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RESEARCH ARTICLE

Comparative Morphological Studies on *Scutellaria salviifolia* Benth. and *Scutellaria diffusa* Benth. (Lamiaceae) Growing In Turkey

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Comparative Morphological Studies on Scutellaria salviifolia Benth. and Scutellaria diffusa Benth. (Lamiaceae) Growing In Turkey

SUMMARY

Scutellaria L. species are especially used as folk medicine in Far Eastern countries and some of them have patented preparations. Chemical studies have been performed on Scutellaria species grown in Turkey although there is not any detailed botanical investigation. In this study, the morphological properties of S. salviifolia Benth. (endemic) and S. diffusa Benth. were determined and the descriptions of the species were identified, figures were drown and the original photographs were taken. The simple description of S. salviifolia was given in "Flora of Turkey", the detailed description of S. diffusa is not available. By this study the new morphological characters that were not previously given in descriptions of each species were determined. Some distinctive characters such as indumentum, number of flowers in rasem and properties of leaves which might be important for the identification of the species were recorded. In addition, distribution and habitat of S. salviifolia and S. diffusa were evaluated.

Key Words: *Lamiaceae, Scutellaria salviifolia, Scutellaria diffusa, endemic, morphology.*

Türkiye'de Yetişen Scutellaria salviifolia Benth. ve Scutellaria diffusa Benth. (Lamiaceae) Türleri Üzerinde Karşılaştırmalı Morfolojik Çalışma

ÖZET

Scutellaria türleri özellikle Uzakdoğu ülkelerinde halk ilacı olarak kullanılmaktadır ve bazılarına ait patentli preparatlar mevcuttur. Türkiye'de yetişen Scutellaria türleri üzerinde kimyasal çalışmalar olmasına rağmen detaylı bir botanik çalışmaya rastlanmamıştır. Bu çalışmada S. salviifolia Benth. (endemik) ve S. diffusa Benth. türlerinin morfolojik özellikleri belirlenmiş, türlerin deskripsiyonları ve çizimleri yapılmış, fotoğrafları çekilmiştir. Daha önce bu türlerden "Flora of Turkey"de sadece S. salviifolia'nın deskripsiyonu verilmiştir, S. diffusa'nın ise detaylı deskripsiyonu mevcut değildir. Bu çalışmada bu iki türün deskripsiyonlarında verilmemiş olan yeni morfolojik özellikler belirlenmiştir. Tüy örtüsü, rasemdeki çiçeklerin sayısı ve yaprak özellikleri gibi türlerin tayininde önemli olabilecek bazı ayırıcı karakterler kaydedilmiştir. Ek olarak S. salviifolia ve S. diffusa türlerinin habitat ve yayılışları değerlendirilmiştir.

Anahtar kelimeler: *Lamiaceae, Scutellaria salviifolia, Scutellaria diffusa, endemik, morfoloji.*

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INTRODUCTION

In Turkey, *Scutellaria* genus from Lamiaceae is represented by 39 taxa under 19 species with 15 endemic taxa (1-6).

Scutellaria species have been used for a long time against several diseases in traditional medicine in China and Japan. Among the other species, especially *S. baicalensis* have been used as antipyretic, antiinflammatory and againist respiratory or digestive system diseases, hyperlipidemia, arteriosclerosis, hypertension, hypoglycemia, allergic diseases, liver diseases, some skin diseases and cancer (7-14). Also, in some European countries *S. orientalis* is used against diarrhea, as tonic and as well as pain relief and wound healing (15). Also *Scutellaria* species have patent preparations all over the world**.**

Aerial parts of *S. orientalis* are used in Turkey as an astringent and against pain (16,17). The usage of the *Scutellaria* species in folk medicine coincide with the biological activity studies carried out to date (18). However, there are no detailed botanical studies on this biologically active and widespread plant that is used as a folk medicine.

