



Some geophyte plants determined in Bartın/Turkey

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Abstract

Geophyte plants, the subject of our research, are quite important in terms of ecology, economy, and ethnobotany. The discovery and promotion of these plants are important for conservation and sustainability of biodiversity. In this study, the province of Bartın and its surroundings were examined in terms of geophyte plant. Within this context, field works were made between the years 2012 and 2014 and geophytic species were collected. Collected plants were dried and preserved according to herbarium standards and their diagnostics were made utilizing some taxonomic and floristic references. 36 taxa from 4 families were identified as a result of this study. 1 plant is Iranian-Turanian (2.8%), 7 plants are European-Siberian (19.4%), and 13 plants are Mediterranean elements (36.1%), whereas 15 plants (41.7%) are from the group, the phytogeographical region of which are unknown. *Galanthus plicatus* Bieb. ssp. *byzantinus* (Baker.) D. A. Webb. and *Crocus ancyrensis* (Herbert) Maw are endemic and the rate of endemism is 5.6%. With this study, one of the key components of biodiversity, the geophyte plants, that spread in the province of Bartın are identified, their current conditions and the constraints on them are explained and improvement opportunities are specified. Besides this, it is intended to contribute to the identification and conservation of biological resources.

Key words: geophyte plant, flora, biodiversity, Bartın, Turkey

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Bartın kentinde tespit edilen bazı geofit bitkiler

Özet

Araştırma konumuzu oluşturan geofit bitkiler, ekolojik, ekonomik ve etnobotanik açıdan oldukça önemlidir. Bu bitkilerin keşfi ve tanıtımı, biyoçeşitliliğin korunması ve sürdürülebilirliği açısından önem taşımaktadır. Bu çalışmada, Bartın kenti ve yakın çevresi geofit bitki yönünden incelenmiştir. Bu kapsamda 2012- 2014 yılları arasında arazi çalışmaları yapılmış ve geofit bitki türleri toplanmıştır. Toplanan bitkiler herbarium standart ve ölçülerinde kurularak saklanmış, teşhisleri bazı taksonomik ve floristik referanslardan yararlanılarak yapılmıştır. Çalışma sonucunda 4 familyaya ait 36 takson saptanmıştır. Bitkilerin 1'i İran- Turan elementi, (% 2.8), 7'si Avrupa- Sibirya (% 19.4), 13'ü Akdeniz elementi (% 36.1) olup 15'i fitocoğrafik bölgesi bilinmeyenler (% 41.7) grubundadır. *Galanthus plicatus* Bieb. subsp. *byzantinus* (Baker.) D. A. Webb. ve *Crocus ancyrensis* (Herbert) Maw taksonları endemik olup, endemizm oranı % 5.6'dır. Bu çalışma ile Bartın kentinde yayılış yapan ve biyoçeşitliliğin önemli bileşenlerinden biri olan geofit bitkiler tespit edilmiş, mevcut durumları ve maruz kaldıkları baskılar açıklanarak koruma ve iyileştirme olanakları belirtilmiştir. Bununla, biyolojik kaynakların belirlenmesi ve korunmasına katkı sağlanması amaçlanmıştır.

Anahtar kelimeler: geofit bitki, flora, biyoçeşitlilik, Bartın, Türkiye

1. Introduction

Ecosystem is naturally occurring unit of organisms such as plants and animals, and their relationships with the environment (Demiröz et al., 2014). With its topography including different altitudes, soil diversity, geologic and geomorphologic properties, and its location on the junction of three different phytogeographical regions, Turkey has a rich ecosystem and flora. Geophytes, which are the subject of our research, have an important place within the floral

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diversity of Turkey (Kandemir and Yakupoğlu, 2016). “Geophytes” is the name given to herbs with underground organs such as bulbs, corms, rhizomes, and tubers, which gained food-storing specialty by mutation (Mammadov and Sahranç, 2003; Özuslu and İskender, 2009; Sargin et al., 2013). In our country, approximately 900 geophytic species grow naturally and almost all of them are economical and medical plants. As a result of floristic studies, the number of geophytes and other group plants increase year by year (Koyuncu and Alp, 2014).

Due to their properties, geophytes have been the focus of people’s attention for many years and they were initially used in folk medicine and are currently used in modern medicine. Part of the geophytic plants is used as aromatic herbs due to their fragrances. Also, as these plants, which stay underground during large period of the year and blossom beautiful and glossy flowers at the beginning of spring and in autumn, have high ecological tolerances and they are easily cultivated, and blossom very shortly after planted. They are outstanding for landscape planning. Besides, the endemism rate of geophytic plants is quite high. The discovery, promotion, and if necessary, cultivation of these plants are needed for conservation and sustainability of biodiversity (Özel and Erden, 2010).

