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## Synoptic View of the Steppe Vegetation of Central Anatolia (Turkey)

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**Abstract:** Ecological and syntaxonomical characteristics and the diagnostic species of syntaxa described from Central Anatolian steppe vegetation were brought out in the present study. All of the Central Anatolian steppe communities belong to the Astragalo-Brometea Class and the Onobrychido armenae-Thymetalia leucostomi order and its two suborders. Some further details studies show that the status of the alliance Astragalo karamasici-Gypsophyllion erioalycis which has been represented with three suballiances on the gypsaceous soils in vast part of Central Anatolia may be reviewed and recombined as a new order or suborder.

**Key words:** Synecology, steppe vegetation, central Anatolia, Turkey

### INTRODUCTION

Turkey is one of the richest and interesting country in the world in respect to its flora, as in other resources. The richness of the flora of a country can be measured with its number of plants and its floristic attraction can be measured with respect to the distribution of plants and the diversity of vegetation types. In both respects, Turkey is one of the most richest country in the world. The reasons why Turkey's flora is rich and interesting can be summarized as follows:

- Turkey is situated where the continents meet and where the migration route of plants passes through
- Climatological diversity (three different types of climate as Continental, Oceanic and Mediterranean)
- Topographical diversity
- Geological and geomorphological diversity
- Aquatic habitat diversity: sea, lake and river
- Attitudinal variation from sea level to 5000 m
- It's location at intersection points of three phytogeographical regions (Euro-Siberian, Irano-Turanian and Meditteranean)
- If Anatolian Diagonale which is a hypothetical line is accepted as a border, the ecological differences between west and east and its results in floristic diversity

As a result of these reasons, there are approximately 9000 flowering plants and various vegetation types in Turkey. If it is thought that there are 11000 flowering plants in European continent it can be said that Turkey exhibits a continental characteristic.

One of the most important vegetation type of Turkey is steppe which spreads particularly in Central Anatolia and extending towards east and south-east Anatolia. It also occupies high altitudes of Black sea and Taurus mountains.

In the present study, the syntaxonomic analysis of steppe formations of Central Anatolia have been carried out. Central Anatolian steppe developed as the result of destruction of primary forest vegetation by biotic factors (Uslu, 1970; Akman, 1974; Kilinc, 1976; Aytug, 1967, 1970; Inceoglu and Pehlivan, 1987). The steppe vegetation which is peripherically delimited by woody vegetation of the Anatolian territory has been exploited by men, especially thorough grazing and intensive agricultural activities, as in the most of the world.

Although Central Anatolian steppe shows a uniform physiognomy, it sometimes harbours trees and shrubs within it and hemicryptophytic grasses (*Bromus tomentellus* Boiss., *Festuca valesiaca* Schleicher ex Gaudin, *Koeleria cristata* (L.) Pers., *Stipa lessingiana* Trin. et Rupr., *S. holosericeus* Trin.) and cushion forming chamephytes (*Astragalus angustifolius* C. Koch., *A. microcephalus* Willd., *Onobrychis cornuta* (L.) Desv. etc.) are dominant due to its peculiar ecologies.

**Study area:** The steppe vegetation covering approximately all of the Central Anatolian territory extending from Ilgaz mountains at north to Taurus mountains at south and from Afyon at west to Anatolian Diagonale (Sivas environs) at east.

## STEPPE VEGETATION OF CENTRAL ANATOLIA

Steppe formations in Central Anatolia can be physiognomically gathered in groups:

- Malacophyll steppes: Steppes that broad-leaved plants dominate in. It is thought that they can be derived from Gramineae steppes as a result of over grazing at relatively moist conditions and deep soils.
- Gramineae steppe: Gramineae species are dominant and today it is very rare.
- Tragaganthic steppes: Steppes that cushion forming spiny species like *Astragalus* L. and *Acantholimon* Boiss. are dominant.
- Salty steppes: Steppes that species of Chenopodiaceae and Plumbaginaceae families are dominant and particularly occupies salt pans around Salt and Seyfe Lake.

Central Anatolian steppe vegetation also shows altitudinal variations. Therefore, steppe vegetation between 800-1200 m is called "plain steppe" and steppe vegetation above 1200 m is called "montane steppe".

## PHYTOGEOGRAPHICAL CHARACTERISTICS OF CENTRAL ANATOLIAN STEPPE VEGETATION

Central Anatolian region is within the borders of Irano-Turanian phytogeographical region.

