Plate 59. *Iris pallida* Lam.: a. type specimen; b. close view of few plants (in the foreground); c. close up of flower; d. floral parts
Subsect. *Pseudoregelia* (Dykes) Lawr.


Rhizomes very compact and gnarled with nipple-shaped growing points. Blossoms open when leaves are still short; tepals mottled with two shades of purple, hairs springing from very rudimentary crest on the falls; standards oblong and truncated. Capsules broad, with attenuate apex, tardily dehiscent below the tip. Seeds with small flat ring-like creamy white aril. Pollen large, spheroidal, inaperturate, verrucate.

This subsection comprises c. 8 species, most of them are confined to the Sino-Indian Himalayas. Kohlein (1987) is of the opinion that the species of *Pseudoregelia* originated from Himalayas and are scattered throughout Central Asia. Of the eight species only three viz. *Iris kemaonensis, I. hookeriana* and *I. goniocarpa* are known from India. They have more or less distinct phytogeographic localities in Western, Trans and Eastern Himalayas respectively. Another species, *I. dolichosiphon* evidently occurs in Eastern Himalayas (Arunachal Pradesh).

The species of this subsection are restricted to temperate and alpine regions of the Himalayas occupy the highest altitude among all the
rhizomatous *Iris*. They are exposed to considerable temperature fluctuations. They grow on light, fertile soil on slopes. The rhizomes and seeds remain preserved under cold, dry and frozen soil, where these propagules are vernalised for almost the whole length of winter. Their growth resumes in late spring (i.e., in early April) as soon as the ground becomes free from snow or the soil returns to normal moist condition from the state of physiological dryness. They get a very short period of favourable time to complete their life cycle. They grow quickly in early summer and flower while the leaves are too small and continue flowering in rainy season. The plants remain exposed in fog and rain for most part of their life. A unique phenomenon of post-flowering elongation of leaves continues till September. The aerial parts perish with the onset of snowfall and rhizomes again go dormant for the next six months. In the growing season they get ample moisture. *Lgoniocarpa* and *L.dolichosiphon* grow in the alpine areas of eastern Himalayas, *L.kemaonensis* in the western Himalayas and *L.hookeriana* mainly in the cold deserts of Trans-Himalayas.

The *Pseudoregelia* have had a chaotic botanical history during the last hundred years. Initially Baker (1877 & 1892) treated them as a subgenus *Pseudoevansia*, characterised by beard arising from a rudimentary crest but inadvertently included *L.clarkei* (*Apogon*) and *L.alberti* Regel (*Pogoniris*) in this group. Lynch (1904) reduced it to a section and like Baker (1892) he retained the above two species under it. Foster (1887) and Dykes (1913) rightly adjudged that the rudimentary crest character as least trustworthy to form the taxonomic basis of the group since it goes unnoticed and sometimes the flowers of allied subsection *Pogoniris* also show presence of rudimentary crest at the base of the beards. Dykes (1913) deliberately changed the name 'Evansia' to 'Pseudoregelia' on the ground that the plants are quite different from the crested *Iris* of the section *Evansia* but closely allied to his section 'Regelia' by their gnarled rhizomes, beaked capsules, subterminal dehiscence of capsule through lateral slits, arillate seeds and...
flowers with blunt ended standards. He re-circumscribed this as a section by ignoring the rudimentary crest character and excluding two species viz., *I. clarkei* and *I. alberti* but added *I. sikkimensis*, whose identity is still doubtful. He also reduced *I. kingiana*, *I. duthieu* and *I. tigrina* to synonymy of *I. kemaonensis*, and *I. gilgitensis* and *I. kemaonensis* var. *caulescens* Baker to synonym of *I. hookeriana* in his monograph. His classification was followed by Diels (1930). Lawrence (1953) reduced it to a subsection of *Ins* and proposed *I. kemaonensis* as its type and retained the 4 species under it as recognised earlier by Dykes. Osborne (1973) and Kohlein (1987) recognised two more species, *I. tigridia* Bunge ex Ledeb. (from disjunct localities like Altai Mountains, Manchuria and Mongolia) and *I. potanii* Maxim. (from Western China and central and eastern Tibet) under *Pseudoregelia*. Recently, Mathew (1989) and Rix (1997) have recognised *I. tigridia* Bunge ex Ledeb. and *I. pandurata* Maxim. (from Mongolia, Manchuria and USSR) in this subsection but transferred *I. potanii* to the subsection *Psamiris*. In the last decade two more species from Bhutan and Yunnan Province of China (*I. dolichosiphon* Noltie and *I. cuniculoformis* Noltie & K.Y.Guan respectively), one allied to *I. kemaonensis* and the other to *I. goniocarpa* and two subspecies of *I. dolichosiphon* from China have been added to this subsection. Based on leaf anatomy Wu & Cutler (1985) suggested transfer *I. leptophylla* of *Nepalensis* to the *Pseudoregelia*.

Most of the 8 species in *Pseudoregelia* except the Indian representatives are very poorly defined. *I. kemaonensis*, *I. hookeriana* and *I. goniocarpa*, all occurring in the Himalayas seem to be basal species and all others appear as variants of these three.

The interrelationship among species of *Pseudoregelia* studied in present work does not appear perfectly homogenous. While, *I. kemaonensis*, *I. hookeriana* and *I. dolichosiphon* are clump forming, show gnarled rhizome, post flowering leaf elongation, reflexed falls and erect standards,
Lgomocarpa show rudimentary rhizome, no remarkable post-flowering elongation of leaves, more or less spreading tepals in flowers and bigger arils in seeds. Thus in a way Lgomocarpa is intermediate between the subgenera Ins (subsect. Pseudoregelia) and Nepalensis. Again, it appears from literature that Lcunculoformus from Yunnan Province (China) is very close to Lgomocarpa Baker but the plants are robust with bigger flowers and the standards are erect instead of spreading. Lgoniocarpa var. grosa Y.T.Zhao is apparently synonym of Lcunculoformus (Noltie, 1995). Idolichosiphon is immediately allied to Lkemaonensis due to most similar characters except a longer perianth tube and less reflexed falls with more or less uniform colour at anthesis but the blotches become visible as the flowers fade.

The very name Pseudoregelia was proposed by Dykes only because of their closure affinity to the Regelia. Baker (1887) and Lynch (1904) considered them as a connecting link between the Pogoniris and the Evansia (now Lophins) by possessing both crest and beard. According to them Lkingiana (now Lkemaonensis) is intermediate between dwarf-bearded Lpumila and crested Ltectorum.

It seems that the rudimentary crest on the falls of this subsection is a vestigial organ phylogenetically derived from the crest through transformation of crest to beard. Lhookeriana with simple scape and bearded falls appear to have been derived from Ltectorum like ancestor. Although, not particularly attractive but it may also be probable that the tall Pogoniris (ser. Elatae) might have evolved from Lmulesii like Lophiris and the dwarf and very dwarf Pogoniris (ser. Pumilae) from the Ltectorum (Lophirs) like ancestor through Pseudoregelia. If the assumption holds true in the hybridisation experiments then the subsection Pseudoregelia can be raised to a level of section and placed between the sections Pogiris and Lophiris. Thus, a probable scheme of evolution of Pseudoregelia and Pogoniris based on the present observation is as follows.
Very little is known about the economic importance of the members of the group. These species mainly relish fodder for cattle during winter and their rhizomes are sometimes used as febrifuge.

