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The Geophytes of Sakarya City

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Abstract

Sakarya city is within the Europe-Siberia phytogeographic region in Turkey. The effect of the Black Sea climate is usually seen in the study area. Black sea climate is effective in the northern part, while the Mediterranean climate is generally dominant in the South. In the area under the influence of the Mediterranean climate, there is a vegetation where the maquis-pseudomaquis communities are seen. The main research area of this study is chosen to be the geophyte plants collected in the city of Sakarya, Turkey. 1051 plant specimens were collected during field studies between 2009-2020. From the plant collection, 220 taxa and 80 genus belonging to 29 families have been identified. 18 of these taxa, are endemic. Of the total taxa in the area are 40 elements Euro-Sibirian, 41 widespread, 79 Mediterranean, 7 Iranian-Turan, 16 Euxine, 34 phytogeographically unknown, 1 Hyrcano, 1 Hyrcano-Euxine, 1 North Americana elements.

Keywords: Geophyte, Endemic, Sakarya, Turkey

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1. INTRODUCTION

The term of Geophyte means ground plants. They are commonly known as onion, tuber, rhizome, corm plants. Turkey stays in mild climate zone in the World. From the plant variety point of view, it appears in the first rank. In Turkey there are exists about 12 000 plant taxa. Geophyte plants are of importance within this wealth flora. About 2500 geophyte plants grow in Turkey [1]. These plants are attractive for their alluring flowers. Geophytes are accepted to be the herald of the spring and the source of inspiration of arts and love. With this biodiversity in Turkey, the flora becomes privileged and the works carried upon these flora may thus have the potential to obtain different results. The geophyte species are the main part in the flora of Sakarya. In this study it is aimed to determine the geophyte taxa growing the city of Sakarya.

Sakarya city stays within the Europe-Siberia phytogeographic region (Figure 1). The effect of the Black Sea climate is mostly seen in the study area. While the black sea climate has a prominent effect in the northern part of the province, the Mediterranean climate is seen in the south. In the area under the influence of the Mediterranean climate, there is a vegetation where the maquis-pseudomaquis communities are seen.

There are various habitats in Sakarya province such as mauntainous areas, hills, valleys, wide sands, lakes, rivers, floodplain ranging from to 0 to 1600 m. There are many and different species in these particular habitat types. In this study geophyte species in Sakarya are given.

2. MATERIALS AND METHODS

The main materials for that study were geophyte plants spread in the city of Sakarya. The plants were collected between the years 2009 and 2020.

For the identification process of the taxa we used the books titled “Flora of Turkey and the East Aegean Islands [2-4]. The names of the detected species were organized according to the book “Türkiye Bitkileri Listesi (Damarlı Bitkiler)” [5]. The threat categories of these endemic and rare taxa were determined using the criteria described in the book “Türkiye Bitkileri Kırmızı Kitabı [6]” and IUCN [7]. Plants were made Herbarium materials and conserved at the herbarium of Biology Department, Sakarya University.

Some geofit taxa given in Geyve flora could not be found in the specified localities [8]. It has been observed that most of these localities have turned into agricultural lands or settlements. Taxa that we believe can be in the area but cannot be found by us are given with their records in this list.

Taxons collected in this study are given together with their localities, phytogeographic elements and endemism states.

2.1 Abbreviations

Sakarya University: SAU, Iranian Turanian Element: Ir.-Tur, Widespread: Widesp., -Siberian Element: Euro-Sib., Element: Mediterranean; Medit., Euxine Element: Eux., Hyrcano Element: Hyrc., Hyrcano-Euxine Element: Hyrc.-Eux., North America Element: N.Ame., Unknown: Unk., Critically endangered: CR, Endangered: EN, Vulnerable: VU, Near Threatened: NT, Least concern: LC.
3. RESULTS

Geophyte Flora of Research Area

**ALISMATACEAE**

*Alisma plantago-aquatica* L.

Sapanca lake, 10.06.2012, M. Sağiroğlu 3421. **Euro.-Sib.**

*Alisma lanceolatum* With.

Acarlar longozu, 15.06.2020, M. Sağiroğlu 6766. **Widesp.**

*Alisma gramineum* Lej.

Acarlar longozu, 15.06.2020, M. Sağiroğlu 6767. **Unk.**

**AMARYLLIDACEAE**

*Allium rubellum* M. Bieb

SAU- Aşağıdereköy way 100 m, 20.06.2012, M. Sağiroğlu 3544. **Ir.-Tur.**

*Allium paniculatum* L. subsp. *paniculatum*

SAU, surroundings of Engineering Faculty 180 m, 14.06.2012 M. Sağiroğlu 3541. **Medit.**

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

Pamukova Hayrettin village, 400 m, 15.07.2013, M. Sağiroğlu 3948. **Medit.**

*Allium pallens* L. subsp. *pallens*

Karasu-Akkum village, 40 m, 15.06.2012, M. Sağiroğlu 3848. **Medit.**

*Allium rupestris* Steven

Geyve, Kışlaçay-Doğançay, 2nd Km, 100 m, 14.11.2016, M. Sağiroğlu 5485. **Eux.**

*Allium hirtovaginatum* Kunth

Pamukova-Kırca upland, 850 m, 05.06.2013, M. Sağiroğlu 3940. **Medit.**

*Allium sativum* L.

Pamukova-Hüseyinli village way, 3rd km, 200 m, 17.06.2012, M. Sağiroğlu 3524. **Widesp.**

*Allium atrovioaceum* Boiss.

