MONOCOTYLEDONOUS GEOPHYTIC FLORA OF BOLU PROVINCE

by

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ABSTRACT

MONOCOTYLEDONOUS GEOPHYTIC FLORA OF BOLU PROVINCE

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This study was carried out between 2012 and 2013 in order to determine petaloid monocotyledonous geophytic Flora of Bolu province, located within A3 and A4 of the grid system in Turkey. In the research area, 818 plant specimens that consisted of 116 taxa belonging to 10 families and 40 genera were collected. From all collected specimens, four taxa are new records for the A3 grid square, one taxon is a new record for the Black Sea region and 14 taxa are new record for Bolu province. The number of endemic taxa in the research area is 18 and the rate of endemism is 15.51%. The distribution of the taxa according to the phytogeographical regions, the Mediterranneans ranked first among the specimens, accounting for 30.17%, followed by the euxine and/or Euro-Siberians 24.14%, Irano-Turanians 7.76%. The remain part of the identified species (37.93%) are widespread and/or unknown phytogeographic origin. The most common families in the research area according to APG III system are as follows: Orchidaceae has the highest number of taxa (31.03%) and followed by Asparagaceae (19.83%), Amaryllidaceae (18.10%) and Iridaceae

(12.07%). The most common genera in the area are as follows: *Allium* L. has the highest number of taxa (14.66%) and followed by *Ornithogalum* L. (9.48%), *Iris* L. (6.03%). Moreover, of all collected taxa, 43.10% bulbous, 24.14% rhizomous, 21.56% tuberous and 11.21% are cormous plants. Concerning flowering time, 94.83% of the taxa bloom in early-spring and spring, while 5.17% bloom in autumn.

Keywords: Bolu, Flora, Geophytes, Petaloid monocotyledonous, Taxonomy

ÖZET

BOLU İLİNİN MONOKOTİLEDON GEOFİT FLORASI

Demir, Sina Cafer

Yüksek Lisans, Biyoloji Bölümü

Tez Danışmanı: Yrd. Doç. Dr. İsmail Eker

Ekim 2013, 118 sayfa

Bu çalışma, 2012-2013 yılları arasında Bolu ilinin petaloid monokotiledon geofit florasını tespit etmek amacıyla yapılmıştır. Bolu il sınırları, Türkiye'nin grid sistemine göre A3 ve A4 karelerinde yer almaktadır. Araştırma alanından toplanan 818 bitki örneğinden 10 familyaya ait 40 cins ve 116 takson tespit edilmiştir. Toplanan örneklerden 4 takson A3 karesi, 1 takson Karadeniz bölgesi ve 14 taksonda Bolu ili için yeni kayıttır. Araştırma alanındaki endemik taksonların sayısı 18 olup endemizim oranı %15,51'dır. Araştırma alanından toplanan bitki örneklerinin fitocoğrafik bölgelere dağılımlarında %30,17 oranı ile Akdeniz elementleri ilk sırayı almaktadır. Avrupa-Sibirya ve/veya öksin elementleri %24,14 ile, İran-Turan elementleri ise %7,76 oranlarıyla takip etmektedir. Teşhisi yapılan taksonların %37,93'ü ise ya farklı fitocoğrafik bölgelerde geniş yayılışlıdır ve/veya hangi fitocoğrafik bölge elementi olduğu bilinmemektedir. Araştırma alanındaki en yaygın familyalar APG III sistemine göre şöyledir: Orchidaceae en fazla takson sayısına sahiptir (%31,03) ve sırasıyla Asparagaceae %19,83, Amaryllidaceae %18,10 ve Iridaceae %12,07 takip etmektedir. Alanda en yaygın cinsler ise şunlardır: *Allium* L. en fazla takson sayısına sahiptir (%14,66). Daha sonra gelen

cinsler ise *Ornithogalum* L. %9,48 ve *Iris* L. %6,03'dir. Taksonların %43,10'u soğanlı, %24,14'ü rizomlu %21,56'sı yumrulu, %11,21'i ise kormlu bitkilerdir. Mevsimsel çiçeklenme periyoduna bakıldığında, taksonların %94,83'ü erken ilkbahar ve ilkbahar dönemlerinde çiçeklenirken, % 5,17'si sonbahar aylarında çiçeklenir.

Anahtar Kelimeler: Bolu, Flora, Geofitler, Petaloid monokotiledon, Taksonomi

To My Parents

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ABBREVIATIONS

AIBU	Herbarium of Abant İzzet Baysal University
APG	Angiosperm Phylogeny Group
a.s.l	Above sea level
CR	Critically Endangered
Det.	Determinative
EKER	İsmail EKER
EN	Endangered
et al.	and others
ISTO	Herbarium of İstanbul University Faculty of Forestry
ISTE	Herbaryum of İstanbul University Faculty of Pharmacy
ibid.	Same place
Lc	Least Concern
Leg.	Collector
LR	Lower Risk
N.A.	Necmi AKSOY
nt	Near Threatened
S. DEMİR	Sina DEMİR
s.l.	*sensu lato* (in the broad sense)
s.s.	*sensu stricto* (in the narrow sense)
subsp.	Subspecies
Tunçkol	Bilge Tunçkol
var.	Variety
vol.	Volume
VU	Vulnerable
WSpAS	Winter, Spring, Autumn, Summer

1. INTRODUCTION

Anatolia is one of the most significant flora centers in the World due to its geographical position. It is located between Europe and Asia continents and on the intersection point of Irano-Turanian, Euro Siberian and Mediterranean phytogeographical regions (Figure 1). In addition, it ranges in altitude from sea level to 4000-5000 m, and varies climatically, geologically and topographically (Avcı, 2005; Koyuncu & Eker, 2011). And also, the fact that our country was not hardly affected by the natural events during the four main ice ages on earth (Ocak, 2012).

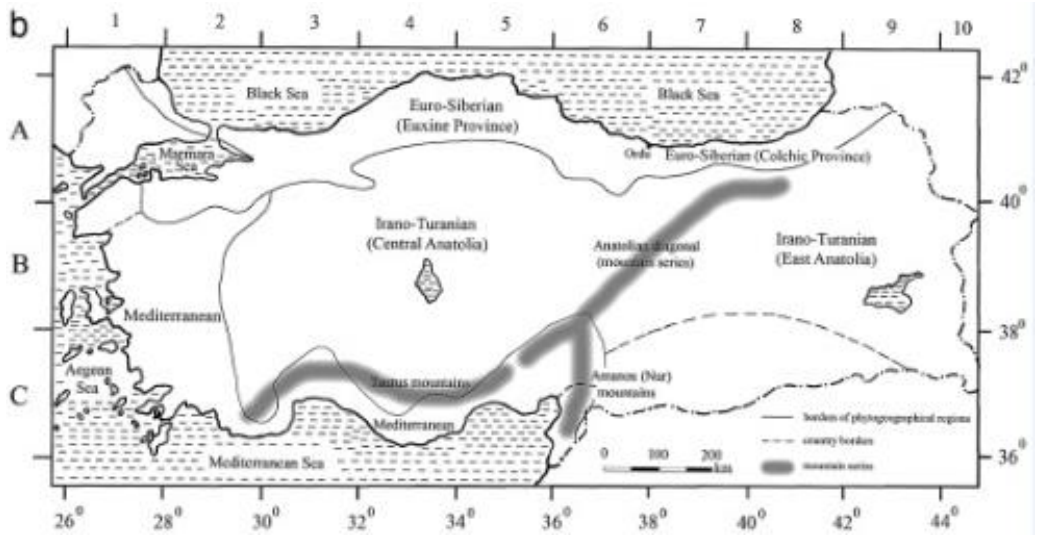

Figure 1: Phytogeographical regions of Turkey (Türe and Böcük, 2010)

Our country has been a habitat for almost 12,000 various plant taxa (Erik and Tarıkahya, 2004). This number has gone up to 12,476 with recently added numbers of new species and new records (Özhatay and Kültür, 2006; Özhatay et. al., 2009). Turkish flora is very

significant in terms of endemic plants as well as its varied diversity of species. European Flora except of Turkey have around 3,500 endemic plants while our country has almost 4,000 endemic plants. Considering the number of species, the rate of endemism in Turkey is 34% at species level, and also it is 36% when all of the taxa are considered (Figure 2; Vural, 2009).

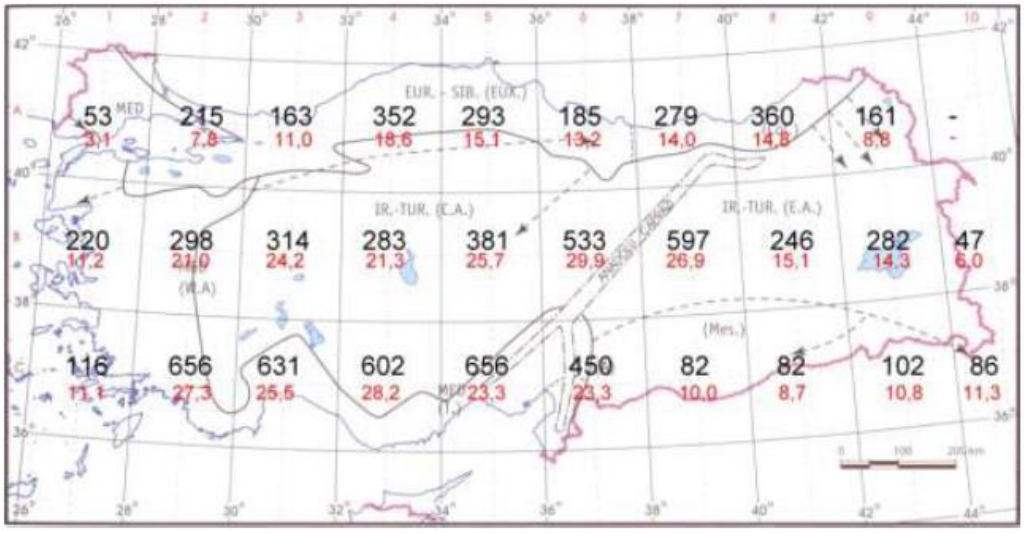

Figure 2: The Grid System of Turkey and number of endemic species (Kutluk and Aytuğ, 2004)

Due to the rich and interesting flora of Anatolia, it has always captured the interests of foreign botanists and allowed them to make floristic studies. The first significant study related with Turkish flora is *'Flora Orientalis'* which was published by a Sweedish botanist E. Boissier between 1867-1888. The most remarkable study on our country's flora is *'Flora of Turkey and the East Aegean Islands'* which had 10 volumes, was published between 1965-1988 and editted by P.H. Davis. In the following years, the 11th (supplement) volume was prepared and published by the Turkish botanists (Güner et. al. 2000). Recently, Güner et. al. (2012) published a checklist incluiding all of plant taxa in Turkey according to the current systematic changes.

Raunkiaer, Danish Botanist, divided plants into 5 main groups considering the conditions of renewing organs (buds) of plants in the unsuitable season (Figure 3; Yaltırık and Efe, 1996, Kılınç et al. 2006).

Phanerophytes: Buds continue living at 30 cm higher than soil level in the unsuitable season conditions. They are woody taxa and perennial.

Chamaephytes: Buds continue living at most 30 cm higher than soil level in the unsuitable season conditions. These are shrub or herbaceous taxa and perennial.

Cryptophytes: They continue living as bulb, tuber or rhizom (Geophyte) on body parts under soil or under water or marsh area (Halophyte-Hydrophyte) in the unsuitable season conditions and they are perennial.

Hemicryptophytes: They continue living on the soil surface as rosette leaves in the unsuitable season conditions. Upper soil parts are renewed in every vegetation period. They are biennial or perennial.

Therophytes: They complete their development in a vegetation period and die. They remain as seeds in the soil during insuitable season conditions and they are annual.

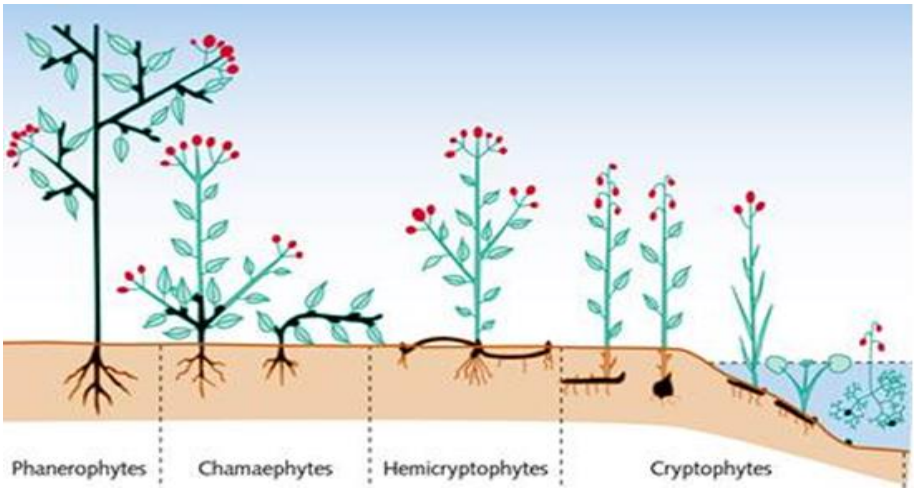

Figure 3: Raunkier's life forms (Kamenetsky, 2012)

Plants, which spend most of time in a year under soil as bulb, tuber, rhizom, corm or rootstock, are called Geophytes (ground plants) or Cryptophytes (hidden plants). Most of the Geophytes bloom beautiful and remarkable flowers in the first days of spring while some of them bloom in autumn (Eker, 2005).

Geophytes have been used in various industries for centuries; many of petaloid geophytes have ornamental features while some geophytes are used as vegetable plants. For example, leaves of *Arum* L. species are used as vegetables by local people. Orchid species used for making ice-cream and salep. On the other hand, geophytes are used as medicinal plants. For example, Galantamine, used to cure Alzheimer, is produced *Galanthus* L., *Leucojum* L. and *Narcissus* L. species. Colchicine, produced by *Colchicum* L., is also used to cure gout as well as other illnesses such as familial Mediterranean fever, pericarditis, and Behçet's disease (Baktır, 2012). Apart from these, geophytes are used in cosmetic industury, that is, cream and perfume are produced by some orchid species (Bulpitt, 2005).

Due to commercial properties of geophytes, they have attracted the interests of foreign researchers and merchants since 16th century. The first European adventure of the natural flower bulbs gathered from Anatolia started with the exhibition of our tulips in a botanic garden in Holland in 1550. Market of bulbous plants started with the export of bulbs of snowdrops (*Galanthus elwesii* Hooker fil.) and tulips (*Tulipa humilis* Herb.) which were picked up in the Taurus Mountains by Austurian Franz Schlosser, who lived in İzmir in 1885 (Alp, 2006; Demir, 2009). However, Turkish businessmen started to export wild flower bulbs in 1960's. Digging up excessive amounts of natural flower bulbs in the nature of Turkey between 1960-1990 led to destructions in the population of many species, and even caused some of them to become extinct. As a consequence, some laws were made in order to protect these plants and avoid the excessive dig ups after 1990's and their exports were related to quotas after that (Ekim et. al., 1991). In this connection, Turkish geophytes incluiding 17-21 species have been commercially exported every year (Anonymous 5, 2012).

Geographically, there are four important regions for diversity of geophytes. Among these regions, Mountain region from Chile to USA and Canada is broadest one. Asia region include China, Japan and Russia while South Africa region has important ornamental geophytes in the World. The other one is the Mediterranean basin which include Turkey, Greece, Northern Africa and Italy (Figure 4; Kamenetsky, 2012).

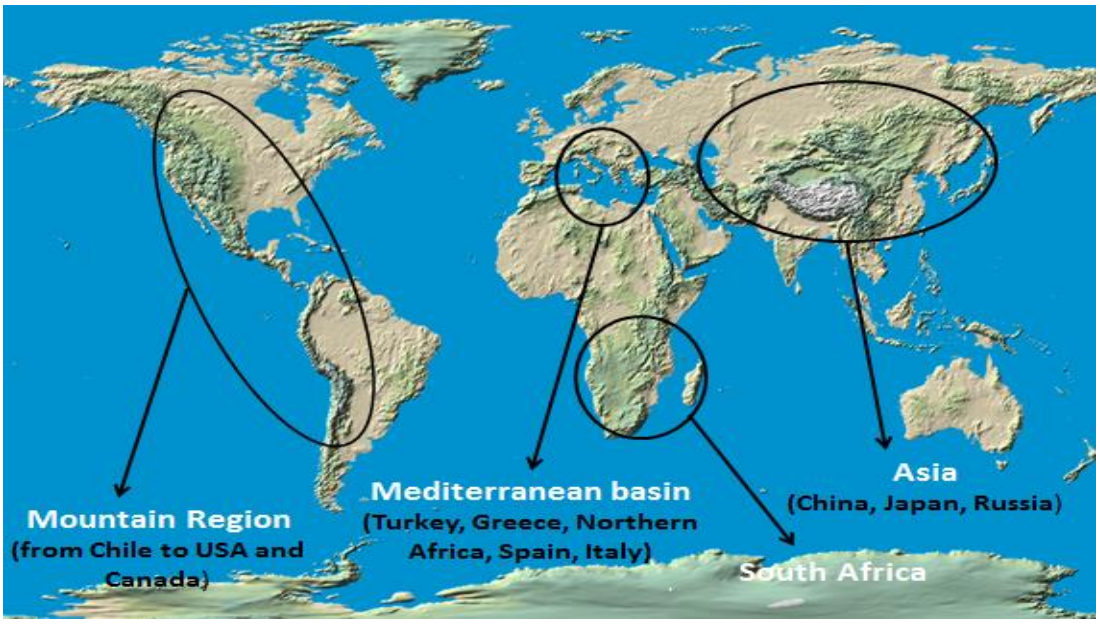

Figure 4: Important geophyte regions in the World

Turkey has six important regions for diversity of geophytes. Among these regions, Taurus and Amanos Mountains in south part, Van-Hakkâri and Munzur Mountains in east part, Olympos (Uludağ) and Ida (Kazdağı) in west part are present in Turkey (Figure 5). Turkish geophytes includes Equisetales, some dicotyledonous and many of monocotyledonous. There are around 80 geophytic taxa in equisetales, 1200-1500 dicotyledonous geophytes, 250-350 non-petaloid monocotyledonous geophytes and around 1000 petaloid monocotyledonous geophytes in our country. Petaloid monocotyledonous species are found mostly in Amaryllidaceae J.St.-Hil., Araceae Juss., Asparagaceae Juss., Colchicaceae DC.,

Iridaceae Juss., Liliaceae Juss. and Orchidaceae Juss. families when APG III (Angiosperm phylogeny group III) is taken into consideration.

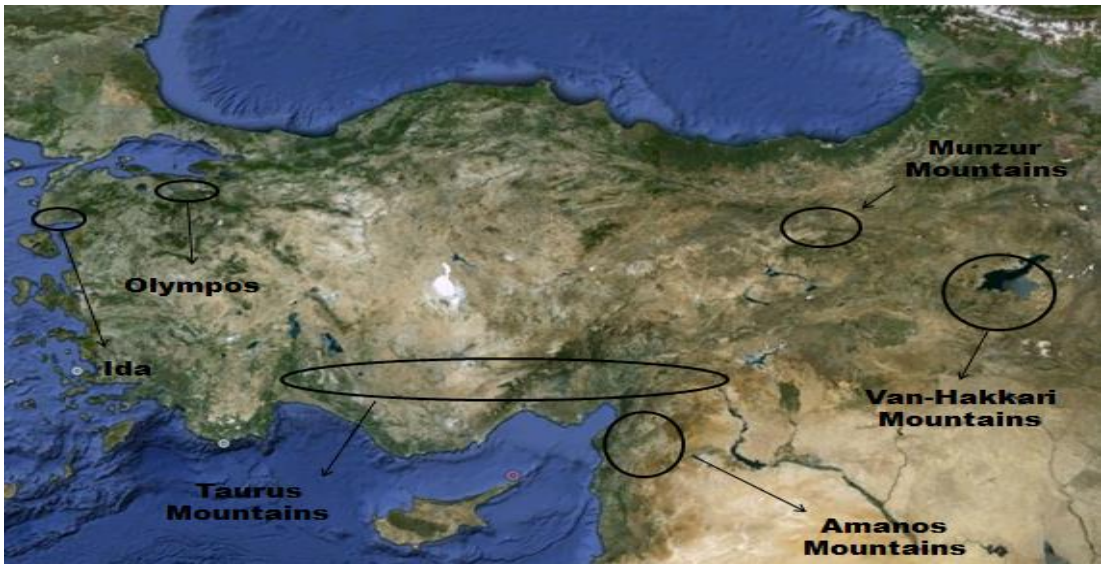

Figure 5: Important geophyte regions in Turkey

The main aim of this thesis is to prepare the species inventory of petaloid monocotyledonous geophytes in Bolu province and its counties. Here are the other reasons mentioned briefly why petaloid monocotyledonous geophytic Flora of Bolu province was chosen as a title of this thesis:

1) Geophytic Flora of Bolu province has not been studied before. Therefore it is an original study.

2) Geophytes have been collected and consumed as ornamentation, food source and medical plant by the local people or foreign collectors and researchers. The future of the species is under threat in the wild as a result of excessive collection. Therefore, to detect the recent population status of mainly endemic taxa, and also narrowly and rarely distributed plants.

3) To verify some doubtful records after the first collection of material in Bolu. And also to solve some nomenclatural problems under the light of the current taxonomic approaches directly or indirectly.

4) To provide contribution to the colourful-illustrated Turkish Flora started to be written by Turkish taxonomists by 2023.

5) Set up a garden for the *ex-situ* protection of bulbous plants within the Abant Izzet Baysal University in Bolu.

6) To prepare a book about bulbous plants of Bolu.

1.1. An overview to geophyte studies in Turkey

There are a few studies related to geophytes directly in our country. One of the oldest studies related to geophytes was made by Malyer on Liliaceae and Iridaceae families in Karacadağ (1983). In this study, the chorological and ecological features of the local plants were reflected. The most important work on this subject was made by Baytop and Mathew (1984). In this study, approximately 500 plants belonging to petaloid monocotyledonous geophytes were introduced, and their morphological features and economical importance were given. The other important study was made by Ekim et al. (1991). In this study, taxonomical and ecological properties of some of Turkish geophytes were investigated. Also, one of the most extensive local study on geophytes was made by Eker et al. (2008). Within this study, 102 geophyte taxa were determined from Şanlıurfa and also threatened categories of endemic and rare plants and their population density were exhibited.

Apart from these detailed studies mentioned above, there are some inventorial and floristic works on autumn geophytes in the city center of Muğla province were studied by Mammadov and Sahranç (2003), some geophyte taxa in Denizli province by Çelik et al. (2004), on Amaryllidaceae and Iridaceae families of Murat Mountain (Uşak-Kütahya) by Zilci (2007), and worked on Liliaceae family of Türkmen Mountain (Kütahya-Eskişehir) by Kısa (2009). Additionally, Özuslu and İskender (2009) studied on monocotyledonous geophytes of Sof Mountain (Gaziantep), Kupik (2009) on monocotyledonous geophytes of Çermik (Diyarbakır), and Duman (2010) on geophytes of Euxine region and Colchic sector. Lastly,

Çıngay et. al. (2012) researched the geophytes of Yazılıkaya (Eskişehir), Kayıkçı et. al. (2012) on some geophytes of Hatay province, and Şekeroğlu et. al. (2013) on some geophytes of Kilis province.

1.2. An overview to floristic studies in the province of Bolu

Considering literature studies, there is no a study directly made on geophytes in the province of Bolu. However, important floristic and vegetational studies made in Bolu. The oldest floristic works; by Akman and Ketenoğlu (1979) Gerede and Aktaş Forests, by Akman and Yurdakulol (1981) Bolu and Semen Mountains, by Ekim and İlarslan (1982) Yedigöller Natural Park were performed and significant information about Flora of Bolu province were given. In addition to these studies, Turgut (1996) studied Flora of Abant İzzet Baysal University Campus, Uluğ (1999) Flora of Gökçeler Mountain, Türker and Güner (2003) Flora of Lake Abant, Sümer (2002) Flora of Lake Yeniçağa, İkinci and Güner (2007) Flora of Lake Gölcük, Aksoy (2009) Flora of Karakiriş Mountain, İkinci (2011) Lake Sünnet, Sungurlu (2011) Flora of Kartalkaya, and Kanoğlu (2011) Flora of Lake Sülüklü and its surrounding flora. Also, vegetational studies made in Bolu are as following: Akman and Ketenoğlu (1978) Köroğlu Mountains, Akman et al. (1983) Bolu and Semen Mountains, and Akman and İlarslan (1983) Mudurnu surroundings.

2. GENERAL INFORMATIONS

2.1. General informations about the province of Bolu

Bolu province, which covers %1,015 of Turkey area, is located with 8.276 km² (827.600 Ha.) area in west Blacksea part of the Blacksea region. Average altitude is 1000 m while the center province altitude is around 725 m. Bolu, with its geographic coordinate position takes place between 40º 06' - 41º 01' north latitudes and 30º 32' - 32º 36' east longitudes. According to Bolu province centers: Dörtdivan, Yeniçağa and Gerede county are in east, Mengen is in northeast, Göynük and Mudurnu counties are in southwest, Seben and Kıbrıscık are in south. In the west part of Bolu, there is Düzce and Sakarya, and in its southwest Bilecik and Eskişehir take place while there is Ankara in its south, Zonguldak in its north and Karabük in its northeast. Province border lenght is 621.4 km.'dir. Mountains with east-west direction and the plains, valleys, and rivers between these mountains form the general sight of Bolu province. Mountains cover more than half of Bolu province with 56% ratio. Mountain heights increase from north to south and west to east. The highest points of these mountains, compared to the mountains on the coast, are Çele with 1980 m. and Naldöken Hills with 1911 m. The highest point of Köroğlu Mountains, one of the highest mountains, is Köroğlu Hill with 2.499 m. The extension of this mountain chain are Seben Mountains in the south of Bolu province and Ardıç Mountains going through Mudurnu. Kıbrısçık Plateau, shaped by volcanic effects and after rainfalls, takes place in the south of Köroğlu Mountains. Especially Seben Mountains with 1.854 m is totally covered with forests with its rich tree species. The elevations of Köroğlu Mountains ranging through Mudurnu and Göynük contain Ardıç (1.443 m), Hoca (Çal Hill 1.640 m), Kocaman and Kapı Forest Mountains. Plains generally with east-west direction in Bolu province are seperated from each other by mountain thresholds. These are Bolu, Gerede, Himmetoğlu and Mudurnu Plains. Plains, especially uplands, in Bolu geography have a significant importance. Apart from a few of the uplands in every part of Turkey, it is impossible to find ones as green,

fresh, cool and fruitful as Bolu uplands. Bolu plateaus covered with forests are the green fruitful plains crossed by small and large streams. The most known are: Aladağ, At, Kızık, Gerede, Kıbrıscık, Mengen, Göynük and Seben plateaus. Bolu province, located on geologically the most important fault line of our country, also has geothermal water sources. Thermal sources have an important role on tourism. Well known thermal springs in our countries are Karacasu, Mudurnu – Babas and Sarot, Seben – Kesenözü – Pavlu, Göynük – Çatak Thermal Springs. As a result, hot water sources and mineral water occur. The most significant ones are Ömerler, Akkaya and Kınık mineral waters. The entire water derived from the lands within the province borders reach through Blacksea. Bolu Water, of which the starting branch is outlet of Lake Abant connects with Mengen Stream, which gets its springs from Lake Çağa, and then comes together with Filyos Stream out of the province border with the name of Devrek Stream, Gerede Stream, regarded as the starting branch of Filyos Stream, has its spring in the north and east hillsides of Aladağ on Köroğlu Mountains. Kirmir, Aladağ, Çatak, Göynük, and Mudurnu Streams, sprung from south, southwest and west parts, connect with Sakarya River out of the city borders. Big and little mixed together lakes in Bolu city that have occured especially in the forest are famous around the country. The most well-known lakes are Abant, Yeniçağa, Çubuk that is in almost 11 km north of Göynük, Sünnet that is in 27 km east of Göynük, Karagöl which is located on the direction of Kıbrısçık-Beypazarı way, Karamurat and Sülüklü lakes on the Mudurnu-Akyazı direction and Yedigöller in 42 km north of Bolu which was named as National Park area. Among our remarkable artificial lakes there are Gölköy Dam Lake, used to irrigate Bolu Plain 8 km away from Bolu center, Gölcük Pond, used for recreation on Bolu-Seben highway in 13 km, Aladağ Pond and Seben Pond 30 km away from Bolu located on Aladağ direction (Anonymous 4, 2013).

2.2. Geological characteristics of the research area

Within the borders of Bolu province; groups of rock together with Paleozoic sediment stacking and cover rocks which belong to Bolu massive, are located. Granitoid that form the core of the massive shape the heights almost extending east to west. In the northwestern

parts, there are gravels belonging to this group in Upper Ordovician. In southern parts, old Devonian carbonate rocks are interrupted by the settlement of deep igneous rocks. Also, throughout the northeastern parts, clastic that belong to granitic rocks are intense in old Silurian sediment. In the middle and eastern parts of the massive, there lies a volcanic stack closely related to granitoids. The rock types of this unit (metavolcanics) have mostly had metamorphism. Paleozoic sediment stacks, detrital rocks which are accepted as Upper Ordovician-Lower Silurian age, Upper Silurian-Lower Devonian aged various clast and limestone are represented with Middle-Upper Devonian age dolomite and Permian-Triassic old and thin detrital rocks. Within this basis, there comes cover rocks which are represented in various units. Cover rocks begin with an Upper Jurassic-Lower Cretaceous aged carbonate stack in the very east and a flysch stack which follows it transitively. In the west, an Upper Cretaceous aged volcanic flysch type of stack differ in the south and north part of the massive. Eocene units which rise as the transitive sediments and shallow sea in the south are grown as deep sea stacks in the north. Structural elements that grow with the effect of an almost north-south compressional regime generally show an east-west direction. These structural elements are particularly common in southern parts. Due to limitation of Upper Cretaceous-Tertiary basins by faults and the growth of fold structures in these basins again show that these structures were formed after Upper Cretaceous. The elements reflecting the effects of Alpine orogenic system have been thought to ocur as a consequence of Upper Cretaceous – Eocene tectonic process. Besides, there are economically precious coal reserves in clastic which reflect the Middle Eocene aged shallow sea-land transitions that have surface locations along the southern border of Bolu massive (Anonymous 3, 2013).

2.3. Soil types of the research area

Alluvial soil

This kind of soil is (A) C profiled young soil located on accumulated sediments which are carried by rivers or on the bases of surface waters. The soil has various layers according to the strenght of the sedimentation that occurs at different. Upper soil moves over the lower soil uncertainly. After long years, they may embrace lime. While the amount of organic

material is changeable in alluvial soil, there is not a specific climate or vegetation. They can have every climate and vegetation.

Hydromorphic Alluvial Soil

This kind of soil, which faces with frequent flood, has a gley profile and a high level of base water. Its base water is high and lower layers are wet. The fluctuation in the base water causes the soil layers to go up and down. These sort of soils are mostly found in Gerede.

