

## Plant Species Diversity in Isparta Region Rangelands

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**Abstract:** Turkey as a consequence of its exceptionally diverse topographical structure and differing climatic features is one of the world's richest countries of the world as regards to the diversity of the plant species. The Mediterranean region takes the first place in the country, in relation with the number of species grown in a single region. The aim in this study conducted in the rangelands of Isparta which is located in the Mediterranean region between the years of 2008-2009 is to present the plant species diversity of the local rangelands. In the study area, 302 plant taxa belonging to 43 families and 190 plant genera were identified and 28, 39 and 234 of these belonged to the gramineae, legume and other families, respectively. The family that is represented with the most number of taxa with 41 taxa is the Asteraceae family. It is followed by Fabaceae, Lamiaceae and Poaceae families, respectively with 39, 30 and 29 taxa. Among the 302 plant taxa, 84 of the plants are annual; 3 of them are annual and biennial plants; 14 of the plants are biennial and 201 of them are perennial plants. Among the taxa encountered in the study area, 73 of them were recorded as the element of the Mediterranean region; 64 taxa were recorded as the element of Irano-Turanian region; 17 of them were recorded as the element of Euro-Siberian region and 148 taxa were recorded as widespread or belonging to an unknown region. Moreover, 82 plant taxa were endemic and the endemism ratio was identified as 27.15%.

**Key words:** Plant species richness, endemic plants, rangelands, isparta, Mediterranean, Turkey

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### INTRODUCTION

Turkey is one of the richest countries of the world as regards to its flora and vegetation. With approximately 9200 genera and 1200 species and subspecies taxa, the country has one of the richest floras of its climatic zone in the world according to the diversity of the plant species. Moreover, the endemism ratio is approximately 34% with 3925 endemic species (NPNC, 2007). The reason for such richness is that Mediterranean, Irano-turanian and Euro-Siberian floristic regions are located in Anatolia and they even merge in some sections (Davis, 1965-1985). Furthermore, the variety of the topographical, geological and geomorphological structures and climatic differences can be stated as among the reasons for this wide diversity of herbaceous and woody plants (Turkmen, 1987). The Mediterranean region takes the first place with 750 species in relation with the number of species grown in a single region within the country (Ekim *et al.*, 2000).

The rangelands, among the natural resources take one of the first places when their significances in the ecological system, places in stockbreeding, roles in preventing the erosion, biological diversities and

situations of becoming a gene center are considered (Acikgoz, 2001). In relation with the land use, the richest places are the rangelands with the numerous herbaceous and ligneous plants contained in these lands because the abundance of the number of plant species in the rangeland vegetations is a significant indicator of the biological diversity in the area.

The rangelands of Isparta region as the field of study are located in the intersection zone of Mediterranean and Irano-turanian floristic regions and also have considerably rich structures according to their natural vegetation. In this regard, the aim of this study is to determine the plant species diversity of the rangelands in Isparta region. Moreover, the determination of the endemic and endangered plant species which have the features of a biological heritage for the country is also, aimed with this study.

### MATERIALS AND METHODS

The study was conducted, between the years of 2008-2009 in Davraz Mountain, Kulova Plateau Rangeland (1650 m), Darioren Rangeland (1500 m), Kozagaci Plateau Rangeland (1450 m), Kayi village Rangeland (1400 m)

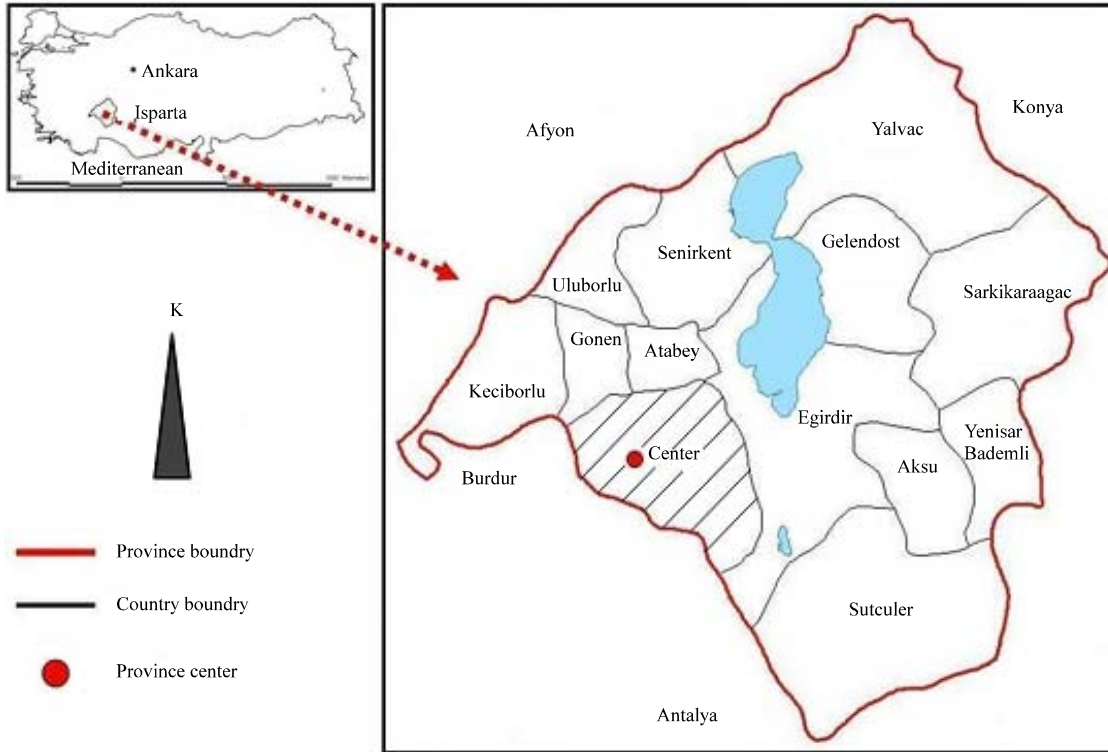


Fig. 1: Research area

and Kirtepe Rangeland (1200 m) situated within the province of Isparta (Fig. 1). The study area is located in the transition area of the Mediterranean and continental climatic zones (Babalik and Sonmez, 2010). According to the data of Isparta meteorological station, the annual mean temperature is 12°C while the mean value of annual rainfall is 506 mm (TMS, 2009).

