

Salvia anatolica (Lamiaceae), a new species from East Anatolia, Turkey

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Salvia anatolica Hamzaoğlu & A. Duran *sp. nova* (Lamiaceae) is described and illustrated from East Anatolia, Turkey. It is closely related to *S. bracteata*, an endemic also confined to East Anatolia. Diagnostic morphological characters of *S. anatolica* from closely similar taxa are discussed. The pollen characteristics of *S. anatolica* and *S. bracteata* are presented in photographs.

Key words: Lamiaceae, new species, *Salvia*, taxonomy

The genus *Salvia* (Lamiaceae) contains over 900 species world-wide (Hedge 1992, Walker & Elisens 2001). The two centres of diversity are America and SW Asia (Hedge 1960, 1992). Anatolia is a major centre for *Salvia* in Asia, with 46 (52%) of its 89 species endemic to Turkey (Hedge 1982a, Davis *et al.* 1988, Duman 2000, Dönmez 2001). The distribution in neighbouring countries or “Flora areas” is as follows: 75 species in the former USSR (Pobedimova 1954), 70 in the *Flora Iranica* area (Hedge 1982b), 36 in Europe (Hedge 1972) and 21 in the *Flora Palestina* area (Zohary 1966).

Salvia in Turkey was revised by Hedge (1982a). Three species have been described subsequently (Davis *et al.* 1988, Duman 2000, Dönmez 2001), as well as a further taxon whose status is in some doubt (Hedge 1982a). We place the new species described here in “Group B” as defined by Hedge (1982a). The number of species within this group is now 14 and the total number for Turkey is 90.

In Spring 2003, during a botanical trip to the area between Divriği and Kemaliye (Sivas and Erzincan provinces), the authors collected interesting flowering specimens of *Salvia*. The specimens were not referable to any known species. A study of the descriptions in Pobedimova (1954), Zohary (1966), Hedge (1972, 1982a, 1982b), Davis *et al.* (1988) and Duman (2000) as well as a comparison with material in GAZI and ANK showed that the specimens represented a new species. They were also compared to the specimens of a closely similar species, *S. bracteata*, which are cited below.

Pollen for examination by light microscopy was prepared according to Wodehouse (1935) and the measurements were made with a Nikon E600 microscope. The measured pollen diameters are based on at least 50 samples and the other characters on approximately ten. For SEM study, the pollen grains were coated with gold and the micrographs were obtained using a JSM-5600 microscope. The descriptive terminology of Faegri and Iversen (1975) was followed.

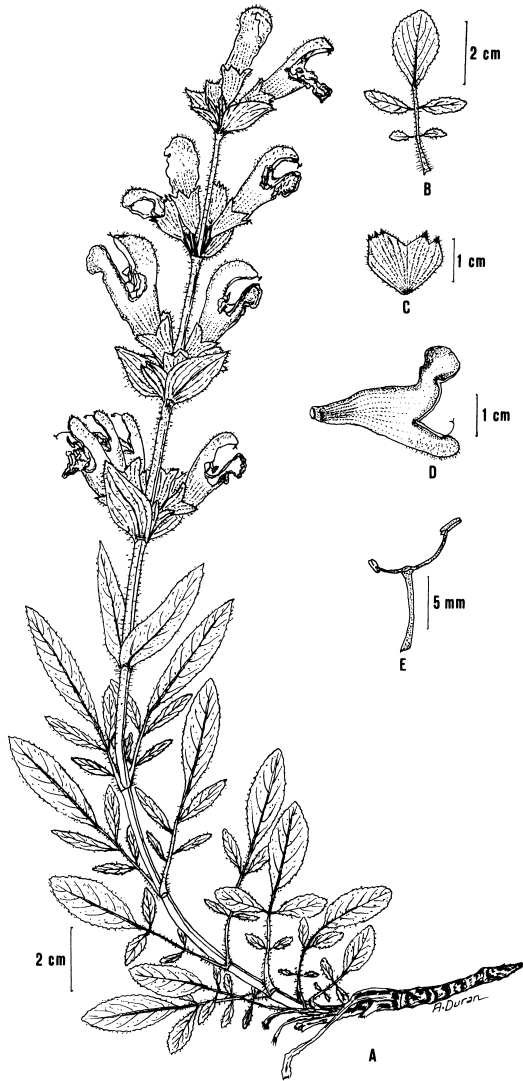


Fig. 1. *Salvia anatolica* (from holotype). — A: Habit. — B: Basal leaf. — C: Calyx. — D: Corolla. — E: Stamen.