Calluvial Soil

This young profiled kind of soil which is shaped by accumulation of the materials carried by the gravity, landslide and sub rivers. They form different sized layers according to the heaviness of rain and the degree of the slope. The ones located at escarpment side and valley gaps have stone and rubble with less soil. They can mix together with alluvial soils in the fields where slope decreases. The colour of this soil is related to the moment they occur and to the material. Some problems of this soil, which show no acummulation of salt, lead to slope, stony fields and flood. They do not reflect any specific climate or vegetation. This soil is widely seen in Bolu centre.

Red Yellow Podzolic Soil

This kind of soil is deep, ABC profiled, acid characterized, well grown, found in old fields at a climate changing from watery clement to tropical. Its natural flora is formed by forests filled with patching off trees which have coniferous or by both.

Grey Brown Podzolic Soil

This kind of soil has ABC profile and it is slightly podzolization. Natural flora is patching off forests. Liming of this soil, manuring with organic and chemical muck will give satisfactory results. It is mostly seen in Mengen.

Brown Forest Soil

Characteristic feature of this kind of soil is that it grows on a basic material which includes excessive lime. A (B) C horizons exist and can be transitive to each other. Depth is generally between 50-90 cm. Natural vegetation consists of patching off trees and bushes. It is found in warm areas that have dry season. The main materials are pH valued acid and base as well clay stones which mostly appear as base rich in lime, mica schist and gnays. They form the biggest soil group of Bolu city and they can be mostly found in Göynük.

Limeless Brown Forest Soil

These kinds are A, (B), C profiled ones. The organic material is generally acid chracaterized. Their depths are normally between 40-70 cm and their natural vegetation is formed by patching off forest trees. It is found in warm climate areas. The main materials are sandy clay stone, clayey, limy, sandy and pebbly materials. It is intensely found in all provinces and is mostly under forest usage.

Red Chestnut Soil

It occurs on a surface where there is much temperature and rain compared to chestnut coloured soil. The colour gets reddish because excessive heat oxidates the iron in the soil as much. When the oxidated iron pieces organic substances, the level of organic material is low. All of it is apparent in Gerede.

Rendzina Soil

It takes all its characteristics from the main material which has significantly high level of lime. Horizons are too weak and AC profiled. Natural vegetation is formed by plant, grass and bush–shrub. It appears in cool and cold cilmates. The main materials are limestone, dolomite, marl and chalk. All of it is found in Göynük.

Vertisol Soil

This kind of soil is generally formed by dark coloured clayey soil that extend in rainy season while shrinking in dry season. They appear in many dry seasoned and rainy seasoned climates. Their profile is AC. Their main materials are carried materials. Some are formed as a result of resolution of limestone and basalt. In Bolu city, the whole of it is used as grass field.

Scars and Rubbles

These are the areas which are covered with stones and non-pieced or partly pieced rough rocks, assessed as domain and which has no soil layer on it. It has no usage in agriculture, forestation or feding ground, however, it has usage in house field, mining area and quarry.

Sandy, Pebbly, Rubble, River flood beds

It includes the areas where there are clayey, sandy and pebbly, rubble materials in the flood bed of rivers. These fields appear in summer time when there is less rain. It has no usage in agriculture.

Reedy, Boggy Fields

These are the reedy bogs stay aside the alluvial coast bogs. They are found only in Mudurnu province of Bolu city.

2.4. Climatic characteristics of the research area

Considering temperature and rainfall data of Bolu, the city is included in semi arid-moist climate region according to the De Martonne method and it is included in Mediterranean climate region according to Emberger drought index (Akman, 2011). There is more rainfall in winter months and less rainfall in summer months in Bolu. Regarding the last decade's rainfall data, annual mean temperature in Bolu city is 11.5ºC. As the same data, mean maximum temperature is 29.5ºC in August and mean minimum temperature is counted as 1.6ºC in February. According to the temperature avarages related to the seasons, it is 10.2ºC in spring, 20.9ºC in summer, 12.2ºC in autumn and 2.6ºC in winter (Table 1). When distribution of rainfalls regarding the seasons are evaluated, they are as follows: 159.9 mm in spring, 111.3 mm in summer, 120.6 mm in autumn and 166.5 mm in winter and annual mean rainfall is 558.3 mm (Table 2). According to these data, the rainfall regime of Bolu city is classified as the 1st Lower Type of East Mediterranean rainfall regime (Akman, 2011). Annual mean relative humidity is 72%. The highest humidity is 82% in January while the lowest is observed as 63.3% in August (Figure 6).

a	b	c	d	e	m	n
Bolu	741.78 m	10	11.5 °C	558.3 mm	-1.6 °C	-15.6 °C

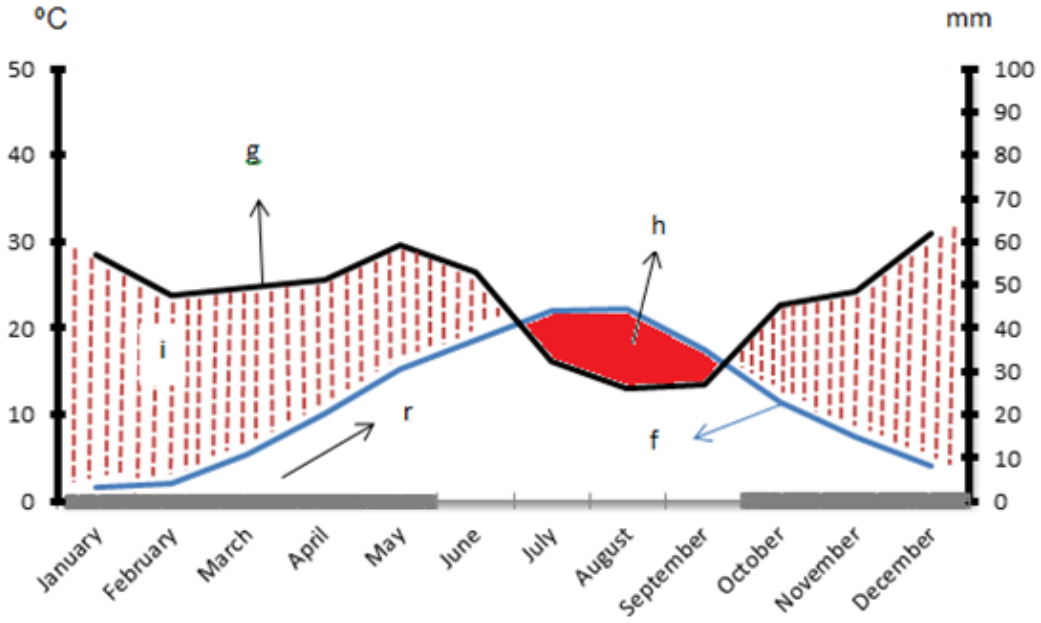

Figure 6: Climatic Diagram of Bolu (for the last 10 years). Explanations: a) Meteorological Station, b) Altitude of Meteorological Station, c) Data Collection Period (last ten years), d) Mean Annual Temperature, e) Mean Annual Precipitation, f) Temperature, g) Precipitation, h) Dry Season, i) Humid Season, m) Minimum Temperature of Coldest Month, n) Absolute Minimum Temperature, and r) Possible Freezing Months

Table 1: Meteorological data of Bolu province for the last 10 years

Meteorologic Elements	Months												
	1	2	3	4	5	6	7	8	9	10	11	12	Annual
Mean Temperature (ºC)	1.7	2.1	5.4	10.2	15.2	18.6	22.1	22.2	17.6	11.5	7.5	4.1	11.5
Mean Max. Temperature (ºC)	5.7	6.7	11.1	16.9	22.3	25.9	28.6	29.5	25.1	19.6	13.5	8.5	17.8
Mean Min. Temperature (ºC)	-1.3	-1.6	-1.0	4.5	8.6	11.8	14.1	14.5	11.1	8.0	3.1	0.5	6.2
Max. Temperature (ºC)	18.9	18.7	24.4	29.6	32.8	36.6	38.3	39.7	36.7	34.4	25.5	20.1	29.6
Min. Temperature (ºC)	-14.4	-15.1	-11.4	-5.8	-0.6	4.7	7.8	6.3	3.0	-1.8	-7.4	-15.6	-4.2
Mean Precipitation (mm)	56.8	47.6	49.2	51.3	59.4	52.9	32.2	26.2	26.9	45.4	48.3	62.1	558.3
Average Relative Humidity (%)	82.0	78.2	74.0	69.0	70.9	69.9	64.7	63.3	70.0	75.9	76.1	70.2	72.0

Table 2: Precipitation regime of Bolu province

Station	Spring		Summer		Autumn		Winter		Annual	Precipitation regime	Precipitation regime type
	Mm	%	mm	%	Mm	%	mm	%			
Bolu	159.9	28.64	111.3	19.93	120.6	21.60	166.5	29.82	558.3	WSpAS	Eastern Mediterranean (First Type)

2.5. Vegetation type of the research area

The dominant vegetation type of Bolu provice is forests. In the region, up to 1000 m high, there are generally *Abies nordmanniana* (Steven) Spach subsp. *bornmuelleriana* (Mattf.) Coode & Cullen, *Fagus orientalis* Lipsky, *Pinus nigra* J. F. Arnold subsp. *pallasiana* (Lamb.) Holmboe, *Alnus* Mill., *Ulmus* L., *Acer* L., and *Quercus* L. taxa are found and from 1000 m to 2000 m high, there are *Fagus orientalis*, *Abies nordmanniana* subsp. *bornmuelleriana*, *Pinus sylvestris* L., *Quercus*, and *Carpinus* L. taxa grow. In the higher areas, there are generally shrubs, subalpinic and alpinic plants. From the begining of early spring time till the end of autumn, geophytes can be seen in the both forest and alpinic zones. In the early spring, *Galanthus plicatus* M.Bieb. subsp. *plicatus*, *Crocus ancyrensis* (Herb.) Maw, *Crocus olivieri* J.Gay subsp. *olivieri*, *Crocus biflorus* Mill. subsp. *pulchricolor* (Herb.) B.Mathew, *Scilla bifolia* L., and *Colchicum szovitsii* Fisch. & C.A.Mey. subsp. *szovitsii* can be observed widely in a big part of the research area. In the early spring, as well as *Crocus abantensis* T. Baytop & B. Mathew in Abant Lake area and *Galanthus elwesii* Hook.f. var. elwesii. in Aladağlar are remarkable. In the middle of spring, *Ornithogalum* L., *Muscari* Mill. and *Gagea* Salisb. species together with *Ruscus hypoglossum* L. are dominant in the area. Through the end of spring, *Iris* L., *Orchis* L., *Cephalanthera* Rich. species, *Gladiolus italicus* Mill., *Neottia nidus-avis* (L.) Rich., *Polygonatum orientale* Desf. are intensively observed. In the begining of summer, *Orchis*, *Anacamptis* Rich., *Dactylorhiza* Neck. ex Nevsk, *Platanthera* Rich., *Himantoglossum* Spreng., and *Allium* L. species are distributed. In the middle of summer, *Epipactis* Zinn and *Allium* species are the dominant ones in the area. At the end of summer and begining of autumn, *Prospera autumnale* (L.) Speta, *Allium* species together with *Colchicum umbrosum* Steven, *Colchicum speciosum* Steven, *Crocus speciosus* M.Bieb. subsp. *speciosus*, *Spiranthes spiralis* (L.) Chevall., in the following days, *Sternbergia colchiciflora* Waldst. & Kit. on Abant lake area, and *Colchicum boissieri* Orph. on the Çal Hill are observed taxa in the area.

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3. MATERIAL AND METHODS

Research materials of this study were based mainly on fresh flower and fruit samples of petaloid monocotyledonous geophytes. Totally 70 field trips were performed in the research area between 2012 and 2013 when geophytes were intensively bloom especially in spring and autumn. While planning the field studies, the blooming period of plants, the geographical structure of the region, changing weather conditions and previous records were considered and these studies were carried on certain periods beginning from February (start of vegetation) to November (end of vegetation) and 818 plant samples were collected and determined. The plant specimens were collected from 28 stations within the borders of Bolu province are as follows (Figure 7):

1. Lake Abant
2. Aladağlar
3. Campus area
4. Çal Hill
5. Çele Hill
6. Çepni
7. Lake Çubuk
8. Dörtdivan
9. Eskiçağa
10. Gerede
11. Gökçeler Mountain
12. Gökçesu
13. Gölcük
14. Gölköy
15. Göynük
16. Lake Karamurat
17. Karakiriş Mountain
18. Kartalkaya
19. Kıbrıscık
20. Mengen
21. Mudurnu
22. Seben
23. Lake Sülüklü
24. Lake Sünnet
25. Taşkesti
26. Taşlıyayla
27. Tomb of Tokad-i Hayrettin Hz.
28. Yedigöller

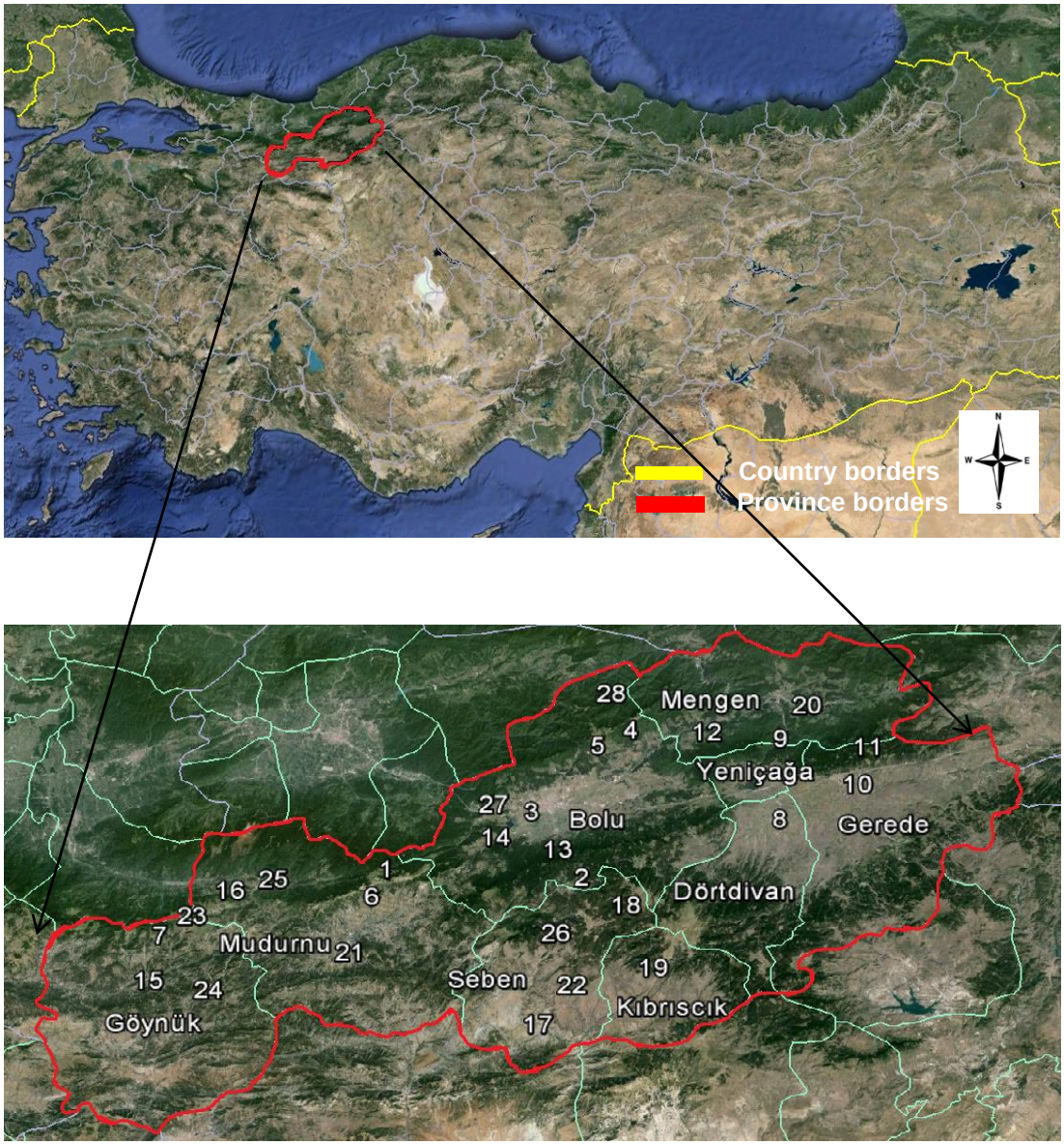

Figure 7: The Geographic location of the research area

Each collected specimen was marked with the researcher's number and dried according to standard herbarium methods. Voucher specimens of all individuals were deposited in the "herbarium of Abant İzzet Baysal University (AIBU)". In addition to the collected materials, two herbarium specimens (*Iris kerneriana* Asch. & Sint. ex Baker and *Iris schachtii* Markgr.), which were previously collected from Bolu by different researchers, were examined in ISTE

and ISTO herbaria and added to the floristic list of the present study (Herbarium abbreviations as in the "*Index Herbariorum* (Thiers 2012)".

For identification of the plants, initially it was benefitted from "*Flora of Turkey and East Aegean Islands* (Davis, 1965-1985)", "*Flora of Turkey and East Aegean Islands* (Supplement I) (Davis et al., 1988)", "*Flora of Turkey and East Aegean Islands* (Supplement II) (Güner et al., 2000)", "*Türkiye Orkideleri* (Kreutz, 2009)". For the nomenclatural checking of plant names it was benefitted from "*Türkiye Bitkileri Listesi* (Güner et al., 2012)" as well as web sites, *World Checklist of Selected Plant Families* (Govaerts, 2013)", "*International Plant Name Index* (IPNI, 2013)" and "*the Plant List* (2013)" and also related literature. Author abbreviations are given according to IPNI (2013). For plant terminology it was benefitted from "*İngilizce-Türkçe Botanik Kılavuzu* (Baytop, 1998)", "*Plant Identification Terminology* (Harris & Harris, 2001)".

The complete floristic list was set out according to the the systematic order in "*Angiosperm Phylogeny Group III* (APG III, 2009)". In the list, the following details are provided: class, order, family, genus, and species names and the author(s), if it is present infraspecific category, square and name of the district, habitat of the plant, altitude, collection date, GPS data, name and number of the collector(s), determinative person, the phytogeographic region element and endemism. Endemic and rare species were categorized according to new IUCN Red Data categories (Ekim et al., 2000; IUCN Survival Commission, 2001).

In this study, climatic data of Bolu province were received from "Bolu Meterology Station" (Anonymous 1, 2013). The data of soil characteristics of the research area were quoted from "*the Bolu Field Report*" prepared by "General Directorate for Rural Services" (Anonymous 2, 2002). The geological data were quoted from the literatures prepared by "Regional Directorate of Kocaeli" (Anonymous 3, 2013).

4. RESULTS AND DISCUSSION

4.1. Enumeration of taxa found in Bolu

MAGNOLIOPHYTA Cronquist, Takht. & Zimmerm. ex Reveal

MAGNOLIOPHYTINA Frohne & U. Jensen ex Reveal

LILIOPSIDA Batsch

ACORALES Mart.

ACORACEAE Martinov

***Acorus* L.**

***Acorus calamus* L.**

A4 Bolu: Yeniçağa, south of Lake Yeniçağa, lake margin, 992 m., 12.07.2013, 40º 46.418'' N – 032º 01.703'' E, Leg.: S. Demir–773, Det.: S. Demir–2013.

ALISMATALES Dumort.

ARACEAE Juss.

***Arum* L.**

***Arum euxinum* R.R.Mill**

A3 Bolu: North of the Gölköy , woodland, 826 m., 04.05.2012, 40º 42.789'' N – 031º 31.341'' E, Leg.: S. Demir–55 & Eker, Det.: S. Demir–2012; North of the Campus area, woodland, 849 m., 07.05.2012, 40º 43.186'' N – 031º 30.927'' E,Leg.: S. Demir–57, Det.: S. Demir–2012; West of the Tomb of Tokad-i Hayrettin Hz., woodland, 952 m., 18.05.2012, 40º 43.890'' N – 031º 28.159'' E, Leg.: S. Demir–64 & Eker, Det.:S. Demir–2012; Abant, on the Mudurnu – Abant road, 2 km to Lake Abant, woodland, 1356 m. 18.05.2012, 40º 35.319'' N – 031º 16.178'' E, Leg.: S. Demir–78 & Eker, Det.: S. Demir–2012; Abant, on the Mudurnu – Abant road, 2 km to Lake Abant, around the Antenna Tower, woodland, 1452

m., 18.05.2012, 40º 35.332" N – 031º 17.019" E, Leg.: S. Demir–82 & Eker, Det.: S. Demir–2012; East of the Lake Abant, around picnic area, woodland, 1340 m., 01.06.2012, 40º 35.980" N – 031º 16.898" E, Leg.: S. Demir–120 & Eker, Det.: S. Demir–2012; Mudurnu, Lake Karamurat, on the Dokurcun – Lake Karamurat road, around the Mehmet Topçuoğlu fountain, woodland, 395 m., 05.04.2013, 40º34.495" N – 030º 54.065" E, Leg.: S. Demir–378, Det.: S. Demir–2013; Yeniçağa, turnout of the Hamzabey village, 999 m., 25.04.2013, 40º 46.238" N – 031º 59.276" E, Leg.: S. Demir–552 & Eker, Det.: S. Demir–2013; A4 Bolu: Gerede, Gökçeler Mountain, between Çayören village and Çayören upland, woodland, 1590 m, 22.06.2012, 40º 49.631" N – 032º 17.732" E, Leg.: S. Demir–222 & Eker, Det.: S. Demir–2012.

Euxine Element, ***Endemic***

***Arum maculatum* L.**

A3 Bolu: Tomb of Tokad-i Hayrettin Hz, West of the Tomb of Tokad-i Hayrettin Hz., woodland, 952 m., 18.05.2012, 40º 43.890" N – 031º 28.159" E, Leg.: S. Demir–66 & Eker, Det.: S. Demir–2012.

New record for Bolu Province

BUTOMACEAE Mirb.

***Butomus* L.**

***Butomus umbellatus* L.**

A3 Bolu: North of the Lake Gölcük, lake margin, 1200 m., 23.07.2012, 40º 39.374" N – 031º 37.717" E, Leg.: S. Demir–252 & Eker, Det.: S. Demir–2012.

Euro – Siberian Element

LILIALES Perleb

COLCHICACEAE DC.

***Colchicum* L.**

***Colchicum bivonae* Guss. (=*Colchicum bowlesianum* Burtt.)**

A3 Bolu: Abant, on the Lake Abant – Antenna Tower road, 1 km to Lake Abant, woodland, 1461 m., 24.09.2012, 40º 35.356'' N – 031º 17.132'' E, Leg.: S. Demir–284 & Eker, Det.: S. Demir–2012; Northeast of the Lake Abant, around picnic area, woodland, 1337 m., 24.09.2012, 40º 36.452'' N – 031º 17.605'' E, Leg.: S. Demir–285 & Eker, Det.: S. Demir–2012; Northwest of the Lake Abant, around Abant Palace Hotel, woodland, 1302 m., 24.09.2012, 40º 36.473'' N – 031º 16.284'' E, Leg.: S. Demir–287 & Eker, Det.: S. Demir–2012.

East Mediterranean Element

***Colchicum boissieri* Orph.**

A3 Bolu: Çal Hill, on the Çal Hill road – Tetemeçele village, 5 km to the Tetemeçele village, stony places, 1636 m, 27.09.2012, 40º 52.280'' N – 031º 44.071'' E, Leg.: S. Demir–292 & Eker, Det.: S. Demir–2012; ibid., 27.09.2012, Leg.: S. Demir–315 & Eker, Det.: S. Demir–2012.

East Mediterranean Element, ***New record for the Black Sea Region, A3 square and Bolu Province***

***Colchicum speciosum* Steven (=*Colchicum bornmuelleri* Freyn)**

A3 Bolu: on the Bolu – Yedigöller road, 18 km to Yedigöller, meadows,1057 m., 27.09.2012, 40º 53.031'' N – 031º 40.987'' E, Leg.: S. Demir–299 & Eker, Det.: S. Demir–2012; on the Bolu – Yedigöller road, 11 km to Yedigöller, meadows, 1422 m., 27.09.2012, 40º 55.206'' N – 031º 41.899'' E, Leg.: S. Demir–300 & Eker, Det.: S. Demir–2012.

Hyrcano – Euxine Element

***Colchicum szovitsii* Fisch. & C.A.Mey. subsp. *szovitsii* (=*Colchicum nivale* Boiss. et Huet.)**

A3 Bolu: South of the Yumrukaya village, meadows, 782 m., 03.04.2012, 40º 42.587" N – 031º 30.030" E, Leg.: S. Demir–2, Det.: S. Demir–2012; Southeast of the Lake Abant, around picnic area, wet meadows, 1345 m., 20.04.2012, 40º 35.891" N – 031º 16.786" E, Leg.: S. Demir–26, Det.: S. Demir–2012; Abant, on the Mudurnu – Abant road, 2 km to Lake Abant, around the Antenna Tower, steppe, 1452 m., 18.05.2012, 40º 35.332" N – 031º 17.019" E, Leg.: S. Demir–50 & Eker, Aladağlar, around Değirmenözü Forest Management, steppe, 1268 m., 07.03.2013, 40º 36.043" N – 031º 39.094" E, Leg.: S. Demir–331, Det.: S. Demir–2013; Aladağlar, around Demirciler upland, open turf in Pinus forest, 1306 m., 07.03.2013, 40º 37.700" N – 031º 41.551" E, Leg.: S. Demir–333 & Eker, Det.: S. Demir–2013; Northwest of the Lake Abant, around Abant Palace Hotel, marshes, 1328 m., 31.03.2013, 40º 36.607" N – 031º 16.548" E, Leg.: S. Demir–371 & Eker, Det.: S. Demir–2013; A4 Bolu: Gerede, Gökçeler Mountain, around Keltepe, woodland, 1588 m, 25.04.2013, 40º 51.414" N – 032º 18.993" E, Leg.: S. Demir–421 & Eker, Det.: S. Demir–2013; Gerede, Esentepe, around the Rumşah upland, marshes, 1695 m., 25.04.2013, 40º 49.926" N – 032º 11.814" E, Leg.: S. Demir–424 & Eker, Det.: S. Demir–2013.

Irano – Turanian Element

***Colchicum triphyllum* Kunze (=*Colchicum ancyrense* B.L.Brutt)**

A3 Bolu: Seben, Karakiriş Mountain, on the Çayırhan – Nallıgölcük road, 3 km to Nallıgölcük, stony steppe, 1276 m., 25.03.2013, 40º 16.407" N – 031º 33.468" E, Leg.: S. Demir–361, Det.: S. Demir–2013.

Mediterranean Element

***Colchicum umbrosum* Steven**

A3 Bolu: West of the Lake Abant, around picnic area, woodland, 1374 m., 29.08.2013, 40º 36.111" N – 031º 16.584" E, Leg.: S. Demir–811, Det.: S. Demir–2013.

Euxine Element

LILIACEAE Juss.

***Fritillaria* L.**

Fritillaria pinardii* Boiss. subsp. *pinardii

A3 Bolu: Kıbrıscık, on the Bolu – Kıbrıscık road, 20 km to Kıbrıscık, rocky steppe, 1386 m., 30.04.2013, 40º 28.540'' N – 031º 42.736'' E, Leg.: S. Demir–509 & Eker, Det.: S. Demir–2013.

Irano – Turanian Element, ***New record for Bolu Province***

***Fritillaria pontica* Wahlenb.**

A3 Bolu: West of the Tomb of Tokad-i Hayrettin Hz., woodland, 952 m., 18.05.2012, 40º 43.890'' N – 031º 28.159'' E, Leg.: S. Demir–67 & Eker, Det.: S. Demir–2012; ibid., 13.06.2012, Leg.: S. Demir–134 & Eker, Det.: S. Demir–2012; North of the Campus area, woodland, 896 m., 25.05.2012, 40º 43.134'' N – 031º 31.048'' E, Leg.: S. Demir–118, Det.: S. Demir–2012; Göynük, around the Örencik upland, rocky slopes, 1042 m., 01.06.2012, 40º 28.362'' N – 030º 51.424'' E, Leg.: S. Demir–130 & Eker, Det.: S. Demir–2012; Çal Hill, on the Bolu Yedigöller road, around the Çele Hill, rocky slopes, 1957 m., 20.06.2012, 40º 51.982'' N – 031º 42.239'' E, Leg.: S. Demir–187 & Eker, Det.: S. Demir–2012; Yedigöller, on the Bolu, Yedigöller road, 17 km to Yedigöller, rocky slopes, 1689 m., 20.06.2012, 40º 53.053'' N – 031º 42.239'' E, Leg.: S. Demir–188 & Eker, Det.: S. Demir–2012; Yedigöller, on the Mengen Yedigöller road, 6 km to Yedigöller, rocky slopes, 490 m., 20.06.2012, 40º 58.666'' N – 031º 44.338'' E, Leg.: S. Demir–192 & Eker, Det.: S. Demir–2012; Yedigöller, on the Mengen Yedigöller road, 10 km to Yedigöller, rocky slopes, 415 m., 20.06.2012, 40º 59.623'' N – 031º 45.579'' E, Leg.: S. Demir–195 & Eker, Det.: S. Demir–2012; Yedigöller, on the Mengen Yedigöller road, 14 km to Yedigöller, rocky slopes, 331 m., 20.06.2012, 41º 00.573'' N – 031º 47.575'' E, Leg.: S. Demir–197 & Eker, Det.: S. Demir–2012. Çal Hill, on the Bolu Çal Hill road, around the Kadıköy upland, woodland, 1587 m., 28.04.2013, 40º 53.492'' N – 031º 45.898'' E, Leg.: S. Demir–467 & Eker, Det.: S. Demir–2013; Abant, on the Bolu – Abant road, 9 km to Abant, woodland, 966 m., 23.05.2013, 40º 39.154'' N – 031º 22.679'' E, Leg.: S. Demir–652 & Eker, Det.: S. Demir–2013; A4 Bolu: Gerede, Gökçeler

Mountain, around Keltepe, woodland, 1588 m, 25.04.2013, 40º 51.414" N – 032º 18.993" E, Leg.: S. Demir–420 & Eker, Det.: S. Demir–2013.

Euro – Siberian Element

***Gagea* Salisb.**

***Gagea bithynica* Pascher**

A3 Bolu: Kıbrıscık, on the Bolu – Kıbrıscık road, 20 km to Kıbrıscık, rocky steppe, 1386 m., 30.04.2013, 40º 28.540" N – 031º 42.736" E, Leg.: S. Demir–506 & Eker, Det.: S. Demir–2013.

East Mediterranean Element, ***Endemic***

***Gagea bohemica* (Zauschn.) Schult. & Schult. f.**

A3 Bolu: Kartalkaya, alpine meadows, 2038 m., 22.05.2012, 40º 35.126" N – 031º 48.456" E, Leg.: S. Demir–113 & Eker, Det.: S. Demir–2012; Kıbrıscık, on the Kıbrıscık – Sakallı upland, 18 km to Sakallı upland, rocky slopes, 1103 m., 25.03.2013, 40º 24.378" N – 031º 58.511" E, Leg.: S. Demir–355, Det.: S. Demir–2013; Kıbrıscık, on the Kıbrıscık – Seben road, around the Şaduman creek, rock slopes, 889 m., 25.03.2013, 40º 22.980" N – 031º 50.625" E, Leg.: S. Demir–356, Det.: S. Demir–2013; Aladağlar, around Karacasu upland, open turf in Pinus forest, 1385 m., 16.04.2013, 40º 36.435" N – 031º 37.598" E, Leg.: S. Demir–390 & Eker, Det.: S. Demir–2013; A4 Bolu: Gerede, Gökçeler Mountain, around Keltepe, marshes, 1588 m, 25.04.2013, 40º 51.414" N – 032º 18.993" E, Leg.: S. Demir–412 & Eker, Det.: S. Demir–2013.

