

A TAXONOMIC STUDY OF THE GENUS *Fritillaria* L. (LILIACEAE) FROM PAKISTAN AND KASHMIR

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The genus *Fritillaria* L. is represented by 6 species and one new subspecies, *F. cirrhosa* D. Don subsp. *roylei* (Hook.) Ali in Pakistan and Kashmir.

Key words: *Fritillaria*, Pakistan, Kashmir, taxonomy.

Ali, S. I. (2007) – Estudo taxonómico do género *Fritillaria* L. (*Liliaceae*) no Paquistão e Cachemira. *Portugaliae Acta Biol.* **22**: 221-230.

O género *Fritillaria* L. é representado por 6 espécies e uma nova subespécie, *F. cirrhosa* D. Don subsp. *roylei* (Hook.) Ali, no Paquistão e na Cachemira.

Palavras chave: *Fritillaria*, Paquistão, Cachemira, taxonomia.

INTRODUCTION

The genus *Fritillaria*, distributed in the temperate regions of the world consists of about 130 species (TAMURA, 1998). Many species are well known from the horticultural and ornamental point of view as evident by the fact that L. H. BAILEY & E. Z. BAILEY *et al.* (1980) have listed about 34 species of the genus *Fritillaria* in Hortus Third; *F. imperialis* L. being the best known ornamental species. Some species are very well known from the medicinal point of view. *F. imperialis* L. yields steroidal alkaloids, used in traditional Chinese medicine as analgesic, expectorant and in the treatment of fever and tumours (VAN WYK & WINK, 2004). The bulbs of *F. cirrhosa* D. Don subsp. *roylei* (Hook.) Ali [*F. roylei* Hook.] constitute the Chinese drug Szechuan-Pei-Mu used as antipyretic, expectorant and lactagogue in China (KIRTIKAR & BASU, 1991). The dried bulbs of *F. cirrhosa* subsp. *cirrhosa* D. Don are used in asthma, bronchitis and tuberculosis (AMBASTA *et al.*, 1986). *F. raddiana* Regel and *F. pallidiflora* Schrenk ex Fischer & A. C. Meyer are also medicinally important.

HOOKE f. (1892) recognized two species, *F. roylei* Hook. and *F. imperialis* L. from the area under consideration. TURNILL & SEALY (1955) also reported

the above-mentioned species in addition to *F. imperialis* var. *chitralensis* Hort. Rechinger f. (1990) recognized three species *F. imperialis* L., *F. gibbosa* Boiss., and *F. roylei* Hook. S. DASGUPTA & DEB (1986) have accepted *F. imperialis* L., *F. cirrhosa* D. Don, *F. pallidiflora* Schrenk and *F. raddeana* Regel. In the present paper 6 species and one new subspecies *F. cirrhosa* D. Don subsp. *roylei* (Hook.) Ali are recognized.

The grid system used for citing the specimens is the same as adopted in Flora of Pakistan (ALI & QAISER, 2005).

FRITILLARIA L.

Sp. Pl. 303. 1753; Gen. Pl. ed. 5. 144. 1754; Boiss., Fl. Or. 5: 176. 1882; Hook.f., Fl. Brit. Ind. 6: 352; Turrill & Sealy in Hook., Ic. Pl. 39 (1&2). 1980; S. Dasgupta & Deb in J. Ind. Bot. Soc. 65: 288. 1986; Rech.f., Fl. Iran. 165: 61. 1990; Tamura in Kubitzki, Fam. Gen. Vasc. Pl. 3: 352. 1998; Xinqi & H. V. Mordak in Zhengyi & P. H. Raven, Fl. China 24: 127. 2000.

Perennial herbs. Bulbs usually tunicated with few tightly packed scales which gradually become thin and scarious towards the outer side with 3-4 nut-like fleshy ones inside the bulb. Daughter bulbs are produced from inner scales. Foliage leaves verticillate, opposite or alternate, sessile, lanceolate. Inflorescence a raceme or an umbel, often 1-flowered. Flowers nodding, actinomorphic. Perianth campanulate or saucer-shaped. Tepals 6, in 2 whorls, each of outer whorl oblanceolate, obovate or elliptic, those of inner whorl often broader, gibbous, nectariferous at base, blunt. Nectaries at base or slightly above the base of tepals. Stamens 6, epitepalous, anthers pseudobasifixed, dehiscence latrose. Pistil syncarpous, trilocular, axile placentation, ovules many, style longer than ovary, stigma trifid or trilobate. Capsule flat topped, 6-lobed or winged. Seeds many, broadly winged.

