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General Characteristics of Flora and Vegetation Formations of Eastern Anatolia Region and Its Environs (Türkiye)

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ABSTRACT: Eastern Anatolia and its environs are included in the Irano-Turanian phytogeographical region of Türkiye. The region abounds in highest mountain ranges (average 1900 m) of the country some of which are of quarternary age and volcanic character. Many rivers of historical and international importance like Euphrates, Dicle, Murat, Karasu and Aras. Tigris, Aras and Çoruh flow through the region. It experiencens a typical continental climate. Soils are generally of alluvial, colluvial, chestnut-brown, regosal and basaltic types. The area embodies over 8 million ha of meadows and grasslands which is 41% of Türkiye's total pasturelands as such cattle raising is very high in this area. Forest vegetation is represented mainly by ***Pinus sylvestris, Quercus libani, Q. longipes, Q. brantii, Q. macranthera, Juniperus excelsa*** and ***Betula pendula.*** Most of these are highly degraded. Plant cover is rich in Irano - Turanian elements but we find Mediterranean and Euro-Siberian elements too to some extent, richest families being Asteraceae, Fabaceae and Poaceae, Lamiaceae, Caryophyllaceae and Apiaceae richest genera being ***Astragalus, Verbascum, Centaurea, Ranunculus, Alyssum, Vicia, Silene, Dianthus, Veronica*** and ***Trifolium.*** The number of endemics is very high, being around 950. And also the region has gene centers of genera ***Astragalus, Gypsophila, Cousinia***, ***Acanthophyllum*** etc. The some typical associations one comes across in this area are; *Triseto-Pinetum sylvestris, Trifolio-Pinetum sylvestris, Ballato-Rhamnetum pallasii, Caragano-Minuartietum lineatea, Hippophaetum rhamnoidis, Typho-Juncetum inflecii, Hordeetum violaceumii, Deschampsio-Ranunculetum brachylobus, Hordeeto-Ranunculetum comosae* and *Polygon-Primuletum auriculatae.* Dominantly vegetation of the region is steppe. The are a lot of natural plant taxa using local people.

Key Words: Eastern Anatolia, Flora, Vegetation, Biodiversity, Geobotany, Endemism, Türkiye.

Doğu Anadolu Bölgesi ve Çevresinin Flora ve Vejetasyon Formasyonlarının Genel Özellikleri

ÖZET: Doğu Anadolu bölgesi ve çevresi Türkiye'nin İran-Turan bölgesinde yer alır. Ülkenin yüksek dağlık bölge silsilesinde (ortalama 1900 m) yer alan bölge Quaterner yaşlı ve volkanik karakterlidir. Fırat, Dicle, Karasu, Aras ve Çoruh gibi tarihi ve uluslararsı öneme haiz çoğu ırmak bölge boyunca akar. Bölge tipik kontinental iklim özelliği taşır. Toprakları genellikle allüviyal, kolluviyal, kestane-kahverengi, regosol ve bazalttır. Alan, 8 milyon ha'ın üzerinde çayır ve otlaklara sahiptir. Bu alan Türkiye toplam çayır ve otlaklarının yaklaşık % 41'ini teşkil eder. Sığır üretimi bölgede giderek yükseliyor. Orman vejetasyonu esas itibariyle ***Pinus sylvestris, Quercus libani, Q. longipes, Q. brantii, Q. macranthera, Juniperus excelsa*** ve ***Betula pendula***'dır. Ormanlık alanların çoğu tahrip edilmiştir. Bitki örtüsü İran-Turan elementleri bakımından çok zengindir. Fakat biz Akdeniz ve Avrupa-Sibirya elementleri açısından da bir dereceye kadar zengin bulduk. Bölgedeki takson sayısı bakımından en zengin familyalar; Asteraceae, Fabaceae, Poaceae, Lamiaceae, Caryophyllaceae ve Apiaceae; en zengin cinsler ise ***Astragalus, Verbascum, Centaurea, Ranunculus, Alyssum, Vicia, Silene, Dianthus, Veronica*** ve ***Trifolium***'dur. Endemiklerin sayısı çok yüksektir, yaklaşık 950. Aynı zamanda bölge ***Astragalus, Gypsophila, Cousinia*** and ***Acanthophyllum*** gibi cinslerin gen merkezidir. Bölgenin vejetasyonunda hakim tipik bazı birlikler; *Triseto-Pinetum sylvestris, Trifolio-Pinetum sylvestris, Ballato-Rhamnetum pallasii, Caragano-Minuartietum lineatea, Hippophaetum rhamnoidis, Typho-Juncetum inflecii, Hordeetum violaceumii, Deschampsio-Ranunculetum brachylobus, Hordeeto - Ranunculetum comosae* and *Polygon-Primuletum auriculatae* vs.dir. Hakim vejetasyonu

steptir. Yerli halkın kullandığı çok sayıda doğal bitki türü vardır.

Anahtar kelimeler: Doğu Anadolu, Flora, Vejetasyon, Biyoçeşitlilik, Jeobotanik, Endemizm, Türkiye.

1. Introduction: Researching area called as East Anatolian region and it covers Malatya, Muş, Elazığ, Bingöl, Tunceli, Erzincan, Erzurum, Kars, Iğdır, Ardahan, Ağrı, Bitlis, Van and Hakkari vilayets of Türkiye. It occupies a transitional position between three continents, being divided into three phytogeographical regions; the **Mediterranean, Euro-Siberian** and **Irano-Turanian (Table 1).** The area and its environs is included in the **Irano-Turanian** region with an area of about 164 000 km²(21,0 % of Türkiye). The so-called "**Anatolian Diagonal**; extending from the Anti-Taurus region north east wards to Suşehri (Sivas); divides the Irano-Turanian part forming the western boundry of researching area which is a high plateau and mountainous, most of it lying above an altitude of 1700 m. The important mountains rising above the plateau are Ağrı (5165 m), Sübhan (4434 m), Erek (3250 m) and Nemrut (3030 m), all of which are of quarternary volcanic origin **[1]**. Munzur mountains (3449 m) are dominated by ophiolites of upper cretaceous-paleocene whereas mountain Cilo (4168 m) is dolomitic. Allahuekber (3120 m), Palandöken (31256 m), Gâvur (3313 m), Kop (2409 m) and Kargapazarı (3132 m) are other notable mountains found in the area. Allahuekber embodies stratigraphic series of cretaceous, eocene and neojen, however more than 3/4 of its area is covered by acidic and basic volcanic deposits of neojen age. Palandöken is mainly composed of ophiolites and magmatic andesite tuffs of tertiary age mixed up with a little of pliocene sediments as well as serpentine formations. Gâvur mountains(in Gümüşhane-Erzurum zone) show series of sediments form mesozoic, coenazoic and quarternary periods which in general is conglomerate sand stone, represented by silty- stony deposits in between, together with volcanic deposits of trachit and andesite of eocene-oligocene age. The region is bounded on the South by the lower plateau of Mesopotamia, characterised by low-rounded hills varying in altitude from 400 to 800 m, except for the broad basaltic hump of Karacadağ (1919 m). Saline habitats are commonly observed on the alluvial deposits at the base of mount Ağrı, which are the westward extensions of similar habitats found along the Caspian Sea; reaching here via Aras Valley. Most important rivers in the region are Euphrates, Dicle, Murat, Zap and extensions of Tigris, Aras, and Çoruh; entering Basra Bay, Caspian Sea, and Black Sea respectively. Major plains are in vilayets Erzurum, Erzincan and Iğdır.

2. Climate: The area investigated during the present survey exists at a place where different types of climates intercross and mix up, but in general climate is characterised by long and harsh cold winters. From north to south and east to west temperatures increase gradually. Summer rains are excessive than winter ones particularly in the northeast around the vilayets of Erzurum and Kars. Hotest month here is August with a mean maximum temperature of 24-28 °C and in the coolest month mean minimum varies between -16 to -17 °C. Highest rainfall is observed in Tunceli (1033.8 mm) and lowest in Erzincan (359.6 mm). Extermedly cold temperatures of -45.6°C have been recorded around Ağri, whereas around Malatya and Elaziğ summer temperatures reach 42°C (There is no dry season in the vilayet of Kars, but in other vilayets from east to west and north to south, intensity increases and from mid June till ending September or October a dry hot summer prevails as shown in the Ombrothermic diagram**.** S values for eastern most parts such as Doğubeyazıt

(Ağri) and Iğdır (Kars) vary between 1.8-1.3, it can be included in cold dry mediterranean climate. The environs of Erzurum, Kars, Ardahan, Sarıkamış, and Posof show a continental type of climate with S values varying between 6.4-8.2 according to Emberger's summer drought index. Semi-continental climate is seen at Oltu, Pasinler and Horasan in Erzurum. East of Van lake up to Ardahan (Kars) in the north and Iranian border in the southeast experiences a semi-dry mediterranean climate according to Emberger's summer drought index. West of Lake Van; from Gümüşhane to Hakkari; in Malatya, Elaziğ, and Tunceli semi-wet mediterranean climate dominates, whereas partially wet mediterranean climate is observed in Bingöl and Erzincan. Cilo (4168 m) and Ağrı (5165 m) show snow capped tops even in summer **[6-8, 16, 19].** result in higher mechanical weathering of parent material than chemical one, as such soils are pebbly in natüre. Main soil types met within the area are; **Alluvial Soils:** This azonal group of soils with a (A) C profile character occurs around smooth plains and embodies young and old transported sediments, with a little of calcium leaching. The texture, drenage and topographical differences are visible in relation to wide alluvial flood plains around big rivers and streams, such as in the basins of Aras, Euphrates, Lake Van, as well as plains of Elaziğ, Malatya, Erzurum. Organic matter shows a great variation depending upon the use of these soils. Alluvial coastal swampy soils are very rare and are observed in the hydromorphic alluvial areas. **Colluvial Soils:** These resemble the former, being young with a (A) C profile. Texture of sediments varies in relation to the intensity of precipitaion and degree of slope. Sediments do not show a parallel character, those at the base of steepy slopes and around valley straits contain little soil but more debris and coarse material, color depends on the parent material. The soils are not saline in nature because of being well drained. **Chestnut Soils:** These are the zonal soils formed due to calcification within A,B,C or A(B)C profiles. They are rich in calcium and base saturation in general. A horizon is quite thick (0-30 cm), granuler in structure, medium in organic matter content, with a dispersable appearance and dark brown in color. B horizon shows clay deposits followed by calcified zone, which varies in depthe depending on the intensity of precipitation. **Brown Soils:** Usually dominate the areas with an annual precipitaion of 250-400 mm. There is a lot of $CaCO_3$ accumulation followed by jips in deeper layers below horizon B. The whole profile is of calcareous nature. A horizon is 10-25 cm thick with good porosity, medium organic matter. Color in general varies form light brown to dark brown. A rough blunt angled blocky structure is visible in this zonal soil group. It has A,B,C horizons, B horizon usually gets lost due to erosion. **Regosols:** This azonal soil group has a A(C) profile, being rough in texture originating from calcareous or non-calcareous rocks. These are observed mainly on sandy heaps, volcanic clay and slopy icy deposits. Parent material is soft sand, moving with wind or water, tumbling marn, calcareous clay and chalk. **Basaltic Soils:** Clayey in nature, without a distinct profile, A horizon blck to granular in structure, B being thin textured and blocky. Non-calcareous mostly, neutral to alkaline, poor in organic matter content, high water holding capacity, other physical characters are poor. **Organic Soils:** Organic matter content in these soils varies between 20 to 95 % in relation to clay. A horizon is 30 cm. **Arid Soils:** Formed in poorly drained areas with salt crusting in the upper horizon. Electrical conductivity in such soils is higher than 4 mmho/cm at 25°C, exchangeable sodium being less than 15% and pH is below 8,5. They are covered by halophytic plant species. In some of these soils exchangeable Na is higher than 15% and pH above 8,5. Physical characteristics of these

soils are poor in general, because clay and humus are dispersed. A-B-C profiles are observed clearly, A4 horizon being well developed with medium organic matter, A2 is light in color and thin, B dark in color, columnar or prismatic in structure. These soils are less productive. Saline-alkaline soils show an electrical conductivity of higher than 4 mmhos at 25°C and exchangeable Na is above 15%, pH rarely goes beyond 8,5, Na ions are higher **[18, 23, 24, 105]**.