***Gagea fistulosa* (Ramond ex DC.) Ker Gawl.**

A3 Bolu: Northwest of the Lake Abant, around the Abant Palace Hotel, meadows, 1334 m., 17.04.2012, 40º 36.542" N – 031º 16.391" E, Leg.: S. Demir–18, Det.: S. Demir–2012; Northwest of the Lake Abant, around the Abant Palace Hotel, meadows, 1328 m., 30.04.2012, 40º 36.607" N – 031º 16.548" E, Leg.: S. Demir–40 & Eker, Det.: S. Demir–2012; ibid., 31.03.2013, Leg.: S. Demir–370, Det.: S. Demir–2013; Lake Abant, around the Antenna Tower, alpine steppe, 1756 m., 18.05.2012, 40º 36.185" N – 031º 19.326" E, Leg.:

S. Demir–70 & Eker, Det.: S. Demir–2012; Kartalkaya, alpine meadows, 2038 m., 22.05.2012, 40º 35.126" N – 031º 48.456" E, Leg.: S. Demir–110 & Eker, Det.: S. Demir–2012; Aladağlar, around Demirciler upland, open turf in Pinus forest, 1306 m., 07.03.2013, 40º 37.700" N – 031º 41.551" E, Leg.: S. Demir–336 & Eker, Det.: S. Demir–2013; ibid., 19.03.2013, Leg.: S. Demir–350 & Eker, Det.: S. Demir–2013; Aladağlar, around Karacasu upland, open turf in Pinus forest, 1385 m., 16.04.2013, 40º 36.435" N – 031º 37.598" E, Leg.: S. Demir–388 & Eker, Det.: S. Demir–2013; Çele Hill, on the Bolu – Yedigöller road, around the Çele Hill, rocky slopes, 1720 m., 28.04.2013, 40º 52.175" N – 031º 43.492" E, Leg.: S. Demir–471 & Eker, Det.: S. Demir–2013; A4 Bolu: Gerede, Gökçeler Mountain, around the Esentepe, meadows, 1685 m., 25.04.2013, 40º 49.490" N – 032º 11.627" E, Leg.: S. Demir–433 & Eker, Det.: S. Demir–2013.

***Gagea foliosa* (C.Presl) Schult. & Schult. f.**

A3 Bolu: South of the Yumrukaya village, meadows, 817 m., 12.04.2012, 40º 42.921" N – 031º 30.200" E, Leg.: S. Demir–10, Det.: S. Demir–2012; Abant, on the Mudurnu – Abant road, 2 km to Lake Abant, meadows, 1437 m., 30.04.2012, 40º 35.502" N – 031º 16.804" E, Leg.: S. Demir–45 & Eker, Det.: S. Demir–2012. Lake Abant, around the Antenna Tower, alpine steppe, 1756 m., 18.05.2012, 40º 36.185" N – 031º 19.326" E, Leg.: S. Demir–77 & Eker, Det.: S. Demir–2012; ibid., Leg.: S. Demir–540 & Eker, Det.: S. Demir–2013. 01.05.2013, Kartalkaya, alpine meadows, 2038 m., 22.05.2012, 40º 35.126" N – 031º 48.456" E, Leg.: S. Demir–112 & Eker, Det.: Eker–2012; Yeniçağa, on the Yeniçağa – Bolu road, 3 km to the Hamzabey village, meadows, 1056 m., 14.03.2013, 40º 46.263" N – 031º 59.196" E, Leg.: S. Demir–347 & Eker, Det.: S. Demir–2013; Aladağlar, around Karacasu upland, open turf in Pinus forest, 1385 m., 16.04.2013, 40º 36.435" N – 031º 37.598" E, Leg.: S. Demir–389 & Eker, Det.: Eker–2013; Mudurnu, around Lake Sülüklü, meadows, 1081 m, 24.04.2013, 40º 31.281" N – 030º 52.431" E, Leg.: S. Demir–399, Det.: Eker–2013; Çal Hill, on the Çal Hill road – Tetemeçele village, 5 km to the Tetemeçele village, stony places, 1636 m, 28.04.2013, 40º 52.280" N – 031º 44.071" E, Leg.: S. Demir–455 & Eker, Det.: Eker–2013; Çele Hill, on the Bolu – Yedigöller road, around the Çele Hill, rocky slopes, 1720 m., 28.04.2013, 40º 52.175" N – 031º 43.492" E, Leg.: S.

Demir–472 & Eker, Det.: S. Demir–2013; South of the Lake Abant, around the Abant Köşk Hotel, open turf in Pinus forest, 1313 m., 01.05.2013, 40º 36.029" N – 031º 16.507" E, Leg.: S. Demir–530 & Eker, Det.: Eker–2013.

***Gagea granatellii* (Parl.) Parl.**

A3 Bolu: Göynük, west of the Lake Sünnet, rocky slopes, 1088 m., 31.03.2013, 40º 36.432" N – 031º 15.861" E, Leg.: S. Demir–372, Det.: Eker–2013; Mudurnu, east of the Lake Karamurat, rocky slopes, 858 m., 05.04.2013, 40º 33.509" N – 030º 57.995" E, Leg.: S. Demir–380, Det.: Eker–2013; Abant on the Lake Abant – Antenna Tower road, around the Antenna Tower, rocky slopes, 1756 m., 01.05.2013, 40º 36.185" N – 031º 19.326" E, Leg.: S. Demir–542 & Eker, Det.: Eker–2013.

Mediterranean Element

Gagea villosa* (M.Bieb.) Sweet var. *villosa

A3 Bolu: North of the Gölköy, steppe, 814 m., 22.03.2013, 40º 42.464" N – 031º 31.132" E, Leg.: S. Demir–353, Det.: Eker–2013; ibid., 29.03.2013, Leg.: S. Demir–366, Det.: Eker–2013; Kıbrıscık, on the Kıbrıscık – Seben road, 1 km to Geriş village, steppe, 889 m., 25.03.2013, 40º 22.495" N – 031º 50.037" E, Leg.: S. Demir–357, Det.: S. Demir–2013; Göynük, west of the Lake Sünnet, rocky slopes, 1088 m., 31.03.2013, 40º 36.432" N – 031º 15.861" E, Leg.: S. Demir–373, Det.: Eker–2013; Seben, around the Gölönü district, meadows, 1204 m., 16.04.2013, 40º 24.068" N – 031º 38.182" E, Leg.: S. Demir–395 & Eker, Det.: Eker–2013.

Mediterranean Element

***Lilium* L.**

Lilium martagon* L. var. *martagon

A3 Bolu: Yedigöller, on the Bolu – Yedigöller road, 7 km to Yedigöller, woodland, 1284 m., 12.07.2012, 40º 55.696" N – 031º 43.623" E, Leg.: S. Demir–236 & Eker, Det.: S. Demir–2012.

Euro – Siberian Element

***Tulipa* L.**

***Tulipa sylvestris* L. subsp. *australis* (Link) Pamp.**

A3 Bolu: Kıbrıscık, on the Bolu – Kıbrıscık road, 18 km to Kıbrıscık, meadows, 1315 m., 30.04.2013, 40º 27.979'' N – 031º 43.670'' E, Leg.: S. Demir–505 & Eker, Det.: S. Demir–2013.

ASPARAGALES Link

ORCHIDACEAE Juss.

***Anacamptis* Rich.**

***Anacamptis coriophora* (L.) R. M. Bateman (=*Orchis coriophora* L.)**

A3 Bolu: Abant, on the Lake Abant – Antenna Tower road, 1 km to Lake Abant, open forests, 1420 m., 13.06.2012, 40º 37.522'' N – 031º 18.902'' E, Leg.: S. Demir–150 & Eker, Det.: Eker–2012; on the Bolu – Abant road, 19 km to Abant, open forests, 823 m., 23.05.2013, 40º 42.489'' N – 031º 27.799'' E, Leg.: S. Demir–655 & Eker, Det.: Eker–2013; A4 Bolu: Dörtdivan, on the Sivrigöynük – Göbüler village road, 5 km to Göbüler village, wet meadows, 1357 m., 22.06.2012, 40º 38.871'' N – 032º 06.107'' E, Leg.: S. Demir–217 & Eker, Det.: Eker–2012.

***Anacamptis laxiflora* (Lam.) R. M. Bateman (=*Orchis laxiflora* Lam.)**

A3 Bolu: Abant, on the Taşkesti – Abant road, 2 km to Abant, open forests, 1414 m., 13.06.2012, 40º 36.034'' N – 031º 14.275'' E, Leg.: S. Demir–154 & Eker, Det.: Eker–2012; Abant, on the Bolu – Abant road, 3 km to Abant, open forests, 823 m., 23.05.2013, 40º 42.489'' N – 031º 27.799'' E, Leg.: S. Demir–654 & Eker, Det.: Eker–2013.

Mediterranean Element

Anacamptis morio* (L.) R. M. Bateman subsp. *morio* (=*Orchis morio* L. subsp. *morio)

A3 Bolu: North of the Gölköy, woodland, 845 m., 04.05.2012 40º 42.728'' N – 031º 31.630'' E, Leg.: S. Demir–53 & Eker, Det.: Eker–2012; North of the Gölköy, woodland, 807 m., 20.05.2013, 40º 42.600'' N – 031º 31.431'' E, Leg.: S. Demir–620 & Eker, Det.: Eker 2013.

***Anacamptis palustris* (Jacq.) R. M. Bateman (=*Orchis palustris* Fork.)**

A3 Bolu: Yeniçağa, on the Yeniçağa – Bolu road, 2 km to the Hamzabey village, wet meadows, 1020 m., 22.05.2012, 40º 47.141" N – 031º 59.695" E, Leg.: S. Demir–92 & Eker, Det.: Eker–2012; Yeniçağa, on the Yeniçağa – Bolu road, 2 km to the Hamzabey village, wet meadows, 950 m., 09.05.2013, 40º 46.767" N – 031º 59.406" E, Leg.: S. Demir–589 & Eker, Det.: Eker–2013.

***Anacamptis pyramidalis* (L.) Rich.**

A3 Bolu: on the Bolu – Abant road, 20 km to Abant, woodland, 812 m., 13.06.2012, 40º 42.512" N – 031º 22.679" E, Leg.: S. Demir–652 & Eker, Det.: S. Demir–2013; Abant, on the Abant – Taşkesti road, 4 km to Gökören village, meadows, 855 m., 13.06.2012, 40º 35.679" N – 031º 09.021" E, Leg.: S. Demir–157 & Eker, Det.: Eker–2012; North of the Gölköy, woodland, 849 m., 21.06.2012, 40º 42.794" N – 031º 31.279" E, Leg.: S. Demir–203, Det.: Eker–2012; North of the Gölköy, woodland, 814 m., 28.06.2012, 40º 42.464" N – 031º 31.132" E, Leg.: S. Demir–230 & Eker, Det.: Eker–2012; Mudurnu, on the Dokurcun – Lake Karamurat road, around the Mehmet Topçuoğlu fountain, meadows, 395 m., 10.06.2013, 40º 34.495" N – 030º 54.065" E, Leg.: S. Demir–674 & Eker, Det.: Eker–2013; Mengen, on the Gökçesu – Mengen road, 8 km to Mengen, woodland, 560 m., 05.07.2013, 40º 53.800" N – 031º 59.512" E, Leg.: S. Demir–730 & Eker, Det.: Eker–2013.

***Cephalanthera* Rich.**

***Cephalanthera damasonium* (Mill.) Druce**

A3 Bolu: Mudurnu, on the Mudurnu – Lake Sülüklü road, 1 km to Lake Sülüklü, woodland, 1014 m., 01.06.2012, 40º 31.385" N – 030º 52.629" E, Leg.: S. Demir–125 & Eker, Det.: Eker–2012; Göynük, around the Lake Sünnet, woodland, 1103 m., 01.06.2012, 40º 24.961" N – 030º 57.044" E, Leg.: S. Demir–129 & Eker, Det.: Eker–2012; Abant, on the Taşkesti – Abant road, 2 km to Abant, open forests, 1414 m., 13.06.2012, 40º 36.034" N – 031º 14.275" E, Leg.: S. Demir–153 & Eker, Det.: Eker–2012; North of the Gölköy, woodland, 817 m., 20.05.2013, 40º 42.484" N – 031º 31.157" E, Leg.: S. Demir–613 & Eker, Det.: Eker–2013; Tomb of Tokad-i Hayrettin Hz, West of the Tomb of Tokad-i Hayrettin Hz.,

woodland, 952 m., 23.05.2013, 40º 43.890" N – 031º 28.159" E, Leg.: S. Demir–623 & Eker, Det.: Eker–2013; Southwest of the Lake Abant, around the walk way, meadows, 1330 m., 20.06.2013, 40º 36.299" N – 031º 16.203" E, Leg.: S. Demir–697 & Eker, Det.: Eker–2013; A4 Bolu: Gerede, on the Samsun – Gerede road, 17 km to Gerede, meadows, around Lake Keçi, 1200 m., 21.06.2013, 40º 50' 082'' N – 032º 26' 218'' E, S. Demir–571 & Eker, Det.: Eker–2013.

Euro – Siberian Element

***Cephalanthera epipactoides* Fisch. & C.A.Mey.**

A3 Bolu: Göynük, around the Lake Sünnet, woodland, 1103 m., 18.05.2012, 40º 24.961" N – 030º 57.044" E, Leg.: S. Demir–85 & Eker, Det.: Eker–2012; North of the Gölköy, woodland, 817 m., 20.05.2013, 40º 42.484" N – 031º 31.157" E, Leg.: S. Demir–612 & Eker, Det.: Eker–2013.

East Mediterranean Element

***Cephalanthera longifolia* (L.) Fritsch**

A3 Bolu: North of the Campus area, woodland, 896 m., 25.05.2012, 40º 43.134" N – 031º 31.048" E, Leg.: S. Demir–116, Det.: Eker–2012; Yedigöller, on the Mengen – Yedigöller road, 7 km to Yedigöller, woodland, 486 m., 28.04.2013, 40º 59.083" N – 031º 44.587" E, Leg.: S. Demir–500 & Eker, Det.: Eker–2013; Gölcük, on the Bolu – Gölcük road, 3 km to Gölcük, woodland, 923 m., 07.05.2013, 40º 40.496" N – 031º 38.185" E, Leg.: S. Demir–554 & Eker, Det.: Eker–2013.

Euro – Siberian Element

***Cephalanthera rubra* (L.) Rich.**

A3 Bolu: West of the Tomb of Tokad-i Hayrettin Hz., woodland, 952 m., 13.06.2012, 40º 43.890" N – 031º 28.159" E, Leg.: S. Demir–136 & Eker, Det.: Eker–2013; on the Bolu Abant road, 19 km to Abant, woodland, 822 m., 13.06.2012, 40º 42.038" N – 031º 27.213" E, Leg.: S. Demir–143 & Eker, Det.: Eker–2012; Seben, on the Bolu – Seben road, 31 km to Seben, woodland, 1437 m., 19.06.2012, 40º 37.015" N – 031º 37.111" E, Leg.: S.

Demir–162 & Eker, Det.: Eker–2012; North of the Campus area, woodland, 875 m., 21.06.2012, 40º 42.800" N – 031º 30.944" E, Leg.: S. Demir–202, Det.: Eker–2012; Kartalkaya, on the Dörtdivan – Kartalkaya road, 9 km to Kartalkaya, woodland, 1498 m., 22.06.2012, 40º 37.855" N – 031º 50.779" E, Leg.: S. Demir–210 & Eker, Det.: Eker–2012; Mudurnu, West of the Lake Sülüklü, woodland, 1081 m., 10.06.2013, 40º 31.281" N – 030º 52.431" E, Leg.: S. Demir–682 & Eker, Det.: Eker–2013; A4 Bolu: Gerede, on the Samsun – Gerede road, 17 km to Gerede, meadows, around Lake Keçi, 1200 m., 21.06.2013, 40º 50' 082'' N – 032º 26' 218'' E, S. Demir–724 & Eker, Det.: Eker–2013; Mengen, around the Şirinyazı Pond, wet meadows, 1110 m., 05.07.2013, 40º 58.732" N – 032º 12.979" E, Leg.: S. Demir–741 & Eker, Det.: Eker–2013.

***Dactylorhiza* Neck. ex Nevski**

***Dactylorhiza iberica* (M. Bieb. ex Willd.) Soó**

A3 Bolu: Southwest of the Lake Abant, around the walk way, meadows, 1330 m., 12.07.2012, 40º 36.299" N – 031º 16.203" E, Leg.: S. Demir–241 & Eker, Det.: Eker–2013; ibid., 12.07.2012, Leg.: S. Demir–242 & Eker, Det.: Eker–2013; ibid., 20.06.2013, Leg.: S. Demir–698, Det.: Eker–2013; ibid., 20.06.2013, Leg.: S. Demir–699, Det.: Eker–2013. Abant, on the Bolu – Abant road, 4 km to Abant, meadows, 1006 m., 20.06.2013, 40º 37.993" N – 031º 19.970" E, Leg.: S. Demir–694, Det.: Eker–2013; Northeast of the Lake Abant, around the picnic area, wet meadows, 1330 m., 20.06.2013, 40º 36.389" N – 031º 17.269" E, Leg.: S. Demir–702, Det.: Eker–2013; A4 Bolu: Mengen, on the Mengen – Şirinyazı Pond road, 1 km to Şirinyazı Pond, wet meadows, 1053 m., 05.07.2013, 40º 58.519" N – 032º 12.737" E, Leg.: S. Demir–733 & Eker, Det.: Eker–2013; Mengen, around the Şirinyazı Pond, wet meadows, 1110 m., 05.07.2013, 40º 58.732" N – 032º 12.979" E, Leg.: S. Demir–743 & Eker, Det.: Eker–2013.

East Mediterranean Element

Dactylorhiza incarnata* (L.) Soó subsp. *incarnata

A3 Bolu: Abant, on the Bolu – Abant road, 9 km to Abant, marshes, 971 m., 13.06.2012, 40º 38.933" N – 031º 22.304" E, Leg.: S. Demir–145 & Eker, Det.: Eker–2012; Southeast

of the Lake Abant, around picnic area, wet meadows, 1345 m., 13.06.2012, 40º 35.891" N – 031º 16.786" E, Leg.: S. Demir–149 & Eker, Det.: S. Demir–2012; on the Bolu – Yedigöller road, 24 km to Yedigöller, meadows, 1372 m., 12.07.2012, 40º 51.256" N – 031º 40.582" E, Leg.: S. Demir–232 & Eker, Det.: S. Demir–2012; Southwest of the Lake Abant, around the walk way, meadows, 1330 m., 20.06.2013, 40º 36.299" N – 031º 16.203" E, Leg.: S. Demir–700, Det.: Eker–2013.

***Dactylorhiza nieschalkiorum* H. Baumann & Künkele**

A3 Bolu: Abant, on the Abant – Taşkesti road, 4 km to Gökören village, meadows, 855 m., 13.06.2012, 40º 35.679" N – 031º 09.021" E, Leg.: S. Demir–155 & Eker, Det.: Eker–2012; Southwest of the Lake Abant, around the walk way, meadows, 1330 m., 20.06.2013, 40º 36.299" N – 031º 16.203" E, Leg.: S. Demir–701, Det.: Eker–2013; West of the Lake Abant, around the Örencik upland, wet meadows, 1553 m., 20.06.2013, 40º 36.563" N – 031º 15.574" E, Leg.: S. Demir–708, Det.: Eker–2013; A4 Bolu: Yeniçağa, on the Mengen – Yeniçağa road, 1 km to Eskiçağa, open forests, 961 m., 20.06.2012, 40º 49.444" N – 032º 02.637" E, Leg.: S. Demir–200 & Eker, Det.: Eker–2012; Gerede, Gökçeler Mountain, around the Sungurlar upland, wet meadows, 1745 m., 22.06.2012, 40º 50.468" N – 032º 14.167" E, Leg.: S. Demir–219 & Eker, Det.: Eker–2012; Mengen, North of the Şirinyazı Pond, open forests, 1309 m., 05.07.2013, 40º 59.717" N – 032º 15.801" E, Leg.: S. Demir–736 & Eker, Det.: Eker–2013.

Endemic

Dactylorhiza romana* (Sebast.) Soó subsp. *romana

A3 Bolu: Çal Hill, on the Çal Hill – Tetemeçele village road, 3 km to Tetemeçele village, woodland, 1311 m., 28.04.2013, 40º 51.691" N – 031º 44.507" E, Leg.: S. Demir–441 & Eker, Det.: Eker–2013; Gölcük, on the Bolu – Gölcük road, 3 km to Gölcük, woodland, 923 m., 07.05.2013, 40º 40.496" N – 031º 38.185" E, Leg.: S. Demir–563 & Eker, Det.: Eker–2013; North of the Gölköy, woodland, 817 m., 20.05.2013, 40º 42.484" N – 031º 31.157" E, Leg.: S. Demir–617 & Eker, Det.: Eker–2013.

Mediterranean Element

***Dactylorhiza saccifera* (Brongn.) Soó subsp. *saccifera* (=*Dactylorhiza bithynica* H. Baumann)**

A3 Bolu: Abant, on the Bolu – Abant road, 3 km to Abant, marshes, 1121 m., 13.06.2012, 40º 37.526" N – 031º 18.900" E, Leg.: S. Demir–147 & Eker, Det.: Eker–2012; Çele Hill, on the Bolu, Yedigöller road, around the Çele Hill, marshes, 1218 m., 12.07.2012, 40º 50.275" N – 031º 40.185" E, Leg.: S. Demir–238 & Eker, Det.: Eker–2012.

East Mediterranean Element

***Coeloglossum* Hartm.**

***Coeloglossum viride* (L.) Hartm.**

A3 Bolu: West of the Lake Abant, around the Örencik upland, wet meadows, 1553 m., 20.06.2013, 40º 36.563" N – 031º 15.574" E, Leg.: S. Demir–696, Det.: Eker–2013.

***Epipactis* Zinn**

Epipactis helleborine* (L.) Crantz subsp. *helleborine

A3 Bolu: Kartalkaya, on the Sarıalan – Kartalkaya road, 6 km to Kartalkaya, meadows, 1617 m., 23.07.2012, 40º 37.505" N – 031º 49.092" E, S. Demir–264 & Eker, Det.: Eker–2012; ibid., 19.07.2013, S. Demir–801 & Eker, Det.: Eker–2013; Mengen, on the Gökçesu – Mengen road, 8 km to Mengen, woodland, 560 m., 05.07.2013, 40º 53.800" N – 031º 59.512" E, Leg.: S. Demir–731 & Eker, Det.: Eker–2013; Seben, on the Taşlıyayla Pond – Kuzgölcük village road, woodland, 1490 m., 19.07.2013, 40º 31.412" N – 031º 35.544" E, S. Demir–790 & Eker, Det.: Eker–2013; A4 Bolu: Mengen, on the Mengen – Şirinyazı Pond road, 1 km to Şirinyazı Pond, wet meadows, 1053 m., 05.07.2013, 40º 58.519" N – 032º 12.737" E, Leg.: S. Demir–734 & Eker, Det.: Eker–2013; Mengen, around the Şirinyazı Pond, wet meadows, 1110 m., 05.07.2013, 40º 58.732" N – 032º 12.979" E, Leg.: S. Demir–744 & Eker, Det.: Eker–2013.

***Epipactis microphylla* (Ehrh.) Sw.**

A3 Bolu: Seben, on the Kızık village – Kazak village road, around the stope, open forests, 1424 m., 19.07.2013, 40º 29.189" N – 031º 30.412" E, Leg.: S. Demir–792 & Eker, Det.: Eker–2013.

Euro – Siberian Element

***Epipactis palustris* (L.) Crantz**

A3 Bolu: Southwest of the Lake Abant, around the walk way, meadows, 1330 m., 12.07.2012, 40º 36.299" N – 031º 16.203" E, Leg.: S. Demir–244 & Eker, Det.: Eker–2013; A4 Bolu: Mengen, around the Şirinyazı Pond, wet meadows, 1110 m., 05.07.2013, 40º 58.732" N – 032º 12.979" E, Leg.: S. Demir–742 & Eker, Det.: Eker–2013.

Euro – Siberian Element

***Epipactis persica* (Soó) Hausskn. ex Nannf.**

A3 Bolu: Seben, on the Kızık village – Kazak village road, around the stope, open forests, 1424 m., 19.07.2013, 40º 29.189" N – 031º 30.412" E, Leg.: S. Demir–796 & Eker, Det.: Eker–2013.

***Epipactis pontica* Taubenheim**

A3 Bolu: Yedigöller, on the Mengen – Yedigöller road, 3 km to Yedigöller, woodland, 560 m., 11.08.2012, 40º 57.852" N – 031º 44.277" E, Leg.: S. Demir–281, Det.: Eker–2012; ibid., 26.07.2013, 40º 57.852" N – 031º 44.277" E, Leg.: S. Demir–802, Det.: Eker–2013.

Euxine Element, ***Endemic***

***Epipactis turcica* Kreutz**

A3 Bolu: North of the Gölköy, around the Campus forests, woodland, 875 m., 28.06.2012, 40º 42.800" N – 031º 30.944" E, Leg.: S. Demir–228, Det.: Eker–2012; ibid., 11.07.2012, Leg.: S. Demir–231, Det.: Eker–2012; on the Bolu – Gökçesu road, around the Çatakören village, woodland, 735 m., 18.06.2013, 40º 46.503" N – 031º 45.237" E, Leg.: S. Demir–683, Det.: Eker–2013; on the Bolu – Gökçesu road, around the Semerciler village,

woodland, 753 m., 18.06.2013, 40º 50.184" N – 031º 48.288" E, Leg.: S. Demir–684, Det.: Eker–2013.

Endemic

***Epipogium* J.G. Gmel. ex Borkh**.

***Epipogium aphyllum* Sw.**

A3 Bolu:Yedigöller, on the Bolu – Yedigöller road, around the Kuşötmez district, woodland, 1162 m., 10.07.2013, 40º 56.102" N – 031º 45.623" E, Leg.: S. Demir–771 & Eker, Det.: Eker–2013.

Euro – Siberian Element

***Himantoglossum* Spreng**

***Himantoglossum caprinum* (M. Bieb.) Spreng.**

A3 Bolu: Çele Hill, on the Bolu – Yedigöller road, around the Çele Hill, woodland, 1063 m., 20.06.2012, 40º 49.140" N – 031º 39.970" E, Leg.: S. Demir–178 & Eker, Det.: Eker–2012; ibid., 12.07.2012, Leg.: S. Demir–239 & Eker, Det.: Eker–2012; North of the Gölköy, around the Campus forests, woodland, 814 m., 28.06.2012, 40º 42.464" N – 031º 31.132" E, Leg.: S. Demir–225 & Eker, Det.: Eker–2012; North of the Gölköy, around the farm, woodland, 849 m., 28.06.2012, 40º 42.794" N – 031º 31.279" E, Leg.: S. Demir–229 & Eker, Det.: Eker–2012; on the Bolu – Abant road, around the Akçaalan village, woodland, 1024 m., 10.06.2013, 40º 40.343" N – 031º 25.530" E, Leg.: S. Demir–671 & Eker, Det.: Eker–2013.

Euxine Element

***Himantoglossum comperianum* (Steven) P.Delforge (=*Comperia comperiana* (Steven) Aschers. & Graebn.)**

A3 Bolu: Göynük, around the Lake Sünnet, woodland, 1103 m., 01.06.2012, 40º 24.961" N – 030º 57.044" E, Leg.: S. Demir–127 & Eker, Det.: Eker–2012; ibid., 10.06.2013, Leg.: S. Demir–679 & Eker, Det.: Eker–2013.

Irano – Turanian Element

***Limodorum* Boehm.**

Limodorum abortivum* (L.) Sw. var. *abortivum

A3 Bolu: North of the Gölköy, around the Campus forests, woodland, 800 m., 20.05.2013, 40º 42.687" N – 031º 31.574" E, Leg.: S. Demir–621 & Eker, Det.: Eker–2013; Abant, on the Bolu – Abant road, 1 km to Abant, woodland, 1298 m., 23.05.2013, 40º 36.901" N – 031º 17.028" E, Leg.: S. Demir–646 & Eker, Det.: Eker–2013.

***Neotinea* Rchb. f.**

***Neotinea tridentata* (Scop.) R. M. Bateman subsp. *tridentata* (=*Orchis tridentata* Scop.)**

A3 Bolu: North of the Gölköy, woodland, 817 m., 20.05.2013, 40º 42.484" N – 031º 31.157" E, Leg.: S. Demir–616 & Eker, Det.: Eker–2013; on the Bolu – Abant road, 13 km to Abant, woodland, 966 m., 23.05.2013, 40º 39.154" N – 031º 22.679" E, Leg.: S. Demir–647 & Eker, Det.: Eker–2013.

Mediterranean Element

***Neottia* Guett.**

***Neottia nidus-avis* (L.) Rich.**

A3 Bolu: North of the Campus area, woodland, 896 m., 25.05.2012, 40º 43.134" N – 031º 31.048" E, Leg.: S. Demir–117, Det.: Eker–2012; West of the Tomb of Tokad-i Hayrettin Hz., woodland, 952 m., 13.06.2012, 40º 43.890" N – 031º 28.159" E, Leg.: S. Demir–137 & Eker, Det.: Eker–2012; ibid., 23.05.2013, Leg.: S. Demir–622 & Eker, Det.: Eker–2013; Gölcük, on the Bolu – Gölcük road, 1 km to Gölcük, woodland, 1070 m., 19.06.2012, 40º 39.940" N – 031º 37.860" E, Leg.: S. Demir–161 & Eker, Det.: Eker–2012; A4 Bolu: Mengen, on the Gökçesu – Mengen road, 6 km to Mengen, around the Ağalar village, woodland, 794 m., 01.08.2012, 40º 54.263" N – 032º 02.808" E, Leg.: S. Demir–279, Det.: Eker–2012; on the Bolu – Abant road, 18 km to Abant, woodland, 1156 m., 19.07.2013, 40º 41.055" N – 031º 24.087" E, Leg.: S. Demir–775 & Eker, Det.: Eker–2013.

Euro – Siberian Element

***Ophrys* L.**

***Ophrys apifera* Huds.**

A3 Bolu: on the Bolu – Abant road, 20 km to Abant, meadows, 812 m., 13.06.2012, 40º 42.512" N – 031º 27.899" E, Leg.: S. Demir–141 & Eker, Det.: Eker–2012; on the Bolu Abant road, 13 km to Abant, woodland, 966 m., 23.05.2013, 40º 39.154" N – 031º 22.679" E, Leg.: S. Demir–649 & Eker, Det.: S. Demir–2013.

***Ophrys sphegodes* Mill. subsp. *mammosa* (Desf.) Soó ex E.Nelson (=*Ophrys mammosa* Desf.)**

A3 Bolu: Yeniçağa, on the Bolu – Yeniçağa road, around the Dereköy, open forests, 1116 m., 17.05.2013, 40º 48.466" N – 031º 57.324" E, Leg.: S. Demir–610 & Eker, Det.: Eker–2013.