Several studies have been made in order to determine the richness of our country in terms of geophytic floral diversity. As a result of studies, the ecological, ethnobotanical, economical, and ecotourism potentials of species in different regions are assessed and anthropogenic negative impacts on taxa are identified (Demiröz et al., 2014; Özuslu and İskender, 2009; Sargin et al., 2013; İpek et al., 2013; Eker et al., 2008; Sandal and Söğüt, 2010; Kayıkçı et al., 2012; Özhatay et al., 2013). Floristic researches had been made earlier in Bartın, which is the subject of our research. Kaya and Başaran (2006) provided detailed information about the flora of the province and its surroundings. Moreover, Ekici (2010) evaluated the use of natural flora of the cities in landscape planning. Ekici and Kaya (2014) made contribution to identification of natural flora of the vicinity.

In this study, the province of Bartın and its vicinity was examined in terms of geophytes and these plants were evaluated according to IUCN Red List (Ekim et al., 2000). Turkey is a country that signs agreements on protecting the biological diversity (Özyavuz et al., 2006). IUCN brings the countries under the same roof in terms of protection standards, as national protection regulations. However, some of these countries are quite different, and they undertake the maintenance and the sustainability of biological diversity by legal or several other means. Thus, accurate data on local to global protection status of geophytes will be provided as well as the making their promotions.

2. Materials and methods

The study is based on the geophytes naturally grown around the province of Bartın and its surroundings. In this study, field works were made between years of the 2012 and 2014, geophytic species were collected, photographed, and notes were taken about their habitats and cultivation conditions. Collected plants were dried and preserved according to herbarium standards and their diagnostics were made utilizing Davis (1984).

3. Results

In this research, geophytes spreading in the Bartın and surroundings are determined. 36 taxa from 4 families are identified. Photos of some plants are stated below (Figure 1). 1 plant is Iranian-Turanian (2.8%), 7 plants are European-Siberian (19.4%), and 13 plants are Mediterranean elements (36.1%), whereas 15 plants (41.7%) are from the group, the phytogeographical region of which are unknown. *Galanthus plicatus* ssp. *byzantinus* and *Crocus ancyrensis* taxa are endemic and their endemism rate is 5.6%.

The study offers an insight into nature conservation studies, identifies endemic plants as well as rare and threatened non-endemic species, and provides support for their conservation. In this study, the identified plants are also evaluated according to the IUCN Red List. From the plants in this context, *Crocus ancyrensis* is in “VU”(Vulnerable) and *Crocus speciosus* Bieb. ssp. *speciosus* is in “LC” (Least concern) categories.

The statuses of collected plants according to their families, scientific names, place and time of collection, phytogeographical regions, endemism, and IUCN categories are stated below.

AMARYLLIDACEAE

- 1) *Galanthus plicatus* Bieb. ssp. *byzantinus* (Baker.) D. A. Webb., Zoni Plateau (Art), 475 m, 07.03.2014, Endemic, Euro-Siberian element.
- 2) *Leucojum aestivum* L., Gecen village, in the wetlands, 50 m, 13.05.2014, Euro-Siberian element.
- 3) *Narcissus x laetus* Salisb., Karaköy, in the agricultural fields, 110 m, 08.03.2014.
- 4) *Narcissus pseudonarcissus* L., Kozcağız, in the *Carpinus* sp. forests, 120 m, 22.04.2013.
- 5) *Pancreatum maritimum* L., İnkumu coast, dune fields, 1 m, 29.06.2014, Mediterranean element.

IRIDACEAE

- 6) *Crocus ancyrensis* (Herbert) Maw, Başköy (Kurucaşile), 260 m, 18.04.2012, Endemic, Iranian-Turanian element, LC.
- 7) *C. speciosus* Bieb. ssp. *speciosus*, İnkumu, in the wooded area that behind the coast, 55 m, 03.09.2013, VU.
- 8) *Iris germanica* L., Amasra, Ağlayan ağaç sites, 120 m, 13.05.2014.