Salvia anatolica Hamzaoğlu & A. Duran,
sp. nova (Figs. 1 and 2)

Affinis S. bracteatae sed caulibus pauce, glaberis inferne (nec aliquot, omnino dense glandiferis-villosis), foliis terminalibus segmentis 0.9–1.5 cm latis (nec 1.5–3.5 cm latis), verticillastris 4–6 floribus (nec 5–10), bracteis 3–5 mm latis, virellis (nec 6–9 mm latis, purpurascensibus), pedicellis 5–7 mm longis (nec 1–5 mm longis), corollis omnino luteis, 35–40 mm longis (nec roseis ad purpurascensibus, 20–30 mm longis) differt.

TYPE: Turkey. B7 Sivas: 22 km from Divriği to Kemal-
iye, 1580 m, 30.V.2003 A. Duran 6159, Hamzaoğlu &
Sağiroğlu (holotype KNYA; isotypes GAZI, ANK, HUB, hb.
Yildirimli).

Perennial herb with a woody rootstock; stems few, ± erect, 25–40 cm long, unbranched, (with sterile shoots), greenish, glabrous below, with glandular and simple patent hairs above; leaves mostly basal, pinnatisect, oblong-lanceolate in outline, with two pairs of lateral segments, or more rarely with only one pair on sterile shoots; terminal leaf segments ovate-elliptic to lanceolate, 2.0–6.5 × 0.9–1.5 cm, greenish, glandular and sometimes with a few simple hairs, margin crenulated; lateral segments 4–22 × 2–7 mm; petiole 1–3 cm, winged, with dense glandular hairs and long ciliate margins; inflorescence 15–24 cm long, clearly exceeding leaves with 5–7 verticillasters, each verticillaster 4–6-flowered, internodes 2.5–4.0 cm, clearly distant; floral leaves dissimilar to stem leaves, ovate to lanceolate, widening at base, 16–30 × 10–14 mm, greenish, with dense glandular and patent simple hairs and ± long ciliate margins; bracts narrowly lanceolate to elliptic, 10–15 × 3–5 mm, greenish, indumentum similar to floral leaves; bracteoles present; pedicels 5–7 mm long, ± erect, with dense patent and sparse glandular hairs; calyx tubular-infundibuliform, shortly bi-labiate, membranous-reticulate, greenish, 14–16 × 10–14 mm, 15-veined, with dense glandular and patent simple hairs; upper lip with three teeth, triangular ca. 1 mm long, lower lip with two teeth, triangular-lanceolate ca. 3 mm long; corolla entirely yellow, 35–40 mm long, glandular and with long simple hairs on outside of upper lip; tube 20–24 mm long, not squamulate, gradually widening above, with an annulus in throat; upper lip ± straight, ± equalling lower lip; stamens included within corolla lips; filaments 6–8 mm, staminal connectives shorter than filaments; upper theca ca. 4 mm, longer than lower theca, with long villous hairs; style 35–40 mm, ± equalling corolla; immature nutlets obovoid, 2–2.6 × 1.2–1.6 mm, blackish, rugose.

DISTRIBUTION. *Salvia anatolica* seems to be endemic to the area between Divriği and Kemal-
iye, East Anatolia, and belongs in the Irano-Turanian element. All specimens were collected in Sivas province (B7), where the plant seems to be very rare and local.