***Orchis* Tourn. ex L.**

***Orchis mascula* (L.) L. subsp. *mascula* (=*Orchis mascula* (L.) L. subsp. *pinetorum* (Boiss. & Kotschy) G.Camus)**

A3 Bolu: North of the Gölköy, woodland, 893 m., 04.05.2012, 40º 42.788" N – 031º 31.182" E, Leg.: S. Demir–54 & Eker, Det.: Eker–2012; North of the Campus area, woodland, 849 m., 07.05.2012, 40º 43.186" N – 031º 30.927" E, Leg.: S. Demir–56, Det.: Eker–2012; North of the Campus area, woodland, 857 m., 07.05.2012, 40º 43.315" N – 031º 31.084" E, Leg.: S. Demir–58, Det.: Eker–2012; Mudurnu, on the Bolu – Mudurnu road, around the Gürçam village, woodland, 1316 m., 18.05.2012, 40º 25.996" N – 031º 19.275" E, Leg.: S. Demir–80 & Eker, Det.: Eker–2012; Kartalkaya, on the Dörtdivan – Kartalkaya road, 4 km to Kartalkaya, woodland, 1560 m., 22.05.2012, 40º 38.882" N – 031º 50.367" E, Leg.: S. Demir–114 & Eker, Det.: Eker–2012; Yedigöller, on the Bolu – Yedigöller road, 6 km to Yedigöller, woodland, 1293 m., 28.04.2013, 40º 35.707" N – 031º 44.003" E, Leg.: S. Demir–484 & Eker, Det.: Eker–2013; Aladağlar, on the Bolu – Aladağlar road, 2 km to Okçular upland, woodland, 1478 m., 07.05.2013, 40º 38.158" N – 031º 38.549" E, Leg.: S. Demir–565 & Eker, Det.: Eker–2013; West of the Tomb of Tokad-i Hayrettin Hz., woodland, 952 m., 23.05.2013, 40º 43.890" N – 031º 28.159" E, Leg.: S. Demir–624 & Eker, Det.: S.

Demir–2013; Abant, on the Bolu – Abant road, 1 km to Abant, woodland, 1298 m., 23.05.2013, 40º 36.901" N – 031º 17.028" E, Leg.: S. Demir–645 & Eker, Det.: Eker–2013**.**

East Mediterranean Element

Orchis purpurea* Huds. subsp. *purpurea

A3 Bolu: Gölcük, on the Bolu – Gölcük road, 3 km to Gölcük, woodland, 923 m., 07.05.2013, 40º 40.496" N – 031º 38.185" E, Leg.: S. Demir–553 & Eker, Det.: Eker–2013; North of the Gölköy, woodland, 817 m., 20.05.2013, 40º 42.484" N – 031º 31.157" E, Leg.: S. Demir–615 & Eker, Det.: Eker–2013.

Euro – Siberian Element

***Orchis pallens* L.**

A3 Bolu: Abant, on the Mudurnu – Abant road, 2 km to Antenna Tower, woodland, 1452 m., 30.04.2012, 40º 35.334" N – 031º 17.004" E, Leg.: S. Demir–51 & Eker, Det.: Eker–2012; Çal Hill on the Çal Hill road – Tetemeçele village, 5 km to the Tetemeçele village, meadows, 1636 m, 28.04.2013, 40º 52.280" N – 031º 44.071" E, Leg.: S. Demir–450 & Eker, Det.: Eker–2013; Yedigöller, on the Bolu – Yedigöller road, 10 km to Yedigöller, meadows, 1453 m., 28.04.2013, 40º 55.519" N – 031º 42.285" E, Leg.: S. Demir–478 & Eker, Det.: Eker–2013; Northeast of the Abant, around the picnic area, woodland, 1330 m., 40º 36.389" N – 031º 17.269" E, Leg.: S. Demir–534 & Eker, Det.: Eker–2013; A4 Bolu: Gerede, on the Gerede – Kızılcahamam road, around the Ovacık village, open forests, 1576 m., 22.05.2012, 40º 37.172" N – 032º 23.318" E, Leg.: S. Demir–100 & Eker, Det.: Eker–2012.

Euro – Siberian Element

Orchis simia* Lam. subsp. *simia

A3 Bolu: North of the Gölköy, woodland, 817 m., 20.05.2013, 40º 42.484" N – 031º 31.157" E, Leg.: S. Demir–614 & Eker, Det.: Eker–2013.

Mediterranean Element, ***New record for Bolu Province***

***Platanthera* Rich**

***Platanthera chlorantha* (Custer) Rchb.**

A3 Bolu: North of the Campus area, woodland, 896 m., 25.05.2012, 40º 43.134" N – 031º 31.048" E, Leg.: S. Demir–115, Det.: Eker–2012; ibid., 03.06.2012, Leg.: S. Demir–133, Det.: Eker–2012; Kartalkaya, on the Sarıalan – Kartalkaya road, 5 km to Kartalkaya, meadows, 1547 m., 22.06.2012, 40º 37.659" N – 031º 49.305" E, S. Demir–205 & Eker, Det.: Eker–2012; North of the Gölköy, woodland, 817 m., 20.05.2013, 40º 42.484" N – 031º 31.157" E, Leg.: S. Demir–618 & Eker, Det.: Eker–2013; Mengen, on the Gökçesu – Mengen road, 8 km to Mengen, woodland, 560 m., 05.07.2013, 40º 53.800" N – 031º 59.512" E, Leg.: S. Demir–729 & Eker, Det.: Eker–2013; A4 Bolu: Dörtdivan, on the Dörtdivan – Sivrigöynük Tepesi road, around the Sivrigöynük Tepesi, woodland, 1467 m., 22.06.2012, 40º 34.488" N – 032º 04.227" E, Leg.: S. Demir–213 & Eker, Det.: Eker–2012.

***Spiranthes* Rich.**

***Spiranthes spiralis* (L.) Chevall.**

A3 Bolu: Çal Hill, on the Bolu – Çal Hill road, around the Mesciçele village, open forests, 1156 m., 27.09.2012, 40º 50.514" N – 031º 42.879" E, Leg.: S. Demir–297 & Eker, Det.: Eker–2013.

Mediterranean Element, ***New record for Bolu Province***

***Steveniella* Schltr.**

***Steveniella satyrioides* (Spreng.) Schltr.**

A3 Bolu: on the Bolu – Abant road, around the Akçaalan village, woodland, 1024 m., 18.05.2013, 40º 40.343" N – 031º 25.530" E, Leg.: S. Demir–611 & Eker, Det.: Eker–2013.

Hyrcano – Euxine Element

IRIDACEAE Juss.

***Crocus* L.**

***Crocus abantensis* T. Baytop & B. Mathew**

A3 Bolu: Southeast of the Lake Abant, around picnic area, meadows, 1340 m., 20.04.2012, 40º 35.980" N – 031º 16.898" E, Leg.: S. Demir–29, Det.: S. Demir–2012; ibid., 19.03.2013, Leg.: S. Demir–351, Det.: S. Demir–2013; Abant on the Lake Abant – Antenna Tower road, 1 km to Lake Abant, woodland, 1420 m., 26.02.2013, 40º 37.522" N – 031º 18.902" E, Leg.: S. Demir–319 & Eker, Det.: S. Demir–2013; Lake Abant, around the Antenna Tower, alpine steppe, 1756m., 01.05.2013, 40º 36.185" N – 031º 19.326" E, Leg.: S. Demir–543 & Eker, Det.: S. Demir–2013.

Euro – Siberian Element, ***Endemic***

***Crocus ancyrensis* (Herb.) Maw**

A3 Bolu: Abant, on the Lake Abant – Antenna Tower road, 1 km to Lake Abant, rocky slopes, 1430 m., 30.04.2012, 40º 35.325" N – 031º 16.876" E, Leg.: S. Demir–49 & Eker, Det.: S. Demir–2012; ibid., 26.02.2013, Leg.: S. Demir–320, Det.: S. Demir–2013; Kartalkaya, alpine meadows, 2038 m., 22.05.2012, 40º 35.126" N – 031º 48.456" E, Leg.: S. Demir–107 & Eker, Det.: S. Demir–2012; Yedigöller on the Bolu – Yedigöller road, 10 km to Yedigöller, meadows, 1428 m., 06.03.2013, 40º 55.525" N – 031º 42.383" E, Leg.: S. Demir–329, Det.: S. Demir–2013; Aladağlar, on the Bolu – Aladağlar road, around the Demirciler upland, meadows, 1306 m. 07.03.2013, 40º 37.700" N – 031º 41.551" E, Leg.: S. Demir–335 & Eker, Det.: S. Demir–2013; Seben, Karakiriş Mountain, on the Çayırhan – Nallıgölcük road, 3 km to Nallıgölcük, stony steppe, 1276 m., 25.03.2013, 40º 16.407" N – 031º 33.468" E, Leg.: S. Demir–359, Det.: S. Demir–2013; Çele Hill, on the Bolu – Yedigöller road, around the Çele Hill, rocky slopes, 1720 m., 28.04.2013, 40º 52.175" N – 031º 43.492" E, Leg.: S. Demir–470 & Eker, Det.: S. Demir–2013; A4 Bolu: Gerede, on the Kızılcahamam – Gerede road , 30 km to Gerede, meadows, 1458 m., 14.03.2013, 40º 38.096" N – 032º 25.875" E, Leg.: S. Demir–338, Det.: S. Demir–2013; Gerede, on the Gerede – Kızılcahamam road, around the Ovacık village, open forests, 1517 m., 14.03.2013, 40º 37.493" N – 032º 23.259" E, Leg.: S. Demir–344, Det.: S. Demir–2013;

Kıbrıscık, on the Kıbrıscık – Sakallı upland road, 13 km to Sakallı upland, meadows, 1279 m., 25.03.2013, 40º 24.345" N – 032º 00.523" E Leg.: S. Demir–354 & Eker, Det.: S. Demir–2013.

Irano – Turanian Element, ***Endemic***

***Crocus biflorus* Mill. subsp. *pulchricolor* (Herb.) B. Mathew**

A3 Bolu: Northwest of the Lake Abant, around the Abant Palace Hotel, meadows, 1304 m., 17.04.2012, 40º 36.622" N – 031º 16.568" E, Leg.: S. Demir–13, Det.: S. Demir–2012; Northwest of the Lake Abant, around the Abant Palace Hotel, meadows, 1334 m., 17.04.2012, 40º 36.542" N – 031º 16.391" E, Leg.: S. Demir–19, Det.: S. Demir–2012; Northwest of the Lake Abant, around the Abant Palace Hotel, meadows, 1328 m., 31.03.2013, 40º 36.607" N – 031º 16.548" E, Leg.: S. Demir–369, Det.: S. Demir–2013. Southwest of the Lake Abant, around the walk way, meadows, 1350 m., 20.04.2012, 40º 36.160" N – 031º 16.190" E, Leg.: S. Demir–25, Det.: S. Demir–2012; Southeast of the Lake Abant, around picnic area, wet meadows, 1345 m., 20.04.2012, 40º 35.891" N – 031º 16.786" E, Leg.: S. Demir–27, Det.: S. Demir–2012; Southeast of the Lake Abant, around picnic area, meadows, 1340 m., 19.03.2013, 40º 35.980" N – 031º 16.898" E, Leg.: S. Demir–352, Det.: S. Demir–2013; Abant, on the Mudurnu – Abant road, 2 km to Lake Abant, meadows, 1437 m., 30.04.2012, 40º 35.502" N – 031º 16.804" E, Leg.: S. Demir–47 & Eker, Det.: S. Demir–2012; Kartalkaya, alpine meadows, 2038 m., 22.05.2012, 40º 35.126" N – 031º 48.456" E, Leg.: S. Demir–106 & Eker, Det.: S. Demir–2012; Aladağlar, around Demirciler upland, meadows, 1306 m., 07.03.2013, 40º 37.700" N – 031º 41.551" E, Leg.: S. Demir–337 & Eker, Det.: S. Demir–2013; A4 Bolu: Gerede, on the Kızılcahamam – Gerede road , 30 km to Gerede, meadows, 1458 m., 14.03.2013, 40º 38.096" N – 032º 25.875" E, Leg.: S. Demir–339, Det.: S. Demir–2013; Gerede, on the Gerede – Kızılcahamam road, around the Ovacık village, open forests, 1517 m., 14.03.2013, 40º 37.493" N – 032º 23.259" E, Leg.: S. Demir–345, Det.: S. Demir–2013; Gerede, Gökçeler Mountain, around Keltepe, woodland, 1588 m, 25.04.2013, 40º 51.414" N – 032º 18.993" E, Leg.: S. Demir–415 & Eker, Det.: S. Demir–2013; Gerede, Gökçeler

Mountain, around Esentepe, meadows, 1685 m., 16.04.2013, 40º 49.490" N – 032º 11.627" E, Leg.: S. Demir–437 & Eker, Det.: S. Demir–2013.

Euro – Siberian Element, ***Endemic***

Crocus olivieri* J. Gay subsp. *olivieri

A3 Bolu: Campus area, right side of the entrance, meadows, 835 m., 04.04.2012, 40º 43.079" N – 031º 31.260" E, Leg.: S. Demir–3, Det.: S. Demir–2012; Campus area, around the Medical Faculty, meadows, 804 m., 04.04.2012, 40º 43.092" N – 031º 31.405" E, Leg.: S. Demir–4, Det.: S. Demir–2012; West of the Lake Abant, around the picnic area, meadows, 1345 m., 17.04.2012, 40º 36.355" N – 031º 16.203" E, Leg.: S. Demir–21, Det.: S. Demir–2012; Southeast of the Lake Abant, around picnic area, meadows, 1340 m., 20.04.2012, 40º 35.980" N – 031º 16.898" E, Leg.: S. Demir–28, Det.: S. Demir–2012; Abant, on the Mudurnu – Abant road, 2 km to Lake Abant, meadows, 1437 m., 30.04.2012, 40º 35.502" N – 031º 16.804" E, Leg.: S. Demir–48 & Eker, Det.: S. Demir–2012; Mudurnu, on the Dokurcun – Alaçam village road, 1 km to Alaçam village, meadows, 745 m., 26.02.2013, 40º 34.122" N – 030º 57.945" E, Leg.: S. Demir–321, Det.: S. Demir–2013; Kıbrıscık, on the Kıbrıscık – Seben road, around the Dokumacılar village, steppe, 1058 m., 25.03.2013, 40º 21.701" N – 031º 47.525" E, Leg.: S. Demir–358, Det.: S. Demir–2013; A4 Bolu: Gerede, on the Tatlar village – Yenecik village road, 2 km to Yenecik village, meadows, 1207 m., 14.03.2013, 40º 41.962" N – 032º 16.942" E, Leg.: S. Demir–342, Det.: S. Demir–2013; Gerede, Gökçeler Mountain, around Keltepe, marshes, 1588 m, 25.04.2013, 40º 51.414" N – 032º 18.993" E, Leg.: S. Demir–409 & Eker, Det.: S. Demir–2013.

***Crocus* × *paulineae* Pasche & Kerndorff**

A3 Bolu: Abant, on the Mudurnu – Abant road, 1 km to Lake Abant, steppe, 1443 m., 01.03.2013, 40º 35.320" N – 031º 16.368" E, Leg.: S. Demir–609, Det.: S. Demir–2012.

Endemic

Crocus speciosus* M. Bieb. subsp. *speciosus

A3 Bolu: Northeast of the Lake Abant, around picnic area, meadows, 1337 m., 24.09.2012, 40º 36.452" N – 031º 17.605" E, Leg.: S. Demir–286 & Eker, Det.: S. Demir–2012; Northwest of the Lake Abant, around Abant Palace Hotel, meadows, 1302 m., 24.09.2012, 40º 36.473" N – 031º 16.284" E, Leg.: S. Demir–288 & Eker, Det.: S. Demir–2012; Çal Hill, on the Çal Hill road – Tetemeçele village, 5 km to the Tetemeçele village, meadows, 1636 m, 27.09.2012, 40º 52.280" N – 031º 44.071" E, Leg.: S. Demir–293 & Eker, Det.: S. Demir–2012; ibid., 14.10.2012, Leg.: S. Demir–316 & Eker, Det.: S. Demir–2012; Çal Hill, on the Bolu – Yedigöller road, around the Çal Hill, meadows, 1877 m., 27.09.2012, 40º 53.611" N – 031º 46.633" E, Leg.: S. Demir–295 & Eker, Det.: S. Demir–2012; Çele Hill, on the Bolu Yedigöller road, around the Çele Hill, meadows, 957 m., 27.09.2012, 40º 51.982" N – 031º 42.239" E, Leg.: S. Demir–296 & Eker, Det.: S. Demir–2012; South of the Campus area, woodland, 845 m., 12.10.2012, 40º 42.728" N – 031º 31.630" E, Leg.: S. Demir–305, Det.: S. Demir–2012; Kartalkaya, alpine meadows, 2038 m., 13.10.2012, 40º 35.126" N – 031º 48.456" E, Leg.: S. Demir–311 & Eker, Det.: S. Demir–2012; A4 Bolu: Gerede, Gökçeler Mountain, around Esentepe, meadows, 1711 m., 14.10.2012, 40º 49.275" N – 032º 11.494" E, Leg.: S. Demir–317 Det.: S. Demir–2012.

***Gladiolus* L.**

***Gladiolus italicus* Mill.**

A3 Bolu: on the Mudurnu – Abant road, around the turnout of the Bolu, cultivated fields, 800 m., 01.06.2012, 40º 31.058" N – 031º 14.337" E, Leg.: S. Demir–122 & Eker, Det.: S. Demir–2012; on the Bolu – Abant road, 20 km to Abant, meadows, 812 m., 13.06.2012, 40º 42.512" N – 031º 27.899" E, Leg.: S. Demir–138 & Eker, Det.: S. Demir–2012; on the Abant – Taşkesti road, 4 km to Gökören village, meadows, 855 m., 13.06.2012, 40º 35.679" N – 031º 09.021" E, Leg.: S. Demir–158 & Eker, Det.: S. Demir–2012; Kıbrıscık, on the Bolu – Kıbrıscık road, 34 km to Kıbrıscık, meadows, 1416 m., 19.06.2012, 40º 33.306" N – 031º 40.421" E, Leg.: S. Demir–164 & Eker, Det.: S. Demir–2012; Kıbrıscık, on the Bolu – Kıbrıscık road, 28 km to Kıbrıscık, around the stream, meadows, 1462 m., 19.06.2012, 40º31.215" N – 031º 42.998" E, Leg.: S. Demir–166 & Eker, Det.: S. Demir–

2012; Seben, on the Seben – Karakiriş Mountain road, around the memorial forest, cultivated fields, 867 m., 07.05.2013, 40º 23.178'' N – 031º 32.119'' E, Leg.: S. Demir–568 & Eker, Det.: S. Demir–2013; on the Bolu – Abant road, 19 km to Abant, open forests, 823 m., 23.05.2013, 40º 42.489'' N – 031º 27.799'' E, Leg.: S. Demir–658 & Eker, Det.: Eker–2013; Yeniçağa, on the Yeniçağa – Bolu road, 3 km to the Hamzabey village, meadows, 974 m., 18.06.2013, 40º 46.173'' N – 031º 59.390'' E, Leg.: S. Demir–691, Det.: S. Demir–2013.

***Iris* L.**

***Iris × germanica* L.**

A3 Bolu: Abant, Northeast of the Lake Abant, around picnic area, meadows, 1330 m., 06.06.2013, 40º 36.389'' N – 031º 17.269'' E, Leg.: S. Demir–659 & Eker, Det.: S. Demir–2013.

New record for A3 square and Bolu Province

***Iris kerneriana* Asch. & Sint. ex Baker**

A3 Bolu: Seben, on the Korucuk upland-Kabak village road around the pit, 1425 m., 19.06.2011, N 40º 29.20'' – E 031º 30.39'', TUNÇKOL 2627, ISTO 35844.

Euro – Siberian Element, ***Endemic***

***Iris pseudacorus* L.**

A3 Bolu: Yeniçağa, on the Yeniçağa – Bolu road, 3 km to the Hamzabey village, marshes, 1040 m., 22.05.2012, 40º 46.518'' N – 031º 59.092'' E, Leg.: S. Demir–91 & Eker, Det.: S. Demir–2012; Aladağlar, on the Bolu – Aladağlar road, around the Kızık upland, marshes, 1274 m., 19.06.2012, 40º 35.186'' N – 031º 38.119'' E, Leg.: S. Demir–163 & Eker, Det.: S. Demir–2012.

***Iris pumila* L. subsp. *attica* (Boiss. & Heldr.) K.Richt.**

A3 Bolu: Göynük, on the Nallıhan – Göynük road , 1 km to Göynük, open shrubs, 794 m., 24.04.2013, 40º 24.010'' N – 030º 47.436'' E, Leg.: S. Demir–397, Det.: S. Demir–2013.

East Mediterranean Element

***Iris purpureobractea* B. Mathew & T. Baytop**

A3 Bolu: Göynük, on the Mudurnu – Lake Sünnet road , 2 km to Lake Sünnet, rocky slopes, 900 m., 10.06.2013, 40º 26.816" N – 030º 57.833" E, Leg.: S. Demir–678 & Eker, Det.: S. Demir–2013.

East Mediterranean Element, ***Endemic***

***Iris schachtii* Markgr.**

A3 Bolu: Seben Karakiriş Mountain, Daşbükü district, rocky areas, 665 m. 19.07.1999, N.A. 1973, ISTO 2843.

Irano – Turanian Element, ***Endemic***

Iris sintenisii* Janka subsp. *sintenisii

A3 Bolu: Campus area, right side of the entrance, rocky slopes, 856 m., 03.06.2012, 40º 42.576" N – 031º 31.122" E, Leg.: S. Demir–131, Det.: S. Demir–2012; on the Bolu Abant road, 19 km to Abant, woodland, 822 m., 13.06.2012, 40º 42.038" N – 031º 27.213" E, Leg.: S. Demir–144 & Eker, Det.: S. Demir–2012; on the Lake Abant – Antenna Tower road, 1 km to Lake Abant, open forests, 1420 m., 13.06.2012, 40º 37.522" N – 031º 18.902" E, Leg.: S. Demir–151 & Eker, Det.: S. Demir–2012; on the Bolu – Yedigöller road, around the Çele Hill, woodland, 1063 m., 20.06.2012, 40º 49.140" N – 031º 39.970" E, Leg.: S. Demir–179 & Eker, Det.: S. Demir–2012; North of the Gölköy, woodland, 807 m., 20.05.2013, 40º 42.600" N – 031º 31.431" E, Leg.: S. Demir–619 & Eker, Det.: S. Demir–2013; Abant, on the Bolu – Abant road, 13 km to Abant, woodland, 966 m., 23.05.2013, 40º 39.154" N – 031º 22.679" E, Leg.: S. Demir–650 & Eker, Det.: S. Demir–2013.

Euro – Siberian Element

XANTHORRHOEACEAE Dumortier

***Asphodeline* Rchb.**

***Asphodeline lutea* (L.) Rchb.**

A3 Bolu: Kıbrıscık, on the Kıbrıscık – Beypazarı road, 7 km to Alemdar village, rocky steppe, 1149 m., 19.06.2012, 40º 24.397" N – 031º 58.336" E, Leg.: S. Demir–173 & Eker, Det.: S. Demir–2012; ibid., 13.10.2012, Leg.: S. Demir–312 & Eker, Det.: S. Demir–2012; ibid., 30.04.2013, 40º 24.397" N – 031º 58.336" E, Leg.: S. Demir–502 & Eker, Det.: S. Demir–2013.

Mediterranean Element, ***New Record for Bolu Province***

***Eremurus* M. Bieb.**

***Eremurus spectabilis* M. Bieb.**

A3 Bolu: Kıbrıscık, on the Kıbrıscık – Beypazarı road, 7 km to Alemdar village, rocky steppe, 1149 m., 19.06.2012, 40º 24.397" N – 031º 58.336" E, Leg.: S. Demir–172 & Eker, Det.: S. Demir–2012; ibid., 13.10.2012, Leg.: S. Demir–313 & Eker, Det.: S. Demir–2012; ibid., 30.04.2013, 40º 24.397" N – 031º 58.336" E, Leg.: S. Demir–503 & Eker, Det.: S. Demir–2013.

Irano – Turanian Element, ***New Record for Bolu Province***

AMARYLLIDACEAE J.St.-Hil.

***Allium* L.**

***Allium hirtovaginatum* Kunth**

A3 Bolu: Lake Abant, around the Antenna Tower, alpine steppe, 1756m., 11.08.2012, 40º 36.185" N – 031º 19.326" E, Leg.: S. Demir–282, Det.: Eker–2012.

Mediterranean Element

Allium decipiens* Fisch. ex Schult. & Schult. f. subsp. *decipiens

A3 Bolu: Southeast of the Lake Abant, around picnic area, meadows, 1340 m., 18.05.2012, 40º 35.980" N – 031º 16.898" E, Leg.: S. Demir–69 & Eker, Det.: Eker–2012; ibid., 13.06.2012, Leg.: S. Demir–148 & Eker, Det.: Eker–2012; ibid., 23.05.2013, Leg.: S.

Demir–625 & Eker, Det.: Eker–2013; A4 Bolu: Kıbrıscık, on the Kıbrıscık – Beypazarı road, turnout of the Alemdar village, open meadows, 1564 m., 19.06.2012, 40º 26.841" N – 032º 01.582" E, Leg.: S. Demir–175 & Eker, Det.: Eker–2012.

Euxine Element

***Allium flavum* L. subsp. *tauricum* (Besser ex Rchb.) K. Richt.**

A3 Bolu: Seben, Karakiriş Mountain, around the Çeltik Deresi, rocky slopes, 611 m., 23.07.2012, 40º 17.996" N – 031º 41.596" E, Leg.: S. Demir–256 & Eker, Det.: Eker–2012; Abant, on the Abant – Taşkesti road, 4 km to Gökören village, rocky slopes, 963 m., 24.07.2012, 40º 35.947" N – 031º 08.847" E, Leg.: S. Demir–274, Det.: Eker–2012.

Mediterranean Element

***Allium fuscum* Waldst. & Kit. (=*Allium paniculatum* L. subsp. *fuscum* (Waldst. & Kit.) Arc.)**

A3 Bolu: Southeast of the Yumrukaya village, dry open slopes, 855 m., 26.07.2013, 40º 42' 548'' N – 031º 30' 027'' E, Leg.: S. Demir–805, Det.: Eker–2013.

East Mediterranean Element

Allium guttatum* Steven subsp. *guttatum

A3 Bolu: on the Bolu – Yedigöller road, 18 km to Yedigöller, rocky slopes, 1057 m., 12.07.2012, 40º 53.031" N – 031º 40.987" E, Leg.: S. Demir–234 & Eker, Det.: Eker–2012; Kartalkaya, on the Sarıalan – Kartalkaya road, 1 km to Kartalkaya, rocky slopes, 1952 m. 23.07.2012, 40º 35.590" N – 031º 48.484" E, Leg.: S. Demir–268 a & Eker, Det.: Eker–2012; Kartalkaya, around the Doruk Hotel, montane steppe, 2150 m., 23.07.2012, 40º 35.467" N – 031º 47.577" E, Leg.: S. Demir–269 & Eker, Det.: Eker–2012.

***Allium guttatum* Steven subsp. *sardoum* (Moris) Stearn**

A3 Bolu: Kartalkaya, on the Sarıalan – Kartalkaya road, 1 km to Kartalkaya, rocky slopes, 1952 m., 23.07.2012, 40º 35' 590'' N – 031º 48' 484'' E, Leg.: S. Demir–268 b & Eker, Det.: Eker–2012.

Mediterranean Element

***Allium guttatum* Steven subsp. *dalmaticum* (A. Kern. ex Janch.) Stearn**

A3 Bolu: Seben, on the Seben – Kızık village, around the Zincirlikuyu district, montane steppe, 1567 m., 19.07.2013, 40º 30.970" N – 031º 34.025" E, Leg.: S. Demir–787 & Eker, Det.: Eker–2013.

East Mediterranean Element

***Allium huber-morathii* Kollmann**

A3 Bolu: Kıbrıscık, on the Kıbrıscık – Beypazarı road, 7 km. to Alemdar village, rocky slopes, 1122 m., 19.06.2012, 40º 24.210" N – 031º 57.512" E, Leg.: S. Demir–176 & Eker, Det.: Eker–2012; Seben, on the Bolu – Seben road, around the Dereceören village, rocky slopes, 1334 m., 19.07.2013, 40º 33.445" N – 031º 37.228" E, Leg.: S. Demir–786 & Eker, Det.: Eker–2013.

lrano-Turanian Element, ***New record for Bolu Province, Endemic***

***Allium olympicum* Boiss.**

A3 Bolu: Kartalkaya, on the Sarıalan – Kartalkaya road, 5 km to Kartalkaya, rocky slopes, 1952 m., 23.07.2012, 40º 37.237" N – 031º 48.622" E, Leg.: S. Demir–267 & Eker, Det.: Eker–2012; Abant, on the Abant – Taşkesti road, 2 km to the Lake Abant, rocky slopes, 1952 m., 23.07.2012, 40º 37.237" N – 031º 48.622" E, S. Leg.: S. Demir–273, Det.: Eker–2013; on the Aladağlar – Bolu road, 18 km to Bolu, rocky slopes, 1601 m., 01.08.2012, 40º 38.017" N – 031º 36.864" E, Leg.: S. Demir–277, Det.: Eker–2013; Seben, Taşlıyayla Pond, around the Nimetli upland, rocky slopes, 1442 m., 19.07.2013, 40º 31.277" N – 031º 39.245" E, Leg.: S. Demir–799 & Eker, Det.: Eker–2013; Kartalkaya, around the Doruk Hotel, montane steppe, 2150 m., 23.07.2012, 40º 35.467" N – 031º 47.577" E, Leg.: S. Demir–271 & Eker, Det.: Eker–2012.

Euxine Element, ***Endemic***

***Allium pallens* L.**

A3 Bolu: Seben, Karakiriş Mountain, around Çalkayası district, rocky slopes, 664 m., 23.07.2012, 40º 18.059'' N – 031º 41.748'' E, Leg.: S. Demir–259 & Eker, Det.: Eker–2012.

Mediterranean Element

Allium paniculatum* L. subsp. *paniculatum

A3 Bolu: Seben, Karakiriş Mountain, around the Ellez waterfall, rocky slopes, 851 m., 12.07.2013, 40º 17.969'' N – 031º 34.378'' E, Leg.: S. Demir–772, Det.: Eker–2013.

Mediterranean Element

***Allium pseudoflavum* Vved.**

A3 Bolu: Kartalkaya, on the Sarıalan – Kartalkaya road, 6 km to Kartalkaya, rocky slopes, 1617 m., 23.07.2012, 40º 37.505'' N – 031º 49.092'' E, Leg.: S. Demir–265 & Eker, Det.: Eker–2012.

