

**MORPHOLOGICAL AND ANATOMICAL CHARACTERISTICS
 OF *Veronica turrilliana* Stoj. & Stef. (Scrophulariaceae): THE RARE
 AND THREATENED SPECIES OF TURKEY**

S. DEMİRCİ*, N. ÖZHATAY, E. AKALIN

SUMMARY

Veronica turrilliana Stoj. & Stef. is a Balkan endemic species widely distributed in Northern part of European Turkey. It is listed as threatened species in App.I of the Bern Convention. The species was described by N. Stojanov and B. Stefanov in 1923 from material collected from the Strandzha Mountains in Southeast Bulgaria. In this paper, morphological descriptive characteristics of *V. turrilliana*, its distribution and approaches on threats and conservation is given. Also anatomical properties of its aerial parts have been presented.

ÖZET

Balkan endemiği olan *Veronica turrilliana* Stoj. & Stef. Trakya'nın kuzeyinde oldukça geniş bir yayılışa sahip olan ve Bern Sözleşmesi Ek Liste I'de yer alan nadir bir türdür. İlk kez 1923 yılında N. Stojanov ve B. Stefanov tarafından Bulgaristan'ın güneydoğusunda, Istranca dağlarından toplanan örneklerle bilim dünyasına tanıtılmıştır. Bu çalışmada *V. turrilliana* türünün morfolojik ve tanıttıcı özellikleri, yayılışı, tehdit ve korunması ile ilgili görüşler verilmiştir. Ayrıca toprak üstü kısmının anatomik özellikleri belirtilmiştir.

Key words: *Veronica turrilliana*, European Turkey, Morphology, Anatomy, Description, Threats, Conservation

INTRODUCTION

The genus *Veronica* L. consists of about 500 species widely distributed throughout the Northern and Southern Hemisphere. It is ecologically di-

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verse with species growing in aquatic to dry steppe habitats, from sea level to high alpine regions (1, 2). In Turkey, the genus *Veronica* has 109 taxa of which 37 are endemic (34 %). In European part of Turkey this genus is represented by 28 species (3, 4, 5, 6, 7).

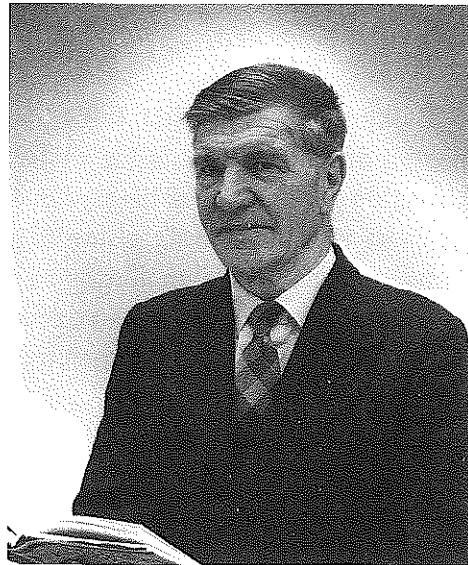
The list of the *Veronica* species occurring in European Turkey: R =rare, B= Bern species)

| | |
|---|--|
| <i>V. acinifolia</i> L. | <i>V. multifida</i> L. |
| <i>V. anagallis-aquatica</i> L. | <i>V. officinalis</i> L. |
| <i>V. anagalloides</i> Guss. | <i>V. pectinata</i> L. var. <i>pectinata</i> |
| <i>V. arvensis</i> L. | <i>V. persica</i> Poiret |
| <i>V. beccabunga</i> L. | <i>V. polita</i> Fries |
| <i>V. bozakmanii</i> M.A. Fischer | <i>V. pontica</i> Velen. |
| <i>V. chamaedrys</i> L. | <i>V. prostrata</i> L. (7) |
| R <i>V. crinita</i> Kit. ex Schultes | <i>V. samuelssonii</i> Rech. fil. |
| <i>V. cymbalaria</i> Bodard | <i>V. scutellata</i> L. |
| <i>V. dillenii</i> Crantz | <i>V. serpyllifolia</i> L. |
| <i>V. grisebachii</i> S.M. Walters | <i>V. triloba</i> (Opiz) Kerner |
| <i>V. hederifolia</i> L. | <i>V. triphyllos</i> L. |
| <i>V. jacquinii</i> Baumg. | B <i>V. turrilliana</i> Stoj. & Stef. |
| <i>V. montana</i> L. | <i>V. verna</i> L. |

Veronica turrilliana Stoj. & Stef. was described in 1923 by Bulgarian botanists N. Stojanov and B. Stefanov from the specimens collected in 1921 by them northwards of Mal-ko Turnovo, in Bulgaria (Strandzha Mountains).