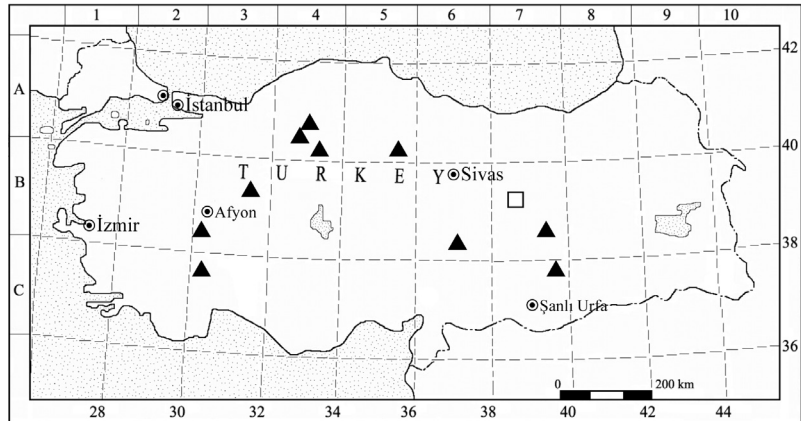


Fig. 2. Distribution map of *Salvia anatolica* (□) and *S. bracteata* (▲) in Turkey.

HABITAT AND LIFE FORM: *Salvia anatolica* grows on calcareous stony slopes and in open *Quercus* scrub with *Anchusa azurea* var. *azurea*, *Alyssum* sp., *Silene* sp., *Trigonella* sp., *Melilotus officinale*, *Coronilla orientalis*, *Crataegus tanacetifolia*, *Centaurea* sp., *Dorycnium pentaphyllum*, and *Dactylis glomerata* at an altitude of 1500–1650 m. It flowers in May and June and has fruits in July and August. It is a hemicyptophyte.

The pollen of *S. anatolica* and *S. bracteata* was studied by SEM. Given the great homogeneity of characters of the species, a general description suffices. The details are provided in Table 1.

The pollen of *S. anatolica*, studied from the holotype, is isopolar, radiosymmetrical, and oblate-spherioid with $P = 47.5 \pm 2.75 \mu\text{m}$ and $E = 48.5 \pm 1.7 \mu\text{m}$ and $P/E = 0.97$. The outline is oval or subcircular in meridional optical section and circular in equatorial optical section. The aperture is hexazonacolpate, and the colpi are long, with acute apices. The exine is $1.82 \pm 0.26 \mu\text{m}$ thick, the sexine slightly thicker than the nexine, semitectate and eurireticulate. The intine is $0.65 \pm 0.1 \mu\text{m}$ (Fig. 3A–C).

The pollen of *S. bracteata* is isopolar, radiosymmetrical, and oblate-spherioid with $P = 47.6 \pm 0.42 \mu\text{m}$ and $E = 48.2 \pm 0.39 \mu\text{m}$, $P/E = 0.99$.

The outline is oval or subcircular in meridional optical section and circular in equatorial optical section. The aperture is hexazonacolpate, and the colpi are long, with acute apices. The exine is $1.72 \pm 0.15 \mu\text{m}$ thick, the sexine is slightly thicker than the nexine, semitectate, suprareticulate, muri with a single row of bacula. The intine is $0.65 \pm 0.01 \mu\text{m}$ thick (specimen Davis 29192 & Hedge, ANK) (Fig. 3D–F).

Within *Salvia* three major groups are recognised (Hedge 1980a) based on stamen characters and these have important taxonomic value. The new species is included within group B since it has a small fertile or subfertile theca. In group B there are 13 species, of which eight are endemic to Turkey. Two of them were described only recently, viz. *S. aytachii* and *S. hedgeana* (Vural & Adıgüzel 1996, Dönmez 2001).

Salvia anatolica is closely similar to the Turkish endemic *S. bracteata*. The morphological differences between them are presented in Table 2. Especially in Elazığ province, *S. bracteata* forms fertile hybrids with the clearly distinct species *S. suffruticosa*. In hybrid swarms a wide range of intermediates occurs, although solitary specimens are usually closer to *S. suffruticosa*. The latter mainly differs from *S. anatolica* in having clump-forming stems, being branched above and

Table 1. Pollen morphology of *S. anatolica* and *S. bracteata* (values in μm).