4. Land and Uses: The region is rough topographically, plateaus being very high in particular around Erzurum, Ağri, Bitlis, Van and Hakkâri, where high altitude mountains are gathered together **[23, 24, 54]**. Grasslands cover large areas around these vilayets due to the topography. They have an area of 8.900.000 ha, which is 41% of the total grasslands of Türkiye, highest being, Van followed by in Hakkâri, Kars, Ağri, Erzincan, Erzurum and Bitlis. Agricultural land is found mostly around the vilayet of Erzurum, being 500.000 ha. The least area of agriculturally fit land is found in Tunceli, being 114.000 ha. Cattle raising is thus very important in this region. Most of the grasslands are moved for winter fodder. Others are used for grazing in summer. Agricultural products shown are mainly cereals, namely; wheat, barley, rye, lenttils and chickpea. Eastern parts mainly sow fodder crops, in particular alfalfa. Beet cultivation is also common in the area together with potatoes, tomatoes, peppers, cucumbers and cabbages etc. Out of fruit trees we commonly get apples, pear, plum, walnut and prune etc. Plum is a major exported product from Malatya. Tobacco cultivation is dominant in Bitlis, Malatya and Elazığ, parts of Van and sunflower in Muş. Forest cover is poor in the region lying around 11.8 % (2.337.004 ha), most of it has got destroyed due to cutting, grazing, fires and lately heavy urbanisation. The destroyed oak forests are visible throught the area, however presently a highest distribution of these forests is observed in Bingöl with an area of 310.000 ha. Oak forests distributed Bitlis towards Siirt and around Lake Van. ***Quercus libani, Pinus sylvestris*** and ***Juniperus excelsa*** are very important for foresty in the region **[63, 66, 91, 94]**. (**Fig. 1, 2**).

5. Flora: The area of Eastern Anatolia region and its environs have attracted the attention of a lot of plant investigators notable among them being; **[2, 4-15, 17, 21, 22, 25-42, 45, 46, 48, 49, 51-59, 61, 62, 65, 67-77, 80, 81, 83-90, 92, 95-97, 99, 102-104, 110-112, 119-124, 126]**. Variations in altitude between l200-l500 m greatly effect the floral structure of the region together with climatic and geographical position. **Irano-Turanian** elements dominate the area, but we do get **Euro-Siberian** elements particularly in the northern part in wet meadows at high mountainous altitudes. The ratio of phytogeographical elements varies from north to south and east to west in the region **(Fig. 3).** In the northeast on Allahuekber mountains and near Kars-Iğdır vilayets Armenian border **Irano-Turanian** elements are 2l.3-24.7 %, whereas **Euro-Siberian** elements vary between l5.5-45.5 %. Percentage of **Irano-Turanian** elements at Nemrut and Erek mountains is over 40 %, but **Euro-Siberian** elements are 4-l0 %. Mediterranean elements are observed more near **Turanian** Malatya and Elazig (5-8 %). It is very difficult to draw a northern line of **Irano-elements** dominating in Eastern Anatolia and its environs, however, Giresun(3.400 m), Soğanli (2967 m), Kaçkar(3932 m), and Yalnizçam mountainous(Şavşat/Artvin and Ardahan) ranges of east black sea could be accepted as a borderline. On the south at higher altitudes Euro-Siberian elements may dominate but in Çoruh (Artvin), Tortum and Oltu

valley areas, Kargapazarı, Dumlu Mountains (Erzurum), Keşiş and Tercan Mountains (Erzincan), Tendürek Mountains, Soğuksu(in Çaldıran/Van) as well as places above timberline on east and south slopes of mountains still **Irano-Turanian** elements dominate physionomically and floristically. At Allahuekber mountains (Kars) in the degraded pine forests of ***Pinus sylvestris*** upto 2600 m altitude, percentage of **Irano-Turanian** elements are 56 and **Euro-Siberian** ones 24 on east and southeast slopes, whereas on the north and northwest slopes of these forests percentage of **Euro-Siberian** elements are 58, **Irano-Turanian** ones are only 20 percent. The southern border of **Irano-Turanian** elements towards the **Mesopotamian** part is under influence of a **Saharo-Arabian** subregion. Typical representatives of **Irano-Turanian** elements distributed only in the Eastern Anatolia and its environs are; ***Barbarae vulgaris, Gypsophila bitlisensis, G. bicolor, G. graminifolia, G. paniculata*** var. ***araratica, Pyrus salicifolia*** var. ***salicifolia, Sorbus tamamschjanae, Sempervivum davisii, Echinophora orientalis, Carum leucocoleon, Prangos ulopetra, Rindera albida, R. lanata, Pastinaca pimpinellifolia, Ferula orientalis, F. haussknechtii, Catabrosella fibrosa, Ferulago setifolia, F. stellata, Cymbocarpum anethoides, C. erythraeum, Valerianella tuberculata, V. amblyotis, Poa araratica, Cephalaria hirsuta, Senecio erucifolius, Tripleurospermum transcaucasicum, Centaurea albonitens, C. aucheri, Sonchus palustris, Scorzonera veratrifolia, Rhagadiolus papposus, Cicerbita adenophora, Paracaryum laxiflorum, Solenanthus circinnatus, Teucrium chamaedrys*** subsp. ***sinuatum, Phlomis pungens*** var. ***seticalycina, Scutellaria albida, S. orientalis*** subsp. ***bornmuelleri, Stachys inflata, Marrubium cordatum, Satureja boissieri, Lamium tomentosum*** var. ***tomentosum, Lallemantia canescens, Origanum vulgare*** subsp. ***gracile, Nepeta meyeri, Scilla rosenii, Salvia pachystachys, S. hydrangea, S. kronenburgii, Diarthon magakjanii, Mentha longifolia, Euphobia armena, E. marschalliana, Tulipa julia, Asphodeline dendroides, Allium oreophilum, A. longisepalum, A. hirtifolium, A. longicuspis***- progenitor of ***A. sativum*** (Pırasa in Turkish) distributed in cental Asia and reported only from Başkale (Van) in Türkiye, ***Bellavalia paradoxa, B. fominii, B. pycnantha, B. longistyla, Nectaroscordum tripedale, Fritillaria minuta, F. zagrica, Gagea confusa, Sorbus migarica, Iris iberica*** subsp. ***elegantissima, I. musulmanica, Sameraria armena, Dactylorhiza sanasunitensis, Pimpinella peucedanifolia, Typha angustifolia, Elymus hispidus*** subsp. ***pulcherrimus, Aegilops tauschii*** subsp***. tauschii, Psathyrostachys fragilis, Bromus trinianus, Alopecurus textilis*** subsp. ***tiflisiensis, Puccinellia distans*** subsp. ***sevangensis, Stipa araxensis, S. caragana, Piptatherum laterale*** subsp. ***laterale, Veronica poljensis, Carex orbicularis*** subsp. ***kotschyana*** var. ***caucasica, Thlaspi tatianae, Polygala hohenackeriana, Hypericum davisii, Bunium verruculosum, Diarthon vesiculosum, Cuscuta kotschyana*** subsp. ***caudata*** -occuring just on the diagonal towards Eastern Anatolia and ***Triticum carthlicum***- a notably resistant taxon of persian black wheat cultivated only in the highlands of the area. The taxa present only in the vilayets of **Kars, Iğdır, Ardahan** and **Ağrı** are; ***Rorippa islandica, Reseda microcarpa, Allochrusa versicolor, A. bungei, Anthriscus sylvestris, A. nemorosa, Heracleum crenatifolium, Cotoneaster multiflorus, C. transcaucasicus, C. meyeri, Bunium cylindricum, Pimpinella aromatica, Cuscuta campestre, Seseli grandivittatum, C. araratica, Echinops tournefortii, Onopordum armenum, Centaurea erivanensis, C. pseudoscabiosa*** subsp. ***araratica, Hieracium macrophyllopodum, H. erythrocarpum, Campanula massalskyi***-known as type specimen only, ***Symphyandra***

armena-represented only by two species from Türkiye other being endemic to the nearby vilayet Rize, ***Lappula sinaica, Arnebia linearifolia, Onosma gracile, Allium albidum, Eremostachys glabra, Stachys fruticulosa, S. araxina, Lamium tomentosum*** var. ***alpestre, Acantholimon quinquelobum, Sparganium minimum, Koeleria eriostachya, Consolida persica, Isatis ornithorhynchus, Ranunculus polyphyllus, Atriplex micrantha***-present in Kirghizia ***Kalidium capsicum***-occuring around the Caspian Sea, ***Viola rupestris, Cardamine microphylla, Halostachys belangeriana, Saxifraga tridactylites, Polemonium caeruleum, Galium czerepanovii, Crepis pannonica, Erysimum armeniacum, Aellania glauca*** subsp. ***glauca, Gypsophila patrinii***-occuring in Kazakhistan upto Urals, ***Puccinellia dolicholepis***-found around Akmola in Kazakhistan, ***Ribes uva-crispa-***a native taxon of Kars, ***Salsola nodulosa, Suaeda linifolia, Petrosimonia squarrosa, Bienertia cycloptera, Marrubium persicum*** and ***Matricaria matricarioides***-a weed occuring in Canada and Kamchatka, together with the pteridophyte taxon ***Equisetum litoralis.***