Its species name came after English botanist William Bertram Turrill, (1890-1961), he joined Kew as assistant in 1909 and remained there until retirement, he was keeper of Kew Herbarium and Library (1946-1957). He is an author of several books including *Balkan Plants Life* (8) and *British Plant Life* (9).

This rare species has been studied recently from chemically point of



William Bertram Turrill, (1890-1961)

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view and preliminary investigations revealed that this species had a chemical profile different from other representatives of subgenus **Pentasepalae** (10).

The list of the species named by W. B. Turrill and recorded in the *Flora of Turkey and the East Aegean Islands*.

| | |
|---|--|
| <i>Alyssum campestre</i> L. var. <i>compactum</i> Turrill | <i>Herniaria micrantha</i> A. K. Jackson & Turrill |
| <i>Biarum davisii</i> Turrill | <i>Limonium angustifolium</i> (Tausch) Turrill |
| <i>Campanula davisii</i> Turrill | <i>Orbanche amethystea</i> Turrill |
| <i>Centaurea albonitens</i> Turrill | <i>Ornithogalum alatum</i> Turrill |
| <i>Clypeola aspera</i> (Grauer) Turrill | <i>Sempervivum minus</i> Turrill |
| <i>Dianthus ingoldbyi</i> Turrill | <i>Silene vulgaris</i> (Moench) Garcke |
| <i>Euphorbia amygdaloides</i> L. | var. <i>macrocarpa</i> (Turrill) Coode & Cullen |
| var. <i>robbiae</i> (Turrill) Radcliffe-Smith | <i>Trifolium stellatum</i> L. |
| <i>Fritillaria alfredae</i> Post. | var. <i>adpressum</i> Turrill |
| subsp. <i>glaucoviridis</i> (Turrill) Rix | <i>Vicia anatolica</i> Turrill |

The morphological, anatomical and palynological properties of some Turkish *Veronica* L. species (*V. officinalis*, *V. multifida*, *V. persica* and *V. beccabunga*) have been studied (11).

In this paper, morphological characteristics, detailed description, distribution and treats of Turkish *V. turrilliana* have been given based on the field surveys and previous studies. Additionally aerial part of the plant has been investigated for anatomical properties.

Aim of this study is to make more understandable of this Bern Convention species for scientific point of view and protect its wild population.

MATERIAL and METHODS

Plant samples of *V. turrilliana* were collected from European Turkey during The Yildiz Mountains Biosphere Project "Yildiz Mountains Biosphere Project, the abbreviated name for Service Contract TR 0602.16-01/001 *Technical Assistance for Protection and Sustainable Development of Natural Resources and Biodiversity in the Yildiz Mountains in Turkey* (EuropeAid/125289/D/SER/TR)". The collected plant samples were identified according to the *Flora of Turkey and the East Aegean Islands* (3, 4). Voucher specimens housed in Herbarium of Faculty of Pharmacy, İstanbul University (ISTE).

For anatomical studies the plant material was stored in 70 % alcohol solution. Anatomical sections of the material were taken from stem and leaves

by hand. All sections were examined in Sartur Reactive. Photographs were taken with a light microscope, Olympus BH-2 by using a microphotography apparatus. For description anatomical features, the terminology of Metcalfe and Chalk (12) was used.

RESULT and DISCUSSION

V. turrilliana is a perennial herb and endemic to Southern of Balkan Peninsula. Its morphological and anatomical properties have been given as follows based on Turkish specimens. (3, 13, 15).

Morphological properties and Description

Veronica turrilliana Stoj. et Stef., J. Bot. (London) 61:219 (1923)