The study was conducted during the vegetation period between May and October in the both years and the assessment of the flora was performed, during these periods by visiting the rangelands which each had different topographical structures bi-weekly.

The samples of the plants identified in these lands were obtained and they were brought to the herbarium by means of placing them in the pressers. Moreover, the digital photographs of the plant species obtained from the areas were taken.

During the obtainment of the samples, it was taken special care that the organs of the plants such as flower, leaf, stem and root which are essential for the identification of the plants were picked as a whole and each sample was numbered.

The lands where the plants were obtained and their picking times were noted. Since, the plants came into blossom at different times, obtaining samples from the

plants with different blossom periods were ensured by visiting the same lands at various dates in the vegetation period. After the species identification of the plants brought to the herbarium is performed, their lengths of lives, element regions and conditions of endemism were then determined (Davis, 1965-1985; Davis *et al.*, 1988; Guner *et al.*, 2000; Tutin *et al.*, 1964-1980).

During the identification of the plants, the flora studies conducted in Isparta and its surroundings (Fakir, 2006; Babalik and Fakir, 2009; Fakir *et al.*, 2009; Ozcelik and Ozturk, 1999; Ozcelik and Korkmaz, 2002) and the data of the Herbariums belonging to Faculty of Forestry and Faculty of Science and Letters at Süleyman Demirel University were used. Furthermore, the danger categories and endemism conditions of the plants taxa according to the IUCN threatened categories were shown in Table 1 (IUCN, 2001; Ekim *et al.*, 2000). The abbreviations used in the floristic list are as follows:

- Euro-Sib. : Euro-Siberian Elements
- Ir.-Tur. : Irano-Turanian Elements
- Medit. : Mediterranean Elements
- E. Medit. : East Mediterranean Elements
- MR. : Multiregional
- UPR. : Unknown Phytogeographical Region

Table 1: Plant taxa encountered in the study area and some of their significant characteristics

Families and plant taxa	Length of life	Element region	Endemic condition	Threat categories
<b>Acanthaceae</b>				
<i>Acanthus hirsutus</i> Boiss.	Per.	Medit.	End.	LR(Ic)
<b>Anacardiaceae</b>				
<i>Pistacia terebinthus</i> L. subsp. <i>palaestina</i> (Boiss.) Engler	Per.	E.Medit.	-	-
<i>Rhus coriaria</i> L.	Per.	MR.	-	-
<b>Apiaceae</b>				
<i>Bupleurum falcatum</i> L. subsp. <i>polyphyllum</i> (Ledeb.) Wolff.	Per.	Euro-Sib.	-	-
<i>Bupleurum rotundifolium</i> L.	Ann.	MR.	-	-
<i>Eryngium campestre</i> L. var. <i>virens</i>	Per.	MR.	-	-
<i>Falcaria vulgaris</i> Bernh.	Per.	MR.	-	-
<i>Torilis japonica</i> (Houtt.) DC.	Ann.	MR.	-	-
<i>Torilis ucranica</i> Sprengel	Ann.	MR.	-	-
<b>Araceae</b>				
<i>Arum elongatum</i> Steven	Per.	Ir.-Tur.	-	-
<b>Asteraceae</b>				
<i>Achillea Biebersteinii</i> Afan.	Per.	Ir.-Tur.	-	-