Irano – Turanian Element

***Alium rotundum* L. (=*Allium scorodoprasum* L. subsp. *rotundum* (L.) Stearn)**

A3 Bolu: Yedigöller, on the Bolu – Yedigöller road, 10 km to Yedigöller, rocky slopes, 1456 m., 20.06.2012, 40º 55.536'' N – 031º 47.376'' E, Leg.: S. Demir–190 & Eker, Det.: Eker–2012; on the Mengen – Yedigöller road, 7 km to Yedigöller, rocky slopes, 487 m., 20.06.2012, 40º 58.791'' N – 031º 44.305'' E, Leg.: S. Demir–194 & Eker, Det.: Eker–2012; on the Mengen Yedigöller road, 14 km to Yedigöller, rocky slopes, 331 m., 20.06.2012, 41º 00.573'' N – 031º 47.575'' E, Leg.: S. Demir–197 & Eker, Det.: Eker–2012; East of the Lake Abant, around picnic area, open meadows, 1340 m., 12.07.2012, 40º 35.980'' N – 031º 16.898'' E, Leg.: S. Demir–247 & Eker, Det.: Eker–2012; Kartalkaya, on the Sarıalan – Kartalkaya road, 6 km to Kartalkaya, rocky slopes, 1617 m., 23.07.2012, 40º 37.505'' N – 031º 49.092'' E, Leg.: S. Demir–266 & Eker, Det.: Eker–2012; Mudurnu, on the Mudurnu – Vakıfaktaş village road, 6 km to Vakıfaktaş village, rocky slopes, 1360 m., 06.06.2013, 40º 25.363'' N – 031º 14.518'' E, Leg.: S. Demir–663 & Eker, Det.: Eker–2013; Göynük, around the Lake Sünnet, rocky slopes, 1088 m., 06.06.2013, 40º 36.432'' N – 031º 15.861'' E,

Leg.: S. Demir–667 & Eker, Det.: Eker–2013; Göynük, on the Mudurnu – Lake Sünnet road, 2 km to Lake Sünnet, rocky slopes, 900 m., 06.06.2013, 40º 26.816'' N – 030º 57.833'' E, Leg.: S. Demir–668 & Eker, Det.: Eker–2013; Mudurnu, on the Dokurcun – Lake Karamurat road, around the Mehmet Topçuoğlu fountain, rocky slopes, 395 m., 10.06.2013, 40º 34.495'' N – 030º 54.065'' E, Leg.: S. Demir–673 & Eker, Det.: Eker–2013; Mudurnu, around the Lake Karamurat, lake margins, 858 m., 10.06.2013, 40º 33.509'' N – 030º 57.995'' E, Leg.: S. Demir–676 & Eker, Det.: Eker–2013; Northwest of the Lake Abant, around the Abant Palace Hotel, marshes, 1328 m., 20.06.2013, 40º 36.607'' N – 031º 16.548'' E, Leg.: S. Demir–695 & Eker, Det.: Eker–2013; on the Sarıalan – Kartalkaya road, 5 km to Kartalkaya, rocky slopes, 1547 m., 21.06.2013, 40º 37.659'' N – 031º 49.305'' E, Leg.: S. Demir–710, Det.: Eker–2013; Seben, on the Bolu – Seben road, around the Dereceören village, rocky slopes, 1334 m., 19.07.2013, 40º 33.445'' N – 031º 37.228'' E, Leg.: S. Demir–783 & Eker, Det.: Eker–2013; A4 Bolu: Yeniçağa, on the Mengen – Eskiçağa road, 1 km to Eskiçağa, rocky slopes, 961 m., 20.06.2012, 40º 49.444'' N – 032º 02.637'' E, Leg.: S. Demir–201 & Eker, Det.: Eker–2012; Dörtdivan, on the Dörtdivan Sivrigöynük road, around the Sivrigöynük, rocky slopes, 1449 m., 22.06.2012, 40º 34.839'' N – 032º 05.503'' E, Leg.: S. Demir–215 & Eker, Det.: Eker–2012; Gerede, Gökçeler Mountain, between Çayören village and Çayören upland, woodland, 1590 m, 22.06.2012, 40º 49.631'' N – 032º 17.732'' E, Leg.: S. Demir–223 & Eker, Det.: Eker–2012; Gerede, on the Samsun – Gerede road, 17 km to Gerede, around Lake Keçi, rocky slopes, 1200 m., 21.06.2013, 40º 50.082'' N – 032º 26.218'' E, Leg.: S. Demir–723, Det.: Eker–2013.

Mediterranean Element

Allium sphaerocephalon* L. subsp. *sphaerocephalon

A3 Bolu: on the Bolu – Yedigöller road, 18 km to Yedigöller, rocky slopes, 1657 m., 12.07.2012, 40º 53.031'' N – 031º 40.987'' E, Leg.: S. Demir–233 & Eker, Det.: Eker–2012.

Euro – Siberian Element, ***New Record for Bolu Province***

***Allium stamineum* Boiss.**

A3 Bolu: on the Mengen – Yedigöller road, 7 km to Yedigöller, rocky slopes, 487 m., 20.06.2012, 40º 58.791" N – 031º 44.305" E, Leg.: S. Demir–193 & Eker, Det.: Eker–2012; on the Bolu – Yedigöller road, 6 km to Yedigöller, rocky slopes, 1258 m., 12.07.2012, 40º 55.673" N – 031º 44.132" E, Leg.: S. Demir–237 & Eker, Det.: Eker–2012; Mengen, on the Gökçesu – Mengen road, 8 km to Mengen, rocky slopes, 560 m., 05.07.2013, 40º 53.800" N – 031º 59.512" E, Leg.: S. Demir–728 & Eker, Det.: Eker–2013; Yedigöller, on the Bolu – Yedigöller road, around the Anıtçam, rocky slopes, 1215 m., 10.07.2013, 40º 56.015" N – 031º 45.549" E, Leg.: S. Demir–770 & Eker, Det.: Eker–2013.

East Mediterranean Element

***Allium vineale* L.**

A3 Bolu: Northwest of the Lake Abant, around Abant Palace Hotel, meadows, 1334 m., 12.07.2012, 40º 36.542" N – 031º 16.391" E, Leg.: S. Demir–240 & Eker, Det.: Eker–2012.

***Allium wiedemannianum* Regel**

A3 Bolu: Seben, on the Kızık village – Kabak village road, around the pit, rocky slopes, 1424 m., 19.07.2013, 40º 29.189" N – 031º 30.412" E, Leg.: S. Demir–794 & Eker, Det.: Eker–2013.

Irano – Turanian Element

***Galanthus* L.**

Galanthus elwesii* Hook. f. var. *elwesii

A3 Bolu: Aladağlar, on the Bolu – Aladağlar road, around the Demirciler upland, open forests, 1306 m., 07.03.2013, 40º 37.700" N – 031º 41.551" E, Leg.: S. Demir–332 & Eker, Det.: S. Demir–2013; ibid., 19.03.2013, Leg.: S. Demir–348 & Eker, Det.: S. Demir–2013.

East Mediterranean Element

Galanthus plicatus* M. Bieb. subsp. *plicatus

A3 Bolu: Abant, on the Taşkesti – Abant road, 1 km to Lake Abant, woodland, 1356 m., 26.02.2013, 40º 35.319" N – 031º 16.178" E, Leg.: S. Demir–318, Det.: S. Demir–2013; Mudurnu, around Lake Sülüklü, woodland, 1120 m., 26.02.2013, 40º 31' 230'' N – 030º 52' 320'' E, Leg.: S. Demir–323, Det.: S. Demir–2013; on the Bolu – Abant road, around the Çayırbıçkı district, woodland, 922 m., 26.02.2013, 40º 39.344" N – 031º 24.103" E, Leg.: S. Demir–325, Det.: S. Demir–2013; on the Mengen – Yedigöller road, 11 km to Yedigöller, woodland, 140 m., 06.03.2013, 41º 00.620" N – 031º 48.666" E, Leg.: S. Demir–327, Det.: S. Demir–2013; Çal Hill, on the Bolu – Çal Hill road, around the Kadıköy upland, woodland, 1587 m., 28.04.2013, 40º 53.492" N – 031º 45.898" E, Leg.: S. Demir–460 & Eker, Det.: S. Demir–2013; A4 Bolu: Gerede, Gökçeler Mountain, around the Keltepe, woodland, 1588 m., 25.04.2013, 40º 51.414" N – 032º 18.993" E, Leg.: S. Demir–408 & Eker, Det.: S. Demir–2013.

***Leucojum* L.**

Leucojum aestivum* L. subsp. *aestivum

A3 Bolu: Yeniçağa, on the Yeniçağa – Bolu road, turnout of the Hamzabey village, wet meadows, 1056 m., 22.05.2012, 40º 46.263" N – 031º 59.196" E, Leg.: S. Demir–87 & Eker, Det.: S. Demir–2012; Aladağlar, on the Bolu – Aladağlar road, around the Turkish – German forest, wet meadows, 1117 m., 30.04.2013, 40º 39.602" N – 031º 37.500" E, Leg.: S. Demir–511 & Eker, Det.: S. Demir–2013.

Euro – Siberian Element

***Sternbergia* Waldst & Kit**

***Sternbergia colchiciflora* Waldst. & Kit.**

A3 Bolu: West of the Lake Abant, around the Örencik upland, wet meadows, 1553 m., 20.09.2013, 40º 36.563" N – 031º 15.574" E, Leg.: S. Demir–812, Det.: Eker–2013.

ASPARAGACEAE Juss.

***Asparagus* L.**

***Asparagus officinalis* L.**

A3 Bolu: Göynük, on the Mudurnu – Lake Sünnet road, 2 km to Lake Sünnet, rocky slopes, 900 m., 06.06.2013, 40º 26.816" N – 030º 57.833" E, Leg.: S. Demir–668 & Eker, Det.: S. Demir–2013.

***Bellevalia* Lapeyr.**

***Bellevalia clusiana* Griseb.**

A3 Bolu: Seben, on the Seben – Karakiriş Mountain road, around the memorial forest, cultivated fields, 867 m., 07.05.2013, 40º 23.178" N – 031º 32.119" E, Leg.: S. Demir–568 & Eker, Det.: Eker–2013.

Irano-Turanian element, ***New record for Bolu Province*, *Endemic***

***Muscari* Mill.**

***Muscari armeniacum* Leichtlin ex Baker**

A3 Bolu: center of the Campus area, around the Art and Science Faculty, meadows, 875 m., 26.04.2012, 40º 42.800" N – 031º 30.944" E, Leg.: S. Demir–30, Det.: S. Demir–2012; North of the Campus area, meadows, 879 m., 26.04.2012, 40º 42.962" N – 031º 31.051" E, Leg.: S. Demir–31, Det.: S. Demir–2012; ibid., 02.05.2012, Leg.: S. Demir–52, Det.: S. Demir–2012; Abant, on the Lake Abant – Antenna Tower road, 1 km to Lake Abant, woodland, 1437 m., 30.04.2012, 40º 35.502" N – 031º 16.804" E, Leg.: S. Demir–42 & Eker, Det.: S. Demir–2012; Northwest of the Lake Abant, around the Abant Palace Hotel, meadows, 1323 m., 08.05.2012, 40º 36.588" N – 031º 16.524" E, Leg.: S. Demir–60, Det.: S. Demir–2012; Göynük, around the Lake Sünnet, meadows, 1103 m., 18.05.2012, 40º 24.961" N – 030º 57.044" E, Leg.: S. Demir–86 & Eker, Det.: Eker–2012; Yeniçağa, on the Yeniçağa – Bolu road, 3 km to the Hamzabey village, meadows, 1040 m., 22.05.2012, 40º 46.518" N – 031º 59.092" E, Leg.: S. Demir–90 & Eker, Det.: S. Demir–2012; Mudurnu, around Lake Sülüklü, meadows, 1052 m., 01.06.2012, 40º 31 217" N – 030º 52 234" E, Leg.: S. Demir–123 & Eker, Det.: S. Demir–2012; Çal Hill on the Bolu – Çal Hill road,

around the Avşar upland, meadows, 1877 m., 20.06.2012, 40º 53.611" N – 031º 46.633" E, Leg.: S. Demir–183 & Eker, Det.: S. Demir–2012; Çele Hill, on the Bolu – Yedigöller road, around the Çele Hill, meadows, 1957 m., 20.06.2012, 40º 51.982" N – 031º 42.239" E, Leg.: S. Demir–186 & Eker, Det.: S. Demir–2012; Mudurnu, on the Abant – Taşkesti road, 1 km to Taşkesti, meadows, 680 m., 24.04.2013, 40º 34.361" N – 031º 04.213" E, Leg.: S. Demir–400, Det.: S. Demir–2013; Yedigöller, on the Bolu – Yedigöller road, 6 km to Yedigöller, meadows, 1293 m., 28.04.2013, 40º 35.707" N – 031º 44.003" E, Leg.: S. Demir–485 & Eker, Det.: S. Demir–2013; Aladağlar, on the Bolu – Aladağlar road, around the Turkish – German forest, wet meadows, 1117 m., 22.05.2012, 40º 39.602" N – 031º 37.500" E, Leg.: S. Demir–513 & Eker, Det.: S. Demir–2013; Northeast of the Abant, around the picnic area, woodland, 1330 m., 01.05.2013, 40º 36.389" N – 031º 17.269" E, Leg.: S. Demir–532 & Eker, Det.: S. Demir–2013; South of the At upland, around the picnic area, meadows, 1095 m., 01.05.2013, 40º 45.612" N – 031º 29.833" E, Leg.: S. Demir–544 & Eker, Det.: S. Demir–2013; Seben, on the Bolu – Seben road, around the Dereceören village, rocky slopes, 1334 m., 19.07.2013, 40º 33.445" N – 031º 37.228" E, Leg.: S. Demir–779 & Eker, Det.: S. Demir–2013; A4 Bolu: on the Gerede – Kızılcahamam road, around the Ovacık village, open forests, 1576 m., 22.05.2012, 40º 37.172" N – 032º 23.318" E, Leg.: S. Demir–101 & Eker, Det.: S. Demir–2012.

***Muscari aucheri* (Boiss.) Baker**

A3 Bolu: Northwest of the Lake Abant, around the Abant Palace Hotel, meadows, 1341 m., 17.04.2012, 40º 36.567" N – 031º 16.442" E, Leg.: S. Demir–15, Det.: S. Demir–2012; Northwest of the Lake Abant, around the Abant Palace Hotel, meadows, 1328 m., 30.04.2012, 40º 36.607" N – 031º 16.548" E, Leg.: S. Demir–38 & Eker, Det.: S. Demir–2012; ibid., 18.05.2012, Leg.: S. Demir–68 & Eker, Det.: S. Demir–2012; ibid., 31.03.2013, Leg.: S. Demir–368, Det.: S. Demir–2013; Abant, on the Mudurnu Abant road, 2 km to Lake Abant, meadows, 1437 m., 30.04.2012, 40º 35.502" N – 031º 16.804" E, Leg.: S. Demir–44 & Eker, Det.: S. Demir–2012; Northwest of the Lake Abant, around the Abant Palace Hotel, meadows, 1323 m., 08.05.2012, 40º 36.588" N – 031º 16.524" E, Leg.: S. Demir–61, Det.: S. Demir–2012; Mudurnu, on the Bolu – Mudurnu road, around the

Gürçam village, woodland, 1316 m., 18.05.2012, 40º 25.996" N – 031º 19.275" E, Leg.: S. Demir–81 & Eker, Det.: S. Demir–2012; Yeniçağa, on the Yeniçağa – Bolu road, turnout of the Hamzabey village, wet meadows, 1056 m., 22.05.2012, 40º 46.263" N – 031º 59.196" E, Leg.: S. Demir–88 & Eker, Det.: S. Demir–2012; ibid., 25.04.2013, Leg.: S. Demir–403 & Eker, Det.: S. Demir–2013; Kartalkaya, alpine meadows, 2038 m., 22.05.2012, 40º 35.126" N – 031º 48.456" E, Leg.: S. Demir–109 & Eker, Det.: S. Demir–2012; Aladağlar, around Karacasu upland, open turf in Pinus forest, 1385 m., 16.04.2013, 40º 36.435" N – 031º 37.598" E, Leg.: S. Demir–386 & Eker, Det.: S. Demir–2013; A4 Bolu: on the Gerede – Kızılcahamam road, around the Ovacık village, open forests, 1576 m., 22.05.2012, 40º 37.172" N – 032º 23.318" E, Leg.: S. Demir–103 & Eker, Det.: S. Demir–2012; Gerede, Esentepe, around the Rumşah upland, marshes, 1695 m., 25.04.2013, 40º 49.926" N – 032º 11.814" E, Leg.: S. Demir–423 & Eker, Det.: S. Demir–2013; Gerede, Gökçeler Mountain, around the Esentepe, meadows, 1685 m., 25.04.2013, 40º 49.490" N – 032º 11.627" E, Leg.: S. Demir–434 & Eker, Det.: S.Demir–2013.

Endemic

***Muscari bourgaei* Baker**

A3 Bolu: Northwest of the Lake Abant, around the Abant Palace Hotel, meadows, 1328 m., 30.04.2012, 40º 36.607" N – 031º 16.548" E, Leg.: S. Demir–36 & Eker, Det.: S.Demir–2012; Lake Abant, around the Antenna Tower, alpine steppe, 1756 m., 18.05.2012, 40º 36.185" N – 031º 19.326" E, Leg.: S. Demir–74 & Eker, Det.: S.Demir–2012; Çal Hill, on the Bolu – Çal Hill road, around the Avşar upland, meadows, 1877 m., 20.06.2012, 40º 53.611" N – 031º 46.633" E, Leg.: S. Demir–181 & Eker, Det.: S.Demir–2012; Çal Hill, on the Bolu – Çal Hill road, around the Avşar upland, meadows, 1877 m., 20.06.2012, 40º 53.611" N – 031º 46.633" E, Leg.: S.Demir–294 & Eker, Det.: S.Demir–2012; Çal Hill, on the Çal Hill – Tetemeçele village road, 5 km to the Tetemeçele village, meadows, 1636 m, 28.04.2013, 40º 52.280" N – 031º 44.071" E, Leg.: S. Demir–453 & Eker, Det.: S.Demir–2013; Lake Abant, around the Antenna Tower, alpine steppe, 1756 m., 01.05.2013, 40º 36.185" N – 031º 19.326" E, Leg.: S. Demir–539 & Eker, Det.: S.Demir–2013.

Mediterranean Element, ***New record for A3 square***, ***Endemic***

***Muscari comosum* (L.) Mill.**

A3 Bolu: Mudurnu, on the Abant – Mudurnu road, around the Çepni village, cultivated fields, 954 m., 01.06.2012, 40º 34.029" N – 031º 15.244" E, Leg.: S. Demir–121 & Eker, Det.: S.Demir–2012; on the Abant – Taşkesti road, around the Dedeğen village, cultivated fields, 1008 m., 13.06.2012, 40º 37.344" N – 031º 08.844" E, Leg.: S. Demir–160 & Eker, Det.: S.Demir–2012; on the Mudurnu – Göynük road, around the Dere village, rocky slopes, 963 m., 06.06.2013, 40º 20.579" N – 030º 58.527" E, Leg.: S. Demir–665 & Eker, Det.: S.Demir–2013; Seben, on the Bolu – Seben road, around the Dereceören village, rocky slopes, 1334 m., 19.07.2013, 40º 33.445" N – 031º 37.228" E, Leg.: S. Demir–780 & Eker, Det.: S.Demir–2013.

Mediterranean Element

***Muscari neglectum* Guss. ex Ten.**

A3 Bolu: North of the Gölköy, meadows, 849 m., 29.03.2013, 40º 42.794" N – 031º 31.279" E, Leg.: S. Demir–363, Det.: S.Demir–2013; Mudurnu, Lake Karamurat, on the Dokurcun – Lake Karamurat road, around the Mehmet Topçuoğlu fountain, woodland, 395 m., 05.04.2013, 40º 34.495" N – 030º 54.065" E, Leg.: S. Demir–376, Det.: S.Demir–2013; Göynük, North of the Lake Çubuk, meadows, 1033 m., 05.04.2013, 40º 28.965" N – 030º 50.193" E, Leg.: S. Demir–381, Det.: S.Demir–2013.

***Polygonatum* Mill.**

***Polygonatum multiflorum* (L.) All.**

A3 Bolu: Mudurnu, on the Mudurnu – Lake Sülüklü road, 1 km to Lake Sülüklü, woodland, 1014 m., 01.06.2012, 40º 31.385" N – 030º 52.629" E, Leg.: S. Demir–125 & Eker, Det.: Eker–2012.

***Polygonatum orientale* Desf.**

A3 Bolu: West of the Tomb of Tokad-i Hayrettin Hz., woodland, 952 m., 18.05.2012, 40º 43.890" N – 031º 28.159" E, Leg.: S. Demir–64 & Eker, Det.: S.Demir–2012; Yedigöller, on the Mengen – Yedigöller road, 10 km to Yedigöller, rocky slopes, 415 m., 20.06.2012, 40º

59.623'' N – 031º 45.579'' E, Leg.: S. Demir–196 & Eker, Det.: S.Demir–2012; Yedigöller, on the Mengen – Yedigöller road, 7 km to Yedigöller, woodland, 486 m., 28.04.2013, 40º 59.083'' N – 031º 44.587'' E, Leg.: S. Demir–501 & Eker, Det.: S.Demir–2013.

Euxine Element

***Prospero* Salisb.**

***Prospero autumnale* (L.) Speta (=*Scilla autumnalis* L.)**

A3 Bolu: on the Bolu – Çal Hill road, around the Mesciçele village, open forests, 1156 m., 26.07.2013, 40º 50.514'' N – 031º 42.879'' E, Leg.: S. Demir–803, Det.: S.Demir–2013; Southeast of the Yumrukaya village, dry open slopes, 855 m., 26.07.2013, 40º 42' 548'' N – 031º 30' 027'' E, Leg.: S. Demir–804, Det.: S.Demir–2013.

Mediterranean Element

***Scilla* L.**

***Scilla bifolia* L.**

A3 Bolu: Southeast of the Yumrukaya village, dry open slopes, 782 m., 03.04.2012, 40º 42' 587'' N – 031º 30' 001'' E, Leg.: S. Demir–1, Det.: S.Demir–2012; West of the Gölköy, lake margin, 814 m., 05.04.2012, 40º 42.464'' N – 031º 31.132'' E, Leg.: S. Demir–8, Det.: S.Demir–2012; Southeast of the Yumrukaya village, dry open slopes, 847 m., 12.04.2012, 40º 42' 863'' N – 031º 30' 612'' E, Leg.: S. Demir–9, Det.: S.Demir–2012; Northwest of the Lake Abant, around the Abant Palace Hotel, meadows, 1341 m., 17.04.2012, 40º 36.567'' N – 031º 16.442'' E, Leg.: S. Demir–14, Det.: S.Demir–2012; Southwest of the Lake Abant, around the walk way, meadows, 1350 m., 20.04.2012, 40º 36.160'' N – 031º 16.190'' E, Leg.: S. Demir–23, Det.: S.Demir–2012; Northwest of the Lake Abant, around the Abant Palace Hotel, meadows, 1323 m., 08.05.2012, 40º 36.588'' N – 031º 16.524'' E, Leg.: S. Demir–63, Det.: S.Demir–2012; Lake Abant, around the Antenna Tower, alpine steppe, 1756 m., 18.05.2012, 40º 36.185'' N – 031º 19.326'' E, Leg.: S. Demir–72 & Eker, Det.: S.Demir–2012; Kartalkaya, alpine meadows, 2038 m., 22.05.2012, 40º 35.126'' N – 031º 48.456'' E, Leg.: S. Demir–105 & Eker, Det.: S.Demir–2012; ibid., 22.06.2012, Leg.: S. Demir–209 & Eker, Det.: S.Demir–2012; on the Bolu – Abant road, around the Çayırbıçkı

district, woodland, 922 m., 26.02.2013, 40º 39.344" N – 031º 24.103" E, Leg.: S. Demir–326, Det.: S. Demir–2013; on the Bolu – Aladağlar road, around the Demirciler upland, open forests, 1306 m., 07.03.2013, 40º 37.700" N – 031º 41.551" E, Leg.: S. Demir–334 & Eker, Det.: S. Demir–2013; ibid., 19.03.2013, , Leg.: S. Demir–349 & Eker, Det.: S. Demir–2013; Seben, Karakiriş Mountain, on the Çayırhan – Nallıgölcük road, 3 km to Nallıgölcük, stony steppe, 1276 m., 25.03.2013, 40º 16.407" N – 031º 33.468" E, Leg.: S. Demir–362, Det.: S.Demir–2013; Çele Hill, on the Bolu – Yedigöller road, around the Çele Hill, rocky slopes, 1720 m., 28.04.2013, 40º 52.175" N – 031º 43.492" E, Leg.: S. Demir–473 & Eker, Det.: S.Demir–2013; A4 Bolu: Gerede, on the Kızılcahamam – Gerede road , 30 km to Gerede, meadows, 1458 m., 14.03.2013, 40º 38.096" N – 032º 25.875" E, Leg.: S. Demir–343, Det.: S.Demir–2013; Gerede, on the Kızılcahamam – Gerede road , 2 km to Havullu village, meadows, 1458 m., 14.03.2013, 40º 38.096" N – 032º 25.875" E, Leg.: S. Demir–346, Det.: S.Demir–2013; Gerede, Gökçeler Mountain, around the Esentepe, meadows, 1685 m., 16.04.2013, 40º 49.490" N – 032º 11.627" E, Leg.: S. Demir–430 & Eker, Det.: S.Demir–2013.

Mediterranean Element

***Ruscus* L.**

***Ruscus* hypoglossum L.**

A3 Bolu: West of the Tomb of Tokad-i Hayrettin Hz., woodland, 938 m., 13.06.2012, 40º 43.822" N – 031º 28.132" E, Leg.: S.Demir–135, Det.: S.Demir–2012; ibid., 24.07.2012, Leg.: S. Demir–272, Det.: S.Demir–2012; ibid., 31.03.2013, Leg.: S. Demir–367, Det.: S.Demir–2013; on the Bolu – Abant road, 18 km to Abant, woodland, 1156 m., 19.07.2013, 40º 41.055" N – 031º 24.087" E, Leg.: S. Demir–778 & Eker, Det.: S.Demir–2013.

Euro – Siberian Element

***Ornithogalum* L.**

***Ornithogalum armeniacum* Baker**

A3 Bolu: Kıbrıscık, on the Kıbrıscık – Beypazarı road, 8 km to Alemdar village, rocky steppe, 1188 m., 30.04.2013, 40º 24.237" N – 031º 59.274" E, Leg.: S. Demir–504 & Eker, Det.: Eker–2013.

East Mediterranean Element

***Ornithogalum comosum* L.**

A3 Bolu: Seben, Karakiriş Mountain, around Menga district, rocky slopes, 840 m., 07.05.2013, 40º 18.610" N – 031º 35.097" E, Leg.: S. Demir–574 & Eker, Det.: Eker–2013; Seben, Karakiriş Mountain, 2 km to Ellez waterfall, rocky slopes, 851 m., 07.05.2013, 40º 17.969" N – 031º 34.378" E, Leg.: S. Demir–579 & Eker, Det.: Eker–2013.

Ornithogalum fimbriatum* Willd. *subsp. fimbriatum

A3 Bolu: North of the Gölköy, steppe, 810 m., 05.04.2012, 40º 42.477" N – 031º 31.129" E, Leg.: S. Demir–5, Det.: Eker–2012; ibid., 29.03.2013, Leg.: S. Demir–365, Det.: Eker–2013; West of the Gölköy, lake margin, 782 m., 05.04.2012, 40º 42.197" N – 031º 31.113" E, Leg.: S. Demir–6, Det.: Eker–2012; North of the Campus area, meadows, 879 m., 26.04.2012, 40º 42.962" N – 031º 31.051" E, Leg.: S. Demir–32, Det.: Eker–2012; Mudurnu on the Dokurcun – Alaçam village road, 1 km to Alaçam village, meadows, 745 m., 26.02.2013, 40º 34.122" N – 030º 57.945" E, Leg.: S. Demir–322, Det.: Eker–2013; Yedigöller, on the Bolu – Yedigöller road, 10 km to Yedigöller, meadows, 1428 m., 06.03.2013, 40º 55.525" N – 031º 42.383" E, Leg.: S. Demir–330, Det.: Eker–2013; North of the Gölköy, meadows, 849 m., 29.03.2013, 40º 42.794" N – 031º 31.279" E, Leg.: S. Demir–364, Det.: Eker–2013; Aladağlar, around Karacasu upland, open turf in Pinus forest, 1385 m., 16.04.2013, 40º 36.435" N – 031º 37.598" E, Leg.: S. Demir–387 & Eker, Det.: Eker–2013; Kıbrıscık, on the Bolu – Kıbrıscık road, 20 km to Kıbrıscık, rocky steppe, 1386 m., 30.04.2013, 40º 28.540" N – 031º 42.736" E, Leg.: S. Demir–507 & Eker, Det.: Eker–2013.

East Mediterranean Element

***Ornithogalum nallihanense* Yıld. & Doğru-Koca**

A3 Bolu: Göynük, west of the Lake Sünnet, rocky slopes, 1088 m., 31.03.2013, 40º 36.432" N – 031º 15.861" E, Leg.: S. Demir–374, Det.: Eker–2013; Göynük, on the Nallıhan – Göynük road , 1 km to Göynük, open shrubs, 794 m., 24.04.2013, 40º 24.010" N – 030º 47.436" E, Leg.: S. Demir–398, Det.: Eker–2013; Seben, Karakiriş Mountain, rocky slopes, 780 m., 07.05.2013, 40º 18.912" N – 031º 33.387" E, Leg.: S. Demir–572 & Eker, Det.: Eker–2013.

New record for Bolu province, Endemic

***Ornithogalum narbonense* L.**

A3 Bolu: Campus area, right side of the entrance, rocky slopes, 856 m., 03.06.2012, 40º 42.576" N – 031º 31.122" E, Leg.: S. Demir–132, Det.: Eker–2012; on the Bolu – Abant road, 19 km to Abant, woodland, 822 m., 13.06.2012, 40º 42.038" N – 031º 27.213" E, Leg.: S.Demir–142 & Eker, Det.: Eker–2012; ibid., 23.05.2013, Leg.: S. Demir–657 & Eker, Det.: Eker–2013; Abant, on the Abant – Taşkesti road, 3 km to Gökören village, meadows, 980 m., 13.06.2012**,** 40º 36.210" N – 031º 09.018" E, Leg.: S. Demir–159 & Eker, Det.: Eker–2012; North of the Gölköy, steppe, 814 m., 21.06.2012, 40º 42.464" N – 031º 31.132" E, Leg.: S. Demir–204, Det.: Eker–2012; Yeniçağa, on the Yeniçağa – Bolu road, 3 km to the Hamzabey village, meadows, 974 m., 18.06.2013, 40º 46.173" N – 031º 59.390" E, Leg.: S. Demir–692, Det.: Eker–2013.

Mediterranean Element

***Ornithogalum neurostegium* Boiss. & Blanche subsp. *neurostegium* (=*Ornithogalum ulophyllum* Hand.-Mazz.)**

A3 Bolu: Mudurnu, on the Mudurnu – Vakıfaktaş village road, 6 km to Vakıfaktaş village, rocky slopes, 1360 m., 06.06.2013, 40º 25.363" N – 031º 14.518" E, Leg.: S. Demir–662 & Eker, Det.: Eker–2013.