In this paper, we report on the morphological features of one endemic species *Scutellaria salviifolia* Benth. and

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Scutellaria diffusa Benth. which belong to the Section Salviifolia (Boiss.) Edm. The morphological characters were compared with the literature records and with each other (1). In addition to descriptions, distribution and habitat of both species are given.

MATERIALS AND METHODS

Plant materials were collected during the flowering period. The voucher specimens are deposited in the Herbarium of Faculty of Pharmacy of Hacettepe University in Ankara, Turkey (HUEF).

S. salviifolia was collected from Ankara, Niğde, Amasya, in June 1998, 1999, 2004 (HUEF 04158, 04157, 99003, 98050). *S. diffusa* was collected from Karaman, in June 2004 (HUEF 04160, 04159).

Morphological features were identified from fresh samples and also herbarium specimens (AEF, ANK, GAZİ, HUB, HUEF). Taxonomic descriptions of the plants were made according to "Flora of Turkey and the East Aegean Islands" (1). A map, (Figure 1,2) showing the distribution of both species based on the localities where we found specimens herbaria records and the citation in the Flora of Turkey is provided (1). A Leica MZ 75 stereomicroscope with a drawing tube was used in the studies.

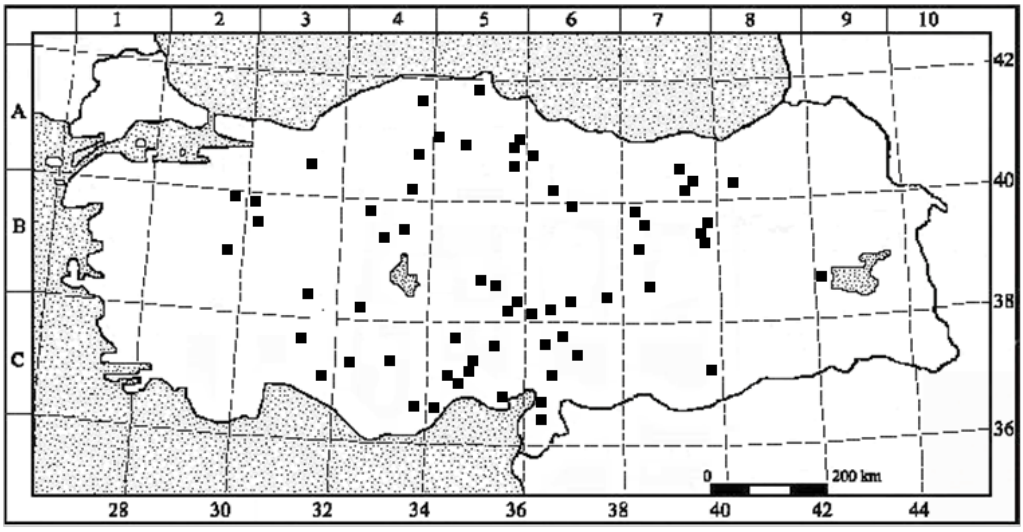

Figure 1. Distribution of *S. salviifolia* Benth.