- | | | | |
|----|---|--|---------------------------|
| 1. | + | Flowers in false umbel with the leaf-like floral bracts arranged in a tuft over-topping the flowers. | 2 |
| | - | Flowers racemose or solitary, bracts not over-topping the flowers. | 3 |
| 2. | + | Flowers in shades of orange-red; nectaries 4-5 (-8) mm in diameter. | 4. F. imperialis |
| | - | Flowers bright yellow; nectaries 1.5-2.5 mm in diameter. | 1. F. chitralensis |
| 3. | + | Bracts 1-2 at the base of the pedicel. | 4 |
| | - | Bracts 3 at the base of the pedicel. | 6 |

- | | | |
|----|---|--|
| 4. | + Filaments slightly longer than anthers. | 5. F. pallidiflora |
| | – Filaments at least twice as long as the anthers. | 5 |
| 5. | + Bulbs 4-5 x 4-5 cm. Tepals 3-4 (-5) x 1.5-2.0 cm; filament 2.2 cm. | 6. F. raddeana |
| | – Bulbs up to 3.0 x 3.0 cm. Tepals 1.5 x 1.0 cm; filament 0.9-1.1 cm. | 3. F. gibbosa |
| 6. | + Bulb 1-2 cm in diameter, leaves linear with cirrhose tips. | 2.a. F. cirrhosa subsp. cirrhosa |
| | – Bulb 2-3 cm in diameter, leaves linear-lanceolate, tip obtuse to acute-acuminate. | 2.b. F. cirrhosa subsp. roylei |

1. **Fritillaria chitralensis** (Hort.) B. Mathew in Curtis Bot. Mag. 13(1): 30. 1996.
Fritillaria imperialis L. var. *chitralensis* Hort. In Gard. Chron. Ser. III. 47: 171. f. 73. 1910 & J. Roy. Hort. Soc. 36. Proc.: 1. f 76. 1911; R. R. Stewart, Ann. Cat. Vasc. Pl. W. Pak. Kashm. 52. 1972; L. H. Bailey & L. Z. Bailey et al. Hortus Third 488. 1976; Turrill & Sealy in Hook., Ic. Pl. 39: 255. t. 3849. 1980.

Perennial. Bulb ovoid, up to 3 cm in diameter. Roots branched. Stem 20-45 cm. Leaves (5-7)9, subopposite, opposite or whorled, present on the lower and central region of the stem, glabrous, glossy, 6-14 x 2-7 cm, oval to ovate-lanceolate, lower most broadest, upper most lanceolate. Inflorescence 1-4 flowered pseudo-umbel bracts 2-5, lanceolate to linear-lanceolate, 6-8 x 0.5-1.5 cm, glossy, green. Flowers pendent, broadly campanulate, bright yellow, slightly fragrant. Pedicel 2-4 cm. Tepals 3-4 (-5) cm, curved at the cuneate base, tip obtuse, papillose; outer obovate or rhombiform, inner elliptic or ovate-elliptic. Nectaries white, subcircular-oval, c. 1.5-2.5 mm in diameter. Stamens included, filaments 2.5-3 cm, tapering, c. 1 mm wide, anthers 1.3 mm long before dehiscence, 7-8 mm after dehiscence. Ovary c. 11 mm long; style c. 2.7 cm long, 3 branched, branches 3-4 mm, curved outward. Fruit pedicellate, pedicel 3.5-4 cm; capsule 2-2.5 cm long, with 2-3 mm wide 6 undulate wings. Seeds 6-8 mm, flat, brown.

Holotype: Cultivated specimen from bulbs collected by H. D. Watson in Chitral, *Watson* (K).

B-6 Chitralr, Drosh, *Brown* (K); Drosh, 4500-4700 ft, April 1908, *Toppin* 28 (K).

Distribution: Eastern Afghanistan, Pakistan (Chitral).

Fl. Per.: April

Beautiful delicate ornamental plant. Introduced in England for the first time in 1910 from Chitral; reintroduced again from Afghanistan in 1970.

