

## Analysis of Plant Samples in Gypsum Habitats in Herbarium (ANK)

### ANK Herbariumundaki Jipsli Habitatlarda Bulunan Bitki Örneklerinin Analizi

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**Abstract:** In this research, the samples belonging to the Gypsophile plants kept in the herbarium of Ankara University Faculty of Science, Biology Department (ANK) were examined. 51 plant samples belonging to gypsophile plants were determined in herbarium. The samples are composed of 51 taxa belonging to 15 families and 38 genera. A database of the taxa belonging to the samples was created and lists of the taxa were prepared. The first three families that contain the most plant specimens are as follows: Umbelliferae, the richest family, has a sample number of 11. 7 samples of the Cruciferae family and 6 samples of the Compositae family. Distribution of collected samples according to Davis' square system; B6 74%, B5 8%, A3 6%, A4 6%, B4 4%, B3 2%. The earliest examples were collected by H. Birand-B. Kasaplıgil in 1952 and their diagnosis was made by G.Sezik in 1976. The greatest examples were collected by T. Ekim in the 1980s. The collected samples were diagnosed by T. Ekim, B. Yıldız, Ş. Civelek, N. Adıgüzel, Y. Akman, A. Baytop, H. Duman and other researchers. Most of the plant specimens have been collected up to 1500 m.

**Key words:** Herbarium, ANK, gypsum, database, Turkey.

**Özet:** Bu araştırmada, ANK (Ankara Üniversitesi Fen Fakültesi, Biyoloji Bölümü) herbariumunda muhafaza edilen jipsofil bitkilere ait örnekler incelenmiştir. Herbariumda 51 bitki örneği jipsofil bitki olarak belirlenmiştir. Örnekler 15 familya ve 38 cinse ait 51 taksondan oluşmaktadır. Örnekler için taksonların veritabanı oluşturulmuş ve takson listeleri hazırlanmıştır. En çok bitki örneği içeren ilk üç familya sırasıyla şöyledir: En zengin familya Umbelliferae, örnek sayısı 11'dir. Crucifera familyası 7 örnek içermekte iken Compositae familyası 6 örnek içermektedir. Toplanan örneklerin Davis'in kare sistemine göre dağılımı; B6 %74, B5 %8, A3 %6, A4 %6, B4 %4, B3 %2'dir. İlk örnekler H. Birand-B. Kasaplıgil tarafından 1952'de toplanmış ve örneklerin teşhisi G.Sezik tarafından 1976'da yapılmıştır. En fazla örnek T. Ekim tarafından 1980'lerde toplanmıştır. Toplanan örnekler T. Ekim, B. Yıldız, Ş. Civelek, N. Adıgüzel, Y. Akman, A. Baytop, H. Duman ve diğer araştırmacılar tarafından teşhis edilmiştir. Bitki örneklerinin çoğu 1500 m'ye kadar olan yükseltilerden toplanmıştır.

**Anahtar sözcükler:** Herbarium, ANK, jips, veritabanı, Türkiye.

### 1. Introduction

The relationship of human beings with plants is very ancient. The first people had used plants for food, medicine, shelter, clothing and other purposes. Nowadays, some plants, especially natural plants, are collected and dried for scientific purposes and these plant specimens are kept in special places called Herbarium.

The plants are usually collected in situ (e.g., where they were growing in nature), identified by experts, pressed, and then carefully mounted to archival paper in such a way that all major morphological characteristics are visible (i.e., both sides of the leaves and the floral structures). The mounted plants are labeled with their proper scientific names, the name of the collector, and, usually, information about where they were collected and how they grew and general observations. The specimens are commonly filed in cases according to families and genera and are available for ready reference.

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Herbarium collections are often housed in botanical gardens, arboretums, natural history museums, and universities. The largest herbaria, many of which are in Europe, contain several million specimens, some of which date back hundreds of years. Herbaria are the “dictionaries” of the plant kingdom and provide comparative material that is indispensable for studies in plant taxonomy and systematics. Given that nearly every plant species has a dried “type specimen” on which its description and Latin name are based, taxonomic disputes are commonly resolved by referencing type specimens in herbaria. The collections are also essential to the proper naming of unknown plants and to the identification of new species (Anonymous, 2018).

Paste of dried plant samples to cartons was first applied by Italian botanist Lucca Ghini (1490-1556) (Bellorini, 2016). In the herbarium sample label information, the plant sample has the name of the family and the name of the plant and the number of the plant sample. It also includes the place where the plant sample was collected, the height and date it was collected, the name of the person collecting the sample, the name of the person who named the sample, and other information (habitat, habitus properties, etc.). Samples are grouped as species, genus, family. It is stored horizontally in special cabinets. The arrangement of the cabinets can be in the accepted evolutionary order or in alphabetical order.