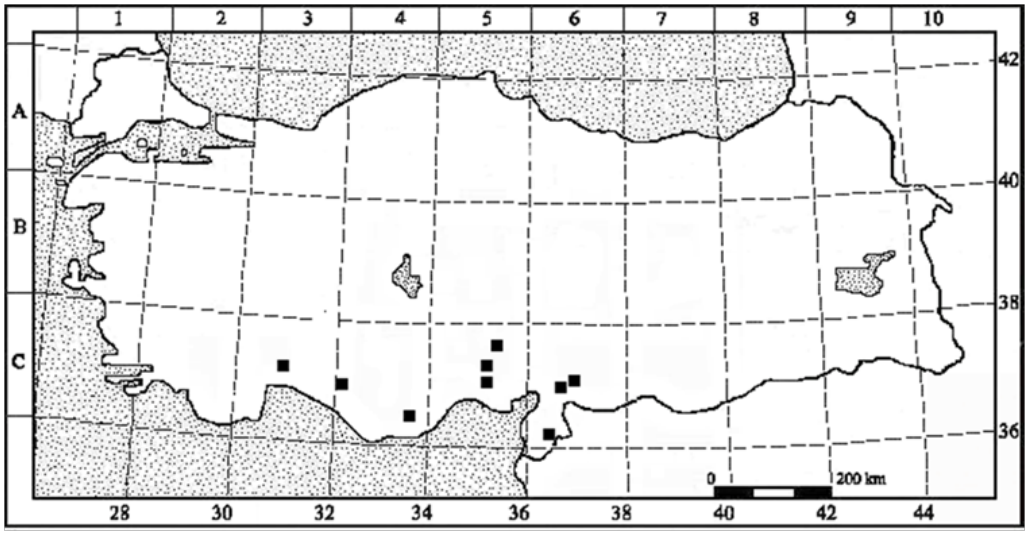

Figure 2. Distribution of *S. diffusa* Benth.

RESULTS

***Scutellaria salviifolia* Benth.**

Perennial herb. Stem greenish and sometimes purple, branched at base, erect and ascending at the uppper parts, 8-35 cm, tomentose to upper parts and pilose and with internodes 0.2-3.9(-5.2) cm. Leaves simple, decussate. The cauline leaves ovate to oblong, 0.5-2.4 × 0.3- 1.1 cm, apex acute-obtuse rarely rotundate, the base acute to rotundate, crenate and near to petiol dentate, surface reticulate, rugose, two of the faces pilose, margin dense, petiolate, petioles tomentose, 0.6-2.5(-3.3) cm. Flowers in axils of floral leaves, every one with 6-34 flowers, raceme. The floral leaves elliptic, ovate, spatulate, rarely oblong, 0.5-2 × 0.25-0.7 cm, apex acute to obtuse, base acute rarely attenuate, margin integer at base, crenate-dentate to upper parts, reticulate, surface short tomentose, sparsely pilose, margin dense, subsessilis 0.2-1.6 cm, pilose and puberulose. Petiole usually purplish green. Pedicels with two opposite subulate bracteoles, bracteoles 0.4-0.6 cm, puberulose. Calyx persistent, 0.4-0.5 cm, green, tubular. At the upper lip of calyx with a scale (scutellum) characteristic for *Scutellaria*, bilabiate, lips entire, external surface with glandular and nonglandular hairy, puberulose. Margin of scutellum and margin of lips especially the upper lip also the vein that lips connected, long nonglandular hairy. Internal surface glabrous, veins not significant. Corolla yellow, 1.3-2.7 cm, like a erect sigmoid tube, bilabiate, the upper lip galeate with three parts, lower lip wide, erect or concave, external surface of corolla tube glandular and nonglandular hairy, hairs sparsely and long at the margins of lips, internal part of corolla and calyx glabrous, veins significant. Stamens 4, didynamous inserted in the upper lip, filaments nearly equal to each other, lower filaments connected to corolla with 2/3 of their length, Upper filaments connected to corolla with 1/3 of their length, anthers ciliate, anthers belong to upper stamens divided into two equal thecae, lower pair has one thecae. Style glabrous, divided into two parts at the apex, the upper part is short. Ovary ginobasic, with a key like gynophore, that has a swollen nectary base. Fruit nutlet, on a short pedicel in the structure that is formed by the calyx lips after inflorescence, 0.17 cm, greenish brown, covered by grey hairs (Figures 3, 4, 7).

