



The Anatomical Surveys on the Two *Salvia* L. Species (Sect. *Hymenosphace*, Sect. *Hemisphace*) Spreading in Mardin (Turkey)

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Abstract

In this study, we investigated two *Salvia* species (sect. *Hymenosphace*, sect. *Hemisphace*) distributed in the province of Mardin in the Southeastern Anatolia Region in terms of anatomy. These species are *S. multicaulis* Vahl. (sect. *Hymenosphace*) and *S. russellii* Benth. (sect. *Hemisphace*). For anatomical investigation, cross-sections taken from roots, stems, leaves, and petioles of the taxa were examined under a light microscope. In anatomical examinations, it was observed that root, stem, leaf, and petiole structures of the taxa were similar but shapes and measurements as well as the the number of tissue layers and pith rows were different. In addition, it was observed that the surface of the *S. multicaulis* species was covered by multicellular and compound hairs. In conclusion, anatomical characters provide information of taxonomic importance, and especially hairiness is important in species differentiation.

Keywords: Anatomy; *Salvia*; *Hymenosphace*; *Hemisphace*; Mardin; Turkey.



Mardin'de (Türkiye) Yayılış Gösteren İki *Salvia* L. Türü (Seksiyon *Hymenosphace*, Seksiyon *Hemisphace*) Üzerine Anatomik Araştırmalar

Öz

Bu çalışma Güneydoğu Anadolu Bölgesi'nde Mardin ilinde yayılış gösteren iki *Salvia* türü (Seksiyon *Hymenosphace*, Seksiyon *Hemisphace*) anatomik açıdan araştırılmıştır. Bu türler *S. multicaulis* Benth. (Seksiyon *Hymenosphace*) ve *S. russellii* Vahl. (Seksiyon *Hemisphace*)'dir. Anatomik inceleme için taksonların kök, gövde, yaprak ve petiollerinden alınan kesitler ışık mikroskopunda incelendi. Anatomik incelemelerde taksonların kök, gövde, yaprak ve petiyol yapılarının benzer olduğu ancak şekil ve ölçülerinin bunlarla beraber doku tabakası ve öz sıra sayılarının da farklı olduğu görüldü. Ayrıca anatomik analizlerde *S. multicaulis* türünün yüzeyinin çok hücreli ve bileşik tüylerle örtülü olduğu gözlemlendi. Sonuç olarak anatomik karakterler taksonomik öneme sahip bilgiler sağlar ve türlerin farklılaşmasında özellikle tüylülük önemlidir.

Anahtar Kelimeler: Anatomi; *Salvia*; *Hymenosphace*; *Hemisphace*; Mardin; Türkiye.

1. Introduction

The Lamiaceae family is one of the largest families in the world. Although there is no fossil record of the family, its origin is thought to date back to 70-90 million years ago [1]. Family members are more common in the Mediterranean phytogeographic region. Due to the high rate of endemism, it is among the first three large families in our country [1]. There are 245 genera and 7,886 species of the Lamiaceae family in the world [2]. In Turkey, Lamiaceae includes 46 genera and more than 870 taxa [3].

The genus *Salvia* L., which is one of the richest members of the Lamiaceae family, is represented by about 1.037 taxa in the world [2]. In Turkey, the genus *Salvia* has about 100 defined taxa in Flora of Turkey which of 50% were recorded as endemic [3-5].

Salvia is a very important genus of the Lamiaceae family as it has many medicinal and aromatic taxa that are widely used, collected from their natural habitats, and utilised locally. The genus *Salvia* is popularly known as sage. Many types of sage are used in the treatment of various diseases [6]. In addition, *Salvia* species have economic importance as they are used as therapeutic, herbal tea, food and decorative purposes and can be utilised in cosmetics, perfumery, and pharmaceutical industries [7,8].

The *Hymenosphace* section, which is mostly grown in Turkey in terms of the number of taxa, has herbaceous and woody semi-shrub forms. On the other hand, the *Hemisphace* section has herbaceous and woody rootstock forms, and is represented by only three species in Turkey [9].

This study aims to investigate the anatomical features of *Salvia multicaulis* and *S. russellii* in detail and also discuss the anatomical importance of the findings with former studies relevant to the section.

2. Materials and Methods

The study area is surrounded by the Tigris basin in Southeastern Anatolia, Batman and Şırnak in the east, Şanlıurfa in the west, north of Diyarbakır and Syria in the south [10] (Fig. 1). Mardin belongs to the Iran-Turanian Phytogeographical Region and includes the Mesopotamian lowland. The region has a Mediterranean, continental, and desert climate and is rich in plant diversity.

In this study, the anatomical features of *S. multicaulis* and *S. russellii* species distributed in Mardin province were investigated. Both species were collected from different populations of Mardin during the flowering and seed formation periods between April 2018 and August 2019. The taxonomic description of the plant was prepared according to Davis [4] and Güner et al. [3]. Some of the plant samples collected from different localities were fixed in alcohol and dried. Samples are stored in Mardin Artuklu University Kızıltepe Animal and Plant Production Department. The places and regions where the plants were collected are given in Table 1.