Kaynarca-Oflak Mountain, Around Taşoluk village, 170 m, M. Sağiroğlu 3954. **Widesp.**

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

Geyve, Doğançal village, 1340 m, 18.05.2017, M. Sağiroğlu 6065. **Widesp.**

*Allium ameloprasum* L.

Kaynarca-Karasu way, 3rd km, 60 m, 15.06.2012, M. Sağiroğlu 3993. **Widesp.**

*Allium sphaerocephalon* L. subsp. *sphaerocephalon*

Hendek-Çamlıca village, 700 m, M. Sağiroğlu 5032. **Euro.-Sib.**

*Allium amethystinum* Tausch

Geyve, Doğançal village, 1350 m, 18.05.2017, M. Sağiroğlu 6065. **Medit.**

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

Pamukova-Hüseyinli village way, 450 m, 17.06.2012, M. Sağiroğlu 3521. **Medit.**

*Allium lycaonicum* Siehe ex Hayek

Geyve, kulfalar-kamışlı road, 647 m, 20.04.2008, OUFE 15878 [8] **Unk.**
Leucojum aestivum subsp. aestivum
Karasu, around Karapınar village, 11 m, 05.04.2017, M. Sağiroğlu 5738. Euro.Sib.

Sternbergia lutea (L.) Ker Gawl. ex Spreng.
Serdivan-Kazımpaşa way, 2nd km, 09.10.2016, M. Sağiroğlu 5341. Widesp.

Pancratium maritimum L.
Karasu, Denizköy coast, 5 m, 18.09.2016, M. Sağiroğlu 5095. Medit.

Narcissus poeticus L. subsp. poeticus
Arifiye-Akçay stream, roadside, 50 m, 01.06.2011, M. Sağiroğlu 3096. Medit.

Narcissus jonquilla L.
Kaynarca-Kefken way, 2nd km, 120 m, 15.06.2012, M. Sağiroğlu 3489. Medit.

Narcissus pseudonarcissus L.
Karasu-Denizköy, roadside, 16.03.2020, M. Sağiroğlu 6628. Unk.

ARACEAE

Arum italicum Mill
Sapanca, İkramiye valley, 170 m, 01.06.2011, M. Sağiroğlu 3051. Unk.

Arum byzantinum Blume
Kaynarca,UGHuro village, clearings forest, 170 m, 27.04.2017, M. Sağiroğlu 5893. Eux.

Arum maculatum L.
Geyve, Epçelen village, 250 m, 13.06.2017, M. Sağiroğlu 5771. Unk.

Arum orientale M.Bieb.
Pamukova, Şahmelek village, 350 m, 02.04.2017, M. Sağiroğlu 5701. Eux.

Arum higrophilum Boiss. subsp. euxinum (R.R.Mill.) Alpınar. Endemic
Akyazı, Keremali mountain, 980 m, 09.03.2017, M. Sağiroğlu 5587. Eux.

Arum elongatum Steven
Sapanca, İkramiye valley, 250 m, 01.06.2011, M. Sağiroğlu 3091. Unk.

Dracunculus vulgaris Schott
Geyve, Hacılar village, 300 m, 25.05.2017, M. Sağiroğlu 6228. Medit.

ARISTOLOCHIACEAE

Asarum europaeum L.
Hendek-Kocaali road, Kırazlı village, 350 m, 25.04.2017, M. Sağiroğlu 5864. Euro.-Sib.

Aristolochia clematitis L.
Kaynarca-Oflak mountain, 150 m, 24.07.2013, M. Sağiroğlu 3955. Euro.-Sib.

Aristolochia pallida Willd.
Pamukova, Kazımiye, Kırca upland, 1000 m, 01.05.2017, M. Sağiroğlu 5931. Euro.-Sib.

Aristolochia bodamae Dingler
Akyazı, Sultanpinar upland, 1230 m, 08.06.201, M. Sağiroğlu 6247. Unk.

Aristolochia pontica Lam.
Geyve, Akınıç village, 570 m, 04.05.2016, M. Sağiroğlu 5000. Eux.

ASPARAGACEAE

Agave americana L. subsp. americana
Serdivan mountain, roadside, 210 m, 02.07.2011, M. Sağiroğlu 3148. Widesp.
Asparagus acutifolius L.
Geyve, between Kışlaçay-Doğançay, 150 m, 14.11.2016, M. Sağıröğlu 5487. Medit.

Asparagus aphyllu L. subsp. orientalis (Baker) P.H. Davis
Kaynarca, between Şeyhtımarı-Yenice, 180 m, 16.10.2016, M. Sağıröğlu 5344. Medit.

Asparagus tenuifolius Lam.
Pamukova, West of Kemaliye village, 732 m, 28.09.2016, M. Sağıröğlu 5266. Euro.-Sib.

Asparagus officinalis L. subsp. officinalis
Kaynarca, around Karaboğaz village, 120 m, 09.05.2017, M. Sağıröğlu 5964. Widesp.

Prospero autumnale (L.) Speta
Karasu, Denizköy coast, 5 m, 18.09.2016, M. Sağıröğlu 5101. Medit.

Bellevalia clusiana Griseb. Endemic
Sakarya, around Poyrazlar Lake, 30 m, 02.05.2017, M. Sağıröğlu 5954. Ir.-Tur.

Hyacinthella lineata (Steed. ex Schult. &Schult.f.) Chouard Endemic
Geyve-Akıncı village, Beşiktaş stream, 525 m, 13.04.2013, M. Sağıröğlu 3815. Medit.

Hyacinthella micrantha (Boiss.) Chouard. Endemic
Taraklı-Karagöl upland, 1122 m, 26.03.2017, M. Sağıröğlu 5659. Medit.