<i>Achillea kotschyi</i> Boiss. subsp. <i>kotschyi</i>	Per.	E.Medit.	End.	LR (Ic)
<i>Achillea lycanica</i> Boiss. and Heldr.	Per.	Ir.-Tur.	End.	LR (Ic)
<i>Anthemis cretica</i> L. subsp. <i>cassia</i> (Boiss.) Grierson	Per.	UPR.	-	-
<i>Anthemis tinctoria</i> L. var. <i>tinctoria</i>	Per.	Mr.	-	-
<i>Anthemis wiedemanniana</i> Fisch. and Mey.	Ann.	UPR.	End.	LR (Ic)
<i>Artemisia campestris</i> L.	Per.	MR.	-	-
<i>Bellis perennis</i> L.	Per.	Euro-Sib.	-	-
<i>Carduus olympicus</i> Boiss. subsp. <i>hypoleucus</i> (Bornm.) Davis	Per.	UPR.	End.	LR (Ic)
<i>Centaurea mathioliifolia</i> Boiss.	Per.	Ir.-Tur.	End.	VU
<i>Centaurea pulchella</i> Ledeb.	Ann.	Ir.-Tur.	-	-
<i>Centaurea reuterana</i> Boiss. var. <i>phrygia</i> Bornm.	Per.	E.Medit.	End.	LR (Ic)
<i>Centaurea solstitialis</i> L. subsp. <i>Solstitialis</i>	Ann.	MR.	-	-
<i>Centaurea virgata</i> Lam.	Per.	Ir.-Tur.	-	-
<i>Chondrilla juncea</i> L. var. <i>juncea</i>	Per.	MR.	-	-
<i>Cichorium intybus</i> L.	Per.	MR.	-	-
<i>Cirsium vulgare</i> (Savi) Ten.	Bia.	MR.	-	-
<i>Conyza canadensis</i> (L.) Cronquist	Ann.	MR.	-	-
<i>Crepis alpina</i> L.	Ann.	MR.	-	-
<i>Crupina crupinastrum</i> (Moris) Vis.	Ann.	Medit	-	-
<i>Echinops viscosus</i> DC. var. <i>bithynicus</i> (Boiss.) Rech.	Per.	Ir.-Tur.	-	-
<i>Helichrysum compactum</i> Boiss.	Per.	E.Medit	End.	EN.
<i>Hieracium pannosum</i> Boiss.	Per.	E.Medit	-	-
<i>Hieracium phrygiense</i> Sell and West	Per.	E.Medit	End.	LR (Ic)
<i>Ymula anatolica</i> Boiss.	Per.	Medit	End.	LR (Ic)
<i>Lactuca intricata</i> Boiss.	Per.	E.Medit.	-	-
<i>Lactuca scarioloidea</i> Boiss.	Bia.	Ir.-Tur.	-	-
<i>Onopordum anatolicum</i> (Boiss.) Eig.	Bia.	Ir.-Tur.	End.	LR (Ic)
<i>Picnomon acarna</i> (L.) Cass.	Ann.	Medit.	-	-
<i>Pilosella hoppeana</i> (Schultes) C.H. and F.W. Schultz subsp. <i>cilicica</i> (NP.) Sell and West	Per.	MR.	-	-
<i>Scorzonera cana</i> (C. A. Meyer) Hoffm. var. <i>alpina</i> (Boiss.) Chamberlain	Per.	UPR.	-	-
<i>Scorzonera mollis</i> Bieb. subsp. <i>szowitzii</i> (DC.) Chamberlain	Per.	Ir.-Tur.	-	-
<i>Senecio vulgaris</i> L.	Ann.	MR.	-	-
<i>Taraxacum turcicum</i> Van Soest	Per.	UPR.	-	LR (Ic)
<i>Tragopogon dubius</i> Scop.	Bia.	MR.	-	-
<i>Tragopogon latifolius</i> Boiss. var. <i>angustifolius</i> Boiss.	Per.	Ir.-Tur.	-	-
<i>Tragopogon olympicus</i> Boiss.	Per.	E.Medit.	End.	LR (Ic)
<i>Tussilago farfara</i> L.	Per.	Euro-Sib.	-	-
<i>Xanthium spinosum</i> L.	Ann.	MR.	-	-
<i>Xanthium strumarium</i> L.	Ann.	Medit.	-	-
<i>Xeranthemum annuum</i> L.	Ann.	Ir.-Tur.	-	-
<b>Berberidaceae</b>				
<i>Berberis crataegina</i> DC.	Per.	Ir.Tur.	-	-
<b>Boraginaceae</b>				
<i>Alkanna incana</i> Boiss.	Per.	E.medit.	End.	LR (cd)
<i>Anchusa azurea</i> Miller var. <i>azurea</i>	Per.	Mr.	-	-
<i>Anchusa stylosa</i> Bieb.	Ann.	Mr.	-	-
<i>Buglossoides arvensis</i> (L.) Johnston	Ann.	Mr.	-	-
<i>Echium italicum</i> L.	Bia.	Medit.	-	-
<i>Molikia aurea</i> Boiss.	Per.	Ir-Tur	-	-
<i>Myosotis refracta</i> Boiss. subsp. <i>refracta</i>	Ann.	E.medit.	-	-
<i>Onosma aucheranum</i> DC.	Per.	E.medit.	-	-
<i>Onosma mite</i> Boiss. and Heldr.	Per.	E.medit.	-	-