KEY TO THE SPECIES

1a. Scape not produced, usually 0 – 2 cm long, rarely 4 – 12 cm long; spathe 1-flowered, perianth tube 5 – 14 cm long ............... . . . 2
    b. Scape produced, 10 – 30 cm long, spathe 1 – 2-flowered, perianth tube 1 – 3 cm long .............. ......... ...................... ....3

1. **I. dolichosiphon** Noltie in *Kew Mag* 7 12 1990 & Fl. Bhutan 3 (1) 11 1994 Type: Bhutan, above Lava, Mo Chu, 12,000 ft, 8.6.1949, Ludlow, Sheriff & Hicks 16564 (BM holo, E iso !)

Rhizomes compact and gnarled. Leaves linear, short, glaucous with hyaline margin and acute apex at flowering, afterwards becomes deep green and elongates to c. 54 x 1.4 cm. Scape nearly obsolete; spathe 1-flowered, 2-valved. Flowers up to c. 8.5 cm across. Perianth tube 7 – 14 cm long, funnel shaped, c. 1 cm in diameter at apex, brownish violet; falls spathulate, unguiculate, blade c. 3.3 x 1.8 cm, shallowly retuse at apex, dark violet with very lightly blotches above, greenish white streaks beneath, claw oblong, c. 1 x 0.8 cm, with c. 2.3 cm long beard of clavate orange tipped hairs; standards, unguiculate, claw spreading, c. 6 mm long, brownish, blade diflexed, dark violet, c 3 x 1 5 cm, abruptly narrowed to claw. Stamens c 2.2 cm long, filaments c. 1.1.2 cm long, cream towards base and blue upwards; anthers c. 10 x 2 mm. Ovary c. 13 x 7 mm; style branches c 1 8 x 1.5 cm, more or less elliptic, dark violet with paler margins; stigma flap c. 8 mm wide, truncate with a shallow notch in the centre; lobes c. 10 x 6 mm, curved inward, acute at apex, slightly toothed at margin. Capsule trigonous, narrowly ellipsoid, up to 5 cm long, acute at apex, dehisce by lateral slits. Seeds arillate, c. 3.5 cm long

Flowering: May – June; Fruiting: July – Sept.

Chromosome number: 2n = 22 (Noltie, 1990)

Distribution: India: Arunachal Pradesh

Bhutan, China (Xizang), open grassy hillsides or among scrubs at 2740 – 4130 m.

**Specimens examined:** ARUNACHAL PRADESH: Namche Bazar to Thangbochi, 1958, *Indian CHO OYU expedition* 13729.

**Note:** The species appears to be a variant or eastern counterpart of *Iris kemaonensis* and differs from the later by broader leaves, uniform deep violet flowers with indistinct blotching on spreading falls (distinct blotching on reflexed falls in *I. kemaonensis*), longer perianth tube. The blotching on falls becomes visible on fading of flowers. Longer perianth tube of this species does not appear species specific since some specimen of
I. kemaonensis from Western Himalayas also show c. 11 cm long perianth tube. Its chromosome report 2n=22 (Noltie, 1990) is the same as that of Iris kemaonensis A detail study of this species is required to confirm its occurrence in Arunachal Pradesh.

Type: Sikkim. Tangu, 12-13000 ft., J.D.Hooker s.n. (K: holo, Photol)
Plate 60; Fig. 22

Slender herb. Rhizomes very short, compact; roots thin and branched, yellowish white. Shoots tufted, slender, covered by reticulate fibrous remains of old leaves at base. Leaves 5 - 6 at base, yellowish green, often overtopping the flowers, narrow-linear, 15 – 25 x 0.2 – 0.3 cm, obtuse at apex. Scape simple, I-headed, 10 – 30 cm high; spathes 1-flowered; valves 2, thin, green, persistent, lanceolate, 3 – 4 cm long, acute-acuminate at apex, enclosing perianth tube completely. Flowers violet or mauve-purple, ± 4 cm across; perianth tube 1.2 – 1.8 cm long; falls obovate or elliptic, 2 – 3 x 0.8 – 1.2 cm, shallowly deflected, mottled with darker blotches, centrally bearded with orange tipped white hairs; standards spreading, narrowly elliptical or oblanceolate, 1.8 – 2.2 x 0.5 – 0.7 cm, abruptly narrowed in to a very narrow claw. Stamens c. 1.5 cm long; anthers linear, basifixed, yellow; pollen subspheroidal, 56 – 97 x 54 – 90 μ inaperturate, intectate, with verrucate surface. Ovary ellipsoid, 1 –1.5 cm long, trigonous, green; style arms bilobed, c. 1.8 cm long, lobes narrow-deltoid, entire, acute at apex. Capsule prismatic-ellipsoid, 2.5 – 3 x 1.5 – 1.8 cm, tapering to a short beak, thin-
Figure 22. *Ins goniocarpa* Baker: a. habit; b. fall; c. fruit, d. seed
(source: *Dungboo* s.n, CAL; *D D Bahal* & *S.S.Dash* 10901, BSHC)
Plate 60. *Iris goniocarpa* Baker: a. type specimen; b. fruiting plant.
walled, acutely angled, with flat valves, dehiscence by lateral slits. Seeds ellipsoid-ovoid, 4 – 4.5 x 2 – 2.5 mm, finely warty, aril elongated.

Flowering: May – July; Fruiting: July – August

Distribution: India (North Sikkim (Thangu, Yatung and Lachung)), Nepal and China.

**Specimens examined:**

Sikkim: Sikkim Himalaya, 1885, fl., A.F. Jaffrey, s.n., Acc. No 470789; Rukab, above Lachung, 12,000 ft., Aug. 1885, fl., Gyalu (King’s collector) s.n., Acc. No. 470788; Thangu, 23.7.1997, fr., D.D. Bahali & S.S. Dash 19384 (BSHC).

**Notes:**

i. Baker (1876) described the species with 1-2-flowered. This was followed by Hooker f. (1892) in *Flora of British India*. In 1892 Baker clarified the situation (in *Handb. Irid.*) by mentioning spathe 1-flowered. Zhao (1992), Noltie (1994) have also accepted this 1-flowered character in 'Flora of Bhutan' and 'Iris of China' respectively. All the specimens examined in the present work including the type specimen (J.D. Hooker s.n., K) bear solitary flowers.

ii. It grows in moist grassy meadows and scrub covered hillsides between 2700 – 5500 m (Mathew, 1989). According to Kohlein (1987) it grows in isolated clusters between stunted trees and shrubs and in open birch groves. In the present work only a fruiting specimen was collected from the periphery of the *Rhododendron* forest at Thangu.

Local name: Tezma (Ladaki)

Perennial, densely tufted herb. Rhizomes slender, branched and gnarled. Scapes unbranched, one headed, almost covered by reduced leaves, 10 - 20 cm long. Leaves distichous, pale green, ribbed, acute; radical leaves 5 - 6 per rosette, sheathing at base, linear, 15 - 25 x 0.6 - 0.9 cm in flowers, erect, elongates subsequently to c. 50 x 1.5 cm; cauline leaves 3 - 4 per scape, reduced, 3 - 10 x 0.5 - 0.7 cm. Spathe 2-flowered, valves 3, pale green, lanceolate, 5 - 7.5 x 0.8 (folded), subscariose, ventricose, persistent, cm. Flowers 4 - 5.5 cm across, lilac to purple, scented; pedicel 0.5 - 1.5 cm in flower and elongating in fruits up to 2.5 cm; perianth tube 1.5 - 3 cm, green with purple stripes and spots; falls unguiculate, reflexed, lilac-purple, 4 - 5 cm long, blade obovate-oblong, entire, variegated with darker blotches, 2.5 x 1.5 - 2 cm, claw white with purple veins, c. 2 x 0.6 cm, under surface faint green in thickened median and lilac laterally, beard on upper surface arising from an obscure crest, ends about half way down the blade, hairs white, with orange tip; standards erect, unguiculate, uniformly coloured, blade oblong, c. 2 x 1.3 cm, emargmuate at apex, narrowing suddenly into a
canaliculate 1.5 cm long claw. Stamens reaching beyond stigma, filaments 1.3–1.5 cm long, flattened, anthers linear, 1–1.2 cm, creamy, divaricate at base; pollen aperturate, subspheroidal, 66–106 x 66–104 μ with entirely verrucate surface. Ovary obscurely trigonous, 1.2–1.8 cm long, narrow at both ends, green, style free down the perianth tube, style-arms connate at the end of the tube, c. 2 x 0.6 cm, purple, bilobed, lobes triangular, sharply recurved, with serrulate margin, stigma pendant, slightly notched, white. Capsule trigonal with convex sides, obovate to ellipsoid, 3.5–5 x 1.2–1.8 cm, narrowing gradually to a conspicuous beak, splitting below the apex. Seeds pyriform, 5.5–6 x 3.5–4 mm, wrinkled, brown; aril flat ring-like, yellowish-white.

