

Ecology and Morpho-anatomical structure of *Comperia comperiana* (Steven) Asch. & Graebn. and its on contribution to the taxonomy of Orchidaceae

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ABSTRACT

In this study, in the present study reveals the morphological, anatomical and ecological characteristic of *Comperia comperiana* (Steven) Asch. & Graebn. in Turkey. Plant materials of *Comperia* species were collected from one population, between 2018 in Eskişehir/Turkey. *Comperia comperiana* samples were analyzed for 9 morphological, 5 anatomical and soil characters and habitat properties. In morphological investigations, the structure of flower, lateral sepal, petal, dorsal sepal, lip, anther cap and column was determined. The findings were compared with those in Flora of Turkey. to habitat definition, *Comperia comperiana* grew up to 880 m to 1000 m. Also, *Quercus cerris* forests and glades were most common habitat of *Comperia comperiana*, found generally over calcareous soils.

Keywords: *Comperia*, Ecology, Morphology, Anatomy, Orchidaceae

INTRODUCTION

The flora of Turkey is represented 1.220 genus and 11.707 species and sub-species which belong to 154 family. Turkey is one of the country that has the richest flora in the World with 11.707 species and sub-species taxa. Floristic Statement of Steppe in Central Anatolia According to the study of Turkey's Flora the number of species is more than 2.000. The number of endemic species is higher in Central Anatolia as well as floristic richness (Akman, 2014). In the steppes of Central Anatolia particularly species of Labiatae, Scrophulariaceae, Caryophyllaceae, Crucifera, Boraginaceae, Cistaceae and Leguminosae families are predominate (Akman, 2014).

Orchidaceae is the most famous and attractive plant family among all plant families of the world (Arditti, 1992; Prigdeon, 1992). The family Orchidaceae comprises approximately 19,500 species distributed all around the world. Turkish orchidaceae were introduced in the volume 8 and 11 of Flora of Turkey. *Comperia* is a minor genus of Orchidaceae family in Flora of Turkey, represented by one species (Renz and Taubenheim, 1984; Kreutz, 2000). In Turkey, Orchidaceae is represented by 26 genus and about 166 species, of which 60 are endemic (Davis et al. 1978; Güner et al. 2000) Most cultivars are tropical or sub-tropical. Many orchidaceae species are threatened in wild due to over collection and habitat degradation. Therefore, orchidaceae studies have got considerable importance. This species is known as salep in Turkey likes many other members of Orchidaceae (Baytop, 1997; Tuzlaci, 2006). Dried and powdered roots of this species are used to produce hot beverage "salep" and in preparing ice cream. For this reason many individuals of this species are collected and sold by local people (Toroglu *et al.*, 2010).

COMPERIA C. Koch

Plants usually robust, with undivided globose tubers. Stem leafy, mainly below. Spike few- to many-flowered, rather lax. Flowers large, showy. Sepals coanivent into a hood (galea) with free tips. Petals linear, adhering to sepals. Labellum expanded from broadly triangular-cuneate, inwardly curved base into

4 very long filiform segments. Spur cylindrical, slightly shorter than ovary. Caudicles of the 2 pollinia attached to separate viscidia, both enclosed in a single pouch. Ovary cylindrical-fusiform, subsessile, slightly twisted, glabrous. -Monotypic.

The aim of the present study is to describe the morphological and anatomical structure and in addition to investigate the epidermal cell and stomata of leaves of *C. comperiana*. Moreover the research contributes to the taxonomy of Orchidaceae family (Davis et al. 1988).

MATERIALS AND METHODS

Comperia comperiana was collected from Eskişehir: Sarıcakaya-Hekimdağ, below Quercus trees, 980 m., 19.05.2018 and stored in the Eskişehir Osmangazi University Herbarium as a herbarium specimen (OUFE 12509). Determination of the species was made according to the Davis (1978 & 1988). Morphological descriptions are based on living plants and herbarium specimens.

In anatomical studies, the collected plant were stored in 70% alcohol, and made permanent with glycerine-gelatin by taking cross-sections from their root, stem, leaf and surface sections of the leaf (Vardar 1987). A light microscope was used to examine the sections and photographs were made using a Olympus CX41, diagnostic digital camera. For each plant sample, morphological and ecological features were recorded. . In this study, plant samples were collected for anatomical studies.

The surface layer of soil was removed and soil samples taken from 0-5 and 5-15 cm depth were analysed. The samples were air dried, ground, passed through a 2 mm sieve and subjected to physico-chemical analysis. Total soluble salts, pH, calcium carbonate content and texture were determined by the methods outlined in detail by Ozturk et al. (1997).Results and discussion

CONCLUSION

C. comperiana (Steven) Aschers. & Graebn.

Plants to 60 cm. Leaves 3-4, oblong-ligulate to lanceolate, to 15 x4 cm. Spike broadly cylindrical, rather lax *Fl.* (4-)5-7 (Fig. 1). Quercus forests, mainly in montane region, 900-1000 m.