The taxa occuring in the vilayet of **Van** only are; ***Limonium vanense, Gypsophila bicolor, G. polyclada, Salvia kronenburgii, Astragalus sphaeranthus, A. gevashensis, A. robustus, Delphinium dolichostachyum, D. album, D. staphigera, Linum vanense, Carex iraquensis, Prangos acaulis, Senecio paucilobus, Tanacetum uniflorum, T. tabrisianum, Cousinia vanense, C. urumiensis, C. bicolor, C. grandis, C. vanensis, Cousinia x kurubasgecidiensis, Centaurea vanensis, C. albonitens, Tulipa biflora, T. humilis, Carduus onopordioides*** subsp. ***onopordioides, Taraxacum fedtschenkoi-***occuring in Pamir Alai***, Androsace caduca***-occuring in Uzbekistan, ***Lamium tomentosum*** var. ***filicaule, Onosma subsericeum, O. chlorrrotrichum***-known from type only, ***Verbascum nudicaule, V. vanense, V. songaricum***- occuring in Karatau, ***Scrophularia variegata, S. crenophila, Galium subvelutinum, Gagea tenera***-found in Samarqand, ***G. helenae, Dactylorhiza vanensis, Bromus gracillimus***-found in Karakum Kirghizistan, ***Eremopoa multiradiata, Isatis brachycarpa, Vania campylophylla, Hypericum helianthemoides, Carex songorica***-occuring in Kazakhistan Pamir Alai, ***Chondrilla juncea*** var. ***latifolia, Ferulago bernardii, Tragopogon vaginatum*** and ***Inula peacockiana***-found around Tien Shan. The taxa found only in the vilayet of **Erzurum** are; ***Astragalus hymenocystis, Chaerophyllum roseum, Peucedanum zedelmeierianum, Scorzonera sosnowskyi, S. latifolia*** var. ***angustifolia, Cuscuta subuniflora, Scrophularia zuvandica, Thlaspi kochianum*** and ***Elymus transhyrcanus***-occuring on Kopet Dagh in Central Asia. Other interesting taxa like ***Cephalaria stellipilis, Scutellaria orientalis*** subsp. ***cretacea, Hammada ramosissima*** grow in vilayet **Malatya** only, ***Ribes nigrum*** in vilayet **Muş**, ***Limoniopsis owerinii***-represented by only two species in Türkiye one being endemic, ***Poa bulbosa*** subsp. ***bulbosa, Thlaspi huber-morathii*** and ***T. huber-morathii*** subsp. ***divergens*** in vilayet **Erzincan**, ***Onobrychis shahpurensis, Cousinia arbelensis*** and ***Amaranthus retroflexus***-a species of American origin, in vilayet **Bitlis** only. The **Euro-Siberian** elements with a wider occurence in the region are ***Filipendula vulgaris, F. ulmaria, Polygonum alpinum, P. bistorta*** subsp. ***bistorta, Genista tinctoria, Hypericum androsaemum, Linum hypericifolium, Acer hyrcanum*** subsp. ***hyrcanum, Rhamnus catharticus, Astragalus galegiformis, Vicia cracca*** subsp. ***cracca, V. truncata, V. sepium, Lathyrus pratensis, L. tuberosus, Ononis arvensis, Trifolium aureum, T. spadiceum, T. alpestre, Melilotus alba, Anthyllis vulneraria*** subsp. ***polyphylla, Spiraea hypericifolia, Prunus spinosa, Rubus canescens***

var. ***glabratus, Potentilla rupestris, P. thuringiaca, P. pimpinelloides, Fragaria viridis, Geum urbanum, G. coccineum, Alchemilla erythropoda, Rosa pimpinellifolia, R. jundzillii, Lythrum salicaria, Epilobium tetragonum*** subsp. ***lamyi, Bryonia alba, B. aspera, Sedum annuum, S. telephium, Saxifraga paniculata*** subsp. ***paniculata, S. moschata, S. hirculus, Chaerophyllum bulbosum, Seseli libanotis, S. peucedanoides, Geranium palustre, Parnassia palustris, Ranunculus repens, Cornus sanguinea*** subsp. ***australis, Sambucus ebulus, S. nigra, Viburnum lantana, Inula britannica, Pulicaria vulgaris, P. dysenterica, Heracleum persicum, Gnaphalium uliginosum, G. sylvaticum, Galatella punctata, Crinilaria villosa, Senecio aquaticus*** subsp. ***eraticus, S. nemorensis*** subsp. ***nemorensis, S. othonnae, Anthemis setacea, A. millefolium*** subsp. ***millefolium, A. nobilis*** subsp. ***neilreichii, Leucanthemum vulgare, Artemisia armeniaca, A. chamaemellifolia, Carduus hamulosus*** subsp. ***hamulosus, Sausurea salsa, Echinops sphaerocephalus*** subsp. ***sphaerocephalus, Tragopogon reticulatus, Leontodon hispidus*** var. ***hispidus, Picris hieracioides, Hieracium rigens, H. erythrocarpum, H. pollichiae, H. prenanthoides, H. olympicum, H. lanceolatum, Pilosella cymosa, P. echioides*** subsp. ***echioides, Mulgedium quercinum, Lactuca serriola, Campanula latifolia, C. rapunculoides*** subsp. ***rapunculoides, C. glomerata*** subsp. ***hispida, Pyrola rotundifolia, Utricularia vulgaris, Primula elatior*** subsp. ***pallasii, P. veris, Myosotis stricta, M. sparsiflora, Androsace villosa, Gentiana cruciata, Cynoglossum officinale, C. montanum, Lithospermum officinale, Echium vulgare, Onosma ictatinctorium, O. rigidum, Cerinthe glabra, C. minor*** subsp. ***minor, Sanguisorba minor, Solanum dulcamara, Verbascum flavidum, Scrophularia umbrosa, Linaria genistifolia*** subsp. ***genistifolia, Pseudolysimachion longifolium, Veronica verna, V. dillenii, Melampyrum arvense*** var. ***arvense, Euphrasia pectinata, Odontites verna*** subsp. ***serotina, Teucrium scordium*** subsp. ***scordioides, Lamium amplexicaule, L. album, Leonurus quinquelobatus, Ballota nigra*** subsp. ***nigra, Nepeta cataria, Stachys sylvatica, Dracocephalum austriacum, D. ruyschiana, Prunella vulgaris, P. laciniata, Origanum vulgare*** subsp. ***vulgare, Acinos arvensis, Lycopus europaeus, Limonium gmelinii, Salvia verticillata*** subsp. ***verticillata, Daphne mezereum, Thesium arvense, Urtica dioica, Ulmus glabra, Aristolochia clematitis, Euphorbia seguieriana*** subsp. ***seguieriana, Coryllus avellana*** var. ***avellana, Alnus glutinosa*** subsp. ***glutinosa, Salix alba, S. fragilis, S. caprea, S. triandra*** subsp. ***triandra, Galium rivale, G. uliginosum, G. verum*** subsp. ***verum, G. spurium*** subsp. ***spurium, Cruciata laevipes, Alisma plantago-aquatica, Populus alba, P. nigra, P. tremula, Ceratophyllum demersum, C. submersum, Allium scorodoprasum*** subsp. ***waldsteinii, Gagea bulbifera, Iris sibirica, I. caucasica*** subsp. ***caucasica, Cephalanthera longifolia, C. damasonium, Epipactis palustris, Orchis purpurea, O. pallens, Platanthera chlorantha, Sparganium erectum*** subsp. ***microcarpum, S. erectum*** subsp. ***neglectum, Typha laxmannii, T. minima*** var. ***angustifolia, Juncus atratus, J. articulatus, Luzula campestris, L. pallescens, Cyperus fuscus, Carex microglochin, C. paniculata*** subsp. ***paniculata, C. diandra, C. otrubae, C. spicata, C. muricata, C. divulsa*** subsp. ***leersii, C. praecox, C. divisa, C. pseudofoetida*** subsp. ***acrifolia, C. ovalis, C. hirta, C. acutiformis, C. riparia, C. capillaris, C. panicea, C. brevicollis, C. distans, C. pallescens*** var. ***pallescens, C. umbrosa*** subsp. ***huetiana, C. caryophyllea, C. supina, C. tomentosa, C. atrata*** subsp. ***atrata, C. hartmanii, C. acuta, C. caespitosa, Elymus caninus, Hordeum geniculatum, Brachypodium sylvaticum, B. pinnatum, Helictotrichon***

armeniacum, H. pubescens subsp. ***pubescens, H. pratense, Arrhenatherum elatius*** subsp. ***elatius, Trisetum flavescens, T. sibiricum, Trisetaria loeflingiana, Koeleria pyramidata, Deschampsia flexuosa, Calamagrostis canescens, C. epigejos, C. pseudophragmites, C. arundinacea, Apera interrupta, Agrostis canina, A. capillaris*** var. ***capillaris, A. gigantea, A. lazica, A. balansae, A. stolonifera, Polypogon viridis, Lolium perenne, Alopecurus aequalis, A. glacialis, A. arundinaceus, A. myosuroides*** var. ***myosuroides, Phleum alpinum, P. pratense, P. phleoides, Festuca gigantea, F. drymeja, F. airoides, Poa supina, Sclerochloa dura, Cynosurus cristatus, Melica picta, Stipa tirsa, S. joannis, Selaginella helvetica, Aconitum anthora, Fumaria schleicheri, Chenopodium glaucum, Serratula radiata*** subsp. ***radiata*** and ***Sonchus arvensis*** subsp. ***arvensis.*** The **Euro-Siberian elements:** ***Solidago virgaurea*** subsp. ***virgaurea, S. virgaurea*** subsp. ***alpestris, Antennaria dioica, Tussilago farfara, Eupatorium cannabinum, Datisca cannabina, Asperugo procumbens, Glechome hederacea, Plumbago europaea, Butomus umbellatus, Sagittaria sagittifolia, Groenlandia densa, Leucojum aestivum, Dactylis glomerata*** subsp. ***glomerata, Gymnadenia conopsea, Corallorrhiza trifida, Beckmannia eruciformis, Nardus stricta, Phragmites australis***, coumarine smelling ***Hierochloe odorata*** and the pasture grass ***Scolochloa festucacea*** occuring in **Kars** only though represented by **single species** in Türkiye are distributed in the region and its environs as well, together with such interesting taxa as ***Primula veris*** subsp. ***macrocalyx*** existing only here and extending upto Altai's, a Virginian taxon ***Pyrola rotundifolia*** found in the north and Kars only vis-a-vis ***Epilobium tetragonum*** subsp. ***lamyi.*** The **Euxine** elements like; ***Heracleum persicum, H. crenatifolium, Cirsium cephalotes, C. cheiranthifolia*** var. ***cheiranthifolia, C. nawaschinii, Tanacetum punctatum, Hieracium taberdense, Pyrus oxyprion, Pedicularis nordmanniana, Carex disticha*** and ***C. orbicularis*** subsp. ***kotschyana*** var. ***caucasica*** are distributed only in this region whereas ***Swertia iberica, Myosotis olympica, M. propinqua, Nonea versicolor, Scrophularia chrysantha, S. olympica, Veronica peduncularis, Euphrasia petiolaris, E. lebardensis, E. sevanensis, Pedicularis condensata, P. crassirostris, Lamium armenum*** subsp. ***armenum, L. crinitum, Stachys macrantha, S. macrostachya, Mentha longifolia*** subsp. ***longifolia, Euphorbia oblongifolia, Quercus hartwissiana, Betula litwinowii, Juncus alpigens, Poa longifolia, Salix pentandroides, S. pseudomedemii, S. pseudodepressa, S. armenorossica, Asperula laxiflora, A. gracilis, Polygonatum orientalis, Allium szovitsii***, ***A. decipiens, A. scorodoprasum*** subsp. ***jajlae, Fritillaria latifolia, Vicia balansae, Dactylorhiza romana*** subsp. ***geogrica, D. urvilleana, D. luxina*** var. ***luxina, Luzula pseudosudetica, Lathyrus aureus, Eryngium giganteum, Buplerum falcatum*** subsp. ***polyphyllum, Viburnum orientale, Valeriana alpestris, Inula orientalis, Aster amellus*** subsp. ***ibericus, Erigeron caucasicus*** subsp. ***caucasicus, Echinops galaticus, Cicerbita racemosa, Campanula tridentata, C. aucheri, C. lactiflora, C. sibirica*** subsp. ***hohenackeri, Pinguicula balcanica, Gentiana gelida*** and ***Gentianella caucasia*** show a wider distribution. The **Euxinic** elements like ***Pedicularis wilhelmsiana, P. pontica, Betula recurvata, Allium rupestre, Arabis brachycarpa, Gypsophila silenoides, Rhamnus microcarpa, R. depressus, Potentilla adscharica, P. elatior, Alchemilla minusculiflora, A. dura, Epilobium algidum, Ribes biebersteinii, Cephalaria gigantea, Inula mariae, Doronicum dolichotrichum, Carduus adpressus, Centaurea cheiranthifolia*** var. ***purpurascens, C. macrocephala, Campanula collina, Rhododendron caucasicum, Nonea intermedia, Veronica telephiifolia, Philadelphus caucasicus, Festuca***

