

# GYPWORLD

A GLOBAL INITIATIVE TO UNDERSTAND GYPSUM ECOSYSTEM ECOLOGY



## GYPSICOLE FLORA of TURKEY

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Ankara  
TURKEY

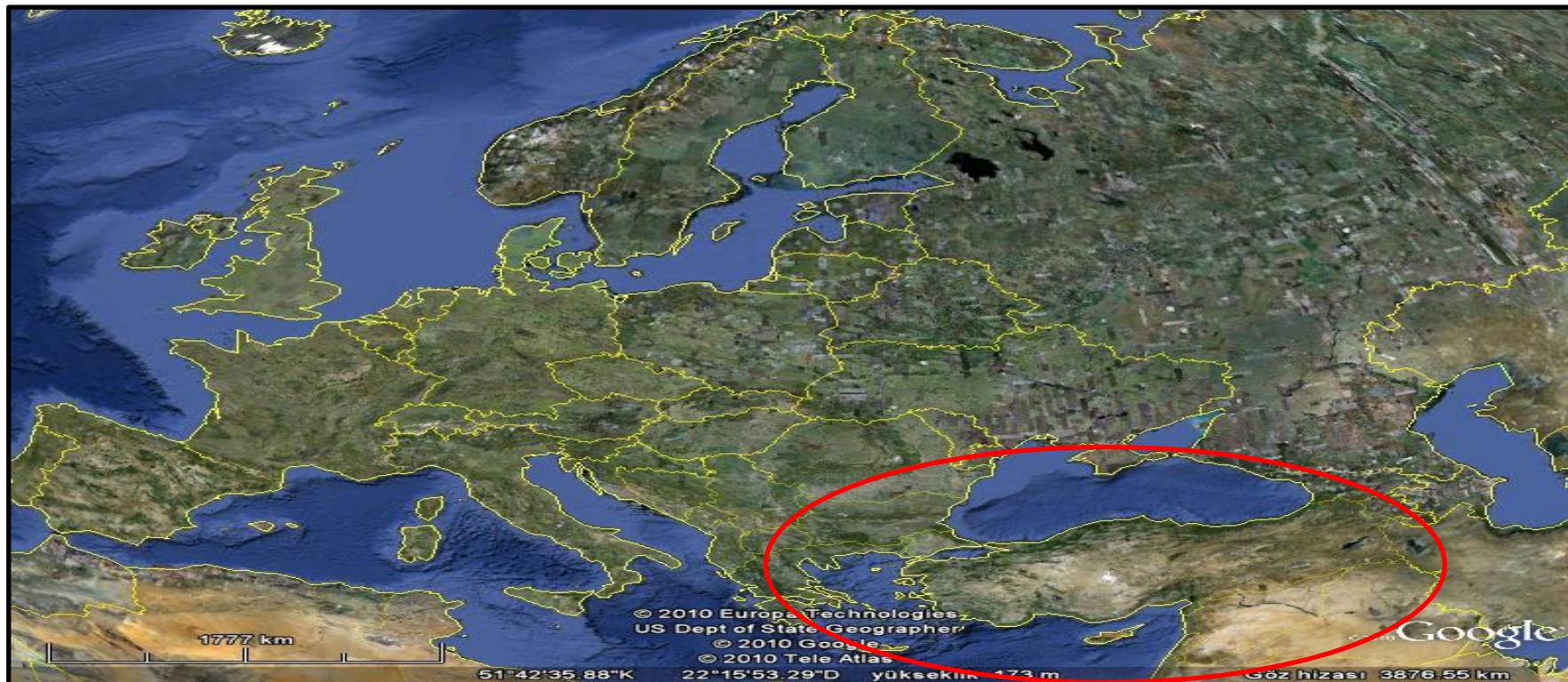


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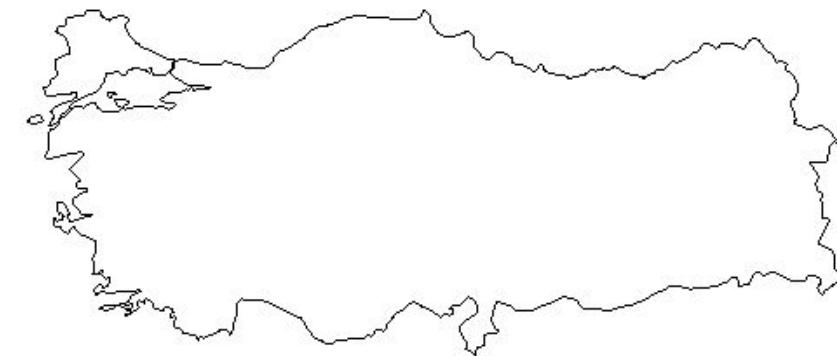
# TURKEY

- ✓ Turkey is situated at the cross roads of Asia and Europe. The nation's total territory is approximately 780,000 km<sup>2</sup>.
  - ✓ The population exceeds 80 million.
- ✓ Over 90% of Turkey's population lives in urban areas. The national literacy rate is over 95%.
- ✓ Turkey's GDP rank is in the world's top 20.



**Turkey is one of the richest country of the temperate zone in terms of biological diversity with;**

- ✓ **12,000 flowering plant species (including infraspecific taxa)**
- ✓ **165 mammals**
- ✓ **456 birds**
- ✓ **28 amphibians**
- ✓ **129 reptiles and 236 freshwater fish species.**



**Biological diversity is a reflection of climatic, edaphic, topographic etc. diversities, especially ecosystem diversity.**

10000

9000

8000

7000

6000

5000

4000

3000

2000

1000

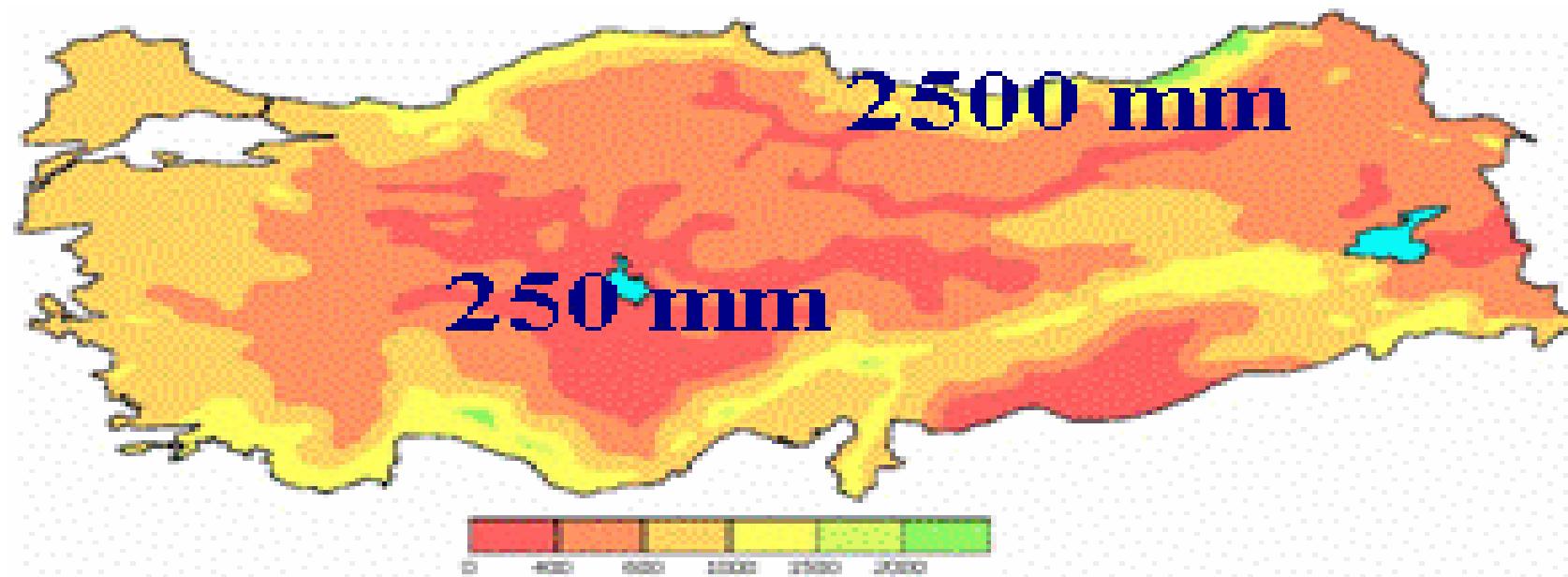
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**9500****5500****5000****5000****4500****2800****2500****2000****1500****Turkey****Italy****Spain****Greece****France****Germany****Portugal****United Kingdom****Holland**

The primary reasons of Turkey's biological diversity as follows



**Climatic Diversity:** Turkey is harboring **three different climate types** such as Mediterranean, Continental and Oceanic climate such that, this climatic diversity leads to biological diversity.



# Soil (Edaphic) and Topographical Structure Diversity:

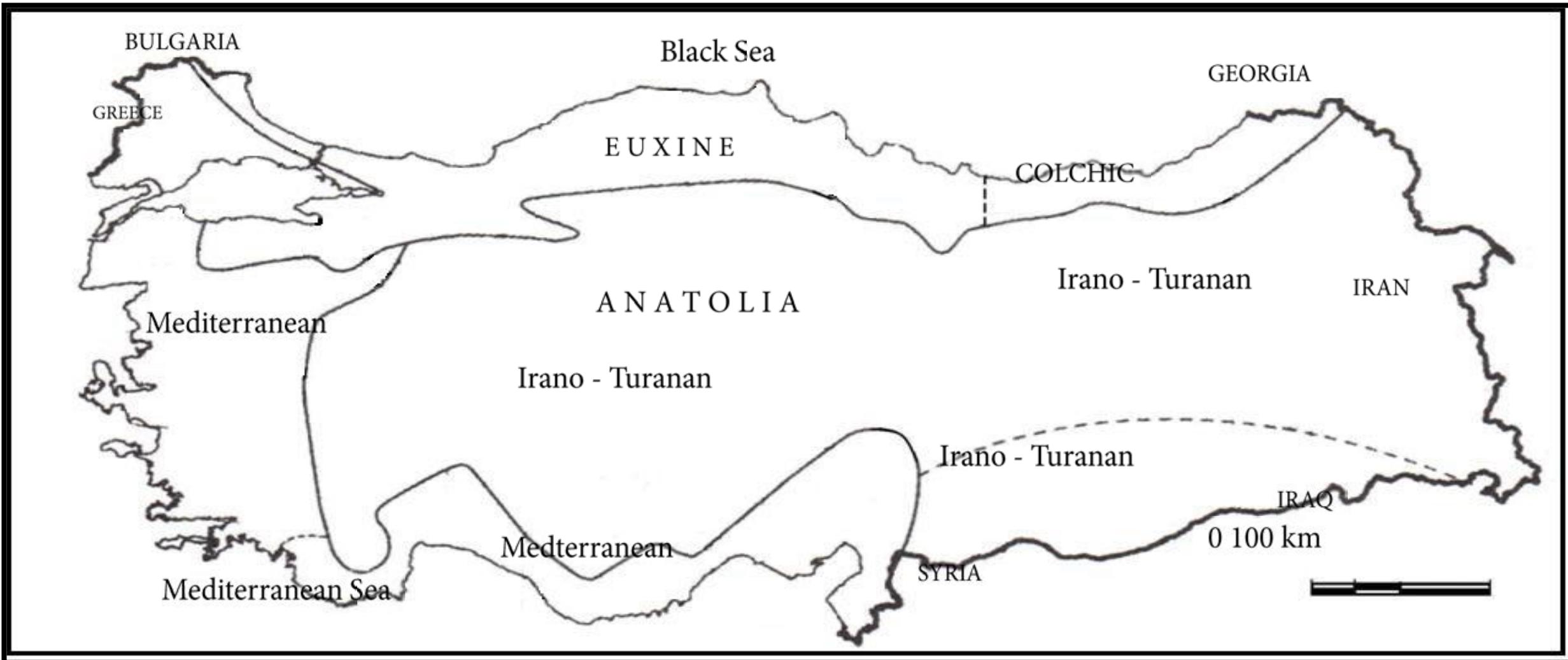
Turkey has different soil groups where geological and geomorphologic varieties are frequently seen and different topographical structures.



# Phytogeographic diversity:

Turkey is at the meeting part of **3 different phytogeographical region**

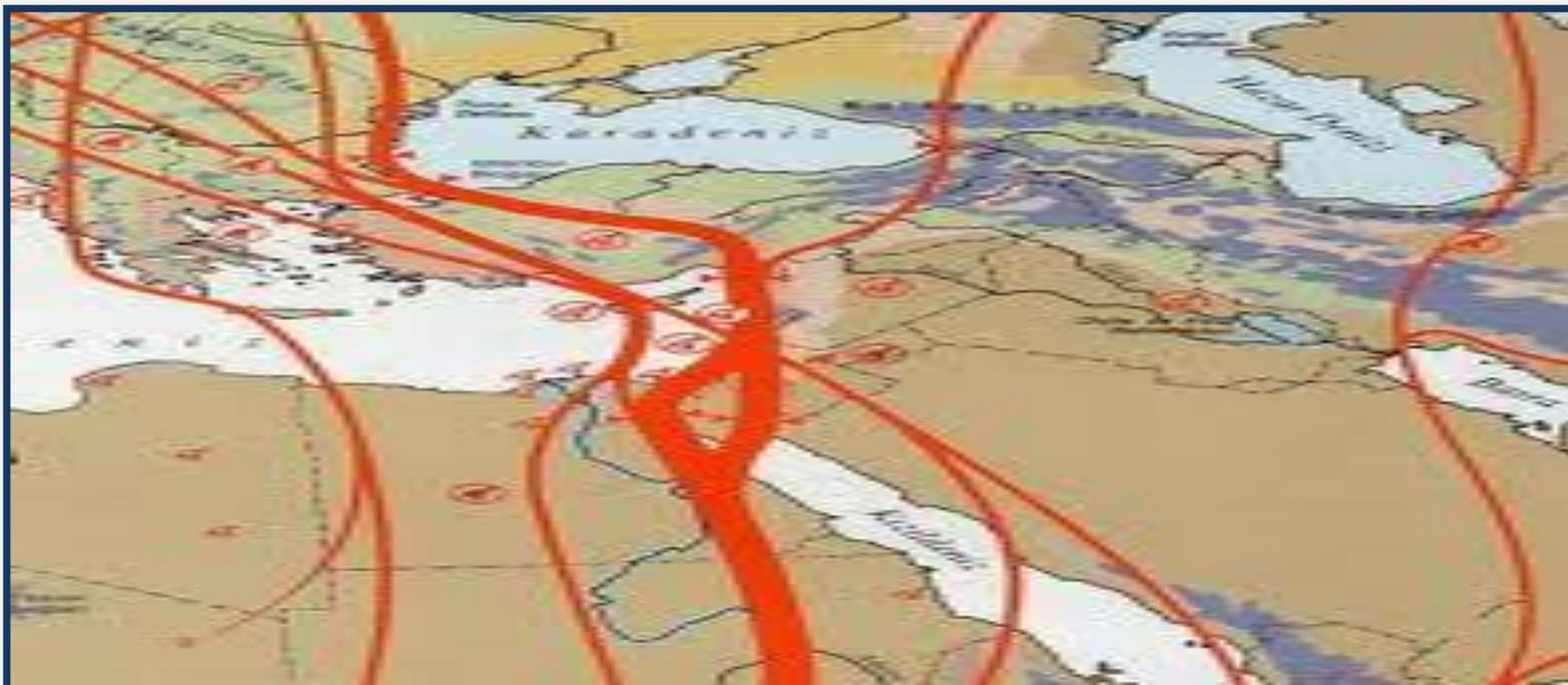
(Europe-Siberia, Irano-Turanian and Mediterranean) included in the Holarctic Kingdom.