Galanthus elwesiïHokk.f. subsp. elwesii
Akyazı, Keremali mountain, 550 m, 09.03.2017, M. Sağıröğlu 5585. Medit.

Galanthus gracilis Çelak.
Geyve, Kışlaçay village, 133 m, 13.11.2016, M. Sağıröğlu 5476. Medit.

Galanthus nivalis L. subsp. nivalis
Kaynarca- Acarlar longozu, 20 m, 14.03.2020, M. Sağıröğlu 6635, Euro.-Sib.

Scilla bithynica Boiss.
Sakarya, Sinanoğlu village, open Quercus, 60 m, 28.02.2017, M. Sağıröğlu 5557. Eux.

Scilla bifolia L.
Akyazı. Dokurcun, Davlumbaz upland, 1000 m, M. Sağıröğlu 06.04.2017. Medit.

Muscari comosum (L.) Mill.
Pamukova, Şahmelek village, 300 m, 01.05.2017, M. Sağıröğlu 5905. Widesp.

Muscari armeniacum Leichtlin ex Baker
Kaynarca, around Karaboğaz village, 110m, 09.05.2017, M. Sağıröğlu 5963. Widesp

Muscari tenuiflorum Tausch.
Geyve, around Akıncı village, 140 m, 24.05.2017, M. Sağıröğlu 6186. Widesp.

Muscari bourgaei Baker
Akyazı, Dokurcun-Davlumbaz upland, 1450 m, 06.04.2017, M. Sağıröğlu 5749. Medit. Endemic

Muscari neglectum Guss. ex Ten.
Karasu, Sakarya riverside, 15, m, 09.05.2017, M. Sağıröğlu 5987. Medit.
Muscari aucheri (Boiss.) Baker **Endemic.**

Pamukova-Kazimiy-Kırca upland, 1020 m, 01.05.2017, M. Sağiroğlu 5932.  **Ir.-Tur.**

Ornithogalum pyrenaicum L.

Pamulova, Hüseyinli way, 3rd km, 11.05.2019, M. Sağiroğlu 6520.  **Euro.-Sib.**

Ornithogalum sphaerocarpum Kerner

SAU campus, 170 m, 18.05.2010, M.Sağıroğlu 2897.  **Widesp.**

Ornithogalum narbonense L.

Akyazı-Mudurnu, Taşkesti-Bakdemirler, 550 m, 08.05.2014, M.Sağıroğlu 4975.  **Widesp.**

Ornithogalum oligophyllum E.D.Clark

Pamukova, Kırca upland, 950 m, 02.04 2017, M. Sağiroğlu 5688.  **Eux.**

Ornithogalum montanum Cirillo.

Karasu-Karapınar village, 40 m, 05.04.2017, M. Sağiroğlu 5740.  **Medit.**

Ornithogalum fimbriatum Willd.

Pamukova, Çilekli village, 700 m, 23.06.2019, M. Sağiroğlu 6487.  **Medit.**

Ornithogalum wiedemannii Boiss. var. wiedemannii

Karasu, Camitepe village, 20 m, 06.03.2017,M.Sağıroğlu 5578.  **Widesp.**

Ornithogalum sigmoideum Freyn & Sint.

Taraklı-Şehren way, 300 m, 13.06.2017, M. Sağiroğlu 5783.  **Euro.-Sib.**

Ornithogalum comosum L.

Taraklı-Şehren way, 410 m, 13.04.2017, M. Sağiroğlu 5788.  **Medit.**

Ornithogalum umbellatum L.

Hende-karadere way 8. Km, 640 m, 20.03.2017, M. Sağiroğlu 5652.  **Medit.**

Ornithogalum orthophyllum Ten.

Hende-Düze border, left hand, 300 m, 20.03.2017, M. Sağiroğlu 5657.  **Widesp.**

Ornithogalum nutans L.

Geyve-Akınç village, 536 m, 15.04.2013, M. Sağiroğlu 3818.  **Medit.**

Polygonatum orientale Desf.

Geyve-Akınç village, Beşiktaş stream, 370 m, 07.05.2013, M. Sağiroğlu 3887.  **Eux.**

Polygonatum multiflorum (L.) All.

Geyve, Doğancılı, 1352 m, 18.05.2017, M. Sağiroğlu 6078.  **Widesp.**

Ruscus aculeatus L.

Geyve-Akınç village, Beşiktaş stream, 105 m, 19.11.2016, M. Sağiroğlu 5503.  **Medit.**

Ruscus hypoglossum L.

Geyve-Akınç village, Beşiktaş stream, 105 m, 19.11.2016, M. Sağiroğlu 5502.  **Euro.-Sib.**

ASTERACEAE

Helianthus tuberosus L.

Kaynarca-Şeyhtımarı village, 180 m, 16.10.2016, M. Sağiroğlu 5353.  **N. Ame.**

Leontodon tuberosus L.

Hende-Kocaali, 17th km, 800 m, 25.04.2017, M. Sağiroğlu 5873.  **Medit.**

Lactuca tuberosa Jacq.