Flowering: May–July; Fruiting: July–Sept.

Distribution: India: very common, Jammu & Kashmir (Kashmir).

Pakistan

Chromosome number: 2n=24 (Karihaloo, et al., 1984; Present work, PI 47:b)

**Specimens examined:**

JAMMU & KASHMIR: Pushana, May 1847, Winterbottom 83; Kajnag range, 10-11,000 ft., 1.5.1892, J.F.Duthie 10934, 11054, 12-13,000 ft., 19.5.1892, J.F.Duthie 11102; Lowari Pass, 10,500 ft., 15.6.1895, Harriss 16675; Near Burzil Pass, 11-12,000 ft., 13.8.1893, J.F.Duthie 14025; Chhath Punjalnala, Liddar valley, 21.5.1901, Inayat 25820-22 (CAL, DD); Liddar valley, 22.5.1901, Inayat 25815, 25817 (DD); Mammal, Liddar Valley, 22.5.1901, Inayat 25816, 25819, 25980-81; Kimmaula nala, Liddar valley, 23.5.1901, Inayat 25814, 25943, 25962; Liddarwat, Liddar valley, 27.5.1901, Inayat 25811, 25812 (DD); Kalhoi, Liddar valley, 28.5.1901, Inayat, 25805 (DD), Dabyan, Liddar valley, 2.6.1901, Inayat 25779, 25801-04 (DD), 25798-99, 25802-04; Matyan, Drass valley, 23.6.1901, Inayat, 25861 (DD); 25844-47, 25849, 25859–61; Jahan, Liddar valley, 3.6.1901, Inayat 25973; Tolhan, Liddar valley, 3.6.1901, Inayat, 25794-97 (DD); Sunamarg, Sindh valley, 20.6.1901, Inayat 25839 (CAL); 25838 (DD); Baltal, Sindh valley, 21.6.1901, Inayat 25828–35, 25837, 25862-64, 25935, 25937, 25947, 25949-51, 25953, 25955, 25957, 25964, 25965 (CAL), 25862-65, 25828, 25834, 25859-60 (DD); Jeluknath, Chenab, July 1864, Brandis 3360; Machoi,
Drass valley, 22.6.1901, Inayat, 25850-58 (DD); 25852-53, 25855-57, 25859 (CAL), Kurgainala, Drass valley, 26.6.1901, Inayat, 25914-18 (CAL), 25900-03, 25841-43 (DD, CAL), Gurjan, Jilainala, Guraish valley, 27 6 1901, Inayat 25940-42 (CAL); 25906, 25908-09, 25911, 25913-14 (CAL, DD); Jilainala, Guraish valley, 28.6 1901, Inayat 25921-23, Charwan pass, Guraish valley, 1.7 1901, Inayat 25924, 25932; Burzil Pass, Guraish valley, 3.7 1901, Inayat 25928-31, 25945 (CAL), 25905 (CAL, DD); Aster, 4 7 1901, Inayat 25869-76 (DD), 25870-78 (CAL); Kamri Pass, Guraish valley, 15.7 1901, Inayat 254885, 25887; Tiragbal, 16 7 1901, Inayat 25866-68 (DD,CAL); 25879 (CAL); Khilanmarg, 13.9 1980, M.R. Almeida 530 (BLATT), Kishanganga valley, 9500 ft, 2.7 1907, Hukum Singh 1690 (DD); Narla range, Kishanganga valley, 13-14,000 ft., 12.8 1907, Keshavanand 791 (DD); Nagmarg, Jhelum valley, 7500-8000 ft., 3.6 1909, Keshavanand, 1232 (DD); Kishanganga valley, 10-11,000 ft., 7.9 1909, Keshavanand 1469 (DD), Gulmarg, 9,000 ft., Aug. 1939, B. S. Harland s.n. (DD); Kolohai glacial valley, 18.7 1956, T.A. Rao, 698 (CAL, BSD); Aharbal, Kungwatan, 3,000 m, 6.6 1959, T.A. Rao 9279 (BSD, CAL); Seshnag, 3600 m, 24.7 1966/25.7 1966, N.C. Naur 36935 & 36940, a rare form having 4 cm long pedicel and 2.7 cm long perianth tube (BSD); Nichuai, 12,000 ft., 27.6 1946, Acc. No. 8648 (JRL); Sarthal, 5.5 1957, S. N. Sobti 5624 (JRL); Symthen, 2700m, 22.6 1960, Y.K. Sarin 6421 (JRL); 3500 m, Y.K. Sarin 6476 (JRL); Khillamarg, 29.9 1971, B.K. Kapahi 11753 (JRL); Dessa, Doda dist., 8000 ft, 5.6 1979, J. Chandar 17 (JMU); Killenmarg, 12.6 1963, U Kohli s.n., Acc. No. 4499 (KASH); Above Harwan, 2400 m, 1.5 1971, G. Singh 2513 (KASH); Gulmarg, 22.5 1973, A.R. Naqshi 2206 (KASH); Sonamarg, 19.6 1973, A.R. Naqshi 1207 (KASH); Ledwas, 2800 m, 20.6 1974, U. Dhar 642 (KASH); Gulmarg, 23.6 1974, A.R. Naqshi (KASH); Gulmarg, 20.8 1976, A.R. Naqshi 19780 -81 (KASH); Khan mountain, 10,000 ft, G.H. Dar 187 (KASH); Sonamarg, Sind valley, 2700 m, 28.5 1983, G.H. Dar 5299 (KASH), Sarbal, Sind valley, 2850 m, 14.6 1983, G.H. Dar 5571 (KASH); Baltal, Sind valley, 2900 m, 15.6 1983, G.H. Dar 5737 (KASH), Chorwan, 10 8 1984, Naqshi & Party 10300 (KASH), Kongwattan, dist. Pulwama, 3.6 1985, Acc No. 15708 (KASH); Kashmir, April-May, V. Kaul s.n., Acc. No. 8620 (KASH),

HIMACHAL PRADESH: Lahaul, 9-10,000 ft, May 1864, Dr.Brandis s.n., Acc.No. 470793; Above Chechul, Chamba, 10-12,000 ft., June 1897, J.H Lace 1695, right one Lhookerana but the left one I.kemaonensis (CAL, DD), Above Podoban to Chandni peak, Chamba dist, 11,500- 15,000 ft, 23.8.1899, Harsukh s.n., Acc. No.470795; Lahul, Jaeschhe s.n., Acc. No 470703; Sissu, Lahul, 10,500-11,000 ft, 6.6.58, S.P.Sethu & R.S.Negi 167 (DD); Tandi, Lahul, 3500 m, 29.6.1958, M.A.Rau 5987 (BSD); Khoksar, Lahul, 3600 m, 6.8.1970, U.C.Bhattacharyya 40583 (BSD); Koksar, Lahul, 3200 m, 2.8.1971, U.C.Bhattacharyya 44969 (BSD); Koksar, Lahul, 3200 m, 3.7.1973, U.C.Bhattacharyya 51756 (BSD); Roding, Upper Chenab, Lahul, 3000m, 13.8.1971, U.C.Bhattacharyya 45308 (BSD).