ANK Herbarium is visited by a large number of domestic and foreign botanists each year, comparing the herbarium specimens collected in their research with the herbarium specimens and taking advantage of the largely ANK Herbarium (Figure 1). In this study, the samples of the gypsicol plants in the ANK Herbarium, which has a large preparation in the floristic investigations, were analyzed.



Figure 1. Herbarium ANK

## 2. Material and Methods

Between 1933 and 1988, many foreign and Turkish researchers in Herbarium (ANK) collected 51 plant specimens of gypsophile plants, which were gathered as herbarium specimens, as well as species list and study material of specimens. Control of information on these samples; 'Flora Europea Vol I' (Tutin 1964), 'Flora of the East Aegean Islands' (Davis, 1965; Davis *et al.*, 1988; Güner, 2000), 'Flore de J'Iran' (Parsa, 1951), and Distribution Maps (Donner, 1990). Various botanical books have been used (Heywood, 1978; Hickey and King, 1997; Birand, 1952; Brummit and Powell, 1992; Baytop, 1998). Referred to Med Checklist (Grauter *et al.*, 1956) and Index Kewensis (Durand ve Jackson, 1886-1895) for control purposes.

Taxons are listed alphabetically. Name, height, date, habitat, name of the place where the plant was gathered together with the inventory number if given together with the collector. Based on the list prepared previously under the DOS operating system, the data which has been destroyed, each sample is handed one by one and the data belonging to the samples are renewed and the taxon list belonging to the samples is prepared by bringing it into working state under Windows. Photographs of plant specimens were taken and added to the plant list, some of the photographs were given as figures. The database program was used to prepare the lists (Geven *et al.*, 2008, 2014).

At the end of the work, the corrugated cardboard and sheath of the plant specimens were renewed and the plant specimens were arrayed in accordance with the flora arrangement, depending on the improvement and listing of the plants.

All plant samples used as material were examined with care not to be harmed during the study, plant lists belonging to taxa were prepared and they were taken under protection by the Ankara University Science Faculty Herbarium (ANK).

## 3. Results

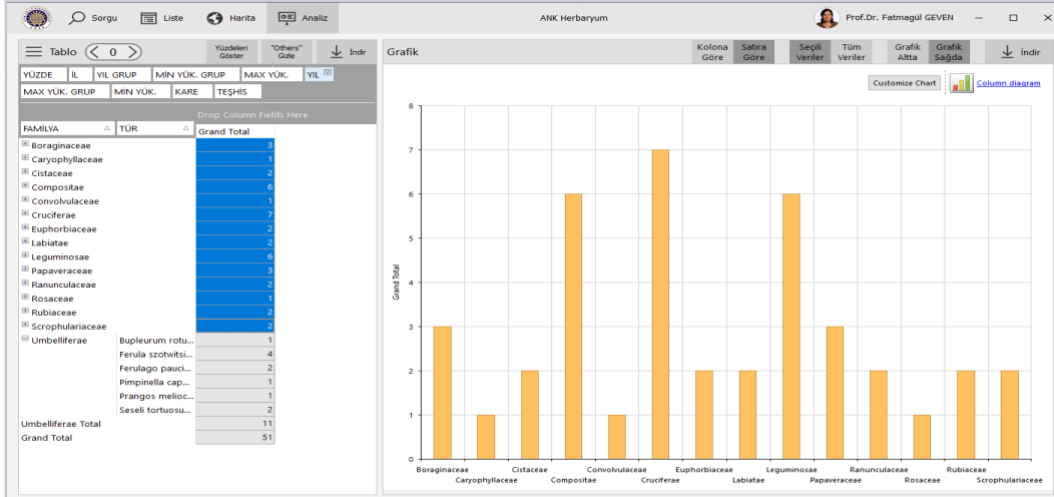
Ankara University Faculty of Science Herbarium (ANK) has 51 samples of gypsophile plants. These examples were collected by many researchers between 1952 and 1985. The collected samples were diagnosed by T. Ekim, B. Yıldız, Ş. Civelek, N. Adıgüzel, Y. Akman, A. Baytop, H. Duman and other researchers.