Root, stem, leaf and petiole samples of species collected from different localities for anatomical examinations were conserved in 70% alcohol. All cross-sections were made manually by using a razor blade. Cross-sections of root, stem, leaf and petiole were stained with safranin and fast-green solutions [11]. Anatomical features of root, stem, leaf and petiole were studied by light microscopy (ISOLAB). The micro-anatomic measurements of tissue and cells of root, stem, leaf and petiole are given in Table 2-5.

3. Results

Transverse sections taken from the root, stem, leaf and petiole of the plants were analysed in detail and the obtained results are outlined below. The taxa are given in alphabetical order.

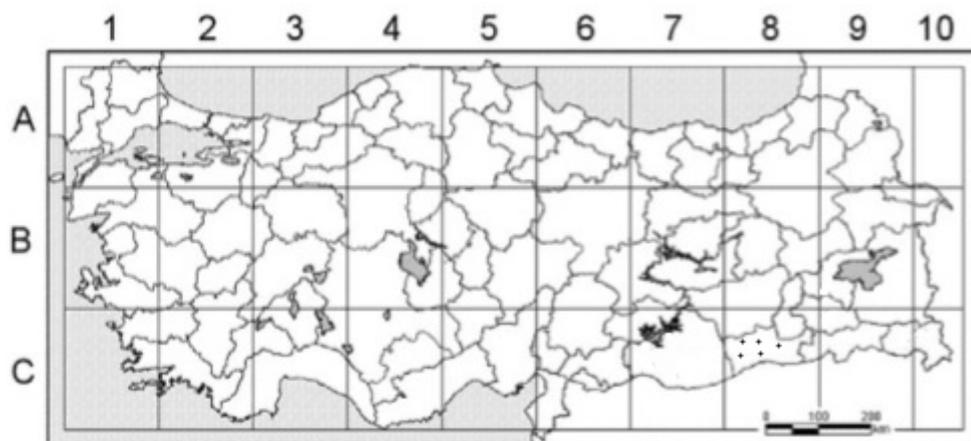


Figure 1: Distribution map of *S. multicaulis* and *S. russellii* taxa (.)

3.1. Root anatomical characteristics

Salvia multicaulis: Peridermis was thick layer, crushed and fragmented at the outermost of the root. Beneath the periderm is multilayered parenchymal cells, which are 6.11-21.97 μ wide. Under the parenchyma, there are several layers of sclerenchyma. There is multi-layer of phloem under sclerenchyma groups. Cambium was unclear. Tracheae conspicuous in the xylem are numerous, and their diameters vary between 19.93-44.35 μ . In the xylem, besides the large tracheas, tracheids and xylem parenchyma have lignified walls. Pith rays consist of 2-4 rowed narrow cells. As the xylem occupies the pith, it is narrow (Fig. 2, Table 2).

Salvia russellii: Peridermis was thick layer, crushed and fragmented at the outermost of the root. Beneath the periderm is multilayered parenchymal cells, which are 9.46-26.31 μ wide. Under the parenchyma, there are several layers of sclerenchyma. There is multi-layer of phloem under sclerenchyma groups. Cambium was unclear. Tracheae conspicuous in the xylem are numerous, and their diameters vary between 16.89-67.12 μ . In the xylem, besides the large tracheas, tracheids and xylem parenchyma have lignified walls. Pith rays consist of 1-2 rowed narrow cells. As the xylem occupies the pith, it is very narrow (Fig. 2, Table 2).

Table 1: *S. multicaulis* and *S. russellii* taxa that were used for anatomical studies and their collected localities.

Species	Locality (Turkey, C8, Mardin)	Date	Coordinates	Altitude	Habitat	Collector's number
<i>S. multicaulis</i>	Artuklu, Yalım Village	27.04.2019	37°19'39"N-40°44'28"E	886 m	rocky, valley edge, <i>Crataegus</i> communities	M. Kılıç, F. Mungankılıç 194, 200, 209, 211
	Artuklu, Eskikale Village, Bakırkırı	27.04.2019	37°19'14"N-40°45'36"E,	1.004 m	roadsides	
	Artuklu, Hamzabey Village, Yalım to Hamzabey road, spring water-cemetery	28.04.2019	37°21'49"N-40°44'10"E	895 m	roadside, slopes	
	Artuklu, Cevizpınar Village, Nehruk Street	04.05.2019	37°21'50"N-40°45'21"E	1087 m	stony slope	
	Artuklu, Hamzabey Village, Yalım to Hamzabey road, Old hippodrome location	18.05.2019	37°22'14"N-40°43'55"E	970 m	roadside, degraded steppe	
	Kızıltepe, Beşdeğirmen village	24.02.2019	37°16'56"N-40°32'56"E	770 m	rocky slopes	
	Kızıltepe, between Uluköy-Ayaz villages	25.05.2019	37°18'09"N-40°37'23"E	737 m	roadside rocky slopes	
	Artuklu, Zınnar	04.05.2020	37°24'41"N-40°41'13"E	1076 m	highland road, roadside slopes, <i>Quercus brantii</i> lower locality	
	Artuklu, Bakırkırı	11.05.2020	37°19'22"N-40°46'04"E	979 m	roadside slopes, <i>Quercus brantii</i> Lower locality	
	Mazıdağı, Derik-Mazıdağı road, Enginköy erosion control area site	16.06.2019	37°28'00"N-40°26'42"E	1.001 m	,barren slopes	
	Mazıdağı, Derik-Mazıdağı road, Enginköy erosion control area upper level, Radio television station lower locality	16.06.2019	37°27'41"N-40°26'55"E	1.089 m	between menengiç and grape gardens	
	Midyat, Eskimidyat, Kooperatif street-833 street, Çetintaş limestone mining road	15.06.2019	37°26'13"N-41°21'06"E	969 m	roadside	
<i>S. russellii</i>	Artuklu, Hamzabey Village, Çağlar-Hamzabey road	09.06.2019	37°22'18"N-40°42'09"E	972 m	fields, gardens	M.Kılıç, F.Mungankılıç 210, 218
	Artuklu, Hamzabey Village, Zınnar locality	22.06.2019	37°22'17"N-40°41'12"E	1.003 m	highland road, <i>Glycyrrhiza</i> community, roadside	
	Midyat, Cumhuriyet Village, location on Adnan Aslan street	15.06.2019	37°25'45"N-41°21'30"E	950 m	vineyards	