Notes:

i. This Iris species named after Joseph Dalton Hooker, the author of monumental 'Flora of British India'. Majorities of the collection of the species in CAL, BSD and DD are either identified as I.kemaonensis or left unidentified. A number of authors have described Lhookeriana under the name of I.kemaonensis (l.c.) and their cited specimens were examined to be I.kemaonensis. Although, these two species are very similar in vegetative stage but in flowering Lhookeriana differs from I.kemaonensis by its produced scape (obsolete or very short in kumaonensis); 2-flowered and 3-valved spathe spathe (1-flowered and 2-valved spathe in kemaonensis); 15 – 3 cm long perianth-tube (longer, 5 - 8 cm long in kemaonensis) and in chromosome number 2n= 24 (2n= 22 in kemaonensis).
ii. The species grows luxuriantly in large clumps on open mountain slopes of cold desert areas, often covering large areas between 2500 - 4000 m. It is practically absent in the eastern Himalayas. Phytogeographically Lahul-Spiti region of Himachal Pradesh represents the meeting zone of these two species with *I. hookeriana* extending northwesternly to Kashmir and Pakistan and *I. kemaonensis* to the central Himalayas in the east.

iii. The colour of the flower of the species range from lilac to purple (blue-purple and red purple) through mauve associated with darker blotches and veins of respective colour. In some cases the flowers are not variegated. In addition to the above variations Bevan (1949), Lowndes (1953) and Kohlein (1987) have noted rare albino forms of flower in nature. The leaves are small during anthesis. In wild they grow in such profusion turning the whole hillside colourful. But it has not yet been brought into cultivation anywhere in India, though there are records of occasional cultivation of this species in European countries. Dykes (1913) states that it grows easily in light rich soil in sunny expositions but slow growing and the seeds often take six years to germinate. Kohlein (1987) recorded that a few *Iris* enthusiasts in England have grown it successfully, where they let the rhizomes mature fully in the summer so that the *Iris* produces its buds late in the spring and thus escapes late frost. However, the plants collected during the present work were introduced in the nursery of Indian Botanical Garden, Howrah, but did not survive under tropical conditions despite of much care. The gardens of Kashmir and North-West Himalayan regions are apparently suitable places for bringing the species into cultivation.

iv. Usually the species is not grazed by the cattle but they relish as hay in winter (Stewart, 1869). The leaves are used for thatching (Pers.Com A.R.Naqshi). The seeds are used as a remedy for epilepsy and the roots and leaves are given in fever (Wealth of India P. 254, 1959 and Aswal & Meherotra, 1994). Rhizomes soaked in glycerine is chiefly used a diuretic and also believed to be an antidote for opium (Watt, 1889). Shawl, et al (1985) have reported Irisflorentin, irigenin, Junipigenin and Iridin, and Shawl (1993) reported a glucoside ‘peiceid’ from its rhizomes.
Figure 23. *Ins hookeriana* Foster: a. habit; b. fall.; c. fruits; d. seed
(source: Bot. Mag. t. 7276; J.H. Lace 1695 & D.D. Bahakt 10920, CAL)
Plate 61. *Iris hookeriana* Foster: a. type specimen; b. representative specimen; c. whole plant


KEY TO THE VARIETIES

1a. Flowers lilac purple; Falls distinctly blotched....................kemaonensis

1b. Flowers reddish lilac; Falls indistinctly blotched .................duthieii

var. kemaonensis

Dwarf perennial, tufted herb. Rhizome gnarled, short creeping; roots cylindrical, fleshy. Shoots acaulisent, tufted, base surrounded by 4 – 6 imbricately sheathed membranous reduced leaves and fibres of dead leaves crown the bases. Leaves radical, 5 - 6 in a rosette, linear, 8 - 15 x 0.6 cm in flowers, light green, ribbed, hooked at apex, acute, elongating up to c. 60 x 1 cm after flowering. Scape simple, usually obsolete, some times 2 - 6 cm high, most rarely up to 12 cm high, slender; spathes 1-flowered, valves
unequal, conduplicate, lanceolate, 5 - 8 cm long, acute, margin narrowly membranous. Flowers lilac to purple, 4.5 - 6 cm across; pedicel 2 - 10 mm long, perianth tube slender, greenish, cylindrical, dilated upwards, 5 - 7 cm long; falls reflexed, obovate, 4 - 5 cm long; blades oblong, c. 3 x 2 cm, strongly reflexed, with purple veins and blotches, with central beards down to the claw, hairs white, springing from a hardly visible rudimentary white crest, claw cuneate, 2 - 2.5 cm long, medially bearded; standards erect, unguiculate, uniformly lilac; blade ovate-oblong, c. 3 x 1.5 cm, emarginate, abruptly narrowed to a more light-coloured claw of 1 cm long. Stamens 2.2-2.5 cm long; filaments c. 1.3 cm long; anthers whitish-lilac, 1 - 1.2 cm long; pollen subspheroidal, 87 - 102 x 84 - 101 μ, inaperturate, intectate, entirely verrucate. Ovary trigonous, obovate-oblong, 8 - 10 mm long, style branches outspreading, c. 3 x 1 cm, curved inward at apex, lilac in the middle and paler towards edge, bilobed; lobes deltoid, c. 5 x 5 mm, acute, entire, deep lilac. Capsule borne at ground level, ovoid to subglobose, 2 - 2.5 x 1.5 - 1.8 cm, trigonous, angles obtuse, beaked, dehiscence subterminal by lateral slits. Seeds dark brown to black, pyriform, 5 - 6 x 3 - 3.5 mm, wrinkled, with an inconspicuous disc shaped creamy aril.

Flowering: May – July; Fruiting: July – Aug.

Chromosome number: 2n=22 (Mehra & Sachdeva 1976, sub: I.duthieii)


Specimens examined:

UTTARANCHAL: Kumaon, August, R.Blinkworth (Wall. Cat.) 5052 (CAL, K), Kedarkanta, Royle s.n. (K); Kedarkanta, 10-12,000 ft, 26.5.1879, Duthie 1268, 1268a; Phalaldare, 11-12,000 ft, 20.6.1883, Duthie 149; Kuthiamund, 10-11,000 ft, 17.5.1899, Duthie 22556, Kedarkanta, 9-10,000 ft., 1.5.81, W.Gellani s.n., Acc No. 470709, Garbyang, 3200-3300 ft., 14.6 1960, T.A.Rao 11891 (CAL, BSD); Kedarkanta, 12,000 ft., J.S.Gamble s.n., Acc No. 470625; Harkidun, 11,000 ft, 10.6.91, C.G.Rogers s.n., Acc. No 470626; 11,000 ft., 16.6.91, C.G.Rogers s.n., Acc. No. 470627; Way to...
Khaphllis, Garhwal, 3300 m, 29.5.1972, B.D.Nathani 48077; Panwali, 3200 m, 3.6.1972, B.D.Nathani 48141 (CAL, BSD); Paurn, Kumaon hills, 17,000 ft, 11.6.1882, H.Collett 161, Ralam valley, Inayat 24991, Pindari, 12,000 ft, 01.5.1848, Strachey & Winterbottom 2; Nandadevi, Lata Kharak, 19.6.1982, P.K.Hajra 73647 (BSD), Himtoli, 20.6.1982, P.K.Hajra 73647 ‘a rare white-flowered variant’ (BSD); Duphan, Tehri Dist., 3500 m, 18.5.1979, A.K.Goel 66569 (BSD, DD), Tali, Tehri Dist., 3600-3700 m, 17.6.1981, A.K.Goel 72884 (BSD, DD); Valley of Flowers, 3800 m, 20.6.1969, U.C.Bhattacharyya 39097 (BSD); Ghangaria, 3200 m, 16.6.1979, U.C.Bhattacharyya 66380 (BSD, DD); Martoli, Pithoragarh dist., 3500 m, 28.4.1965, N.C.Nair 35606 (BD, DD); Poteng, 3500 m, 4.5.1966, N.C.Nair 36783 (BSD, DD); Kedarnath, 28.5.1972, Mehrotra & Party 3306 (CDRI), Suryakund, 5200 m, 9.6.1958, T.A.Rao 7092 (BSD, DD); Bogdwar-Martoli, 3000-4500 m, 14.6.1958, T.A.Rao 6797 (BSD, DD); Between Larat & Chanchal Pass, 3500 m, 23.7.1965, N.C.Nair 36115 (BSD, DD); Vasudhara, 4000 m, 29.6.1957, Y.K.Sann & M.A.Rau 2877 (BSD); Kumaon, 9000 ft., May 1881, D.Brandis s.n. (DD); Kedarkanta, 10-11000 ft, May 81, W.Sollan s.n. (DD); Kedarkanta, 11,000 ft, June 1893, J.S.Gamble s.n. (DD); Near Pindar valley, Almora dist., 10,000 ft, 10.6.35, C.E.Parkinson 70118 (DD); Panch-chaulchi glacier, Almora dist., 13,500 ft., 10.6.51, K.C.Sahni 20471 (DD); Valley of flowers,12,500 ft, 1.6.1959, K.M.Vaid s.n. ‘scape c. 10 cm long’ (DD); Chansil, 13000 ft, 7.6.08, K.N.Krishnatawade 240 (DD).

HIMACHAL PRADESH: Marali, near Simla, 1886, Collett s.n., Acc 470691, Chitkul, c. 3425 m, 24.5.1972, K.P.Janardhanan 47424; Rakcham, 3200 m, 19.5.1972, K.P.Janardhanan 47326; Ranikhand, c. 3800 m, 25.5.1972, K.P.Janardhanan 47471 (CAL, BSD); Kamru (Baspa valley), 13,500 ft., 26.6.1972, G.Sherriff 7348 ‘One out of 3 plants mounted is a rare caulescent form, 10cm high excl. flower); Punjab Himalaya, May 1884, D.D.Cunningham, s.n., Acc.No. 470688; Mulluk & south of Bhadeh Pass, 9-12,000 ft., Shalitsea s.n, Acc.No. 470688; Dhanchho-mani Mahesh 3300 m, 28.6.1974, B.M.Wadhwa 53438 ‘A rare caulescent form 12cm high excl flower’ (BSD); Chanchal Pass, Mahasus dist., 3500 m, 23.7.1965, N.C.Nair
36115 (BSD); Mahri, Kulu dist, 2800 m, 4-6-1978, B.S.Aswal 9246 (CDRI), Lacca-Kangra, 3500 m, 9-6-1958, M.A.Rau 5646 (BSD), Khoksar (Lahul), 3400 m, 25-6-1958, M.A.Rau, 5856 (BSD); Rainfall, 26-6-1984, H.J.Chowdhery et al. 75970 (BSD), Kalpa (Bashahr), 3200 m, 4-6-1962, N.C.Nair 22409 (BSD), Satrundi, Chamba dist, 3475 m, N.C.Nair 32421, 4000 m, 24-7-1964, N.C.Nair 32794 (BSD); Rotang, Lahul, 11 - 13 000 ft., 1-7-38, N.L.Bor 12096 (DD); Koksar, 11 000 ft, 3-7-38. N.L.Bor 12291 (DD); Parbati valley, Kulu, 9400 ft., 30-5-39, C.E.Parkinson 3996 (DD); Pulga, Kulu, 18-6-50, S.K.Jain & R.C. Bharadwaj s.n. (DD); Manali, 11000 ft, 23-5-41, N.L.Bor 12612 (DD); Kulu, 30-5-30, K.D.Bagchee s.n. (DD); Between Koti & Rotang, Lahul, 11000 ft, 4-6-58, R.C.Negi 120 (DD); Bassaher, 12,000 ft., May 1881, D. Brandis s.n. (DD); Bashahr State, 10,000 ft, 14-5-1928, R.N.Parker 2836 (DD); Haranghate, Bashahr, 12,000 ft., 25-5-13, Kartar Singh 219 (DD); Satrundi, Chamba State, 3-7-99, Harsukh s.n. ‘perianth-tube 9 - 10 cm’ (DD); Mari (Byas), Lahaul, 22-6-1973, B.K. Kapaha 12603 (JRL); Rotang road, Lahaul, 3000 m, 11-6-1962, Y.K.Sarin 8722 (JRL); Mani to Rothang, 3-5-1994, Husain & Datt 210265 (LWG); Rotang & Lahul, 11,000-13,000 ft., 1-7-38, N.L.Bor, 12096 (BLATT); Koksar, Lahul, 11,000 ft., 3-7-38, N.L.Bor 12291 ‘scape c.10 cm long, perianth tube c. 9 cm long’ (BLATT) Tamta Thach, Kulu valley, 12,600 ft., M.J.Kackney 35 (BLATT).

JAMMU & KASHMIR: Golhan ridge, 9000 ft., 17-4-1898, J.H.Lace 1695; Aru, Kashmir, 2600 m, 10-7 1956, T.A.Rao 556 (BSD); Bagi to Sungri (Kashmir ?), 8000 ft., 12-5-1890, fl, J.H.Lace 91 (BSIS).

Notes:

i. The epithet of this species has 3 orthographic variants, viz., kamaonensis, kemaonensis and kumaonensis and author citations, viz., Wall., Wall. ex D Don, D.Don ex Royle, Royle ex D.Don. Of these, the name I.kumaonensis Wall. ex D.Don and I.kamaonensis Wall. ex D.Don are found in frequent use. This shows that, Royle’s publication remained in dark for a century. In fact Wallich (1830-31) listed the name as Ins kamaonensis to his catalogue.
number 5052, which was collected from the Kumaon region of Western Himalayas. Royle (1839) first validated the name with description based on Wall. Cat. n. 5052 (Kemaon, Blinkworth, Kedarkanta, Royle) but changed the spelling of the specific epithet to ‘kemaonensis’. Two years later, D Don published this species as *Ikamaonensis* based on the same specimens Wall cat. 5052. Baker (1876) recognised the name as *Ikumaonensis* Wall., which is again an altered spelling for the name of the species but philologically correct. Hooker (1892) and Dykes (1913) followed Baker’s spelling of the plant name (*Ikumaonensis*) in ‘Flora of British India’, and ‘The Genus Iris’ respectively but overlooked Royle’s publication by attributing the name to Wallich only. This was followed by Polunin & Stainton (1984), Chowdhery & Wadhwa (1984), Naithani (1985), Karthikeyan et al. (1989), Zhao (1992) and Hajra & Balodi (1995) citing the author as D.Don ex Royle.