Geyve-Setçe, 340 m, 10.05.2017, M. Sağiroğlu 6016.  **Widesp.**
BRASSICACEAE

*Cardamine bulbifera* (L.) Crantz
Sapanca-İ stanbulderesi, 300 m, 15.06.2011, M. Sağiroğlu 3119. **Euro.-Sib.**

*Cardamine quinquefolia* (M. Bieb.) Schmalh.
Karasu, Sinanoğlu köyü, under forest, 60 m, 14.03.2020, M. Sağiroğlu 6616. **Euro.-Sib.**

BORAGINACEAE

*Symphytum bulbosum* K.F. Schimp.
Karasu-Başoğlu- 15 m, 07.04.2013, D. Karaduman 1748, [9] **Medit.**

*Symphytum tuberosum* L. subsp. *nodosum* (Schur) Soó
Karasu-Manavpinar village, 20 m, 06.04.2017, M. Sağiroğlu 5706. **Euro.-Sib.**

BUTOMACEAE

*Butomus umbellatus* L.
Sapanca Lake, 30 m, 14.06.2012, M. Sağiroğlu 3515. **Euro.-Sib.**

COLCHICACEAE

*Colchicum umbrosum* Steven
Akyazı, AÇelya upland, 1218 m, 08.08.2018, M. Sağiroğlu 6437. **Medit.**

*Colchicum turcicum* Janka
Pamukova, Çilekli village, 700 m, 16.10.2018, M. Sağiroğlu 6452. **Medit.**

*Colchicum speciosum* Steven
Geyve, Şehren-Gündüzler villages, 3rd km, 09.10.2016, M. Sağiroğlu 5332. **Eux.**

*Colchicum atticum* Spruner ex Tommas
Pamukova-Mekece village, 600 m, 25.10.2017, M. Sağiroğlu 6417. **Medit.**

CYPERACEAE

*Carex flacca* Schreb. subsp. *erythrostachys* (Hoppe) Holub
Sapanca Lake, 30 m, 18.05.2010, M. Sağiroğlu 2900. **Medit.**

DIOSCOREACEAE

*Dioscorea communis* (L.) Caddick & Wilkin
Geyve, Akıncı village, Beşiktaş stream, 170 m, 07.05.2013, M. Sağiroğlu 3891. **Unk.**

GERANIACEAE

*Geranium tuberosum* L.
Arifiye, E5 Motorway, 70 m, 21.04.2010, M. Sağiroğlu 2830. **Ir.-Tur.**

*Geranium sylvaticum* L.
West of Sapanca Lake, 23.05.2011, M. Sağiroğlu 3038. **Euro.-Sib.**

*Geranium asphodeloides* Burm. subsp. *asphodeloides*
Serdivan mountain, 315 m, 28.04.2012, M. Sağiroğlu 3227. **Euro.-Sib.**

*Geranium sanguineum* L.
Pamukova, Kazımiye-Kırca upland way, 560 m, 01.05.2017, M. Sağiroğlu 5929. **Euro.-Sib.**

*Geranium pyrenaicum* Burm. f.
SAU, around guesthouse, 90 m, 24.05.2009, M. Sağiroğlu 2686. **Unk.**

*Erodium acaule* (L.) Becherer & Thell.
SAU campus, 110 m, 08.05.2011, M. Sağiroğlu 3029. **Medit.**
IRIDACEAE

*Crocus abantensis* T. Baytop & B. Mathew **Endemic**
Sakarya-Akyazi, Süülkü Lake, 1450 m, 26.03.2017, M. Sağiroğlu 5671. **Euro.-Sib.**

*Crocus chrysanthus* (Herb.) Herb.
Pamukova-Kırca upland, 992 m, 02.04.2016, M. Sağiroğlu 5686. **Unk.**

*Crocus danfordiae* Maw subsp. *danfordiae**Endemic*
Pamukova, Çilekli village, 750 m, 12.02.2019, M. Sağiroğlu 6465. **Unk.**

*Crocus flavus* Weston subsp. *flavus*
Sakarya Taşkısıği Lake, clearings forest, 100 m, 27.02.2017, M. Sağiroğlu 5523. **Euro.-Sib.**

*Crocus flavus* Weston subsp. *dissectus* T. Baytop & B. Mathew **Endemic**
Akyazi-Dokurcun, Davlumbaz upland, 1450 m, 06.04.2017, M. Sağiroğlu 5748. **Unk.**

*Crocus antalyensis* B. Mathew subsp. *antalyensis**Endemic*
Pamukova, Mesriyiye way, 740 m, 22.02.2019, M. Sağiroğlu 6467. **Medit.**

*Crocus olivieri* J. Gay subsp. *istanbulensis* B. Mathew **Endemic**
Pamukova, Çilekli village, 755 m, 19.03.2017, M. Sağiroğlu 6544. **Euro.-Sib.**

*Crocus olivieri* J. Gay subsp. *olivieri*
Pamukova-Kadıköy, Pamukova, 2nd km, 653 m, 02.03.2017, M. Sağiroğlu 5566. **Euro.-Sib.**

*Crocus pallasii* Goldb. subsp. *pallasii*
Doğançay-karaçam road, 90 m, 10.04.2007, OUFE 15888 [8]. **Unk.**

*Crocus speciosus* M. Bieb subsp. *speciosus*
Akyazi, Aşelya upland, 1157 m, 23.10.2016, M. Sağiroğlu 5425. **Euro.-Sib.**

*Crocus speciosus* M. Bieb subsp. *sakariensis* Rukşâns **Endemic**
Akyazi, Keremali mountain, 1300 m, 06.11.2016, M. Sağiroğlu 5454. **Euro.-Sib.**

*Crocus pulchellus* Herb.
Pamukova- Hüseyinli upland, 1140 m, 16.9.2018, M. Sağiroğlu 6454. **Medit.**

*Romulea columnae* Sebast. & Mauri subsp. *columnae*
Sakarya, Aşağıdere -Eşme way, 1st km, 40 m, 18.03.2012, M. Sağiroğlu 3212. **Medit.**

*Romulea linaresii* Parl. subsp. *graeca* Bég.
Geyve-Akıncı village, Beşiktaş stream, 540 m, 13.02.2013, M. Sağiroğlu 3812. **Medit.**