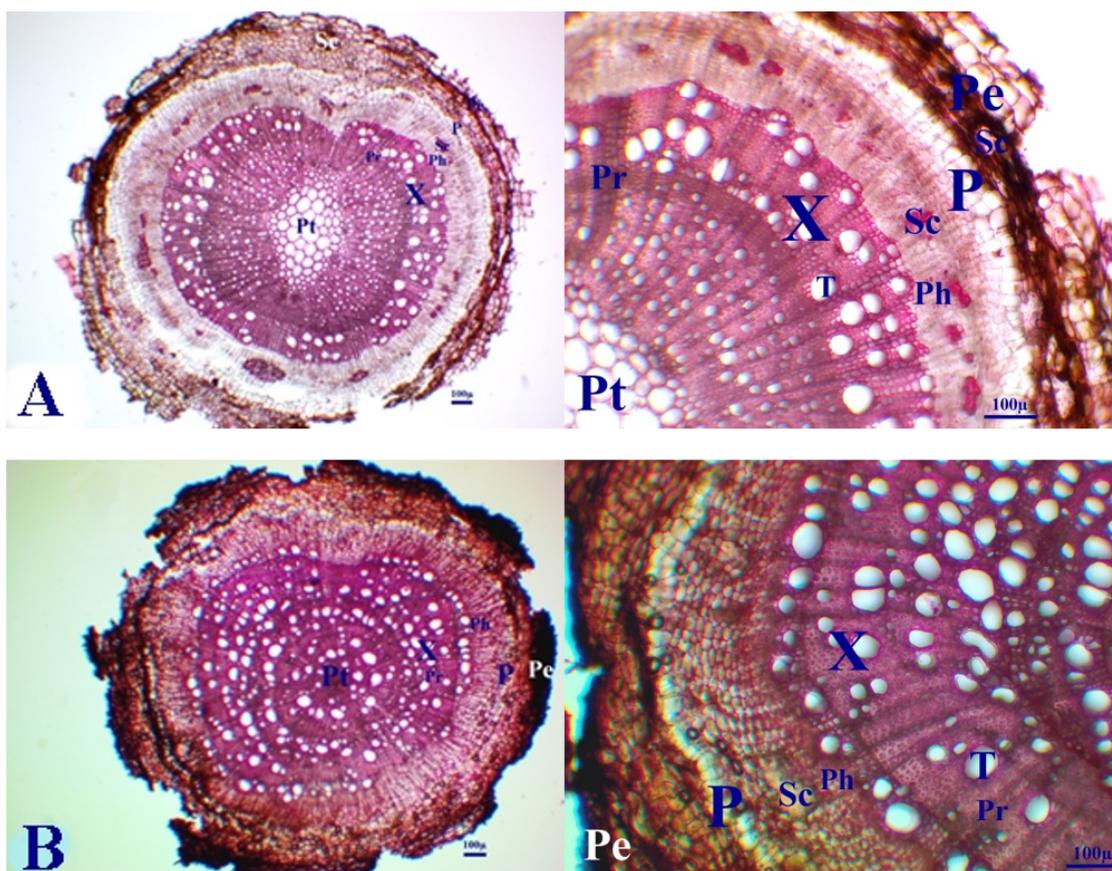


Figure 2: Cross-section of the root of *S. multicaulis* (A) and *S. russellii* (B). Pe: Periderm, P: Parenchyma, Sc: Sclerenchyma, Ph: Phloem, X: Xylem, Pr: Pith ray, T: Trachea, Pt: Pith region

Table 2: Anatomical measurements of root tissues of *S. multicaulis* and *S. russellii*. S.D.: Standard Deviation

Species	Tissue	Width (μ)		Length (μ)	
		Min.–Max.	Mean \pm S.D.	Min.–Max.	Mean \pm S.D.
<i>S. multicaulis</i>	Peridermis cell	12.02–34.25	23.92 \pm 6.99	8.33–21.05	14.40 \pm 3.29
	Parenchyma cell	14.70–44.72	24.76 \pm 9.06	6.11–21.97	12.62 \pm 4.19
	Trachea cell	16.73–66.50	36.98 \pm 13.13	19.93–44.35	32.73 \pm 7.76
	Pith cell	7.88–14.85	11.77 \pm 1.95	7.52–30.37	16.57 \pm 5.50
<i>S. russellii</i>	Peridermis cell	20.59–52.17	32.89 \pm 9.15	11.87–34.34	22.33 \pm 5.80
	Parenchyma cell	9.92–50.67	25.33 \pm 9.56	9.46–26.31	16.66 \pm 5.25
	Trachea cell	13.98–61.54	36.61 \pm 15.15	16.89–67.12	41.90 \pm 15.49
	Pith cell	3.40–8.22	5.90 \pm 1.49	3.40–15.10	11.12 \pm 2.88