## Existing at Migration Routes:

Turkey, it is located at the connection point of Europe, Asia and Africa continents and on the migration routes of living beings.

As at its zoogeographical position, two important bird migration routes at the West Palearctic pass over our country; these are the migration routes which go down South from over Dardanelles and East black sea (Çoruh Valley).

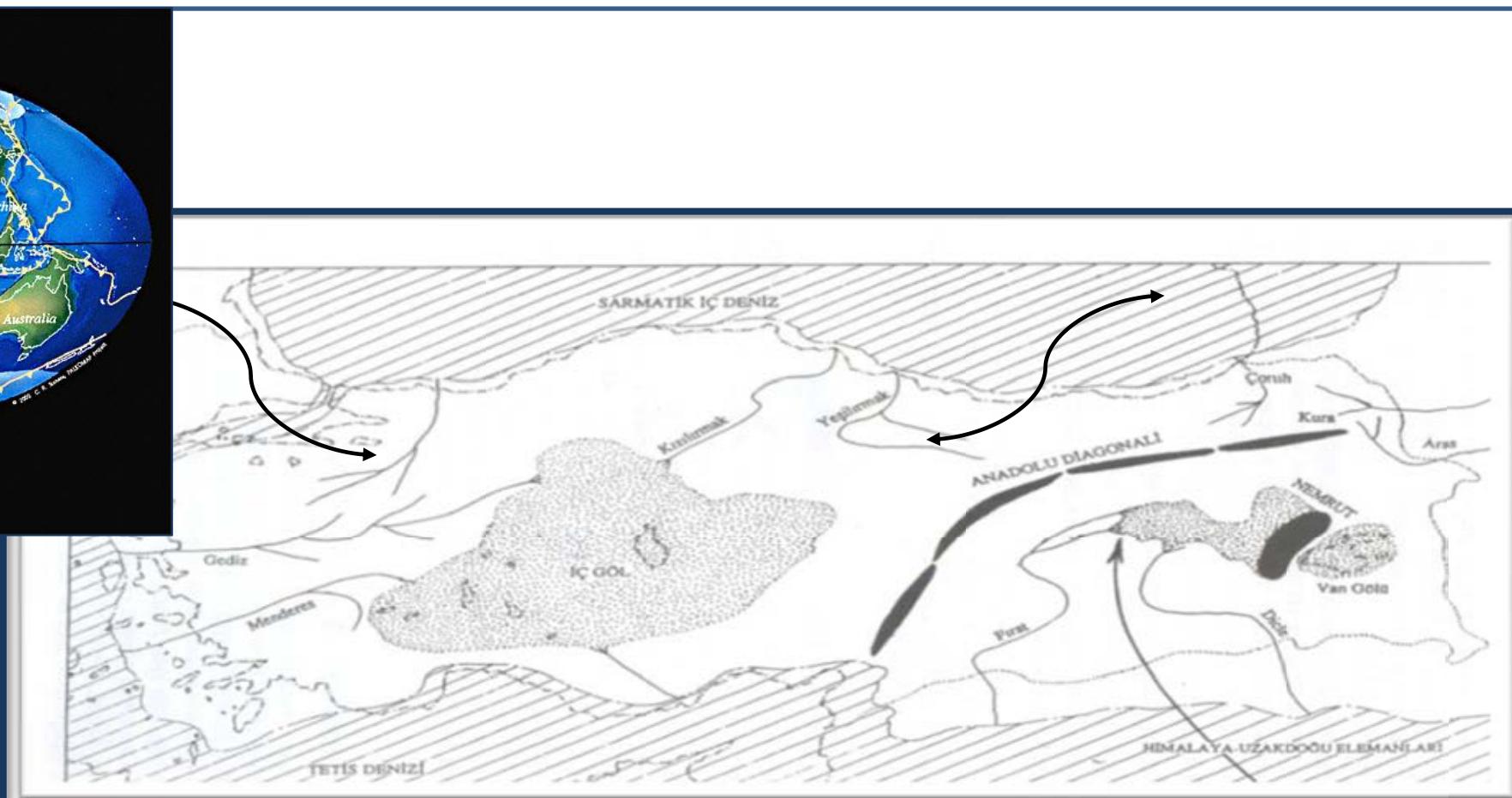
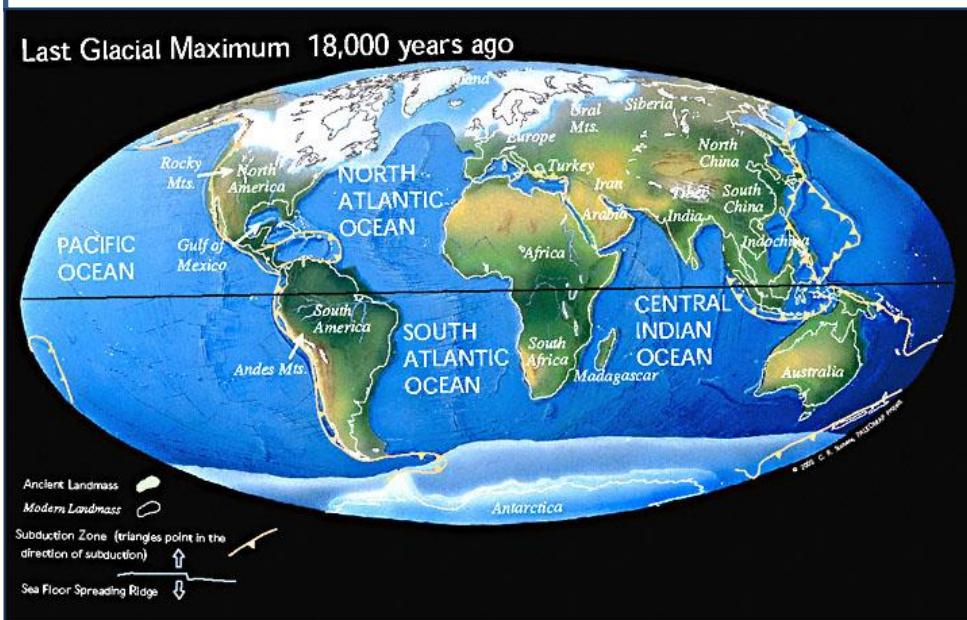


In the same way, **glacier movements** happened at different geological periods has contributed to the biological diversity of Anatolia.

From the plant and animal migrations which were lived at the glacial and interglacial periods, **Anatolia has been affected a lot.**

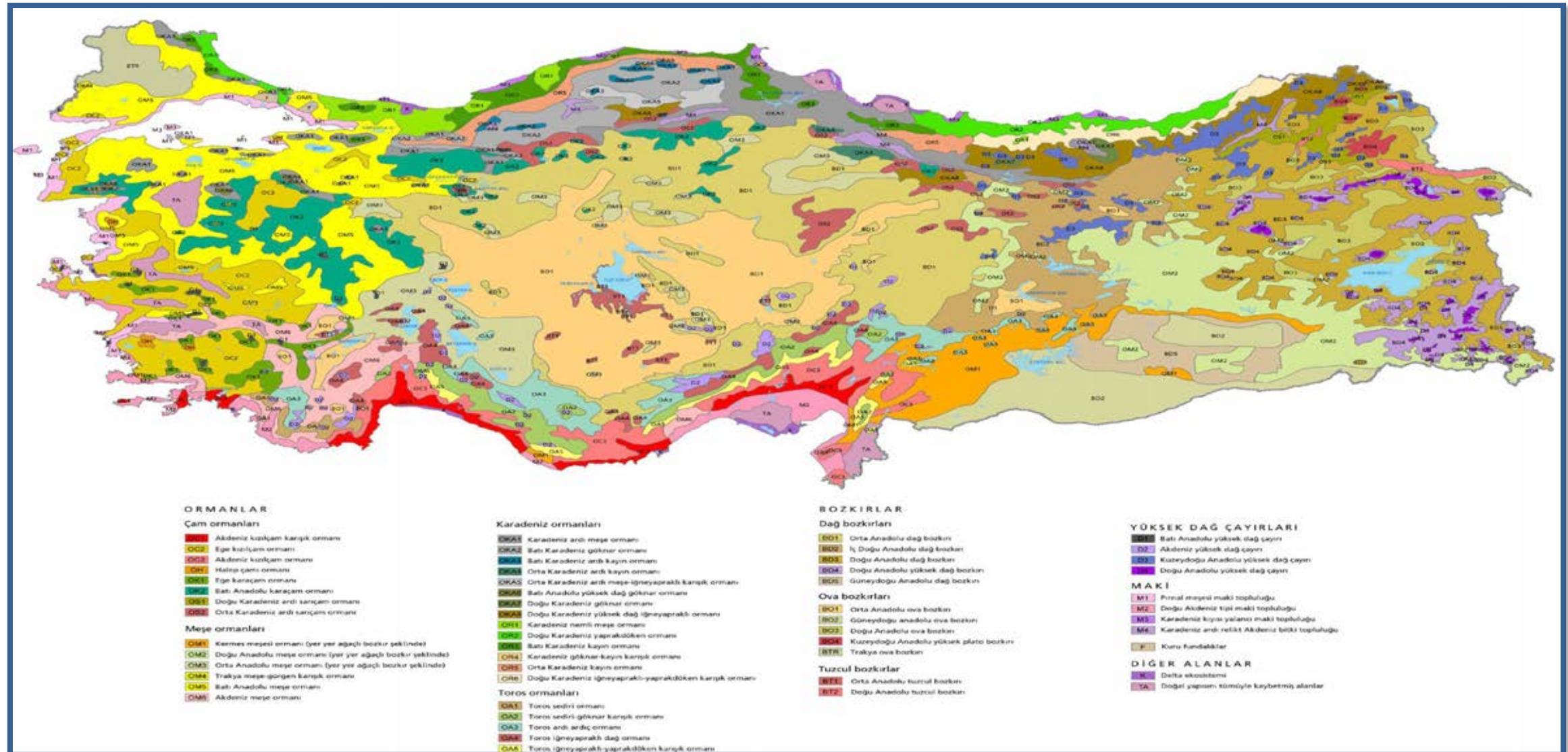
Many mammalian species have sheltered to Anatolia at these periods.

Species that migrated to South at glacial periods have **left relict forms behind** while they were receding back at inter glacial periods.

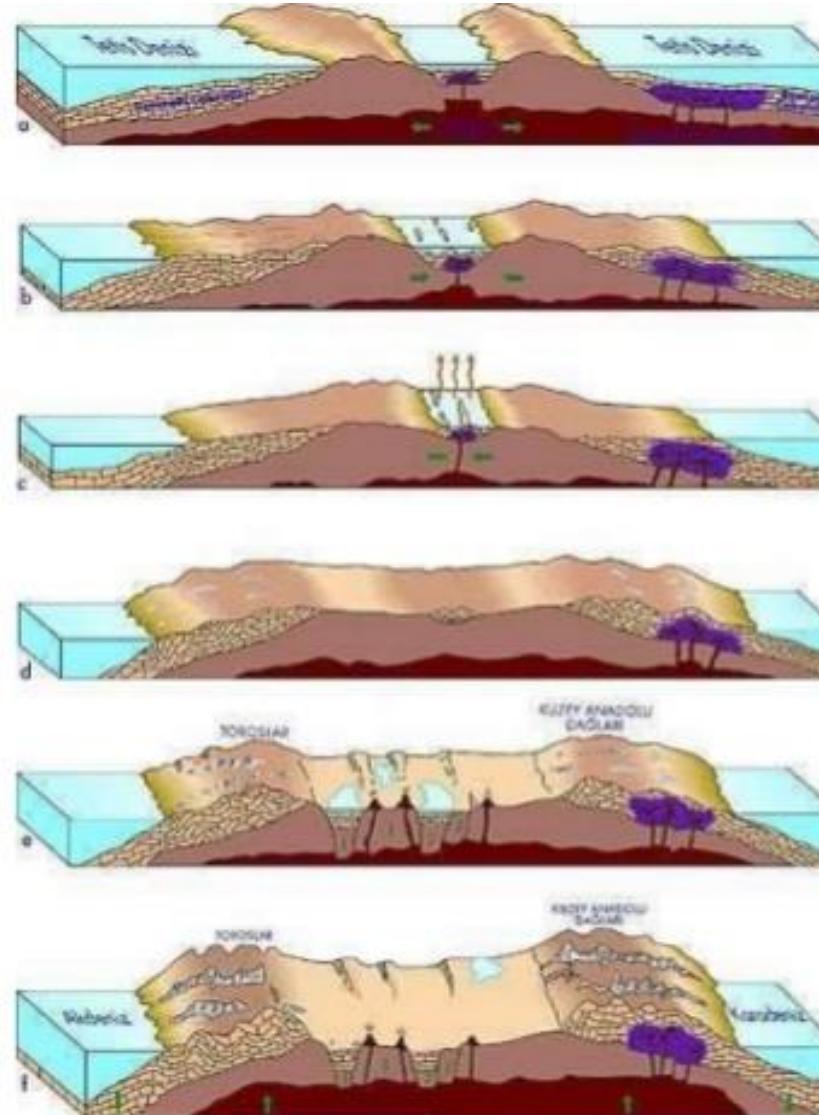
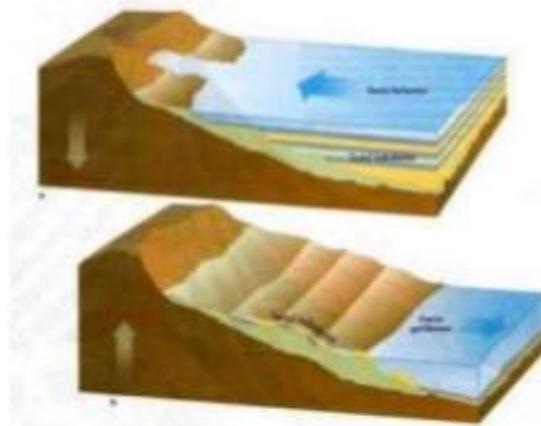


# Habitat Differences:

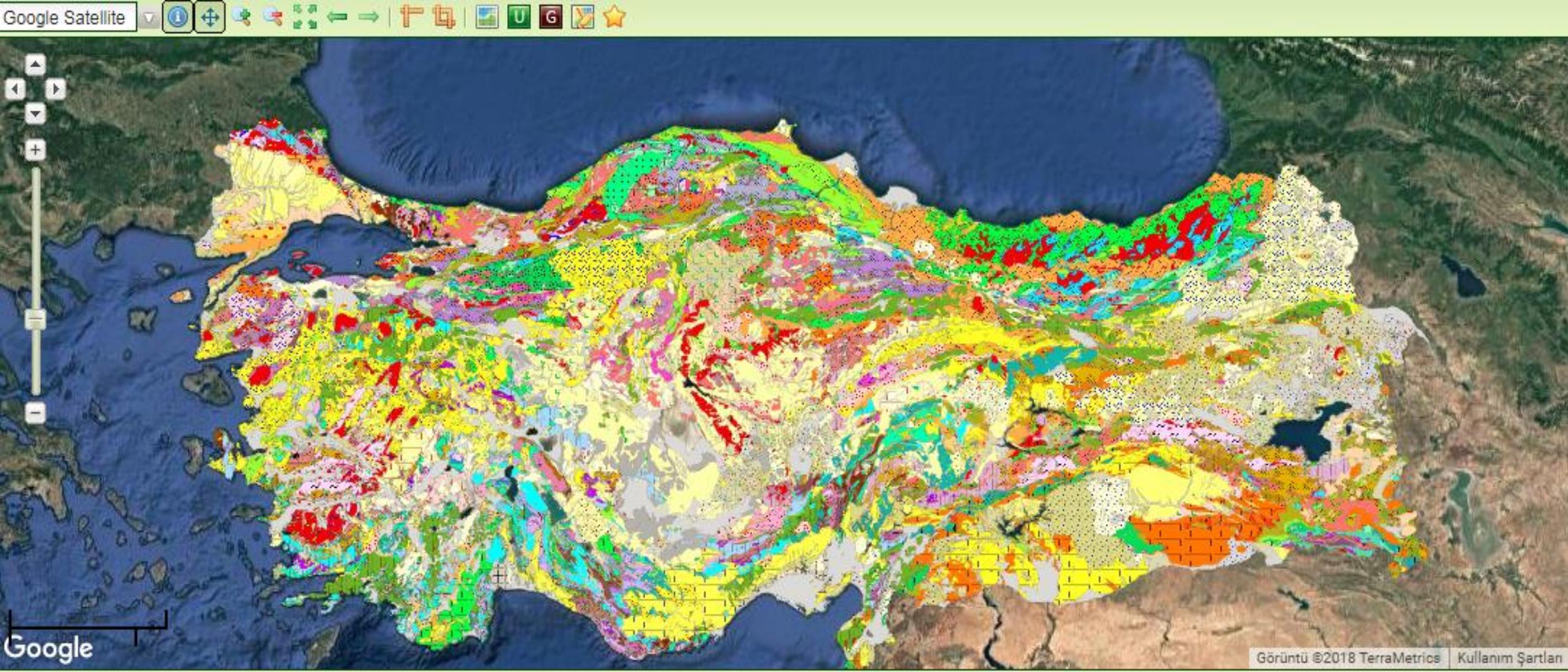
Different habitat types such as forest, steppe, maquie and dune, rocks, sea, lake and river leads to increase in biological diversity.