As a result of the examination of herbarium specimens, it has determined that plant samples grown in gypsiferous soils belong to 15 families. Search, display and printout of plant samples are prepared using the database program running under Windows operating system (Figure 2). A list of some taxa belonging to plant specimens grown in gypsiferous soils are given in Table 1. Herbarium list of plant samples collected in 1980 are given in Table 2. In addition, the herbarium list of plant samples which is collected from 1500 m are given in Table 3.

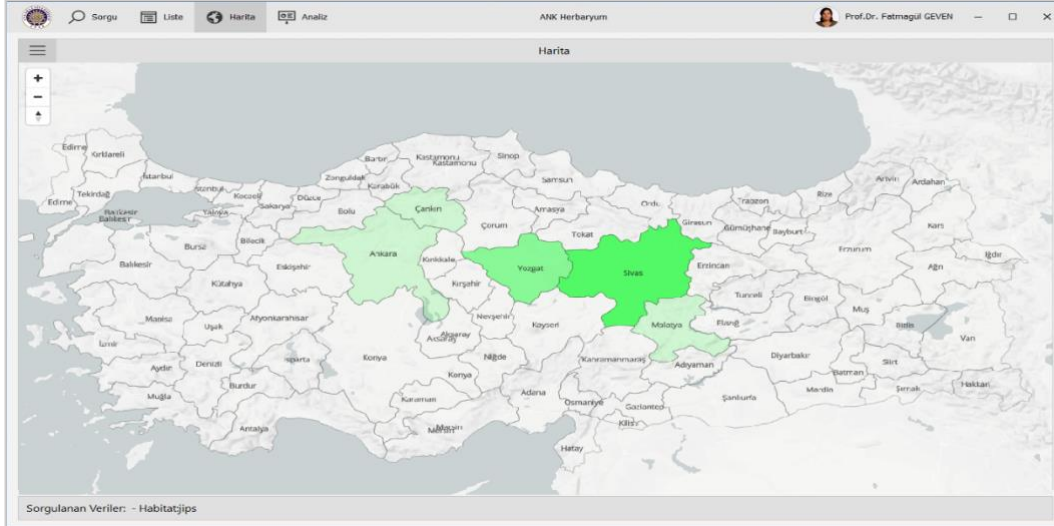
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31071	Boraginaceae	Onosma polyanthum DC.			B6	Sivas	Şarkışla	Gemerek yolu, 1	Jips anakaya	T.Ekim, 4972	T.Ekim	
6030	Caryophyllaceae	Minuartia anatolica (Boiss.)	scleranthoides (B)		B6	Sivas	Şarkışla'nın kuzey	akaya jips, kayalı	im, 5122	7/6/		
5208	Cistaceae	Helianthemum germanicum			A4	Çankırı		Step, Marl- jips	Y.Akman, 14985		H.Duman	700
5260	Cistaceae	Helianthemum nummulariu	lycaonicum Cooi		A4	Çankırı		Anakaya mar-jips	Y.Akman		Y.Akman	700
24266	Compositae	Achillea gypsicola Hub.-Mo			A4	Çankırı		Jipsli topraklar	Y.Akman, 15203		H.Duman	
24296	Compositae	Achillea sintenisii Hub.-Mo			B6	Sivas	Şarkışla	5 km.kuzey	Kayalık ve az de	T.Ekim, 5081	T.Ekim	
25799	Compositae	Centaurea drabifolia Sm.	detonsa (Borrm.)		B6	Sivas	Görün	10 km kala	Jipsli arazi, derir	T.Ekim, 8142	N.Adigüzel, 1985	
25041	Compositae	Gundelia tournefortii L.			B6	Sivas	Yıldızeli	5-7 km.arası	Step, jips anakaya	T.Ekim-A.Düzenli, 5356	T.Ekim-A.Düzenli	
23024	Compositae	Helichrysum noeanum Boiss			B4	Ankara		Ş.Koçhisar yolu, G	Jips dağları	H.Birand-8.Kasaphgil, 725	G.Sezik, 1976	