Though *Fritillaria chitralensis* is reported from Kashmir also by BRIAN MATHEW (l. c.) who has treated Chitral as part of Kashmir, however, to my knowledge, this taxon does not extend to Kashmir.

2. ***Fritillaria cirrhosa*** D. Don, Prodr. Fl. Nepal. 51. 1825; Baker in J. Linn. Soc. 14: 257. 1874; Hook.f., Fl. Brit. Ind. 6: 353. 1892; Turrill in Curtis Bot. Mag. 170: t. 255. 1955; Kitam. in Kihara, Fauna Fl. Nep. Himal. 92. 1955; Spring Fl. Sikkim Himal. fig. 88. 1963; Hara, Fl. E. Himal. 1: 408. 1966; Rep. 2: 166. 1971; Turrill & Sealy in Hook. Ic. Pl. 39 (1&2): t. 3826. 1980; S. Dasgupta & Deb in J. Ind. Bot. Soc. 65: 291. 1986; Xinqi & V. H. Mordak l. c. 128.

Two taxa, *Fritillaria cirrhosa* D. Don and *F. roylei* Hook., are closely related. Hooker f. (l. c.) states that *F. cirrhosa* is "very nearly allied to *F. roylei*, and perhaps, as Wallich believed, a variety of that plant, the leaves are however larger and narrower and the uppermost have cirrhose tips." S. Dasgupta and Deb (l.c.) have stated that "Examination of large number of specimens collected from Bhutan, Sikkim, Nepal, U.P., H.P., Kashmir, shows that there is no qualitative difference between the two species, smaller plants with smaller bulbs, linear leaves and cirrhose tips of E. Himalaya gradually change to bigger plants with bigger bulbs, broader leaves without cirrhie in W. Himalaya giving some indication of geographical and ecological distinction." "The plants occurring in U.P. and Nepal are intermediate between the two extremes and cannot be grouped in any one of them." Earlier Turrill (in Curtis Bot. Mag. 170 t. 255. 1955) had stated that extreme specimens differ so greatly one from another that it seems absurd to include them under one species. On the other hand, series of specimens can be so arranged as to show practically continuous variation in characters" In view of these considerations, it is proposed to recognize the following taxa:

a. subsp. ***cirrhosa***

Plants smaller with smaller bulbs, linear leaves and cirrhose tips.

Isotypes: Tibet, E. Gossainthan, August 1819, *E. Gardner* s. n. ex Wall. Cat. 3079A (BM) Duplicate (K).

S. W. China, Myanmar, Bhutan, Sikkim, Nepal, India.

2n = 24 (Kurosawa, S. In Hara, H. 1971. The Flora of Eastern Himalaya, Second Report: 356-364. Univ. Tokyo Press, Tokyo).

An ornamental plant. Dried bulbs are used in asthma, bronchitis and tuberculosis (AMBASTA *et al.*, 1986).

b. subsp. **roylei** (Hook.) Ali stat. nov.

Fritillaria roylei Hook. in Hook. Ic. Pl. 9: t. 8600. 1852; Baker in J. Linn. Soc. Bot. 14: 173. 1874; Hook.f., Fl. Brit. Ind. 6: 353. 1892; M. A. Rau, High Alt. Fl. Pl. W. Himalaya 187. 1975; Rech.f., Fl. Iran. 165: 76. 1990; Polunin & Stainton, Fl. Himalaya 422. 1997.

Bulbs 5-7.5 cm below the ground, 2-3 cm in diameter. Stem 30-65 cm. Leaves 7-11, opposite or in whorls of 3 or 4 or alternate; linear-lanceolate, 5-12 x 0.5-1.5 cm, obtuse to acute-acuminate. Pedicel 1-4 cm long. Flowers solitary or 2-3 in raceme. Bracts 3 at the base of the pedicel. Flowers nodding, campanulate, 3-5.5 x 2.0-5.0 cm; tepals oblong-elliptic to obovate, yellow, yellowish green, tasselled with purple on the inner side, base purple on the outer side, 3-5 x 1.2-1.8 cm. Nectaries 3-5 x 2-3 mm, projecting abaxially. Stamens 2-3 cm, filaments sometimes papillose. Ovary sessile, 5-16 x 1.5-2 mm. Style 1-2 cm, 3-lobed, each lobe 3-5 mm. Capsule 2.0-3.5 x 1.2-2.5 cm, broadly oblong, obtusely angled, triloculed, 6-winged, wing 1-1.5 mm broad. Pedicel c. 10 cm, stipe 2-6 mm long. Seeds many, 3-7 x 2.5-5.0 mm, wing 1-2 mm.