3.2. Stem anatomical characteristics

Salvia multicaulis: The stem is quadrangular and has a thin cuticle layer on the outside. Just below, there is a single row of small, square, oval nearly rectangular epidermal cells. There are many glandular and eglandular hairs on the epidermis cells. Most of them are eglandular made up of compound hair. Under the epidermis, there are 6-7 rows of collenchyma cells

concentrated at the corners and 3-4 rows between the corners, and the sizes of these cells are 7.87-25.32 μ . Parenchyma, formed by parenchymatous, cubic, and oval cells was 2-5 rowed at the edges and 4-6 rowed at the corners. 3-5 rows of sclerenchyma were located on the vascular bundles are just above the phloem. Conduction tissue is more developed in the corners. Below the several rows of phloem tissue is an indistinct cambium. In the xylem region, which has wider pith arms, there are large round tracheal cells and many small tracheids between them. The trachea is arranged quite regularly. Wide with 35.03-165.69 μ parenchyma diameter in the center, there is an essence. The cells in the pith region are angular, polygonal, or orbicular parenchymatic cells that grow towards the center and form triangular spaces between them (Fig. 3, Table 3).

Salvia russellii: The stem is quadrangular and has a thin cuticle layer on the outside. Just below, there is a single row of small, square, oval nearly rectangular epidermal cells. There are many single or multicellular eglandular hairs on the epidermis cells. Under the epidermis, there are 6-7 rows of collenchyma cells concentrated at the corners and 3-4 rows between the corners, and the sizes of these cells are 7.75-17.62 μ . Parenchyma, formed by parenchymatous, cubic, and oval cells was 1-2 rowed at the edges and 2-3 rowed at the corners. 3-5 rows of sclerenchyma were located on the vascular bundles are just above the phloem. The parenchyma is tucked towards the corners. Conduction tissue is more developed in the corners. Below the several rows of phloem tissue is an indistinct cambium. In the xylem region, which has wider pith arms, there are large round tracheal cells and many small tracheids between them. The trachea is arranged quite regularly. Wide with 22.07-75.90 μ parenchyma diameter in the center, there is an essence. The cells in the pith region are angular, polygonal, or orbicular parenchymatic cells that grow towards the center and form triangular spaces between them (Fig. 3, Table 3).

3.3. Leaf anatomical characteristics

Salvia multicaulis: The epidermis formed by oval and nearly rectangular cells. The leaf type is bifacial. A thin layer of cuticle with a diameter of 1.86-3.18 μ surrounds the outer part of the leaf. Below the cuticle is the upper epidermis, which contains one and multicellular or compound hairs. Cells are variable in size. Palisade parenchyma cells are in 1-3 rows and their thickness varies between 28.28–55.67 μ , while spongy parenchyma cells are 1-2 rows and between 14.26-24.61 μ . Lower epidermis cells are larger than upper epidermis cells. Xylem and phloem elements are prominent in the bundles. In leaf sections, it was determined that the species had diacytic type stomata. The adaxial surface is slightly convex and has 1-2 rows of collenchyma underneath. The vascular bundles are collateral. The arcuate vascular bundle is

surrounded by parenchyma cells. Just below the parenchyma are the trachea and the xylem consisting of tracheids. The phloem is several layers and is located below the xylem. The abaxial surface is slightly convex and located below it there are 4-5 rows of Collenchyma (Fig. 4, Table 4).