## Topographic structure diversity:



Differences in topographic structure (plains, valleys, mountain ranges, etc.), elevation differences from sea level up to 5000 m are another reason for biological diversity.



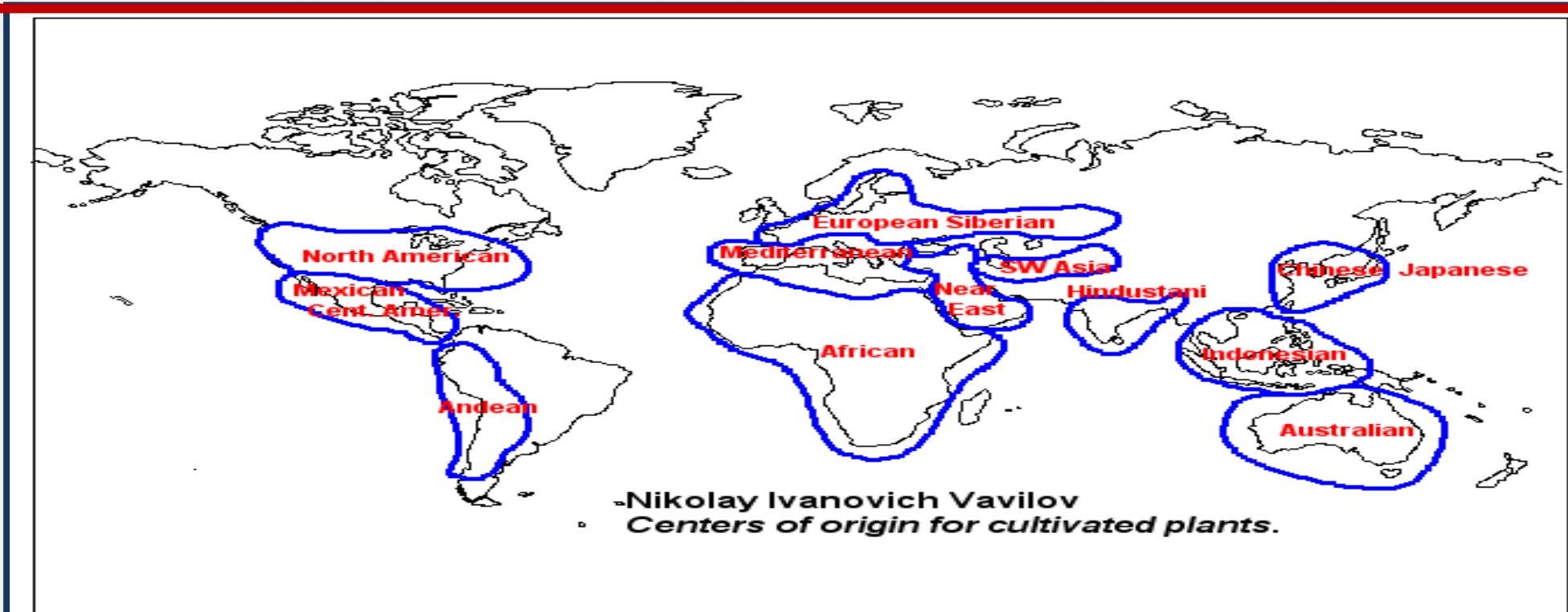
## *Geological Formation of Turkey*

# Floristic richness of Turkey

- ✓ There are approximately 9,000 vascular plant species. Turkey which it contains, as well as being rich in endemic species of flora with around 2991 has an **important place among other countries**.
- ✓ If the floristic diversity of Turkey and continental Europe which covers west of Urals and has approximately 11.000 species is compared it can be said that **Turkey has a continental feature in respect to floristic diversity**.
- ✓ Turkish flora, besides being rich, has an important place among other countries with the approximately **3000 endemic taxa** it contains.
- ✓ Although some of the endemics of Turkey are rather widespread, some are peculiar to a specific region or mountain range.
- ✓ Some endemics however, might be peculiar to special habitats like soils with serpentine or **gypsum**.

# Plant Gene Resources in Turkey

- ✓ In spite of genetic diversity our country takes a special place among world countries.
- ✓ Anatolia, which is at the meeting part of **two important gene centers according to Vavilov's classification** (Mediterranean and Near East), is very rich in genetic resources.
- ✓ According to J. Harlan, there are **5 micro gene centers where species more than 100 show wide changes in our country** (Demir 1990). Turkey is the origin or diversity center of important cultivated plants at a large number and other plant species.



- ✓ **Turkey**, as being the gene center of many cultivated plants, is accepted as the speciation center of some families, sections, species and some other taxonomical groups.
- ✓ As example, *Isatis*, *Draba*, *Alyssum*, *Astragalus*, *Alcea*, *Phlomis*, *Salvia*, *Verbascum*, *Scrophularia*, *Veronica*, *Campanula*, *Anthemis*, *Centaurea*, *Achillea*, *Allium* and *Iris* species can be given.
- ✓ An example for the woody plants is ***Quercus***. The genus consists of 18 species in Turkey. **The gene center of this genus** is Turkey.
- ✓ Turkish flora, among the Middle East Countries is also rich in the view of woody species as it is in other herbaceous endemic species.
- ✓ Number of tree species and tall bushes is around 300 and most remarkable ones among them are:

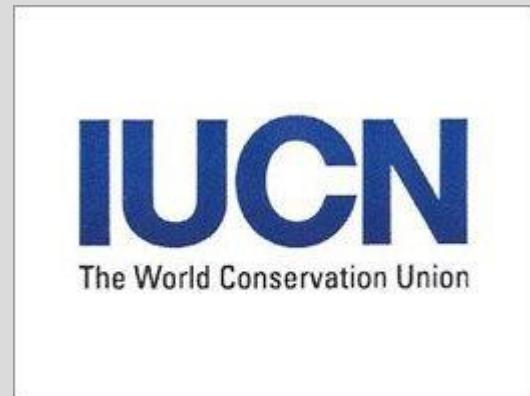
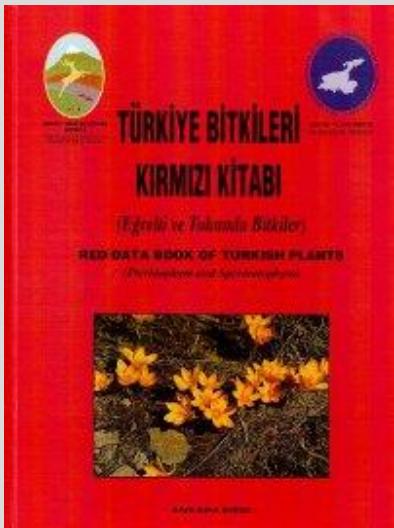
*Sorbus*, *Pyrus*, *Amelanchier*, *Malus*, *Mespilus*, *Crataegus*, *Amygdalus*, *Prunus*, *Cerasus*, *Cotoneaster*. Especially the abundance of fruit trees results among other Middle Eastern countries, in the agriculture of these fruits is **Anatolian origin**.



# THREATENED PLANT TAXA

**RED DATA BOOK** which covers the classification of the plants of our according to the categories of IUCN.

	EX	EW	CR	EN	VU	LR (lc)	LR (cd)	LR (nt)	DD	NE
<b>Endemic</b>	12	-	171	774	688	769	470	347	270	3
<b>Non Endemic</b>	1	-	10	69	769	-	-	-	244	3
<b>Total</b>	13	-	181	843	1457	769	470	347	514	6



Gypsum, the chemical formula of which is  $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ , is an hydrated calcium sulphate.



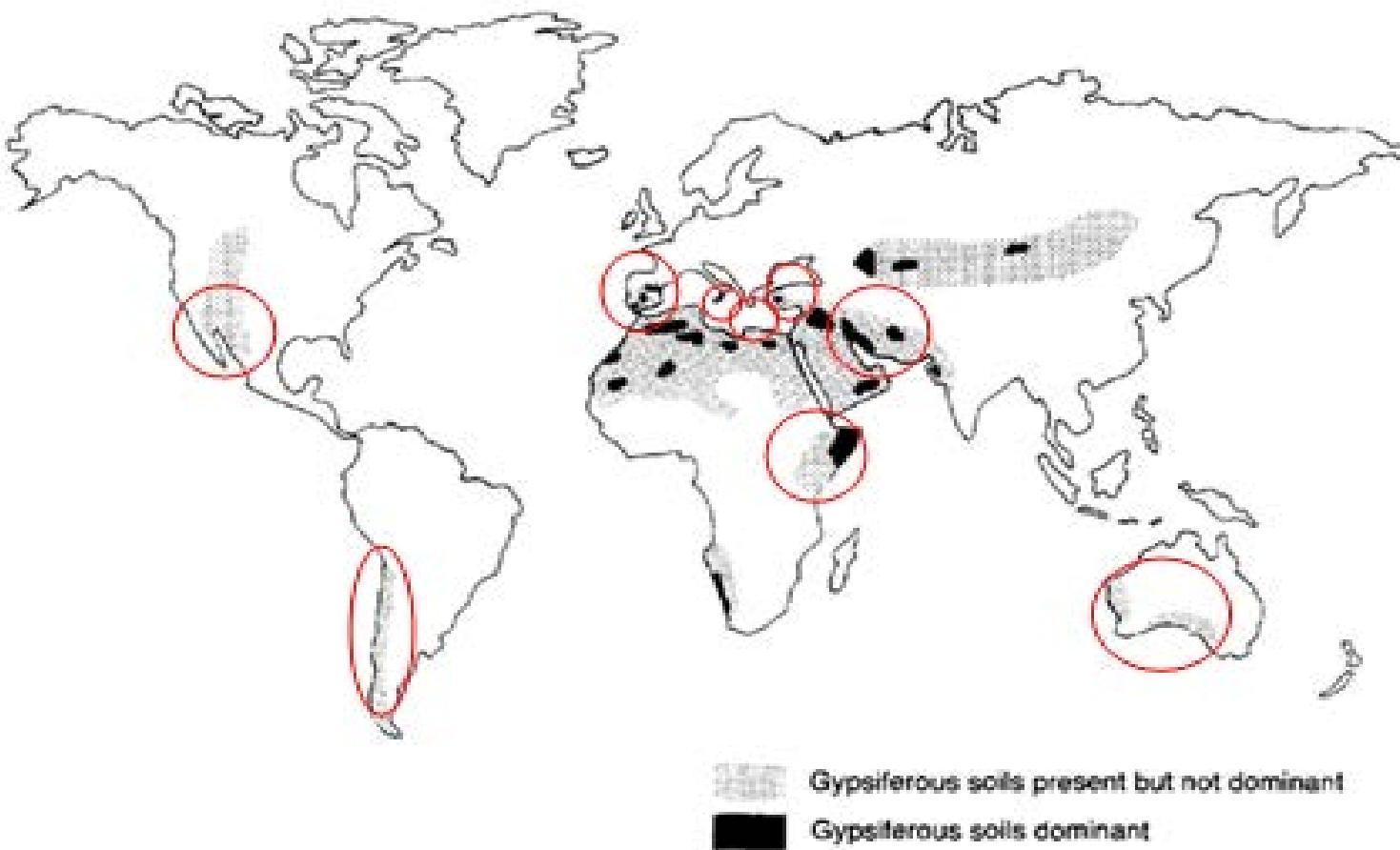








## Gypsum soils of the world



**Gypsum soils cover 200 million hectares all over the World, particularly in arid and semi-arid regions where low precipitation prevents gypsum from leaching.**

(Eswaran & Zi-Tong 1991; Alphen & Rios Romero 1971; Verheyen & Boyadgiev 1997; Akpulat & Celik 2005)

- ✓ Soils with high gypsum content are inherently **nutrient-poor substrates** due to calcium saturating the soil cation exchange complex.
- ✓ Although their salinity is moderate, they contain a high concentration of sulphate ions, which may be **toxic for plants**.

(Oyonarte et al. 2002; Food and Agriculture Organization 1990; Meyer et al. 1992; Guerrero Campo et al. 1999).  
(Herrero & Porta 2000; Duvigneaud 1968; Ruiz et al. 2003)

- ✓ Physical properties of gypsum soils restrictive to plant life include the presence of a **hard soil surface crust**, which can restrict seedling establishment;
- ✓ mechanical instability of soil material due to its **lack of plasticity, cohesion and aggregation**;
- ✓ and in certain areas, low porosity, which **may limit penetration of certain plant roots**.

(Meyer 1986; Escudero et al. 1999, 2000; Bridges & Burnham 1980; Guerrero Campo et al. 1999)

- ✓ Despite their restrictive nature, gypsum soils form '**edaphic islands**' with a vast diversity of plants, **rich in endemics** and **rare and threatened species**.
- ✓ Hence, **gypsum ecosystems constitute an international conservation priority.**

(Kurt et al.2013; Johnston 1941; Parsons 1976; Powell & Turner 1977; Meyer 1986; Meyer & Garcia-Moya 1989; Cerrillo et al. 2002; Mota et al. 2003)

200000 000000

700000 000000

1200000 000000

4800000 000000

4500000 000000

4200000 000000

3900000 000000

# Gypsum soils are spread in various regions of Turkey

## BLACK SEA

ANKARA

## MEDITERRANEAN SEA

0  
115  
230

460 Kilometers

700000 000000

1200000 000000

Legend		
Gypsum fields		
Lake		
City border		

Within Europe, gypsum soils are mainly restricted to Turkey and Spain (FAO, 1990).