Table 1: Continue

Families and plant taxa	Length of life	Element region	Endemic condition	Threat categories
<b>Brassicaceae</b>				
<i>Alyssum alyssoides</i> (L.) L.	Ann.	MR.	-	-
<i>Alyssum murale</i> Waldst. and Kit. var. <i>murale</i>	Per.	MR.	-	-
<i>Arabis aubrietoides</i> Boiss.	Per.	MR.	End.	LR (Ic)
<i>Arabis ionocalyx</i> Boiss.	Per.	E.Medit.	-	-
<i>Aubrieta pinardii</i> Boiss.	Per.	Ir.Tur.	End.	LR (Ic)
<i>Barbarea verna</i> (Mill.) Aschers.	Bia.	MR.	-	-
<i>Capsella bursa-pastoris</i> (L.) Medik.	Bia.	MR.	-	-
<i>Cardamine hirsuta</i> L.	Ann.	MR.	-	-
<i>Cardaria draba</i> (L.) Desv. subsp. <i>draba</i>	Per.	MR.	-	-
<i>Descurainia sophia</i> (L.) Webb ex Prantl	Bia.	MR.	-	-
<i>Diplotaxis tenuifolia</i> (L.) DC.	Per.	MR.	-	-
<i>Erophila verna</i> (L.) Chevall. subsp. <i>verna</i>	Ann.	MR.	-	-
<i>Eruca sativa</i> Miller	Ann.	MR.	-	-
<i>Erysimum crassipes</i> Fisch. and Mey.	Per.	MR.	-	-
<i>Erysimum leptocarpum</i> Gay.	Per.	UPR.	End.	End.
<i>Isatis glauca</i> Aucher ex Boiss. subsp. <i>glauca</i>	Per.	Ir.Tur.	-	-
<i>Lepidium latifolium</i> L.	Per.	MR.	-	-
<i>Lepidium perfoliatum</i> L.	Bia.	MR.	-	-
<i>Malcolmia africana</i> (L.) R. Br.	Ann.	MR.	-	-
<i>Rapistrum rugosum</i> (L.) All.	Ann.	MR.	-	-
<i>Sinapis arvensis</i> L.	Ann.	MR.	-	-
<i>Sisymbrium altissimum</i> L.	Bia.	MR.	-	-
<i>Sisymbrium orientale</i> L.	Ann.	MR.	-	-
<i>Thlaspi perfoliatum</i> L.	Ann.	MR.	-	-
<b>Campanulaceae</b>				
<i>Asyneuma compactum</i> (Boiss. and Heldr.) Damboldt	Per.	E.Medit.	End.	LR (nt)
<i>Asyneuma isauricum</i> Contandr.	Per.	E.Medit.	End.	LR (cd)
<i>Asyneuma rigidum</i> (Willd.) Grossh. subsp. <i>sibthorpiarum</i>	Per.	E.Medit.	End.	LR (Ic)
(Roemer and Schultes) Damboldt	Per.	E.Medit.	End.	LR (cd)
<i>Campanula balansae</i> Boiss. and Hausskn.	Per.	E.Medit.	End.	LR (nt)
<i>Campanula fruticulosa</i> (Schwarz and Davis.) Damboldt.	Per.	E.Medit.	End.	EN
<i>Campanula peregrina</i> L.	Bia.	Medit.	-	-
<i>Legousia speculum-veneris</i> (L.) Chais	Ann.	Medit.	-	-
<b>Caryophyllaceae</b>				
<i>Arenaria deflexa</i> Dec. subsp. <i>microsepala</i> McNeill	Per.	E.Medit.	End.	LR (nt)
<i>Bolanthus mimurartioides</i> (Jaub. and Spach) Hub.-Mor.	Per.	UPR.	End.	LR (Ic)
<i>Cerastium banaticum</i> (Roch.) Heuffel	Per.	MR.	-	-
<i>Cerastium chlorifolium</i> Fisch. and Mey.	Ann.	MR.	-	-
<i>Dianthus brevicaulis</i> Fenzl. subsp. <i>setaceus</i> Reeve	Per.	UPR.	End.	VU
<i>Dianthus micranthus</i> Boiss. and Heldr.	Per.	UPR.	-	-
<i>Dianthus orientalis</i> Adams	Per.	MR.	-	-
<i>Dianthus zonatus</i> Fenzl. var. <i>zonatus</i>	Per.	UPR.	-	-
<i>Gypsophila elegans</i> Bieb.	Ann.	Ir.-Tur.	-	-
<i>Gypsophila pilosa</i> Hudson	Ann.	Ir.-Tur.	-	-
<i>Holosteium umbellatum</i> L. var. <i>umbellatum</i>	Ann.	MR.	-	-
<i>Mimurartia gracilis</i> McNeill	Per.	UPR.	End.	VU
<i>Mimurartia hybrida</i> (Vill.) Schischk. subsp. <i>hybrida</i>	Per.	MR.	-	-
<i>Mimurartia umbellulifera</i> (Boiss.)	Per.	UPR.	End.	LR (Ic)
McNeill subsp. <i>umbellulifera</i> var. <i>umbellulifera</i>				
<i>Petrorragia hispidula</i> (Boiss. and Heldr.) Ball and Heywood	Ann.	UPR.	End.	VU
<i>Sagina apetala</i> Ard.	Ann.	MR.	-	-
<i>Saponaria dalmasii</i> Boissieu	Ann.	UPR.	End.	DD
<i>Saponaria pamphylica</i> Boiss. and Heldr.	Per.	UPR.	End.	LR (Ic)
<i>Saponaria pinetorum</i> Hedge	Per.	E.Medit.	End.	LR (cd)
<i>Saponaria pumilio</i> Boiss.	Per.	MR.	-	-
<i>Silene armena</i> Boiss. var. <i>armena</i>	Per.	UPR.	End.	LR (Ic)
<i>Silene leptoclada</i> Boiss.	Per.	E.Medit.	End.	LR (nt)
<i>Silene lycanica</i> Chowdh.	Per.	Ir.Tur.	End.	EN
<b>Chenopodiaceae</b>				
<i>Atriplex rosea</i> L.	Ann.	MR.	-	-
<i>Chenopodium botrys</i> L.	Ann.	MR.	-	-
<i>Chenopodium foliosum</i> (Moench) Aschers.	Per.	MR.	-	-
<i>Salsola kali</i> L.	Ann.	MR.	-	-
<b>Convolvulaceae</b>				
<i>Convolvulus arvensis</i> L.	Per.	MR.	-	-
<b>Cucurbitaceae</b>				
<i>Ecballium elaterium</i> (L.) A. Rich.	Per.	Medit.	-	-