In Turkey, regions where steppe vegetation are dominant are included in the Central Anatolia sector of West Asian subregion of Irano-Turanian region of Tethys subkingdom of Holarctic kingdom (Takhtajan, 1986).

Zohary (1973) separated Irano-Turanian region into four sectors in Turkey.

- East Anatolia high mountains
- Central Anatolia sector
- Southeast Anatolia sector
- Mesopotamia sector

Central Anatolia sector is divided into two parts according to the phytogeographical properties.

- Xero-Euxin zone: It surrounds the Central Anatolia and characterized with steppe-forest climax vegetation. This zone forms a transition belt between Euro-Siberian and Irano-Turanian regions from the ecological point of view and looks like Irano-Turanian steppe with randomly dispersed Euxin trees and shrubs in it.
- Inner parts differ from the other zone with respect to its floristic structure.

According to the recent studies (Takhtajan, 1986) study area considered in the following regions from phytogeographical point of view;

- West Asia sub-region
- Central Asia sub-region

West Asia sub-region is divided into 8 provinces:

- Mesopotamia
- Central Anatolia
- East Anatolia-Iran
- Turanian or Aralo-Caspian
- Hircanian
- Turkmenistan
- North Blucistan
- West Himalaya

The areas where the steppe vegetation is dominated are included in Central Anatolian region of West Asia sub-region in Irano-Turanian territory.

## SOILS OF CENTRAL ANATOLIA STEPPE

The most common soil types on which the steppe vegetation spreads in Central Anatolia are the ones derived from calcareous, marly, marly-gypsaceous and gypsaceous mother rocks. Due to the variation of the mother rock types in very short distances, the floristic composition of steppe varies as mosaics in short intervals.

## HISTORY OF CENTRAL ANATOLIAN STEPPE VEGETATION

Since the prehistorical times, the various civilizations settled in Anatolia have destructed the original vegetation type in Central Anatolia for the ages. Today, the woody vegetation previously dominated in Central Anatolia was replaced by steppe vegetation due to the heavy anthropogenic impacts, which have still been going on. During the successive change in the vegetation in past, the species of Mediterranean origin were altered with the ones originated from Irano-Turanian floristic region. Today the woody vegetation has peripherally surrounded, as relicts, the herbaceous plant cover in Central Anatolia.

There are 42 primary forest remnants around Anatolian province at Afyon-Eskişehir at west, Sivas at east, Çankırı at north and Konya at south (Uslu, 1970).

The most common trees seen at these remnant areas are *Pinus nigra* Arn. sp. *pallasiana* (Lamb.) Holmboe, *Quercus pubescens* Willd., *Q. robur* L. sp. *robur*,

*Q. ithaburensis* Decne. sp. *macrolepis* (Kotschy) Hedge et Yald., *Juniperus* sp. as *J. oxycedrus* L., *J. foetidissima* Willd., *J. excelsa* Bieb., *Pyrus eleagnifolia* Pallas, *Rhus coriaria* L., *Celtis tournefortii* Lam., *C. australis* L., *Sorbus umbellata* (Desf.) Fritsch subsp. *cretica* (Lindl) Schnieder, *Cistus laurifolius* L. and *Prunus domestica* L.

In Anatolian steppe, various plant communities evolve according to the physical and chemical characteristics of mother rock. The anthropogenic steppes in Anatolia form a mosaic structure. As the mother rock and soil type covering it change, the floristic structure of sociological units change. The endemism ratio at these communities is relatively high.

### CLIMATE OF STEPPE VEGETATION

The boundaries of the Central Anatolia are encircled by the mountains. The mean annual temperature of the most part of this region ranges from 12-8°C. The temperature is over 20°C during the summer. In most part of the Central Anatolia, the annual precipitation is below 400 mm; more than half of which falls during the winter and the spring. Water deficiency effectively occurs during the summer period.

From the bioclimatological point of view, steppe vegetation occupies the areas that have characterized with semi-arid and arid cold and very cold climate.

In Central Anatolian steppe, two major types of Mediterranean climate are dominated.

- Arid cold Mediterranean climate at south
- Semi-arid, cold and very cold Mediterranean climate at north.

Other variants of Mediterranean climate can be seen locally at the steppic areas.

### FLORISTIC CHARACTERISTICS OF CENTRAL ANATOLIAN STEPPE

The approximate, number of species only at Central Anatolia exceeds 2000. The plants of Mediterranean origin from Tertiary era are very rich at particularly northern parts of Central Anatolia. But at south where destruction increases and climate become more arid especially plants from *Chenopodiaceae* and *Plumbaginaceae* families of Irano-Turanian origin are more abundant.