artvinensis, F. karsiana, Carex nigra subsp. ***dacica, C. michelii, C. pallescens*** var. ***chalcodeta, Dactylorhiza luxina*** var. ***markowitschii, Polygonum bistorta*** subsp. ***carneum, Astragalus frickii, A. falcatus, Vicia dadianorum, Heracleum apiifolium, Anthemis cretica*** subsp. ***iberica, Tanacetum sorbifolium, T. coccineum, Daphne glomerata, Centaurea simplicicaulis, Scrophularia macrobotrys, Rhynchocorys stricta, R. orientalis, Euphorbia wittmannii, E. macroceros, Lilium monadelphum*** var. ***armenum, Iris vallicola, Dorycnium graecum, Aconitum nasutum, Origanum rotundifolium*** and ***Senecio integrifolius*** subsp. ***aurantiacus*** var. ***leiocarpus*** are particularly restricted to the vilayets of **Kars** and **Erzurum.** Some of the **Euxinic taxa** reported as a **single species** from Turkey like ***Aconitum nasutum, A. orientale, Astrantia maxima*** subsp. ***maxima, Convallaria majalis*** *var.* ***transcaucasica, Lapsana communis*** subsp. ***grandiflora, L. communis*** subsp. ***alpina*** are also found in the vilayets **Kars** and **Erzurum** together with an interesting **tertiary relict** ***Epigaea gaultheroides.***

Hyrcano-Euxine elements like; ***Brunnera orientalis***, ***Lathyrus roseus, Swertia longifolia, Trifolium rytidosemium*** var. ***rytidosemium, T. canescens, Alchemilla sericata, Sedum spurium, S. gracile, S. pilosum, Eleutherospermum cicutarium, Veronica gentianoides, Pedicularis caucasica, Lonicera iberica, Valeriana leucophaea, Campanula stevenii*** subsp. ***stevenii, Androsace albana, Lysimachia verticillaris, Gentiana septemfida, G. verna*** subsp. ***pontica, Myosotis sylvatica, Arnebia pulchra, Symphytum asperum*** var. ***armeniacum, Verbascum pyramidatum, V. filiformis, Euphrasia juzepczukii, Salvia glutinosa, Zelkova carpinifolia, Carex tristis, Salix elbursensis, Fritillaria caucasica, Colchicum speciosum, Orchis stevenii, Papaver orientale, P. pseudo-orientale*** and ***Poa masenderana*** are commonly seen in the area***. Alchemilla surculosa, Saxifraga paniculata*** subsp. ***cartilaginea, Traunsteinera sphaerica, Lathyrus cyaneus*** var. ***cyaneus, Cirsium frickii, Scrophularia divaricata, Fraxinus excelsior*** subsp. ***coriariifolia*** occur only in **Kars**. ***Mespilus germanica***, ***Chamaesciadium acaule***, ***Hyssopus officinalis*** and ***Pterocarya fraxinifolia*** found as a **single species** in Türkiye are observed to show a distribution in this region too. Frequently growing species like ***Sideritis montana*** subsp. ***montana, Galium tricornutum, G. verticillatum, Trifolium hirtum*** and ***Heliotropium suaveolens*** are **East Mediterranean** elements. These probably have reached here by crossing Anatolian Diagonal and East Taurus proceeding along **Euphrates and Murat basins.** Other **Mediterranean** elements found in the area are; ***Ptilostemon diacantha*** subsp. ***turcicus, Sternbergia lutea, Cistus salviifolius, Colutea*** spp., ***Juniperus oxycedrus, Vitex agnus-castus***, ***Petrorhagia velutina, Heliotropium greuteri, Echium plantagineum, Allium flavum*** subsp. ***tauricum*** var. ***tauricum, Dactylorhiza saccifera, Aegilops markgrafii*** and ***Cleome ornithopodioides*** found in vilayet **Erzurum** (in especially Tortum, Uzundere); ***Poa diversifolia, Beta macrocarpa, Parietaria lusitanica*** in **Kars**; ***Papaver minus, Orobanche pubescens, Taraxacum scolopendrinum*** in **Van**; ***Sedum laconicum, Ferula communis*** subsp. ***communis*** in **Erzincan; *Trifolium dasyrum, Linaria simplex, Verbascum sinuatum*** var. ***adenosepalum, Orobanche grisebachii, Gagea villosa*** var. ***villosa*** in **Elazığ; *Arum dioscoridis*** var. ***syriacum, Legousia hybrida, Echium glomeratum, Salix pedicillata*** subsp. ***pedicillata*** in **Malatya**; ***Myosotis incrassata, Galium paschale, Aegilops neglecta, Phleum montanum*** subsp. ***serrulatum, Dactylorhiza romana*** subsp. ***romana, Carex flacca***

subsp. ***serrulata*** in **Bitlis**; ***Crucianella angustifolia, Orchis punctulata*** **in Bingöl;** ***Allium roseum, Colchicum triphyllum*** in **Tunceli;** whereas ***Velezia rigida, Glycyrrhiza echinata, G. glabra, Lathyrus gorgoni*** var. ***gorgoni, Tanacetum cilicium, Anagallis foemina, Verbascum mucronatum, Kickxia elatina*** subsp. ***crinita, Orobanche schultzii, Thymus leucotrichus*** var. ***leucotrichus, Asperula arvensis, Allium paniculatum*** subsp. ***paniculatum, A. pallens*** subsp. ***pallens, A. scorodoprasum*** subsp. ***rotundum, A. guttatum*** subsp. ***sardoum, Ornithogalum narbonense, Gagea granatellii, Ophrys holoserica*** subsp. ***holoserica, Orchis tridentata, O. mascula, Dactylorhiza iberica, Elymus panormitans, Avena barbata*** subsp. ***barbata*** and ***Cleome iberica*** are widely seen in different vilayets of the region. The taxa ***Lagurus ovatus, Micropyrum tenellum, Picnomon acarna, Jasminum fruticans, Trachomitum venetum, Periploca graeca, Cionura erecta, Melissa officinalis*** subsp. ***inodora*** and ***Ostrya carpinifolia*** represented only by **single species** in Türkiye are also distributed in different vilayets of East Anatolia region.

The widely distributed interesting genera represented by only **single species** in Türkiye are found in the area of Eastern Anatolia and its environs as well together with such **monotypic genera** like ***Vavilovia formosa, Caragana grandiflora***-occuring in **Erzurum** and ***Halimodendron halodendron***- present in **Kars**. The examples of these taxa are; ***Didymophysa aucheri, Texiera glastifolia, Armoracia rusticana, Peltariopsis planisiliqua, Drabapsis verna, Anchonium elichrysifolium*** subsp. ***persicum, Alliaria petiolata, Sobolewskia clavata, Murbeckiella huetis, Torularia contortuplicata, Oxyria digyna, Cucubalus baccifer, Lepyrodiclis holosteoides, Moehringia trinervia, Pteropyrum olivieri, Rheum ribes***(in Ağrı, Bitlis, Van, Hakkari, Malatya, Elazığ, Bingöl), ***Ceratocarpus arenarius, Camphorosma monspeliaca*** subsp. ***lessingii, C. monspeliaca*** subsp. ***monspeliaca, Panderia pilosa, Seidlitzia florida, Myricaria germanica, Aellenia glauca*** subsp. ***cinerascens, Impatiens noli-tangere, Staphylea pinnata, Padus avium, Hippuris vulgaris, Datisca cannabina, Myrrhoides nodosa, Fuernrohria setifolia, Sium sisarum, Berula erecta, Physospermum cicutarium, Conium maculatum, Trachydium depressum, Lecokia cretica, Cicuta virosa, Szovitsia callicarpa, Selinum silaifolium, Ligusticum alatum, Xanthogalum purpurascens, Angelica sylvestris, Diplotaenia cachrylifolia, Zosima absinthifolia, Ormosciadium aucheri, Laser trilobum, Astrodaucus orientalis, Caucalis platycarpa, Turgenia latifolia, Cymbolaena griffithii, Gundelia tournefortii, Acroptilon repens, Oligochaeta divaricata, Zoegea leptaurea, Cnicus benedictus*** var***. kotschyi, Chardinia orientalis, Acantholepis orientalis, Koelpinia linearis, Steptorhamphus tuberosus, Glaux maritima, Cynanchum acutum*** subsp. ***sibiricum, Lomatogonium carinthiacum, Heterocaryum szovitsianum, Trichodesma incanum, Physalis alkekengi, Lycium ruthenicum, Paliurus spina-christi, Anarrhinum orientale, Dodartia orientalis, Limosella aquatica, Lagotis stolonifera, Rhinanthus angustifolia*** subsp. ***grandiflorus, Bungea trifida, Cistanche salsa, Echinaria capitata, Hymenocrater bituminosus, Hippophae rhamnoides*** subsp. ***caucasica, Elaeagnus angustifolia, Arceuthobium oxycedddri, Pilostyles haussknechtii, Zannichellia palustris, Spirodella polyrhiza, Puschkinia scilloides, Hemerocallis fulva, Ixiolirion tataricum*** subsp. ***montanum, Limodorum abortivum, Coeloglossum viride, Scirpoides holoschoenus, Anacamptis pyramidalis, Scirpus sylvaticus, Blysmus compressus, Bulboschoenus maritimus*** var. ***maritimus, Schoenus nigricans, Cladium mariscus, Kobresia***

simpliciuscula, Heteranthelium piliferum, Agropyron cristatum subsp. ***incanum, A. cristatum*** subsp. ***pectinatum*** var. ***pectinatum, A. cristatum*** subsp. ***pectinatum*** var. ***imbricatum, Psilurus incurvus, Colpodium versicolor, Stipagrostis plumosa, Brachiaria eruciformis, Pennisetum orientale, Chrysopogon gryllus*** subsp. ***gryllus*** and ***Trifolium pratense*** var. ***americanum.*** We also come across a few **circumboreal-circumpolar** elements like ***Aster alpinus, Erigeron uniflorus, Galium trifidum*** subsp. ***trifidum, Calamogrostis stricta,*** **Eurosiberian- boreoamerican** elements like ***Carex canescens, C. atherodes, C. limosa***, **Sudanoindian** element ***Cuscuta hyalina,*** **Sarmatian** elements like ***Serratula erucifolia, Stachys atherocalyx.*** The typical **disjuncts** met within this area are*;* ***Pimpinella kotschyana, Galium boreale, Allium rubellum, Dactylorhiza cruenta, Echium russicum***-an **Euro-Siberian disjunct**, ***Carex prostrata, C. pseudocyperus***-**Eurosiberian/Boreoamerican disjuncts,** ***Gentianella ciliata*** subsp. ***blepharophora***-Hyrcano Euxin disjunct, ***Kickxia lanigera***- Mediterranean disjunct and ***Cephalanthera kurdica*** an Eastern vicariad of East Mediterranean ***Cephalanthera epipactoides.*** Most widespread species of the **grasslands** are; ***Agrostis stolonifera, Deschampsia caespitosa, Festuca pratense, Triglochin palustris, Dactylorhiza umbrosa, D. osmanica, Hordeum violaceum, Trifolium repens, T. pratense, Orchis palustris*** and ***Pedicularis comosa*** var. ***acmodonta.***