Species	Polar axis	Equatorial axis	P/E	Colpus length	Exine thickness	Intine thickness	Ornamentation
<i>S. anatolica</i>	47.5 ± 2.75	48.5 ± 1.7	0.97	41.1 ± 2.6	1.82 ± 0.26	0.65 ± 0.1	eurireticulate
<i>S. bracteata</i>	47.6 ± 0.42	48.2 ± 0.39	0.99	40.6 ± 0.75	1.72 ± 0.15	0.65 ± 0.01	suprareticulate

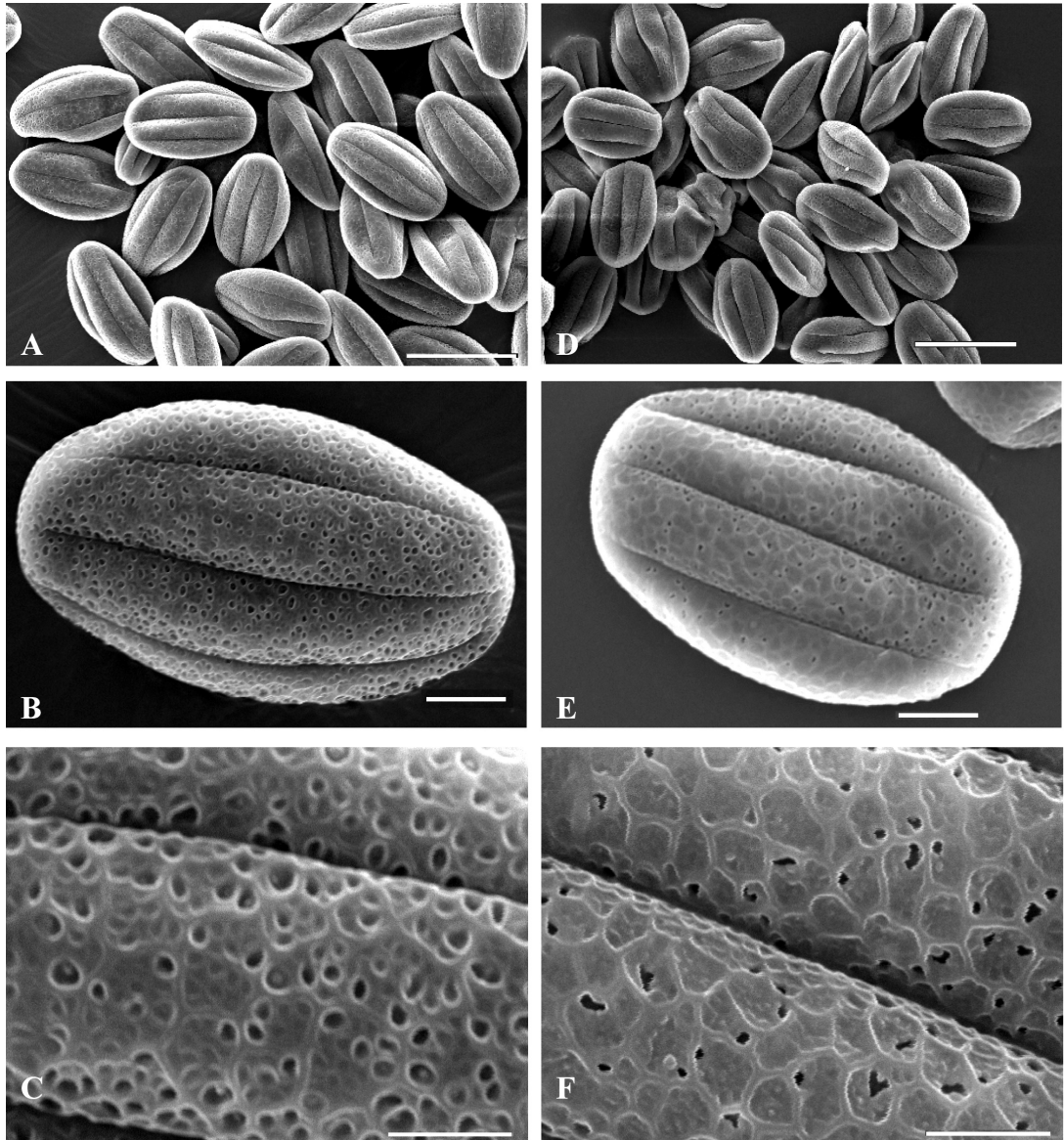


Fig. 3. SEM micrographs of the pollen grains. — *Salvia anatolica*: (A) general view, (B) equatorial view, (C) ornamentation of pollen. — *S. bracteata*: (D) general view, (E) equatorial view, (F) ornamentation of pollen. Magnifications: A $\times 450$, D $\times 350$, B and E $\times 1500$, C and F $\times 5000$.

usually glabrous; also the leaves have 2–4 lateral segments, and the corolla is sulphur-yellow or lilac, 22–25 mm long, with a tube ca. 15 mm.

Pollen size, shape, and aperture characters of *S. anatolica* are very stable (Fig. 3A) and thus it is unlikely that the new species is of hybrid origin. The pollen grains *S. anatolica* and *S. bracteata* show clear differences in the ornamentation and shape (Fig. 3C and F).

Salvia bracteata is distributed throughout much of Turkey amongst *Quercus* scrub on calcareous and igneous slopes at 50–2000 m altitude (Hedge 1982a). The distribution of *S. anatolica* and *S. bracteata* is given in Fig. 2. *Salvia bracteata* is morphologically fairly constant throughout most of Anatolia, but intergrades with *S. trichoclada* in SE Anatolia (Şanlıurfa and Diyarbakır provinces). *Salvia trichoclada* is a problematic