Perennial herbs. Stem up to 40 cm, woody, branched, decumbent or erect at the base; flowering stems ascending at base, pubescent with short curved glandular or eglandular hairs, usually with the hairs in 2 opposite lines. Leaves 5-20 x 2,5-10 mm, elliptic, obtuse, suborbicular, obovat or oblong, sessile to shortly petiolate (to 2 mm), coriaceous, completely glabrous or only margins puberulent with very short curved hairs (rarely sparsely puberulent elsewhere), base cuneate, apex obtuse, margin entire, crenate or serrate, subrevolute; lowest and uppermost leaves smaller. Vegetative shoot apex small, strongly overtopped by 1-4(-6) opposite racemes. Racemes 2-8, 4-8 cm, opposite, oblong, glabrous, rather lax, dense, 20-40-flowered, often ovate-globose in flower, elongated in fruit; peduncles 10-30 mm, peduncle and axis pubescent with short eglandular curved hairs. Pedicels pubescent to glabrous, 1.5-3 mm, 0.5-1.5 x length of usually glabrous bracts. Calyx 2-3(-4) mm, lobes (4-)5, linear to oblong, obtuse, glabrous (rarely with shortly pubescent margins). Corolla deep blue to lilac, with a bright-yellow ring in the middle, 8-14 mm diam. Style 2,5-4(-5) mm. Capsule 2,5-5 x 3-4 mm, suborbicular, exceeding calyx, glabrous, rounded at base, acutely emarginate. Seeds dark brown, 4-10, orbicular, 1,2-1,7 x 1,1-1,8 mm, rugose.

Flowering time: April to May

Fruiting time: June to July

Habitat and ecology: Dry rocky calcareous hills and in rock crevices,

Quercus shrub. Forms fragmented scanty populations participating in the composition of vegetation of transition of Mediterranean origin.

Altitude: 20-520 m.

Type: (Bulgaria) Bulgaria austro-orientalis, in rupestribus cretaceis ad Malko Tarnovo (Malko Tarnovo) in monte Strandja (Strandza), Stojanov & Stefanov.



Figure 1: Photo of wild population *V. turrilliana* from Olimpiyat village (photo: A.Byfield)

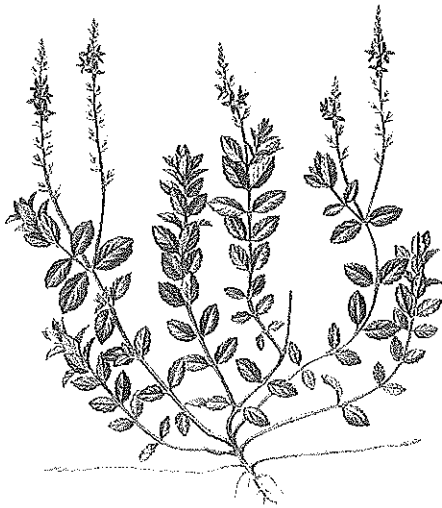
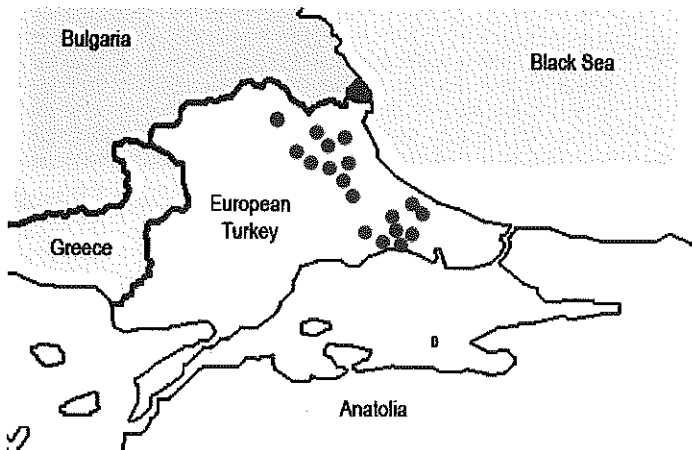


Figure 2: *V. turrilliana*, Drawing in Atlas of Bulgarian Endemic Plants, 250-251 (12)

Distribution in Turkey : **A1 (E) Kirklareli:** Çakilli to Vize (ISTE 13197), Sergen road, 7 km from main junction (ISTE 28324), Poyrali to Demirkoy (ISTE 24302), near to Kapakli village, Derekoy (ISTE 24451), Soğucak (ISTE 24503), Vize to Saray (ISTE 24510), Vize Pinarhisar road (ISTE 28204), Sergen road, 2 km from main junction (ISTE 28314), Poyrali-Demirkoy road, (ISTE 28308), Demirköy, Mahya mountain, above Sapdere, rocky places (ISTE 91982), Demirköy, above Dupnisa cave (ISTE 93725), **A2 (E) Istanbul:** Çatalca (ISTE 7610), Halkali (ISTE 12653), rocky places to Halkali Train station (ISTE 27842), Halkali, charcoal depot (ISTE 19365), 1 km from Kalfakoy junction (ISTE 16533), Terkos-Yassiviran road (ISTE 19502), Çatalca, Hadimkoy, Central Army barracks station (ISTE 82076), Olimpiyat village, Basak residence, 1. Etap (ISTE 79831).



