

Fritillaria mughlae (Liliaceae), a new species from Turkey

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Fritillaria mughlae M. Tekşen and Aytaç *sp. nova* (Liliaceae) is described from Turkey and illustrated. It is related to *F. forbesii*, from which it mainly differs in the shape of the leaves, petal colours and divided style. In addition seed and pollen micromorphology and karyotype of *F. mughlae* and *F. forbesii* were studied.

Key words: *Fritillaria*, new species, taxonomy

The genus *Fritillaria* has about 165 taxa world-wide (Rix 2001). With the new species described here, it is represented in Turkey by 38 species and six subspecies (Rix 1984, Özhatay 2000), 27 of the species being endemic. It has 25 taxa in Greece (Rix 2001), 22 in Russia (Lozina-Lozinskaya 1968) and 18 in Iran (Rechinger 1990). In southwestern Turkey most species grow on rocky soils in *Pinus* forests, often in clearings, and also in macchia-type vegetation.

The plants reported here were collected in Marmaris and Datça in Muğla province and deposited at GAZI. They were compared with the specimens of the morphologically close *F. forbesii* kept in GAZI (M. Tekşen 1997, 2111) and K (lectotype *E. Forbes* 626).

Seed samples were obtained from an immature capsule and prepared for a SEM study. Mature seeds were transferred to stubs and coated with gold. The literature (Miklas *et al.* 1987, Chuang & Ornduff 1992, Omer & Quasier 1995, İlarslan & Koyuncu 1997, Membrives *et al.* 2003) was consulted when studying of seed surface.

Polliniferous material collected by M. Tekşen in Muğla was obtained from GAZI. For light microscopic study, pollen slides were prepared with the technique of Wodehouse (1935). A Prior microscope was used. For SEM study, dry pollen grains were transferred to stubs and coated with gold. A JEOL JSM-5600 scanning electron microscope was used. The terminology used is mainly from Faegri and Iversen (1975).

To study somatic chromosomes, root tips were pre-treated with α -monobromonaphthalene overnight and then fixed in alcohol:acetic acid (3:1). Roots were hydrolysed in 1 N HCl at 60 °C for 12 minutes, and stained in Feulgen. Permanent slides were prepared in Depex. Chromosomes were classified using the nomenclature of Levan *et al.* (1964). Idiograms were prepared in decreasing order.

***Fritillaria mughlae* M. Tekşen & Aytaç, *sp. nova* (Figs. 1–6)**

Affinis F. forbesi, sed *caulis laevigatus* (non *pap-*

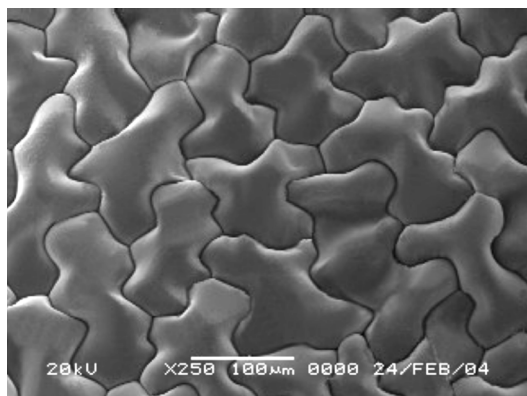


Fig. 1. *Fritillaria mughlae* (M. Tekşen 1996). Scanning electron micrographs of seed (SEM $\times 250$).

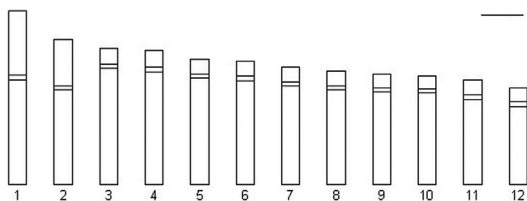


Fig. 3. *Fritillaria mughlae* (M. Tekşen 1996). Idiogram of somatic chromosomes. Scale bar 5 μ m.



Fig. 2. *Fritillaria mughlae* (M. Tekşen 1996). Somatic chromosomes. Scale bar 10 μ m.

illosus), *folia anguste lanceolata* (*non linearia*), *glauca* (*non viride*), *stylus trifidus* (*non clavatus vel undivisus*), *pollinis grana semiprolatis* (*non prolatis*).