*Gladiolus italicus* Mill.
Geyve, Akıncı village, Hacılar station, 570 m, 04.05.2016, M. Sağiroğlu 4998. **Medit.**

*Gladiolus atroviolaceus* Boiss.
Geyve, Akıncı village, 400 m, roadside, 05.07.2016, M. Sağiroğlu 5012. **Ir.-Tur.**

JUNCACEAE

*Juncus acutus* L. subsp. *acutus*
Kaynarca, Ortaköy, 30 m, 06.05.2012, D. Karaduman 1232 [9]. **Widespr.**
**Juncus heldreichianus** Marssonsubsp. heldreichianus

Geyve-Pamukova yolu, 50 m, 10.05.2017, M. Sağiroğlu 6010. **Medit.**

**Juncus compressus** Jacq.

Sapanca lake, 30 m, 01.06.2012, M. Sağiroğlu 3374. **Unk.**

**Juncus articulatus** L.subsp. articularis

Geyve-Sakarya Nehri kenarı, 40 m, 10.05.2017, M. Sağiroğlu 6013. **Widespr.**

**LILIACEAE**

**Lilium martagon** L.

Hendek-Kocaali way, 22 km, 680 m, 14.06.2012, M. Sağiroğlu 3490. **Euro.-Sib.**

**Fritillaria pontica** Wahlenb.

Geyve, between Doğançay-Boğazköy, 560 m, 20.04.2017, , M. Sağiroğlu 5794. **Euro.-Sib.**

**Fritillaria bithynica** Baker

Pamukova, Kazımiye, Kirca upland, 1000 m, 01.05.2017, , M. Sağiroğlu 5930. **Medit.**

**Gagea bithynica** Pasch. **Endemic.**

Sakarya, west of Taşkısiği lake, 220 m, 27.02.2017, M. Sağiroğlu 5531. **Medit.**

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

Pamukova, Şahmelek village, 690 m, 02.03.2017, M. Sağiroğlu 5562. **Medit.**

**Gagea granatelli** (Parl.) Parl.

Akyazı-Dokurcun davlumbaz upland, 1400 m, 06.04.2017, M. Sağiroğlu 5751. **Medit.**

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

Geyve-Akıncı village, 520 m, 07.05.2013, M. Sağiroğlu 3902. **Widespr.**

**NYMPHAEACEAE**

**Nuphar lutea** (L.) Sm.

Sapanca lake, 30 m, 14.04.2009, M. Sağiroğlu 2733. **Unk.**

**Nymphaea alba** L.

Sapanca lake, 30 m, 24.05.2007, M. Sağiroğlu 2677. **Unk.**

**ORCHIDACEAE**

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

Geyve, Akıncı village, 450 m, 05.06.2016, M. Sağiroğlu 5011. **Widespr.**

**Cephalanthera longifolia** (L.) Fritsch

Geyve, Akıncı village, Beşiktaş stream, 340 m, 07.05.2013, M. Sağiroğlu 3883. **Medit.**

**Cephalanthera damosonium** (Mill.) Druce

Geyve, Akıncı village, 500 m, 10.05.2017, M. Sağiroğlu 6008. **Widesp.**

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

Geyve, Akıncı village, Beşiktaş stream, 290 m, M. Sağiroğlu 5002-B, **Unk.**

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

Geyve-Akıncı village, 350 m, 09.04.2016, M. Sağiroğlu 4989. **Medit.**

**Dactylorhiza saccifera**(Brongn.) Soó subsp. **saccifera**

SAU campus, near 190 m, 21.04.2010, M. Sağiroğlu 2862-A. **Medit.**
Dactylorhiza saccifera (Brongn.) Soó subsp. bithynica (H. Baumann) Kreutz *Endemic.*

Geyve-Burhaniye village, 380 m, 10.05.2017, M. Sağiroğlu 6002. *Medit.*

Dactylorhiza nieschalkiorum H. Baumann & Künkele *Endemic.*

Pamukova-Kırca upland, 1000 m, 05.06.2013, M. Sağiroğlu 3942. *Unk.*

Dactylorhiza incarnata (L.) Soó subsp. incarnata

SAU campus, near cafetaria, 190 m, 21.04.2010, M. Sağiroğlu 2862-B. *Medit.*

Epipactis helleborine (L.) Crantz subsp. helleborine

Geyve-Akıncı village, 800 m, 25.07.2013, M. Sağiroğlu 3959. *Widespr.*

Epipactis pontica Taubenheim

Geyve-Akıncı village, 450 m, 15.07.2013, M. Sağiroğlu 3946. *Eux.*

Limodorum abortivum (L.) Schwartz subsp. abortivum

Geyve, Akıncı village, Beşiktaş stream, 250 m, 07.05.2013, M. Sağiroğlu 3884. *Widespr.*

Spiranthes spiralis (L.) Chevall.

Geyve, Akıncı village, Beşiktaş stream, 290 m, 07.05.2013, M. Sağiroğlu 3890. *Medit.*

Platanthera bifolia (L.) Rich.

Sapanca-İstanbul stream, 370 m, 10.06.2011, M. Sağiroğlu 3395. *Euro.-Sib.*

Platanthera chlorantha (Cruster) Rehb.

Pamukova-Kırca upland, 990 m, 05.06.2013, M. Sağiroğlu 3944. *Widesp.*

Coeloglossum viride (L.) Hartman

Pamukova-upland of Hüseyinli village, 800 m, 17.06.2012, M. Sağiroğlu 3522. *Widespr.*

Himantoglossum caprinum (M. Bieb.) Spreng.