Figure 1. *C. comperiana* (Steven) Aschers. & Graebn. A. Herbarium image, B-C. Habitat view.



Figure 2. *C. comperiana* morphology: **A** dorsal sepal , **B** ,Brakte, **C** Spur, **D**, Labellum

Bracts linear-lanceolate. Hood olivegreen, often flushed brownish-purple or rose, to 20 mm. Petals with sinuate margins and 1-2 fine teeth. Labellum 3-lobed, base rose-tinged or whitish, lateral lobes prolonged into pendulous segments, middle lobe divided into 2 segments, all up to 8(-10) cm. Column c. 5 mm, brownish-purple. Ovary to 15 mm (Fig. 2).

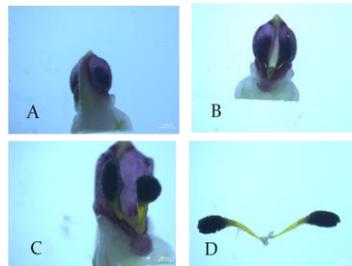


Figure 3. *C. comperiana* morphology: **A -B -C** anther cap and column, **D** Anters
Anatomical Results (Root)

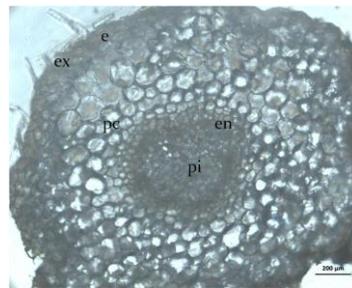


Figure 4. Root transverse section of *C. comperiana*, **e** epidermis, **ex** exodermis, **pc** parenchymatic cells, **en** endodermis, **pi** pith (Bar 100 μm)

Anatomical Results (Stem)

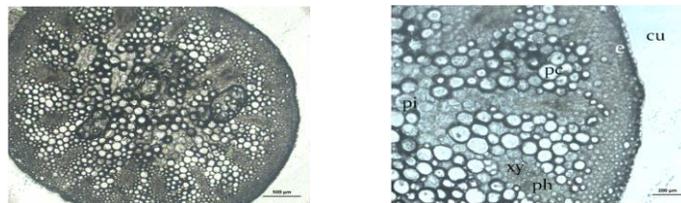


Figure 5. Stem transverse section of *C. comperiana*, **cu** cuticle, **e** epidermis, **pc** parenchymatic cells, **ph** phloem, **xy** xylem, **pi** pith (Bar 100 μm)

Anatomical Results (Leaf)

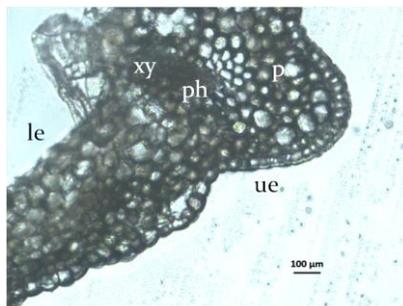


Figure 6. Leaf transverse section of *C. Comperiana*, **k** kutikula, **ue** upper epidermis, **p** parenchyma, **ph** phloem, **xy** xylem, **le** lower epidermis (Bar 100 μm)

Anatomical Results (Leaf superficial)

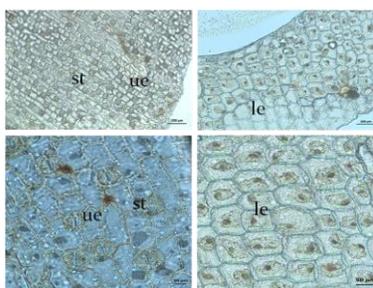


Figure 7. Leaf epidermal peeling of *C. comperiana*, **ue** upper epidermis, **le** lower epidermis, **st** stomata

In this study *C. comperiana* was investigated ecology, morphologically and anatomically. Morphological drawings of flower, lateral sepal, dorsal sepal, petal, lip, anther cap and column were made. The results obtained from morphological studies were generally consistent with the description given in the Flora of Turkey (Davis 1978 & 1988). The leaf is isolaral and compose of parenchymatic cells with intensively chloroplast. Vascular bundle is collateral and there hasn't bundle sheath. Stoma cells are located only on the abaxial side of the epidermis, as shown in Figure 6; just as Sevgi et al. (2012) were reported.