HOLOTYPE: Turkey. C1 Muğla: Marmaris – Datça, between Hisarönü and Emecik, 45 km to Datça, 70–80 m,

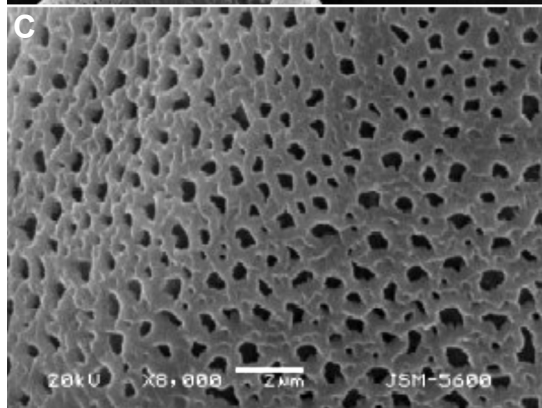
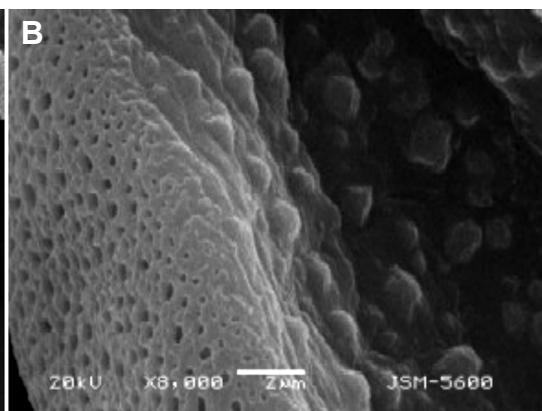
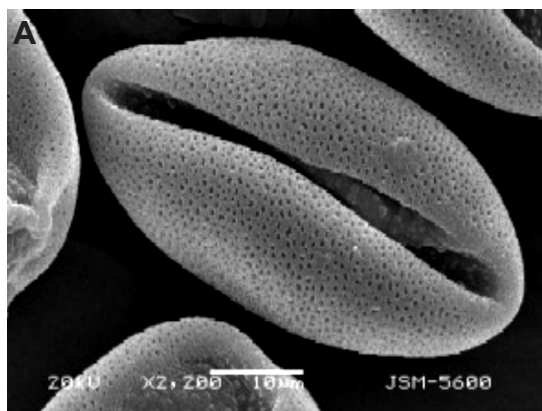
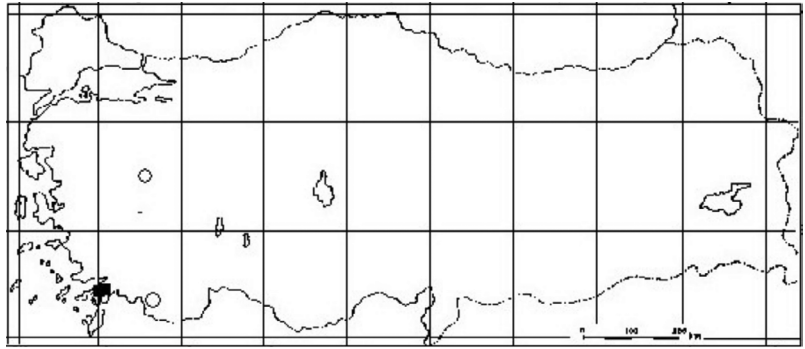


Fig. 4. *Fritillaria mughlae* (M. Tekşen 1996). Scanning electron micrographs of pollen. — **A:** Pollen grain in equatorial view (SEM $\times 1800$). — **B:** Sulcus membrane (SEM $\times 8000$). — **C:** Exine surface (SEM $\times 8000$).

Fig. 5. Geographic distribution of *Fritillaria mughlae* (■) and *F. forbesii* (○).



rocky slopes, 01.III.2001 *M. Tekşen* 1996, *E. Tekşen* and *U. Soydemir* (GAZI; isotypes ANK, ISTF, HUB). — PARATYPE: Turkey. C2 Muğla: Marmaris to Emecik, 350 m, 25.III.1956 *D. & Pollunin* 25375 (ANK!, K, E, BM).