24682	Compositae	Tanacetum heterotomum (			B6	Malatya	Gürün	Darendeye 20 k	Jips anakaya, az	T.Ekim, 8149	N.Adigüzel, 1985	1500
30079	Convolvulaceae	Convolvulus compactus Bo			B3	Ankara	Sivrihisar	Afyon yolu, Aşa	Jipsli toprak	Y.Akman, 12998	Y.Akman	
3102	Cruciferae	Aethionema armenum Boiss			B6	Yozgat		Çayralan, Çukur	Anakaya jips	T.Ekim, 4800	T.Ekim	1500
3511	Cruciferae	Alyssum blebharocarpum f			B4	Ankara	Beypazarı		Jipsli tepelerde	Y.Akman, 8604	Y.Akman	1550
5010	Cruciferae	Chrysocamela noeana (Boi			B6	Sivas		Sivas-Yıldızeli ara	Jipsli anakaya, st	T.Ekim-R.Ilarislan, 5076	T.Ekim	1400
5011	Cruciferae	Chrysocamela noeana (Boi			B6	Sivas		Şarkışla'nın 5 km	Kayalık ve az de	T.Ekim, 5083	T.Ekim	
4762	Cruciferae	Erysimum thyrsoideum Boi	thyrsoideum		B6	Yozgat		Çayralan, Çukur	Anakaya jips	T.Ekim, 4648	T.Ekim	1500
4764	Cruciferae	Erysimum thyrsoideum Boi	thyrsoideum		B6	Sivas		Tağlıdere, Kayse	Jipsli arazi	Ş.Civelek	T.Ekim	1500
2815	Cruciferae	Isatis cappadocica Desv.	cappadocica		B6	Sivas	Şarkışla	Gemerek yolu, G	Anakaya jips	T.Ekim, 4958	T.Ekim	1300
39063	Euphorbiaceae	Euphorbia arvalis Boiss.& I			B6	Yozgat	Çayralan	Çukur-Taşlık ara	Jips anakaya	T.Ekim, 4649	T.Ekim	1500
39290	Euphorbiaceae	Euphorbia cheiradenia Boi			B6	Sivas	Şarkışla	5 km kuzeyi	Jips anakaya, Ka	T.Ekim, 5101	Ş.Yıldırım, 1985	
35264	Labiatae	Marrubium ansodon C.Ko			A3	Ankara	Beypazarı	Güdüllü Beypazarı	Jips anakaya üze	Y.Akman	Y.Akman	1550
35536	Labiatae	Sideritis libanotica Labill.			B5	Yozgat		Çayralan Çukur	Anakaya jips	T.Ekim	T.Ekim 1985	1500
16397	Leguminosae	Alhagi pseudalhagi (Bieb.)			A3	Ankara	Beypazarı	Güdüllü yol avrımı	Jips ana kaya	Y.Akman,8826	Y.Akman	