Type: N. W. India, Royle s.n. (LIV).

B-7 Hazara, Kagan, Bhurj, 12.7.1897, legit *J. F. Duthie* (K); Kaghan valley, Burj Danna, 3050 m, aspect NNE, on grazing ground, rare, 18.6.1990, *U. Schickhoft* 433 (K); Upper Kaghan valley around Saiphul Muluk, 3500-3600 m, Battakungi, 34° 50' N/73° 40-51' E, subalpine *Juniperus squamata* dwarf scrub on SE-vegetation record no: 1-5, 14.7.1990, *G. & S. Miehe* 71 (K); Saiful Maluk, Kaghan valley, 10000 ft, June 1960, *Dr. McVean* s.n. (RAW); Below Sarihut, ± 8400 ft, Kaghan, in forest shade, fruiting, 14.8.1987, *Y. Nasir & Rubina Akhtar* 12999 (RAW); Mengandot, 12000 ft, Kishenganga valley and road to Nanga Parbat, 10.8.1939, *R. R. Stewart* 18239 (RAW); Hazara, Shinkari, Richmori, 10200 ft, 10 June 1899, *Inayat* legit *J.F.Duthie* (K); Kashmir, Kolahoi 10000 ft, 7.7.1902, *J. R. Drummond* 4142 (K); Kalamarg, near Gulmarg, 3200 m, alpine meadows near *Betula* – *Salix* subalpine forest, near snow; tepals green outside, yellow-green and brown spotted inside, 1.7.1976, *F. Billiet & J. Leonard* 6738 (K); **B-8** Kashmir, Gulmarg, profuse, 8600 ft, June 1877, *Aitchison* 111 (K); Kashmir, Lidar valley, 11000 ft, *S. K. Mukerji* (K); Kashmir, Nabug nay Pup, 16.5.1894, *J. E. Winterbottom* 54 (K); Gurais valley, Tilailnala, Gujran, 27.6.1907, *Inayat* s.n. (RAW); Kashmir, Astan Marg, 12-13000 ft, 12.7.1902, *J. R. Drummond* 4303 (K); Kashmir, Chandan Wari, 9-11000 ft, damp shady localities, undergrowth of forests, herb, greenish-yellow with purple spots, August 1924, *S. K. Mukerji* 42 (K); Gulmarg, 9000 ft, 12.6. 1933, *Joan Venning* 13 (K); Sonamarg, 9400 ft, 27.6.1919, *H. H. Rich* 1081 (K); Gulmarg, 9000 ft, 18.7.1891, *G. A. Gammie* (K); Liddar-wat in regno, c. 9000-10000 ft, 1902, *D. A.*