New record for A3 square

***Ornithogalum oligophyllum* E. D. Clarke**

A3 Bolu: Northwest of the Lake Abant, around Abant Palace Hotel, marshes, 1328 m., 30.04.2012, 40º 36.607" N – 031º 16.548" E, Leg.: S. Demir–41 & Eker, Det.: Eker–2012; Northwest of the Lake Abant, around the Abant Palace Hotel, meadows, 1323 m., 08.05.2012, 40º 36.588" N – 031º 16.524" E, Leg.: S. Demir–62, Det.: S.Demir–2012; Lake Abant, around the antenna tower, alpine steppe, 1756 m., 18.05.2012, 40º 36.185" N – 031º 19.326" E, Leg.: S. Demir–76 & Eker, Det.: S.Demir–2012; ibid., 06.06.2013, Leg.: S. Demir–661 & Eker, Det.: Eker–2013; Kartalkaya, alpine meadows, 2038 m., 22.05.2012, 40º 35.126" N – 031º 48.456" E, Leg.: S. Demir–111 & Eker, Det.: Eker–2012; ibid., 22.06.2012, Leg.: S. Demir–206 & Eker, Det.: Eker–2012; ibid., 21.06.2013, Leg.: S. Demir–711, Det.: Eker–2013; Yedigöller, on the Bolu – Yedigöller road, 10 km to Yedigöller, meadows, 1453 m., 28.04.2013, 40º 55.519" N – 031º 42.285" E, Leg.: S. Demir–482 & Eker, Det.: Eker–2013; Aladağlar, on the Bolu – Aladağlar road, around the Turkish – German forest, wet meadows, 1117 m., 30.04.2013, 40º 39.602" N – 031º 37.500" E, Leg.: S. Demir– 518 & Eker, Det.: Eker–2013; Gölcük, on the Bolu – Gölcük road, 3 km to Gölcük, woodland, 923 m., 07.05.2013, 40º 40.496" N – 031º 38.185" E, Leg.: S. Demir–559 & Eker, Det.: Eker–2013; Seben, on the Seben – Bolu road, 33 km to Bolu, woodland, 1479 m., 07.05.2013, 40º 30.197" N – 031º 36.530" E, Leg.: S. Demir–566 & Eker, Det.: Eker–2013.

***Ornithogalum pyrenaicum* L.**

A3 Bolu: Göynük, between the Sünnet village – Lake Sünnet road, 1 km to Lake Sünnet, rocky slopes, 1071 m., 06.06.2013, 40º 24.496" N – 031º 57.217" E, Leg.: S. Demir–666 & Eker, Det.: Eker–2013; ibid., 10.06.2013, Leg.: S. Demir–680 & Eker, Det.: Eker–2013.

***Ornithogalum sigmoideum* Freyn & Sint.**

A3 Bolu: Northwest of the Lake Abant, around Abant Palace Hotel, marshes, 1279 m., 30.04.2012, 40º 36.686" N – 031º 16.628" E, Leg.: S. Demir–33 & Eker, Det.: Eker–2012; Northwest of the Lake Abant, around Abant Palace Hotel, marshes, 1328 m., 30.04.2012, 40º 36.607" N – 031º 16.548" E, Leg.: S. Demir–35 & Eker, Det.: Eker–2012; Abant, on the

Mudurnu – Abant road, 2 km to Lake Abant, meadows, 1437 m., 30.04.2012, 40º 35.502" N – 031º 16.804" E, Leg.: S. Demir–43 & Eker, Det.: Eker–2012; Lake Abant, around the antenna tower, alpine steppe, 1756 m., 18.05.2012, 40º 36.185" N – 031º 19.326" E, Leg.: S. Demir–73 & Eker, Det.: S.Demir–2012; Mudurnu, around Lake Sülüklü, woodland, 1120 m., 05.04.2013, 40º 31' 230'' N – 030º 52' 320'' E, Leg.: S. Demir–375, Det.: Eker–2013; Göynük, North of the Lake Çubuk, meadows, 1033 m., 05.04.2013, 40º 28.965" N – 030º 50.193" E, Leg.: S. Demir–382, Det.: S.Demir–2013; Regional Directorate of forestry in Bolu, meadows, 742 m., 14.04.2013, 40º 44.017" N – 031º 36.123" E, Leg.: S. Demir–383, Det.: Eker–2013; Mudurnu, east of the Lake Karamurat, rocky slopes, 858 m., 05.04.2013, 40º 33.509" N – 030º 57.995" E, Leg.: S. Demir–379, Det.: Eker–2013; Lake Abant, around the antenna tower, alpine steppe, 1756 m., 06.06.2013, 40º 36.185" N – 031º 19.326" E, Leg.: S. Demir–660 & Eker, Det.: S.Demir–2013; A4 Bolu: on the Gerede – Kızılcahamam road, around the Ovacık village, open forests, 1576 m., 22.05.2012, 40º 37.172" N – 032º 23.318" E, Leg.: S. Demir–102 & Eker, Det.: Eker–2012.

Euro – Siberian Element

***Ornithogalum uluense* Speta**

A3 Bolu: Mudurnu, Lake Karamurat, on the Lake Karamurat – Karamurat village, 1 km to Karamurat village, woodland, 858 m., 05.04.2013, 40º 33.509" N – 030º 57.995" E, Leg.: S. Demir–379, Det.: Eker–2013.

Endemic

***Ornithogalum umbellatum* L.**

A3 Bolu: Kıbrıscık, on the Bolu – Kıbrıscık road, 21 km to Kıbrıscık, meadows, 1371 m., 19.06.2012, 40º 28.569" N – 031º 43.004" E, Leg.: S. Demir–169 & Eker, Det.: Eker–2012; A4 Bolu: Dörtdivan, on the Dörtdivan – Sivrigöynük Hill road, around the Sivrigöynük Hill, woodland, 1673 m., 22.06.2012, 40º 34.844" N – 032º 03.456" E, Leg.: S. Demir–212 & Eker, Det.: Eker–2012; Dörtdivan, on the Dörtdivan – Sivrigöynük Hill road, around the Sivrigöynük Hill, woodland, 1467 m., 22.06.2012, 40º 34.488" N – 032º 04.227" E, Leg.: S. Demir–214 & Eker, Det.: Eker–2012; Dörtdivan, on the Dörtdivan – Sivrigöynük Hill road,

around the Sivrigöynük Hill, woodland, 1449 m., 22.06.2012, 40º 34.839'' N – 032º 05.503'' E,Leg.: S. Demir–216 & Eker, Det.: Eker–2012.

4.2. Results and observations

As a result of this study, 818 plant specimens were collected between 2012 and 2013 vegetation seasons. After the identification processes, 116 taxa belonging to 10 families and 40 genera were determined. According to the phytogeographical regions, the distribution of the taxa were as follows: the Mediterrannean elements 30.17% (35 taxa), the euxine and/or Euro-Siberian elements 24.14% (28 taxa), and the Irano-Turanian elements 7.76% (9 taxa) respectively. The phytogeographic region of remain 37.93% (44 taxa) of the identified taxa were unknown and/or widespread (Figure 8).

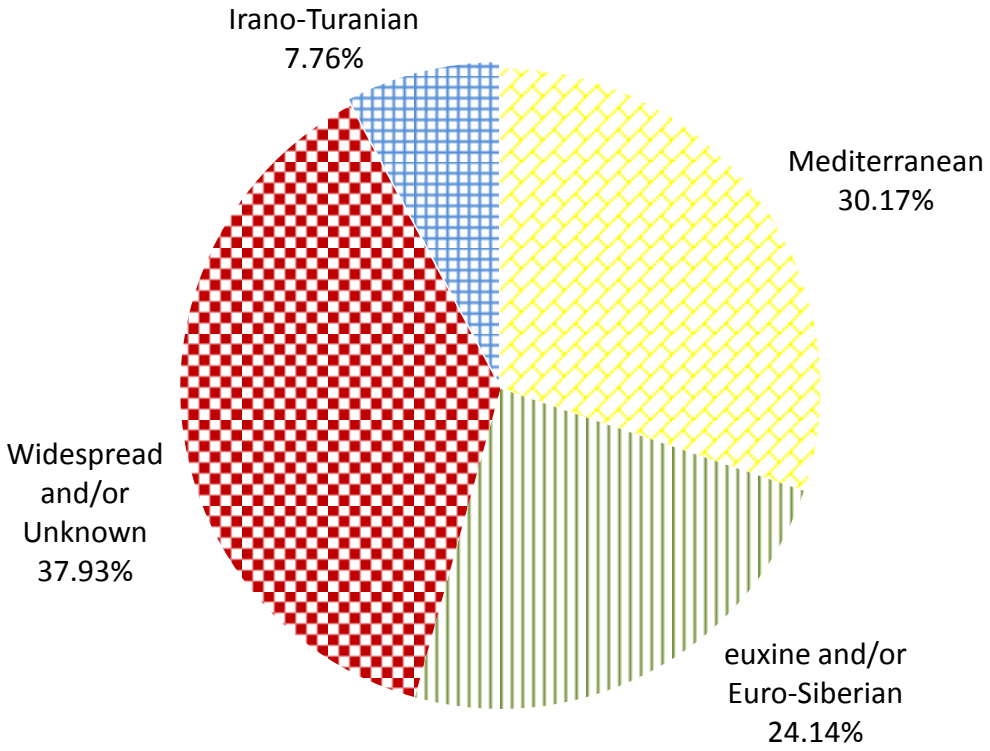

Figure 8: Distribution of phytogeographic elements

According to APG III system (2009), The most common five families according to their the number of taxa in the area were as follows: Orchidaceae 31.03% (36 taxa), Asparagaceae 19.83% (23 taxa), Amaryllidaceae 18.10% (21 taxa), Iridaceae 12.07% (14 taxa), Liliaceae s.s. 8.62 (10 taxa). The rate of taxa belonging to the other families were 10.34% (12 taxa) (Figure 9). However, if the families were arranged according to "*Flora of Turkey* (Davis;1984)", Liliaceae s.l. was the most common family by 50.00% (58 taxa). In this case, the other families were aligned as Orchidaceae 31.03% (36 taxa), Iridaceae 12.07% (14 taxa), Amaryllidaceae 3.45% (4 taxa) respectively, and in this account Asparagaceae was embedded in Liliaceae (Figure 10).

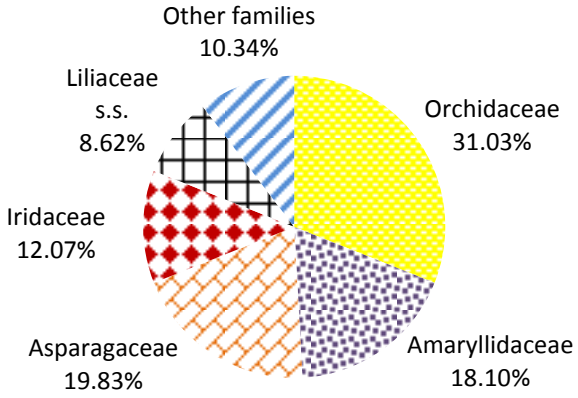

Figure 9: Distribution of the most common families according to APG III system

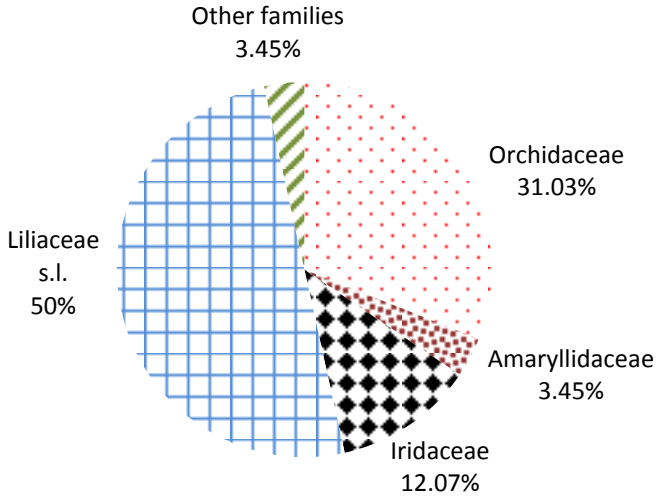

Figure 10: Distribution of the most common families according to the "Flora of Turkey"

In terms of species number, the major genera in the region were as follows: The most common three genera were *Allium* 14.66% (17 taxa), *Ornithogalum* 9.48 (11 taxa), *Iris* 6.03% (7 taxa) respectively. The followig four genera *Epipactis, Gagea*, *Colchicum*, and *Crocus* had the same number of taxa (6) with a rate of 5.17%. The rate of the other genera were 43.97% (57 taxa) Distributions of the most common genera are shown in Figure 11.

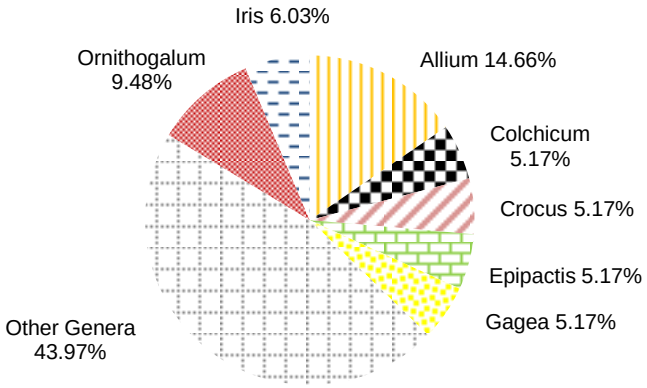

Figure 11: Distribution of the most common genera

Of all the collected taxa, distribution of the stem metamorphosis were as follows. 43.10% (50 taxa) were bulbous, 24.14% (28 taxa) were rhizomous, 21.56% (25 taxa) were tuberous, 11.21% (13 taxa) were cormous, and The distribution of stem metamorphosis of taxa are shown in Figure 12 and Table 3.

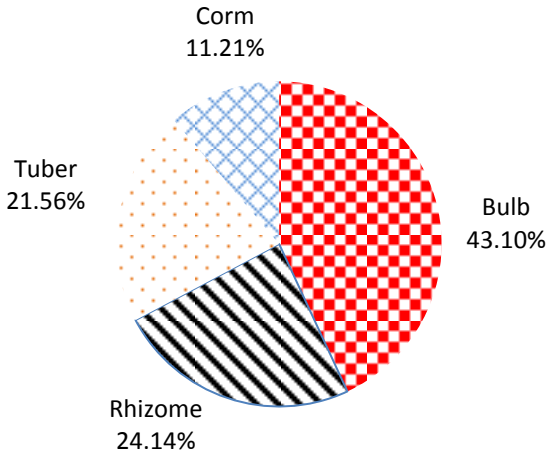

Figure 12: Distribution of stem metamorphosis

Regarding flowering time, 94.83% (110 taxa) of the identified taxa bloomed in early-spring and spring, while 5.17% (6 taxa) of the identified taxa bloomed in autumn. Distribution of the first flowering times of taxa are shown in Figure 13 and Table 3.

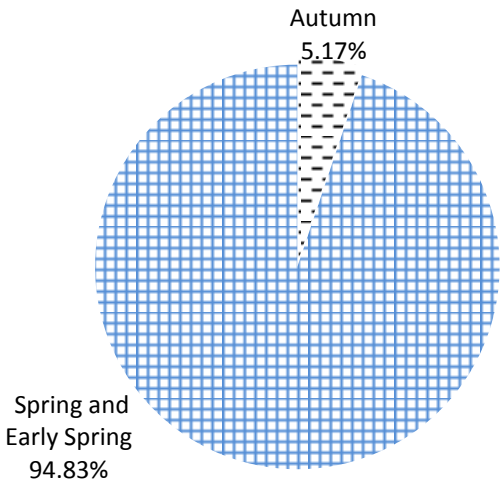

Figure 13: Distribution of flowering times

Table 3: Types of stem metamorphosis of plant samples and flowering times of taxa in the research area

Plant name	Stem metamorphosis				Flowering times (months)											
	Bulb	Corm	Tuber	Rhizom	J	F	M	A	M	J	J	A	S	N	O	D
Acorus calamus				+						+	+					
Arum euxinum			+					+	+	+						
Arum maculatum			+						+							
Butomus umbellatus				+							+	+				
Colchicum bivonae		+											+	+		
Colchicum boissieri		+											+	+		
Colchicum speciosum		+											+	+		
Colchicum szovitsii subsp. *szovitsii*		+					+	+	+							
Colchicum triphyllum		+				+	+									
Colchicum umbrosum		+										+	+			
Fritillaria pinardii subsp. *pinardii*	+							+	+							
Fritillaria pontica	+							+	+	+						
Gagea bithynica	+							+	+							
Gagea bohemica	+						+	+	+							
Gagea fistulosa	+						+	+	+							
Gagea foliosa	+						+	+	+							
Gagea granatellii	+						+	+	+							
Gagea villosa var. *villosa*	+						+	+								
Lilium martagon var. *martagon*	+										+					
Tulipa sylvestris subsp. *australis*	+							+	+							
Anacamptis coriophora			+						+	+						
Anacamptis laxiflora			+						+	+						
Anacamptis morio subsp. *morio*			+						+							
Anacamptis palustris			+						+							
Anacamptis pyramidalis.			+							+	+					
Cephalanthera damasonium				+					+	+						
Cephalanthera epipactoides				+					+							
Cephalanthera longifolia				+				+	+							
Cephalanthera rubra				+						+	+					
Dactylorhiza iberica			+							+	+					
Dactylorhiza incarnata subsp. *incarnata*			+							+	+					
Dactylorhiza nieschalkiorum			+							+	+					
Dactylorhiza romana subsp. romana			+					+	+							
Dactylorhiza saccifera subsp. *saccifera*			+							+	+					
Coeloglossum viride			+							+						
Epipactis helleborine subsp. *helleborine*				+							+					
Epipactis microphylla				+						+	+					
Epipactis palustris				+							+					
Epipactis persica				+						+	+					
Epipactis pontica				+							+	+				
Epipactis turcica				+						+	+					
Epipogium aphyllum				+							+					

Table 3: Types of stem metamorphosis of plant samples and flowering times of taxa in the research area (continued)

Himantoglossum caprinum			+						+	+					
Himantoglossum comperianum			+						+						
Limodorum abortivum var. *abortivum*				+					+						
Neotinea tridentata subsp. *tridentata*			+						+						
Neottia nidus-avis				+					+	+					
Ophrys apifera			+						+	+					
Ophrys sphegodes subsp. *mammosa*			+						+						
Orchis mascula subsp. *mascula*			+					+	+						
Orchis purpurea subsp. *purpurea*			+						+						
Orchis pallens			+					+	+						
Orchis simia subsp. *simia*			+						+						
Platanthera chlorantha			+						+	+					
Spiranthes spiralis			+									+			
Steveniella satyrioides			+						+						
Crocus abantensis		+				+	+	+	+						
Crocus ancyrensis		+				+	+	+	+						
Crocus biflorus subsp. *pulchricolor*		+					+	+	+						
Crocus olivieri subsp. *olivieri*		+				+	+	+							
Crocus × paulineae		+					+								
Crocus speciosus subsp. *speciosus*		+										+	+		
Gladiolus italicus		+							+	+					
Iris × germanica				+						+					
Iris kerneriana				+											
Iris pseudacorus				+					+	+					
Iris pumila subsp. *attica*				+				+							
Iris purpureobractea				+					+	+					
Iris schachtii				+											
Iris sintenisii subsp. *sintenisii*				+					+	+					
Asphodeline lutea				+				+	+						
Eremurus spectabilis				+				+	+						
Allium hirtovaginatum	+										+				
Allium decipiens subsp. *decipiens*	+								+	+					
Allium flavum subsp. *tauricum*	+									+					
Allium fuscum	+									+	+				
Allium guttatum subsp. *guttatum*	+									+					
Allium guttatum subsp. *sardoum*	+									+					
Allium guttatum subsp. *dalmaticum*	+									+					
Allium huber-morathii	+								+	+					
Allium olympicum	+									+	+				
Allium pallens	+									+					
Allium paniculatum subsp. *paniculatum*	+									+					

Table 3: Types of stem metamorphosis of plant samples and flowering times of taxa in the research area (continued)

Allium pseudoflavum	+										+					
Alium rotundum	+									+	+					
Allium sphaerocephalon subsp. *sphaerocephalon*	+										+					
Allium stamineum	+									+	+					
Allium vineale	+										+					
Allium wiedemannianum	+										+					
Galanthus elwesii var. *elwesii*	+						+									
Galanthus plicatus subsp. *plicatus*	+					+	+	+								
Leucojum aestivum subsp. *aestivum*	+							+	+							
Sternbergia colchiciflora	+												+			
Asparagus officinalis				+						+						
Bellevalia clusiana	+								+							
Muscari armeniacum	+							+	+	+						
Muscari aucheri	+						+	+	+							
Muscari bourgaei	+							+	+	+						
Muscari comosum	+									+	+					
Muscari neglectum	+						+	+								
Polygonatum multiflorum				+						+						
Polygonatum orientale				+				+	+	+						
Prospero autumnale	+										+	+				
Scilla bifolia	+					+	+	+	+	+						
Ruscus hypoglossum				+			+									
Ornithogalum armeniacum	+						+	+								
Ornithogalum comosum	+								+							
Ornithogalum fimbriatum subsp. fimbriatum	+					+	+	+								
Ornithogalum nallihanense	+								+							
Ornithogalum narbonense	+								+	+						
Ornithogalum neurostegium subsp. *neurostegium*	+									+						
Ornithogalum uluense	+															
Ornithogalum oligophyllum	+															
Ornithogalum pyrenaicum	+									+						
Ornithogalum sigmoideum	+							+	+	+						
Ornithogalum umbellatum	+									+						

Of all the collected specimen, 18 taxa were endemic to Turkey and 6 taxa were rare in the flora of Turkey and endemism rate was 15.51%. Threatened categories of these endemic and rare taxa were re-evaluated according to population observation and concerning literature. All of the endemic and/or rare taxa are listed with suggested threatened categories in Table 4 and Table 5. The changing of IUCN threatened categories of two endemic plants and one rare plant were suggested and discussed in the Discussion part of this thesis.

Table 4: Threatened categories of endemic taxa

	Plant Names	Ekim et al., 2000; Koca & Yıldırımlı, 2010	Present study, 2013
1	*Arum euxinum*	LR (lc)	LC
2	*Allium olympicum*	LR (lc)	LC
3	*Allium huber-morathii*	LR (lc)	LC
4	*Crocus abantensis*	LR (nt)	**CR**
5	*Crocus ancyrensis*	LR (lc)	LC
6	*Crocus biflorus* subsp. *pulchricolor*	LR (nt)	NT
7	*Crocus* × *paulineae*	Not indicated	**CR**
8	*Dactylorhiza nieschalkiorum*	LR (lc)	LC
9	*Epipactis pontica*	LR (lc)	LC
10	*Gagea bithynica*	LR (lc)	LC
11	*Iris kerneriana*	LR (lc)	LC
12	*Iris schachtii*	LR (lc)	LC
13	*Iris purpureobractea*	LR (nt)	NT
14	*Bellevalia clusiana*	LR (lc)	LC
15	*Muscari aucheri*	LR (lc)	LC
16	*Muscari bourgaei*	LR (lc)	LC
17	*Ornithogalum uluense*	LR (nt)	NT
18	*Ornithogalum nallihanense*	CR	CR

Table 5: Threatened categories of rare taxa

	Plant Names	Ekim et al., 2000	Present study, 2013
1	*Leucojum aestivum* subsp. *aestivum*	VU	VU
2	*Acorus calamus* var. *calamus*	EN	EN
3	*Iris pumila* subsp. *attica*	VU	VU
4	*Allium guttatum* subsp. *dalmaticum*	VU	**EN**
5	*Lilium martagon* var. *martagon*	VU	VU
6	*Dactylorhiza incarnata* subsp. *incarnata*	VU	VU

Of all the collected specimens, four taxa were new records for A3 square, one taxon was a new record for the Black Sea Region and 14 taxa were new record for Bolu province (Akman & Ketenoğlu (1978), Akman & Ketenoğlu (1979), Akman & Yurdakulol (1981) a, Akman & Yurdakulol (1981) b, Ekim & İlarslan (1982), Akman et al. (1983) a, Akman & İlarslan (1983) b, Akman & İlarslan (1983), Davis (1965-1985), Davis et al. (1988), Turgut (1996), Uluğ (1999), Güner et. al. (2000), Sümer (2002), Türker & Güner (2003), Aksoy (2006), İkinci & Güner (2007), Arslan (2008), Aksoy (2009), Ekici (2010) Sungurlu (2011), İkinci (2011), Kanoğlu (2011), Koyuncu et. al. (2012), Tunçkol & Akkemik (2013)) (Table 6).

Table 6: New Records for A3 grid square, the Black Sea region and Bolu province

	Family	**Taxa and Grid Square or Province**
1	Colchicaceae	*Colchicum boissieri* (A3-Black Sea Region-Bolu)
2	Iridaceae	*Iris* × *germanica* (A3-Bolu)
3	Amaryllidaceae	*Allium huber-morathii* (Bolu)
4	Amaryllidaceae	*Muscari bourgaei* (A3-Bolu)
5	Amaryllidaceae	*Allium sphaerocephalon* subsp. *sphaerocephalon* (Bolu)
6	Araceae	*Arum maculatum* (Bolu)
7	Liliaceae	*Fritillaria pinardii* subsp. *pinardii* (Bolu)
8	Orchidaceae	*Orchis simia* subsp. *simia* (Bolu)
9	Orchidaceae	*Spiranthes spiralis* (Bolu)
10	Xanthorrhoeacea	*Asphodeline lutea* (Bolu)
11	Xanthorrhoeaceae	*Eremurus spectabilis* (Bolu)
12	Asparagaceae	*Bellevalia clusiana* (Bolu)
13	Asparagaceae	*Ornithogalum neurostegium* subsp. *neurostegium* (A3-Bolu)
14	Asparagaceae	*Ornithogalum nallihanense* (Bolu)

4.3. Discussion

When the previous studies about Turkish geophytes were considered, for comparision of the most common five monocotyledonous families, Liliaceae s.l. had the most number of taxa among the other families. Since Liliaceae s.l. was divided into many seperate families according to APG III, in this study, the number of taxa of Liliaceae s.s. has been decreased. For this reason, Orchidaceae has replaced by Liliaceae in having more taxa. The number of taxa in the previous studies was low and ranged between 7 and 45 for the most common five monocotyledonous families except Eker et al. (2008)'s study. The reason for the low number was that these studies either were performed on narrow areas or not included whole petaloid geophytes in the city border. However, Eker et al. (2008)'s research was one of the most extensive regional study on geophytes where the number of five monocotyledonous geophytes was accounted as 87. In the remain studies, the number of taxa is lower than 45. Thus, with the present study the highest number of petaloid monocotyledonous has been reached for a regional study by accounting of 116 taxa. In the "*Flora of Turkey and the East Aegean Islands*", 79 petaloid geophytes were recorded for the research area and there was no any study directly about geophytes, but some floristic studies were performed. In these studies, petaloid monocotyledonous were determined between 3 and 51. The data of the present study is compared to the results of some previous studies performed in Turkey and in the investigation area which are given in Tables 7 and 8.

Table 7: A comparision of widespread geophyte families in Turkey as reported by the present study and previous studies

Previous studies in Turkey	Liliaceae s.l.	Iridaceae	Araceae	Amaryllidaceae	Orchidaceae	Total
Malyer-1983	18	8	–	–	–	26
Mammadov & Sahranç-2003	3	1	–	3	1	8
Çelik et al.-2003	13	2	2	–	6	23
Zilci-2007	–	6	–	1	–	7
Eker et al.-2008	59	14	5	5	4	87
Kupik-2009	20	5	2	2	5	34
Özuslu & İskender-2009	20	11	2	3	3	39
Kısa-2009	32	–	–	–	–	32
Duman-2010	13	3	1	3	19	39
Kayıkçı et.al.-2012	18	11	–	5	11	45
Çıngay et.al.-2012	24	7	–	–	4	35
Şekeroğlu et. al.-2013	5	3	1	–	1	10
Present study-2013	**59**	**14**	**3**	**4**	**36**	**116**

Table 8: A comparision of widespread geophyte families in Bolu as reported by the present study and previous studies

Previous studies in Bolu	Liliaceae s.l.	Iridaceae	Araceae	Amaryllidaceae	Orchidaceae	Total
Akman-Ketenoğlu 1979	12	3	1	–	2	18
Akman-Ketenoğlu 1979	7	–	–	–	2	9
Akman-Yurdakulol 1981 a	5	1	–	–	5	11
Akman-Yurdakulol 1981 b	8	6	1	2	–	15
Ekim-İlarslan 1982	7	2	–	–	4	13
Flora of Turkey (Davis, 1984-1988 and Güner et al., 2000)	26	11	4	3	35	79
Turgut-1996	14	5	1	–	9	29
Uluğ-1999	1	–	–	–	2	3
Türker-Güner 2003	21	5	2	2	21	51
Sümer-2002	5	4	–	1	3	13
İkinci-Güner 2007	9	3	1	–	13	26
Aksoy-2009	12	3	–	–	3	18
İkinci-2011	11	4	–	–	6	21
Sungurlu-2011	10	2	–	–	1	13
Kanoğlu-2011	11	5	1	1	7	25
Present study-2013	**59**	**14**	**3**	**4**	**36**	**116**

Considering phytogeographic regions of only 18 endemic taxa, six of them were euxine and/or Euro-Siberian elements, four of them were Irano-Turanian and three of them were Mediterranean elements. And the phytogeographic region of the remain five taxa were multi-regional elements. Despite the fact that Bolu province is located in the Euro-Siberian region, its plant diversity constitutes with the elements of every three regions according to the research results. In the research area, endemism rate was 15.51% and this ratio is low when compared with the average of endemism of Turkish plants (36%). The main reason for low endemism can be considered that likely effected by forest vegetation of the area. That is, the high competitive power of trees supress growth of the other plants. Therefore it can be considered as a barrier to speciation.

Crocus abantensis, which is a local endemic around Lake Abant, is under threat due to mainly suppression of picnic visitors, activities of hotels and extreme pasturage. This species will be faced with extinction if the necessary measures are not taken to protect it. The IUCN threatened category of this species was evaluated as "NT" according to the Red Data Book of Turkish Plants (Ekim et al., 2000). At present, *C. abantensis* is exclusive to one locality, where it has a very limited distribution even in Bolu. It is not so common in its natural habitat and it was estimated that there are *c*. 1000 specimens present within two small area of less than 10 km^2. Thus, the species should be classified as "CR" at global level (criterion B2a-b; IUCN, 2001). Another result of the study is that some of the regions should be declared as protected area. In Abant Natural Park, the first hot spot is the ramp around picnic area at southeast of Lake Abant which has the main population of *C. abantensis*. The second hot spot is on the way to antenna tower which includes *Crocus abantensis*, *C. ancyrensis, C. biflorus subsp. pulchricolor* and C. × *paulinea.* The third hot spot is west of Lake Abant which has many orchid species. And also the fourth hot spot is through Abant way which is very rich in terms of orchids.

Crocus × *paulineae*, which exists on the higher parts of Lake Abant together with two endemic taxa *C. abantensis* and *C. ancyrensis,* is a local endemic hybrid taxon. This taxon is known from only type locality with less than 50 individuals which is under threat of quarry

and extreme pasturage. The threatened category of this species was not shown in Ekim et al. (2000) and hence the IUCN category of it has been suggested as CR at global level (criterion D; IUCN, 2001). Thus, distribution area of both *Crocus* × *paulineae* and *C. abantensis* should be protected immediately.

Iris kerneriana distributes in North and adjacent Inner Anatolia while *Iris schachtii* is found in the Central Anatolia. Both taxa were evaluated as "LC" shown in Ekim et al. (2000). However, although these taxa have a wide distribition in Turkey, but they have restricted distribution ranges in Bolu. For this reason, they were not be able to collected during field works, but added to the list with the other researchers' herbarium records. Further studies should be done to determine their population densities in the other distribution regions.