Table 1: Continue

Families and plant taxa	Length of life	Element region	Endemic condition	Threat categories
<b>Cuscutaceae</b>				
<i>Cuscuta planiflora</i> Ten.	Per.	MR.	-	-
<b>Cyperaceae</b>				
<i>Blasmus compressus</i> (L.) Panzer ex Link.	Per.	MR.	-	-
<i>Carex distans</i> L.	Per.	Euro-Sib.	-	-
<i>Carex hirta</i> L.	Per.	Euro-Sib.	-	-
<b>Dipsacaceae</b>				
<i>Cephalaria salicifolia</i> Post.	Per.	UPR.	End.	DD
<i>Pteroccephalus plumosus</i> (L.) Coulter	Ann.	MR.	-	-
<i>Scabiosa argentea</i> L.	Per.	MR.	-	-
<i>Scabiosa hololeuca</i> Bornm.	Per.	Ir.-Tur.	End.	EN
<b>Ephedraceae</b>				
<i>Ephedra major</i> Host.	Per.	Medit.	-	-
<b>Euphorbiaceae</b>				
<i>Andrachne aspera</i> Sprengel	Per.	MR.	-	-
<i>Euphorbia erythron</i> Boiss. and Heldr.	Per.	Ir.-Tur.	End.	LR (Ic)
<i>Euphorbia kotschyana</i> Fenzl	Per.	E.Medit.	-	-
<i>Euphorbia seguieriana</i> Necker subsp. <i>seguieriana</i>	Per.	Euro-Sib.	-	-
<b>Fabaceae</b>				
<i>Astragalus albifolius</i> Freyn and Sint.	Per.	Ir.-tur.	End.	LR (cd)
<i>Astragalus campylosema</i> Boiss. subsp. <i>atropurpureus</i> (Boiss.) Chamberlain	Per.	UPR.	End.	LR (Ic)
<i>Astragalus gymolobus</i> Fisher	Per.	Ir.-Tur.	End.	LR (Ic)
<i>Astragalus heldreichii</i> Boiss.	Per.	UPR.	End.	LR (nt)
<i>Astragalus macrocephalus</i> Willd. subsp. <i>finitimus</i> (Bunge) Chamberlain	Per.	Ir.-Tur.	-	-
<i>Astragalus microcephalus</i> Willd.	Per.	Ir.-Tur.	-	-
<i>Astragalus nanus</i> DC.	Per.	Ir.-Tur.	-	-
<i>Astragalus oxytropifolius</i> Boiss.	Per.	Ir.-Tur.	End.	DD
<i>Astragalus paecilanthus</i> Boiss. and Heldr.	Per.	UPR.	End.	DD
<i>Astragalus pinetorum</i> Boiss.	Per.	Ir.-Tur.	End.	LR (Ic)
<i>Astragalus ponticus</i> Pall.	Per.	MR.	-	-
<i>Astragalus prusianus</i> Boiss.	Per.	E.Medit.	End.	DD
<i>Astragalus vulnerariae</i> DC.	Per.	UPR.	End.	LR (Ic)
<i>Astragalus zederbaueri</i> Stadlman	Per.	Ir.-Tur.	End.	LR (Ic)
<i>Coronilla varia</i> L. subsp. <i>varia</i>	Per.	MR.	-	-
<i>Genista tinctoria</i> L.	Per.	Euro-Sib.	-	-
<i>Hedysarum varium</i> Willd.	Per.	Ir.-Tur.	-	-
<i>Lathyrus digitatus</i> (Bieb.) Fiori	Per.	E.Medit.	-	-
<i>Lathyrus hirsutus</i> L.	Ann.Bia.	MR.	-	-
<i>Lotus corniculatus</i> L. var. <i>tenuifolius</i> L.	Per.	MR.	-	-
<i>Medicago minima</i> (L.) Bart. var. <i>minima</i>	Ann.	MR.	-	-
<i>Medicago sativa</i> L. subsp. <i>sativa</i>	Per.	MR.	-	-
<i>Melilotus alba</i> Desr.	Ann.	MR.	-	-
<i>Melilotus officinalis</i> (L.) Desr.	Ann.	MR.	-	-
<i>Onobrychis hypargyrea</i> Boiss.	Per.	MR.	-	-
<i>Onobrychis pisdica</i> Boiss.	Per.	Ir.-Tur.	End.	LR (nt)
<i>Ononis spinosa</i> L. subsp. <i>antiquorum</i> (L.) Briq.	Per.	Medit.	-	-
<i>Spartium junceum</i> L.	Per.	Medit.	-	-
<i>Trifolium affine</i> C. Presl	Ann.	MR.	-	-
<i>Trifolium barbulatum</i> (Freyn and Sint.) Zoh.	Ann.	UPR.	End.	LR (Ic)
<i>Trifolium campestre</i> Schreb.	Ann.	MR.	-	-
<i>Trifolium pratense</i> L. var. <i>pratense</i> Boiss. and Bal.	Per.	MR.	-	-
<i>Trigonella lunata</i> Boiss.	Ann.	Ir.-Tur.	-	-
<i>Vicia caesarea</i> Boiss. and Bal.	Ann.	Ir.-Tur.	End.	LR (Ic)
<i>Vicia cracca</i> L. subsp. <i>atroviolacea</i> (Bornm.) Davis	Per.	MR.	-	-
<i>Vicia grandiflora</i> Scop. var. <i>grandiflora</i>	Ann.	MR.	-	-
<i>Vicia peregrina</i> L.	Ann.	MR.	-	-
<i>Vicia sativa</i> L. subsp. <i>nigra</i> (L.) Ehrh. var. <i>nigra</i>	Ann.	MR.	-	-
<i>Vicia villosa</i> Roth. subsp. <i>dasycarpa</i> (Ten.) Cav.	Bia.	MR.	-	-
<b>Fagaceae</b>				
<i>Quercus coccifera</i> L.	Per.	Medit.	-	-
<b>Geraniaceae</b>				
<i>Erodium absinthoides</i> Willd. subsp. <i>absinthoides</i>	Per.	Ir.-Tur.	End.	LR (Ic)
<i>Erodium moschatum</i> (L.) L'Herit.	Ann.	Medit.	-	-
<i>Geranium cinereum</i> Cav. subsp. <i>subcaulescens</i> var. <i>subcaulescens</i>	Per.	MR.	-	-
<b>Globulariaceae</b>				
<i>Globularia orientalis</i> L.	Per.	Ir.-Tur.	-	-