A. Parott 14844 (K); Kashmir, above Liddar-wat, 10000 ft, 6.7.1902, *Miss C. Mathie* 4127 (K); Burzil, 9250 ft, 25.7.1876, *C. B. Clarke* 29590 (K); Dras valley, Kargainala, 26.6.1901, *Inayat* (K); Minimarg, Gurais valley, 2.7.1901, *Inayat* 25755/a (K); S. Kashmir, Butna valley, camp at 11400 ft, 20.6.1848, *T. Thomson* (K); Kashmir, nr. Pulmarg, 9000 ft, woods above, Gulmarg, 11.6.1940, *P. M. Pinfold* 117 (BM); Pir Pinjal, 11000 ft, 6.7.1876, *C. B. Clarke* 28722, 28757 (BM); Gulmarg, 13000 ft, *Prescott Dacie* s.n. (BM); Kashmir, Sind valley, Mohan marg, 9000 ft, open meadows, Corolla outside dark glaucous victoria plum; inside dull green margined plum, with dark green nectaries, 1-2-3-flowered, 7.6.1940, *Ludlow & Sherriff* 8128 (BM); Sind valley, Zaiwan, 11-12000 ft, open meadows, among dwarf Junniper scrub, 17.6.1940, *Ludlow & Sherriff* (BM); Khelanmarg, c. 10000 ft, bushy ground about 'marg', 10.8.1956, *O. Polunin* 56/125 (BM); Khelanmarg, above Gulmarg, 11000 ft, grazed pasture, 30.5.1971, *N. K. B. Robson* 1936 (BM); Kashmir, Bringhi valley, Mantar Nullah, 10000 ft, open rocky grassy slopes, perianth greenish yellow, spotted inside, 29.5.1939, *F. Ludlow* 44 (BM); Near Gulmarg, 9-10000 ft, 3.6.1892, *J. F. Duthie* 11373 (BM); Kashmir, Zojpal, 11300 ft, 26.6.1914, *Mrs. M. A. Evershed* s.n. (BM); **B-9** Kashmir, Kamri Pass on Gilgit Road, 11500 ft, 1885, *Dr. Giles* 150 (K); Kashmir, between Suru and Wurdwan, 10-12000 ft, *T. Thomson* 276 (K); Kashmir, End of Vishensar Lake, 3425 m, among tumbled boulders and in block scree, perianth greenish, only slightly tessellated outside, more distinctly so within, 25.7.1987, *C. C. Townsend* 87/198 (K); Burzi (Burji), Chinari, 25.5.1956, *Collector unknown*, 1372 (KUH); **C-8** Chenab valley, above Tindi, 10000 ft, 14.6.1881, *Robert Ellir* 1265 (K); Kashmir, Kishtwar, Barnaj nullah, sapphire mines, Kishbawar, 10000, grassy slopes in Junniper scrub, abundant, 7.7.1943, *Ludlow & Sherriff* 9132 (BM).

Distribution: Afghanistan (S. Dasgupta & Deb l. c.), Pakistan (Hazara), Kashmir, India (Himachal Pradesh, Kumaon).

Fl. Per.: April-July

2n = 24 (KOUL, A. K. & WAFAI, 1980).

An ornamental plant. The bulbs are used in the treatment of tuberculosis and asthma (KIRTIKAR & BASU, Indian Medicinal Plants. II ed. 4: 2523. 1991).

3. ***Fritillaria gibbosa*** Boiss., *Diagn. Pl. Or. Nov.* 7: 107. 1846; *Wendelbo*, *Tulips Irises Iran* 28. 1977; *Rix in Iran. J. Bot.* 1(2): 82. 1977; *Rech.f., Fl. Iran.* 165: 65. 1990;
Fritillaria pterocarpa Stocks in *Hook., J. Bot. & Kew Gard. Misc.* 4: 180. 1852; *Rhinopetalum gibbosum* (Boiss.) Losinsk. in *Kom., Fl. URSS* 4: 297. 1935.

Bulb diameter up to 3.0 cm. Bulbils and stolons unknown. Stem 6.0-30 cm, glabrous or papillose at nodes or below the lowest leaves. Leaves 4-10, lower 30-120 x 12-18 mm, lanceolate to ovate, other leaves linear, acute. Bracts 2 at the

base of pedicel, 20-40 x 2.0 mm, linear. Flowers 1-7 (-13), flat, horizontal at maturity. Tepals 1.5 x 1.0 cm, the inner somewhat broader than the outer, pinkish spotted, darker towards the base. Nectaries c. 4 mm, upper larger than the others. Filaments 9.0-11.0 mm, papillose, anthers c. 2 mm. Style 8.0-11.0 mm, glabrous. Capsule 14-18 mm, with wings, each with serrate-undulate margin.

Holotype: Hab. In declivibus prope ruinas Persepolis, *Kotschy* 827 (G).

D-4 Baluchistan, Sultan desert, 5000 ft, 2.10.1957, *R. R. Stewart* 28160 (RAW); Urak, Quetta valley, 15.7.1980, *Qutbuddin* s.n. (RAW); near Quetta, 11.1884, *Capt. Appleton* s.n. (K); Baleli-Quetta, in fruit, 1. 5. 1987, *Rubina Akhtar* 12932 (RAW); Nr. Peshin, Zarghun etc. 5.3.1889, *J. H. Lace* 3447 (K); wild and stony mountains beyond Quetta, 1938, *Mrs. J. C. Thomson* H 574 (K); Siriab, 1852, *Griffith* (K); Spazind, 16.3.1984, *Rasool Bakhsh* s.n. (KUH); Zorchi, in fruit, 27. 4. 1987, *Rubina Akhtar* 12765 (RAW).