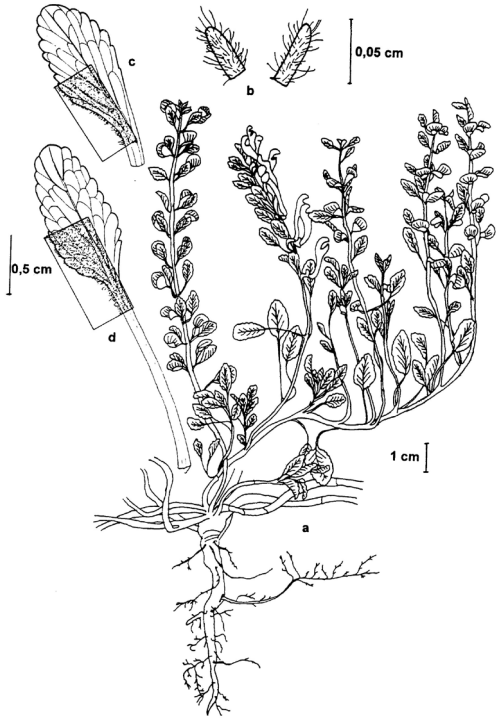

Figure 3. General appearance of *S. salviifolia* Benth.
a)Plant b) Bracteols c) Floral leaf d) Cauline leaf

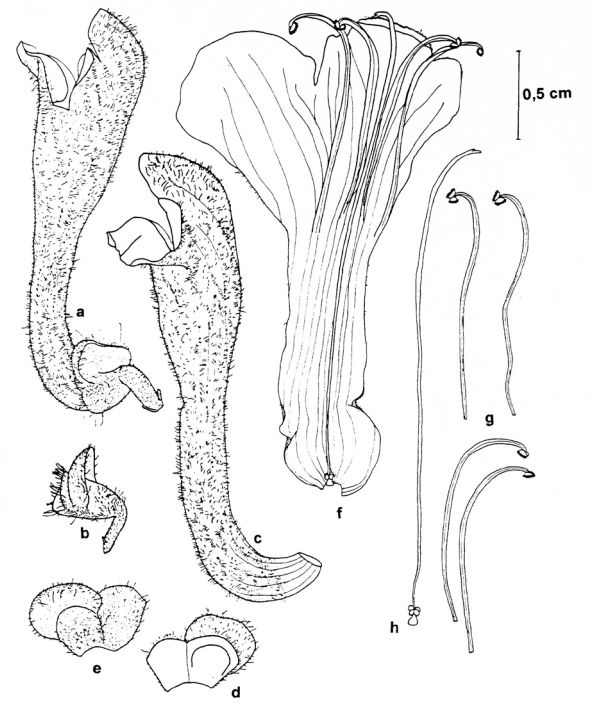

Figure 4. Floral parts of *S. salviifolia* Benth.
a) General view b,d,e) Calyx c,f) Corolla g) Stamens h) Gynoecium

Figure 7. Habitat, flowers and leaf of *S. salviifolia* Benth.

Habitat: Stony slopes, clearings in *Pinus*, *Abies*, *Carpinus* forest, *Quercus* macchie, steppe, 350-2900m. *S. salviifolia* Benth. is widespread in Turkey (Figure 1).