Table 1: Continue

Families and plant taxa	Length of life	Element region	Endemic condition	Threat categories
<b>Hypericaceae</b>				
<i>Hypericum perforatum</i> L.	Ann.	MR.	-	-
<b>Iridaceae</b>				
<i>Crocus biflorus</i> Miller subsp. <i>punctatus</i> Mathew	Per.	E.Medit.	End.	LR (nt)
<i>Crocus fleischeri</i> Gay	Per.	E.Medit.	End.	LR (Ic)
<b>Juncaceae</b>				
<i>Juncus gerardi</i> Loisel subsp. <i>libanoticus</i> (Thieb.) Snog.	Per.	Ir.-Tur.	-	-
<b>Lamiaceae</b>				
<i>Ajuga chamaepitys</i> (L.) Schreber var. <i>mesogitana</i> (Boiss.) Bormm.	Per.	E.Medit.	-	-
<i>Ballota nigra</i> L. subsp. <i>foetida</i> Hayek	Per.	E.Medit.	-	-
<i>Clinopodium vulgare</i> L. subsp. <i>vulgare</i>	Per.	Euro-Sib.	-	-
<i>Lamium amplexicaule</i> L.	Ann.	Euro-Sib.	-	-
<i>Lamium pisidicum</i> R. Mill.	Per.	UPR.	End.	LR (cd)
<i>Marrubium globosum</i> Montbret and Aucher ex Bentharn subsp. <i>globosum</i>	Per.	Ir.-Tur.	End.	LR (Ic)
<i>Marrubium parviflorum</i> Fisch. and Mey. subsp. <i>parviflorum</i>	Per.	Ir.-Tur.	-	-
<i>Marrubium vulgare</i> L.	Per.	MR.	-	-
<i>Melissa officinalis</i> L. subsp. <i>altissima</i> (Sm.) Arcangeli	Per.	E.Medit.	-	-
<i>Nepeta caesarea</i> Boiss.	Per.	E.Medit.	End.	LR (nt)
<i>Origanum sipyleum</i> L.	Per.	E.Medit.	End.	LR (Ic)
<i>Phlomis armeniaca</i> Willd.	Per.	Ir.-Tur.	End.	LR (Ic)
<i>Phlomis pungens</i> Willd. var. <i>pungens</i>	Per.	UPR.	-	-
<i>Salvia candidissima</i> Vahl. subsp. <i>occidentalis</i> Hedge	Per.	Ir.-Tur.	-	-
<i>Salvia ceratophylla</i> L.	Bia.	Ir.-Tur.	-	-
<i>Salvia frigida</i> Boiss.	Per.	Ir.-Tur.	-	-
<i>Salvia tomentosa</i> Miller	Per.	Medit.	-	-
<i>Scutellaria orientalis</i> L. subsp. <i>pinnatifida</i> Edmondson	Per.	MR.	-	-
<i>Sideritis leptoclada</i> Schwarz and Davis.	Per.	E.Medit.	End.	LR (cd)
<i>Sideritis perfoliata</i> L.	Per.	E.Medit.	-	-
<i>Sideritis pisidica</i> Boiss. and Heldr.	Per.	E.Medit.	End.	LR (nt)
<i>Stachys butleri</i> R. Mill.	Per.	E.Medit.	End.	EN
<i>Stachys germanica</i> L. subsp. <i>bithynica</i> (Boiss.) Bhattacharjee	Per.	Euro-Sib.	-	-
<i>Stachys tmolea</i> Boiss.	Per.	E.Medit.	-	-
<i>Teucrium polium</i> L.	Per.	Euro-Sib.	End.	LR (Ic)
<i>Teucrium pruinosum</i> Boiss.	Per.	Ir.-Tur.	-	-
<i>Thymus longicaulis</i> C. Presl. subsp. <i>chaubardii</i> Jalas var. <i>chaubardii</i>	Per.	UPR.	-	-
<i>Thymus zygoides</i> Griseb. var. <i>lycaonicus</i> (Celak) Romniger	Per.	E.Medit.	End.	LR (Ic)
<i>Wiedemannia orientalis</i> Fisch. and Mey.	Ann.	Ir.-Tur.	End.	LR (Ic)
<i>Ziziphora clinopodioides</i> Lam.	Per.	Ir.-Tur.	-	-
<b>Liliaceae</b>				
<i>Allium orientale</i> Boiss.	Per.	E.Medit.	-	-
<i>Bellevalia tauri</i> Feinbrun	Per.	E.Medit.	End.	LR (Ic)
<i>Gagea granatellii</i> (Parl.)	Per.	Medit.	-	-
<i>Gagea peduncularis</i> (J. and C. Presl.) Pascher	Per.	Medit.	-	-
<i>Muscari discolor</i> Boiss. and Hausskn.	Per.	Ir.-Tur.	End.	LR (cd)
<i>Muscari neglectum</i> Guss.	Per.	MR.	-	-
<i>Ornithogalum nivale</i> Boiss.	Per.	E.Medit.	End.	LR (Ic)
<i>Ornithogalum pyrenaicum</i> L.	Per.	MR.	-	-
<b>Linaceae</b>				
<i>Linum tenuifolium</i> L.	Per.	MR.	-	-
<b>Malvaceae</b>				
<i>Alcea apterocarpa</i> (Fenzl.) Boiss.	Per.	Ir.-Tur.	End.	LR (Ic)
<i>Alcea pallida</i> Waldst. and Kit.	Per.	MR.	-	-
<i>Malva neglecta</i> Wallr.	Per.	MR.	-	-
<i>Malva sylvestris</i> L.	Per.	MR.	-	-
<b>Morinaceae</b>				
<i>Morina persica</i> L.	Per.	Ir.-Tur.	-	-
<b>Orchidaceae</b>				
<i>Dactylorhiza romana</i> (Seb.) Soo. subsp. <i>romana</i>	Per.	Medit.	-	-
<i>Orchis spitzelii</i> Sauter ex W. Koch	Per.	Medit.	-	-
<b>Papaveraceae</b>				
<i>Fumaria cilicica</i> Hausskn.	Ann.	Ir.-Tur.	-	-
<i>Glaucium flavum</i> Crantz	Per.	MR.	-	-
<i>Glaucium leiocarpum</i> Boiss.	Per.	MR.	-	-
<i>Hypecoum pendulum</i> L.	Ann.	MR.	-	-
<i>Hypecoum procumbens</i> L.	Ann.	Medit.	-	-
<i>Papaver spicatum</i> Boiss. and Bal. var. <i>spicatum</i>	Per.	UPR.	End.	LR (Ic)
<i>Papaver virchowii</i> Aschers. and Sint. ex Boiss.	Ann.	UPR.	End.	LR (cd)