Sorgulanan Veriler: - Habitatjips



Sorgulanan Veriler: - Habitatjips



Sorgulanan Veriler: - Habitatjips

Figure 2. Database Program (search page, diagram of the families and distribution area)

Table 1. List of taxa belonging to plant samples growing in gypsiferous soils (600 m - 1600 m)

Family	Species	Square	Province
Boraginaceae	<i>Cerithe minor</i> L. subsp. <i>auriculata</i> (Ten.) Domac	B6	Yozgat (Çayıralan)
Boraginaceae	<i>Moltkia coerulea</i> Lehm.	B6	Sivas (Yıldızeli)
Boraginaceae	<i>Onosma polyanthum</i> DC.	B6	Sivas (Şarkışla)
Caryophyllaceae	<i>Minuartia anatolica</i> (Boiss.) Woron. var. <i>scleranthoides</i> (Boiss. & Noe) McNeill	B6	Sivas
Cistaceae	<i>Helianthemum germanicopolitanum</i> Bornm.	A4	Çankırı
Cistaceae	<i>Helianthemum nummularium</i> (L.) Mill. subsp. <i>lycaonicum</i> Coode & Cullen	A4	Çankırı
Compositae	<i>Achillea gypsicola</i> Hub.-Mor.	A4	Çankırı
Compositae	<i>Achillea sintenisii</i> Hub.-Mor.	B6	Sivas (Şarkışla)
Compositae	<i>Centaurea drabifolia</i> Sm. subsp. <i>detonsa</i> (Bornm.) Wagenitz	B6	Sivas (Gürün)
Compositae	<i>Gundelia tournefortii</i> L.	B6	Sivas (Yıldızeli)
Compositae	<i>Helichrysum noeantum</i> Boiss.	B4	Ankara
Compositae	<i>Tanacetum heterotomum</i> (Bornm.) Grierson	B6	Malatya (Gürün)
Convolvulaceae	<i>Convolvulus compactus</i> Boiss.	B3	Ankara (Sivrihisar)
Cruciferae	<i>Aethionema armenum</i> Boiss.	B6	Yozgat
Cruciferae	<i>Alyssum blebharocarpum</i> Dudley & Hub.-Mor.	B4	Ankara (Beypazarı)
Cruciferae	<i>Chrysocamela noeana</i> (Boiss.) Boiss.	B6	Sivas
Cruciferae	<i>Erysimum thyrsoideum</i> Boiss. subsp. <i>thyrsoideum</i>	B6	Yozgat, Sivas
Cruciferae	<i>Isatis cappadocica</i> Desv. subsp. <i>cappadocica</i>	B6	Sivas (Şarkışla)
Euphorbiaceae	<i>Euphorbia arvalis</i> Boiss.& Heldr.	B6	Yozgat (Çayıralan)
Euphorbiaceae	<i>Euphorbia cheiradenia</i> Boiss.& Hohen.	B6	Sivas (Şarkışla)
Labiatae	<i>Marrubium anisodon</i> C.Koch.	A3	Ankara (Beypazarı)
Labiatae	<i>Sideritis libanotica</i> Labill.	B5	Yozgat
Leguminosae	<i>Alhagi pseudalhagi</i> (Bieb.) Desv.	A3	Ankara (Beypazarı)
Leguminosae	<i>Astragalus onobrychis</i> L.	B5	Yozgat (Çayıralan)
Leguminosae	<i>Astragalus pennatulus</i> Hub.-Mor.& Chamb.	B6	Sivas
Leguminosae	<i>Medicago falcata</i> L.	B6	Sivas, Yozgat
Leguminosae	<i>Vicia cracca</i> L. subsp. <i>stenophylla</i> Vel.	B6	Yozgat (Çayıralan)
Papaveraceae	<i>Glaucium corniculatum</i> (L.) Rud. subsp. <i>refractum</i> (Nab.) Cullen	B6	Sivas
Papaveraceae	<i>Papaver fugax</i> Poiret var. <i>fugax</i>	B6	Yozgat
Papaveraceae	<i>Papaver rhoeas</i> L.	B6	Yozgat
Ranunculaceae	<i>Consolida orientalis</i> (Gay.) Schröd.	B5	Yozgat (Çayıralan)
Ranunculaceae	<i>Ranunculus cuneatus</i> Boiss.	B6	Sivas (Şarkışla)
Rosaceae	<i>Amygdalus orientalis</i> Miller.	B6	Sivas (Şarkışla)
Rubiaceae	<i>Callipeltis cucullaria</i> (L.) Steven	B6	Yozgat
Rubiaceae	<i>Galium humifusum</i> Bieb.	B6	Sivas
Scrophulariaceae	<i>Verbascum gypsicola</i> M.Vural & M.Aydoğdu	A3	Ankara (Beypazarı)
Scrophulariaceae	<i>Veronica pectinata</i> L.	B6	Yozgat (Çayıralan)
Umbelliferae	<i>Bupleurum rotundifolium</i> L.	B5	Yozgat (Çayıralan)
Umbelliferae	<i>Ferula szotwitsiana</i> DC.	B6	Sivas
Umbelliferae	<i>Ferulago pauciradiata</i> Boiss.& Heldr.	B6	Sivas
Umbelliferae	<i>Pimpinella cappadocica</i> Boiss. et Bal. var. <i>cappadocica</i>	B6	Yozgat (Çayıralan)
Umbelliferae	<i>Prangos meliocarpoides</i> Boiss. var. <i>meliocarpoides</i>	B6	Sivas
Umbelliferae	<i>Seseli tortuosum</i> L.	B6	Sivas