ETYMOLOGY: The species is named after the Muğla province of Turkey.

Bulb globose, $0.8\text{--}1.2 \times 0.8\text{--}1.7$ cm; tunica thin and papery. Stem erect, 7–25 cm, smooth. Leaves 5–12, sessile, alternate, glaucous green; lowest leaves $4.5\text{--}12.3 \times 0.5\text{--}0.8$ cm, linear-lanceolate to acuminate; median leaves $3.2\text{--}12.5 \times 0.2\text{--}0.7$ cm, linear, acuminate. Bract one, $2.8\text{--}9.2 \times 0.1\text{--}0.4$ cm, linear, acuminate. Flowers 1–2, perigon narrowly campanulate, segments greenish-yellow, fading to brown (veined); outer segments $14\text{--}20 \times 5\text{--}6$ mm, lanceolate, obtuse, ciliate-tufted at apex; inner segments $14\text{--}20 \times 4\text{--}5$ mm, obtuse, ciliate-tufted at apex. Nectaries lanceolate, $3\text{--}4 \times 1$ mm, greenish-yellow, at base of perigon. Filaments 6.5–8 mm, broadening towards base, papillose, yellow; anthers 3.5–5 mm, oblong-elliptic, yellow, basifixed. Style 6–8 mm, trifid, branches 1–3 mm, papillose; stigma entire. Capsule 18–21 the 10–13 mm, oblan-ceolate, unwinged. Seeds 3.5–6 the 3.5–5 mm, flat, ovate, testa pale brown, reticulate-faveolate. Flowering February–March.

DISTRIBUTION AND ECOLOGY: *Fritillaria mughlae* grows on serpentine rocky slopes, in the clearings of *Pinus* forest and in *Quercus coccifera* scrub in SW Turkey, between 70–80 m. East Mediterranean element.

SEED MORPHOLOGY: The mature seeds of *Fritillaria mughlae* are ovate, flattened, $3.5\text{--}6 \times 3.5\text{--}5$ mm and light brown. The surface is unornamented and rugose. The epidermal cells have very distinct interdigitating walls and with 1–6 lobes, but some of them are bifurcate (Fig. 1).

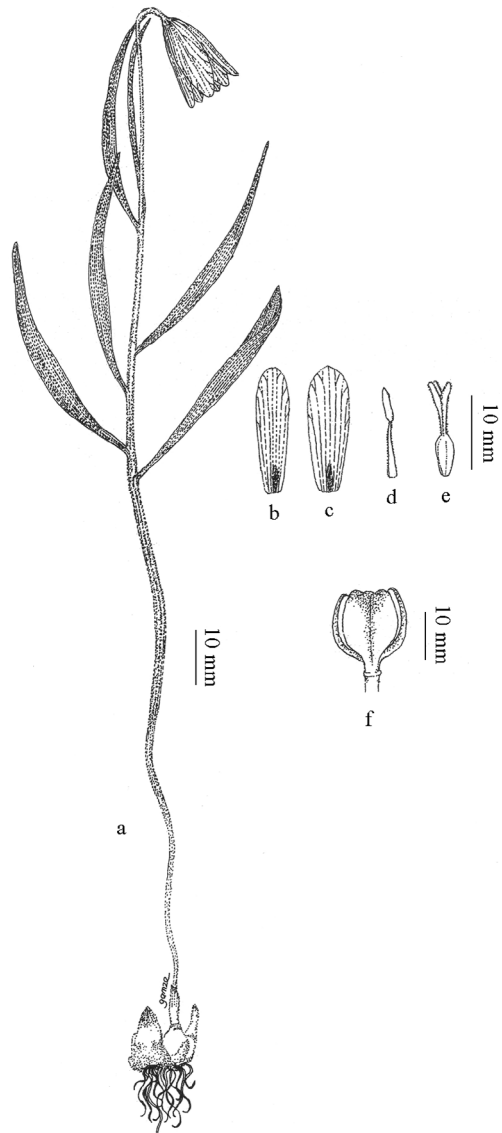


Fig. 6. *Fritillaria mughlae* (*M. Tekşen* 1996). — **a:** Habit. — **b:** Outer segment. — **c:** Inner segment. — **d:** Stamen. — **e:** Style and ovary. — **f:** Capsule.