Distribution: Georgia (Southern Transcaucasia), Kazakhstan, Uzbekistan, Turkmenistan, Iran, Afghanistan, Pakistan (Baluchistan).

Fl.Per.: March-April.

TURRILL & SEALY (1980) have accepted *Fritillaria karelinii* (Fischer ex D. Don) Baker and have reduced *F. gibbosa* Boiss. to synonymy. LOZINA-LOZINSKAYA (1968) has placed both the species in the genus *Rhinopetalum*, which is now regarded as a section of *Fritillaria*. As *F. karelinii* has wingless capsule whereas *F. gibbosa* has winged capsule; the two taxa are being treated as separate species.

4. ***Fritillaria imperialis*** L., Sp. Pl. 303. 1753; Hook.f., Fl. Brit. Ind. 6: 353. 1892; R. R. Stewart, Ann. Cat. Vasc. Pl. W. Pak. Kashm. 52. 1972; Wendelbo, Tulips Irises Iran: 26. fig. 23. 1977; Turrill & Sealy in Hook. Ic. Pl. 39: 251. t. 3849. 1980; Rix in P. H. Davis, Fl. Turk. 8: 286. 1984; S. Dasgupta & Deb in J. Ind. Bot. Soc. 65: 298. 1986; Rech. f., Fl. Iran. 165: 63. 1990.

Foetid robust herbs. Bulb 4-5 (-8) x 4-5-(8) cm; bulbils or stolons absent, scales with scarious margins, inner fleshy, outer coriaceous. Stem 40-100 x 1-2.5 cm. Leaves in 3-4 whorls, 4-8 in each whorl, sessile, 7-18 x (1.5) 5-10 cm. Bracts 6-12 x 0.5-1.5 cm in groups of (5) 10-12 (-20). Peduncle 13-18 cm long. Flowers (1)-3-5 in pseudo-umbel, cupular or broadly campanulate, orange, red. Pedicel 2.5-5.0 cm, nodding in flowers. Tepals 4-5.5 (-7) x 1.5-3.0 cm, oblanceolate, obovate. Nectaries white, ± circular, 4-5-(8) mm in diameter. Filaments 2.5-5 cm, glabrous, anther 7-12 mm, attached to filament c. 1.0 mm from the base. Ovary stipitate, 6-11 x 1-4 mm, style (1.5)-3-4.5 cm, trisulcate, exerted, stigma 2-5 mm broad, tripartite, papillose towards apex. Capsule stalk (elongated pedicel) 6-11 cm long, stipe 0.5-1.5 cm; capsule 3-5 x 2-5 cm,

oblong, wings c. 2 mm. Seeds 5-9 x 3-4 mm, dark brown, oblong, fleshy, winged.

Lectotype: Described from cultivated material. In Persia? Constantinopoli venit in Europam c. 1570, Herb. Linn 421/1 (LINN) (RIX in P. H.DAVIS, Fl. Turk. 8: 286. 1984).

B-8 Liddar valley, Gorasuala, 19.5.1901, *Inayat* 25759a (K); Banihal valley, 8.4.1848, *T. Thomson* (K); Chenab valley, Perti, 25.4.1881, *Ellis* 1062 (K); Liddar valley, below Pahalgam, 5500 ft, on steep rocky slopes, flowers pink-red. A much bigger form is grown on Muslim graves and in gardens. Most recorded localities are not far from vallies (villages) and I wonder if this species is truly wild, 17.4.1983, *J. D. A. Stainton* 8682 (BM); Kashmir, half way to Bannihal Pass, common sides of road, growing among the rocks, 28.4.1940, *P. M. Pinfold* 54 (BM); **C-7** Bagh Tehsil, April 1952, *Jan Mohammad* 23757 (RAW); **C-8** Taulipir, 7-8000 ft, Poonch, 21.4.1953, *A. Rashid, E. Nasir & R. R. Stewart* 24615 (RAW).

Distribution: Turkey (Anatolia), N. Iraq, Afghanistan, Pakistan and Kashmir.

Fl. Per.: April-June

Vern.: Lala-e-Sarnagoon

Engl.: Crown-Imperial

2n = 24 (KOUL, A. K. & WAFAL, B. A., 1980.)