Table 2. Herbarium list of plant samples collected in 1980

Family	Species	Square	Province
Boraginaceae	<i>Cerinth minor</i> L. subsp. <i>auriculata</i> (Ten.) Domac	B6	Yozgat (Çayıralan)
Boraginaceae	<i>Onosma polyanthum</i> DC.	B6	Sivas (Sarkışla)
Caryophyllaceae	<i>Minuartia anatolica</i> (Boiss.) Woron. var. <i>scleranthoides</i> (Boiss. & Noe) McNeil	B6	Sivas
Compositae	<i>Achillea sintenisii</i> Hub.-Mor.	B6	Sivas (Sarkışla)
Cruciferae	<i>Aethionema armenum</i> Boiss.	B6	Yozgat
Cruciferae	<i>Chrysocamela noeana</i> (Boiss.) Boiss.	B6	Sivas
Cruciferae	<i>Erysimum thyrsoideum</i> Boiss. subsp. <i>thyrsoideum</i>	B6	Yozgat
Cruciferae	<i>Isatis cappadocica</i> Desv. subsp. <i>cappadocica</i>	B6	Sivas (Sarkışla)
Euphorbiaceae	<i>Euphorbia arvalis</i> Boiss.& Heldr.	B6	Yozgat (Çayıralan)
Euphorbiaceae	<i>Euphorbia cheiradenia</i> Boiss.& Hohen.	B6	Sivas (Sarkışla)
Labiatae	<i>Sideritis libanotica</i> Labill.	B5	Yozgat
Leguminosae	<i>Astragalus onobrychis</i> L.	B5	Yozgat (Çayıralan)
Leguminosae	<i>Medicago falcata</i> L.	B6	Yozgat
Leguminosae	<i>Vicia cracca</i> L. subsp. <i>stenophylla</i> Vel.	B6	Yozgat (Çayıralan)
Papaveraceae	<i>Glaucium corniculatum</i> (L.) Rud. subsp. <i>refractum</i> (Nab.) Cullen	B6	Sivas
Papaveraceae	<i>Papaver fugax</i> Poirer var. <i>fugax</i>	B6	Yozgat
Papaveraceae	<i>Papaver rhoeas</i> L.	B6	Yozgat
Ranunculaceae	<i>Consolida orientalis</i> (Gay.) Schröd.	B5	Yozgat (Çayıralan)
Ranunculaceae	<i>Ranunculus cuneatus</i> Boiss.	B6	Sivas (Sarkışla)
Rosaceae	<i>Amygdalus orientalis</i> Miller.	B6	Sivas (Sarkışla)
Rubiaceae	<i>Callipeltis cucullaria</i> (L.) Steven	B6	Yozgat
Scrophulariaceae	<i>Veronica pectinata</i> L.	B6	Yozgat (Çayıralan)
Umbelliferae	<i>Bupleurum rotundifolium</i> L.	B5	Yozgat (Çayıralan)
Umbelliferae	<i>Pimpinella cappadocica</i> Boiss. et Bal. var. <i>cappadocica</i>	B6	Yozgat (Çayıralan)

Table 3. Herbarium list of plant samples which is collected from 1500 m

Family	Species	Square	Province	Min (m)	Max (m)
Boraginaceae	<i>Cerinth minor</i> L. subsp. <i>auriculata</i> (Ten.) Domac	B6	Yozgat (Çayıralan)	1500	1600
Compositae	<i>Tanacetum heterotomum</i> (Bornm.) Grierson	B6	Malatya (Gürün)	1500	1600
Cruciferae	<i>Aethionema armenum</i> Boiss.	B6	Yozgat	1500	1600
Cruciferae	<i>Erysimum thyrsoideum</i> Boiss. subsp. <i>thyrsoideum</i>	B6	Yozgat	1500	1600
Cruciferae	<i>Erysimum thyrsoideum</i> Boiss. subsp. <i>thyrsoideum</i>	B6	Sivas	1500	1600
Euphorbiaceae	<i>Euphorbia arvalis</i> Boiss.& Heldr.	B6	Yozgat (Çayıralan)	1500	1600
Labiatae	<i>Sideritis libanotica</i> Labill.	B5	Yozgat	1500	1600
Leguminosae	<i>Medicago falcata</i> L.	B6	Yozgat	1500	1600
Leguminosae	<i>Vicia cracca</i> L. subsp. <i>stenophylla</i> Vel.	B6	Yozgat (Çayıralan)	1500	1600
Papaveraceae	<i>Papaver fugax</i> Poirer	B6	Yozgat	1500	1600
Papaveraceae	<i>Papaver rhoeas</i> L.	B6	Yozgat	1500	1600
Ranunculaceae	<i>Consolida orientalis</i> (Gay.) Schröd.	B5	Yozgat (Çayıralan)	1500	1600
Rubiaceae	<i>Callipeltis cucullaria</i> (L.) Steven	B6	Yozgat	1500	1600
Scrophulariaceae	<i>Veronica pectinata</i> L.	B6	Yozgat (Çayıralan)	1500	1600
Umbelliferae	<i>Bupleurum rotundifolium</i> L.	B5	Yozgat (Çayıralan)	1500	1600
Umbelliferae	<i>Pimpinella cappadocica</i> Boiss. et Bal.	B6	Yozgat (Çayıralan)	1500	1980

#### 4. Discussion and Conclusion

51 plant samples belonging to gypsumophilic plants were determined in herbarium. The samples are composed of 51 taxa belonging to 15 families and 38 genera. The distribution and number of taxa according to their families are given in Table 4 and Figure 3. A database of samples of the taxa has been created and various lists of taxa have been prepared. The order of the other data is as follows: Distribution of taxa by collection date (Figure 4), Distribution of taxa according to diagnosticians

(Figure 5), Distribution of taxa according to the square system (Figure 6). During herbarium studies, care has been taken to work without harming plant specimens. In addition to this, some of the cover and cardboard of the damaged samples in ANK have been changed, the labels on them have been renewed as appropriate and the plants in the cartons have been arranged according to their genus and species order. The photographs of the specimens were taken, various lists were prepared and protected under the ANK Herbarium to be offered to the researchers.