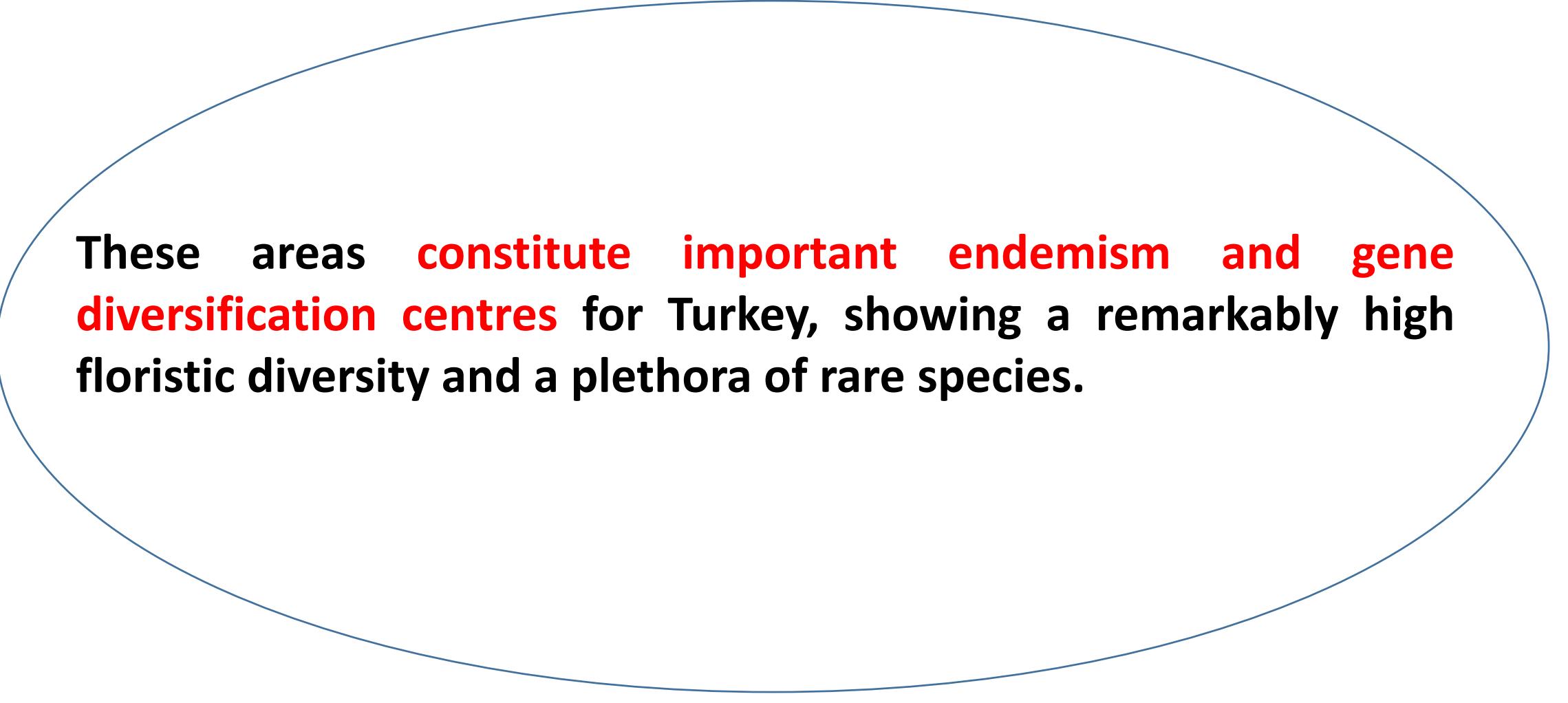


While the ecology of Spanish gypsum ecosystems has received extensive attention in the last decade studies regarding the ecology of gypsum plants from Turkey are scarce.

(Escudero et al., 2014)

Massive gypsum deposits cover large areas in Central Anatolia, and small islands of gypsum soils occur in other regions in Turkey.





**These areas constitute important endemism and gene diversification centres for Turkey, showing a remarkably high floristic diversity and a plethora of rare species.**

Although several wide gypsophile species (such as *Gypsophila eriocalyx* or *Gypsophila linearifolia*) may be identified within the gypsum flora of Turkey,

the area is remarkably rich in narrow gypsum endemics, with more than 20 species showing a very restricted distribution (limited to one or two localities) within gypsum soils (Ekim *et al.*, 2000).



Turkey seems, therefore, a **highly suitable territory** for the analysis of the **ecology** of narrow gypsum endemics.

























# Studies about gypsicole flora of Turkey:



Journal of Arid Environments 61 (2005) 27–46

Journal of  
Arid  
Environments  
[www.elsevier.com/locate/jnlabr/yjare](http://www.elsevier.com/locate/jnlabr/yjare)

## Flora of gypsum areas in Sivas in the eastern part of Cappadocia in Central Anatolia, Turkey

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Available online 26 October 2004

### Abstract

This research was carried out in Sivas province between 2001 and 2003 years and 1450 plant specimens were collected during this period. Identification of the specimens revealed presence of 340 taxa belonging to 164 genera in 45 families. All of the 340 taxa belong to

## The heaven of gypsophilous phytodiversity of Turkey: Kepen, Sivrihisar, Eskişehir, Turkey, 13 taxa as new

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- ✓ Akpulat, H. A., & Celik, N. (2005). Flora of gypsum areas in Sivas in the eastern part of Cappadocia in Central Anatolia, Turkey. *Journal of Arid Environments*, 61(1), 27–46.
- ✓ E. Hamzaoğlu, M. Aydoğdu (1993). Flora of Gypsum Soils of Hafik (Sivas) and its environment/ Hafik (Sivas) ve Çevresindeki Jipsli Toprakların Florası. *Turkish Journal of Botany*, 19 (1993), pp. 373-388.
- ✓ Yıldırımlı, Ş. (2012). The heaven of gypsophilous phytodiversity of Turkey: Kepen, Sivrihisar, Eskişehir, Turkey, 13 taxa as new. *Ot Sistematisk Botanik Dergisi*, 19(2), 1-51.
- ✓ Ertugrul, 2011. Flora of gypsum soils in Cankırı-Korubasitepe and its environment. Master thesis, unpublished.
- ✓ Ozturk, 2016. Flora and vegetation of Gypsum and marly soils in Eskişehir. PhD thesis, unpublished.
- ✓ Cakir, 2018. Gypsum Flora of İlic – Kemah (Erzurum). PhD thesis, unpublished.

# Studies about gypsicole vegetation of Turkey :

Journal  
Israel Journal of Plant Sciences >  
Volume 48, 2000 - Issue 2

Original Articles

## SYNTAXONOMIC RESEARCH ON THE GYPSICOLE VEGETATIONIN CAPPADOCIA, TURKEY

OSMAN KETENOGLU, LATIF KURT, YILDIRIM AKMAN, MUSTAFA AYDOGDU & ERGIN HAMZAOGLU

Pages 121-128 | Published online: 14 Mar 2013

Download citation

References Citations Metrics Reprints & Permissions

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### Abstract

The research was carried out on the steppe vegetation covering the gypsiferous formations in Cappadocia, the eastern part of Central Anatolia. The vegetation, which is under the influences of a semiarid, very cold Mediterranean climate, was analyzed

People

Article

NEW

- ✓ KETENOGLU, O., KURT L., AKMAN, Y., AYDOGDU, M., & HAMZAOGLU, E. (2000). Syntaxonomic research on the gypsicole vegetationin cappadocia, turkey. *Israel journal of plant sciences*, 48(2), 121-128.

ECOLOGIA MEDITERRANEA XX (3/4) 1994 : 9-19

Ek A-2. 3

## Syntaxonomic analysis of gypsaceous vegetation of the surrounding area between Ayas-Polatli and Beypazari (Ankara, Turkey)

M. AYDOGDU\*, Y. AKMAN\*\*, P. QUEZEL\*\*\*, M. BARBERO\*\*\*,  
O. KETENOGLU\*\*, and L. KURT\*\*

### SUMMARY

This study was carried out on the gypsaceous soils in the north-west part of Central Anatolia. The vegetation which is under the effective control of a semi-arid and cold type of Mediterranean climate was analyzed by the Braun-Blanquet approach. Nine plant associations described in the area were included in the alliance *Astragalo karamasici-Gypsophilion eriocalycis* order *Onobrychido armenae - Thymetalia leucostomi* regarding their ecologic and floristic peculiarities.

- ✓ Aydogdu, M., Akman, Y., Quézel, P., Barbéro, M., Ketenoglu, O., & Kurt, L. (1994). Syntaxonomic analysis of gypsaceous vegetation of the surrounding area between Ayas-Polatli and Beypazari (Ankara, Turkey). *Ecologia mediterranea*, 20, 9-19.

## İç Anadolu'dan (Polatlı-Haymana) *Astragalo karamasici-Gypsophilion eriocalycis* Alyansı İçin Yeni Sintaksonlar

Fatmagül Geven<sup>1\*</sup>, Osman Ketenoğlu<sup>1</sup>, Ümit Bingöl<sup>1</sup>, Kerim Güney<sup>2</sup>

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### Özet

Bu çalışmada, Polatlı-Haymana arasında kalan bölgenin step vejetasyonu incelenmiştir. Araştırma alanı İç Anadolu Bölgesinin Güney Batı kesiminde yer almaktadır. Jipsli ve marnlı-jipsli toprakların yaygın olduğu yarıkurak alt çok soğuk Akdeniz İklimi'nin etkisi altında olan bu bölgede vejetasyon Braun-Blanquet metoduna dayalı üç boyutlu polar ordinasyon teknigi ile analiz edilerek iki yeni bitki birliği tanımlanmış ve sintaksonomik olarak sınıflandırılmıştır. İlk kez tanımlanan birlükler "Uluslararası Bitki Sosyolojisi Adlandırma Kodu" kurallarına uygun olarak adlandırılmıştır. Birlükler ve ait oldukları üst birimler aşağıdaki gibidir:

Simf: *Astragalo-Brometea* Quezel 1973

Ordo: *Onobrychido armeni-Thymetalia leucostomi* Akman, Ketenoglu, Quezel 1985

Alyans: *Astragalo karamasici-Gypsophilion eriocalycis* Ketenoglu, Quezel, Akman, Aydogdu 1983

Birlük: *Salvio-Astragaletum microcephali* ass. nova

Birlük: *Minuartio-Acantholimetum acerosi* ass. nova

Bu bitki birlüklerinin fitososyolojik ve fitoekolojik yapısı benzer birlüklerle kıyaslanarak tartışılmıştır.

**Anahtar Kelimeler:** Haymana, ordinasyon, Polatlı, sintaksonomi, step vejetasyonu.

New Syntaxa for Alliance *Astragalo karamasici-Gypsophilion* from Central Anatolia (Polatlı-

- ✓ Geven, F., Ketenoglu, O., Bingöl, Ü., & Güney, K. (2009). New syntaxa for alliance *Astragalo karamasici-Gypsophilion* from Central Anatolia (Polatlı-Haymana). *Ekoloji*, 18(71), 32-48.
- ✓ Aydoğdu, M., & Ketenoglu, O. (1993). Şarkışla-Kangal-Gürün (Sivas) arasında kalan jipsli topraklarda yayılış gösteren bitki toplulukları üzerine gözlemler. *GÜG Eğ. Fak. Der. Yeni Dönem*, 1, 309-311.
- ✓ Ketenoglu, O., Quézel, P., Akman, Y., & Aydogdu, M. (1983). New syntaxa on the gypsaceous formations in the Central Anatolia. *Ecologia mediterranea*, 9(3-4), 211-221.

# SYNECOLOGICAL INVESTIGATIONS of GYPSICOLE SOILS in TURKEY

Class: *Astragalo microcephali-Brometea tomentelli* Quézel 1973 em. Parolly

Order: *Gypsophiletalia eriocalycis* Kurt et all. order nova

1. Alliance: *Artemision santonici* (Ketenoğlu et all., 1983) Kurt et all. stat. nova

1. Association: *Phleo exarati-Alkannetum orientalis* Ketenoğlu et all. 1983 ex Kurt et all. ass. nova

2. Association: *Callipelto cucullariae-Stachydetum cretiae* Ketenoğlu et all. 1983 ex Kurt et all. ass. nova

3. Association: *Alyssso mini-Marrubietum trachytici* Ketenoğlu et all. 1983 ex Kurt et all. ass. nova

4. Association: *Aegylo columnaris-Alhagietum camelorum* Ketenoğlu et all. 1983 ex Kurt et all. ass. nova

5. Association: *Salvio tchatcheffii-Phlometum armeniaceae* Aydoğdu et all. 1994 ex Kurt et all. ass. nova

6. Association: *Haplphylo thesioides-Achilletum gypsicolae* Aydoğdu et all. 1994 ex Kurt et all. ass. nova

7. Association: *Vinco herbaceae-Salvietum wiedemannii* Aydoğdu et all. 1994 ex Kurt et all. ass. nova

8. Association: *Ambylopyro mutici-Astragaletum tmolei* Aydoğdu et all. 1994 ex Kurt et all. ass. nova

9. Association: *Krascheninnikovio ceratoidis-Artemidetum santonici* Aydoğdu et all. 1994 ex Kurt et all. ass. nova

10. Association: *Hyperico depilati-Genistetum sessilifoliae* Aydoğdu et all. 1994 ex Kurt et all. ass. nova

11. Association: *Sileno muradicae-Onobrychetum gracilii* Aydoğdu et all. 1994 ex Kurt et all. ass. nova

12. Association: *Linario corifoliae-Astragaletum pseudocaspiae* Aydoğdu et all. 1994 ex Kurt et all. ass. nova

13. Association: *Centaureo deflexae-Astragaletum microceohalii* Aydoğdu et all. 1994 ex Kurt et all. ass. nova

14. Association: *Thymo gypsacei-Achilleetum goniocephala* Akman et all. 1990 ex Kurt et all. ass. nova

15. Association: *Gypsophilo eriocalicis-Malabailetum secacul* Akman et all. 1990 ex Kurt et all. ass. nova

16. Association: *Salvio-Astragaletum microcephali* Geven et all. 2009

17. Association: *Minuartio-Acantholimetum acerosi* Geven et all. 2009

18. Association: *Thymelo-Gypsophiletum parvae* ass. nova Kurt

19. Association: *Thymo-Genistetum sessilifoliae* ass. nova Kurt et all.

**2.Alliance: *Asperulion bornmuellerii* (Ketenoğlu et all., 1983) Kurt et all. stat. nova**

**1.Association: *Onosma armeni-Glycyrrhizetum glabrae* Ketenoğlu et all. 1983 ex Kurt et all. ass. nova**

**2.Association: *Salvio tchihatcheffii-Astragaletum strigillosi* Ketenoğlu et all. 1983 ex Kurt et all. ass. nova**

**3.Association: *Achillo monocephalae-Astragaletum anthylloidis* Ketenoğlu et all. 1983 ex Kurt et all. ass. nova**

**4.Association: *Thymo longicaulis-Thymeleetum passerinae* Ketenoğlu et all. 1983 ex Kurt et all. ass. nova**

**5.Association: *Achilleo gypsicolae-Genistetum sessilifoliae* Akman et all. 1994 ex Kurt et all. ass. nova**

**6.Association: *Fumano paphlagonicae-Helianthemetum germanicopolitani* Akman et all. 1994 ex Kurt et all. ass. nova**

**3.Alliance: *Helichryso-Thymion cappadocici* (Ketenoğlu et all., 2000) Kurt et all. stat. nova**

**1.Association: *Alllio-Genistetum involucrati* Ketenoğlu et all., 2000.**

**2.Association: *Muscario-Achilletum sintenisii* Ketenoğlu et all., 2000.**

**3.Association: *Astragaletum noeani* Ketenoğlu et all., 2000.**

**4.Association: *Asphodelino-Scorzoneretum tomentosii* Ketenoğlu et all., 2000.**

**5.Association: *Haplophylo-Isotetum sivasicii* Ketenoğlu et all., 2000.**



## RESEARCH PAPER

# Unravelling the mechanisms for plant survival on gypsum soils: an analysis of the chemical composition of gypsum plants from Turkey

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## Keywords

Calcium sulphate; gypsophile endemism; gypsophiles; gypsum flora; leaf chemical composition; nutrients; Turkey.