Especially *Labiatae*, *Scrophulariaceae*, *Caryophyllaceae*, *Cruciferae*, *Boraginaceae*, *Cistaceae* and *Leguminosae* species are at majority in this steppe area.

As in high levels of Taurus mountains, Central Anatolian steppe is composed of cushion forming spiny chamaephytes (*Astragalus microcephalus*) and perennial

*Gramineae* (*Festuca valesiaca*). The cover ratio of these species is between 20-40%. The coverage of the plants growing on different mother rock and having a high endemism ratio is about 40-60%. But this ratio on especially protected areas reaches to 80-90%.

Endemism ratio at Central Anatolia is 30 % that is a very high value. *Phryna*, Pax et Hoff., *Cyathobasis* Aellen, *Kalidiopsis* Aellen, *Tchihatchewia* Boiss., *Sartoria* Boiss. Et Heldr. and *Crenosciadium* Boiss. are specified as endemic genera. The endemic species of Mediterranean and Irano-Turanian phytogeographical regions are mixed at Central Anatolian steppe but the influence of Irano-Turanian flora is particularly seen at halophytic vegetation of Salt Lake, Konya plain. However most of the endemic species at Central Anatolian area are originated from Mediterranean phytogeographical region. *Astragalus*, *Acantholimon*, *Gypsophila* L. and *Achillea* L. are the richest genera according to endemism ratio.

There are many endemic centers in Central Anatolia especially on gypsaceous and marly-gypsaceous soils. The most important ones are Çankiri, Sivas and Beyazari. Endemic species of these centers are especially *Thymus leucostomus* Hausskn. et Velen. subsp. *leucostomus*, *T. leucostomus* Hausskn. et Velen. subsp. *gypsaceus* Jalas, *T. leucostomus* Hausskn. et Velen. subsp. *argillaceus* Jalas, *Helianthemum germenicopolitanum*, *Achillea gypsicola*, *Gypsophila eriocalyx*, *Scabiosa pseudograminifolia*, *Astragalus pseudocaspicus* Fischer, *Verbascum gypsophila*. Besides *Salvia vermifolia* Hedge. Et Hub.-Mor. is the endemic species on serpentine and volcanic rocks of Sivas environs and the endemic species of cilicaceous mother rock at north and northwest Ankara is *Hypericum heterophyllum* Vent.

Irano-Turanian and East Mediterranean floras influence the endemic flora of Central Anatolia. Before the influence of Irano-Turanian flora on Central Anatolia it had a typical Mediterranean flora (Takhtajan, 1986). Today, for this reason there is a markedly change in Central Anatolia in respect to plant geography and Irano-Turanian species has been taking place of Mediterranean ones.

### SYNTAXONOMIC UNITS OF CENTRAL ANATOLIAN STEPPE

(The distribution of the alliances described in Central anatolian steppe vegetation are roughly outlined on Fig. 1).

Class: Astragalo-Brometea (Quézel, 1973)

Order: Onobrychido Armenae-Thymetalia leucostomi Akman, Ketenoğlu, Quézel 1985 (Akman *et al.*, 1985)

Spreads at inner parts of Central Anatolia and its surroundings. Shows "plain steppe" characteristics. Rich in endemic species.