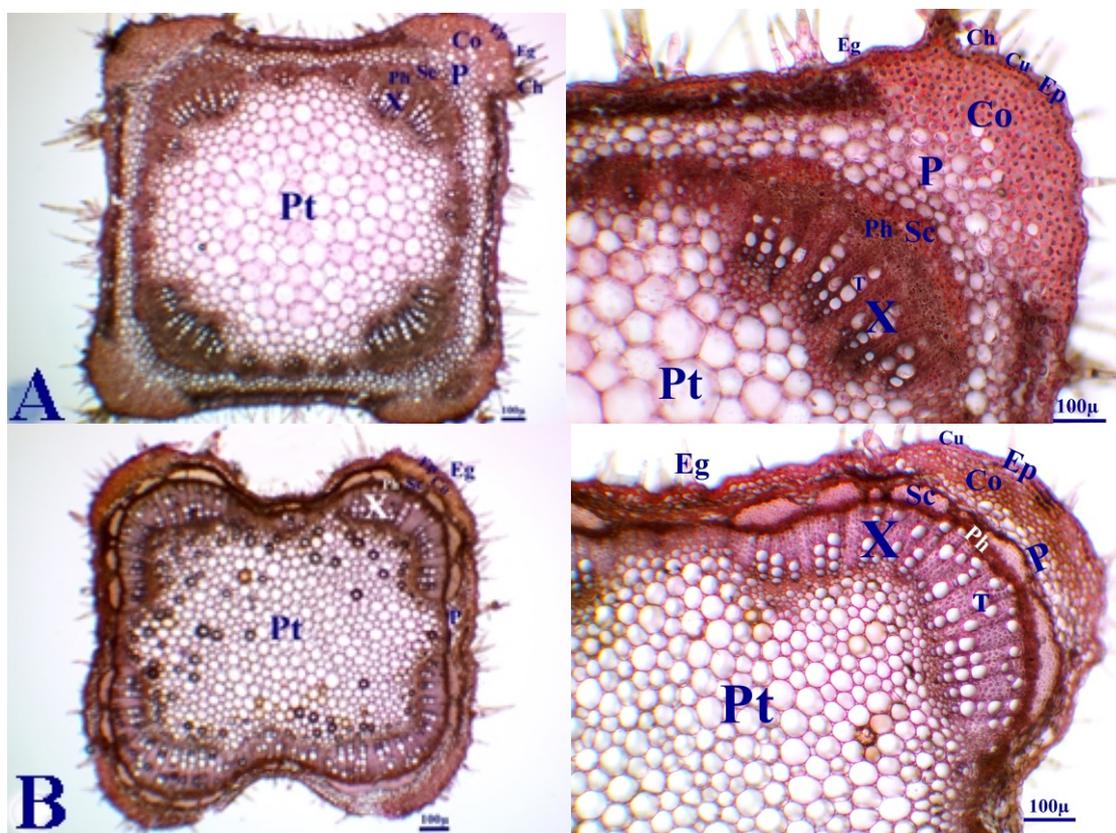


Figure 3: Cross-section of the stem of *S. multicaulis* (A) and *S. russellii* (B). G: Glandular hair, Eg: Eglanular hair, Ch: Compound hair, H: Hair, Cu: Cuticle, Ep: Epidermis, Co: Collenchyma, Crp: Crushed parenchyma

Table 3: Anatomical measurements of stem tissues of *S. multicaulis* and *S. russellii*

Species	Tissue	Width (μ)		Length (μ)	
		Min.–Max.	Mean \pm S.D.	Min.–Max.	Mean \pm S.D.
<i>S. multicaulis</i>	Cuticle	–	–	2.74–8.38	5.86 \pm 1.60
	Epidermis cell	6.56–21.39	12.04 \pm 4.03	5.92–20.92	11.00 \pm 3.49
	Collenchyma cell	9.22–29.34	19.46 \pm 5.23	7.87–25.32	16.47 \pm 4.58
	Parenchyma cell	17.70–61.18	40.64 \pm 12.88	13.22–48.42	31.32 \pm 10.64
	Phloem cell	3.12–13.25	8.10 \pm 2.51	3.05–8.47	5.85 \pm 1.65
	Trachea cell	13.79–34.05	24.02 \pm 6.43	7.98–39.15	20.94 \pm 8.83
	Pith cell	43.44–157.49	95.85 \pm 27.87	35.03–165.69	85.79 \pm 29.89
<i>S. russellii</i>	Cuticle	–	–	2.29–6.27	4.21 \pm 0.94
	Epidermis cell	5.95–18.75	12.23 \pm 3.43	6.52–13.86	9.79 \pm 1.88
	Collenchyma cell	9.33–19.93	14.31 \pm 2.49	7.75–17.62	12.27 \pm 2.90
	Parenchyma cell	9.10–28.93	20.37 \pm 5.40	8.17–23.01	14.34 \pm 4.60
	Phloem cell	2.18–9.00	4.97 \pm 1.81	2.07–5.72	3.87 \pm 1.01
	Trachea cell	9.60–26.38	18.57 \pm 5.13	7.32–31.89	18.93 \pm 7.43
	Pith cell	20.85–73.80	45.19 \pm 14.06	22.07–75.90	48.84 \pm 17.18

Salvia russellii: The epidermis formed by oval and nearly rectangular cells. The leaf type is bifacial. A thick layer of cuticle with a diameter of 5.38-15.62 μ surrounds the outer part of the leaf. Below the cuticle is the upper epidermis, which contains one and multicellular hairs. Cells are variable in size. Palisade parenchyma cells are in 1-3 rows and their thickness varies between 22.38-56.74 μ , while spongy parenchyma cells are 1-2 rows and between 8.49-16.95 μ . Lower epidermis cells are smaller than upper epidermis cells. Xylem and phloem elements are prominent in the bundles. In leaf sections, it was determined that the species had diacytic type stomata. The adaxial surface is slightly concave and has 1-2 rows of collenchyma underneath. The vascular bundles are collateral. The arcuate vascular bundle is surrounded by parenchyma cells. Just below the parenchyma is the trachea and the xylem consisting of tracheids. The phloem is several layers and is located below the xylem. The abaxial surface is slightly convex and located below it there are 1-3 rows of collenchyma (Fig. 4, Table 4).

