, H.

Carex divulsa Stokes subsp. *divulsa*, 4, 1, 27.04.2000, Yalçin 30,108, H., Euro-Sib. el.

C. divisa Huds., 4, 2, 1, 3, 5, 13.04.2001, Yalçin 8,15,86,103, H., Euro-Sib. el.

C. pilosa Scop., 2, 27.04.2000, Yalçin 15, H., Euro-Sib. el.

C. riparia Curtis, 1, 19.04.2001, Yalçin 104, H., Euro-Sib. el.

Gramineae (Poaceae)

Brachypodium pinnatum (L.) P. Beauv., 3, 27.06.2002, Yalçin 257, H.

Elymus elongatus (Host) Runemark subsp. *elongatus*, 3, 07.06.2002, Yalçin 208, H.

Hordeum geniculatum All., 3, 07.06.2002, Yalçin 209, H., Euro-Sib. el.

H. murinum L. subsp. *murinum*, 1, 06.07.2000, Yalçin 76, H.

H. bulbosum L., 3, 07.06.2002, Yalçin 207, H.

Bromus arvensis L. , 3, 27.06.2002, Yalçin 255, H.

Holcus lanatus L., 1, 04.07.2001, Yalçin 158, H., Euro-Sib. el.

Agrostis castellana Boiss. & Reut. subsp. *byzantina* (Boiss.) Hack. apud Kneuck., 3, 07.06.2002, Yalçin 213, H., Euro-Sib. el.

Alopecurus aequalis Sobol., 3, 07.06.2002, Yalçin 204, H., Euro-Sib. el.

A. pratensis L., 3, 03.08.2001, Yalçin 164, H., Euro-Sib. el.

Phleum exaratum Hochst ex Griseb. subsp. *exaratum*, 5, 27.06.2002, Yalçin 258, T.

Bellardiochloa violacea (Bellardi) Chiov., 1, 07.06.2001, Yalçin 118, H., Euro-Sib. el.

Lolium perenne L., 1, 4, 3, 24.04.2001, Yalçin 45,54,132, H., Euro-Sib. el.

Vulpia fasciculata (Forssk.) Fritsch, 3, 07.06.2002, Yalçin 205, H., Medit. el.

V. ciliata Dumort. subsp. ciliata, 4, 08.06.2001, Yalçin 125, H.

Poa annua L., 1, 4, 2, 24.04.2000, Yalçin 1,9,28, T.

P. pratensis L., 1, 4, 2, 26.05.2000, Yalçin 22,42,50, H.

P. chaixii Vill., 1, 02.05.2001, Yalçin 113, H., Euro-Sib el.

Catabrosa aquatica (L.) P. Beauv., 3, 07.06.2001, Yalçin 203, H.

Cynosurus cristatus L., 1, 4, 06.07.2000, Yalçin 65,70, H., Euro-Sib. el.

C. echinatus L., 1, 04.07.2001, Yalçin 157, H., Medit el.

Cynodon dactylon (L.) Pers. var. *dactylon*, 4, 3, 06.07.2001, Yalçin 67,166, H.

Paspalum paspalodes (Michx.) Scribn., 1, 2, 14.09.2000-2001, Yalçin 77,139, H.

Grasses and legumes are the main components of the meadow ecosystems in this study. There were also other families found in the floristic composition. Endemic plants were not found in the study area. The study area is near sea level and, the soil water table is high. Flooding was observed in the study area during the rainy season. These factors may have affected the floristic diversity of the study area (Dodd et al. 2002, Hillerislambers et al. 2002, Jarolimek et al. 2000). The endemism ratio is very small in the Euro-Siberian Region in general (Ekim 1993). Endemic plants could not occur in the area because of the area consist of young sediments. The plant species richness of a given area depends on evolutionary and historical factors, such as speciation and migration and on the ecological factors, such as competition, disturbance, stress, successional state, herbivory, and regeneration. It has been claimed that species richness is highest at the intermediate levels of disturbance and productivity (Jutila 1997). The study area is very rich in terms of biologic and ecologic diversity. But, this diversity is threatened by intensive grazing and agricultural activities.