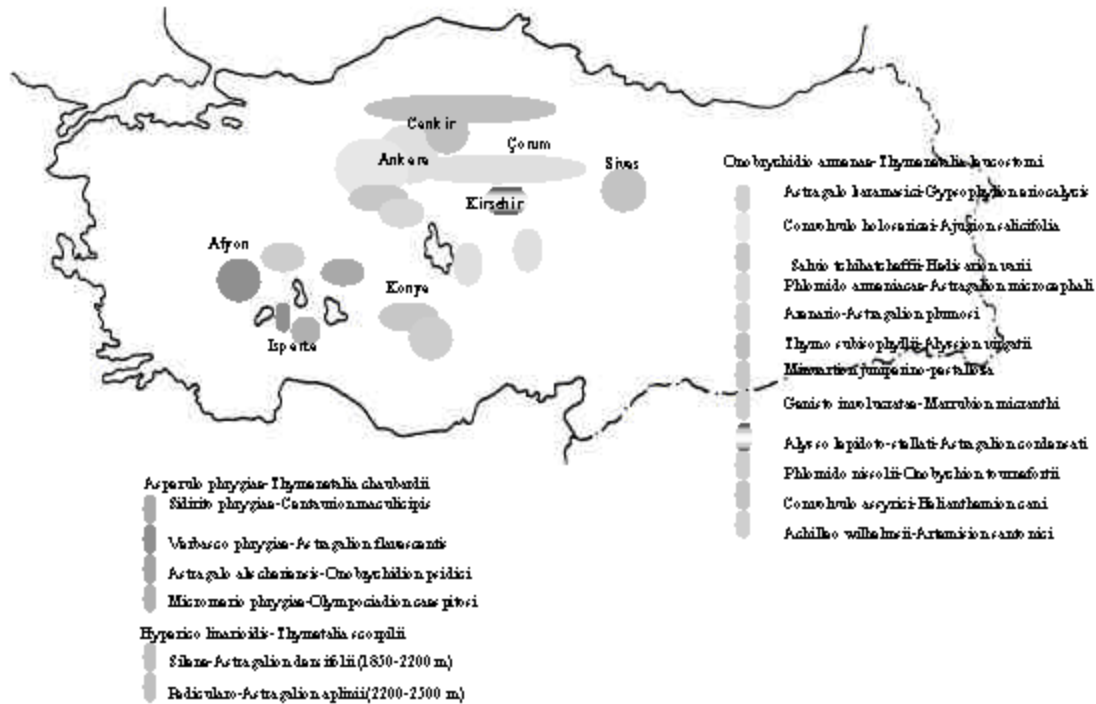


Fig. 1: Distributions of syntaxonomic units of Central Anatolian steppe vegetation

Suborder: Onorychido armenae-Thymenetalia leucostomi Akman, Quézel, Barbero, Ketenoglu, Aydogdu 1991 (Akman *et al.*, 1991)

In Central Anatolia has a homogeneous structure. Spreads at Ankara, Haymana, Polatli, Sivrihisar, Gömül (Afyon), Çankiri and Kirsehir environs between 800 and 1200 m on marly and marly-gypsaceous and gypsaceous deep and rather deep soils and has a “plain characteristics”. This suborder has been represented with 11 Alliance in Central Anatolia.

**Alliance:** Astragalus karamasici-Gypsophyilion eriocalycis Ketenoglu, Quézel, Akman, Aydogdu 1983 (Ketenoglu *et al.*, 1983).

Locality, North-west of Ankara, Çankiri environs

Mother rock; Gypsaceous

Altitude; 600-850 m

Diagnostic species; *Centaurea patula* DC., *Allium flavum* L. subsp. *tauricum* (Besser ex Reichb.) Stearn var. *tauricum*, *Gypsophila eriocalyx* Boiss., *G. parva* Bark, *Eupleurum boissieri* Post., *Astragalus karamasicus* Boiss. et Ball., *Thymus leucostomus* var. *gypsaceus*, *Linum mucronatum* Bertol subsp. *gypsicola* Davis *gypsicola*

Suballiance: Artemision santonicii Ketenoglu, Quézel, Akman, Aydogdu 1983 (Ketenoglu *et al.*, 1983)

*Asperulion bornmuelleri* Ketenoglu, Quézel, Akman, Aydogdu 1983 (Ketenoglu *et al.*, 1983)

*Helichryso-thymenion cappadoci* Ketenoglu, Aydogdu, Kurt, Akman, Hamzaoglu 2000 (Ketenoglu *et al.*, 2000)

**Alliance:** Convolvulo holosericeae-Ajugion salicifolia Akman, Ketenoglu, Quézel, Demirors 1984 (Akman *et al.*, 1984).

Locality, West of Ankara, Ayaş, Temelli Polatli and Beyazari environs

Mother rock; Marly and marly-gypsaceous, slope 5-8%

Altitude; 650-1150 m

Diagnostic species; *Convolvulus holosericeus* Bieb. subsp. *holosericeus*, *Ajuga salicifolia* (L.) Schreber, *Euphorbia macroclada* Boiss., *Linum flavum* L. subsp. *scabrinerve* (Davis) Davis, *Galium verum* L. *verum*.