Kaynarca-Oflak mountain, 200 m, 24.07.2013, M. Sağiroğlu 3952. *Eux.*

Himantoglossum comperianum (Steven) P. Delforge

Geyve-Doğançay village, 560 m, 01.06.2013, M. Sağiroğlu 3938. *Ir.-Tur.*

Anacamptis pyramidalis (L.) Rich.

SAU campus, near cafetaria, 180 m, 14.05.2010, M. Sağiroğlu 2880. *Widespr.*

Listera ovata (L.) R. Br.

Serdivan mountain, 140 m, 02.07.2011. M. Sağiroğlu 3150. *Euro.-Sib.*

Neottia nidus-avis (L.) Rich.

Serdivan-Meşelik village, Fagus forest, 191 m, 02.07.2011, M. Sağiroğlu 3137. *Medit.*

Neotinea maculata (Desf.) Stearn

SAU campus, 140 m, 05.05.2019, M. Sağiroğlu 6497. *Medit.*

Steveniella satyroides (Spreng.) Schlrt.

Hendek, Kocaeli-Kirazlı 1st km, 285 m, 15.06.2012, M. Sağiroğlu 3492. *Hyrc.*

Ophrys speculum Link subsp. speculum

SAU campus, 164 m, 06.04.2019, M. Sağiroğlu 6608. *Medit.*

Ophrys speculum Link subsp. regis-ferdinandii (Acht. & Kellerer ex Renz) Soó
Taraklı-Şehren junction, 2nd km, 410 m, 13.04.2017, M. Sağiroğlu 5787. **Medit.**

**Ophrys mammosa** Desf. subsp. **mammosa**
SAU campus, 150 m, 06.04.2019, M. Sağiroğlu 6482. **Medit.**

**Ophrys oestrifera** M. Bieb subsp. **oestrifera**
SAU campus, Engineering M7, 90 m, 31.05.2012, M. Sağiroğlu 3319. **Medit.**

**Ophrys apifera** Huds.
Around SAU campus cafeteria, 100 m, 14.05.2010, M. Sağiroğlu 2874. **Medit.**

**Orchis tridentata** Scop.
SAU-Dereköy vay, 90 m, 08.05.2011, M. Sağiroğlu 3005. **Medit.**

**Orchis lactea** Poir.
Sakarya-Aşağıdereköy-Eşme way, 1.5 km, 55 m, 18.03.2012, M. Sağiroğlu 3213. **Medit.**

**Orchis purpurea** Huds. subsp. **purpurea**
SAU campus, cafeteria, 18.05.2010, M. Sağiroğlu 2896. **Euro.-Sib.**

**Orchis simia** Lam.
Pamukova, Şahmelek village, 650 m, 01.05.2017, M. Sağiroğlu 5901. **Medit.**

**Orchis italic**a Poir.
Geyve-Kulfalar village, 700 m, 28.02.2017, M. Sağiroğlu 5548. **Medit.**

**Orchis morio** subsp. **morio** L.
SAU campus, Engineering Faculty, 90 m, 21.04.2010, M. Sağiroğlu 2828. **Unk.**

**Orchis morio** L. subsp. **picta** (Loisel.) K. Richt.
Pamukova-Kazımıye, Kırca upland, 950 m, 01.05.2017, M. Sağiroğlu 5918. **Widesp.**

**Orchis anatolica** Boiss.
Geyve, Kulafalar – Kamuﬂı way, 12.03.2003, OUFE 12821 [8]. **Medit.**

**Orchis mascula** (L.) subsp. **pinetorum** (Boiss. & Kotschy) G. Camus
Geyve, Doğançıl village, 1300m, 18.05.2017, M. Sağiroğlu 6082-A. **Widespr.**

**Orchis pallens** L.
Geyve, Doğançıl village, 1400 m, 18.05.2017, M. Sağiroğlu 6081. **Euro.-Sib.**

**Orchis palustris** Jacq. subsp. **palustris**
Geyve, north of Doğançıl village, 1400m, 18.05.2017, M. Sağiroğlu 6082-B. **Widesp.**

**Orchis laxiflora** Lam. subsp. **laxiflora**
Around İkramiye village, clearings forest, 400 m, 13.05.2012, M. Sağiroğlu 3272, **Medit.**

**Orchis coriophora** L. subsp. **coriophora**
SAÜ-Dereköy way, clearings forest, 50 m, 08.05.2011, M. Sağiroğlu 3004. **Medit.**

**Serapis cordigera** L. subsp. **cordigera**
Karasu-Acarlar longozu, 27.05.2012, D. Karaduman 1371 [9]. **Medit.**

**Serapis vomeracea** (Burm.f.) Briq. subsp. **laxiflora** (Soó) Götzl & H. R. Reinhard
Geyve, karaçam-İlimbey way, 12.03.2003, OUFE 12809 [8]. **Medit.**

**Serapis bergonii** E.G. Camus
SAU campus, around cafeteria, 202 m, 31.05.2012, M. Sağiroğlu 3320. **Medit.**
OXALIDACEAE

*Oxalis acetosella* L.
Geyve, between Doğançay-Maksudiye, 200 m, 20.04.2017, M. Sağiroğlu 5805. Unk.

*Oxalis articulata* Savigny
Serdivan-Meşeli village, 110 m, 02.07.2011, M. Sağiroğlu 3144. Unk.

*Oxalis corniculata* L.
Sapanca-İkramiye valley, 70 m, 01.06.2011, M. Sağiroğlu 3066. Unk.

PAEONIACEAE

*Paeonia peregrina* Mill.
Geyve, Doğancıl village, 650 m, 18.05.2017, M. Sağiroğlu 6052. Unk

*Paeonia arietina* G. Anderson
Geyve-Tuzla, plateau path, 1450 m, 10.06.2020, M. Sağiroğlu 6697. Ir.-Tur.