Although, the study area is under the influence of the Euro-Siberian phytogeographic region, some taxa belong to the Mediterranean phytogeographic region. Many authors mentioned that the effect of the Mediterranean climate may be seen along the coastal line of the Black Sea Region (Kavgaci 2007, Kilinc and Özkanca 1991, Akman and Ketenoglu 1986). The Mediterranean climate is seen in the study area. Distribution of the species in the study area according to the phytogeographic region is similar to Kavgaci's study (2007) which was carried out in

Igneada. But, the proportion of the Euro-Siberian taxa is more than the Mediterranean taxa. Karaer et al. (1997) reported that the proportion of the Euro-Siberian taxa increased from the west to the east of the Black Sea coast. Most of the species have unknown or pluriregional distribution in both studies. This is probably due to the climatic conditions, biotic factors, and being close to the sea. However, these areas are young and, more unstable than other ecosystems (Illyes et al. 2007).

High representation of hemicryptophytes may be thought of as an adaptation to grazing. Plants with rosette leaves have defensive and effective allocation mechanism against grazing. This distribution is typical for meadows ecosystems. According to Singh and Yadava (1974), in general meadows are rich in hemicryptophytes. Kavgaci (2007) reported that the proportion of therophytes is more than the hemicryptophytes in the meadow behind sand dune on the Igneada coast. At lower altitudes, temperatures, and length of growing-seasons are adequate but soil moisture may not be readily available, which may be responsible for well-developed annual species (Wang et al. 2002). Sand dune motion causes the low proportion of hemicryptophytes in the meadow behind the sand dune on the Igneada coast. In this study, heavy grazing and climatic conditions cause the high proportion of hemicryptophytes. Particularly, the seasonal drought stress increased the proportion of hemicryptophytes in the lowland meadows.

Some interesting taxa were found in the study area; *B. erecta, M. sicula, K. spuria* subsp. *integrifolia, R. ramiflora* subsp. *ramiflora*, and *P. chaixii*. They are rare in the region because of ecological and anthropogenic pressure.

There are a few studies on the meadow ecosystems in Turkey. Mainly they were carried out on the alpine and subalpine grassland vegetation. Because of different ecological and floristical properties, it is difficult to compare the floristic similarity of vegetation in the study area with the other meadows investigated in nearby places.

Finally, there is heavy grazing pressure on the meadows in the study area. As a result of this, the floristic composition is dramatically affected by heavy grazing. Less palatable species (i.e. *C. dactylon* var. *dactylon*) invaded this meadow with increased grazers. Heavy grazing should be prevented for the year and rotational grazing regimes should be practized in this ecosystem types. The destroyed areas should be fenced with suitable instruments, after then rehabilitation studies should be started.

ACKNOWLEDGEMENTS

This study was funded by the Research Council of the University of Ondokuz Mayis (Project Number F-241). Special thanks to Ümit Erkan SARAÇ for help in the study area.

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Türkiye'nin Orta Karadeniz Bölgesindeki Çayirlarin Floristik Özellikleri

Özet

Türkiye'nin Orta Karadeniz Bölgesi'nde bulunan otlatilan ve otlatilmayan alüvyal çayirlik alanlarin florasi 2001-2003 yillari arasinda arastirildi. Çalisma alani Orta Karadeniz bölgesinin sahil kesimleri boyunca uzanmaktadir. Alan floristik olarak Avrupa-Sibirya fitocografik bölgenin Öksin eyaletinde bulunmaktadir. Çalisilan çayirlar mera olarak kullanilmistir. Çalisma alaninin florasi 29 familya, 84 cins, 122 tür, alttür veya varyeteden olusmaktadir. Tespit edilen bitkiler sirasiyla, %19.66'si Avrupa-Sibirya Bölgesine, %11.46'si Akdeniz Bölgesine, %68.85'i çok bölgeli ya da floristik bölgesi bilinmeyen türlere aittir. Hayat formu spektrumunun %69.67'si Hemikriptofitlerden, %22.13'ü Terofitlerden, %5.73'ü Kamefitlerden ve %2.45'i Geofitlerden olusmaktadir. Bu çalismanin amaci, Türkiye'nin Orta Karadeniz Bölgesi'ndeki dogal alüvyal çayirlarin floristik kompozisyonunu belirlemektir. Örneklerin isimlendirilmesinde baslica "Flora of Turkey and the East Aegean Islands" ve "The Flora Europea" kullanilmistir.

Anahtar Kelimeler: Çayir, flora, otlatma, Karadeniz, Türkiye.

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