Cross section of root showed single layered epidermal cells. The cell length was longer than width (20-40 × 30-50 μm). Cortex consisted of 10-18 layered parenchymatous cells. The shape of cortex cells ranged from oval to globular. These cells were 55-130 μm in diameter and their walls were thin. Parancymatic cells located far from center were smaller than the ones close to center (Fig. 4). Similar results have been earlier reported by several authors in members of Orchidaceae family (Aykebe *et al.*, 2010; Durmuskahya *et al.*, 2015). Endodermal cells (25-40 × 20-50 μm) with thickened wall were seen but were not visible clearly. Pericycle was single-layered and located under endodermis (Fig. 4). The anatomical section of stem showed thick cuticle layer. Under this layer there was a single layered epidermis. Epidermal cells were square or rectangular shaped, 20-60 × 10- 50 μm. 8-12 layers of cortex cells were found under epidermis with 20-70 μm diameter. Few collenchyma cells with thick and lignified cell walls were found in cortex layer. 10-18 layered collenchyma cells gave durability to the stem. Cortical parenchyma, a thinner layer than collenchyma was found with large amount of starch grains (Fig. 5, Tab. 3). Presence of collenchyma cells in *Ophrys* L. and *Dactylorhiza* Necker ex Nevski have been reported previously in other studies (Altundag *et al.*, 2012; Aykebe *et al.*, 2010). Vascular bundles were collateral and located in

one ring. The bundle sheath consisted of sclerenchymatic cells, at the phloem pole of vascular bundles. Pith had many lacunas in the centre of stem due to the breakup of pith into pieces (Fig. 5).

In leaves, upper epidermis consisted of a single layer of rectangular cells (50-100 × 60-85 µm) with smooth cuticle. Upper epidermis was 40-80 × 20-60 µm. Lower epidermis cells were bigger than upper epidermis cells and lower cuticle thicker than lower (Fig 6, Tab. 4). These features were observed in *C. comperiana* Hudson by Aybeke *et al.* (2010). But observed that these species had thicker cuticle on upper side and they had similar thickness on both lower and upper surface. Mesophyll layer was homogenous, without any differentiation in to palisade and sponge parenchyma tissues. As far as ecological status is concerned, due to its extreme habitat, its population are limited. Therefore, some scientist accept that it is an endangered species. Because of local use of this species like in preparing *salep* (Tecimen *et al.*, 2010), natural population is decreasing day by day. As compared to other orchid species, which are used for salep making, such as *Serapias vomeracea*, *Orchis anatolica*, *Anacamptis pyramidalis* (L.) Rich., it was found that in different habitat it blossoms in later time and these reason makes it easy target for plant collectors.

This species usually prefers calcareous soil. It is difficult to find them in clay or on alluvial soil. The soil analysis showed that at 0-5 cm soil depth, stoniness was around 16.8 % and these are mid stony soils (Cepel, 1988). The sand, silt and clay were 59. 25 and 22 % respectively at this depth. Soil was neutral with pH 6.86 and had high humus content. Total nitrogen content of the soil was 0.30 % and C:N ratio 35.15. At 5-15 cm soil depth stoniness was nearly same as in the upper layer, stressing the fact that this species preferred stony soil.

In this study, morphological, anatomical and ecological features of *C. comperiana* were evaluated for the first time in Turkey. We believed that these ecological information and numerical data about species will be useful for further orchidaceae studies.

REFERENCES

- Akman, Y., Ketenoğlu, O., Kurt, L., & Vural, M. (2014). The steppe vegetation of Inner Anatolia.
- Arditti, J. (1992). Fundamentals of orchid biology. John Wiley & Sons.
- Baytop, T. (1997). Türkçe bitki adları sözlüğü. Türk tarih kurumu.
- Çepel, N. (1988). Peyzaj ekolojisi.
- Davis, P.H. 1978. Flora of Turkey and The East Aegean Islands 8, Edinburgh Univ. Press, Edinburgh
- Durmuşkahya, C., Akyol, Y., & Özdemir, C. (2015). Ecology, anatomy and morphology of *Orchis spitzelii* in Turkey. Journal of environmental biology, 36, 177-184.
- Güner, A., Özhatay, N., Ekim, T., & Başer, K. H. C. (2000). Flora of Turkey and the east Aegean Islands. Supplement, 2, 28.
- Kavgacı, A., Carni, A., Tecimen, B., & Ozalp, G. (2010). Diversity and ecological differentiation of oak forests in NW Thrace (Turkey). Archives of Biological sciences, 62(3), 705-718.
- Pridgeon, A. M. (1992). The Illustrated encyclopedia of orchids.
- Renz, J., & Taubenheim, G. (1984). *Dactylorhiza Necker ex Nevski*. Flora of Turkey and the east Aegean islands, 8, 535-551.

Su, O., Toroglu, I., & Akcin, N. A. (2010). An evaluation of the impact strength index as a criterion of grindability. *Energy Sources, Part A: Recovery, Utilization, and Environmental Effects*, 32(17), 1671-1678.

Tuzlacı, E. (2006). *Türkiye bitkileri sözlüğü: türkçe-latince, latince-türkçe; bitki adlarının özel açıklamaları*. Alfa Basım Yayım Dağıtım.

Vardar, Y. (1987). *Botanikte preparasyon tekniği*. Ege Üniversitesi, İzmir.