Table 4. Distribution and number of taxa according to family

<i>Families</i>	Taxa
<i>Rosaceae</i>	1
<i>Caryophyllaceae</i>	1
<i>Ranunculaceae</i>	2
<i>Labiatae</i>	2
<i>Rubiaceae</i>	2
<i>Scrophulariaceae</i>	2
<i>Cistaceae</i>	2
<i>Euphorbiaceae</i>	2
<i>Boraginaceae</i>	3
<i>Papaveraceae</i>	3
<i>Leguminosae</i>	6
<i>Compositae</i>	6
<i>Cruciferae</i>	7
<i>Umbelliferae</i>	11
<b>Total</b>	<b>51</b>

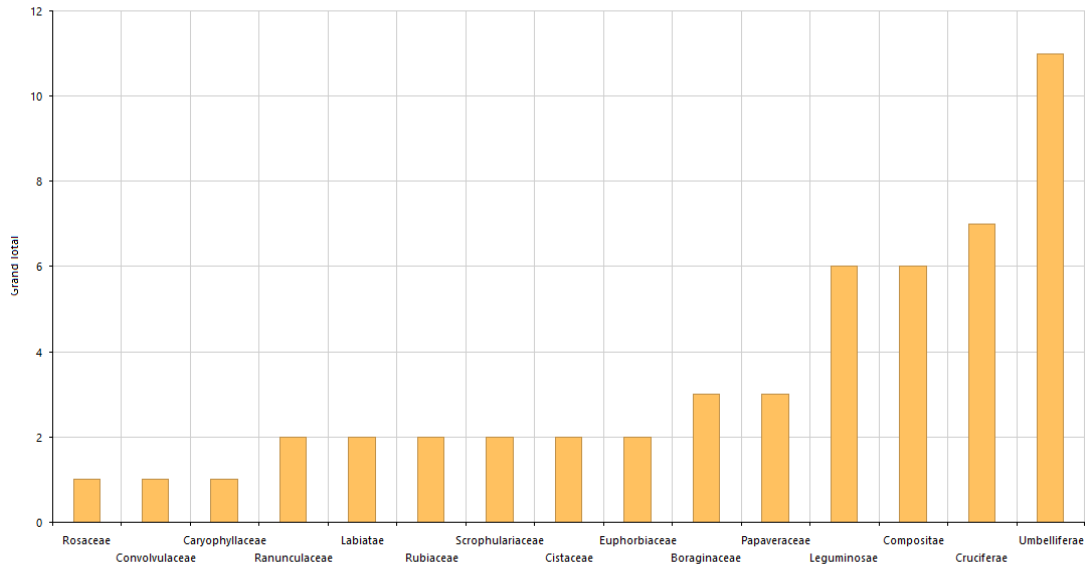