Table 1: Continue

Families and plant taxa	Length of life	Element region	Endemic condition	Threat categories
<b>Plumbaginaceae</b>				
<i>Acantholimon acaerosum</i> (Willd.) Boiss. var. <i>brachystachyum</i> Boiss.	Per.	Ir.-Tur	End.	LR (Ic)
<b>Poaceae</b>				
<i>Aegilops neglecta</i> Req. ex Bertol.	Ann.	Medit.	-	-
<i>Agrostis stolonifera</i> L.	Per.	Euro-Sib.	-	-
<i>Alopecurus myosuroides</i> Hudson var. <i>myosuroides</i>	Ann.	Euro-Sib.	-	-
<i>Arrhenatherum palcaestinum</i> Boiss.	Per.	E.Medit.	-	-
<i>Avena sterilis</i> L. subsp. <i>sterilis</i>	Ann.	MR.	-	-
<i>Briza media</i> L.	Per.	MR.	-	-
<i>Bromus sterilis</i> L.	Ann.	MR.	-	-
<i>Bromus tectorum</i> L.	Ann.	MR.	-	-
<i>Bromus tomentellus</i> Boiss.	Per.	Ir.-Tur.	-	-
<i>Cynodon dactylon</i> (L.) Pers. var. <i>dactylon</i>	Per.	MR.	-	-
<i>Dactylis glomerata</i> L. subsp. <i>hispanica</i> (Roth) Nyman	Ann.	E.Medit.	-	-
<i>Eremopoa capillaris</i> R. Mill.	Ann.	E.Medit.	-	-
<i>Festuca ovina</i> L.	Per.	Medit.	-	-
<i>Hordeum murinum</i> L. subsp. <i>glaucum</i> (Steudel) Tzvelev	Ann.	MR.	-	-
<i>Hordeum murinum</i> L. subsp. <i>murinum</i>	Ann.	MR.	-	-
<i>Koeleria cristata</i> (L.) Pers.	Per.	MR.	-	-
<i>Lolium rigidum</i> Gaudin var. <i>rigidum</i>	Ann.	MR.	-	-
<i>Melica ciliata</i> L. subsp. <i>ciliata</i>	Per.	MR.	-	-
<i>Phalaris arundinacea</i> L.	Per.	MR.	-	-
<i>Phleum montanum</i> C. Koch subsp. <i>serrulatum</i> (Boiss.) M. Dođan	Per.	E.Medit.	-	-
<i>Poa pratensis</i> L.	Per.	MR.	-	-
<i>Poa pschrophila</i> Boiss. and Heldr.	Per.	MR.	-	-
<i>Poa speluncarum</i> Edmondson	Ann.	E.Medit.	-	-
<i>Rostraria cristata</i> (L.) Tzvelev var. <i>cristata</i>	Ann.	MR.	-	-
<i>Secale cereale</i> L. var. <i>cereale</i>	Bia.	MR.	-	-
<i>Stipa ehrenbergiana</i> Trin. and Rupr.	Per.	Ir.-Tur.	-	-
<i>Stipa pulcherrima</i> C. Koch.	Per.	Ir.-Tur.	-	-
<i>Taeniatherum caput-medusae</i> (L.) Nevski subsp. <i>crinitum</i> (Schreber) Melderis	Per.	Ir.-Tur.	-	-
<i>Zingeria pisdica</i> (Boiss.) Tutin	Ann.	Ir.-Tur.	-	-
<b>Polygonaceae</b>				
<i>Atraphaxis billardieri</i> Jaub. and Spach. var. <i>billardieri</i>	Per.	Ir.-Tur.	-	-
<i>Polygonum pulchellum</i> Lois.	Ann.	UPR.	-	-
<i>Rumex conglomeratus</i> Murray	Per.	MR.	-	-
<b>Ranunculaceae</b>				
<i>Adonis aestivalis</i> L. subsp. <i>aestivalis</i>	Ann.	MR.	-	-
<i>Adonis flammea</i> Jacq.	Ann.	MR.	-	-
<i>Adonis microcarpa</i> DC.	Ann.	Medit.	-	-
<i>Ceratocephalus falcatus</i> (L.) Pers.	Ann.	MR.	-	-
<i>Consolida glandulosa</i> (Boiss. and Huet.) Bornm.	Ann.	Ir.-Tur	End.	LR (Ic)
<i>Consolida orientalis</i> (Gay) Schröd.	Ann.	Ir.-Tur	-	-
<i>Consolida stenocarpa</i> (Davis and Hossain) Davis	Ann.	Ir.-Tur	End.	LR (Ic)
<i>Delphinium peregrinum</i> L.	Ann.	E.Medit.	-	-
<i>Delphinium venosum</i> Boiss.	Ann.	Ir.-Tur.	End.	LR (Ic)
<i>Ranunculus argyreus</i> Boiss.	Per.	MR.	-	-
<i>Ranunculus brevifolius</i> Ten.	Per.	MR.	-	-
<i>Ranunculus cadmicus</i> Boiss.	Per.	UPR.	-	-
<i>Ranunculus cuneatus</i> Boiss.	Per.	UPR.	-	-
<b>Resedaceae</b>				
<i>Reseda lutea</i> L. var. <i>lutea</i>	Per.	MR.	-	-
<b>Rosaceae</b>				
<i>Cotoneaster nummularia</i> Fisch. and Mey.	Per.	MR.	-	-
<i>Crataegus monogyna</i> Jacq. subsp. <i>monogyna</i>				
<i>Crataegus orientalis</i> Pallas ex Bieb. var. <i>orientalis</i>	Per.	MR.	-	-
<i>Rosa canina</i> L.	Per.	MR.	-	-
<i>Rubus sanctus</i> Schreber	Per.	MR.	-	-
<i>Sorbus umbellata</i> L. var. <i>umbellata</i> (Desf.) Fritsch	Per.	MR.	-	-
<b>Rubiaceae</b>				
<i>Galium verum</i> L. subsp. <i>verum</i>	Per.	Euro-Sib.	-	-
<b>Scrophulariaceae</b>				
<i>Digitalis cariensis</i> Boiss. ex Jaub. and Spach	Per.	E.Medit.	End.	LR (Ic)
<i>Digitalis ferruginea</i> L.	Per.	Euro-Sib.	-	-
<i>Linaria corifolia</i> Desf.	Per.	Ir.-Tur.	End.	LR (Ic)
<i>Scrophularia canina</i> L. subsp. <i>bicolor</i> (Sm.) Greuter	Per.	E.Medit.	-	-