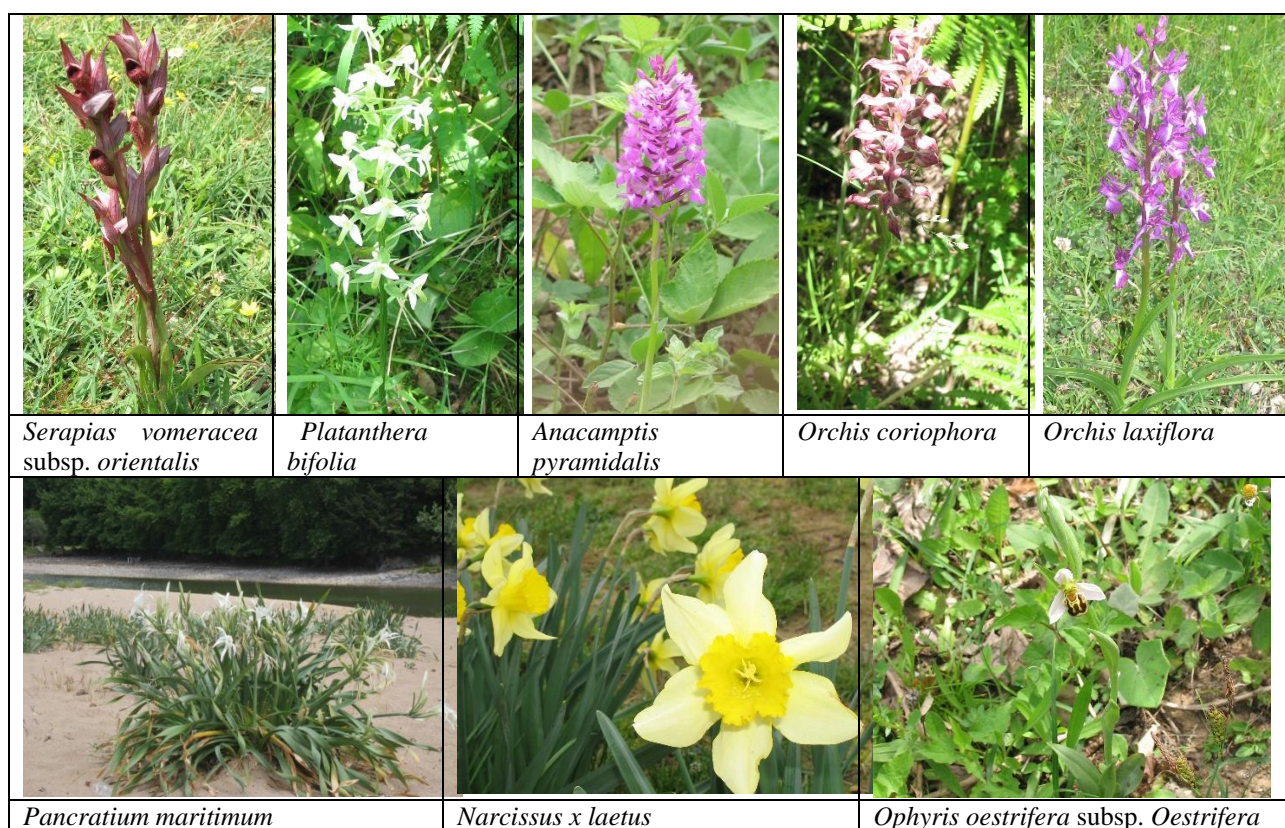


Figure 1. The some geophyte plants identified in the research area

9) *I. pseudacorus* L., Amasra, Ağlayan ağaç sites, in the humid areas, 364 m, 04.05.2014.