Figure 3. Distribution and number of taxa according to family

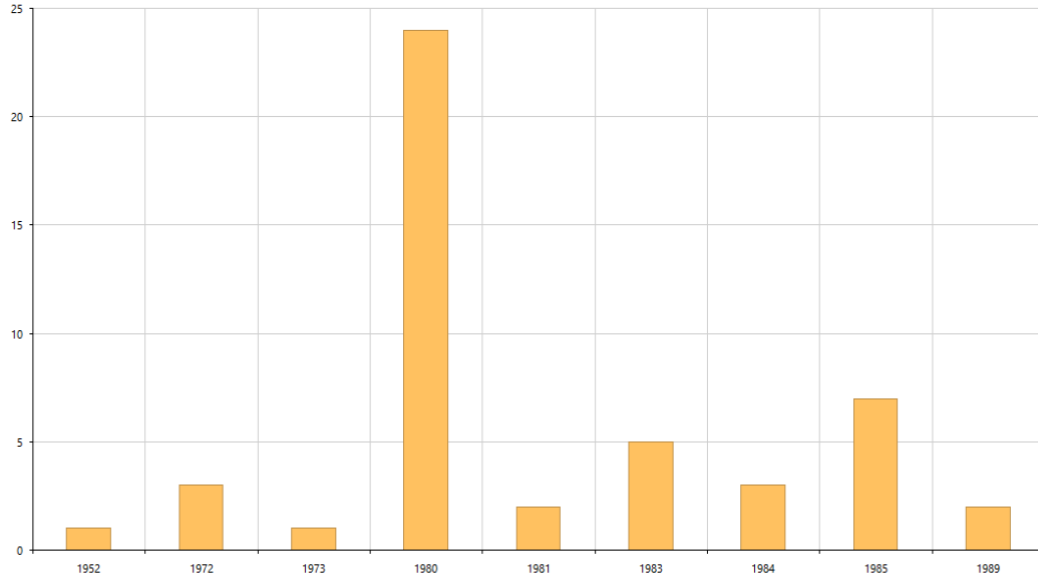


Figure 4. Distribution of taxa by collection date

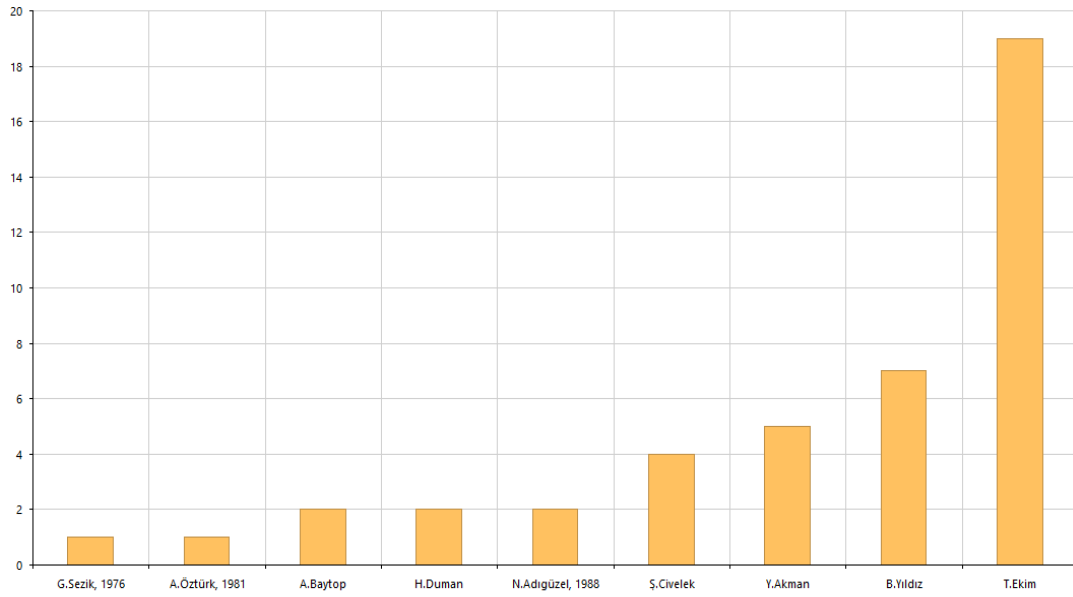


Figure 5. Distribution of taxa according to diagnosticians



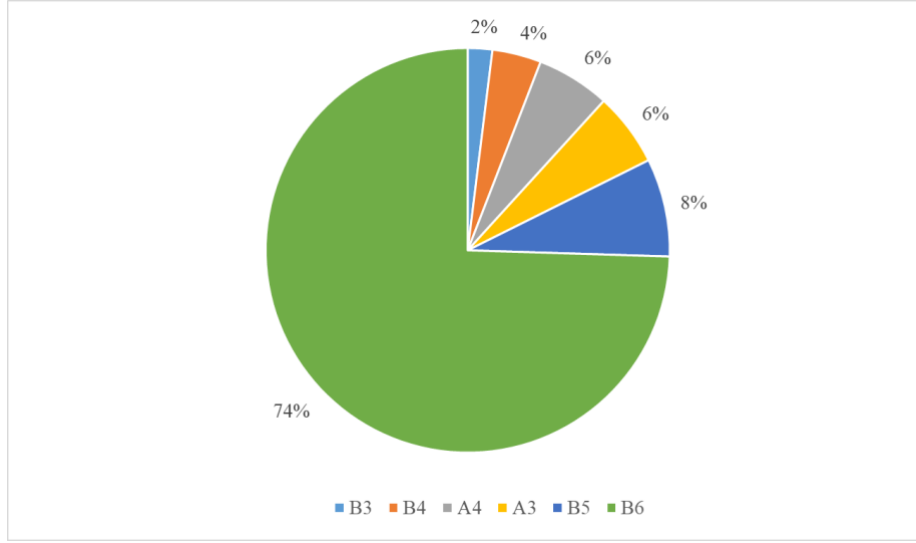


Figure 6. Distribution of taxa according to the square system

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