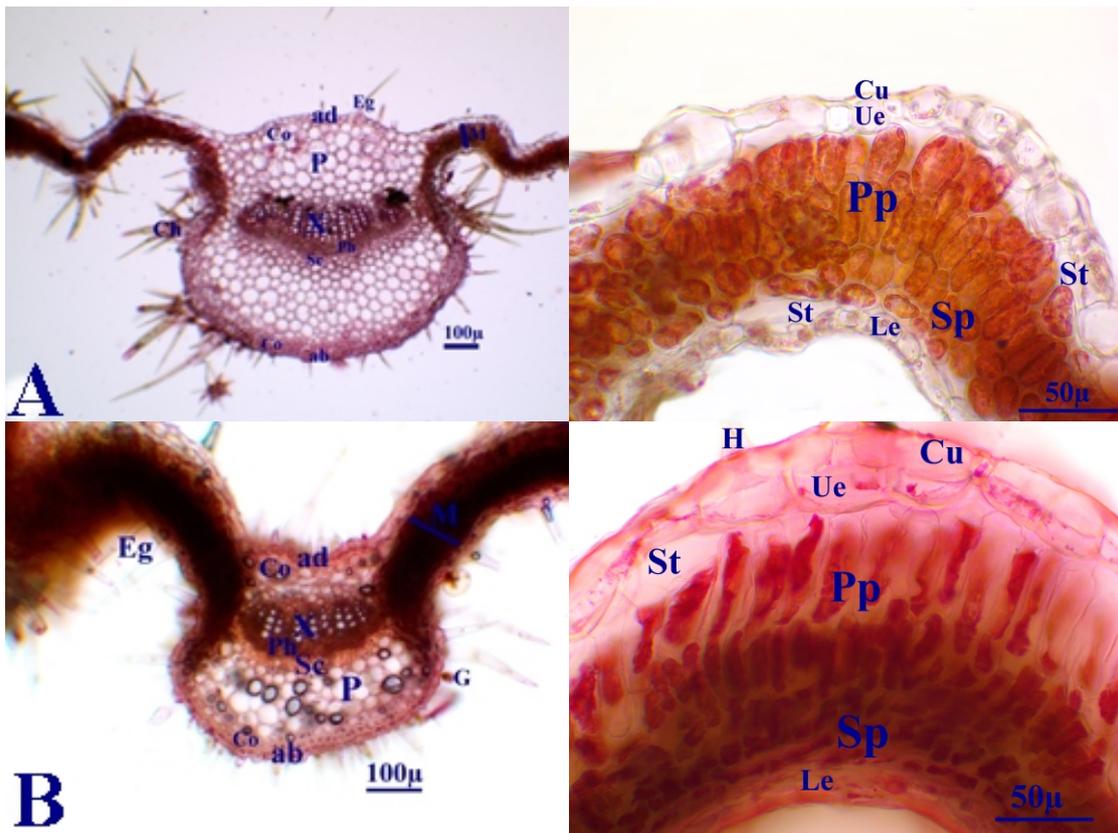


Figure 4: Cross-section of the leaf of *S. multicaulis* (A) and *S. russellii* (B). M: Mesophyll layer, ad: Adaxial surface, ab: Abaxial surface, Ue: Upper epidermis, Le: Lower epidermis, Pp: Palisade parenchyma, Sp: Spongy parenchyma, Hp: Hypodermis, St: Stomata

Table 4: Anatomical measurements of leaf tissues of *S. multicaulis* and *S. russellii*

Species	Tissue	Width (μ)		Length (μ)	
		Min.–Max.	Mean \pm S.D.	Min.–Max.	Mean \pm S.D.
<i>S. multicaulis</i>	Cuticle	–	–	1.86–4.72	3.18 \pm 0.89
	Upper epidermis cell	13.88–39.67	25.53 \pm 9.05	6.44–26.49	17.28 \pm 5.86
	Palisade parenchyma	10.23–23.66	15.33 \pm 3.67	28.28–55.67	43.09 \pm 8.52
	Spongy parenchyma	11.50–19.71	15.45 \pm 2.19	14.26–24.61	17.33 \pm 3.15
	Mesophyll layer	–	–	122.47–193.32	153.23 \pm 19.21
	Lower epidermis cell	5.77–36.66	18.48 \pm 9.21	7.99–35.09	15.69 \pm 7.58
<i>S. russellii</i>	Cuticle	–	–	5.38–15.62	10.38 \pm 2.82
	Upper epidermis cell	10.73–43.30	23.83 \pm 8.41	10.04–33.92	17.06 \pm 5.88
	Palisade parenchyma	5.37–21.95	11.30 \pm 4.14	22.38–56.74	34.58 \pm 10.86
	Spongy parenchyma	7.93–18.94	12.48 \pm 2.94	8.49–16.95	12.00 \pm 2.18
	Mesophyll layer	–	–	75.69–216.74	160.77 \pm 42.95
	Lower epidermis cell	8.99–24.87	16.48 \pm 4.18	5.84–15.55	10.00 \pm 2.79

3.4. Petiol anatomical characteristics

Salvia multicaulis: It is anatomically similar to the midrib of the leaf. There is a thin cuticle layer around the single layer of the epidermis with a diameter of 1.82-5.20 μ , and on it are abundant glandular and eglandular hairs consisting of single, multicellular, or compound hairs. Epidermal cells are different size, square, oval and rectangular. Collenchyma cells are 2-4 rows and thick-walled. Just below is the parenchymatic tissue, which occupies a very large space. Parenchyma cells are 35.02-109.07 μ in diameter. Parenchyma cells are round-cornered, with distinct triangular spaces between them. Conduction tissue is integral in the center of the parenchymatic cells. There are underdeveloped or developed, two small vascular bundles at both corners of the petiole. Fragmented bundles of sclerenchyma are located on the phloem. Phloem is several rows, sieves, and companion cells are not very prominent. The xylem consists of many regularly ordered tracheal elements. Trachea diameters vary between 9.33-20.42 μ (Fig. 5, Table 5).