PAPAVERACEAE

*Corydalis caucasica* DC. subsp. *abantensis* Lidén. Endemic
Geyve, Kamışlı village, 1510 m, 30.03.2017, M. Sağiroğlu 5683. Eux.

*Corydalis cava* (L.) Schweigg. & Körtes subsp. *marschalliana* (Willd.) Hayek
Taraklı, Karagöl upland, 1100 m, 26.03.2017, M. Sağiroğlu 5663. Euro.-Sib.

*Corydalis solida* (L.) Clairv subsp. *solida*.
Pamukova, Kazımiye, Kirca upland, 950 m, 02.04.2017, M. Sağiroğlu 5690. Euro.-Sib.

POLYGONACEAE

*Rumex tuberosus* L. subsp. *creticus* (Boiss.) Rech.f.
Kaynarca-Oflak mountain, 150 m, 25.07.2013, M. Sağiroğlu 3956. Medit.

*Rumex tuberosus* L. subsp. *tuberosus*
SAU, Engineering M7, 180 m, 20.06.2012, M. Sağiroğlu 3543. Medit.

POACEAE

*Hordeum bulbosum* L.
Serdivan mountain, 220 m, 02.07.2011, M. Sağiroğlu 3431. Widesp.

*Poa bulbosa* L.
West of SAU campus, 110 m, 06.05.2011, M. Sağiroğlu 3256. Widesp.

*Dactylis glomerata* L. subsp. *glomerata*
SAU, Engineering M7, 80 m, 27.05.2012, M. Sağiroğlu 3306. Euro.-Sib.

PRIMULACEAE

*Primula acaulis* (L.) L. subsp. *acaulis*
Geyve, between Boğazköy-Koru, 600 m, 16.03.2017, M. Sağiroğlu 5637-A, Euro.-Sib.

*Primula acaulis* (L.) L. subsp. *rubra* (Sm.) Greuter & Burdet
Geyve, between Boğazköy-Koru villages, 600 m, 16.03.2017, M. Sağiroğlu 5637-B. Eux.

*Cyclamen hederifolium* Aiton
Geyve, Akıncı village, rocky fields, 210 m, 13.02.2013, M. Sağiroğlu 3810. Medit.

*Cyclamen coum* Mill. subsp. *coum*
Geyve, between Doğançay-Kışlaçay, 100 m, 14.11.2016, M. Sağiroğlu 5483. Unk.
Cyclamen coum Mill. subsp. caucasicum (K. Koch) O. Schwarz
Karasu, Sinanoğlu village, 35 m, clearings forest, 11.12.2016, M. Sağiroğlu 5510. Unk.

Lysimachia vulgaris L.
Arifye- Kalaycı, 90 m, 25.05.2013, M. Sağiroğlu 3931. Widesp.

Lysimachia punctata L.
Pamukova, Hüseyinli İnönü upland, 950 m, 26.07.2019, M. Sağiroğlu 6607. Euro.-Sib.

Lysimachia verticillaris Spreng.
Hendek-Çamlıca village, 900 m, 04.08.2016, M. Sağiroğlu 5056. Hyrc.-Eux.

RANUNCULACEAE

Helleborus orientalis Lam.
SAU campus, Teras houses, 200 m, 14.04.2009, M. Sağiroğlu 2737. Eux.

Anemone coronaria L.
Pamukova-Şahmelek village way, 190 m, 28.02.2017, M. Sağiroğlu 5559. Medit.

Anemone hortensis L.
Pamukova, Mekece-Kemaliye road, 200 m, 22.03.2020, M. Sağiroğlu 6662. Unk.

Adonis aestivalis L. subsp. aestivalis
SAU campus, west entrance, 90 m, 08.05.2011, M. Sağiroğlu 3001. Widesp.

Adonis flammea Jacq.
Geyve, Akıncı village, 400 m, 04.05.2016, M. Sağiroğlu 5001. Widesp.

Ranunculus brutius Ten.
Saparnca, around İkramiye village, 200 m, 30.09.2011, M. Sağiroğlu 3190. Euro.-Sib.

Ranunculus neapolitanus Ten.
SAU campus, Hillside, 90 m, 20.06.2012, M. Sağiroğlu 3542. Medit.

Ranunculus velutinus Ten.
Geyve-Akıncı village, around church, 450 m, 25.04.2013, M. Sağiroğlu 3840. Medit.

Ranunculus repens L.
Sapanca Lake roadside, 30 m, 08.05.2011, M. Sağiroğlu 3017. Widesp.

Ranunculus costantinopolitanus (DC.) d’Urv.
Pamukova, Kırca upland, 950 m, 02.04.2017, M. Sağiroğlu 5690-A. Widespr.

Ranunculus paludosus Poir.
Pamukova-Ahiler village, 250 m, 09.05.2014, M. Sağiroğlu 4979. Unk.

Ranunculus illyricus L. subsp. illyricus
Serdivan mountain, roadside, 150 m, 02.07.2011, M. Sağiroğlu 3153. Widesp.

Ranunculus gracilis E.D.Clarke.
Akyazı, between Şerefiye-Reşadiye, 1,5 km, 276 m, 08.05.2014, M. Sağiroğlu 4971. Unk.

Ranunculus ficaria L. subsp. ficariformis Rouy & Foucaud
SAU campus-Eşme way, 240 m, 08.05.2011, M. Sağiroğlu 3003. Unk.