Since, *Ikemaonensis* Wall. ex Royle (1839) is the earlier to *Ikamaonensis* Wall. ex D.Don (1841), the former has priority over the later. Mathew (1990) has rightly pointed out that Royle did not make a mistake in altering the spelling from ‘kamonensis’ to ‘kemaonensis’ since he repeated the epithet and also referred to the locality as Kemaon and as per Article 60.1 and 60.2 (ICBN).

ii. Foster (1887) described two species viz., *I.kingiana* and *I.duthiei* allied to this species. But there was no distinct differences between *I.kingiana* and *I.duthiei* except that the perianth tube of the later is little longer and the falls are more uniformly reddish-lilac coloured instead of prominently blotched and less reflexed. Although, Baker (1892) as well as Hooker, f (1892) retained *I.duthiei* as a distinct species they indicated that it could be a variety of *Ikumaonensis*. Lynch (1904) also maintained it as a distinct species. Dykes (1913) reduced *I.duthiei* under *Ikumaonensis* as a synonym. Further this name is rarely used in regional Floras of India. The type specimen of this taxon could not be traced. In this work it is treated as a variety of *Ikemaonensis* based on protologue and fresh collections from that region.
Between *Ikemaonensis* and *I.kingiana*, there exist no difference in their description in protologues, moreover the ‘type specimen’ of *Ikemaonensis* and the illustration of *I.kingiana* by Baker appear as the one and same plant. Thus, like the most previous workers, *I.kingiana* Foster is treated as synonym of *Ikemaonensis* in the present work.

Further confusion regarding identity of *Ikemaonensis* in a number of floristic works exists, where *I.hookeriana* is described under *Ikemaonensis* or cited specimens, which were found to be either of *I.hookeriana* or a mixture of *I.hookeriana* and *Ikemaonensis*. *Ikemaonensis* treated by Klatt (1866), J.L.Stewart (1869), Baker (1876), Duthieii (1876), Blatter (1928), Rao (1959 & 1961), R.R. Stewart (1972) are found to be *I.hookeriana*. The description of *Ikemaonensis* by Collett (1902), Rau (1975), and Aswal & Mehrotra (1994) include characters of both *Ikemaonensis* and *I.hookeriana* Baker (1876) and Watt (1890) have treated *I.longifolia* Royle as a synonym of *I.Kemaonensis*, which is not a *Pseudoregelia* but a synonym of *I lactea* Pall., an *Apogon*. Recently, Noltie (1990) published *I.dolicosiphon*, which is very close to *Ikemaonensis*. The photocopies of the specimens of *I.dolicosiphon* personally communicated by Dr. Noltie hardly makes any difference with the specimens of *Ikemaonensis* but the slide of live plant sent by him show spreading falls (strongly reflexed in *Ikemaonensis*) and devoid of blotches (strongly blotched in *Ikemaonensis*).

In all the major Indian herbaria most specimens of *I.hookeriana* were found misidentified as *Ikumaonensis*. The specimens collected at different times of the year and from different localities also exhibit a lot of differences. A plant collected in flower usually possess leaves that are 8–15 cm long but the specimens collected in the later part of the flowering or in fruits exhibit over 40 cm long leaves but without any increase in the length of the scape. This very phenomenon of post flowering elongation of leaves often creates an illusion whether its fruiting specimens belong to some other taxon. *Ikemaonensis* var. *duthieii* is hardly distinguishable from var. *kemaonensis* and *I.dolicosiphon* in the herbarium, if a specimen is not properly mounted or field notes are lacking. Among these three taxa, length of the perianth
tube, blotching and degree of reflection of the falls, size of flower are intermediate in \textit{I. duthiei}. While \textit{I. duthiei} occupies the same habitat of \textit{I. kemaonensis} in western Himalayas

\textbf{iii.} There are two syntypes, viz., Wall. Cat. No. 5052 Kamaon (Blinkworth) and Kedarkanta (Royle). The specimens are in CAL and K. The specimens in CAL were found to have been depauperated. The three sheets of specimens at K show better identifying features than that in CAL. Of these, the sheet Bydrmauth, Kamaon, August, \textit{RB} (Wall Cat. 5052) has six mounted flowering specimens of \textit{I. kemaonensis} and another sheet in the same Wallichian number in Herb Hookerianum has five mounted specimens, four of which belong to \textit{I. kemaonensis} and the fifth specimen with additional labels Yarkand Expedition, 1870 and 20.6.(18)70 numbered 342 on the bottom right corner is a subsequent collection of Henderson (1872) and it is undoubtedly \textit{I. hookeriana} Foster. Dykes has also demarcated this fifth specimen in pencil and determined as \textit{I. hookeriana}. For convenience, the former sheet is considered here as Wall. Cat. 5052 A and the later as Wall. Cat. 5052 B. The third sheet also from Herb. Hookerianum has three mounted flowering specimens with V Jacqueton's label numbered 853 from Kedarkanta (probably written in hand by Royle) below the left specimen and NW India on the bottom right, all of them are \textit{I. kemaonensis}. Among these three sheets Wall. Cat. No. 5052 A (K), which matches well with the protologue and therefore chosen here as lectotype of \textit{I. kemaonensis}.

\textbf{iv.} \textit{I. kemaonensis} with \textit{I. dolichosiphon}, \textit{I. dolichosiphon} subsp. \textit{orientalis}, \textit{I. kemaonensis} var. \textit{duthiei} together represent a species complex and it is difficult to segregate these taxa in the herbarium. The nearest relative of this species complex within the subsection is \textit{I. hookeriana} Foster. In the vegetative state there is no way to differentiate \textit{I. kemaonensis} from \textit{I. hookeriana} unless one goes for a chromosome counting (2n=22 in the former 2n=24 in the later). Probably, due to their nearly similar habit and overlapping habitat and are often confused with each other. In flowers \textit{I. hookeriana} can be easily distinguished on produced scape of 10 - 20 cm long, 2-flowered spathe, shorter perianth tube (1.5 - 3 cm). There are
collections of both *Lkemaonensis* and *I.hookenana* and also some rare caulescent forms of *Lkemaonensis* [Wadhwa 53438, G.Sherriff 7348 (CAL); Bor 12291 (BLATT)] with single flower and produced scape from the Lahul-Spiti of Himachal Pradesh. Probably these specimens belong to *I.kumaonensis* var. *caulescence* Baker and are intermediate between *I.kemaonensis* and *I.hookenana*.

v. It is evident from the available collections of the species that westward and northward distribution of the species from Kumaon region of the Himalayas appears to be limited. Stewart (1972) enumerated this species from West Pakistan and Kashmir. The duplicates of specimens cited by him (Inayat 25894 & Harriss 16675 at CAL) were found to be *I.hookenana*. *Lkemaonensis* treated and illustrated by Blatter (1928) also found to be *I.hookenana*. The species has an eastward distribution to the Central Himalayas. Hara (1971) and Noltie (1994) have treated the species for Eastern Himalayas and cited localities from Bhutan There is no record of the species from the Sikkim Himalayas. Evans (1940) had treated the collection of *Kingdonward* 8281 from Delei valley of Arunachal Pradesh as *I.kumaonensis* new to Assam (undivided). Noltie (1995) treated this as *Ins dolichosiphon* (subspecies *dolichosiphon*). According to Noltie (1990) many of the specimens from Eastern Himalayas and southwest China seem to be closer to *Ldolichosiphon*. *Lkemaonensis* reported from Manipur by Kingdonward (1952) and Deb (1961) appear doubtful as no specimen from this region was found in Indian herbaria.

vi. This species grows in temperate regions between 3000 – 5600 m in moist and open grassy slopes of Himalayas. It is rare in Jammu & Kashmir. Babu (1977) reported cultivation of this alpine species in Dehra Dun. The character (stems 5-25 cm) mentioned therein for this acaulescent species undoubtedly points to a different species and most probably it is *Luctorinum* Maxim., which is in fact cultivated at some places in Dehradun. The plants collected from Garhwal Himalayas were introduced in the garden of Botanical survey of India, Dehradun did not survive. Kohlein (1987) recorded its very slow growth under cultivation in Germany.
vii. Its roots and leaves are medicinal (Gupta 1989). Agarwal et al (1984) have reported isoflavones, viz., Iriskumaonemin methyl ether, irsflorentin, junipigenin-A, irigenin and irdin from the rhizome of this species.

var. duthieii (Foster) Bahali, stat & comb. nov.