There are a lot of plant taxa in rocky places. Most of them are endemics to Türkiye. The common taxa of the places are ***Arabis caucasica*** subsp. ***caucasica, Aubrieta parviflora, Campanula coriacea, Centaurea karduchorum, C. urvillei*** subsp. ***urvillei, C. urvillei*** subsp. ***nimrodis, C. virgata, Androsace maxima, Cotoneaster nummularia, Dianthus orientalis, Ephedra major, Lycium ruthenicum, Minuartia juniperina, M. umbellulifera, Paronychia kurdica*** subsp. ***kurdica*** var. ***kurdica, P. kurdica*** subsp. ***haussknechtii, Potentilla lignosa, Rosularia sempervivum*** subsp. ***kurdica, R. sempervivum*** subsp**.** ***persica, Sedum album, Scorzonera rigida, S. tomentosa, Silene odontopetala, S. araratica, Stachys lavandulifolia*** var. ***glabrescens, S. ballotiformis, Salvia multicaulis, Tanacetum kotschyi, Thymus kotschyanus*** var. ***kotschyanus, T. kotschyanus*** var. ***glabrescens, T. kotschyanus*** var. ***eriophorus, Valeriana sisymbriifolia, V. leucophaea*** etc.

The plant life wakes up in late May at higher altitudes above 2500 m and snow melted areas get covered with ***Colchicum armenum, Merendera trigyna, Fritillaria alburyana, Ornithogalum montana*** and ***Gagea glacialis.*** The richest 10 families in the region on the basis of taxon number are; Asteraceae (Compositae), Fabaceae (Leguminosae), Poaceae (Gramineae), Brassicaceae (Cruciferae), Lamiaceae (Labiatae), Caryophyllaceae, Rosaceae, Ranunculaceae, Apiaceae (Umbelliferae) and Scrophulariaceae. First three families with highest number of taxa from different parts of the studied area are outlined below **(Table 2).**

Table 1. A comparison of the distribution of phytogeographical elements and endemism rate (%) in the research areas of Eastern Anatolia.

Areas	Irano-Turanian(%)	Euro-Siberian(%)	Mediterranean (%)	Cosmopolitan and others (%)	Endemism ratio (%)
Akçadağ [67]	35.4	9.9	2.9	51.6	7.5

Çatak Valley I [27]	**42,89**	**4,85**	**3,88**	**48,35**	**6,43**
Çatak Valley II [97]	**45,78**	**6,09**	**2,58**	**45,55**	**7,37**
Deveboynu[34]	**47,07**	**4,78**	**4,25**	**43,88**	**6,8**
Bahçesaray [34]	**44,0**	**8,0**	**2,0**	**46,0**	**14,26**
Çatak Valley I[97]	**42.89**	**4.85**	**3.88**	**48.35**	**6.42**
Çatak Valley II[97]	**45.78**	**6.09**	**2.58**	**45.55**	
Çavuştepe[34]	**33,0**	**4,3**	**3,5**	**59,5**	**6,3**
Başet Mountain[34]	**46,41**	**5,71**	**1,7**	**51,6**	**12,2**
Özalp [88]	**42,36**	**9,38**	**3,28**	**44,97**	**11,73**
Güzeldere[34]	**50,63**	**4,19**	**1,14**	**40,61**	**12,06**
Erek Mountain [83]	**40,9**	**8,8**	**2,9**	**32,0**	**6,8**
Bitlis River [12]	**31.8**	**4.8**	**8.7**	**54.6**	**6.8**
Deveboynu[97]	**47.07**	**4.78**	**4.25**	**43.88**	**6.8**
Hizan [10]	**34.9**	**6.2**	**4.7**	**54.2**	**7.9**
Sübhan Mountain [28]	**37, 0**	**8.7**	**2.0**	**52.3**	**8.5**
Kurubaş [81]	**44,0**	**7,0**	**1,0**	**47,0**	**7,0**
Toprakkale [77]	**44,4**	**4.4**	**4.8**	**46.8**	**4,0**
Çakmak Mountain[55]	**33.9**	**20**	**2.6**	**37.2**	**6.5**
Tercan, Şengül,B.baba [68]	**25**	**10.7**	**4.4**	**59.9**	**6.5**
Munzur Mountain [124]	**45.7**	**8**	**4.4**	**41.9**	**19.9**
Çiçek Mountain [48]	**12.6**	**29.6**	**1**	**56.8**	**3**
Allahuekber [111]	**37**	**41.3**	**1.6**	**20.1**	**4.6**
Iğdır [110]	**44.4**	**7.7**	**3.5**	**44.4**	**1.4**
Pirreşit Mountain [34]	**38.2**	**9.5**	**2.1**	**50.1**	**8.8**
Köse Mountain[102]	**30.2**	**11.2**	**3.9**	**43.5**	**8.6**
Nemrut Mountain [96]	**44,0**	**23,0**	**4,0**	**?**	**8,4**
Van Castle [80]	**27,2**	**5,9**	**11,8**	**29,0**	**2,9**
Akçadağ[97]	**35.4**	**9.9**	**2.9**	**51.8**	**7.5**

Table 2. The richest three families with highest taxa in different studying areas of Eastern Anatolia

Areas	First Familia	Second Familia	Third Familia
Nemrut Mountain[96]	Fabaceae	Rosaceae	Caryophyllaceae
Pirreşit Mountain[34]	Asteraceae	Poaceae	Fabaceae
Çatak Valley II([97]	Asteraceae	Brassicaceae	Fabaceae
Malatya-Pötürge [13]	Fabaceae	Asteraceae	Brassicaceae
Hazar Mountains[126]	Fabaceae	Asteraceae	Brassicaceae
Hasan Mountain [13]	Fabaceae	Brassicaceae	Asteraceae
Dumlu Mountain[33]	Asteraceae	Poaceae	Lamiaceae
MunzurMountain[124]	Asteraceae	Fabaceae	Brassicaceae
Erek Mountain[83]	Asteraceae	Fabaceae	Brassicaceae
Kars-Iğdır-Armenia Border[34]	Asteraceae	Poaceae	Fabaceae
Köse Mountain[34]	Asteraceae	Lamiaceae	Caryophyllaceae
Van Castle[80]	Brassicaceae	Asteraceae	Fabaceae
Aladağ [59]	Asteraceae	Fabaceae	Brassicaceae
Bingöl Mountains[80]	Asteraceae	Caryophyllaceae	Lamiaceae
Sübhan Mountain[28]	Asteraceae	Fabaceae	Poaceae
Çakmak Mountain[55]	Asteraceae	Poaceae	Fabaceae
Akyaka-Arpaçay[75]	Asteraceae	Poaceae	Fabaceae
Çatak Valley I[97]	Asteraceae	Fabaceae	Brassicaceae
Çatak Valley II[97]	Asteraceae	Brassicaceae	Fabaceae

10 genera with highest number of taxa are ***Astragalus, Centaurea, Verbascum, Trifolium, Silene, Vicia, Veronica, Ranunculus, Alyssum*** and ***Salvia.*** First three genera with maximum number of taxa in the area investigated are given below.

Table 3. The richest 10 genera with highest taxa number in different studying areas of East Anatolia region

Areas	First Big Three Genera in the Researching Areas		
Pirreşit Mountain[34]	***Astragalus***	***Silene***	***Centaurea***

Çatak Valley I [27]	***Astragalus***	***Centaurea***	***Salvia***
Çatak Valley II[97]	***Astragalus***	***Silene***	***Centaurea***
Nemrut Mountain[96]	***Silene***	***Astragalus***	***Trifolium***
Malatya-Pötürge [13]	***Astragalus***	***Trifolium***	***Silene***
Bingöl Mountains[80]	***Astragalus***	***Silene***	***Centaurea***
Hasan Mountain [13	***Astragalus***	***Trifolium***	***Vicia***
Dumlu Mountain[33]	***Astragalus***	***Trifolium***	***Veronica***
Munzur Moutains[124]	***Astragalus***	***Silene***	***Alyssum***
Erek Mountain[83]	***Astragalus***	***Centaurea***	***Veronica-Ranunculus***
Köse Mountain[102]	***Silene***	***Stachys***	***Centaurea***
Van Castle[80]	***Centaurea***	***Alyssum***	***Astragalus***
Aladağ[59]]	***Astragalus***	***Silene***	***Centaurea***
Sübhan Mountain[28]	***Astragalus***	***Centaurea***	***Silene***
Çakmak Mountain[55]	***Astragalus***	***Silene***	***Rumex***
Akyaka-Arpaçay…[75]	***Silene***	***Carex***	***Veronica***

In the area of Çatak Valley II according to Ekim et al. (2000) **[20]** and IUCN (2001) **[50]** they are distributed in the threat categories as follows; 1 Critical (CR), 1 Endangered (EN), 4 Vulnerable (VU), 18 Near Threatened (nt), 39 Least Concern (lc). The threat categories of rare taxa are as follows; 27 VU, 1 nt **[97]**.

There are a lot of useful plant taxa like medicinal, aromatical, dye, food growing naturally in the region. And also local foods like Herbal cheese and Kelledoş prepared from plants of the region **[93, 94, 79].**

Table 4. Life forms of plant taxa growing in the region according to Raunkiaer (1934).