Ranunculus peltatus Schrank subsp. fucoides (Freyn) Muñoz Garm.
Arifye-İkramiye village way, moist places, 150 m, 01.06.2011, M. Sağiroğlu 3053. Unk.
4. DISCUSSION and CONCLUSIONS
As a result of the diagnosis; taxa identified 80 genus, 220 in 29 families in research area. Of these, 29 were identified as endemic and rare species, 13.1% respectively. 29 taxa are endemic and non-endemic taxa (Table 1), risk categories of
Five genera were the largest in terms of number of taxa included in the numerical distribution as follows; *Allium* (15), *Crocus* (13), *Orchis* (12), *Ranunculus* (10), *Iris* (7).

220 plant taxa belonging to 29 families have been collected from the working area. Amongst them 18 are endemic. If we look at the geographical regions it seems that the endemic Siberian character, 41 multi phytogeographical region character, 34 unknown region character, 16 Euxine character, 7 Irano-Turanian character, 1 Hyrcano character, 1 Hyrcano-euxine character and North Americana character.

Table 1
Endemic/rare taxon and their danger category for the current study

| Familya | Taxon | Endemic/rare | Danger category |
|---------|-------|--------------|-----------------|
| Asparagaceae | *Bellevalia clusiana* | Endemic | LC |
| Asparagaceae | *Hyacinthella lineata* | Endemic | LC |
| Asparagaceae | *Hyacinthella micrantha* | Endemic | VU |
| Asparagaceae | *Galanthus nivalissubsp. nivalis* | Rare | VU |
| Asparagaceae | *Muscaria aucheri* | Endemic | LC |
| Asparagaceae | *Muscaria bourgaei* | Endemic | LC |
| Iridaceae | *Crocus antalyensis* | Endemic | VU |
| Iridaceae | *Crocus antalyensis* | Endemic | NT |
| Iridaceae | *Crocus danfordiae* | Endemic | VU |
| Iridaceae | *Crocus olivieris* | Endemic | CR |
| Iridaceae | *Crocus flavus* | Endemic | VU |
| Iridaceae | *Crocus pestalozzae* | Endemic | VU |
| Iridaceae | *Crocus spectosus* | Endemic | CR |
| Iridaceae | *Iris purpureabractea* | Endemic | NT |
| Iridaceae | *Iris germanica* | Rare | VU |
| Iridaceae | *Iris suaveolens* | Rare | VU |
| Iridaceae | *Iris pseudacorus* | Rare | VU |
| Liliaceae | *Gagea bithynica* | Endemic | VU |
| Orchidaceae | *Dactylorhiza saccifera* | Endemic | LC |
| Orchidaceae | *Dactylorhiza nieschalkiorum* | Endemic | VU |
| Orchidaceae | *Dactylorhiza saucifera* | Endemic | VU |
| Orchidaceae | *Dactylorhiza nieschalliorum* | Endemic | VU |
| Orchidaceae | *Arum higrophyllum* | Rare | VU |
| Orchidaceae | *Arum lacteum* | Rare | VU |
| Orchidaceae | *Arum anatolica* | Rare | VU |
| Orchidaceae | *Arum coriophoractus* | Rare | VU |
| Paeoniaceae | *Paeonia peregrina* | Rare | VU |
| Papaveraceae | *Corydalis caucasica* | Rare | VU |
| Araceae | *Arum higrophyllum* | Rare | VU |
| Araceae | *Dracunculus vulgaris* | Rare | VU |
| Amaryllidaceae | *Leucojum aestivum* | Rare | VU |
| Amaryllidaceae | *Pancratium maritimum* | Rare | VU |
taxa are focused on the south region of the city Sakarya. The towns Pamukova and Geyve display Mediterranean-like climate conditions. Therefore, the great amount of endemic taxa have been found in those regions.

studies on the geophyte plants are very limited in Turkey. In that current work we have investigated only the geophyte plants in the region of research area. In the works by Değerli (2018) and Öz (2019) the geophytes of the Muğla city have been investigated (Table 2). In these works Değerli (2018) has found 77 geophyte taxa, whereas Öz (2019) has observed 84 of them [10,11]. From that point of view this work is a comprehensive study carried out on a specific region.

Table 2
Comparison with other studies

| Area worked     | Taxa              |
|-----------------|------------------|
| Sakarya city    | 220 geophytes    |
| Muğla, [11]     | 77 geophytes     |
| Muğla (Dalaman) [12] | 84 geophytes |

People of Sakarya use plants intensively for ethnomedical purposes [12,13, 14]. Some plants are used extensively by the public in the study area. The most important of these is the *Leucojum aestivum* (Göl Soğanı) plant [15]. As a result of scientific studies, this plant; The emergence of its usability in the treatment of Alzheimer's disease has further increased the public's demand for this plant. In addition to the use of the people, the plant is completely dismantled and sold. Unfortunately, this is not in a plan. Wherever the people find the plant, it disassembles and sells it. Similar or close conditions are valid for species belonging to *Asparagus, Aristolochia, Crocus, Orchis, Ophrys, Arum, Dracunculus* genus. This situation causes the natural populations of plants to decrease rapidly.

Our natural onions are at risk due to unconscious picking, grazing pressure, unconscious export, tourism activities and many other reasons. Our people should be properly trained in the use of these plants, both in terms of conservation of our biodiversity and our country's economy.

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No conflict of interest or common interest has been declared by the author.

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The author declares that this document does not require an ethics committee approval or any special permission.

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The author of the paper declares that he complies with the scientific, ethical and quotation rules of SAUJS in all processes of the paper and that he does not make any falsification on the data collected. In addition, he declares that Sakarya University Journal of Science and its editorial board have no responsibility for any ethical violations that may be encountered, and that this study has not been evaluated in any academic publication environment other than Sakarya University Journal of Science.
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