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## Editor

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## ABSTRACT

Depending on their specificity to gypsum, plants can be classified as gypsum exclusive) and gypsovags (non-exclusive). The former may further divide into wide and narrow gypsophiles, depending on the breadth of their distribution area. Narrow gypsum endemics have a putative similar chemical composition to gypsum (i.e. gypsovags), which may indicate their strategy as stress-tolerant plant refugees on gypsum. However, this has been tested in different regions of the world. We compared the chemical composition of four narrow gypsum endemics, one widely distributed gypsophile and one gypsovag growing on high- and low-gypsum content soils. Differences were tested with multivariate analyses (RDA) and mixed models (REML). Narratives segregated from gypsovags in their chemical composition according (mainly due to higher K and ash content in the former). Nevertheless, small and disappeared when different nutrients were analysed in

- ✓ Bolukbasi, A., Kurt, L., & Palacio, S. (2016). Unravelling the mechanisms for plant survival on gypsum soils: an analysis of the chemical composition of gypsum plants from Turkey. *Plant Biology*, 18(2), 271-279.

Toprak Bilimi ve Bitki Besleme Dergisi 4 (2) 57 - 62



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Ankara Üniversitesi, Fen Fakültesi, Biyoloji Bölümü, Ankara

## Özet

Türkiye kuzey yarımkürede yer alan ülkeler arasında biyoçeşitlilik bakımından zengin bir ülkedir. Türkiye'nin bu kadar çeşitliliğe sahip olmasının nedenlerinden biri edafik faktördür. Ülkemiz marnlı, marnlı jipsli, jipsli, serpentinalı, alüvyal gibi çok farklı anamateryal çeşitlerini barındırıldığından önemli endemik merkezleridir. Jips içeren topraklar dünyada kurak ve yarı kurak bölgelerde yaklaşık 100 milyon hektarlık bir alan kaplamaktadır. Ülkemizde de önemli oranlarda bulunan jips içeren topraklar endemik ve nadir türleri barındırarak biyoçeşitliliği katkıda bulunmaktadır. Yetişme ortamı (anamateryal) faktörü fizikal ve kimyasal etkilerinden dolayı kurak bölgelerde çoğu bitki için önemli bir faktördür. Jips içeren topraklar bitki yaşamı için fizikal ve kimyasal stres ortamı yaratmaktadır. Bu ortamda yetişen bitkiler ancak bazı adaptasyon stratejileri geliştirerek hayatı kalabilmektedir. Bu derleme çalışmasında ülkemizde edafik çeşitliliğe örnek olan jips içeren toprakların ekolojisi hakkında bilgiler paylaşılmış, ayrıca jipsin tanımı, jips içeren topraklar üzerinde yetişen bitkilerin adlandırılması, jipsin bitki üzerinde yarattığı fizikal ve kimyasal stresin bahsedilmiştir.

**Anahtar Kelimeler:** Jips, Jipsofil, Jipsofit, Jipsovag, Edafik endemizm.

**Ecology of gypsum plants**

## Abstract

- ✓ Özdeniz E., Böyükbaşı A., Kurt L., Özbeý B.G. 2016. Jipsofil Bitkilerin Ekolojisi. *Toprak Bilimi ve Bitki Besleme Dergisi* 4 (2) 57 – 62.

## Other Publications in Review

✓ Çekiç F. Ö., Özdeniz E., Öktem M., Keleş Y., **Kurt L.** Phenolic Compositions in Some Gypsum and Non Gypsum Plants.

✓ Ozdeniz E., Ozbey B. G., Bolukbasi A., Oktem, M., Keles Y., **Kurt L.** The Role of Free Proline and Soluble Carbonhydrates in Gypsum Stress on Some Gypsum and Non Gypsum Plants.

## **Projects about Gypsum**

**"GYPWORLD" A global initiative to understand gypsum ecosystem ecology"**  
**HORIZON 2020 "Marie Skłodowska Curie Actions Rise". 2017-**

**How do plants live on gypsum soils? Adaptive mechanisms of vascular plants to live on gypsum.**  
**AB National Geographic Project, 2016-**

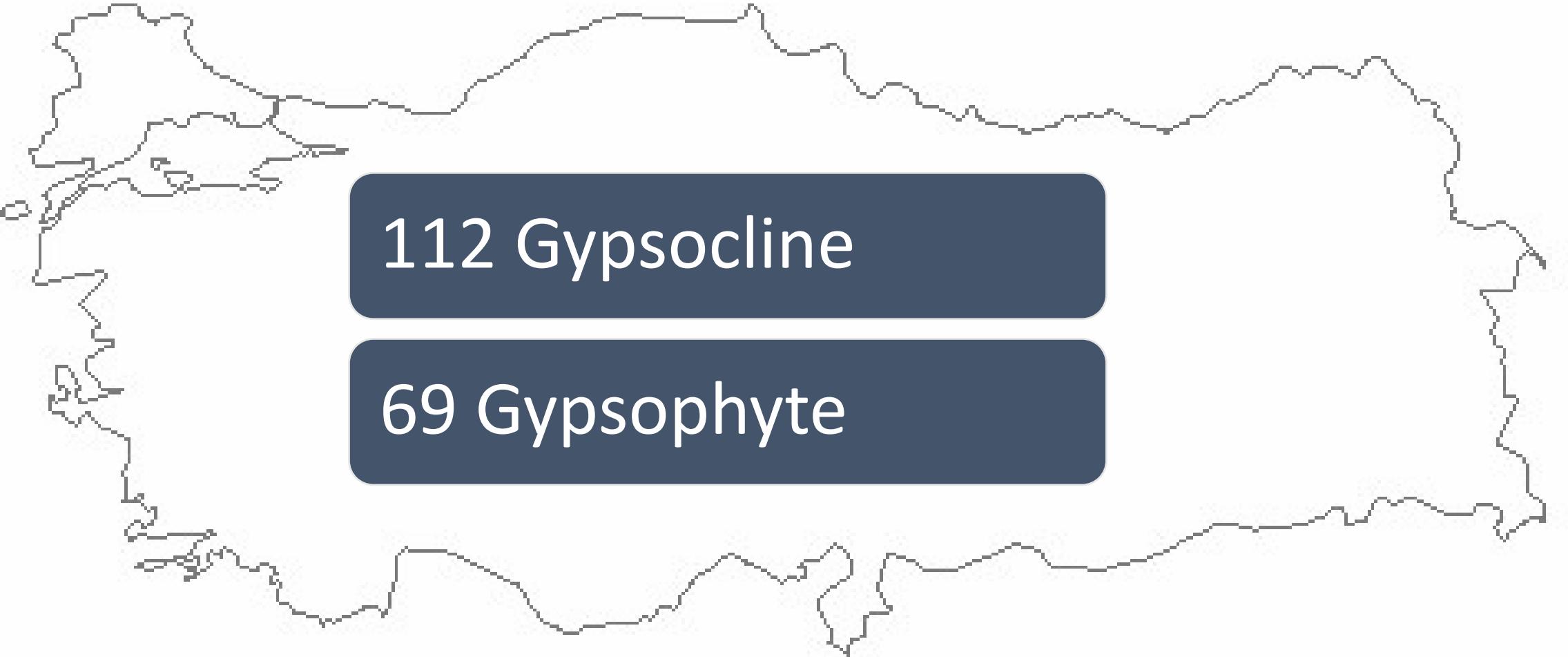
**Promoting research on gypsum ecology in Iran and Turkey.**

**CSIC Convocatoria "I-COOP+" 2016 Memoria Científica Modalidad B Project. 2017-**

**Investigation of Ecological Adaptation Mechanism of the Gypsophile Endemism in the Region Between Polatlı (Ankara) and Sivrihisar (Eskişehir).**  
**Ankara University, 2017-2018**

**A Synecological Investigation of Gypsum Soils in Turkey.**  
**TUBITAK, 2007-2010.**

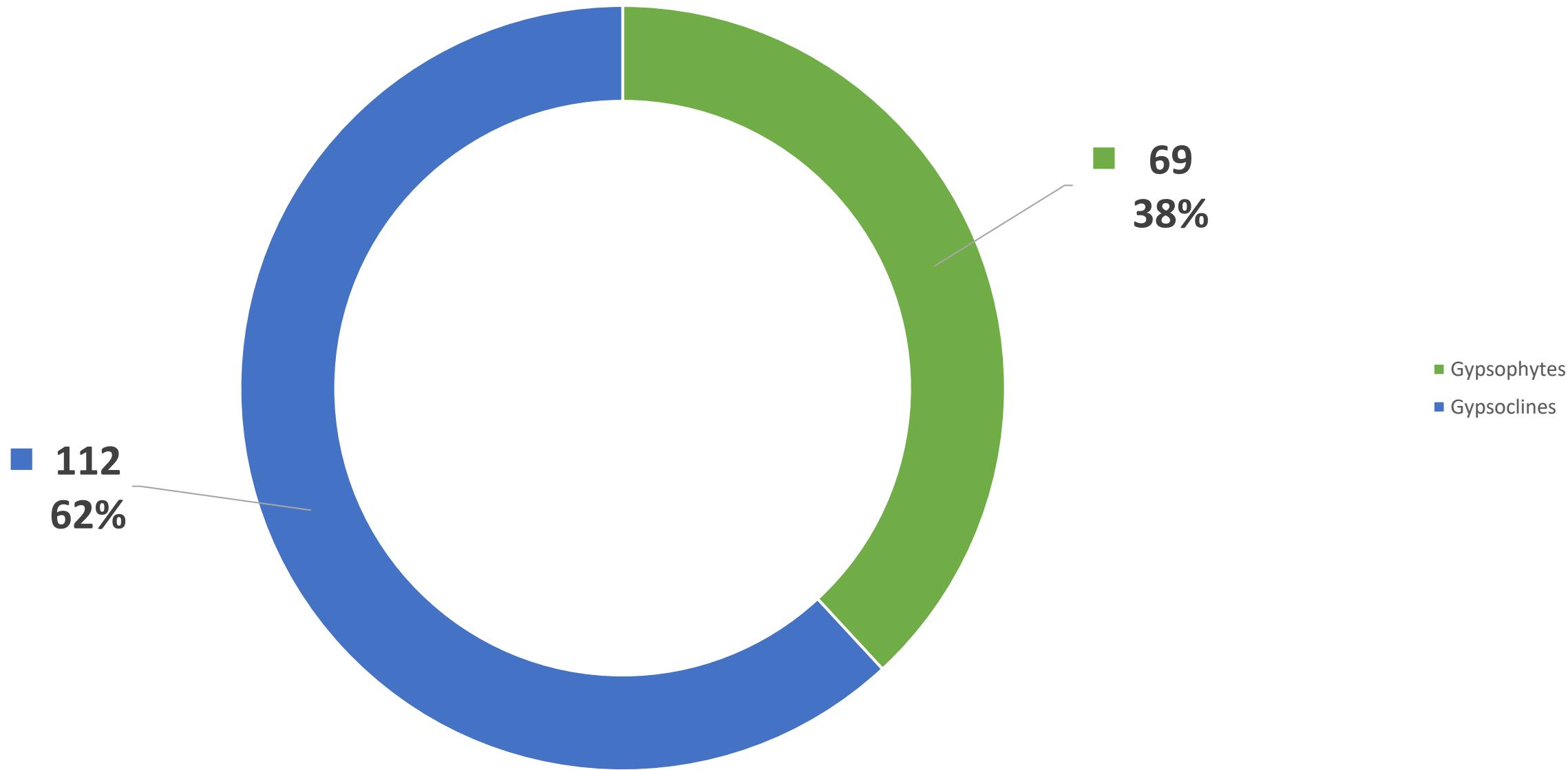
**It is a tentative list and it's developing consistently.  
But now, according to the updated data, we know that Flora of Turkey has,**