Areas	Therophyte Ratio %	Chamaphyte Ratio %	Hemichriptophyte Ratio %	Chriptophyte Ratio %	Phanerophyte Ratio %
Pirreşit Mountain[34]	19,6	9,0	54,9	14,1	1,6
Van Castle[80]	36,5	31,0	10,9	19,4	1,8
Allahuekber Mountains[111]	12,6	13,5	61,5	3,2	8,8
Akyaka-Arpaçay[75]	18,8	2,7	65,5	9,2	-
Gâvur Mountains[108]	5,0	9,0	73,0	3,0	9,0
Çakmak Mountain[55]	21,9	16,2	44,8	10,3	6,8

6. Endemism in the region: Irano-Turanian phytogeographical region with an area of 2.400.000 km² embodies nearly 3500 vascular plant taxa. The total number of endemic taxa found in the region and its environs is almost 1300 **[3, 45, 58]**. Thus giving a ratio of 30-37 %. But this situation is valid for the regional flora, not each a mountain, valley, basin, town etc. The number of endemic genera to this part is almost 80 **[47, 102]**. The highest endemism is observed in Erzincan (Üzümlü, Çayırlı, Tercan), Erzurum (Aşkale, Oltu, Narman, Tortum, Uzundere), Tunceli(Ovacık, Pülümür, Çemişgezek), Malatya (Arapgir, Darende) and on mountains south of Lake Van (Özalp, Bahçesaray, Gürpınar, Gevaş, Çatak, Başkale etc.), Hakkari (Cilo and Sarp Mountains), Ağrı(Eleşkirt, Patnos), Kars(Arpaçay, Diyadin, Taşlıçay) and Bingöl(Yayladere). The ratio increases when we

move from North to South and West to East. In addition to this, endemism in crossroads of phytogeographical region is very high for examples Kop Dağı, Zigana in Aşkale (Erzurum)-Bayburt/Gümüşhane **(Fig. 4).**

Typical representatives of some Irano-Turanian endemics are***: Astragalus hakkiaricus, A. crassinervius, A. karabaghensis, A. shelkovnikovii, A. siliquous, Cerastium araraticum, Bufonia calyculata, Chrysocamela noena, Tchihatchewia isatidea, Bornmuellera cappadocica, Alyssum harputicum, Corydalis oppositifolia*** subsp. ***kurdica, Isatis bitlisica, Silene eminentis, Gypsophila venusta*** subsp. ***staminea, Ranunculus crateris, R. poluninii, R. sintenisii, Dianthus muschianus, Gypsophila graminifolia, G. paniculata*** var. ***araratica, G. aucheri, G. bitlisensis, Silene sclerophylla, S. azirensis, S. araratica, Paronychia arabica*** subsp. ***euphratica, P. turcica, Hypericum scabroides, Linum triflorum, Geranium eginense, Haplophyllum cappadocicum, Rhamnus kayacikii, Chesneya elegans, Astragalus bashkalensis, A. rechingeri, A. baytopianus, A. oltensis, A. gevashensis, A. mukusiensis, A. xerophilus, A. taochius, A. davisii, Oxytropis fominii, Vicia glareosa, Trifolium longidentatum, Hedysarum vanense, Onobrychis huetiana, Ebenus macrophylla, Amygdalus trichamygdalus*** var. ***elongata, Potentilla anatolica, Alchemilla erzincanensis, Rosa pisiformis, Crataegus davisii, Sedum polystriatum, Astrantia maxima*** subsp. ***haradjianii, Rhabdosciadium microcalycinum, Prangos platychlaena, Froriepia gracillima, Malabaila lasiocarpa, Trigonosciadium intermedium, Laserpitium carduchorum, Cephalaria anatolica, Pulicaria armena, Anthemis schischkinii, Tanacetum oltense, Cousinia aucheri, C. vanensis, Cirsium aduncum*** subsp. ***bashkalense, Serratula bornmuelleri, Centaurea demirizii, C. taochia, C. poluninii, C. aucherana, Echinops melitenesis, Uechtritzia armena, Scorzonera davisii, S. aucherana, Tragopogon albinervis, Taraxacum davisii, Chondrilla spinosa, Campanula hakkiarica, C. munzurensis, Dionysia teucrioides, Vincetoxicum fuscatum*** subsp. ***boissieri, Marrubium parviflorum*** subsp. ***oligodon, Convolvulus carduchorum, Myosotis platyphylla, Paracaryum montbretii, Verbascum birandianum, V. vanense, Scrophularia bitlisica, S. libonotica*** subsp. ***libonotica*** var. ***urartuensis, S. erzincanica, Chaenorhinum cryptarum, C. huber-morathii, Veronica polium, Rhynchocorys odontophylla, Teucrium leucophyllum, Phlomis integrifolia, P. sintenisii, Lamium galactophyllum, Wiedemannia orientalis, Ballota rotundifolia, Marrubium vanense, M. vulcanicum, Sideritis vulcanica, S. brantii, S. munzurdagensis, Nepeta baytopii, Dracocephalum multicaule*** var. ***setigerum, Origanum acutidens, Micromeria elliptica, Thymus convolutus, T. canoviridis, Salvia ballsiana, S. kronenburgii, S. odontochlamys, Limoniopsis davisii, Acantholimon spirizianum*** var. ***spirizianum, A. strigillossum, Plantago anatolica, P. euphratica, Thesium oreogetum, Euphorbia petrophila*** var. ***armena, Urtica haussknechtii, Quercus macranthera*** subsp. ***syspirensis, Galium cappadocicum, G. tortumense, Allium oltense, A. baytopiorum, Bellevalia crassa, B. rixii, Fritillaria minima, Tulipa sintenesii, Iris taochia, Crocus karduchorum, Dactylorhiza chuhensis, Luzula turcica, Elymus clivorum, Bromus armenus, Ventenata eigiana, Trisetum thospiticum, Sesleria araratica, Delphinium munzianum, D. carduchorum, D. dolichostachyum, Ranunculus vanensis, R. munzurensis, R. bingoeldaghensis, Papaver persicum*** subsp. ***fulvum, Physocardamum davisii, Aethionema munzurense, Thlaspi aghricum, Gypsophila peshmenii, Hypericum malatyanum, Astragalus altanii, A. tatlii, Pyrus yaltirikii, Sedum sorgerae,***

Chaerophyllum karsianum, Cirsium eliasianum, Campanula aghrica, C. yildirimlii, Veronica allahuekberensis, Stachys tundjeliensis, Origanum munzurense, Limonium vanense, Agropyron deweyi, Nonea karsensis, Vicia rafigae, Astragalus bahcesarayensis etc. **[50, 82]**.

Typical representatives of some Euxine endemics are; ***Draba hispida, Delphinium formosum, Gypsophila glandulosa, Silene lazica, Festuca lazistanica*** subsp. ***lazistanica, Campanula choruhensis, Onosma nigricaule, Allium sosnowskyanum, Geranium cinereum*** var. ***ponticum, Astragalus czorochensis, Sempervivum armenum*** var. ***armenum, Doronicum balansae, Senecio integrifolius*** subsp. ***karsianus, Cirsium trachylepis, Centaurea appendicigera, Hieracium ovalifrons, H. variegatisquamum, H. hypopityforme, H. onosmaceum, H. sarykamyschense, H. lazicum, H. tamderense, H. microtum, Cicerbita baissieri, Symphytum armeniacum, Verbascum transcaucasicum, Necranthus orobanchoides, Asperula pestalozzae*** etc.

Typical representatives of some Mediterranean endemics are; ***Onosma nanum, O. aucheranum, Stachys cretica*** subsp. ***mersinaea, S. citrina*** subsp. ***chamaesideritis, Galium davisii, Carex divulsa*** subsp. ***coriogyne, Pterocephalus pinardii*** etc.

Typical representatives of some Euro-Siberian endemics are; ***Alopecurus laguroides, Silene olympica, Iris kerneriana, Lathyrus karsianus. Cyathobasis fruticulosa*** from Monotypic genus **[3, 20, 47].**

7. Vegetation: There are a lot of literatures on vegetation of the region but **v**ery few studies have been undertaken on the vegetation of Hakkari, Bingöl, Ardahan, Gümüşhane of the region and its environs**[2, 8, 9, 14, 15, 17, 22, 34, 43, 54, 60, 63, 66, 78, 101, 106-109, 112, 116-118, 122, 125, 127]** have studied on vegetation of it. In general semidry areas are dominated by a steppe vegetation, higher altitudes by oaks and in humid areas ***Pinus sylvestris*** forests dominate as in northeast. Vegetation in general thus comprises of forest, shrub and steppe. Both forest and steppe vegetation have been destroyed and natural plant cover has got reduced. For long distances one can observe the degraded areas covered by cushion forming steppy taxa like ***Astragalus microcephalus, A. aureus, A. lagurus, A. aduncus, A. nigripilis, Artemisia austriaca, A. spicigera, Veronica orientalis, Thymus fallax, T. transcaucasica, Acantholimon calvertii, A. ulicinum, Gundelia tournefortii, Stachys iberica, S. lavandulafolia, Salvia multicaulis, Festuca brunnescens, Alopecurus textitis, Phleum montanum***, and ***Poa bulbosa,*** mixed up with shruby forms like ***Cotoneaster nummularia, Rosa pimpinellifolia, R. canina, R. gallica, Rhamnus pallasii, R. catharticus, Viburnum opulus, Sorbus torminalis, Prunus divaricata, Ephedra major*** and ***Crataegus monogyna, C. orientalis*** etc. These are of secondary nature because generally no chance has been given to the destroyed forests to regrow (**Fig. 1).**

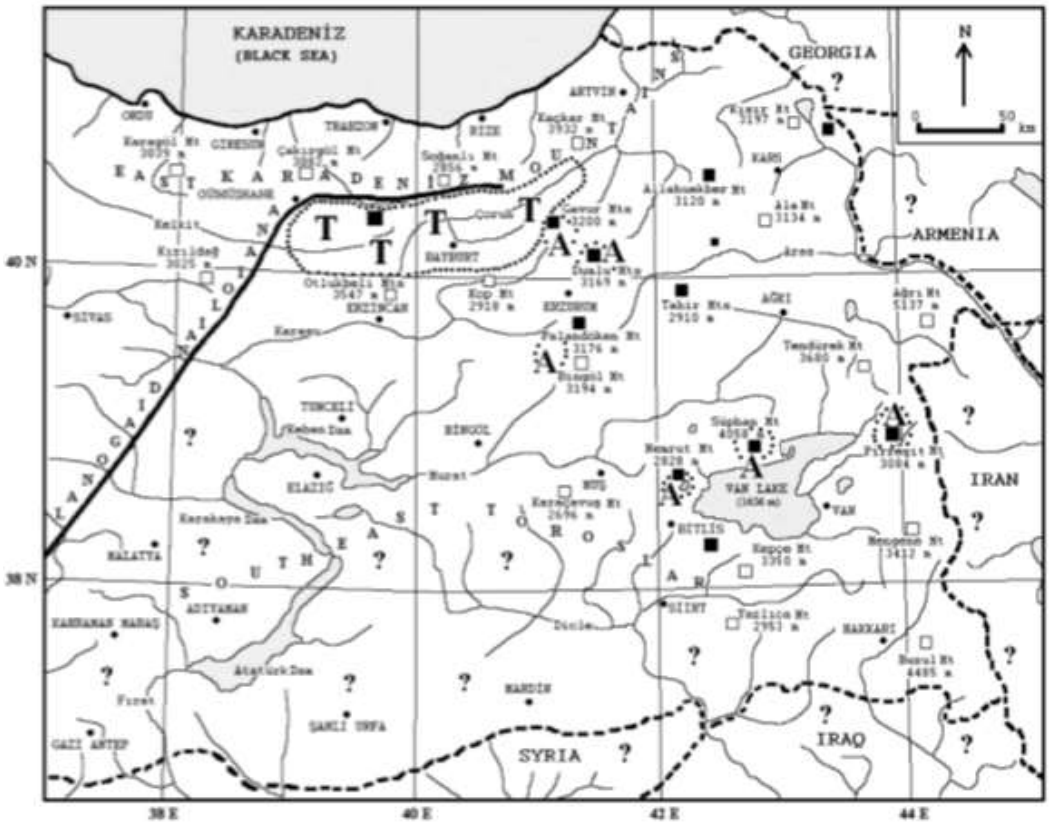

Figure 1. A geographical map of Eastern Anatolia and probable synchorology of the order Festuca oreophilae- Veronicetalia orientalis and its type and other alliances; **T:** the Tanaceto aucherani- Thymion pubescentis alliance, **A:** the Astragalo aurei- Festucion caucasiacae alliance, ??: unknown areas, - -: National borders, Mt-Mts: mountain-mountains, ■ :studied areas, □: some important mountains. **[60].**