Suballiance; *Ebeno hirsutae-thymenion leucostomi* Akman, Ketenoglu, Quézel, Demirors 1984 (Akman *et al.*, 1984)

**Alliance:** *Salvia tchihatcheffii-Hedysarion varii* Akman, Ketenoglu, Quézel,

Demirors 1984 (Akman *et al.*, 1984)

Locality, South-west of Ankara, Haymana environs

Mother rock; Marly

Altitude; 800-1250 m, slope 60%  
Diagnostic species; *Salvia tchihatcheffi* (Fisch. Et Meyr.) Boiss., *Hedysarum varium*, *Linum hirsutum* L. subsp. *anatolicum* (Boiss.) Hayek var. *anatolicum*, *Helianthemum nummularium*, *Asyneuma limonifolium*

**Alliance:** Phlomido armeniaca-Astragalion microcephali Akman, Ketenoglu, Quézel, Demirors 1984 (Akman *et al.*, 1984)  
Locality; South-west of Ankara, Beynam-Bala environs and west of Ankara at Ayaş Mountains  
Mother rock; Radiolarite, flysch, marly and serpentine  
Altitude; 750-1300m, slope 10-30%  
Diagnostic species; *Phlomis armeniaca* Willd., *Astragalus microcephalus*, *Teucrium chamaedrys* L. *chamaedrys*, *Marrubium parviflorum* Fisch. Et Meyr. subsp. *oligodon* Boiss.  
Suballiance; Astragalion fycii Akman, Ketenoglu, Quézel, Demirors 1984 (Akman *et al.*, 1984)

**Alliance:** Arenario-Astragalion plumosi Akman 1990 (Akman, 1990)  
Locality; 30-40 km north of Ankara, Cubuk, Karagol and Aydos Mountains  
Mother rock; Cilicaceous (desite-andesite)  
Altitude; 1300-1800 m  
Diagnostic species; *Astragalus plumosus* Willd. subsp. *plumosus*, *Arenaria ledebouriana* subsp. *ledebouriana*, *Galium verum* L. subsp. *glabrescens* Ehrend, *Stachys iberica* Bieb. subsp. *stenostachya* (Boiss.) Rech. Fil, *Sideritis germanicopolitana* Bornm. subsp. *germanicopolitana*

**Alliance:** Thymo subisophyllii-Alysson virgatii Akman, Quézel, Aydogdu, Ketenoglu, Kurt, Evren, 1994 (Akman *et al.*, 1994)  
Locality; North-east of Çankiri, Yaprakli Mountains  
Mother rock; Calcareous, phyllite and serpentine  
Altitude; 1400-1800 m  
Diagnostic species; *Thymus longicaulis* C. Presl. subsp. *longicaulis* var. *subisophyllus* (Borbas) Jalas, *Alyssum virgatum* Nyar., *Astragalus leucothrix* Freyn. et Bornm., *A. plumosus* subsp. *nitens*, *Helichrysum arenarium* subsp. *aucheri*, *Erysimum thyrsoideum* subsp. *thyrsoideum*, *Paronychia beauverdii* Checz., *Silene olympica*

**Alliance:** Minuartion juniperino-pestallozae Ketenoglu, Serin, Kurt, Akman 1996 (Ketenoglu *et al.*, 1996)  
Locality; South of Konya at Hacibaba Mountain  
Mother rock; Calcareous  
Altitude; 2000-2350 m, slope 20-40%  
Diagnostic species; *Minuartia juniperina* (L.) Marie et Petitm, *M. pestallozae* (Boiss.) Bornm., *Astragalus angustifolius* Lam. subsp. *angustifolius*, *Marrubium*

*globosum* Montbret et Aucher ex Bentham subsp. *micranthum* (Boiss. et Heldr.) P. H. Davis, *Silene pharnaceifolia* Fenzl., *Dianthus zederbaueri* Vierh., *Poa alpina* L. subsp. *fallax* F. Hermann, *Centaurea mucronifera* DC., *Veronica cuneifolia* D. Don subsp. *isaurica* P.H. Davis, *Paronychia davisii* Chaudhri.

**Alliance:** Genisto involucratae-Marrubion micranthi Akman, Vural, Quézel, Kurt, Ketenoglu, Serin, Barbero 1996 (Akman *et al.*, 1996)  
Locality; South of Central Anatolia at Karaman and Ermenek environs  
Mother rock; Calcareous and marly-calcareous  
Altitude; 1600-1700 m  
Diagnostic species; *Marrubium globosum* subsp. *micranthum*, *Arenaria ledebouriana* subsp. *parviflora*, *Paronychia argyroloba* Stapf., *Astragalus acicularis* Bunge, *Genista involucrata*, *Causinia ermenekensis*.