Table 1: Continue

Families and plant taxa	Length of life	Element region	Endemic condition	Threat categories
<i>Verbascum mucronatum</i> Lam.	Bia.	E.Medit.	-	-
<i>Verbascum naticolicum</i> (Fisch. and Mey.) Hub. and Mor.	Bia.	Ir.-Tur.	End.	LR (nt)
<i>Verbascum pestalozzae</i> Boiss.	Per.	E.Medit.	End.	EN
<i>Verbascum salvifolium</i> Boiss.	Per.	Ir.-Tur.	End.	LR (cd)
<i>Veronica caespitosa</i> Boiss. var. <i>caespitosa</i>	Per.	E.Medit.	End.	LR (Ic)
<i>Veronica campylopoda</i> Boiss.	Ann.	Ir.-Tur.	-	-
<b>Thymelaeaceae</b>				
<i>Daphne sericea</i> Vahl	Per.	E.Medit.	-	-
<b>Urticaceae</b>				
<i>Urtica dioica</i> L.	Per.	Euro-Sib.	-	-
<b>Zygophyllaceae</b>				
<i>Tribulus terrestris</i> L.	Ann.	MR.	-	-

End. : Endemic  
 EN : Endangered  
 VU : Vulnerable  
 LR : Lower Risk  
 (cd) : Conservation dependent  
 (nt) : Near threatened  
 (Ic) : Least concern  
 DD : Data Deficient  
 Ann. : Annual  
 Bia. : Biannual  
 Per. : Perennial

**RESULTS AND DISCUSSION**

In the study areas, total of 302 plant taxa, belonging to 43 families and 190 genera were encountered. Some characteristics of the taxa identified in the rangelands such as their plant families, lengths of lives, element regions, endemism conditions and IUCN risk categories are shown in Table 1. Among the 302 plant taxa identified in the study areas, 28, 39 and 234 of them belonged to the gramineae, legume and other families, respectively. About 84 among these plants are annual; 3 of them are annual and biennial plants; 14 of the plants are biennial and 201 of them are perennial plants.

About 73 of the plant taxa were recorded as the element of the Mediterranean region; 64 taxa were recorded as the element of Irano-Turanian region; 17 of them were recorded as the element of Europe-Siberia region and 148 taxa were recorded as widespread or belonging to an unknown region (Table 2). Moreover, 82 plant taxa were endemic and the endemism ratio was calculated as 27.15%.

When these endemic species are evaluated according to IUCN (2001) risk categories, it can be observed that 8 of them falls into the category of Endangered (EN) while 4 of them is categorized as Vulnerable (VU) and 65 of the endemic species falls into the category of Least risk (LC) whereas 5 of them is classified in the Data Deficient (DD) category (Table 1) (IUCN, 2001; Ekim *et al.*, 2000). The family that is represented with the most number of taxa

Table 2: Phytogeographic distribution of the plant taxa located in the study area

Phytogeographical region	No. of taxa	Rates (%)
Mediterranean	73	24.17
Irano-Turanian	64	21.19
Euro-Siberian	17	5.63
Multiregional or unknown phytogeographical region	148	49.01
Total	302	100.00

Table 3: The families with the most number of taxa at the species and subspecies level

Family	No. of taxa	Rates (%)
Asteraceae	41	13.58
Fabaceae	39	12.91
Lamiaceae	30	9.93
Poaceae	29	9.60
Brassicaceae	24	7.95
Other families	139	46.03
Total	302	100.00

with 41 taxa is the Asteraceae family. It is followed by Fabaceae, Lamiaceae and Poaceae families, respectively with 39, 30 and 29 taxa (Table 3).

The families that contain the most of number of genera, on the other hand can be listed, respectively as Asteraceae (27 genera), Poaceae (23 genera) and Brassicaceae (19 genera) families.

**CONCLUSION**

As a result of the study, the region of Isparta was observed to have a considerably rich flora with a total of 302 plants from 43 families and 190 genera. The fact that the rangelands in the field of study were located in the intersection zone of Mediterranean region and Irano-Turanian floristic regions and accordingly contained various topographical structures and climatic features had a significant effect on this diversity of plants in the region. Nonetheless, 77 taxa among the 82 endemic plant taxa identified in the rangelands within the field of study are threatened according to the IUCN (2001). The most significant factor causing this threat in the rangelands is encountered as early grazing and overgrazing. It was ascertained that the rangelands in Isparta region were



benefited 2-2.5 times exceeding its grazing capacity (Babalik, 2007). Thrusting animals, more in number than it can feed into the rangelands; these animals eating the grass together with their roots and practice of grazing during the period when these grass are newly growing and thus not fully developed, cause the extinction of vegetation that covers the surface of the soil and the decrease in the quality of rangelands (Balabanli *et al.*, 2005). The endangered species, especially are eaten by the animals before they reach their seeding periods under the pressure of early and excessive grazing thus, their number decreases day by day and their generations are imperiled. For the protection of endemic and endangered plant species which are considered as natural heritages, there is a need for preventing the excessive and disorganized benefitting from the rangelands and in these regions:

- Grazing with the number of animals compatible with the grazing capacity of the rangeland
- Practice of grazing during the grazing season and duration
- Enabling the uniform distribution of animals in the rangeland
- Grazing with the animal species compatible with the rangeland are highly significant

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