7.1. Forest vegetation: In the north largely ***Pinus sylevestris*** forests are distributed but in other parts we come across ***Quercus longipus, Q. brantii, Q. macranthera*** and ***Betula pendula. Pinus sylvestris*** (Yellow pine***)*** **forests** occur in areas experiencing humid or semi-humid severe winters, with a greater period of sunshine in the vegetative period. An association of a pure stand is observed between 1600-2800 m in the northeast of the region, which is infiltrated by steppe taxa at destroyed sites. The two associations of ***P. sylvestris*** found at Gâvur and Allahuekber mountains in the region are;

Trifolio-Pinetum sylvestris [109]: This association is seen on Gâvur mountains on andesit-basaltic tuff which is slightly acidic in character. Characteristic species are ***Pinus sylvestris, Trifolium ambiguum*** and ***Pastinaca pimpinellifolia.*** Character speices of *Querco - Fagetea* class and *Populetalia albae* order of this association are *Poa nemoralis* **V,** *Vicia cracca* subsp. *tenuirolia* **V,** *Populus tremula* **IV**, those of *Molinio Arrhenatheretea* and Arrhenatheretalia being *Achillea millefolium* subsp. *millefolium* **I,** *Lathyrus pratensis* **I,** *Lotus corniculatus* var. *cornuculatus* **I.** Character speies of *Daphno-Festucatea* are *Centaurea triumfettii* **IV,** *Helianthemum nummularium* **V,** *Alyssum pateri* subsp. *pateri* **III,** *Festuca brunnescens* **II.** This assciation abounds in steppe species and has been classified

as upper class: *Querco-Fagea*, class: *Quercetea pubescentis*, order: *Quercetalia pubescentis*, alliance: *Quercion anatolicae*, association: *Trifolio-Pinetum sylvestris*.

Triseto-Pinetum sylvestris [110]: It is found on north slopes of Allahuekber mountains on andesite-obsidyen parent material, with a pH of 4.8-6.7. The altitude varies between 1900-2500 m. Association is characterised by *Pinus sylvestris, Trisetum flavecens* and *Trifolium ambiguum*. It embodies 70 % **Euro - Siberian** elements, however, at degraded sites particularly on south slopes **Irano-Turanian** elements are higher in percentage, as such south slope is a transition zone for **Euro-Siberian** and **Irano-Turanian** elements. Character species of *Qureco - Fagetea* class are; *Vicia cracca* subsp. *tenuifolia* **IV,** *Poa nemoralis* **III,** *Lapsana communis* subsp. *grandiflora* **III,** *Rubus ideaus* **I.** Character species of *Molinio - Arrhenatheretea* are; *Lotus corniculatus* var. *corniculatus* **II,** *Trifolium pratense* var. *sativum* **I.** Character species of *Quercetea pubescentis* class are; *Coronilla varia* subsp. *varia* **I,** *Euonymus latifolius* **I,** *Juniperus oxycedrus* subsp. *oxycedrus* **I.** Character species of *Daphno - Festucetea* are; *Myosotis lithospermifoia* **I,** *Festuca brunnescens* **I,** *Koeleria cristata* **I.** Character species of *Geranio - Pinion* alliance are, *Lonicera caucasica* subsp. *caucasice* **II.** Syntaxonomic classification of this association is as follows: upper class: *Querco - Fagea*, class: *Quercetea pubescentis*, order: *Querco - Carpinetalia*, alliance: *Carpino - Acerion*, association: *Triseto - Pinetum sylvestris*.

Quercus(Oaks) **Forests** start from south of Europe reaching Anatolia over Balkans extending up to Erzincan, Tunceli, Bingöl, Malatya, Muş and Bitlis, crossing over to Aşkale through Aras, with big forests on the coast and West areas(Bitlis: Tatvan, Mutki, Güroymak; Muş: Hasköy, Korkut etc.) of Lake Van. At places these forests are mixed up with shrubs like ***Juniperus communis, J. excelsa, Quercus libani*** and ***Acer platanoides*****.** ***Quercus macranthera*** subsp. ***syspirensis*** is widely distributed around Erzincan and Gümüşhane, whereas ***Q. brantii*** and ***Q. libani*** are found widely in Malatya and Bingöl.

7.2. Schruby Vegetation*:* This vegetation occupies the areas of degraded forests and depressions. The species of ***Populus tremula, Cotoneaster nummularia, Rubus ideaus, Juniperus oxycedrus*** subsp. ***oxycedrus, J. nana, J. excelsa, Quercus pubescens***, ***Lonicera caucasica*** subsp. ***caucasica, Rhamnus pallasii, R. catharticus, Daphne oleoides, Sorbus torminalis, Rosa pulverulanta, R. canina, R. gallica, R, villosa, Cotinus coggyria, Colutea*** spp. and ***Crataegus monogyna, C. orientalis, Elaeagnus angustifolia, Hippophae rhamnoides***, ***Cotoneaster nummularia*** grow on degraded forests. ***Paliurus spina-christi, Spirea crenata, Cotinus coggyria, Berberis vulgaris, B. crategina, Rhamnus pallasii, Prunus prostrata*** and ***Colutea armena*** occupy the depressions in Erzurum valley, like Tortum, Uzundere and Oltu. Main associations are;

Balloto-Rhamnetum pallasii [110]: This association is found on Allahuekber mountains (Kars) in the Akshar-Yeshildemet between 1400-1800 m on andesite parent material. Character species are; *Ballota nigra* subsp. *nigra* **V,** *Rhamnus pallasii* **V,** *Polygonum convolvulus* **V,** *Spiraea crenata* **IV,** *Acinos arvensis* **III,** *Sobolewskia clavata* **II.** Character species of the associations of class *Quercetea pubescentis* and order *Quercetalia pubescentis* are; *Continus coggyria* **V,** *Teucrium chamaedrys* **V,** those of *Astragalo-*

Brometea and *Astragalo-Brometalia* being *Scutelleria orientalis* subsp. *orientalis* **III,** and *Teucrium polium* **III.**

Caragano-Minuartietum lineatae [9, 14, 108-110]: This association occurs in Tortum valley between 1300-1500 m. The character species of this association are; *Caragana grandiflora* **V,** *Minuartia lineata* **II,** *Nigella arvensis* **II,** *Silene bupleuroides* **II,** *Clypeola elegans* **II**. *Rhamnus pallasii* and *Ephedra major* var. *procera* occur in this assciation as small shrubs. The species found in the *Astragalo-Brometea* and *Astrogalo-Brometea* association are; *Stipa barbata* **IV,** *Teucrium polium* **II,** *Marrubium parviflorum* **II,** *Paronychia kurdica* **II,** *Phlomis armeniaca* **I,** *Centaurea virgata* **I**. The character species of class *Dapho-Festucetea* are; *Prunus prostrata* **III,** *Cruciata coranata* **II,** *Melica ciliata* var. *micrantha* **II,** *Helichrysum plicatum* subsp. *plicatum* **I**, whereas *Quercetea pubescentis* class has *Cotinus coggyria* **IV,** *Acer campestre* **I** as the character species. The character species of the order *Querco-Cedretalia* is *Berberis crataegina* **I**.

7.3. Hydrophytic Vegetation: *Equisetum ramosissimum, Elymus compressus, Prunella vulgaris, Juncus inflexus, Plantago lanceolata, Epilobium hirsutum, Alchemilla capactilis, Geum rivale* together with *Phragmites australis, Typha latifolia, Sparganium erectum, Lythrum salicaria, Veronica anagallis-aquatica***,** *Nasturtium officinale, Heracleum crenatifolium, Mentha spicata, M. longifolia, M. aquatica, Parnassia palustris, Ranunculus trichophyllus, R. repens, Bellis perennis* and *Bidens cernua, Trifolium* and *Coronilla* spp. are frequently observed along the stream banks, wet places and swampy areas**.** Vegetation is represented by such communities as ***Hippophae-Salix*** and ***Typha-Juncus*** **[12, 27, 31, 45-47, 51, 56, 75, 80].**

Hippophaetum rhamnoidis [108]: This association flourishes on slightly basic sandy-loam soils and along water courses. The character species are*; Hippophae rhamnoides* **V,** *Poa angustifolia* **V,** *Apera intermedia* **V,** *Geranium sylvaticum* **III,** *Lysimachia vulgaris* **II**. Two sub-associations found in this assoication are represented by *Salix* species. These are *Salicetosum albae* and *Salicetosum armeno-rossicae*. In the associations of *Alno-Populetea, Populetalia* and *Alno-Quercion* character species are; *Calamagrostis pseudophragmites* **III,** *Galium aperine* **II,** *Myricaria germanica* **II,** *Rubus ceasicus* **II.** Character species of *Molinio-Arrhenathereta* and *Arrhenatheralia* found in this association are; *Lotus corniculatus* var. *corniculatuis* **V,** *Festuca pratensis* **IV,** *Rhinanthus minor* **IV,** *Trifolium pratense* **IV,** *Trifolium repens* **IV,** *Plantago lanceolata* **IV,** *Phleum prantense* **III,** *Dactylis glomerata* **III,** *Achillea millefolium* subsp. *millefolium* **III,** *Medicago lupulina* **II,** *Prunella vulgaris* **II,** *Ranunculus repens* **I**, *Lathyrus pratensis* **I,** *Carum carvi* **I.** Syntaxonomically the association is classified as follows; class: *Alno-Populetea*, order: *Populetalia albae*, alliance: *Alno-Quercion roboris*, sub-alliance: *Salicion albae*, association: *Hippophaetum rhamnoidis*.

Typho-Juncetum inflecii [109]: This community occurs on young alluvial deposits and inside the water around Serçeme stream in Erzurum. Character species of the association are; *Typha latifolia, Juncus inflexus* and *J. articulatus. Mentha tomentosa, Epilobium hirsutum* and *Lacustris tabernamontani* are the differentiating species. Character species

Carex gracilis of alliance *Phragmition communis* is also found in this association. Association is classified as; class: *Phragmitetea*, order: *Pyragmitetalia*, alliance: *Phragmition*, association: *Typho-Juncetum inflecii*[60].