[illegible]

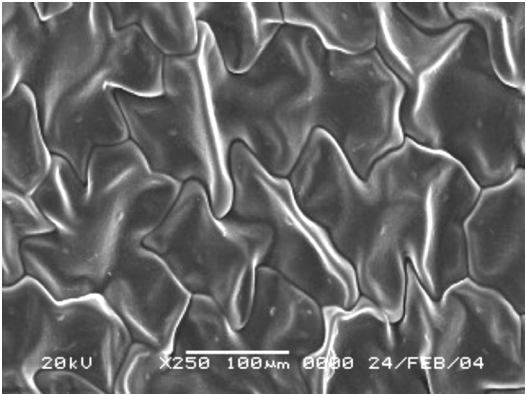


Fig. 7. *Fritillaria forbesii* (M. Tekşen 1996). Scanning electron micrograph of seed (SEM $\times 250$).

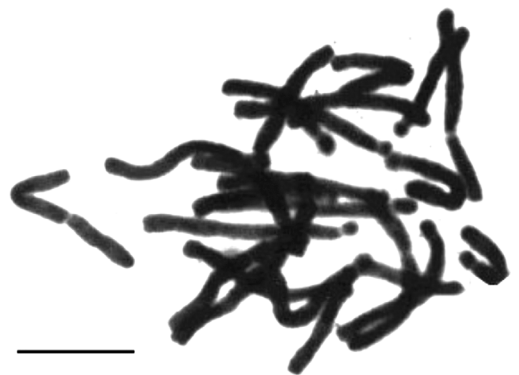


Fig. 8. *Fritillaria forbesii* (M. Tekşen 1996). Somatic chromosomes. Scale bar 10 μm .

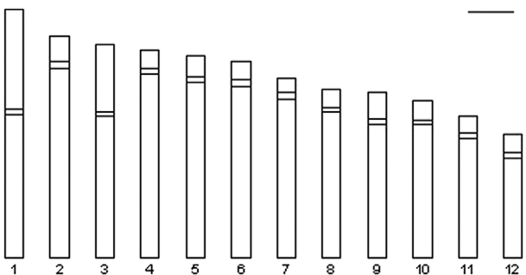


Fig. 9. *Fritillaria forbesii* (M. Tekşen 1996). Idiogram of somatic chromosomes. Scale bar 5 μm .

surface reticulate, muri thickness 0.43 μm thick, lumen 0.42 μm diameter, sulcus membrane verrucate, granules composed of ectexinous elements and sulcus round at apex. Pollen grain in equatorial view, sulcus membrane and exine surface are shown in Fig. 4. *Fritillaria forbesii* has a subprolate pollen type and the exine surface is reticulate.

***Fritillaria forbesii* Rix (Figs. 5 and 7–10).**

SEED MORPHOLOGY: The seed morphology is similar to that of *F. mughlae* (Fig. 7).

CHROMOSOME STRUCTURE: The chromosome number is 24. The karyotype is two \pm symmetric (one pair metacentric, one pair submetacentric) chromosome pairs and ten asymmetric pairs (three subtelocentric pairs, seven telocentric pairs; Fig. 8). The measurements of the somatic chromosomes are in Table 3 and a haploid idiogram based on the measurements of ten metaphase plates is in Fig. 9. The arm ratio in the metacentric chromosome is 1.43, and in the submetacentric chromosome 2.10. In the subtelocentric chromosomes, the ratio ranges from 5.04 to 6.96, and in the telocentric from 7.02 to 10.74. The total length of the haploid complements is 189.69 μm .

POLLEN MORPHOLOGY: The pollen grains are monosulcate, heteropolar, prolate in shape (A/B:

Table 3. Diagnostic characters of *Fritillaria mughlae* compared with *F. forbesii*.