LILIACEAE

- 10) *Allium flavum* L. ssp. *tauricum* (Besser ex Reichb.) K. Richter var. *tauricum* Beser ex Reichb., Kaynarca, in the agricultural fields, 52 m, 13.05.2014, Mediterranean element.
- 11) *Asparagus acutifolius* L., Ağdacı village, in the *Carpinus* sp.-*Quercus* sp. forest areas, 114 m, 12.08.2013, Mediterranean element.
- 12) *A. aphyllus* L. ssp. *orientalis* (Baker) P. H. Davis, Amasra, Ağlayan ağaç sites, 120 m, 11.07.2013, Mediterranean element.
- 13) *Muscari armeniacum* Leichtlin. ex Baker., İnkumu coast, in the dune fields, 5 m, 10.04.2013.
- 14) *M. comosum* (L.) Mill., Ağdacı village, in the *Carpinus* sp.- *Quercus* sp. forest areas, 114 m, 12.06.2013, Mediterranean element.
- 15) *M. neglectum* Guss., Kanlırmak sites, in the humid areas, 65 m, 03.04.2013.
- 16) *Ornithogalum armeniacum* Baker, Ağdacı village, in the *Carpinus* sp.-*Quercus* sp. forest areas, 114 m, 13.04.2014, Mediterranean element.
- 17) *O. fimbriatum* Willd., İnkumu, in the wooded area that behind the coast, 55 m, 03.03.2013, Mediterranean element.
- 18) *O. narbonense* L., Ağdacı village, in the agricultural areas, 120 m, 15.04.2014, Mediterranean element.
- 19) *O. umbellatum* L., Kanlırmak surroundings, 54 m, 10.04.2014.
- 20) *O. wiedemannii* Boiss., Gecen village, in the damp meadows, 110 m, 12.04.2013.
- 21) *Polygonatum hirtum* (Bosc ex Poiret.) Pursh., Gecen village, in the damp meadows, 110 m, 12.04.2013, Euro-Siberian element.
- 22) *P. multiflorum* (L.) All., Bartın-Amasra road sites, in the mixed coniferous forests, 274 m, 13.05.2013.
- 23) *Ruscus aculeatus* L. var. *aculeatus*, Ağdacı village, in the *Carpinus* sp.- *Quercus* sp. forest areas, 114 m, 12.06.2014.
- 24) *R. hypoglossum* L., Bartın-Amasra road sites, in the mixed coniferous forests, 274 m, 13.05.2013, Euro-Siberian element.
- 25) *Scilla bifolia* L., Ağdacı village, in the *Carpinus* sp.- *Quercus* sp. forest areas, 114 m, 12.03.2013, Mediterranean element.
- 26) *S. bithynica* Boiss., Bartın-Amasra road sites, 310 m, 13.05.2013, Euro-Siberian element.
- 27) *Smilax excelsa* L., Ağdacı village, in the *Carpinus* sp.-*Quercus* sp. forest areas, 114 m, 12.06.2014, Mediterranean element.

ORCHIDACEAE

- 28) *Anacamptis pyramidalis* (L.) L. C. M. Richard., Ağdacı village, in the *Carpinus* sp.- *Quercus* sp. forest areas, 114 m, 12.06.2014.
- 29) *Dactylorhiza incarnata* (L.) Soó., Kozcağız surroundings, in the wetlands, 02.06.2013.
- 30) *D. romana* (Seb.) Soó. ssp. *romana*, Bartın-Amasra road sites, in the mixed coniferous forests, 274 m, 13.05.2013, Mediterranean element.
- 31) *Ophrys oestrifera* Bieb. ssp. *oestrifera*, Orduyeri Quarter, in the meadows, 286 m, 20.06.2014.
- 32) *Orchis coriophora* L., Mugada coast, in the dune areas, 5 m, 23.05.2013.
- 33) *O. laxiflora* Lam., Campus of Bartın University (Ağdacı), 110 m, 11.05.2014, Mediterranean element.
- 34) *O. purpurea* Huds., Bartın-Amasra road sites, in the mixed coniferous forests, 310 m, 13.05.2013, Euro-Siberian element.daw
- 35) *Platanthera bifolia* (L.) L.C.M. Richard, Ağdacı village, in the *Carpinus* sp.-*Quercus* sp. forest areas, 130 m, 23.05.2013, Euro-Siberian element.
- Serapias vomeracea* (Burm. Fil.) Briq. ssp. *orientalis* Greuter, Orduyeri Quarter, in the meadows, 250 m, 20.06.2014, Mediterranean element.

4. Conclusions and discussion

With this study, several geophytic plants spread around the province of Bartın are determined. Within this scope, field studies were made between 2012 and 2014 and 36 taxa are identified. When the distribution by phytogeographical regions of these plants is examined, it is seen that they spread in 13 taxa and Mediterranean flora (Table 1). When the distribution of geophytic plants identified in the last 10 years in Turkey is examined, it is seen that Antalya, Muğla, and Konya has the most species. They are neighboring provinces located in the Mediterranean belt. This information supports the fact that the Mediterranean belt is a center in terms of geophytes (Koyuncu and Alp, 2014).

Table 1. The distribution of geophytes identified in the research area, by phytogeographical regions

Phytogeographical region	The number of taxa	Rate (%)
Iranian-Turanian	1	2.8
Euro-Siberian	7	19.4
Mediterranean	13	36.1
Unknowns as phytogeographically	15	41.7

The identified plants in the research area, mostly belong to the *Liliaceae* family (50%). *Liliaceae* is followed by *Orchidaceae* family. The family had the least species in the research area is *Iridaceae*. (11%) (Table 2, Figure 2).