Iris purpureobractea, which distributes in the North, West and Central Anatolia, was shown in "NT" category in Ekim et al. (2000). But it has a restricted distribution range in Bolu. On the other hand, it exists on a narrow area, roadsides, around Sünnet Lake in Bolu. It could be affected due to any road construction.

Ornithogalum nallihanense, which was newly described species to science from Ankara (Koca & Yıldırımlı, 2010), was also collected in Bolu. This species was evaluated in "CR" category at global level by the authors of taxon from one locality which was less than 10 km, and the total number of individuals was given approximately 30-60. However, in this study, two rich population were detected from Göynük and Seben.

Gagea bithynica distributes in the Central, South and West Anatolia while *Ornithogalum uluense* is found only in the Northwest Anatolia. Both species were shown in "LC" and “NT” categories respectively in Ekim et al. (2000). In the present study, *G. bithynica* was collected from only Aladağlar and *O. uluense* was collected in only Lake Karamurat. For this reason, further studies should be carried out to determine their population densities in other distribution regions.

The other endemics *Allium huber-morathii, A. olympicum*, *Arum euxinum*, *Bellevalia clusiana, Crocus biflorus* subsp. *pulchricolor*, *C. ancyrensis*, *Dactylorhiza nieschalkiorum, Epipactis pontica*, *Muscari aucheri* and *Muscari bourgaei* which have wide distribution in both Bolu and Turkey, are not under extinction risk. Among of them *C. biflorus* subsp. *pulchricolor* was shown in “NT” category and the others were accepted in "LC" category in Ekim et al. (2000).

Besides endemic plants in the research area, also six taxa are rare for Turkish Flora. Among the rare plants, *Allium guttatum* subsp. *dalmaticum*, which was recorded from only Kırklareli province in Turkish Flora, was observed on a restricted population around Zincirlikuyu district and a few individuals around Taşlıyayla Pond in Seben. The natural habitats of this taxon likely have been destroyed by the construction of the pond due to a large part of land was submerged beneath the waters. *Allium guttatum* subsp. *dalmaticum* was accepted in "VU" category in Ekim et al. (2000). But, the species are found from two fragmented locations in two cities and the area of occupancy estimated to be less than 500 km^2. Thus, the threatened category of this taxon should be changed from VU to EN at regional level (criterion B2a-b; IUCN, 2001). Besides, the main region of *A. guttatum* subsp. *dalmaticum* that is Zincirlikuyu district had also a rich population of *Epipactis* species. Thus, this region should be protected.

Acorus calamus was recorded from four aquatic regions in Turkey; Lake Sapanca/Sakarya, Lake Yeniçağa/Bolu, Lake Beyşehir/Konya, and Isparta (Miller, 1984). This species shows a fragmented distribution as dependent on the water and the effects of global warming may threat the future of the plant. Its threatened category was suggested to remain in "EN" at regional level as seen in Ekim et al. (2000).

Leocojum aestivum subsp. *aestivum* was recorded from seven regions in Turkey; İstanbul, Kocaeli, Bursa, Bolu, Samsun, Konya, Erzurum (Miller, 1984). This species also shows fragmented distribution as dependent on the water as well as *A. calamus*. The effects of

global warming may treat the future of the plants both in Turkey and the world. Its threatened category was suggested to remain in "VU" at regional level as seen in Ekim et al. (2000).

Lilium martagon var. *martagon* was recorded from only Northwest Anatolia in Turkey; Kırklareli, İstanbul, Bolu, Karabük, Bartın, Kastamonu (İkinci, 2005). In Bolu, this species was recorded only from around Yedigöller and had a restricted and weak population. Its threatened category is suggested to remain in "VU" at regional level as seen in Ekim et al. (2000).

Dactylorhiza incarnata subsp. *incarnata* was recorded from Bilecik, Bolu, Kastamonu, Adana in Turkey (Renz & Taubenheim, 1984). The population density of this species in Bolu was weak and may be threatened in the future. The threatened category of this species was suggested to remain in "VU" at regional level as seen in Ekim et al. (2000). For this reason, further studies should be performed to determine the population densities and on the other threatened categories such as *Dactylorhiza incarnata* subsp. *incarnata,* also *Leocojum aestivum* subsp. *aestivum* and *Lilium martagon* var. *martagon* in the various distribution regions of Turkey. All three plants have the potential to exist in nature at regional level, at least following years may be changed their threatened categories from "VU" to "EN".

Iris pumila subsp. *attica,* which was recorded from only Northwest Anatolia (Bilecik, Bolu, Balıkesir, Eskişehir) in Turkey (Mathew, 1984). This taxon are not under extinction risk at now in the province of Bolu. The threatened category of this species was suggested to remain in "VU" at regional level as seen in Ekim et al. (2000).

Another consequence of this work is that, some species were found as rare plants in Bolu province. *Coeloglossum viride*, which although are widely distributed in North Anatolia, was rare in Bolu. Only one sample has been collected during two vegetation terms. *Arum maculatum, Allium sphaerocephalon* subsp*. sphaerocephalon, Dactylorhiza saccifera* subsp. *saccifera, Epipactis microphylla*, *Epipactis persica, Epipogium aphyllum* were also rare in the research area where these taxa were able to be collected from only one or two locations.

Therefore, the detailed studies should be performed for understanding of population densities of these species, particularly related with orchids.

Among the new records, althogh *Colchicum boissieri* is an Aegean plant, it was found in Bolu province by this study as a new record for Black Sea Region. The species exists on a very narrow area at the way of Çaltepe where should be protected. Besides, four taxa are new record for A3 square and 14 taxa are new records for Bolu province. Four endemic taxa, which are *Muscari bourgaei*, *Allium huber-morathii, Ornithogalum nallihanense* and *Bellevalia clusiana*, were first recorded for Bolu. The province of Bolu, which is located between two of the metropolises İstanbul and Ankara, has lots of touristic natural parks, forests, mountains, lakes and ponds. Thus, the research area has been attracted the attention of many researchers and as a result important floristic areas in Bolu were well studied and many new records were given in the previous studies. Although detailed studies were performed in Bolu, the results also showed that new records are still found in the research area (Table 6).

In the research area, there were some doubtful, wrong and/or no recollected records in the previous studies after first gathering. For this aim, detailed studies were performed to demonsrate existence or nonexistence of the plant records. The absence of some taxa were verified while some records were accepted as doubtful. Also, some taxa recorded from in research area in previous studies were actually not within borders of Bolu province. These problematic records are listed in Tables 9-10.

Among the wrong records, *Galanthus plicatus* Bieb. subsp. *byzantinus* (Baker) D.A. Webb was given in Brickell (1984) and *Galanthus nivalis* L. subsp. *nivalis* was given in Akman & Yurdakulol (1981) from Abant region. These species were confirmed as no distributed in Bolu province according to the detailed field studies and personal communication with Dr. Sırrı YÜZBAŞIOĞLU, expert of the genus *Galanthus* in Turkey. The collected specimens from the cited area were *Galanthus plicatus* subsp. *plicatus.*

The record of *Scilla bithynica* Boiss. was given in Akman & Yurdakulol (1981) from Aladağlar. This species was confirmed as no distributed in Bolu province according to the detailed field studies and personal communication with Dr. Hasan YILDIRIM, expert of the genus *Scilla* L. in Turkey. The collected specimens from the cited area were *Scilla bifolia.*

The record of *Crocus aerius* Herb. was given in Akman & Yurdakulol (1981) from Aladağlar, but this species, in fact, is endemic for Zigana mountain / Trabzon and the collected

specimens from the cited area were *Crocus biflorus* subsp. *pulchricolor*. These two species were argued in "Flora of Turkey" that can be confused with each other.

The record of *Fritillaria viridiflora* Post was given in Akman & Yurdakulol (1981) from around Tokad-i Hayrettin tomb. But this species, in fact, is endemic for Gaziantep province and collected specimens from the cited area were *Fritillaria pontica*.

The record of *Platanthera bifolia* (L.) L. C. M. Richard was given in Turgut (1996) from around Abant İzzet Baysal University campus area. But all collected specimens from the cited area and whole research area were *Platanthera chlorantha.*

Arum conophalloides Kotsch was given in Akman & Yurdakulol (1981) from around Tokad-i Hayrettin tomb. But this species, in fact, is found in Inner Anatolia and collected specimens from the cited area were *Arum maculatum.*

Ornithogalum nutans L. was given in Aksoy (2009) from around Karakiriş mountain while *Smilax aspera* L. was given in Akman & Yurdakulol (1981) from around Bolu Mountain. But both species were not found in the cited regions and, in fact, these species are Aegean plants. The specimens from Karakiriş mountain were identified as belonging to the other *Ornithogalum* L. species.

Muscari racemosum Mill. was given in Akman & Ketenoğlu (1979), Akman & Yurdakulol (1981) and Ekim & İlarslan (1982) from around Gerede-Aktaş forest, Bolu Mountains and Yedigöller. But this species, in fact, is endemic to South-west Anatolia and collected specimens from the cited regions were the other *Muscari* Mill. species.

Crocus pestalozzae Boiss. was given in Mathew (1984) from Bolu. But, actually this species is found around İstanbul. Its type record was wrongly given from Bolu in "Flora of Turkey". Because, there is no any region which have the cited habitat at 90-200 a.s.l. and also detailed field studies verified that this species have not a distributon in Bolu.

The literature record of *Allium pulchellum* G. Don (=*A. carinatum* L. subsp. *pulchellum* (G. Don) Bonnier & Layens) which was given in Akman & Ketenoğlu (1979) are doubtful. This species was argued in "Flora of Turkey" that plants from Turkey recorded as *A. pulchellum* probably belong to several other taxa (Kolmann, 1984): records from Erzurum probably refer to *A. armenum* Boiss. & Kotschy, those from Ankara to *A. huber-morathii,* and all others to *A. flavum* subsp *tauricum*. The plants collected from cited region in Bolu were identified as A. *huber-morathii*.

Gagea fibrosa (Desf.) Schult. & Schult. f. was given in Kanoğlu (2011) from around Lake Sülüklü. But this species, in fact, is found in only South Anatolia (Antalya, İçel, Hatay, Gaziantep, Şanlıurfa) and the Aegean Islands. The collected specimens from the cited area were *Gagea foliosa*.

Gagea anisanthos C.Koch was given in Akman & Ketenoğlu (1979) from around Gerede-Aktaş forests. This plant was accepted as a synonym of *Gagea fistulosa* in the "Flora of Turkey" (Rix, 1984). However, the name of *Gagea fistulosa* was accepted as a "*nomen illeg.*" in Govaerts (2013). But, the name for this species was shown as *Gagea bohemica* which is a different plant. There is both nomenclatural and taxonomic problems in the taxonomy of these taxa. Further studies should be designed to explain this confusions. The collected specimens from the cited area were *Gagea fistolosa* according to "the Flora of Turkey".

Gagea arvensis (Pers.) Roem. et Schult. was given in Akman & Ketenoğlu (1979) from around Gerede-Aktaş forests and in Akman & Yurdakulol (1981) from Semen Mountains. This plant was accepted as a synonym of *Gagea villosa* var. *villosa* in the "Flora of Turkey" (Rix, 1984). However, the name of *Gagea arvensis* was accepted as a "*nomen superf."* in Govaerts (2013) and accepted as a synonym of *Gagea minima* (L.) Ker Gawl. But this plant was also shown in Turkey. There is both nomenclatural and taxonomic problems in the taxonomy of these taxa. Further studies should be made to clarify this confusions. The collected specimens from the cited area were *Gagea villosa* var. *villosa.*

Allium cyrilli Ten. subsp. *asumaniae* N.Özhatay & İ.Genç was published as a new subspecies from Lake Abant/Bolu in Özhatay & Genç (2013). But, the specimens collected from the cited area and also Kıbrıscık and Lake Sünnet were identified as *A. decipiens*. Both *A. cyrilli* and *A. decipiens* are very variable species and there are some confusions between them. Further studies should be made to explain the confusions.

Crocus danfordiae G.Maw was given in Akman & Ketenoğlu (1979), *Hyacinthella micrantha* (Boiss.) Chouard and *Hyacinthella lineata* (Steud. ex Schult. & Schult. f.) Chouard were given in Persson & Wendelbo (1984), *Merendera attica* (Spruner) Boiss. & Spruner was given in Brickell (1984) from around Gerede. But, in fact, the cited region for these records are not found in borders of Bolu province. Also, *Allium sibthorpianum* Schult. & Schult. f. was given in Kanoğlu (2011) from Davlumbaz upland in Bolu, but actually this area is located in Dokurcun/Sakarya borders according to GPS data (40° 31.338' N – 030° 50.369' E) data in the related study. Thus, these five species should be discharged from the floristic list of Bolu.

Many of *Dactylorhiza* species are found through Abant way where they have the opportunity to grow and show the hybridization characteristics according to Kreutz (2009). Unfortunately, these rare hybrids (*Dactylorhiza* x *boluiana* H.Baumann, *D*. x *vogtiana* H.Baumann, *D*. x *abantiana* H.Baumann & Künkele, *D*. x *renzii* H.Baumann & Künkele) were not able to be collected within this study. Also, the systematic positions of these hybrids are unclear.

Additionally, in the recorded regions of hybrids, there are road restructing studies which have been made to prevent landslides. During these works, the hybrids may be threatened or extinct. For this reason, these studies should be managed carefully and cooperated with the related experts in the universities and institutions.

Consequently, it was verified that 20 records had no distribution in the research area and suggested to remove floristic list of Bolu province (Table 9). However, in the previous studies, 23 records were confirmed as doubtful and/or no recollected taxa (Table 10).

Table 9: Some records which were confirmed their absence from the research area

	Taxa	Cited publication
1	*Galanthus nivalis* subsp. *nivalis*	Akman & Yurdakulol (1981)
2	*Galanthus plicatus* subsp. *byzantinus*	Brickell (1984)
3	*Crocus pestalozzae*	Mathew (1984)
4	*Crocus aerius*	Akman & Yurdakulol (1981)
5	*Crocus danfordiae*	Akman & Ketenoğlu (1979)
6	*Allium sibthorpianum*	Kanoğlu (2011)
7	*Allium pulchellum*	Akman & Ketenoğlu (1979)
8	*Fritillaria viridiflora*	Akman & Yurdakulol (1981)
9	*Hyacinthella micrantha*	Persson & Wendelbo (1984)
10	*Hyacinthella lineata*	Persson & Wendelbo (1984)
11	*Merendera attica*	Brickell (1984)
12	*Ornithogalum nutans*	Aksoy (2009)
13	*Smilax aspera*	Akman & Yurdakulol (1981)
14	*Scilla bithynica*	Akman & Yurdakulol (1981)
15	*Muscari racemosum*	Akman & Ketenoğlu (1979); Ekim & İlarslan (1982);Akman & Yurdakulol (1981)
16	*Gagea fibrosa*	Kanoğlu (2011)
17	*Gagea anisanthos*	Akman & Ketenoğlu (1979)
18	*Gagea arvensis*	Akman & Ketenoğlu (1979), Akman & Yurdakulol (1981)
19	*Arum conophalloides*	Akman & Yurdakulol (1981)
20	*Platanthera bifolia*	Turgut (1996)

Table 10: Some doubtful and/or no recollected records in previous studies from the research area

	Taxa	Cited publication
1	*Arum detruncatum* C.A. Meyer ex Schott var. *virescens* (Stapl) K.Alpınar & R.Mill	Miller (1984)
2	*Allium ampeloprasum* L.	İkinci (2011)
3	*Allium jubatum* Macbride	Turgut (1996), Ekim & İlarslan (1982)
4	*Allium orientale* Boiss.	Miller (1984), İkinci (2011)
5	*Muscari tenuiflorum* Tausch	Aksoy (2009)
6	*Gladiolus atroviolaceus* Boiss.	Tan & Edmondson Sümer (2002), Aksoy (2009), Kanooğlu (2011)
7	*Gagea peduncularis* (J. & C. Presl) Pascher	Turgut (1996)
8	*Gagea taurica* Steven	Turgut (1996), İkinci (2007)
9	*Orchis provincialis* Balbis ex DC.	Renz & Taubenheim (1984)
10	*Orchis punctulata* Steven ex Lindley	Renz & Taubenheim (1984)
11	*Orchis spitzelii Sauter* ex W. Koch	Renz & Taubenheim (1984)
12	*Ornithogalum ortophyllum* Ten.	Aksoy (2009)
13	*Ornithogalum pascheanum* Speta	Özhatay (2000), Kanoğlu (2011)
14	*Ornithogalum wiedemannii* Boiss.	Cullen (1984)
15	*Ornithogalum nanum* Sibth.	Akman & Ketenoğlu (1979), Akman & Yurdakulol (1981)
16	*Ornithogalum platyphyllum* Boiss.	Sümer (2002)
17	*Colchicum kotschyi* Boiss.	Brickell (1984), Türker (2002)
18	*Dactylorhiza urvilleana* (Steudel) Baumann & Künkele	İkinci (2007)
19	*Dactylorhiza* x *boluiana*	Renz & Taubenheim (1984), Kreutz (2009)
20	*Dactylorhiza* x *vogtiana*	Renz & Taubenheim (1984), Kreutz (2009)
21	*Dactylorhiza* x *abantiana*	Renz & Taubenheim (1984), Kreutz (2009)
22	*Dactylorhiza* x *renzii*	Renz & Taubenheim (1984), Kreutz (2009), Türker (2002)
23	*Smilax excelsa* L.	Kanoğlu (2011)

5. CONCLUSION

The present study is not only a floristic study but also is a local revisional study about petaloid geophytes in Bolu province. Within this frame, preparation of inventory of petaloid geophytes and determination of habitat features and intensity of populations will contribute to both Bolu and Turkish Floras. It will indirectly contribute to the solutions of some taxonomic problems and geographic distributions for the problematic taxa.

This study also contributes for the *ex-situ* protection of geophytes in Bolu. Some collected bulbs will be planted in the 'Geophyte Garden-Bulbous Plant Research, Conservation and Application Field' recently founded in Abant İzzet Baysal University. Thus, more detailed studies will be improved on the bulbous plants in future. Various sectors (e.g. biotechnology, medicine, agriculture, lansdcape, pharmacy and so on) will benefit from both results of this study and geophyte garden. By multiplication after cultivating of geophytes, the creation of native production projects will support our country economy and provide exportation of ornamental, medicinal or edible geophytes instead of importing them. Today, progresses in literature, art, science and technology are the most important issues that reflect the development level of a country. The other Developed European countries around the World, initially Holland, get a significant income on exporting by giving a special importance to the geophytes. In this connection, new projects should be developed and benefitted from rich biological heritage of Turkey with the supporting of TÜBİTAK, DPT and university funds.

Finally, there should be executed some new necessary legal arrangements to protect geophytes under the light of all these scientific data.

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APPENDIX 1: Photos of some geophytes in the research area

Figure 14: a) *Acorus calamus* b) *Arum euxinum* c) Arum maculatum d) *Butomus umbellatus*

Figure 15: a) *Colchicum bivonae* b) *Colchicum boissieri* c) *Colchicum szovitsii* subsp. *szovitsii* d) *Colchicum speciosum* e) *Colchicum triphyllum* f) *Colchicum umbrosum*

Figure 16: a) *Fritillaria pontica* b) *Fritillaria pinardii* subsp. *pinardii* c) *Gagea bohemica* d) *Gagea foliosa* e) *Gagea fistulosa* f) *Gagea granatellii*

Figure 17: a-b) ***Lilium martagon var. martagon*** **c-d)** ***Tulipa sylvestris*** **subsp.** ***australis***

Figure 18*:* **a) *Anacamptis coriophora* b) *Anacamptis laxiflora* c) *Anacamptis morio subsp. morio* d) *Anacamptis palustris* e-f) *Anacamptis pyramidalis***

Figure 19: a-b) *Cephalanthera rubra* c-d) *Cephalanthera epipactoides* e-f) *Cephalanthera damasonium*

Figure 20: a) *Dactylorhiza iberica* b) *Dactylorhiza incarnata* subsp. *incarnata* c) *Dactylorhiza nieschalkiorum* d) *Dactylorhiza romana* e) *Dactylorhiza saccifera* subsp. *saccifera* f) *Coeloglossum viride*

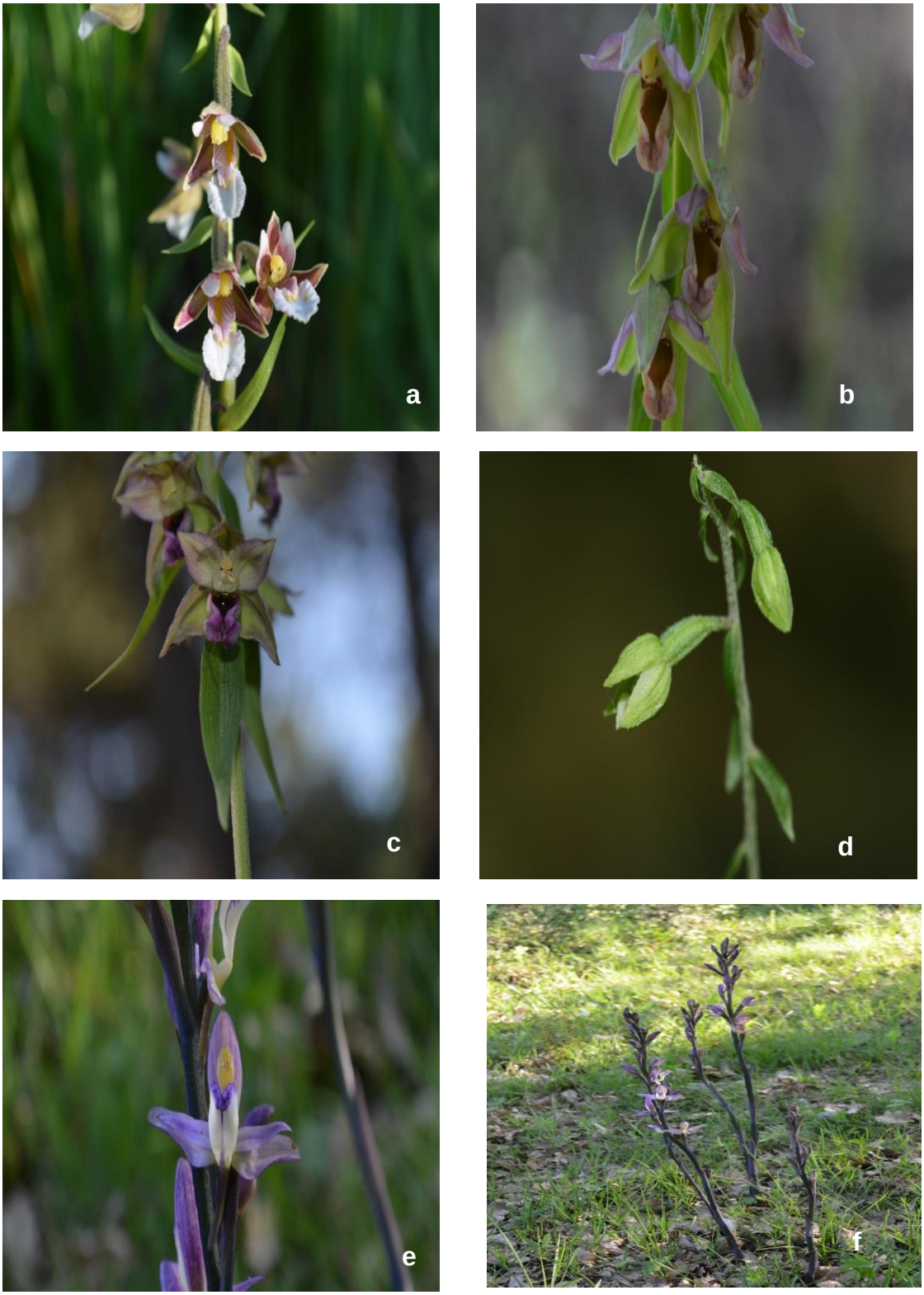

Figure 21: a) *Epipactis palustris* b) *Epipactis helleborine* subsp. *helleborine* c) *Epipactis turcica* d) *Epipactis pontica* e-f) *Limodorum abortivum* var. *abortivum*

Figure 22: a) *Himantoglossum caprinum* b) *Himantoglossum comperianum* c) *Epipogium aphyllum* d) *Neotinea tridentata* subsp. *tridentata* e) *Neottia nidus-avis* f) *Ophrys apifera*

Figure 23: a) *Orchis mascula* subsp. *mascula* b) *Orchis purpurea* subsp. *purpurea* c) *Orchis pallens* d) *Orchis simia* subsp. *simia* e-f) *Platanthera chlorantha*

Figure 24: a) *Crocus abantensis* b) *Crocus biflorus* subsp. *pulchricolor* c) *Crocus ancyrensis* *d*) *Crocus olivieri* subsp. *olivieri* e) *Crocus* × *paulineae* f) *Crocus speciosus*

Figure 25: a) *Gladiolus italicus* b) *Iris* × *germanica* c) *Iris pseudacorus* d) *Iris pumila* subsp. *attica* e-f) *Iris sintenisii* subsp. *sintenisii*

Figure 26: a-b) *Asphodeline lutea* c-d) *Eremurus spectabilis*

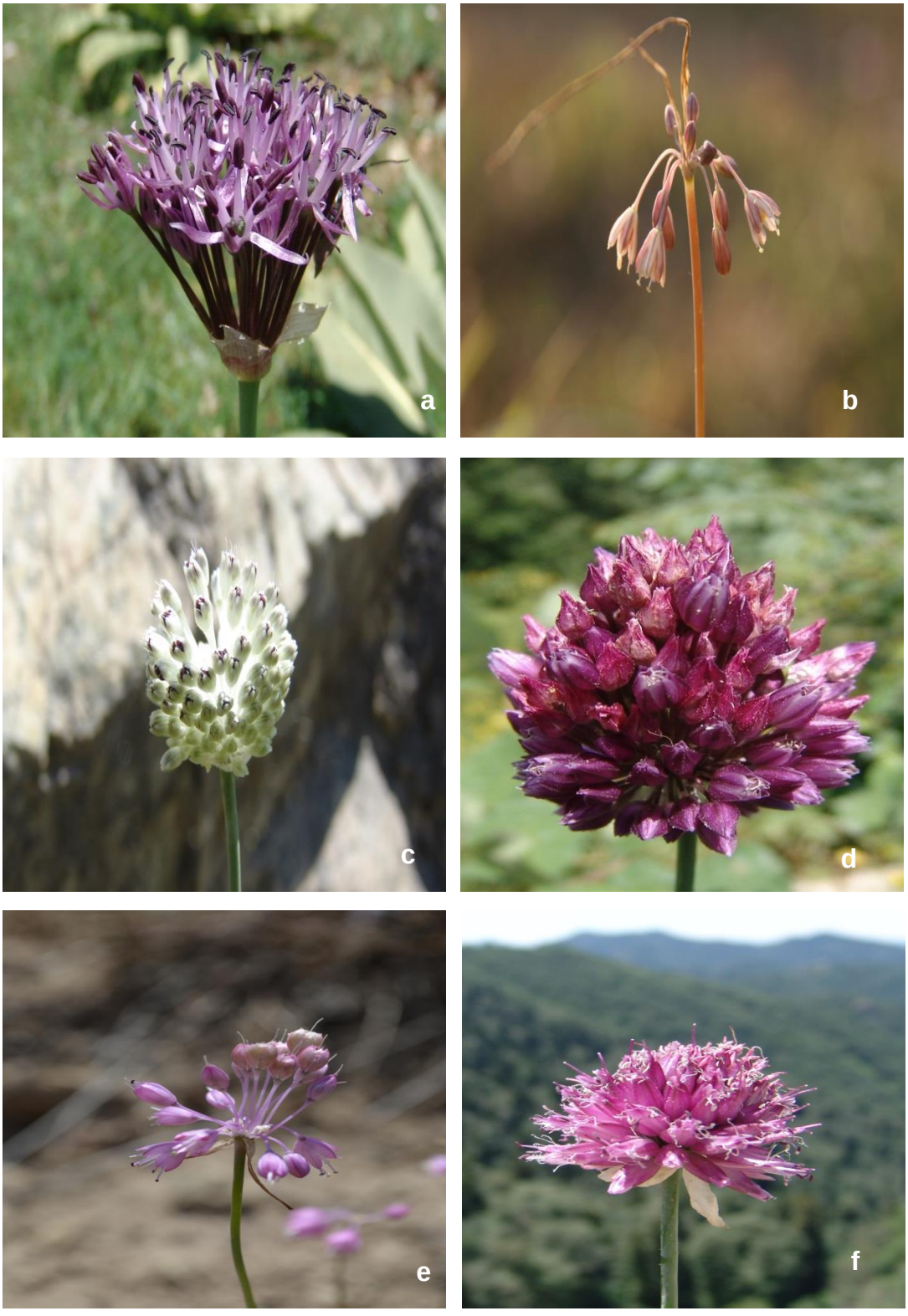

Figure 27: a) *Allium decipiens* subsp. *decipiens* b) *Allium fuscum* c) *Allium guttatum* subsp. *guttatum* d) *Alium rotundum* e) *Allium huber-morathii* f) *Allium sphaerocephalon* subsp. *sphaerocephalon*

Figure 28: a-b) *Allium guttatum* subsp. *dalmaticum* c-d) *Allium olympicum* e-f) *Allium paniculatum* subsp. *paniculatum*

Figure 29: a-b) *Galanthus elwesii* var. *elwesii* c-d) *Galanthus plicatus* subsp. *plicatus* e) *Leucojum aestivum* subsp. *aestivum* f) *Sternbergia colchiciflora*

Figure 30: a) *Muscari armeniacum* b) *Muscari aucheri* c) *Muscari comosum* d) *Muscari neglectum* e-f) *Muscari bourgaei*

Figure 31: a) ***Prospero autumnale*** **b)** ***Scilla bifolia*** **c)** ***Ruscus hypoglossum*** **d)** ***Polygonatum orientale*** **e)** ***Bellevalia clusiana*** **f)** ***Ornithogalum pyrenaicum***