<i>Fritillaria mughlae</i>	<i>F. forbesii</i>
Stem smooth	Stem usually papillose around lowest leaves or smooth
Leaves glaucous-green, linear-lanceolate	Leaves green, linear
Perianth segments greenish-yellow	Perianth segments yellow
Style 6–8 mm, 3-fid, branches 1–3 mm	Style 6–10.5 mm, undivided
Pollen shape subprolate	Pollen shape prolate
Exine surface reticulate	Exine surface reticulate-foveolate
Chromosomes $2n = 2x = 2m + 2sm + 12st + 8t$	Chromosomes $2n = 2x = 2m + 2sm + 6st + 14t$

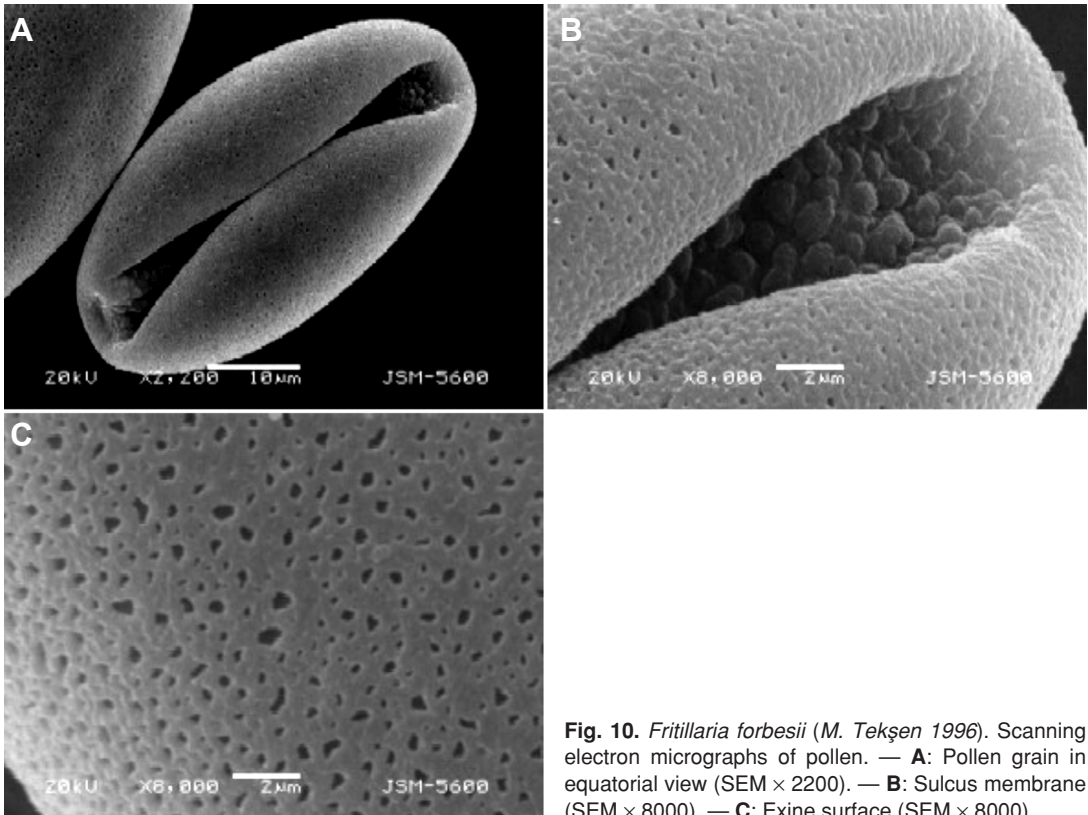


Fig. 10. *Fritillaria forbesii* (M. Tekşen 1996). Scanning electron micrographs of pollen. — **A:** Pollen grain in equatorial view (SEM $\times 2200$). — **B:** Sulcus membrane (SEM $\times 8000$). — **C:** Exine surface (SEM $\times 8000$).

1.37), $46.38\ \mu\text{m}$ in polar diameter (P) and $33.90\ \mu\text{m}$ in equatorial diameter (E), sulcus $42.92\ \mu\text{m}$ length and $20.30\ \mu\text{m}$ width; exine thickness $1.79\ \mu\text{m}$ and semitectate, intine $0.92\ \mu\text{m}$ thick, exine surface reticulate-foveolate, muri thickness $0.70\ \mu\text{m}$ thick, lumen $0.44\ \mu\text{m}$ diameter, sulcus membrane verrucate, granules composed of ectexinous elements and sulcus round at apex. Pollen grain in equatorial view, sulcus membrane and exine surface are shown in Fig. 10.

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