**112 Gypsocline**

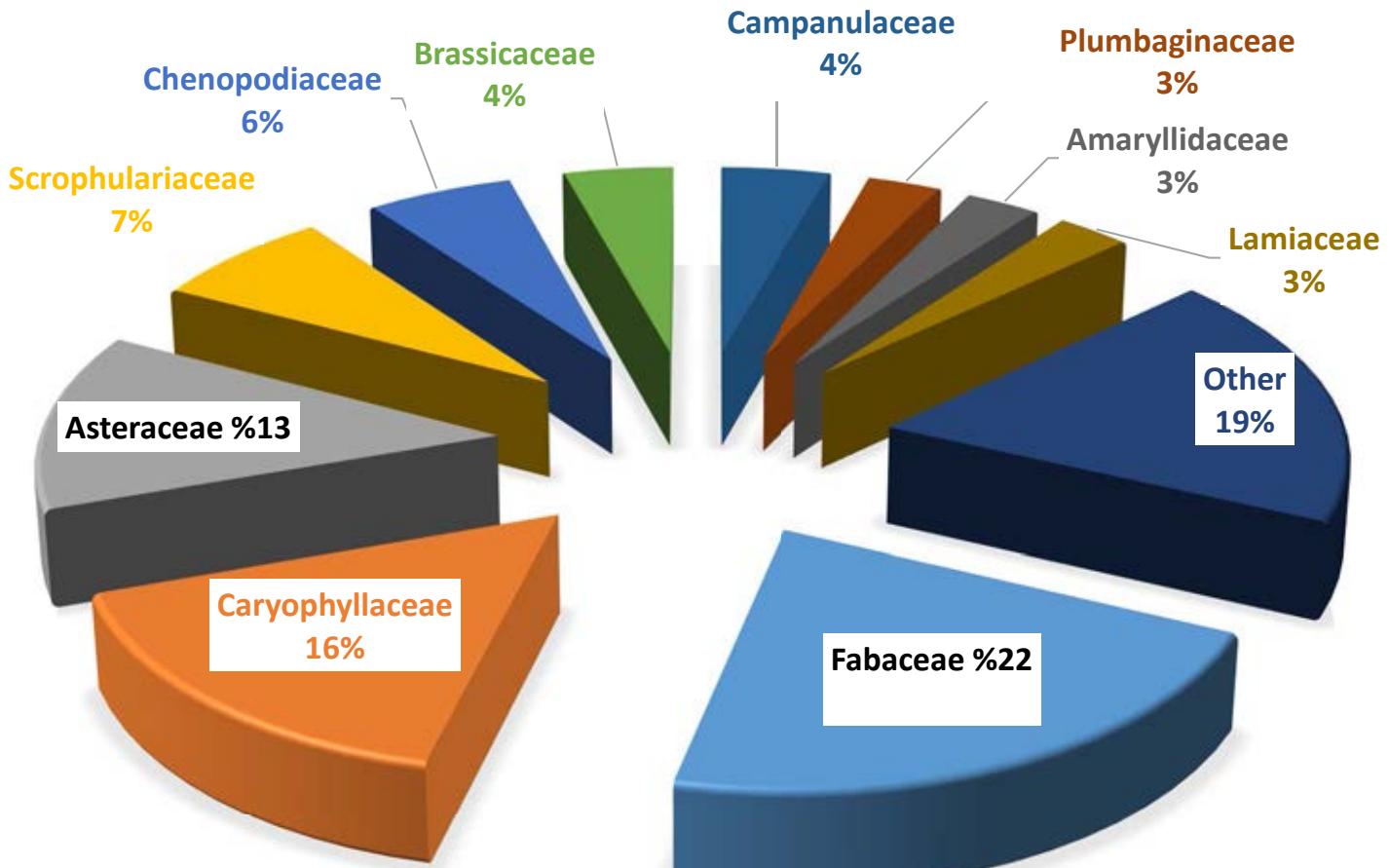
**69 Gypsophyte**

## Spectrum of Taxa

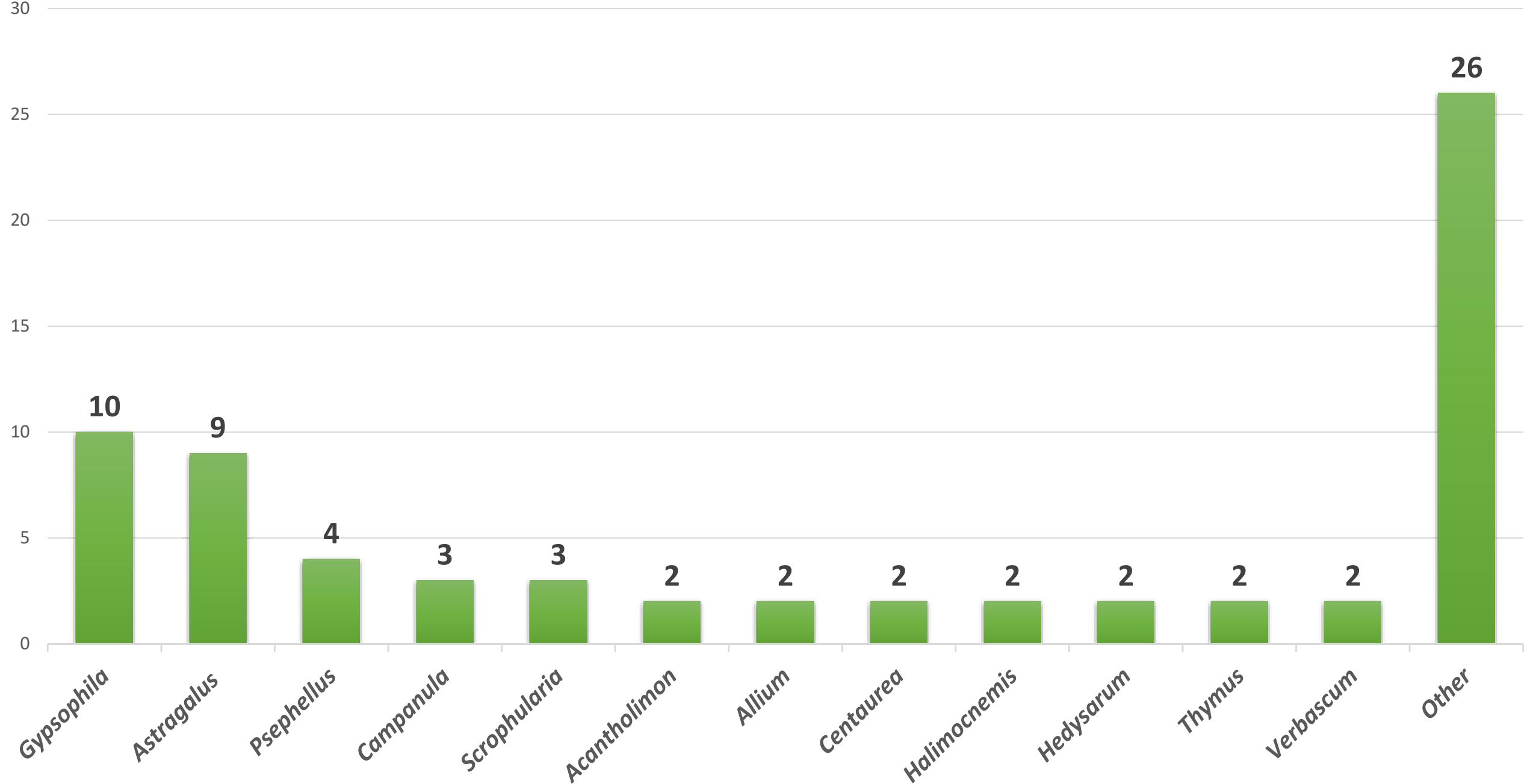


## FAMILY SPECTRUM of GYPSOPHYES

Family	Gypsophyte Taxa
Fabaceae	15
Caryophyllaceae	11
Asteraceae	9
Scrophulariaceae	5
Chenopodiaceae	4
Brassicaceae	3
Campanulaceae	3
Plumbaginaceae	2
Amaryllidaceae	2
Lamiaceae	2
Other	13

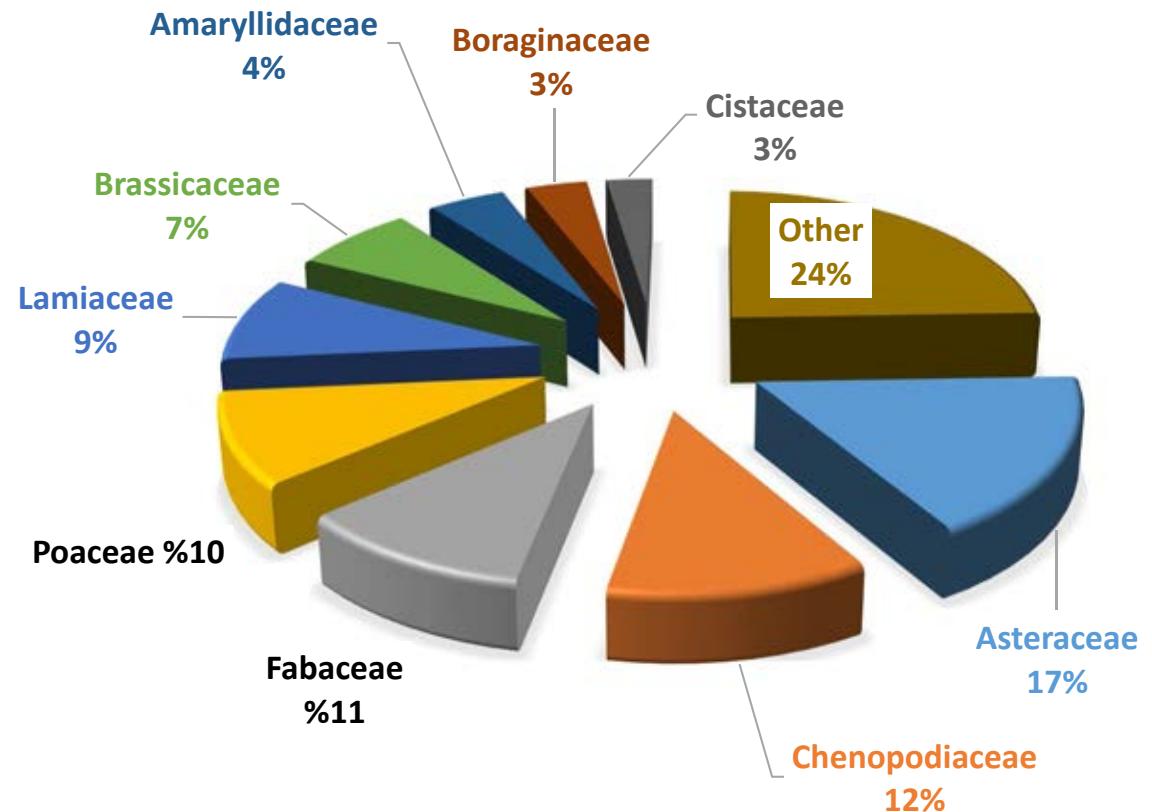


# Genus Spectrum of Gypsophytes

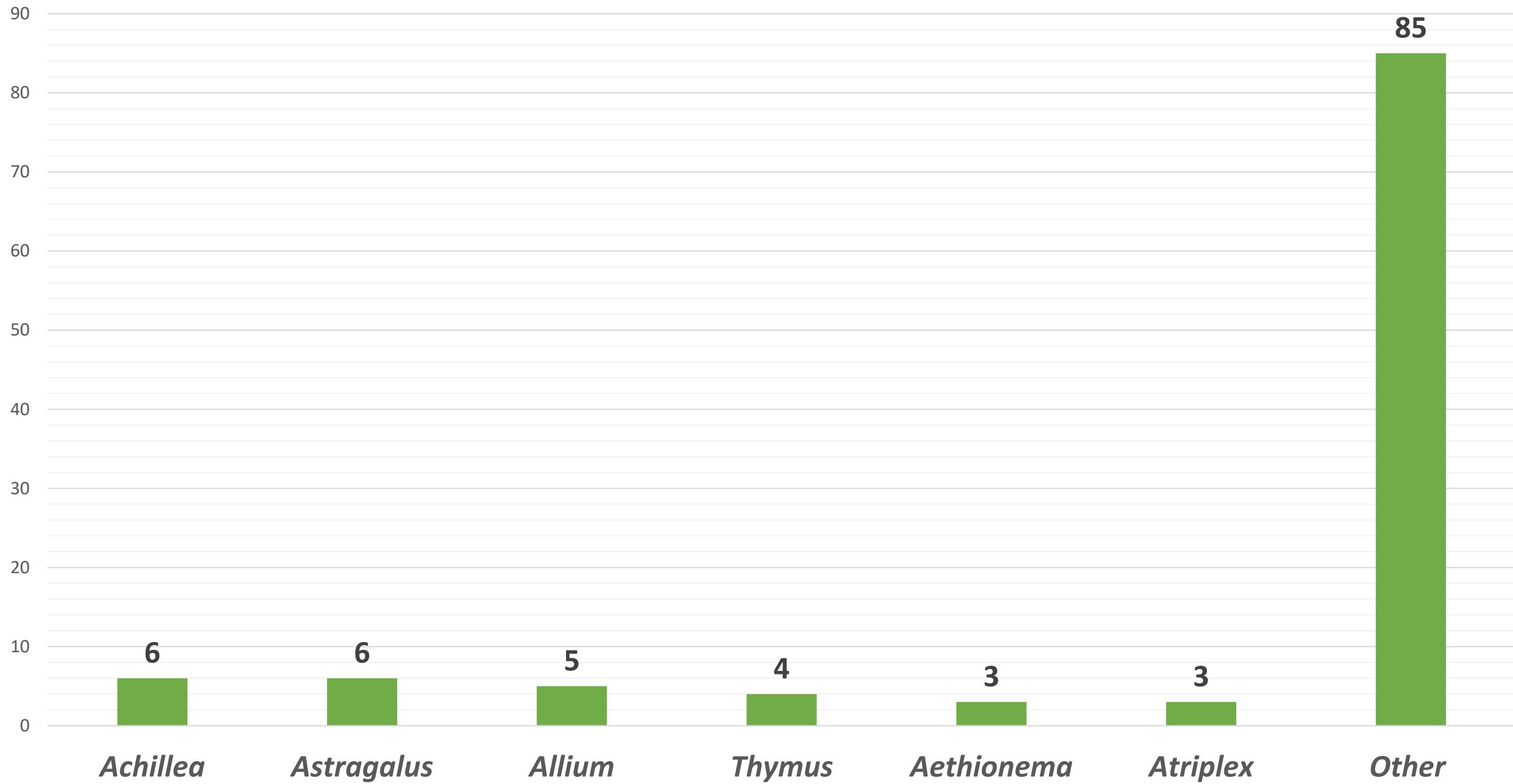


## FAMILY SPECTRUM of GYPSOCLINES

Family	Gypsocline Taxa
Asteraceae	19
Chenopodiaceae	13
Fabaceae	12
Poaceae	11
Lamiaceae	10
Brassicaceae	8
Amaryllidaceae	5
Boraginaceae	4
Cistaceae	3
Other	27



# Genus Spectrum of Gypsoclines

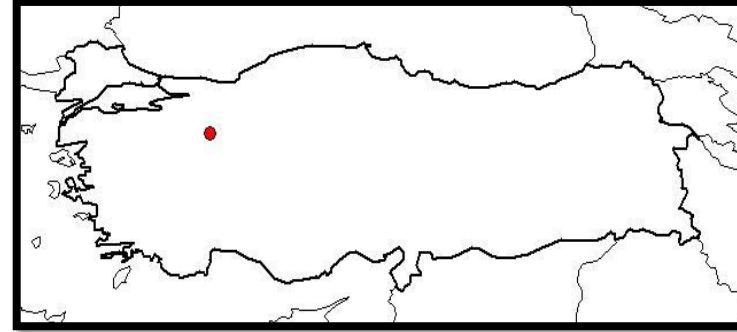




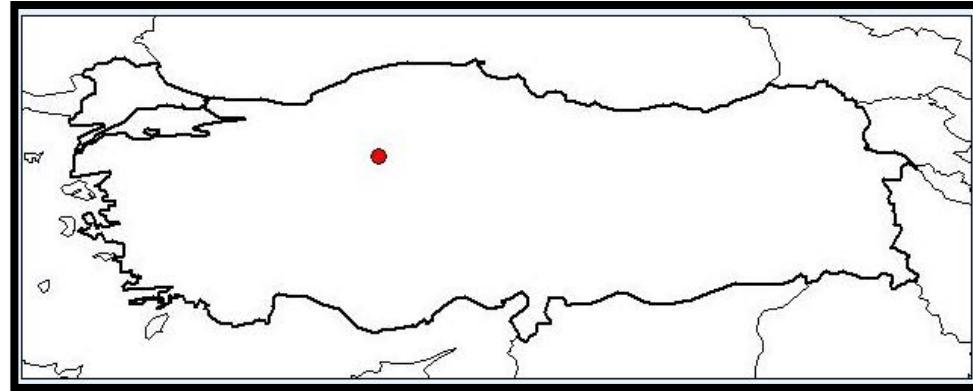




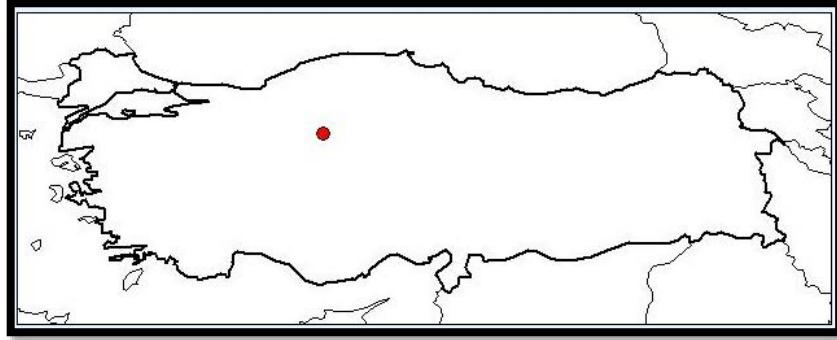
Species	Family	Substrat	Endemism	Phytogeographical Region	Widespreads	
<i>Alyssum niveum</i> DUDLEY	Brassicaceae	calcareous slopes, gypsum hills	+	Ir. Tur	B3	Gypsophyte



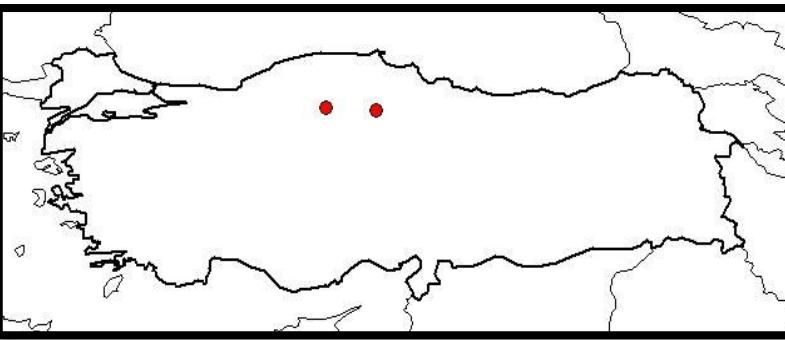
Species	Family	Substrat	Endemism	Phytogeographical Region	Widespreads	
<i>Acantholimon anatolicum</i> Dogan & Akaydin	Plumbaginaceae	deep gypsum-rich sandy soil	+	Ir. Tur	A3	Gypsophyte