Salvia russellii: It is anatomically similar to the midrib of the leaf. There is a thick cuticle layer around the single layer of the epidermis with a diameter of 3.66-10.11 μ , and on it are abundant glandular and eglandular hairs consisting of single, multicellular, or compound hairs. Epidermal cells are different is size, square, oval and rectangular. Collenchyma cells are 2-6 rows and thick-walled. Just below is the parenchymatic tissue, which occupies a very large space. Parenchyma cells are 25.57-77.64 μ in diameter. Parenchyma cells are round-cornered, with distinct triangular spaces between them. Conduction tissue is integral in the center of the parenchymatic cells. There are underdeveloped or developed, two small vascular bundles at both corners of the petiole. Fragmented bundles of sclerenchyma are located on the phloem. Phloem is several rows, sieves, and companion cells are not very prominent. The xylem consists

of many regularly ordered tracheal elements. Trachea diameters vary between 15.10-33.93 μ (Fig. 5, Table 5).

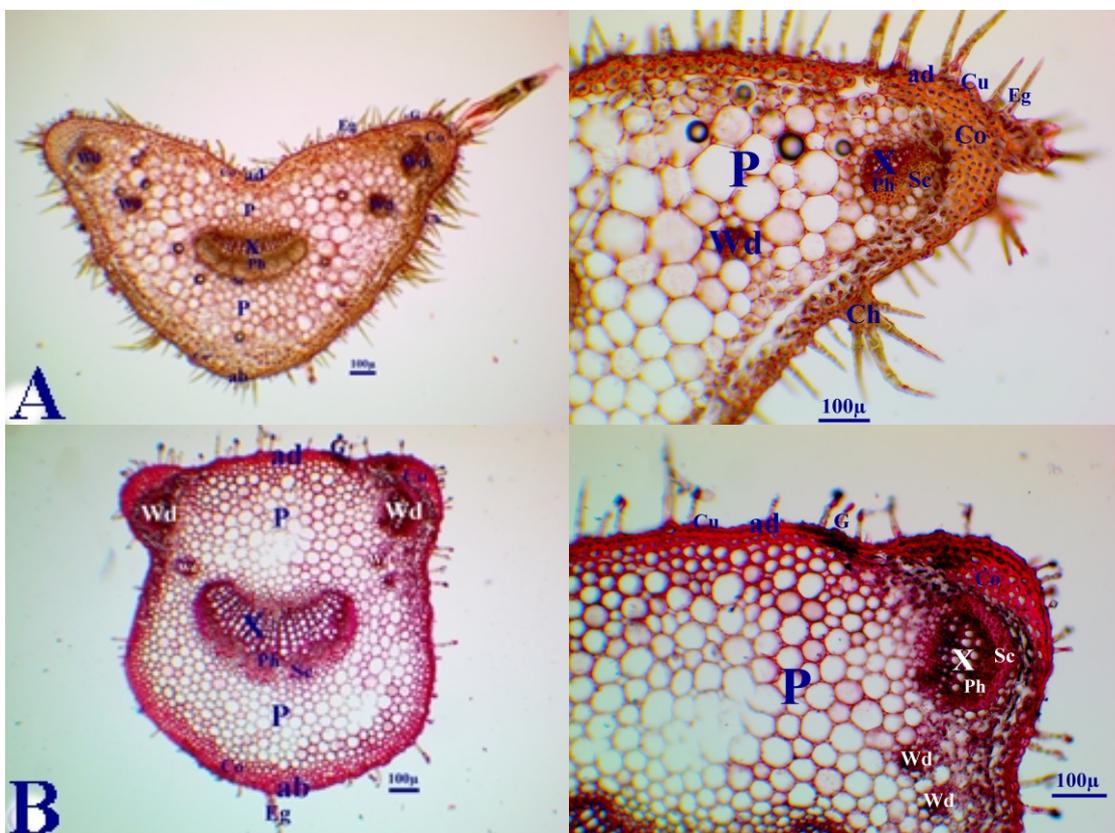


Figure 5: Cross-section of the petiole of *S. multicaulis* (A) and *S. russellii* (B). Mb: Median bundle, Wb: Wing bundle

Table 5: Anatomical measurements of petiole tissues of *S. multicaulis* and *S. russellii*