Map 1: Distrubution of the *V. turrilliana* in European Turkey

Threats: Restricted to limestone grasslands and coppice habitat. It is most abundant in the European Turkey, extends as far as Bulgaria where it is extremely rare. To the west of Istanbul, vast sweeps of grassland and heathland formerly stretched to the horizon, lightly grazed by domestic stock, and rich in orchids and butterflies. Today much has been destroyed by urban development and agricultural reclamation, but a number of large area still survive.

Conservation: *V. turriliana* (Turrill's Speedwell) is protected by Bern Convention (Convention on the Conservation of European Wild Life and Natural Habitats, Bern 19.ix.1979). As a member of the Council of Europe,

Turkey became a signatory to the Bern Convention in 1984. In Bulgaria, species protected by Biodiversity law (2002), included in the Red Data Books of PR Bulgaria (15) and in 1997 IUCN Red List of Threatened Plants (Walter & Gillet) as rare (14).

In Important Plant Areas of Turkey (16) recorded as "The species was described in 1923 by N. Stojanov and B. Stefanov from Strandzha mountains of south-eastern Bulgaria. The first Turkish material was apparently dates from a collect by the great authority on the Istanbul flora, Georges Aznavour, from the west side of Istanbul in 1984, but today the plant is known to occur in two areas: on the reefal limestones along the southern margins of the Strandzha (Yıldız) mountains (particularly abundant in the vicinity of Pinarhisar and Vize); and on the white chalky limestones in the north-western parts of Istanbul province. In total, approximately 20 locations are known with no populations located east of Bosphorus in Asia. In all locations it appears to be confined to the limestones associated with the wetter, more elevated northern half of Turkish Thrace, which form a southeastern extension of Istranca/ Strandzha mountains. The flora of these grasslands is rich and includes rare and local species such as *Crocus olivieri* subsp. *olivieri*, *Linum hirsutum* subsp. *byzantinum*, *L. tauricum* subsp. *bosphori*, *Ophrys bucephala*, *Onosma proponticum*, *Orchis purpurea* and *Orchis simia*."

Anatomical properties

Stem

Transverse sections taken from the middle part of the stem were observed; **The stem** is rounded and show typical dicotyledones stem properties (Figure 3). **The epidermis** is composed of a single layer of almost square-ovoid compactly arranged cells. The upper and lower walls of the epidermis are thicker than the lateral walls (Figure 4). The upper surface is covered with an almost thick crinkled cuticle and trichomes. **Trichomes** are both of glandular and eglandular types. Glandular hairs are very rare, 2 cell in the head and 1-2 cell in stalk. Eglandular hairs are 2-6 cells and cuticle crinkled (Figure 5-6). **Collenchyma** tissue, consisting of roundish-ovoid cells, is located immediately under the epidermis and 1- or rarely 2 layers. **The cortex** tissue is 7-8 layered parenchymatous with starch. The cells are ovoid-square in shape. The numerous **vascular bundles** are arranged in a ring. Vascular bundles are either next to each other within sclerenchymatous

cells. **Endodermis** is 1 layer of oblong-square cells. Sclerenchymatous cells are grouped in the upper of endodermis. **The phloem** is 2-3 layered and consist of irregular cells. The cambium is inconspicuous. **The xylem** consists of regular trachea and tracheids cells. Those cells underlying the xylem are narrower and thick walled. **The pith** is composed of large orbicular or polygonal parenchymatous cells.

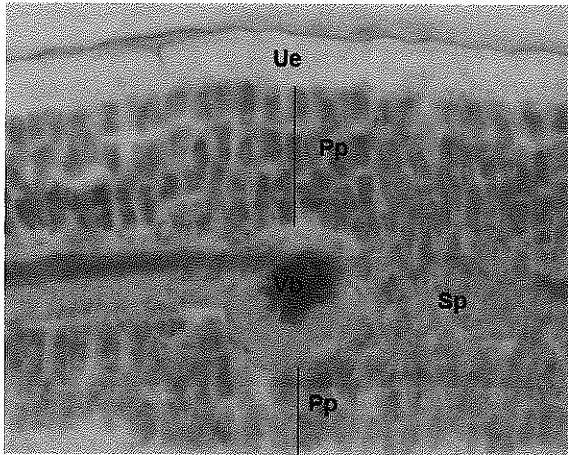


Figure 7. Leaf cross section: **Ue** upper epidermis, **Pp** palisad parenchyma, **Vb** vaskular band, **Sp** sponge paranchyma, **Le** lower epidermis (x10).