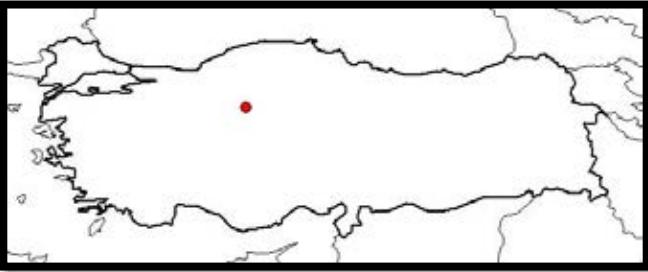
Species	Family	Substrat	Endemism	Phytogeographical Region	Widespreads	
<i>Acantholimon riyatguelii</i> Yildirim	Plumbaginaceae	Gypsum soils	+	Ir. Tur	A3	Gypsophyte



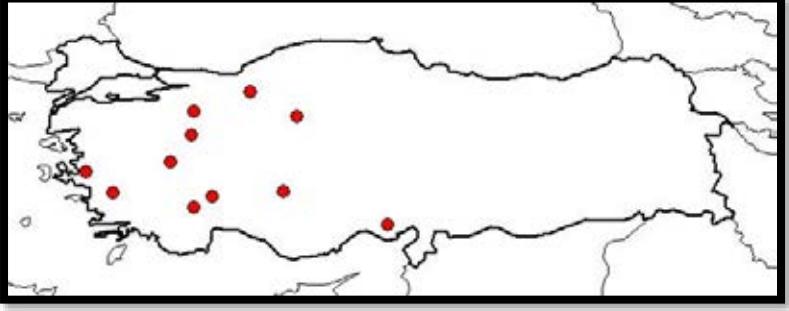
Species	Family	Substrat	Endemism	Phytogeographical Region	Widespreads	
<i>Achillea gypsicola</i> HUB.-MOR.	Asteraceae	Steppe, calcerous slopes, gypsum slopes	+	Ir. Tur	A4,A5	Gypsocline



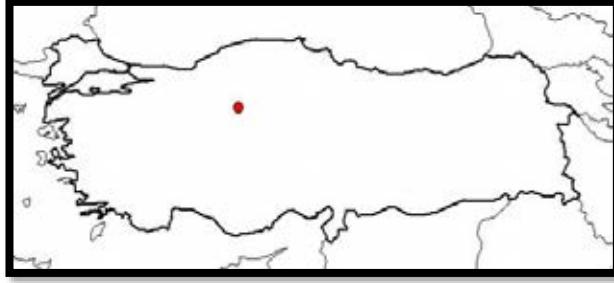
Species	Family	Substrat	Endemism	Phytogeographical Region	Widespreads	
<i>Achillea ketenoglui</i> H. DUMAN	Asteraceae	Marny and gypsum slopes	+	Ir. Tur	B3	Gypsocline



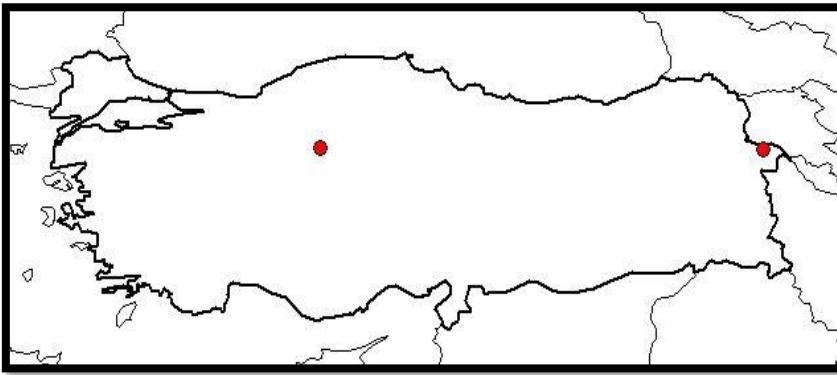
Species	Family	Substrat	Endemism	Phytogeographical Region	Widespreads	
<i>Astragalus lydium</i> Boiss.	Fabaceae	Steppe	+	Ir. Tur	A2, A3, A4, B1, B2, B3, B4, C1, C2, C3, C5	Gypsocline



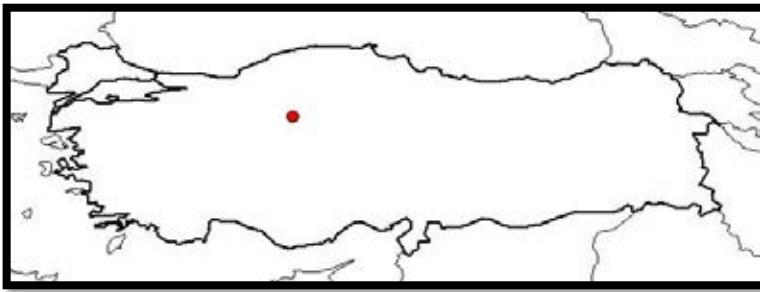
Species	Family	Substrat	Endemism	Phytogeographical Region	Widespreads	
<i>Cytisus acutangulus</i> Jaub. & Spach.	Fabaceae	Gypsum Slopes	+	unknown	A3 Ankara	Gypsophyte



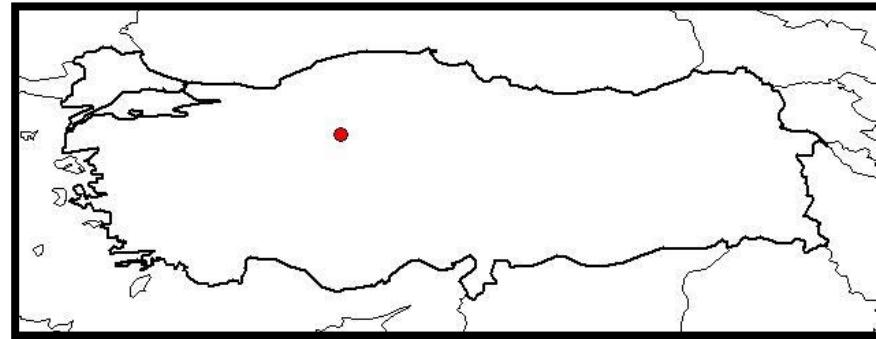
Species	Family	Substrat	Endemism	Phytogeographical Region	Widespreads	
<i>Anabasis aphylla</i> L.	Chenopodiaceae	Gypsum and marly soils		Ir-Tur element	A3, B10	Gypsocline



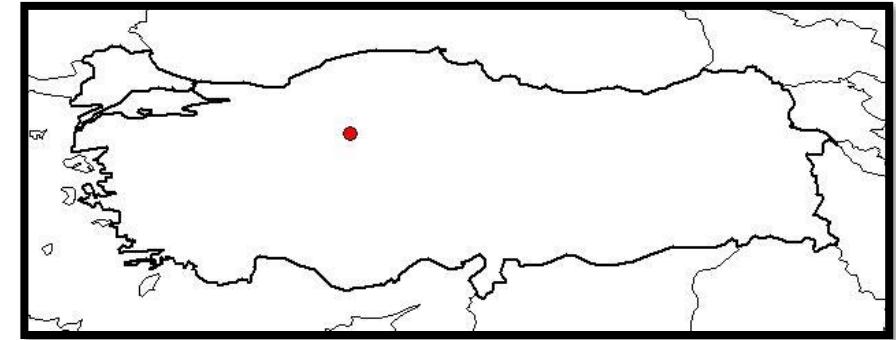
Species	Family	Substrat	Endemism	Phytogeographical Region	Widespreads	
<i>Genista kepenensis</i> Yild.	Fabaceae	Steppe on gypsaceous slopes, 950-1000 m.	+	Ir-Tur element	B3	Gypsophyte



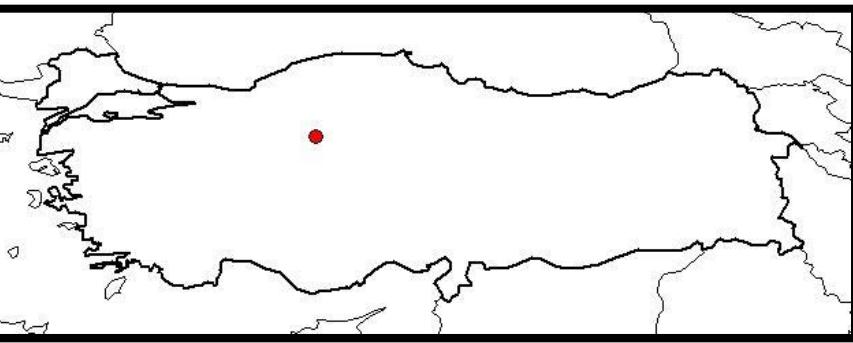
Species	Family	Substrat	Endemism	Phytogeographical Region	Widespreads	
<i>Hedysarum duriaeae</i> Yild.	Fabaceae	Steppe on gypsaceous slopes, 950-1000 m.	+	Ir-Tur element	B3	Gypsophyte



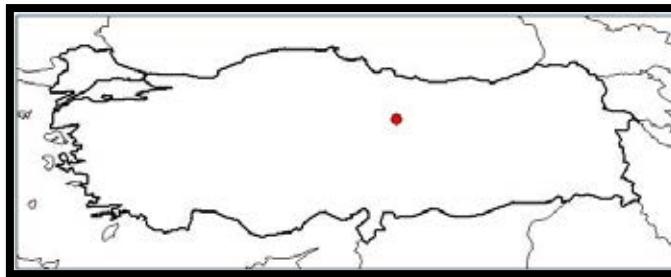
Species	Family	Substrat	Endemism	Phytogeographical Region	Widespreads	
<i>Hedysarum hasanyildirimii</i> Yild.	Fabaceae	Steppe on gypsaceous slopes, 950-1000 m.	+	Ir-Tur element	B3	Gypsophyte



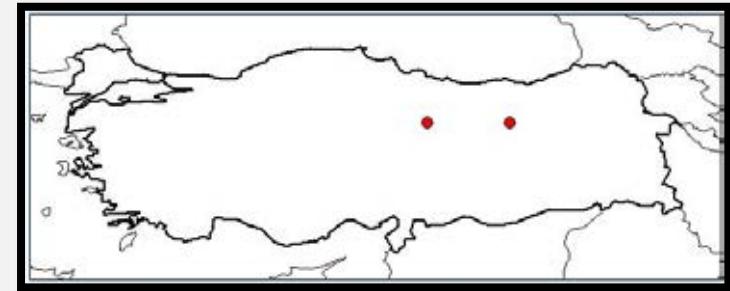
Species	Family	Substrat	Endemism	Phytogeographical Region	Widespreads	
<i>Glaucium secmenii</i> Yild.	Papaveraceae	Steppe on gypsaceous slopes, 950-1000 m.	+	Ir-Tur element	B3	Gypsophyte



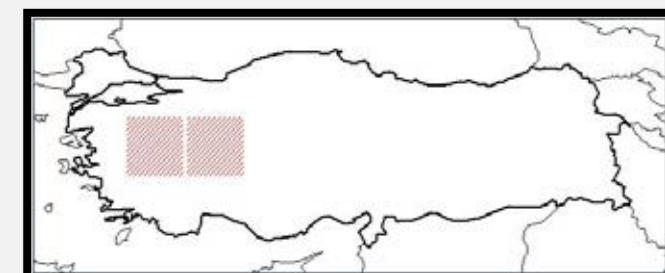
Species	Family	Substrat	Endemism	Phytogeographical Region	Widespreads	
<i>Gypsophila turcica</i> Hamzaoglu	Caryophyllaceae	Gypsaceous hills at 1755-1835 m	+	Ir-Tur element	B6 Sivas	Gypsophyte



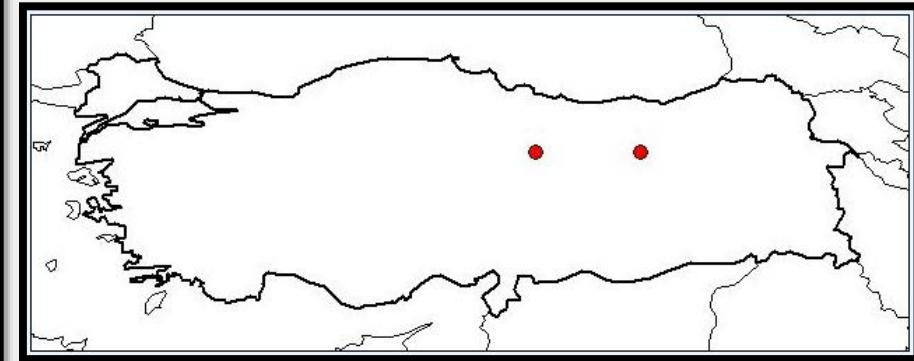
Species	Family	Substrat	Endemism	Phytogeographical Region	Widespreads	
<i>Achillea sintenisii</i> Hub.-Mor.	Asteraceae	Steppe, calcareous slopes, gypsum hills, 1200-1550 m	+	Ir. Tur	B7 Erzincan B6 Sivas	Gypsocline



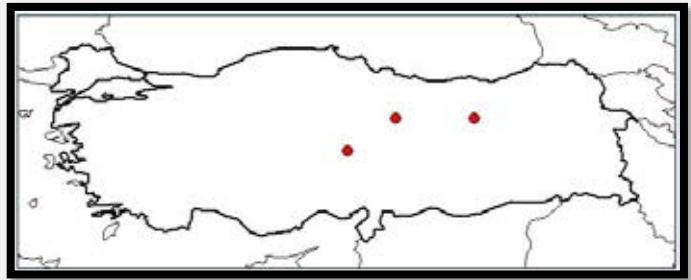
Species	Family	Substrat	Endemism	Phytogeographica I Region	Widespreads
<i>Centaurea nivea</i> (Bor.) Wagenitz	Asteraceae	on gypsaceous	+	Ir. Tur	B4 Eskişehir Gypsophyte

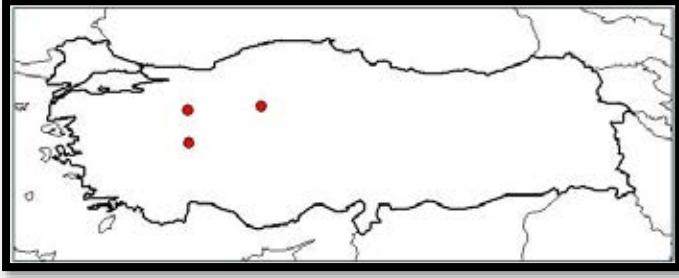
	Species	Family	Substrat	Endemism	Phytogeographical Region	Widespreads	
	<i>Scorzonera aucherana</i> DC.	Asteraceae	Hillsides on calcareous soil or gypsum, 1300-1500 m.	+	Ir. Tur	B7 Cappadocia ad Euphratem B6 Sivas B7 Erzincan	Gypsocline



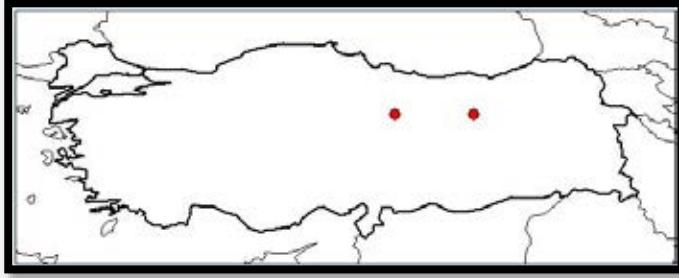
Species	Family	Substrat	Endemism	Phytogeographical Region	Widespread s	
<i>Onosma sintenisii</i> Hausskn. ex Bornm.	Boragineceae	Stony hillsides, gypsum slopes, steppe, 1370-1500 m.	+	Ir. Tur	B7 Erzincan B6 Sivas	Gypsocline