Table 2. Morphological differences between *Salvia anatolica* and *S. bracteata*.

Character	<i>Salvia anatolica</i>	<i>Salvia bracteata</i>
Stems	Few, greenish, glabrous below, with glandular and spreading simple hairs above	Several, often purplish, completely densely glandular pilose-villous and sometimes with long eglandular-villous hairs
Terminal leaf segments	Ovate-elliptic to lanceolate, 2.0–6.5 × 0.9–1.5 cm	Ovate to oblong, 2.5–7 × 1.5–3.5 cm
Verticillasters	4–6-flowered	5–10-flowered
Bracts	10–15 × 3–5 mm, greenish	14–18 × 6–9 mm, purplish
Pedicels	5–7 mm long	1–5 mm long
Corolla	Yellow, 35–40 mm long; tube 20–24 mm long	Pink to purplish, 20–30 mm long; tube 14–20 mm long

taxon, since it intergrades with *S. bracteata* but is distinguished from the latter by its very long stem bearing patent eglandular hairs, its terminal leaf segments being ovate to oblong, 2.5–7 × 1.5–3.5 cm, its floral leaves being smaller, 12–20 × 6–11 mm, its corolla being pink to purplish, and its fruiting calyx being larger, 15–25 mm long.

Chromosome counts of *S. anatolica* have not been carried out but in “Group B” the chromosome number varies from 2n = 16 or 32 in *S. multicaulis*, 2n = 16 in *S. aucheri* and *S. recognita*, to 2n = 14 in *S. fruticosa* and 2n = 14, 16 in *S. cadmica* (Hedge 1982a, Davis *et al.* 1988).