Species	Tissue	Width (μ)		Length (μ)	
		Min.–Max.	Mean \pm S.D.	Min.–Max.	Mean \pm S.D.
<i>S. multicaulis</i>	Cuticle	–	–	1.82–5.20	3.37 \pm 1.13
	Adaxial epidermis	5.93–16.39	10.85 \pm 3.20	6.43–13.70	10.24 \pm 2.20
	Parenchyma cell	42.38–115.70	73.95 \pm 25.20	35.02–109.07	66.28 \pm 21.43
	Trachea cell	9.19–17.90	13.42 \pm 2.19	9.33–20.42	14.30 \pm 3.17
	Phloem cell	3.37–10.28	6.38 \pm 1.88	2.74–8.58	5.21 \pm 1.57
	Abaxial epidermis	9.89–18.65	13.74 \pm 2.82	6.89–17.43	10.60 \pm 2.83
<i>S. russellii</i>	Cuticle	–	–	3.66–10.11	5.63 \pm 1.66
	Adaxial epidermis	11.12–18.32	15.17 \pm 2.47	7.01–17.06	10.48 \pm 2.38
	Parenchyma cell	24.85–82.66	56.97 \pm 13.71	25.57–77.64	54.52 \pm 14.63
	Trachea cell	13.76–30.01	21.09 \pm 4.69	15.10–33.93	24.96 \pm 5.78
	Phloem cell	6.33–13.61	9.47 \pm 2.11	4.54–10.05	6.53 \pm 1.67
	Abaxial epidermis	10.00–21.36	14.63 \pm 3.24	6.53–16.60	11.01 \pm 2.94

4. Discussion and Conclusion

In this research, *Salvia multicaulis* and *Salvia russellii* which spread to Mardin-Turkey between the years 2018-2020, were examined comparatively in terms of anatomy. The anatomical measurements of the root, stem, leaf and petiole are shown in Tables 2-5, respectively. The *Salvia* taxa used in our study belong to the *Hemisphace* and *Hymenosphace* sections. In this section, we will compare it with the former studies on these sections.

Metcalf and Chalk [12], regarding the root anatomy of the Lamiaceae family, stated that the pith rays of the roots consist of 2-12 or more rows of cells. The pith rays of *S. russellii* (sect. *Hemisphace*) are composed of 1-10 rowed cells [13], and those of *S. blepharochlaena* Hedge & Hub.-Mor. (sect. *Hymenosphace*) are 1-2 rowed [14], [13]; *S. multicaulis* (sect. *Hymenosphace*) are 1-3 rowed [13]. Our studies on the cross-sections of the roots of *S. multicaulis*, and *S. russellii* revealed that the taxa comprise 3-4, 1-2 rowed ray cells respectively. The number of rays seen in the anatomical section of the root is significant in the discrimination of species [15].

The quadrangular stem structure is a distinctive feature of the family, and there is a well-developed collenchyma tissue at the stem corners [12]. We found the same anatomical features in the stem cross-section. Kahraman [13] has examined the stem anatomy of *Salvia* species. It can be seen that some data obtained by Kahraman [13] were similar to the results of our study. However, while Kahraman [13] reported that the collenchyma of the *Hymenosphace* section has 3-7 layers at the corners, 1-5 layers at the edges and parenchyma contain 2-9 layers, and the collenchyma of the *Hemisphace* section has 5-8 layers at the corners, 2-4 layers at the edges, and 1-10 layers on the parenchyma. We have found them to consist of 6-7, 3-4, 2-6, and 6-7, 3-4, 1-3 layers respectively.

In the Lamiaceae family, stomata are usually diacytic. In addition to multicellular, glandular, capitate hairs, various types of hairs are also encountered in family members [16]. In addition, the leaf mesophyll of *Salvia* species is entirely parenchymatic and the midrib is surrounded by collenchymatous cells [12]. According to the mesophyll structure, the leaves of *S. multicaulis* and *S. russellii* are bifacial. The palisade parenchyma has 2-3 rows in *S. multicaulis* and *S. russellii*. But the data obtained by Kahraman [13] regarding the anatomy of the leaf of *S. multicaulis* and *S. russellii* species is different from our study. The structure of palisade parenchyma in the leaf anatomy of *Salvia* species can't be used as a helpful key for distinguishing the species. On the contrary the structure of vascular bundles in the leaf anatomy of *Salvia* species can be used as a helpful key for distinguishing the species [15]. In the midrib of *Salvia* taxa, there are one or two large vascular bundles or absent on sides. It can be seen that

the data obtained by Kahraman [13] regarding the anatomy of the vascular bundles of species is compatible with our study.

The structure of the petiole shows differences between the genera and species. Helpful anatomical characters of the petiole can be determinable in the specified taxonomical structures of some species [17]. According to Metcalfe and Chalk [12], the vascular bundles in the petiole of the Lamiaceae family are very important as a diagnostic feature. In the petiole of *Salvia* taxa, there is a single and lobed large bundle and there are two or three small subsidiary bundles in petiolar wings.

S. verticillata L., as indicated by Kaplan [18], has one broad vascular bundle in the middle of the petiole and one-two small bundle in its wings, *Hemisphace* section [13] has a one-five broad vascular bundle in the centre of the petiole and one-two small bundles in its wings, *Hymenosphace* section [13] has usually one broad vascular bundle in the centre of the petiole and one-two small bundles in its wings, and *S. blepharochlaena* Hedge & Hub.-Mor., [14] has one large bundle in the centre and two small bundles in the wings.

Since the stem part of the plants is less exposed to environmental effects, anatomical studies in vascular plants are mostly conducted on this organ [19]. The stem anatomies of these two species support this information as they show distinctive features.

As a result, it is seen that the anatomical characters in the species provide important taxonomic information. In addition, the presence of anatomical data, as well as morphological characters, shows that species distinction can be made more healthily.

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