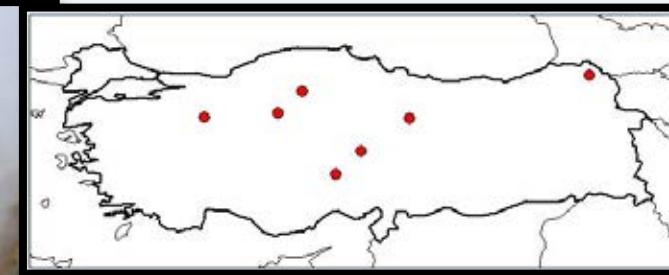
Species	Family	Substrat	Endemism	Phytogeographical Region	Widespreads	
<i>Aethionema dumantii</i> M.Vural & N.Adigüzel	Brassicaceae	Marly and gypsaceous slopes, 840-1400 m	+	Ir. Tur	B3 Eskişehir A4 Ankara B2 Afyon B3 Ankara B4 Ankara	Gypsocline



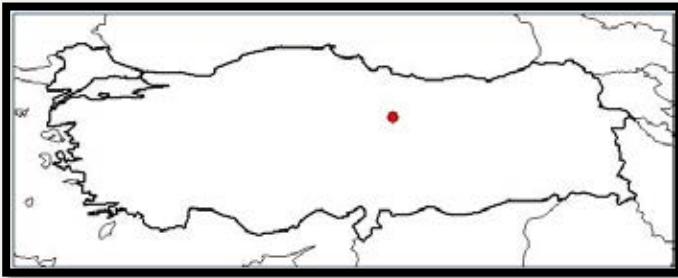
Species	Family	Substrat	Endemism	Phytogeographical Region	Widespreads	
<i>Isatis sivasica</i> Davis	Brassicaceae	Fields, gypsum banks, rocky places, 1200-1400 m.	+	Ir. Tur	B7 Erzincan B6 Sivas	Gypsocline



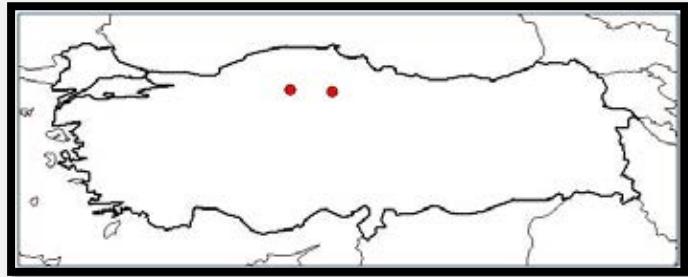
	Species	Family	Substrat	Endemism	Phytogeographical Region	Widespreads	
	<i>Gypsophila eriocalyx</i> Boiss	Caryophyllaceae	Gypsum banks, steppes, 650-1550 m.	+	Ir. Tur	A4 Çankırı A9 Kars B3 Eskişehir B4 Ankara B5 Kayseri B6 Sivas	Gypsophyte



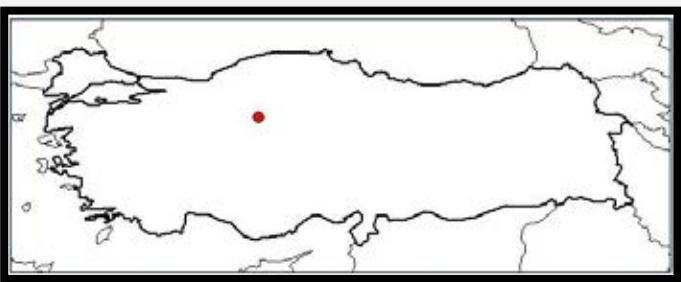
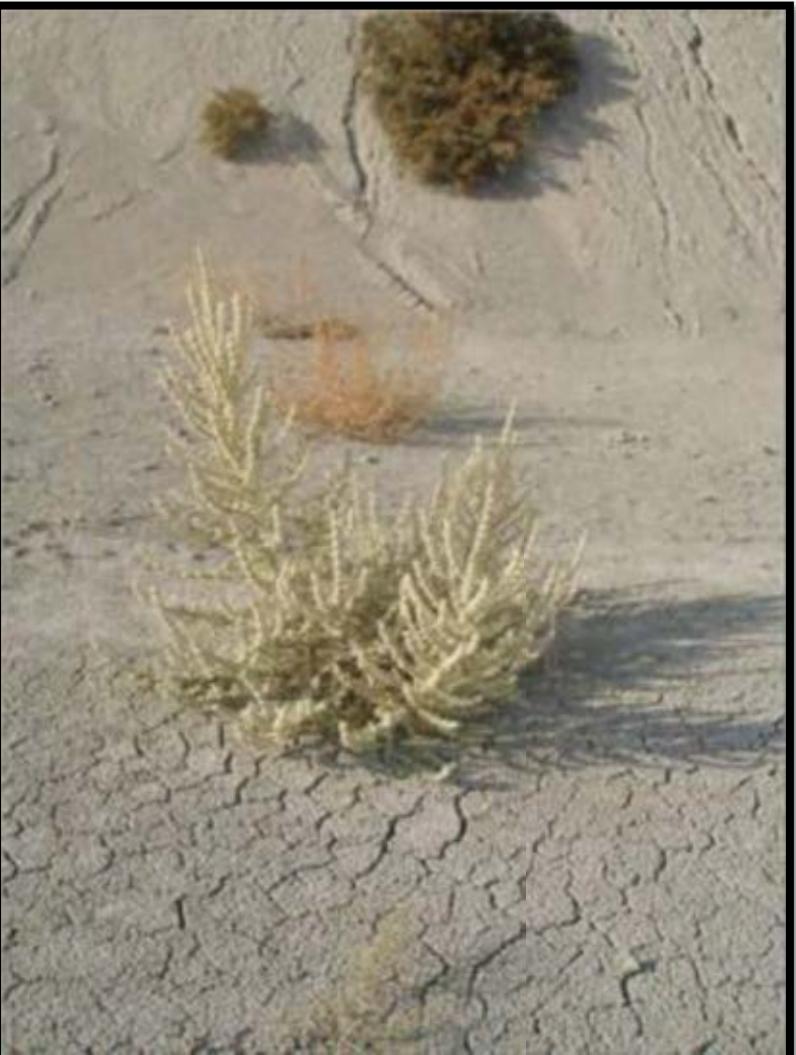
Species	Family	Substrat	Endemism	Phytogeographical Region	Widespreads	
<i>Gypsophila heteropoda</i> Freyn & Sint. subsp. <i>minutiflora</i> Bark	Caryophyllaceae	Gypsaceous soils, 1300-1500 m.	+	Ir. Tur	B6 Sivas	Gypsophyte



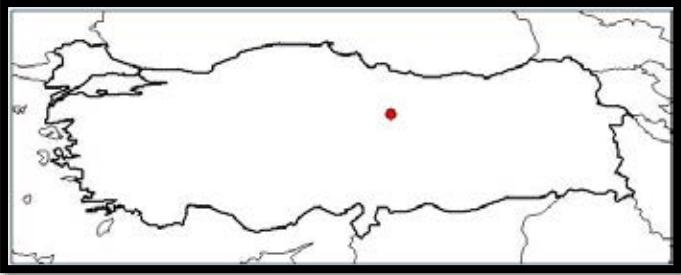
Species	Family	Substrat	Endemism	Phytogeographical Region	Widespreads	
<i>Gypsophila parva</i> Bark	Caryophyllaceae	Gypsum hills, 600-700 m.	+	Ir. Tur	A4 Çankiri A5 Çorum	Gypsophyte



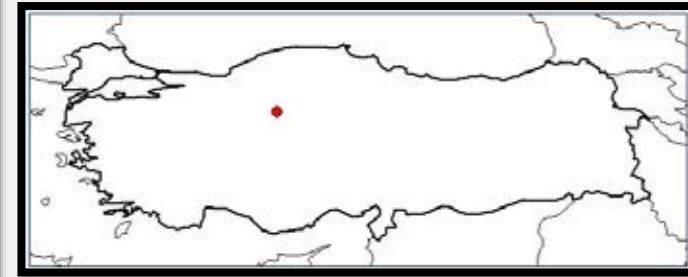
Species	Family	Substrat	Endemism	Phytogeographical Region	Widespreads	
<i>Salsola grandis</i> Freitag. Vural & N.Adıgüzel	Chenopodiaceae	Xerohalophytic colonizer of raw marly substrates containing gypsum and other soluble salts. 450-550 m.	+	Ir. Tur	A3 Ankara	Gypsocline



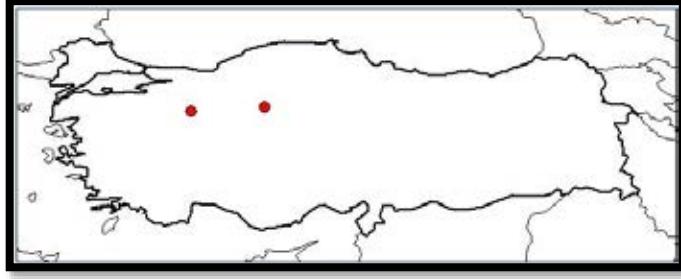
Species	Family	Substrat	Endemism	Phytogeographical Region	Widespreads	
<i>Astragalus aytatchii</i> Akan & Civelek	Fabaceae	Deep soil, gypsum fields and slopes	+	Ir. Tur	B6 Sivas	Gypsophyte



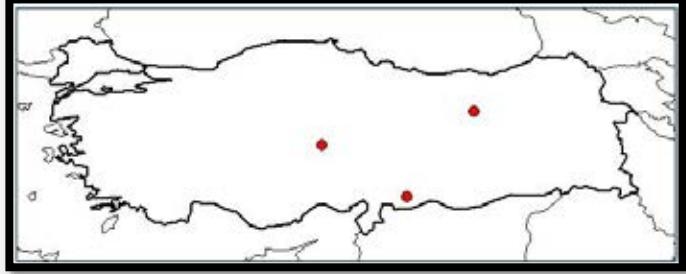
Species	Family	Substrat	Endemism	Phytogeographical Region	Widespreads
<i>Astragalus kochakii</i> Aytaç & H.Duman	Fabaceae	On gypsum steppe, 800-870 m.	+	Ir. Tur	B3 Ankara Gypsophyte



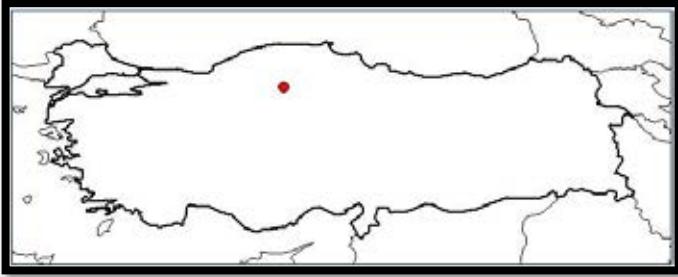
Species	Family	Substrat	Endemism	Phytogeographical Region	Widespreads	
<i>Salvia aytachii</i> Vural & Adığüzel	Lamiaceae	Steppe, marly places and gypsum soils. 650-870 m.	+	Ir. Tur	B3 Ankara A3 Ankara B3 Eskişehir	Gypsocline



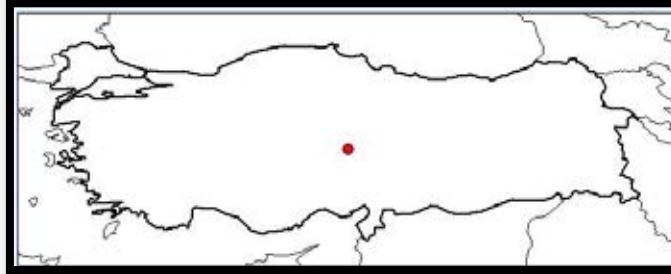
Species	Family	Substrat	Endemism	Phytogeographical Region	Widespreads	
<i>Scutellaria orientalis</i> L. subsp. <i>santolinoides</i> (Hausskn. ex Bornm.)	Lamiaceae	Montane grassland and loose slopes, on gypsum and sandstone, 500-1330 m.	+	Ir. Tur	B7 Erzincan B5 Nevşehir B7 Erzincan C6 Gaziantep	Gypsocline



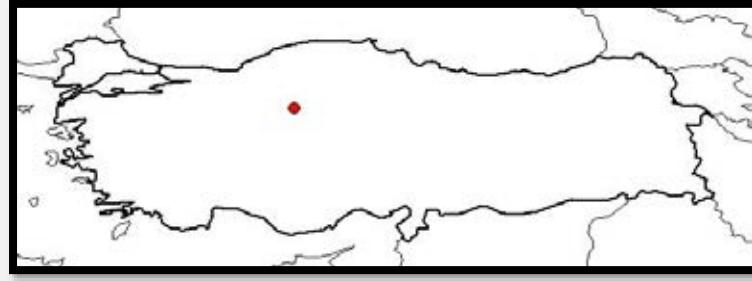
Species	Family	Substrat	Endemism	Phytogeographical Region	Widespreads	
<i>Thymus leucostomus</i> Hausskn. & Velen. var. <i>gypsaceus</i> Jalas	Lamiaceae	Gypsaceous hillsides	+	Ir. Tur	A4 Çankırı	Gypsocline



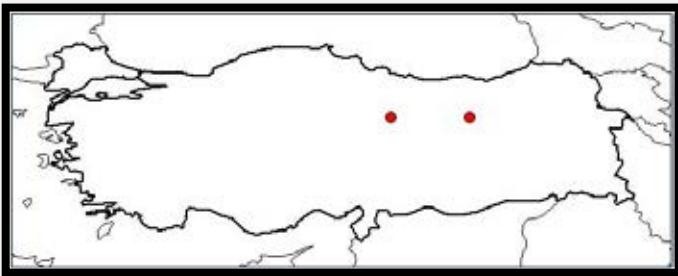
Species	Family	Substrat	Endemism	Phytogeographical Region	Widespreads	
<i>Thymus pectinatus</i> Fisch. & Mey. var. <i>pallasicus</i> (Hayek & Velen.) Jalas	Lamiaceae	Open steppe on gypsaceous or calcareous slopes, 1100-2160 m.	+	Ir. Tur	B5 Kayseri	Gypsocline



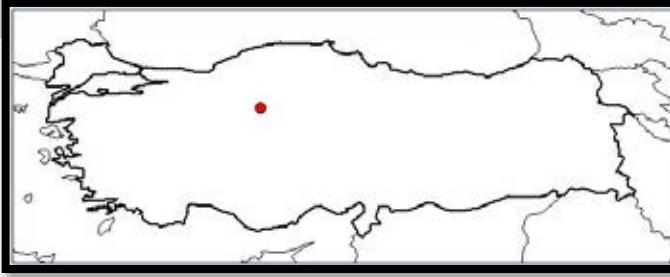
Species	Family	Substrat	Endemism	Phytogeographical Region	Widespreads	
<i>Muscari sivrihisardaghlaensis</i> Yıldırımlı & B. Selvi	Liliaceae	Gypsum places and steppe	+	Ir. Tur	B3 Eskişehir	Gypsophyte



Species	Family	Substrat	Endemism	Phytogeographical Region	Widespreads	
<i>Scrophularia lepidota</i> Boiss.	Scrophulariaceae	Dry gypsaceous hillsides. 1200-1500 m.	+	Ir. Tur	B6 Sivas B7 Erzincan	Gypsophyte



Species	Family	Substrat	Endemism	Phytogeographical Region	Widespreads
<i>Verbascum gypsicola</i> Vural & Aydoğdu	Scrophulariaceae	on gypsaceous slopes in steppe, 500-800 m	+	Ir. Tur	A3/A4 Ankara Gypsophyte





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Thank you for your attention...