REPRESENTATIVE SPECIMENS EXAMINED of *Salvia bracteata*: — Turkey. A4 Ankara: Ayaş Dağları, Ayaş Beli, ca. 1100 m, 1.VI.1971 Akman 6642 (ANK); Ankara: Kızılcahamam, Çamkoru, K. Karamanoğlu s.n. (ANK); Ankara: Yenişehir, W. Kotte s.n. (ANK); Ankara: Hacıkadın deresi, 14.VI.1944 B. Kasaplıgil s.n. (ANK); Ankara: Kalecik, D. 21456 (ANK); A5 Yozgat: Çekerek, Ovacık köyü, Devenci dağı göç yolu, ca. 1300 m, 19.VI.1980 R. İlarstan 839 (ANK); B3 Afyon: Uşak yolu, Banaz-Hocalar arası, ca. 950 m, 11.VI.1975 R. Çetık 3592 (ANK); Eskişehir: Eskişehir-Sivrihisar arası, 75 km, 950 m, 27.V.1999 M. Vural 8178 (GAZI); B4 Ankara: Kayaş, Bayındır Barajı, 985–995 m, 2.VI.1996 M. Soydemir 1823 (GAZI); Ankara: Beytepe, Çiftlik çevresi, 900 m, 26.V.1975 S. Erik 1153 (GAZI); B6 Kahramanmaraş: Göksun, Doğanonak, Binboğa Dağı, Kapıkaya mevkii batısı, 1800–2150 m, 2.VII.1992 Z. Aytacı & H. Duman 4593 (GAZI); B7 Elazığ: Elazığ-Pertek arası, 1300 m, 07.VI.1957 D. 29192 & Hedge (ANK); Elazığ: Elazığ-Kale arası, 1200 m, D. 28946 & Hedge (ANK); C3 Burdur: Burdur'un 5 km güneyi, 950–1050 m, 24.VI.1995 F. Karavelioğulları & H. Duman 4870 (GAZI); C7 Şanlıurfa: Karacadağ, Siverek-Diyarbakır arası, ca. 1250 m, D. 28314 & Hedge (ANK).

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References

- Davis, P. H., Mill, R. R. & Tan, K. 1988: *Salvia* L. — In: Davis, P. H., Mill, R. R. & Tan, K. (eds.), *Flora of Turkey and the East Aegean Islands* (Suppl.) 10: 210. Edinburgh Univ. Press, Edinburgh.
- Dönmez, A. A. 2001: A new Turkish species of *Salvia* L. (Lamiaceae). — *Bot. J. Linn. Soc.* 137: 413–416.
- Duman, H. 2000: *Salvia* L. — In: Güner, A., Özhatay, N., Ekim, T. & Başer, K. H. C. (eds.), *Flora of Turkey and the East Aegean Islands* 11: 209–210. Edinburgh Univ. Press, Edinburgh.
- Fægri, K. & Iversen, J. 1975: *Textbook of pollen analysis*. — Hafner Press, New York.
- Hedge, I. C. 1960: Notes on some cultivated species of *Salvia*. — *J. Royal Hort. Soc.* 85: 451–454.
- Hedge, I. C. 1972: *Salvia* L. — In: Tutin, T. G., Heywood, V. H., Burges, N. A., Valentine, D. H., Walters, S. M. & Webb, D. A. (eds.), *Flora Europaea* 3: 188–192. Cambridge Univ. Press, Cambridge.
- Hedge, I. C. 1982a: *Salvia* L. — In: Davis, P. H. (ed.), *Flora of Turkey and the East Aegean Islands* 7: 400–461. Edinburgh Univ. Press, Edinburgh.
- Hedge, I. C. 1982b: *Salvia* L. — In: Rechinger, K. H. (ed.), *Flora Iranica* 150: 403–476. Akademische Druck und Verlagsanstalt, Graz.
- Hedge, I. C. 1992: A global survey of the biogeography of the Lamiaceae. — In: Harley, R. M. & Reynolds, T. (eds.), *Advances in Labiate science*: 7–18. — Royal Bot. Gardens, Kew.

- Pobedimova, E. G. 1954: *Salvia* L. — In: Schischkin, B. K. (ed.), *Flora of the USSR* 21: 178–260. [translated from Russian] Israel Prog. Sci. Transl., Jerusalem.
- Vural, M. & Adıgüzel, N. 1996: A new species from Central Anatolia: *Salvia aytachii* M.Vural et N.Adıgüzel (Labiatae). — *Türk Bot. Derg.* 20: 531–534.
- Walker, J. B. & Elisens, W. J. 2001: A revision of *Salvia* section *Heterosphace* (*Lamiaceae*) in Western North America. — *Sida* 19: 571–589.
- Wodehouse, R. R. 1935: *Pollen grains*. — McGraw-Hill, New York.
- Zohary, M. 1966: *Salvia* L. — In: Zohary, M., (ed.), *Flora Palaestina* 1: 296–297. Israel Acad. Sci. & Hum., Jerusalem.