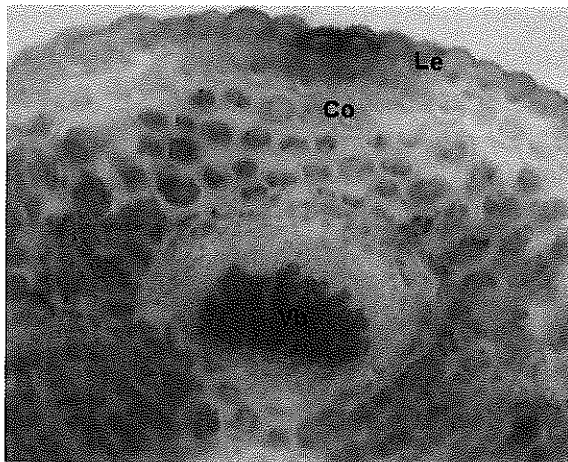


Figure 8. Vascular bundle: **Le** lower epidermis, **Co** collenchyma, **Vb** vascular band, **M** mesophyll, **Ue** upper epidermis (x10).

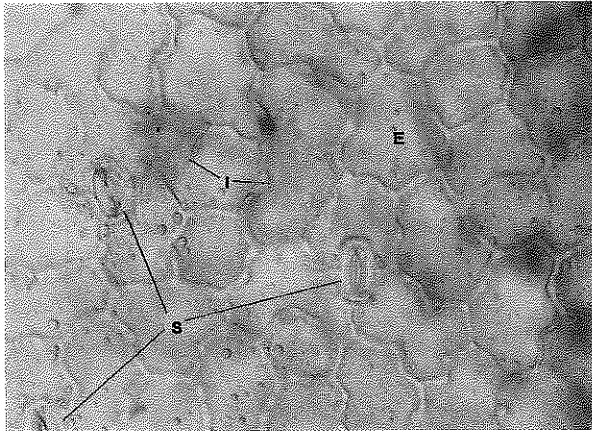


Figure 9. Surface preparation of upper epidermis of leaf with stomata and idioblast cell : E epidermis, S stoma, I idioblast (x40).

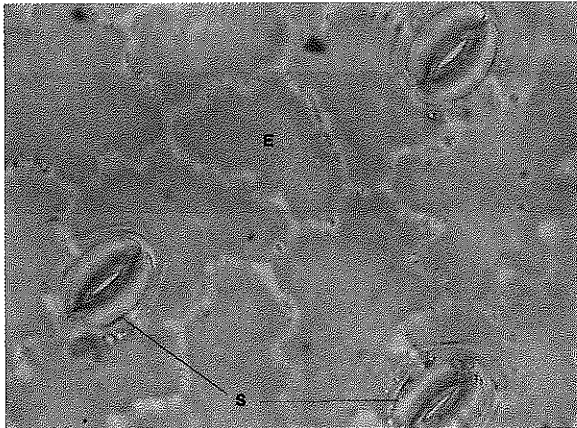


Figure 10. Surface preparation of lower epidermis of leaf with stomata: E epidermis, S stoma (x40).

Leaf

Transverse sections of the lamina and the midrib and surface sections preparations of both epidermises revealed the following elements. Leaf is unifacial type, sponge parenchyma between 2 palisade parenchyma (Figure 7). The upper and lower **epidermis** consists of uniseriate square and rectangular cells in transverse sections. The upper walls of the epidermis

are covered with an almost thick cuticle. Covering **trichomes** are glandular types on both surfaces. **Mesophyll** tissue is differentiated into 3-4 seriate palisades and 2-3 seriate spongy tissue. **The vascular bundle** is collateral type (Figure 8). The xylem faces toward the upper (adaxial) surface and the phloem faces the lower (abaxial) epidermis. Uniseriate collenchymatous cell layer and 3-4 layer parenchymatous cells layers are located below the lower epidermis while several-layer collenchymatous cells located below the upper epidermis in the midrib region. **The phloem** is surrounded by 1-2 layers collenchymatous tissue. **The stomata** are anomocytic and present the surfaces on both epidermises (amphistomatic), with 3-5 neighbouring cells (Figure 9-10). **Idioblast** cells are found in epidermis (Figure 9). **Crystal** not observed.

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