Local name. *Jangli Haldi* (Garhwal)

Differs from var.*kemaonensis* by its red-lilac flowers with more or less uniform colour, indistinct blotches and darker veins on the falls, reddish lilac style arms, deltoid style lobes with somewhat crenate margin.

Flowering: May – June; Fruiting: June – August.

Distribution: India: Uttaranchal (Chamoli district)

Specimens examined:


Note: Foster (1887) simultaneously described two species viz., *Iris duthieiu* and *I.kingiana* from two different localities of Western Himalayas based on some minor differences. Subsequently, most authors reduced *I.kingiana* as synonym of *I.kemaonensis*. Both Hooker, f. (1892) and Baker (1892) expressed doubt that *I.duthieii* could be a variety of *I.kemaonensis*. While, Lynch (1904) treated it as a distinct species. Later Dykes (1913) merged *I.duthieii* with *I.kemaonensis*, which was followed by Rix (1997). Infact, it is difficult to differentiate them in herbarium if notes on flower colour and shape are lacking. But the differences are quite evident in the field at the time of flowering. In the present study *I.duthie* Foster is reduced as a variety of *I.kemaonensis* based on floral characters mentioned above.
Plate 62. *Iris kemaonensis* Wall. ex Royle var. *kemaonensis*: a. type specimen, b. close up of flower; c - d. *I. kemaonensis* var. *kernaonensis* (natural colour of flower reddish lilac)
Excluded species

*L.sikkimensis* Dykes, *Gen. Iris* 134. t 31 1913; *I.kumaonensis* var *caulescens* Dykes in *Gard. Chron.* 43. 396. 1908, non Baker (1892).

This species was described by Dykes (1908) as *I.kumaonensis* var *caulescens* from the rootstock supplied by Messrs. Barr. & Sons from an unknown locality of Sikkim Himalaya. After 4 years he raised it as a species (*L.sikkimensis*) in his monograph. He differentiated his species from *I.hookeriana* by its narrower foliage, 2-3-flowered spathe (2-flowered in *hookeriana*) and longer perianth tube. He also stated that unlike *I.kemaonensis* and *I.hookeriana* this plant refuses to set any seed and its perianth tube is somewhat intermediate between these two species. He published this species with a note “It is with some hesitation that I publish the account of this *Iris*, because although after cultivating it for at least four years side by side with *I.kumaonensis* and *I.hookeriana*, I have no doubt that it is distinct from both of these, I am yet not satisfied that it may not be merely a hybrid between the two. This however can hardly be possible, if as I was led to understand, the plant was wild in Sikkim, for *I.hookeriana* does not seem to extend as Far East as that.”

No specimens of *L.sikkimensis* are seen in any of the Indian herbaria. The diagnostic characters of this species are sometimes observed among the collections of *I.hookeriana*. As such the illustration of the species is not much different from *I.hookeriana*. It is possible that the name of the locality was misread or wrongly indicated by the supplier. The other possibility is hybridisation between *I.kemaonensis* and *I.hookeriana*, since it resembles *I.hookeriana* by its well-developed scape and *I.kemaonensis* by a long perianth-tube. The absence of seed set by the plant also provides a clue of hybridisation. If *I.hookeriana* (2n=24) hybridises with *I.kemaonensis* (2n=22), the resultant offspring (2n=23) obviously shows meiotic irregularities leading to sterility.
A comparison between *L.hookeriana* and *I.sikkimensis*

<table>
<thead>
<tr>
<th><strong>I.hookeriana</strong></th>
<th><strong>I.sikkimensis</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Western and Trans Himalayas</td>
<td>Unknown locality of Sikkim Himalayas</td>
</tr>
<tr>
<td>Leaves pale green, 15-25 x 0.7-1 cm in flowers, elongates up to 40-50 x 1.5 cm</td>
<td>Leaves pale green, 10-20 cm long in flowers, elongating up to 30-45 x 1.2-2 cm</td>
</tr>
<tr>
<td>Scape 10-20 cm, bearing a terminal head of 2 flowers.</td>
<td>Scape 10-15 cm long, bearing a terminal head of 2-3 flowers.</td>
</tr>
<tr>
<td>Spathes pale green, lanceolate, 5-7.5 cm long, subscariose.</td>
<td>Spathes palegreen, lanceolate, 5-7.5 cm long, valves scariose in the upper third and along the edge</td>
</tr>
<tr>
<td>Pedicel 0.5 - 2 cm long</td>
<td>Pedicel 1.2 - 2 cm long.</td>
</tr>
<tr>
<td>Perianth tube 1.5 - 3 cm long with purple stripes and spots.</td>
<td>Perianth tube 3.5 – 5 cm long, trigonal, deep purple.</td>
</tr>
<tr>
<td>Falls lilac-purple, 4-5 x 1.5 – 2.5 cm; blade obovate oblong, mottled with darker blotches</td>
<td>Falls 6.2 x 2.5 cm, blade obovate, dark purple lilac, mottled with deeper shade</td>
</tr>
<tr>
<td>Standards erect, uniformly coloured.</td>
<td>Standards diagonally erect, pale mauve lilac, faintly mottled at base.</td>
</tr>
<tr>
<td>Ovary 1.2–1.8 cm long; style branches c. 2 cm.</td>
<td>Ovary c. 2 cm long, green mottled and faintly purple-striped; style branches c. 2.5 cm long.</td>
</tr>
</tbody>
</table>

Noltie (Pers.Com) informs that he had not seen the species during his tour to Sikkim Himalayas and presumes it to be a hybrid between *I.hookeriana* and *I.kemaonensis*. According to him, Dykes probably described the species from the material obtained by him from a British Nursery, which probably came from wild in Sikkim. Mathew (1989) also has a similar view of its origin from cultivation. In the absence of any material that could be identified as *I.sikkimensis*, it is kept as excluded in the present work.
Subgen. **Nepalensis** (Dykes) Lawr.


Rhizomes reduced to a small hard disc, thickly clothed by fibrous remnants of leaf-sheaths and with cluster of tuberous fleshy roots at base. The flowers are short lived (less than half a day) and have a crest on the falls like those of the sect. *Lophuris*.


Only *I.decora* Wall. occurs in India.

Neubeckia decora Klatt in Linnaea 34: 590. 1866. Type: Nepal, Ekdanta & near Bhimphedi, Wallich s.n. (K).


I.sulcata Wall. Cat. No. 5049, 1832 nom. nud. Neubeckia sulcata Klatt in Linnaea 34: 588. 1866. Type: Nepal, 1821, Wallich 5049 a (K: Photo !, CAL· type number !); Kamaon, 1821, R.Blinkworth in Wall. Cat. No. 5049 b ( K: Photo !).