***Scutellaria diffusia* Benth.**

Perennial herb. Stem purplish-green, cushion forming, branched at base, erect and ascending at the upper parts, 3.3-19.5(-22) cm, pilose and with internodes 0.2-2.8(-3.15) cm. Leaves simple, decussate. The cauline leaves obovate, oblong to elliptic, rarely rotundate 0.5-11.5 × 0.25-0.65 cm, apex obtuse, rotundate, base acute, integer at base crenate to upper parts, reticulate, non-glandular and densely glandular hairy, two of the faces puberulose. Petiolate, petioles puberulose, sparsely rugose, 0.2-0.8 cm, rarely purplish-green. Flowers in axils of floral leaves, every one with 8-14 flowers, raceme. The floral leaves elliptic, ovate, spatulate, 0.55-1.1 × 0.2-0.6 cm, apex obtuse, rotundate, base acute rarely attenuate, margin integer at base, crenate-dentate to upper parts, surface reticulate, short tomentose, sparsely pilose, subsessilis 0.25-0.7(-0.9) cm, petiole tomentose and sparsely pilose, rarely purplish green. Pedisels with two opposite subulate bracteoles, bracteoles 0.5-0.6 cm, puberulose. Calyx persistent, 0.3-0.45 cm, green, with pedicel, short glandular and non-glandular hairy, tubular, upper part wide, the upper lip of calyx with a scale (scutellum) characteristic for *Scutellaria*, bilabiate, lips entire, glandular and non-glandular hairy, puberulose, margin of upper lip, part that lips connected, sparsely long non-glandular hairy, internal surface glabrous, veins not significant. Corolla pinkish purple, margin of lower lip white, 0.6-1.2 cm, tubular, erect like a sigmoide tube, to upper part like campanulate, bilabiate, the upper lip galeate with three parts, lower lip wide or erect, external surface of corolla tube dense glandular and nonglandular hairy, internal part of lower lip short hairy, hairs sparsely and long at the margins of lips, internal part of corolla and calyx glabrous, veins significant. Stamens 4, didynamous, inserted in the upper lip, filaments nearly equal to each other, lower filaments connected to corolla with 1/2 of their length, uppper filaments connected to corolla with 1/7 of their length, anthers ciliate, anthers belong to upper stamens divided into two equal thecae, lower pair has one thecae. Style glabrous, divided into two parts at the apex, the upper part is short. Ovary ginobasic, with a key like gynophore, that has a swollen nectary base. Fruit nutlet, in the structure that is formed by the calyx lips after inflorescence (Figure 5, 6, 8).

Habitat: Rocky slopes, *Cedrus or Pinus* forest, 900-2100m. The distribution of *S. diffusa* Benth. is given (Figure 2).

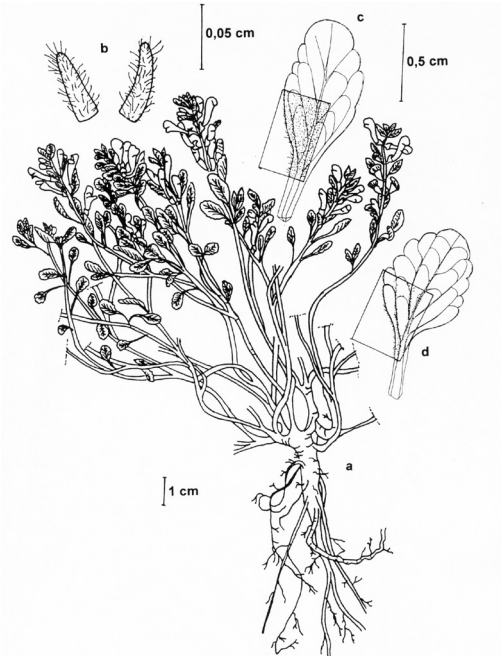

Figure 5. General appearance of *S. diffusa* Benth.
a)Plant b) Bracteols c) Floral leaf d) Cauline leaf

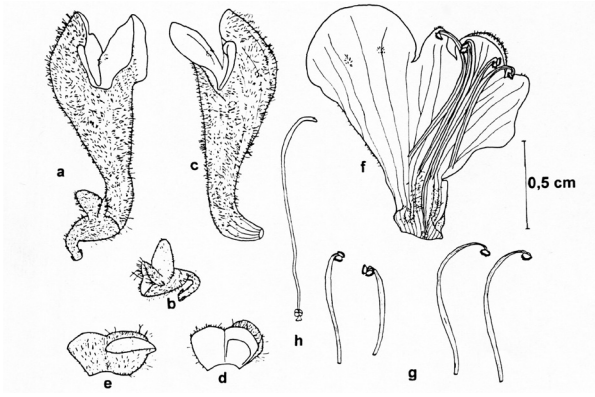

Figure 6. Floral parts of *S. diffusa* Benth.
a)General view b,d,e)Calyx c,f) Corolla g) Stamens
h) Gynoecium

Figure 8. Habitat and floral part of *S. diffusa* Benth.