Table 2. The situation of families identified in the research area, by the number of taxa

Family	The number of taxa	Rate (%)
<i>Amaryllidaceae</i>	5	14
<i>Iridaceae</i>	4	11
<i>Liliaceae</i>	18	50
<i>Orchidaceae</i>	9	20

Two taxa of identified plants, *Galanthus plicatus* ssp. *byzantinus* and *Crocus ancyrensis* are endemic and their endemism rate is 5.6%. These plants are assessed according to the IUCN categories, and it is observed that *Crocus ancyrensis* is in “VU” and *Crocus speciosus* ssp. *speciosus* is in “LC” categories. Necessary regulations must be made and human-induced negative impacts on these endemic species and geophytes which are sensitive according to IUCN, must be reduced in order to maintain the conservation of biodiversity and nature.

As they have glossy structures and are used for economical purposes, they are excessively collected in the areas they spread. Especially the *Orchis* species are under intensive anthropogenic pressure because of high demand and errant harvests. In Turkey, *Orchis* sp. “Salep” is obtained from the tubers of this species for ages and it is sold both in the domestic market and in the foreign markets. Our Salep exports continued until 1996, however as of 2001 exports of its tubers, powder, tablets and drugs in any form was prohibited. Exporting any product with Salep symptoms is also prohibited. However, the domestic consumption still continues (Sezik, 1984). Apart from that, in field study observation, it is clearly seen that *Narcissus x laetus*, *Pancreatium maritimum*, *Iris germanica* and *Iris pseudacorus* which stand out with their flamboyant blossoms and *Ruscus aculeatus* var. *acuelatus*, *Asparagus* sp. which is used in cut flowers, are collected excessively. The likewise collection of these plants, creates the danger of extinction for these taxa. Also geophytes such as *Allium flavum* ssp. *tauricum* var. *tauricum*, *Leucojum aestivum*, *Polygonatum hirtum* and *Smilax excelsa* identified near the agricultural areas, are exposed to anthropogenic pressure. Therefore, cultural production and reproduction of these plants became compulsory in order to protect the species and maintain its use for different purposes.

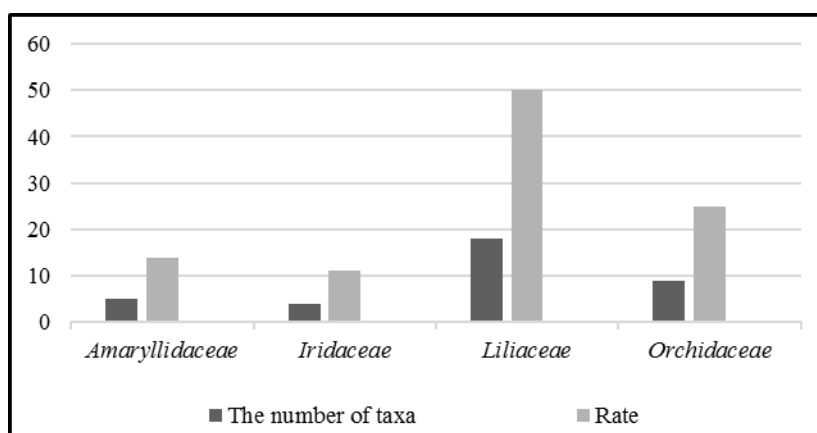


Figure 2. The distribution of families identified in the research area

Conservation of nature and the future of these plants which have ecological, economical, and visual importance, depend on the measures. Although the current regulations and prohibitions made to prevent the gene sources of geophytic plants reduce the amount of ecocide, it is still insufficient. Knowledge of biodiversity is required for conservation. The real solution can be obtained by making the promotion of these plants, determining growing techniques, and cultivation.

Geophytes identified in the research area such as *Leucojum aestivum*, *Anacamptis pyramidalis*, *Ophrys oestriifera* ssp. *oestriifera*, *Platanthera bifolia*, *Serapias vomeracea* ssp. *orientalis* and species of *Muscari* sp., *Ornithogalum* sp., *Scilla* sp., *Dactylorhiza* sp. provide visual impacts on the landscape. Rare species, these geophytic plants, stand out with their visual effects and provide opportunities for an alternative tourism type; flora tourism. It will provide the opportunity to make trekking, to see these plants on site and to learn the properties of the neighborhood. By this way, the local community will be supported economically and the awareness of learning the neighborhood and protecting the nature will be raised.

With this study, the geophytic plants spreading around the province of Bartın are identified, dangers are explained, reasons of pressure are set forth, and improvement opportunities are specified. This study aims to make contribution to future studies, nature conservation, social progress, and to determine the biological resources..

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