7.4. Grasslands: These are widely distributed around Erzurum, Kars and Ardahan at different altitudes on irrigated areas and mowed once a year. The associations in this group are:

Hordeetum violaceumii [108]**:** This association has been described from Serçeme valley in Erzurum and is found on lower cretaceous aged calcareous rocks, rich in $CaCO_3$. Character and differentiating species of this association are; *Hordeum violaceum* **V,** *Agrostis stolonifera* **IV,** *Rhinanthus electrolopus* **III,** *Deschampsia ceaspitosa* **III,** *Thalictrum flavum* **III**. Character species of the associations in *Molinio-Arrhenatheretea* and *Arrhenatheretalia* are; *Festuca pratensis* **V,** *Trifoium pratense* **V,** *Carum carvi* **IV,** *Phleum pratense* **IV,** *Lotus corniculatus* var. *corniculatus* **III,** *Plantago lenceolata* **III,** *Achillea millefolium* subsp. *millefolium* **III,** *Trifolium repens* **I,** *Prunella vulgaris* **I**. Character species of *Triseto-Polygonion bistortae* alliance is *Polygonum bistorta* subsp. *carneum*. Character species of *Astragalo-Brometea* class are; *Bromus tomentellus* **III** and *Melica ciliata* subsp. *micrantha* **III**. The association is classified syntaxonomically as follows; class: *Molinio-Arrhenatheretea elatioris*, order: *Arrhenatheretalia elatioris*, alliance *Triseto-Polygonion bistortae*, association: *Hordeetum violaceumii*.

Deschampsio-Ranunculetum brachylobus [110]**:** The association inhabits the south and west facing slopes of Allahuekber mountains around Kars, with a slope of 3-15, parent rock being andesite and bazalt, occupying irigated areas. Character and differentiating species of this association are; *Deschampsia ceaspitosa* **IV,** *Ranunculus brachylobus* **IV,** *Fuernrohria setifolia* **III,** *Tripleurospermum sevanense* **II,** *Carex diluta* **II.** Character species of *Molinio-Arrhenatheretea* class of *Molinio-Arrhenatheretalia* order are *Trifolium repens* **V,** *Festuca pratensis* **IV,** *Trifolium pratense* **II,** *Carum carvi* **II,** *Lotus corniculatus* var. *corniculatus* **II**. Charcter species of *Triseto-Polygonion bistortae* alliance is *Polygonum bistortea* subsp. *corneum*. This association is present together with *Hordeetum violaceumii* association in the same alliance *Triseto-Polygonion bistortae*.

Hordeeto-Ranunculetum comosae comb. nov.
(Syn: *Hordeum nodosum-Pedicularis comosa* Andic, 1982). Common on grasslands in Erzurum with a pH of 6.0-7.8, organic matter content of 2.65-13.9 %. Characteristic species are *Hordeum nodosum, Pedicularis comosa* and *Orchis laxiflora*. Character species of the *Molinio-Arrhenatheretea* and *Arrhenatheratalia* are; *Poa pratensis V,* *Lotus corniculatus* **IV,** *Trifolium pratense* **III,** *Trifolium repens* **II,** *Phleum prantense* **II,** *Medicago lupulina* **II,** *Dactylis glomerata* **I**, *Festuca pratensis* **I**.

Polygono-Primuletum auriculatae comb. nov.
(Syn: *Polygonum bistorta-Primula auriculata* Andic, 1982). The association is found on Palandöken mountain in Erzurum between 2500-2600 m. It occupies valley meadows with a high organic matter content lying around 20.37 %. The soils are poor in phosphorus,

ground water level being very high. Character species of this association are; *Polygonum bistorta* **V,** *Primula auriculata* **V,** *Orchis caucasica* **V**. Character species of the order *Arrhenatheratalia* are; *Trifolium repens* **V,** *Poa pratensis* **III,** *Cardamina raphanifolia* **III,** *Phleum pratense* **II,** *Lotus corniculatus* **I**. All the 33 species in this association are perennial. The companion species on the basis of cover / percentage are; *Agrostis alba*, *Alopecurus arundinaceus* and *Carex cretica*. There are new researches on vegetation of the region. The most important ones of them were being explained in this paper.

Van Lake basin is important plant area covering 1.8 million ha situated in the East Anatolian region. Most of lakes of the basin are rich in soda and saline(average %0.21) . The area has served as a genetical centre for many species like spinach(***Spinacia oleracea***). Halophytic taxa are mainly distributed around the lakes of Van and Erçek. ***Kochia prostrata, Panderia pilosa, Suaeda confusa, Iris spuria, Juncus*** spp., ***Hordeum marinum, H. murinum, Comphorosma monspeliaca, Triglochin maritima, Artemisia spicigera, A. alba, A. absinthium, Crypsis aculeata, Puccinella distans, Limonium gmelinii, L. vanense, Plantago crassifolia, Glaux maritima, Cyperus glaber, Salsola ruthenica, Chenopodium album, C. foliosum, Alopecurus arundinaceus, Scorzonara parviflora, Peganum harmala, Zygophyllum fabago. Allochrusa versicolor*** that known from one locality in Iğdır is growing in near the Armenia and Nakhitchevan.

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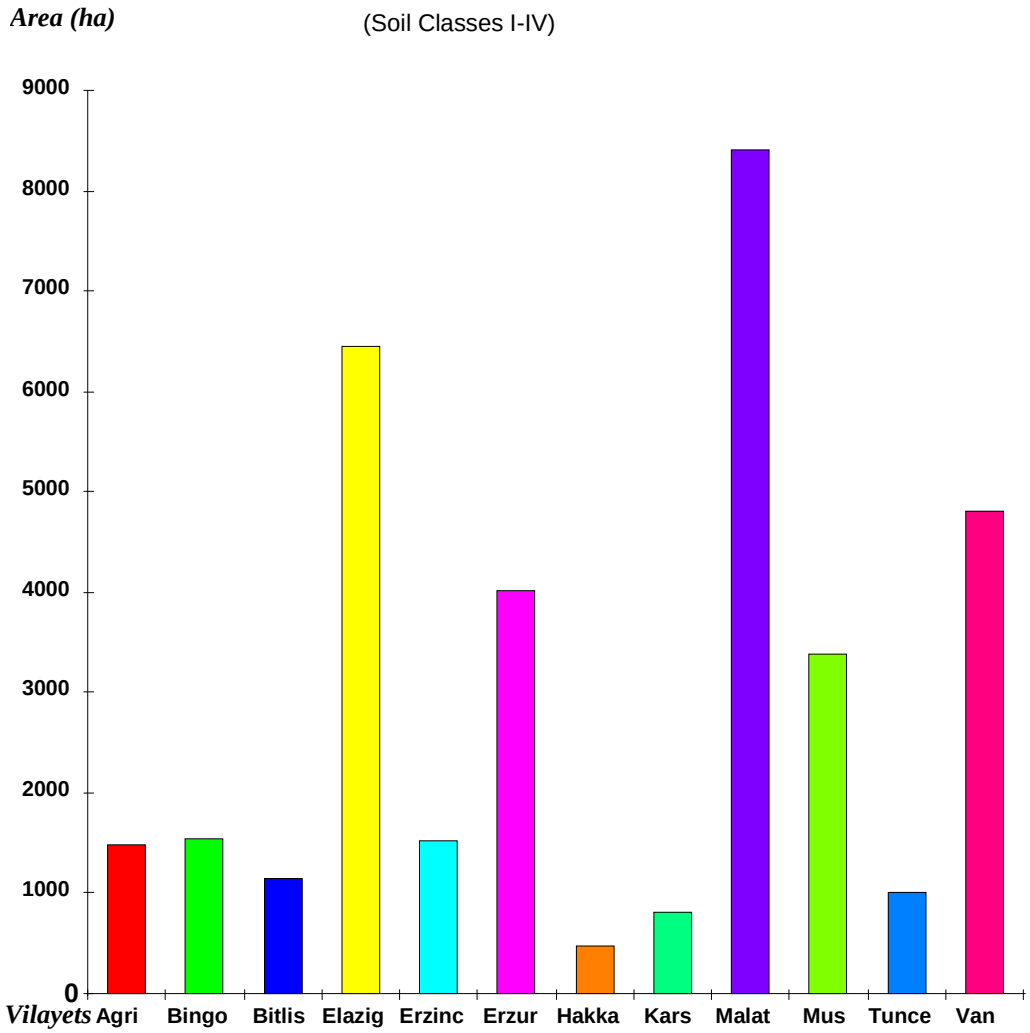

Figure 2. Land used for hausing in Eastern Anatolia

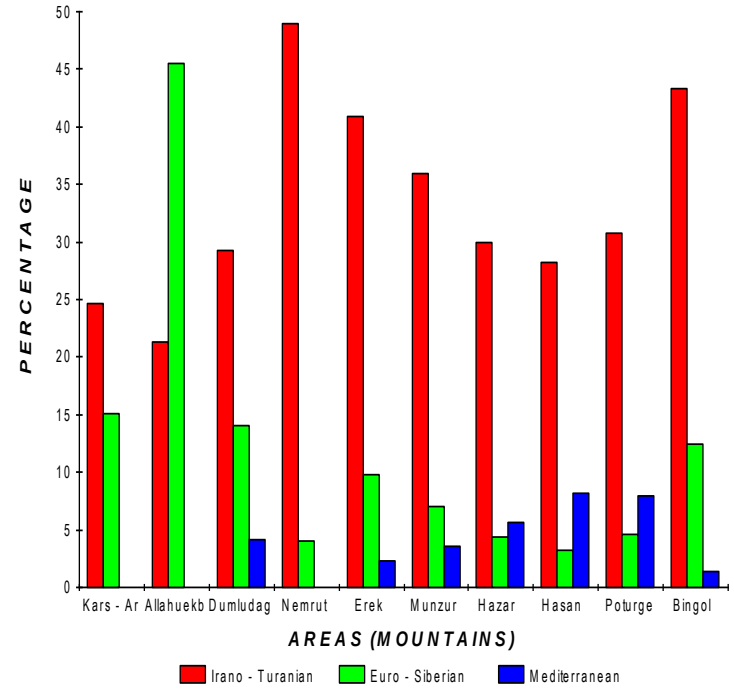

Figure 3. Distribution of phytogeographical elements in Eastern Anatolia

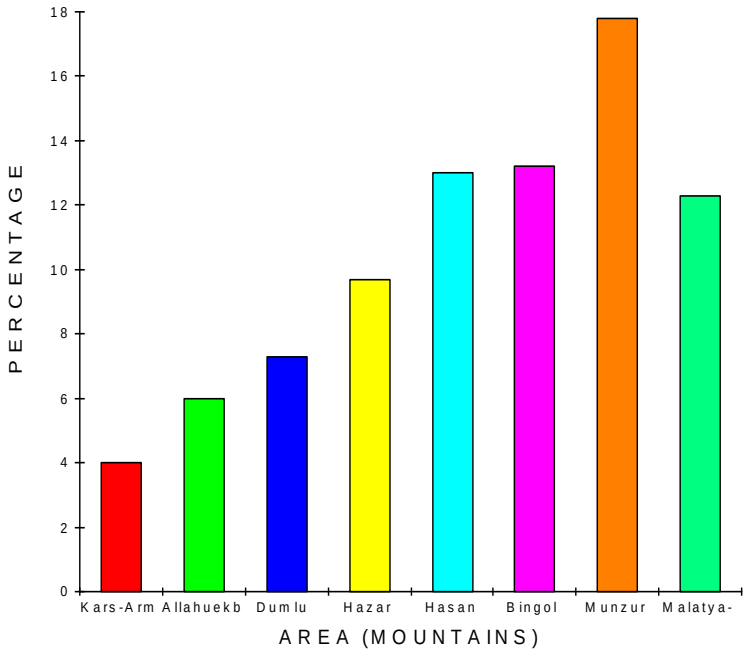

Figure 4. Ratio of endemism in Eastern Anatolia