DISCUSSION

Scutellaria L. (Lamiaceae) genus has 39 taxa with 15 endemic taxa in Turkey. However, there is no detailed morphological studies about these species. In our study, we investigated general appearance of 2 species and the morphological properties of their leaves, floral leaves, bracteoles, flowers. The morphological characters are recorded for *S.salviifolia* Benth., *S. diffusa* Benth. and compared with each other also with literature for the first time in the present paper and differences determined given (Table 1).

The stem of *S. salviifolia* is branched at base, erect and ascending at the upper parts. However stems of *S. diffusa* are cushion forming. Floral leaves of *S. salviifolia* are petiolate and *S. diffusa* has subsessilis floral leaves. Also when compared with each other *S. diffusa* has much smaller calyx and corolla dimensions. Differences at dimensions of species, shapes of cauline and floral leaves (reticulate and rugose at *S. salviifolia*, reticulate at *S. diffusa*), presence of hairs on the internal surface of the corolla in *S. diffusa*, connection types of filaments to corolla tube, hairs of calyx tube and general differences in hairs are the remarkable points (Table 1).

Some of the features of stem, leaves and corolla of *S. salviifolia* and *S. diffusa* were found to be almost the same with those in literature (2,19). Also it is recorded in Flora of Turkey that leaves of *S. salviifolia* is rugose because of impressed veins, racemes few-flowered in *S. diffusa* and many-flowered in *S. salviifolia*. However these features are different from our findings.

Table 1. Comparison and morphological characteristics of *S. salviifolia* Benth. and *S. diffusa* Benth.

Character		*S. salviifolia*	*S. diffusa*
Stem		8-35 cm, Decumbent Tomentose to upper parts and pilose	3.3-19.5(-22)cm Decumbent and cushion forming Dense pilose
Internodiums		0.2-3.9 (-5.2) cm	0.2-2.8 (-3.15) cm
Cauline leaves	Petiol	0.6-2.5(-3.3) cm Tomentose ,	0.2-0.8 cm Puberulose or sparsely pilose,
	Lamina	0.5-2.4 × 0.3-1.1 cm, Apex acute to obtuse, rarely rotundate Base acute to rotundate Surface reticulate, rugose, and pilose	0.5-11.5 × 0.25-0.65 cm, Apex obtuse, rotundate Base acute Surface reticulate and puberulose
Floral leaves	Petiol	Petiolate 0.2-1.6 cm	Subsessilis 0.25-0.7(-0.9) cm,
	Lamina	Elliptic, ovate, spatulate, rarely oblong 0.5-2 × 0.25-0.7 cm Margin integer to crenate-dentate Vesture reticulate, shortly tomentose, sparsely pilose	Elliptic, ovate and spatulate 0.55-1.1 × 0.2-0.6 cm Margin integer to crenate-dentate Vesture reticulate, shortly tomentose, sparsely pilose
Inflorescens		6-34 flowers	8-14 flowers
Bracteol		0.4-0.6 cm	0.5-0.6 cm
Calyx		0.4-0.5 cm Tubular	0.3-0.45 cm Tubular with wide upper part
Corolla		1.3-2.7 cm Yellow Internal surface glabrous	0.6-1.2 cm Pinkish purple Internal surface hairy

According to Flora of Turkey, *S. salviifolia* and *S. diffusa* grow at 400-1900 m and 970-2100 m, respectively. During our field or herbarium examinations, observations showed that *S. salviifolia* and *S. diffusa* grow at 350-2900 m and 900-2100 m, respectively.

In addition to the literature; internodiums, length of cauline and floral leaves, amount of flowers in raceme, length and other properties of petiol and calyx have been recorded.

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