**Alliance:** Alyso lepidoto-stellati-Astragalion condensati Aydogdu, Ketenoglu, Hamzaoglu 1999 (Aydogdu *et al.*, 1999)  
Locality; Kargasekmez, Kervansaray, Naldoken (Kirsehir) Mountains  
Mother rock; Calcareous  
Altitude; 1300-1600 m  
Diagnostic species; *Astragalus condensatus* Ledeb., *A. micropterus* Fischer, *A. densifolius* Lam., *Alyssum lepidostellatum* (Hausskn. et Bornm.) Dudley, *Euphorbia anacampseros* Boiss. var. *anacampseros*, *Salvia modesta* Boiss., *Verbascum vulcanicum* var. *vulcanicum*, *Minuartia anatolica* (Boiss.) Woron. var. *arachnoidae* McNeill, *Anchonium helichrysifolium* subsp. *canescens*, *Sideritis galatica* Bornm., *Salvia blepharochlaena* Hedge et Mub.-Mor., *Centaurea paphlagonica* (Bornm.) Wagenitz.

**Alliance:** Phlomido nissolii-Onobrychion tournefortii Kurt 2002 (Kurt, 2002)  
Locality; South-west of Afyon Emir Mountains at Bolvadin, Çay, Senirkent and Uluborlu environs  
Mother rock; Calcareous and marly  
Altitude; 900-1000 m  
Diagnostic species; *Hypericum avicularifolium* Jaubb. et Spach. subsp. *depilatum* (Freyn et Bornm.) var. *depilatum*, *Phlomis nissolii* L., *Onobrychis tournefortii* (Willd.) Desv., *Eryngium bithynicum*

**Alliance:** Achilleo wilhelmsii-Artemision santonici Aydogdu, Kurt, Hamzaoglu, Ketenoglu, Cansaran 2004 (Aydogdu *et al.*, 2004)  
Locality; Tuz Lake and Seyfe Lake  
Mother rock; Salty soils, salty steppe  
Altitude; 960-1000 m.  
Diagnostic species; *Artemisia santonicum*, *Achillea*

*wilhelmsii*, *Allium pseudoflavum* Vved., *A. scabriflorum* Boiss., *Krascheninnikovia ceratoides* (L.) Guldenst., *Reaumuria alternifolia* (Lab.) Britten., *Alyssum blepharocarpum* Dudley et Hub.-Mor., *Acantholimon halophilum* Bokhari *Anthemis fumariifolia* Boiss., *Verbascum helianthemoides*

Sub Order: Asperulo phrygiae-Thymenitalia chaubardii Akman, Quézel, Barbero, Ketenoglu, Aydogdu 1991 (Akman *et al.*, 1991)

In Central Anatolia, spreads at high altitudes between 1300-1400 and 2000 m. Includes four alliance.

**Alliance:** Sidirito phrygiae-Centaurion maculicipis Akman, Quézel, Barbero, Ketenoglu, Aydogdu 1991 (Akman *et al.*, 1991)

Locality; Sultan Mountains (Aksehir)

Mother rock; Phyllite, Calcareous

Altitude; 1200-2200 m

Diagnostic species; *Asperula nitida* subsp. *hirtella*, *Astragalus strictispinis* Boiss., *A. wiedemannianus* Fischer, *Aubrieta anamasica*, *Bolanthus frankenioides* var. *fasciculatus*, *Centaurea cariensis* Boiss. var. *maculiceps* (O. Schwarz) Wagenitz, *Helictotrichon pubescens* subsp. *longipes*, *Minuartia anatolica* (Boiss.) Woron. subsp. *anatolica*, *M. Leucocephala* (Boiss.) Mattf., *Sideritis phrygia* Bornm., *Verbascum cherianthifolium* subsp. *heldreichii*. All of the characteristic species are endemic.

**Alliance:** Verbasco phrygiae-Astragalion flavescens Akman, Quézel, Barbero,

Ketenoglu, Aydogdu 1991 (Akman *et al.*, 1991)

Locality; Kumalar Mountain (Afyon, Sandikli-Dinar)

Mother rock; Desite and andesite

Altitude; 1200-2300 m

Diagnostic species; *Astragalus flavescens* Boiss., *Euphorbia anacamprecos* subsp. *anacamprecos*, *Sideritis condensata* Boiss. et Heldr. Apud Bentham, *Verbascum crausianum*, *V. phryginum*

**Alliance:** Astragalo akscheriensis-Onobrychidion psidici Akman, Quézel, Barbero, Ketenoglu, Aydogdu 1991 (Akman *et al.*, 1991)

Locality; Karadag (Isparta)

Mother rock; Volcanic

Altitude; 1300-2300 m

Diagnostic species; *Astragalus akscheriensis*, *Chamaecytisus drepanolobus*, *Hieracium patentissimum*, *Onobrychis pisidica* Boiss., *Sideritis pisidica* Boiss. et Heldr. Apud Bentham, *Saponaria chlorifolia*. This alliance harbours 805 endemic species.