Beautiful ornamental plant.

Fresh bulbs poisonous but edible after cooking (AMBASTA *et al.*, 1986). They contain steroidal alkaloids; used as analgesic, expectorant and in treatment of fever and tumours (VAN WYK & M. WINK, 2004).

5. ***Fritillaria pallidiflora*** Schrenk ex Fisch. & C. A. Meyer, Enum. Pl. Nov. 1: 5. 1841; Losinsk. in Kom., Fl. USSR 4: 304. 1935; S. Dasgupta & Deb l.c. 295. 1986; Xinqi & Mordak in Zhengyi & P. H. Raven, Fl. China 24: 128. 2000.

Bulbs 1-4 cm in diameter, ovoid or oblong-ovoid. Stem 15-50 (-80) cm long, glabrous. Leaves 8-13, alternate, sometimes subopposite or subwhorled, 4-8 (-13) x (1)-2-4 cm, lanceolate or oblong-lanceolate, tip obtuse. Inflorescence (1-) 2-5 flowered raceme. Bract solitary per flower, linear-lanceolate, acuminate; pedicel 2-4.5 cm. Flowers nodding, campanulate. Tepals pale yellow, with darker veins and some dark red spots, oblong-obovate or oblong-spathulate 3.0-5.0 x (0.8)-1.5-2.0 cm. Nectaries c. 1.0 cm above the base, ovate-oblong, deeply concave adaxially, projecting abaxially. Stamens 2.0-3.5 cm, filaments slightly longer than anther, glabrous, anthers subdorsifixed. Ovary 10 x 1 mm, 6-lobed, 6-winged; style c. 1.3 cm long, linear, 3-lobed, stigma trisect, truncate. Capsule narrowly winged.

Holotype: USSR, alpine region of Dschillkaragai, 2.6.1840, *Schrenk* s.n. (LE) (DASGUPTA & DEB, *l. c.*).

DASGUPTA & DEB (*l. c.*) have cited the following specimen: Kashmir: Kajnagrange, *Duthie* 10950 (DD).

Distribution: Kazakstan: N.W.Xinjiang (XINQI & MORDAK, *l. c.*); Tajikistan (LOSINSK., 1935) and Kashmir (DASGUPTA & DEB, *l. c.*).

Fl. Per.: June

This species is cultivated in N E China and the bulbs have medicinal importance (XINQI & MORDAK, *l. c.*).

6. ***Fritillaria raddeana*** Regel in *Acta Horti Petrop.* 10: 365. 1887; Losinsk. in *Kom., Fl. USSR* 4: 317. 1935; Rix in *Iran. J. Bot.* 1(2): 78. 1977; S. Dasgupta & Deb in *J. Ind. Bot. Soc.* 65: 288. 1986; *Rech. f., Fl. Iran.* 165: 64. 1990.

Perennial herb; bulb c. 4-5 cm in diameter globose, scales fleshy; bulbils and stolons not known. Stem 45-80 x 1.0 cm. Leaves in loose whorls, each with 3-4 leaves, sessile, 12-18 x 4-7 cm, lanceolate or elliptic, acute-acuminate. Peduncle 13-18 cm. Flowers (3)-5-20 in condensed raceme. Bracts 1-2 per flower, 6-10 x 0.5-2.0 cm, linear-lanceolate. Pedicel 2.5-3.0 cm. Tepals straw yellow or greenish yellow, campanulate, c. 3-4 (-5) x 1.2-1.5 (-2.0) cm, oblong-lanceolate, acute. Nectaries, circular, 2 mm in diameter, at the base of perianth segment. Filament c. 22 mm, glabrous, anthers 7-8 mm. Ovary c. 10-11 x 4 mm, style 2.5-3.0 cm, trifid for c. 2 mm, papillose towards apex, stigma reflexed; stipe 1.0-2.0 mm. Capsule 2.0-3.0 x 2.0-3.0 cm, with 4 mm wide wings.

Holotype: USSR, Khodzha-Kalabani, 11.3.1886, *Radde* s. n. (LE-not seen).

DASGUPTA & DEB (*l. c.*) have cited the following specimen:

B-8 Kashmir, Dras, A. S. *Harriss* (DD).

Distribution: Turkmenistan, Iran and Kashmir, 1500 m.

Fl. Per.: June

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