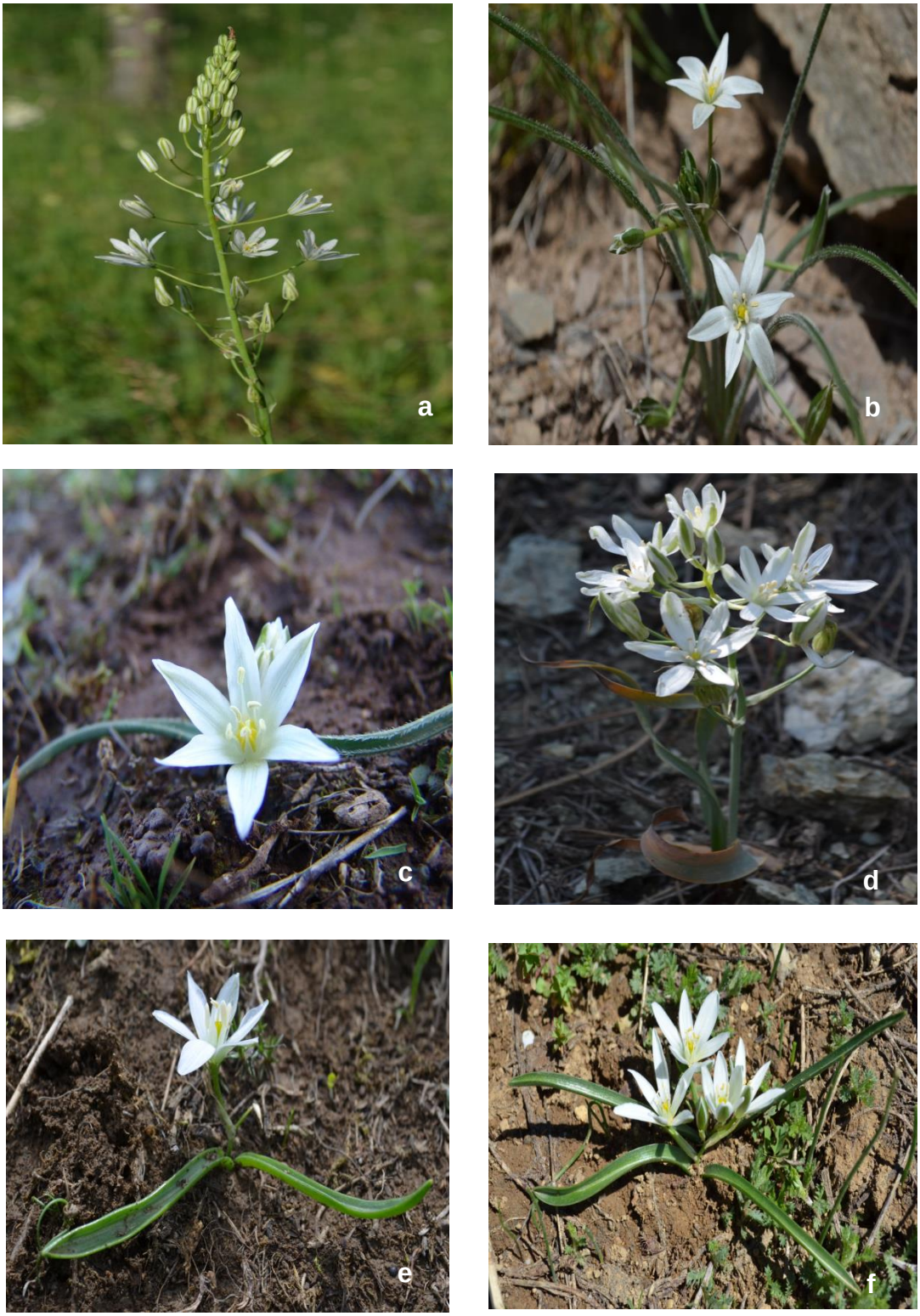

Figure 32: a) *Ornithogalum narbonense* b) *Ornithogalum* armeniacum c) *Ornithogalum fimbriatum* subsp. *fimbriatum* d) *Ornithogalum neurostegium* subsp. *neurostegium* e) *Ornithogalum oligophyllum* f) *Ornithogalum sigmoideum*

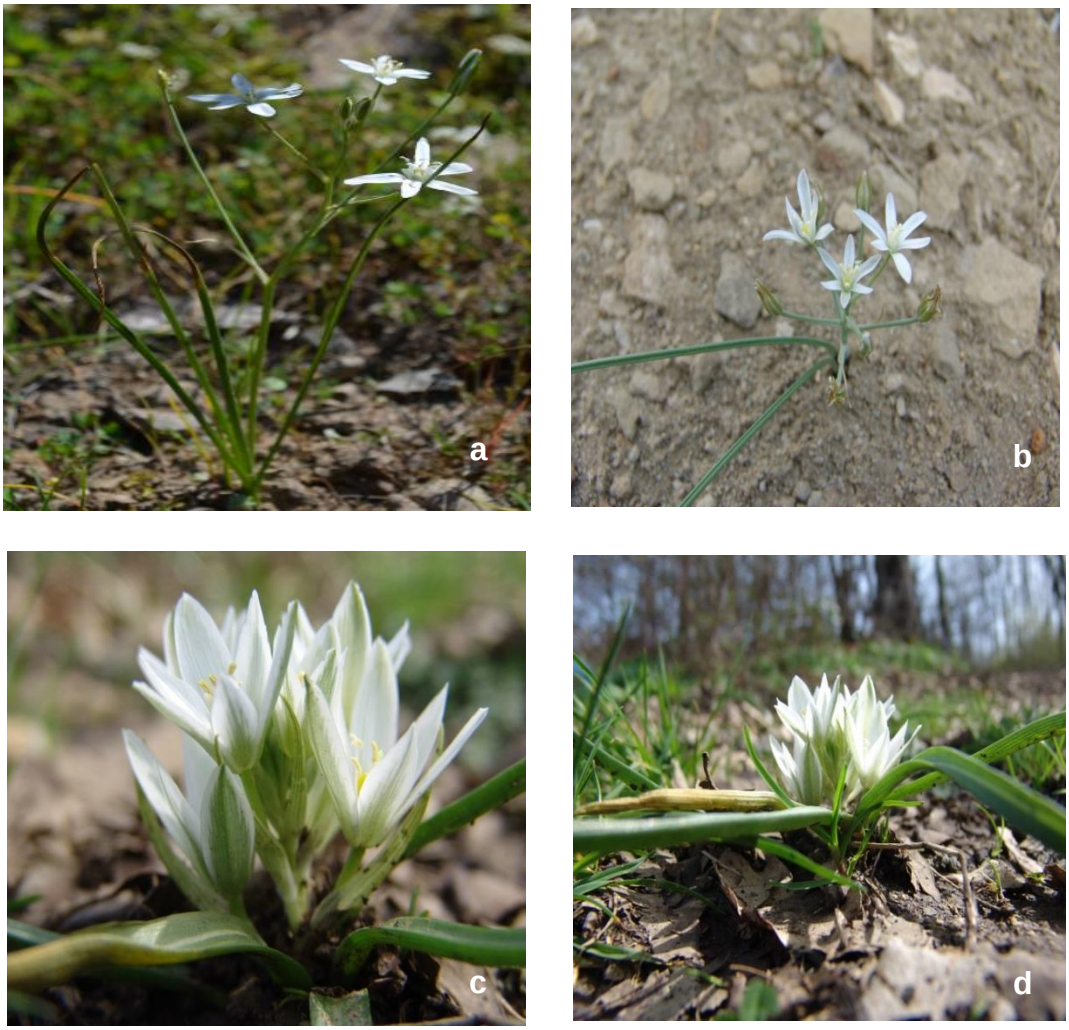

Figure 33: a) *Ornithogalum umbellatum* b) *Ornithogalum comosum* c-d) *Ornithogalum uluense*

APPENDIX 2: A nomenclatural comparison of names of collected taxa in the research area with selected publications

Flora of Turkey (Davis, 1984, 1988; Güner et al., 2000)	**Türkiye Bitkileri Listesi (Güner et. al., 2012)**	**World Checklist of Selected Plant Families (Govaerts, accessed 10.10.2013)**	**Present study, 2013**
Acorus calamus L.	*Acorus calamus* L.	*Acorus calamus* L.	*Acorus calamus* L.
Arum euxinum R.R.Mill	*Arum hygrophilum* Boiss. *euxinum* (R.R.Mill) Alpınar	*Arum euxinum* R.R.Mill	*Arum euxinum* R.R.Mill
Arum maculatum L.	*Arum maculatum* L.	*Arum maculatum* L.	*Arum maculatum* L.
Butomus umbellatus L.	*Butomus umbellatus* L.	*Butomus umbellatus* L.	*Butomus umbellatus* L.
Colchicum bivonae Guss.	*Colchicum bivonae* Guss.	*Colchicum bivonae* Guss.	*Colchicum bivonae* Guss.
Colchicum boissieri Orph.	*Colchicum boissieri* Orph.	*Colchicum boissieri* Orph.	*Colchicum boissieri* Orph.
Colchicum speciosum Steven	*Colchicum speciosum* Steven	*Colchicum speciosum* Steven	*Colchicum speciosum* Steven
Colchicum szovitsii Fisch. & C.A.Mey.	*Colchicum szovitsii* Fisch. & C.A.Mey. subsp. *szovitsii*	*Colchicum szovitsii* Fisch. & C.A.Mey. subsp. *szovitsii*	*Colchicum szovitsii* Fisch. & C.A.Mey. subsp. *szovitsii*
Colchicum triphyllum G.Kunze	*Colchicum triphyllum* Kunze	*Colchicum triphyllum* Kunze	*Colchicum triphyllum* Kunze
Colchicum umbrosum Steven	*Colchicum umbrosum* Steven	*Colchicum umbrosum* Steven	*Colchicum umbrosum* Steven
Fritillaria pinardii Boiss.	*Fritillaria pinardii* Boiss.	*Fritillaria pinardii* Boiss. subsp. *pinardii*	*Fritillaria pinardii* Boiss. subsp. *pinardii*
Fritillaria pontica Wahlenb.	*Fritillaria pontica* Wahlenb.	*Fritillaria pontica* Wahlenb.	*Fritillaria pontica* Wahlenb.
Gagea bithynica Pascher	*Gagea bithynica* Pasch.	*Gagea bithynica* Pascher	*Gagea bithynica* Pascher
Gagea bohemica (Zauschn.) Schult. & Schult. f.	*Gagea bohemica* (Zauschn.) Schult. & Schult. f.	*Gagea bohemica* (Zauschn.) Schult. & Schult. f.	*Gagea bohemica* (Zauschn.) Schult. & Schult. f.
Gagea fistulosa (Ramond ex DC.) Ker Gawl.	synonym of *Gagea bohemica* (Zauschn.) Schult. & Schult. f.	synonym of *Gagea bohemica* (Zauschn.) Schult. & Schult. f.	*Gagea fistulosa* (Ramond ex DC.) Ker Gawl.
Gagea foliosa (C.Presl) Schult. & Schult. f.	*Gagea foliosa* (C.Presl) Schult. & Schult. f.	*Gagea foliosa* (C.Presl) Schult. & Schult. f.	*Gagea foliosa* (C.Presl) Schult. & Schult. f.
Gagea granatellii (Parl.) Parl.	*Gagea granatellii* (Parl.) Parl.	*Gagea granatellii* (Parl.) Parl.	*Gagea granatellii* (Parl.) Parl.
Gagea villosa (M.Bieb.) Duby var. *villosa*	*Gagea villosa* (M.Bieb.) Sweet var. *villosa*	*Gagea villosa* (M.Bieb.) Sweet var. *villosa*	*Gagea villosa* (M.Bieb.) Sweet var. *villosa*
Lilium martagon L.	*Lilium martagon* L.	*Lilium martagon* L. var. *martagon*	*Lilium martagon* L. var. *martagon*
Tulipa sylvestris L.	*Tulipa sylvestris* var. australis (Link) Pamp.	*Tulipa sylvestris* L. subsp. *australis* (Link) Pamp.	*Tulipa sylvestris* L. subsp. *australis* (Link) Pamp.
Orchis coriophora L.	*Orchis coriophora* L. subsp. *coriophora*	*Anacamptis coriophora* (L.) R. M. Bateman	*Anacamptis coriophora* (L.) R. M. Bateman
Orchis laxiflora Lam.	*Orchis laxiflora* Lam. subsp. *laxiflora*	*Anacamptis laxiflora* (Lam.) R. M. Bateman	*Anacamptis laxiflora* (Lam.) R. M. Bateman
Orchis morio L. subsp. *morio*	*Orchis morio* L. subsp. *morio*	*Anacamptis morio* (L.) R. M. Bateman subsp. *morio*	*Anacamptis morio* (L.) R. M. Bateman subsp. *morio*

Orchis palustris Fork.	*Orchis palustris* Jacq. subsp. *palustris*	*Anacamptis palustris* (Jacq.) R. M. Bateman	*Anacamptis palustris* (Jacq.) R. M. Bateman
Anacamptis pyramidalis (L.) L.C. M.Richard	*Anacamptis pyramidalis* (L.) Rich.	*Anacamptis pyramidalis* (L.) Rich.	*Anacamptis pyramidalis* (L.) Rich.
Cephalanthera damasonium (Miller) Druce	*Cephalanthera damasonium* (Mill.) Druce	*Cephalanthera damasonium* (Mill.) Druce	*Cephalanthera damasonium* (Mill.) Druce
Cephalanthera epipactoides Fısch. & Mey.	*Cephalanthera epipactoides* Fisch. & C.A.Mey.	*Cephalanthera epipactoides* Fisch. & C.A.Mey.	*Cephalanthera epipactoides* Fisch. & C.A.Mey.
Cephalanthera longifolia (L.) Fritsch	*Cephalanthera longifolia* (L.) Fritsch	*Cephalanthera longifolia* (L.) Fritsch	*Cephalanthera longifolia* (L.) Fritsch
Cephalanthera rubra (L.) L.C.M. Richard	*Cephalanthera rubra* (L.) Rich.	*Cephalanthera rubra* (L.) Rich.	*Cephalanthera rubra* (L.) Rich.
Dactylorhiza iberica (Bieb. ex Willd.) Soó	*Dactylorhiza iberica* (M. Bieb. ex Willd.) Soó	*Dactylorhiza iberica* (M. Bieb. ex Willd.) Soó	*Dactylorhiza iberica* (M. Bieb. ex Willd.) Soó
Dactylorhiza incarnata (L.) Soó	*Dactylorhiza incarnata* (L.) Soó subsp. *incarnata*	*Dactylorhiza incarnata* (L.) Soó subsp. *incarnata*	*Dactylorhiza incarnata* (L.) Soó subsp. *incarnata*
Dactylorhiza nieschalkiorum H. Baumann & Künkele	*Dactylorhiza nieschalkiorum* H. Baumann & Künkele	*Dactylorhiza nieschalkiorum* H. Baumann & Künkele	*Dactylorhiza nieschalkiorum* H. Baumann & Künkele
Dactylorrhiza ramona (Seb.) Soó	*Dactylorhiza romana* (Seb.) Soó subsp. *romana*	*Dactylorhiza romana* (Sebast.) Soó subsp. *romana*	*Dactylorhiza romana* (Sebast.) Soó subsp. *romana*
Dactylorhiza saccifera (Brongn.) Soó	*Dactylorhiza saccifera* (Brongn.) Soó subsp. *saccifera*	*Dactylorhiza saccifera* (Brongn.) Soó subsp. *saccifera*	*Dactylorhiza saccifera* (Brongn.) Soó subsp. *saccifera*
Coeloglossum viride (L.) Hartm.	*Coeloglossum viride* (L.) Hartman	*Dactylorhiza viridis* (L.) R. M. Bateman var. *viridis*	*Coeloglossum viride* (L.) Hartman
Epipactis helleborine (L.) Crantz	*Epipactis helleborine* (L.) Crantz subsp. *helleborine*	*Epipactis helleborine* (L.) Crantz subsp. *helleborine*	*Epipactis helleborine* (L.) Crantz subsp. *helleborine*
Epipactis microphylla (Ehrh.) Swartz	*Epipactis microphylla* (Ehrh.) Sw.	*Epipactis microphylla* (Ehrh.) Sw.	*Epipactis microphylla* (Ehrh.) Sw.
Epipactis palustris (L.) Crantz	*Epipactis palustris* (L.) Crantz	*Epipactis palustris* (L.) Crantz	*Epipactis palustris* (L.) Crantz
Epipactis persica ([Hausskn. ex] So6) Nannfeldt	*Epipactis persica* (Soó) Hausskn. ex Nannf.	*Epipactis persica* (Soó) Hausskn. ex Nannf.	*Epipactis persica* (Soó) Hausskn. ex Nannf.
Epipactis pontica Taub.	*Epipactis pontica* Taubenheim	*Epipactis pontica* Taubenheim	*Epipactis pontica* Taubenheim
Epipactis turcica Kreutz	*Epipactis tremolsii* C. Pau subsp. *turcica* (Kreutz) Kreutz	*Epipactis turcica* Kreutz	*Epipactis turcica* Kreutz
Epipogium aphyllum Swartz	*Epipogium aphyllum* Sw.	*Epipogium aphyllum* Sw.	*Epipogium aphyllum* Sw.
Himantoglossum caprinum (Bieb.) Sprengel	*Himantoglossum caprinum* (M. Bieb.) Spreng.	*Himantoglossum caprinum* (M. Bieb.) Spreng.	*Himantoglossum caprinum* (M. Bieb.) Spreng.
Comperia comperiana (Steven) Aschers. & Graebn.	*Himantoglossum comperianum* (Steven) P.Delforge	*Himantoglossum comperianum* (Steven) P.Delforge	*Himantoglossum comperianum* (Steven) P.Delforge
Limodorum abortivum (L.) Swartz	*Limodorum abortivum* (L.) Sw. var. *abortivum*	*Limodorum abortivum* (L.) Sw. var. *abortivum*	*Limodorum abortivum* (L.) Sw. var. *abortivum*
Orchis tridentata Scop.	*Orchis tridentata* Scop.	*Neotinea tridentata* (Scop.) R. M. Bateman subsp. *tridentata*	*Neotinea tridentata* (Scop.) R. M. Bateman subsp. *tridentata*
Neottia nidus - avis (L.) L.C. M. Richard	*Neottia nidus-avis* (L.) Rich.	*Neottia nidus-avis* (L.) Rich.	*Neottia nidus-avis* (L.) Rich.
Ophrys apifera Hudson	*Ophrys apifera* Huds.	*Ophrys apifera* Huds.	*Ophrys apifera* Huds.
Ophrys sphegodes Miller	*Ophrys mammosa* Desf. subsp. *mammosa*	*Ophrys sphegodes* Mill. subsp. *mammosa* (Desf.) Soó ex E.Nelson	*Ophrys sphegodes* Mill. subsp. *mammosa* (Desf.) Soó ex E.Nelson
Orchis mascula (L.) L. subsp. *pinetorum* (Boiss. & Kotschy) G.Camus	*Orchis mascula* (L.) L. subsp. *pinetorum* (Boiss. & Kotschy) G.Camus	*Orchis mascula* (L.) L. subsp. *mascula*	*Orchis mascula* (L.) L. subsp. *mascula*

Orchis purpurea Hudson	*Orchis purpurea* Huds. subsp. *purpurea*	*Orchis purpurea* Huds. subsp. *purpurea*	*Orchis purpurea* Huds. subsp. *purpurea*
Orchis pallens L.	*Orchis pallens* L.	*Orchis pallens* L.	*Orchis pallens* L.
Spiranthes spiralis (L.) Chevall.	*Spiranthes spiralis* (L.) Chevall.	*Spiranthes spiralis* (L.) Chevall.	*Spiranthes spiralis* (L.) Chevall.
Steveniella satyrioides (Sprengel) Schlechter	*Steveniella satyrioides* (Spreng.) Schltr.	*Steveniella satyrioides* (Spreng.) Schltr.	*Steveniella satyrioides* (Spreng.) Schltr.
Orchis simia Lam.	*Orchis simia* Lam.	*Orchis simia* Lam. subsp. *simia*	*Orchis simia* Lam. subsp. *simia*
Platanthera chlorantha (Custer) Reichb.	*Platanthera chlorantha* (Custer) Rchb.	*Platanthera chlorantha* (Custer) Rchb.	*Platanthera chlorantha* (Custer) Rchb.
Crocus abantensis T.Baytop & Mathew	*Crocus abantensis* T. Baytop & B. Mathew	*Crocus abantensis* T. Baytop & B. Mathew	*Crocus abantensis* T. Baytop & B. Mathew
Crocus ancyrensis (Herbert) Maw	*Crocus ancyrensis* (Herb.) Maw	*Crocus ancyrensis* (Herb.) Maw	*Crocus ancyrensis* (Herb.) Maw
Crocus biflorus Miller subsp. *pulchricolor* (Herbert) Mathew	*Crocus biflorus* Mill. subsp. *pulchricolor* (Herb.) B. Mathew	*Crocus biflorus* Mill. subsp. *pulchricolor* (Herb.) B. Mathew	*Crocus biflorus* Mill. subsp. *pulchricolor* (Herb.) B. Mathew
Crocus olivieri Gay subsp. *olivieri*	*Crocus olivieri* J. Gay subsp. *olivieri*	*Crocus olivieri* J. Gay subsp. *olivieri*	*Crocus olivieri* J. Gay subsp. *olivieri*
-	*Crocus* × *paulineae* Pasche & Kernd.	*Crocus* × *paulineae* Pasche & Kerndorff	*Crocus* × *paulineae* Pasche & Kerndorff
Crocus speciosus Bieb. subsp. *speciosus*	*Crocus speciosus* M. Bieb. subsp. *speciosus*	*Crocus speciosus* M. Bieb. subsp. *speciosus*	*Crocus speciosus* M. Bieb. subsp. *speciosus*
Gladiolus italicus Miller	*Gladiolus italicus* Mill.	*Gladiolus italicus* Mill.	*Gladiolus italicus* Mill.
Iris germanica L.	*Iris* × *germanica* L.	*Iris* × *germanica* L.	*Iris* × *germanica* L.
Iris kerneriana Ascherson & Sint. ex Baker	*Iris kerneriana* Asch. & Sint. ex Baker	*Iris kerneriana* Asch. & Sint. ex Baker	*Iris kerneriana* Asch. & Sint. ex Baker
Iris pseudacorus L.	*Iris pseudacorus* L.	*Iris pseudacorus* L.	*Iris pseudacorus* L.
Iris attica Boiss. & Heldr.	*Iris pumila* L. subsp. *attica* (Boiss. & Heldr.) K.Richt.	*Iris pumila* L. subsp. *attica* (Boiss. & Heldr.) K.Richt.	*Iris pumila* L. subsp. *attica* (Boiss. & Heldr.) K.Richt.
Iris purpureobractea B.Mathew & T.Baytop	*Iris purpureobractea* B. Mathew & T. Baytop	*Iris purpureobractea* B. Mathew & T. Baytop	*Iris purpureobractea* B. Mathew & T. Baytop
Iris schatti Markgraf	*Iris schachtii* Markgr.	*Iris schachtii* Markgr.	*Iris schachtii* Markgr.
Iris sintenisii Janka	*Iris sintenisii* Janka subsp. *sintenisii*	*Iris sintenisii* Janka subsp. *sintenisii*	*Iris sintenisii* Janka subsp. *sintenisii*
Asphodeline lutea (L.) Reichb.	*Asphodeline lutea* (L.) Rchb.	*Asphodeline lutea* (L.) Rchb.	*Asphodeline lutea* (L.) Rchb.
Eremurus spectabilis Bieb.	*Eremurus spectabilis* M. Bieb.	*Eremurus spectabilis* M. Bieb.	*Eremurus spectabilis* M. Bieb.
Allium cupani Rafin subsp. *hirtovaginatum* Kunth (Stearn)	*Allium hirtovaginatum* Kunth	*Allium hirtovaginatum* Kunth	*Allium hirtovaginatum* Kunth
Allium decipiens Fischer ex Schultes & Schultes fil.	*Allium decipiens* Fisch. ex Schult. & Schult. f. subsp. *decipiens*	*Allium decipiens* Fisch. ex Schult. & Schult. f. subsp. *decipiens*	*Allium decipiens* Fisch. ex Schult. & Schult. f. subsp. *decipiens*
Allium flavum L. subsp. *tauricum* (Besser ex Reıchb.) var. *tauricum*	*Allium flavum* L. subsp. *tauricum* (Besser ex Rchb.) var. *tauricum*	*Allium flavum* L. subsp. *tauricum* (Besser ex Rchb.) K. Richt.	*Allium flavum* L. subsp. *tauricum* (Besser ex Rchb.) K. Richt.
Allium paniculatum L. subsp. *fuscum* (Waldst. & Kit.) Arc.	*Allium fuscum* Waldst. & Kit.	*Allium fuscum* Waldst. & Kit.	*Allium fuscum* Waldst. & Kit.
Allium guttatum Steven subsp. *guttatum*	*Allium guttatum* Stev. subsp. *guttatum*	*Allium guttatum* Steven subsp. *guttatum*	*Allium guttatum* Steven subsp. *guttatum*
Allium guttatum Steven subsp. *sardoum* (Moris) Stearn	*Allium guttatum* Stev. subsp. s*ardoum* (Moris) Stearn	*Allium guttatum* Steven subsp. s*ardoum* (Moris) Stearn	*Allium guttatum* Steven subsp. s*ardoum* (Moris) Stearn
Allium guttatum Steven subsp. *dalmaticum* (A. Kerner ex Janchen) Stearn	*Allium guttatum* Stev. subsp. *dalmaticum* (A. Kern. ex Janch.) Stearn	*Allium guttatum* Steven subsp. *dalmaticum* (A. Kern. ex Janch.) Stearn	*Allium guttatum* Steven subsp. *dalmaticum* (A. Kern. ex Janch.) Stearn
Allium huber-morathii Kollmann	*Allium huber-morathii* Kollmann	*Allium huber-morathii* Kollmann	*Allium huber-morathii* Kollmann
Allium olympicum Boiss.	*Allium olympicum* Boiss.	*Allium olympicum* Boiss.	*Allium olympicum* Boiss.
Allium pallens L. subsp. *pallens*	*Allium pallens* L. subsp. *pallens*	*Allium pallens* L.	*Allium pallens* L.

Allium paniculatum L. subsp. *paniculatum*	*Allium paniculatum* L. subsp. *paniculatum*	*Allium paniculatum* L. subsp. *paniculatum*	*Allium paniculatum* L. subsp. *paniculatum*
Allium pseudoflavum Vved.	*Allium pseudoflavum* Vved.	*Allium pseudoflavum* Vved.	*Allium pseudoflavum* Vved.
Allium scorodoprasum L. subsp. *rotundum* (L.) Stearn	*Allium scorodoprasum* L. subsp. *rotundum* (L.) Stearn	*Alium rotundum* L.	*Alium rotundum* L.
Allium sphaerocephalon L. subsp. *sphaerocephalon*	*Allium sphaerocephalon* L. subsp. *sphaerocephalon*	*Allium sphaerocephalon* L. subsp. *sphaerocephalon*	*Allium sphaerocephalon* L. subsp. *sphaerocephalon*
Allium stamineum Boiss.	*Allium stamineum* Boiss.	*Allium stamineum* Boiss.	*Allium stamineum* Boiss.
Allium vineale L.	*Allium vineale* L.	*Allium vineale* L.	*Allium vineale* L.
Allium wiedemannianum Regel	*Allium wiedemannianum* Regel	*Allium wiedemannianum* Regel	*Allium wiedemannianum* Regel
Galanthus elwesii Hooker	*Galanthus elwesii* Hook. f. var. *elwesii*	*Galanthus elwesii* Hook. f. var. *elwesii*	*Galanthus elwesii* Hook. f. var. *elwesii*
Galanthus plicatus M. Bieb. subsp. *plicatus*	*Galanthus plicatus* M. Bieb. subsp. *plicatus*	*Galanthus plicatus* M. Bieb. subsp. *plicatus*	*Galanthus plicatus* M. Bieb. subsp. *plicatus*
Leucojum aestivum L. subsp. *aestivum*	*Leucojum aestivum* L. subsp. *aestivum*	*Leucojum aestivum* L. subsp. *aestivum*	*Leucojum aestivum* L. subsp. *aestivum*
Sternbergia colchiciflora Waldst. & Kit.	*Sternbergia colchiciflora* Waldst. & Kit.	*Sternbergia colchiciflora* Waldst. & Kit.	*Sternbergia colchiciflora* Waldst. & Kit.
Asparagus officinalis L.	*Asparagus officinalis* L. subsp. *officinalis*	*Asparagus officinalis* L.	*Asparagus officinalis* L.
Bellevalia clusiana Griseb.	*Bellevalia clusiana* Griseb.	*Bellevalia clusiana* Griseb.	*Bellevalia clusiana* Griseb.
Muscari armeniacum Leichtlin ex Baker	*Muscari armeniacum* Leichtlin ex Baker	*Muscari armeniacum* Leichtlin ex Baker	*Muscari armeniacum* Leichtlin ex Baker
Muscari aucheri (Boiss.) Baker	*Muscari aucheri* (Boiss.) Baker	*Muscari aucheri* (Boiss.) Baker	*Muscari aucheri* (Boiss.) Baker
Muscari bourgaei Baker	*Muscari bourgaei* Baker	*Muscari bourgaei* Baker	*Muscari bourgaei* Baker
Muscari comosum (L.) Miller	*Muscari comosum* (L.) Mill.	*Leopoldia comosa* (L.) Parl.	*Muscari comosum* (L.) Mill.
Muscari neglectum Guss.	*Muscari neglectum* Guss. ex Ten.	*Muscari neglectum* Guss. ex Ten.	*Muscari neglectum* Guss. ex Ten.
Polygonatum multiflorum All.	*Polygonatum multiflorum* (L.) All.	*Polygonatum multiflorum* (L.) All.	*Polygonatum multiflorum* (L.) All.
Polygonatum orientale Desf.	*Polygonatum orientale* Desf.	*Polygonatum orientale* Desf.	*Polygonatum orientale* Desf.
Scilla autumnalis L.	*Prospero autumnale* (L.) Speta	*Prospero autumnale* (L.) Speta	*Prospero autumnale* (L.) Speta
Scilla bifolia L.	*Scilla bifolia* L.	*Scilla bifolia* L.	*Scilla bifolia* L.
Ruscus hypoglossum L.	*Ruscus* hypoglossum L.	*Ruscus* hypoglossum L.	*Ruscus* hypoglossum L.
Ornithogalum armeniacum Willd.	*Ornithogalum armeniacum* Baker	*Ornithogalum armeniacum* Baker	*Ornithogalum armeniacum* Baker
Ornithogalum comosum L.	*Ornithogalum comosum* L.	*Ornithogalum comosum* L.	*Ornithogalum comosum* L.
Ornithogalum fimbriatum Willd.	*Ornithogalum fimbriatum* Willd.	*Ornithogalum fimbriatum* Willd. subsp. *fimbriatum*	*Ornithogalum fimbriatum* Willd. subsp. *fimbriatum*
-	*Ornithogalum nallihanense* Yıld. & A.D. Koca	*Ornithogalum nallihanense* Yıld. & Doğru-Koca	*Ornithogalum nallihanense* Yıld. & Doğru-Koca
Ornithogalum narbonense L.	*Ornithogalum narbonense* L.	*Ornithogalum narbonense* L.	*Ornithogalum narbonense* L.
Ornithogalum oligophyllum E. D. Clarke	*Ornithogalum oligophyllum* E. D. Clarke	*Ornithogalum oligophyllum* E. D. Clarke	*Ornithogalum oligophyllum* E. D. Clarke
Ornithogalum pyrenaicum L.	*Ornithogalum pyrenaicum* L.	*Ornithogalum pyrenaicum* L.	*Ornithogalum pyrenaicum* L.
Ornithogalum ulophyllum Hand.-Mazz.	*Ornithogalum neurostegium* Boiss. & C.I. Blanche ex. Boiss.	*Ornithogalum neurostegium* Boiss. & Blanche subsp. *neurostegium*	*Ornithogalum neurostegium* Boiss. & Blanche subsp. *neurostegium*
Ornithogalum sigmoideum Freyn & Sint.	*Ornithogalum sigmoideum* Freyn & Sint.	*Ornithogalum sigmoideum* Freyn & Sint.	*Ornithogalum sigmoideum* Freyn & Sint.
Ornithogalum uluense Speta	*Ornithogalum uluense* Speta	*Ornithogalum uluense* Speta	*Ornithogalum uluense* Speta
Ornithogalum umbellatum L.	*Ornithogalum umbellatum* L.	*Ornithogalum umbellatum* L.	*Ornithogalum umbellatum* L.