**Alliance:** Micromerio phrygiae-Olymposciadion caespitosi Akman, Quézel, Barbero, Ketenoglu, Aydogdu 1991 (Akman *et al.*, 1991)

Locality; Kapi Mountain and Barla Mountain

Mother rock; Calcareous

Altitude; 1950-2250 m

Diagnostic species; *Cyclotrichium origanifolium* (Labill.) Manden. et Scheng., *Festuca jeanpertii* (St.-Yves) F. Markgraff apud Hayek subsp. *jeanpertii*, *Micromeria cristata* (Hampe) Griseb. subsp. *phrygia* P.H. Davis, *Olymposciadium caespitosum* (SM.) Wolff., *Silene caryophylloides* (Poiret) Oth. subsp. *eglandulosa* (Chowdh.) Coode et Cullen.

Order: Hyperico linarioidis-Thymetalia scorpii Akman, Quézel, Yurdakulol, Ketenoglu, Demirors 1987 (Akman *et al.*, 1987)

Spreads on siliceous mother rocks above timber line of Ilgaz Mountains at north of Central Anatolia.

**Alliance:** Silene-Astragalion densifolii Akman, Quézel, Yurdakulol, Ketenoglu, Demirors 1987 (Akman *et al.*, 1987)

Locality; Ilgaz Mountains

Mother rock; Eroded soils

Altitude; 1850-2200 m

Diagnostic species; *Silene olympica* Boiss., *Astragalus densifolius* Lam., *Onobrychis montana* DC. subsp. *cadmea* (Boiss.) P.V.Ball., *Anthemis tinctoria* L. subsp. *pallida* DC., *Ranunculus dissectus* subsp. *sibthorpii*, *Eryssimum pulchellum* (Willd.) Gay, *Stachys cretica* L. subsp. *anatolica* Rech. Fil., *Muscari aucheri*, *Minuartia hirsuta* (Bieb.) Hand-Mazz. subsp. *falcata* (Griss.) Mattf., *Nepeta nuda* L. subsp. *albiflora* (Boiss.) Gams.

Suballiance; Globulario cordifolii-Dianthenion leucophali Akman, Quézel, Barbero, Aydogdu, Demirors, Ekim 1988 (Akman *et al.*, 1988)

**Alliance:** Pedicularo-Astragalion alpinii Akman, Quézel, Yurdakulol, Ketenoglu, Demirors 1987 (Akman *et al.*, 1987)

Locality; Ilgaz Mountains

Mother rock; Eroded soils

Altitude; 2200-2500 m

Diagnostic species; *Pedicularis comosa* L. subsp. *sibthorpii* (Boiss.) Boiss., *Aster alpinus* L., *Galium album* Miller subsp. *prunense* (C.Koch) Ehrend. Et Krendl, *Jasione supina* Sieber, *Gentiana septemfida* Pallas, *Myosotis alpestris* F.W. Schmidt. subsp. *alpestris*.

## DISCUSSION

The synecological studies in Turkey dates back to 1930's although the great interest of Turkey botanists has recently increased. In last 20 years attentions were focused on the sylvatic vegetation along with the steppe and dunes. Turkey has not have her own vegetation map and identification keys for syntaxa yet although

accumulation of the data obtained from syntaxonomical studies. This study is one of the successive study on preparation for Turkey's vegetation map.

Ecological and syntaxonomical characteristics and the diagnostic species of syntaxa described from Central Anatolian steppe vegetation were brought out in the present study. All of the Central Anatolian steppe communities belong to the Astragalo-Brometea Class and the Onobrychido armenae-Thymetalia leucostomi order and its two suborders. Some further details studies show that the status of the alliance Astragalo karamasici-Gypsophyllion ericalycis which has been represented with three suballiances on the gypsaceous soils in vast part of Central Anatolia may be reviewed and recombined as a new order or suborder.

### REFERENCES

- Akman, Y., 1974. Evolution régressive de la végétation a étage du *Pinus nigra* ssp. *pallasiana* dans l'Anatolie Centrale dans un climat méditerranéen semi aride très froid. Comm. de la rac. des Sc. d'Ank. Serie C, Tome, pp: C18.
- Akman, Y., O. Ketenoglu, P. Quézel and M. Demirors, 1984. A syntaxanomic study of steppe vegetation in Central Anatolia. Phytocoenologia, 12: 563-584.
- Akman, Y., O. Ketenoglu and P. Quézel, 1985. A new syntaxa from Central Anatolia. Ecol. Mediterranea, 11: 111-121.
- Akman, Y., P. Quezel, E. Yurdakulol, O. Ketenoglu and M. Demirors, 1987. La végétation des hautes sommets de l'Ilgaz dağ. Ecol. Mediterranea, 13: 119-129.
- Akman, Y., P. Quezel, M. Barbero, M. Aydogdu, M. Demirors and T. Ekim, 1988. La vegetation du Keltepe (region de Karabük), Ecol. Mediterranea, 14.
- Akman, Y., 1990. Etude de la végétation steppique des montagnes d'Aydos située au nord-ouest d'Ankara. Ecol. Mediterranea. Marseille, France, pp: 223-230.
- Akman, Y., P. Quezel, M. Barbero, O. Ketenoglu, and M. Aydogdu, 1991. La végétation des steppes peleuses écorchées et de xérophytes épineux de l'Antitaurus dans la partie sud-ouest de l' Anatolia. Phytocoenologia, 19: 391-428.
- Akman, Y., P. Quézel, M. Aydogdu, O. Ketenoglu, L. Kurt and H. Evren, 1994. A phytosociological research on the steppe vegetation of the yaprakli mountains (Cankiri/Turkey). Ecol. Mediterranea, 20: 1-7.
- Akman, Y., M. Vural, P. Quezel, L. Kurt, O. Ketenoglu, M. Serin and M. Barbero, 1996. Etude de la Végétation Steppique de la Région de Karaman et Ermenek au sud d'Anatolie Centrale. Ecologia Mediterranea, 22: 1-20.
- Aydogdu, M., O. Ketenoglu and E. Hamzaoglu, 1999. New syntaxa from Cappadocia (Kirşehir-Türkiye). Israel J. Plant Sci., 47: 123-129.
- Aydogdu, M., L. Kurt, E. Hamzaoglu, O. Ketenoglu and A. Cansaran, 2004. Phytosociological studies on salty steppe communities of the Central Anatolia, Turkey. Israel J. Plant Sci., 25: 71-79.
- Aytug, B., 1967. Investigation of Neolithic flora around Konya-Suberde. Istanbul Universitesi Orman Fakultesi Dergisi, 27: 98-110 (in Turkish).
- Aytug, B., 1970. Central Anatolian steppe : In the light of archeological studies. Istanbul Universitesi Orman Fakultesi Dergisi, (in Turkish). 20: 127-143.
- Inceoglu, O. and S. Pehlivan, 1987. A palynological research on quaternary layers of Tuz Golu in Central Anatolia. Doğa TU Botanik Dergisi, (in Turkish). 11: 56-86.
- Ketenoglu, O., P. Quézel, Y. Akman and M. Aydogdu, 1983. New syntaxa on the gypsaceous formation in the central Anatolia. Ecologia Mediterranea, 9: 211-221.
- Ketenoglu, O., M. Serin, Y. Akman, M. Aydogdu and L. Kurt, 1996. A new Alliance from Central Anatolia Minuartion juniperino-pestalozzae. Doga Turkish J. Bot., 20: 457-464.
- Ketenoglu, O., M. Aydogdu, L. Kurt, Y. Akman and E. Hamzaoglu, 2000. A Syntaxonomic study on the gypsicole vegetation in cappadocia, Turkey, Israel. J. Plant Sci., 48: 121-128.
- Kilinc, M., 1976. Destruction of Central Anatolian vegetation through historical ages: Human impact. Bitki, 3: 299-307 (in Turkish).
- Kurt, L., 2002. The Steppe Vejetation of Emirdağ (Afyon/Turkey). Anadolu Üniversitesi Bilim ve Teknoloji Degisi, 3: 257-270.
- Quezel, P., 1973. Contribution a l'étude phytosociologique du massif du Taurus. Phytocoenologia, 1: 131-222.
- Takhtajan, A., 1986. Floristic regions of the world. Univ. of California Pres, Los Angles.
- Uslu, S., 1970. Deforestation problem of Central Anatolia. Istanbul Üniversitesi Orman Fakültesi Dergisi , 20: 8-14 (in Turkish).
- Zohary, M., 1973. Geobotanical Foundations of the Middle East, Vol. I-II. Gustav Fischer.