Plate 63 & 64; Fig. 24

Local name: Nyatho, Nyeto (Bhutia); Sdier (Khasi)

Perennnial herb, 15 – 45 cm high. Rootstock a rudimentary disc like rhizome, encircled by short, dense and erect fibres derived from old leaves; roots fleshy, spindle shaped, fascicled, 4 or more in a cluster, whitish. Leaves radical and cauline; radical leaves linear, 20 – 30 x 0.6 - 1 cm at the flowering, 45 – 60 cm long afterwards, green, glaucous beneath, ribbed, acuminate; cauline leaves reduced, 1 - 2 in dwarf plants and 2 – 5 in tall ones. Scape slender, smooth, solid, glossy, somewhat flexuous, cylindrical, usually 20 – 50 cm long, sometimes shorter or longer; the shorter scapes either unbranched or branched once, the tall ones 1–4-branched; spathes 1–3-flowered, 2-valved when 1-flowered and 3-valved when 2 – 3-flowered, valves lanceolate or linear-falcate, acuminate, margin membranous, 5 – 8 x 1 – 1.5 cm, keeled, green, persistent. Flowers usually 2 per head, bloom in succession, pale lavender violet or pale blue limbs spreading or slightly
reflexed, lives for about a half day, 4 -5 cm across; pedicel 1 - 2 cm long, perianth tube slender, obscurely 3-angled, (1-) 3 - 4 (-5) cm long; falls reflexed elliptical-ovate, 4 – 5 x 1.5 – 2 cm, refuse at apex, gradually attenuated towards base, entire, with dichotomously reticulate purple veins, crest on falls denticulate, runs from the centre down to the base of the claw, standards narrowly elliptical or oblanceolate, c. 4 x 1.2 cm, diagonally erect to spreading, uniformly coloured. Stamens c. 2.5 cm long, filaments white, anthers linear, c 1 cm long, dehiscence longitudinal; pollen subspheroidal, 73 – 108 x 56 – 90 µ, monocolpate, monocolpate, coarse-reticulate, lumina conspicuously verrucate Ovary trigonous, 1.4 – 1.8 cm long; style arms lanceolate, keeled, bilobed, c. 3.5 cm long, lobes recurved, serrate. Capsule trigonal, oblong, 2 5 – 4 cm long, with lateral sides grooved, clasped by persistent spathe valves. Seeds elliptical to ovoid, 2.5 – 3.5 x 2 - 3.3 mm; seed coat dark brown, warty; aril whitish, elongated, c. 2 x 1 mm.

Flowering: April – July; Fruiting: July – Aug.

Chromosome number: 2n=24 (Malik, 1961); 2n = 28 (Mehra & Sachdeva, 1971), 2n = 30 (Sharma, A.K. & Talukdar, 1960)

Distribution: India: Himalayas from Jammu & Kashmir to Arunachal Pradesh and NE Indian hills.

Pakistan, Nepal, Bhutan and China (Tibet & Yunnan).

**Specimens examined:**

HIMACHAL PRADESH: Baruni nal Simla, 5,000 ft., 7.7.77, fl., J.S.Gamble 4536 A, 4536 C-D (CAL), 4536 B (DD); Baruni Simla, 5,000 ft., 26.7.77, fr , J.S.Gamble 4600 B; Simla, 6,000 ft., August 1878, fr, J.S.Gamble 6440 A, Simla, Shalibinbelto Rocks, 9,000 ft, June 81, fl., Dr. Brandis s.n. (DD), Jaunsar, 1882, fl., W.R.Fisher s.n. (DD); Jaru ka nal, Simla, 5800ft., 28.6.1886, fl., E.R Johnson s.n., Acc. No. 470563; Between Khandala and Sangri, Bashahr, 8900 ft., 1.7.1953, fl., S.P. Sethi 20174 (DD); Larot, Mahasu dist., 2500 m, fl, 21.7.1965, N.C.Nair 36028 (BSD).
UTTARANCHAL: Near Mussoorie, 1869, fr., G.King s.n., Acc. No.470586 & 470588; July 1898, fl., P.W.Mackinnon s.n.; Mussoorie, fl., Dr.Bacon 137, Jabberkhet, 7,000 ft, 8.8 1938, fr., R.R.Stewart 16707 (DD), Nagtibba, Oct 1897, fr., P.W.Mackinnon s.n., Acc.No 470564; 2,200 m, 27.7 1964, fr., U.C.Bhattacharyya 33775 (CAL, BSD); Gharwal, 4500 ft., July 1857, fl., Anderson 7; Tehri-Garhwal, May 80, fl. & fr., W.Sollan s.n., Acc. No. 470996; Khursu, 6500 ft., 22.6.1918, fl., O.E.Osmaston 33152 (DD); Melkhuli, 1900 m, 21 7 1964, fr., U.C.Bhattacharyya 31161, rare (BSD); Kumaon, above Bugar 3,000 ft., May 1857, fl., T.Anderson s.n., Acc.No. 470583 (CAL, DD), Dhauli valley, 10-11,000 ft., 6.6.1886, fr., J.F.Duthie 6023; Kali valley, Byans, 8 – 9,000 ft., 17.7.1886, fr., J.F.Duthie 6022; Hi forest, 6 – 7,000 ft., 23.8.86, fr., J.F.Duthie 6021; Deoban, Jaunsar, 8,500 ft, 6/1896, fl., J.S.Gamble 25796; fl., Dr. Brandis 1493; Dakera, 6,000 ft., 18.6.91, fl., C.G. Rogers s.n., Acc.No.470512, 470979, 470997, 470998; Chaebbar, 7,000 ft., June 1891, fl., J.S.Gamble 23686; Shinach to Bhagaut, Bashahr, 8 – 9,000 ft., fl., 20 7.1891, J.H.Lace 981 (CAL, BSIS); Bodyar Jaunsar, 8,000 ft., 6/1896, fl., J.S.Gamble 25809 (CAL, DD); Chansil, 13,000 ft., 7.6.1908, fl., K.N.Knshna-tawade 240, with two additional specimens of *L.kemaonensis* (DD); Chakrata, 7,000 ft., 17.6.1946, fl., M.B.Raizada, s.n., Acc.No.98013 (DD); Harkidun, 12,000 ft., 1.7.1955, fl., R.B.Mathur s.n.; Malpa, Kumaon, 2200 m, 12.6.1960, fl., T.A.Rao, 11832 (BSD); Sela to Bungling, Pithoragarh dist., 7-8,000 ft., 13.5.1998, fl., B.P.Uniyal & B.Ghosh 93709 (BSD).

SIKKIM: Above Chungthang, 6500 ft., May 1885, fl., King's Collector s.n.


MANIPUR: Khangam, Ukhrul, 6,000 ft., 9.5.1948, fl., S.K.Mukherjee 2853, Sirohi, 7,000 ft., 20.4.1948, fl., S.K.Mukherjee 2766.

MEGHALAYA: Khasi hills, 6,000 ft., May, 1876, fl., S.Kurz 181-182 (CAL, ASSAM); 6,000 ft., June 1879, fl., S.Kurz s.n., Acc.No. 470605; 5,000 ft., fr.,
Notes:

i. This species, better known as *I. nepalensis* D.Don (1825) described based on a collection of Wallich from Gosamthan of Nepal. Wallich published *Iris decora* in 1830 based on an exceptionally tall specimen from Ekdanta Mountain and Bhimphedi in Nepal. He named similar plants collected from Nepal and Kumaon as *Iris sulcata* in his catalogue in 1832, which is superfluous. However, the name *I. decora* remained unknown for a long time because of the fact that the description of the species was based on a rare tall plant with broader leaves although some have reduced it as a synonym of Don’s *I. nepalensis*. The name *I. nepalensis* existed as a valid name for about a century and often it was confused with its earlier homonym. Prior to Don’s *nepalensis* in 1825, Wallich (1824) had used the same name (in *Bot. Reg. t. 818. 1824*) for a bearded *Iris*, which is presently known as *L. germanica* L. var. *nepalensis* Wall. ex Herb. Royle (1839) reduced *I. nepalensis* D.Don as a synonym of *I. decora* Wall. D.Don again published a *Pogoniris* with the same epithet *I. nepalensis* (in *Trans. Linn. Soc. 18. 310 1841*), which is different from the one he published earlier (1825). Klatt (1866) published *I. decora* Wall. from Nepal and Western Himalayas as *Neubeckia decora* and described the collection of Hooker & Thomson from Khasi hills as *N. sulcata*.

Hooker f (1892) considered *I. nepalensis* D.Don (1825) as correct name and *I. decora* Wall. (1830) as its synonym and kept 2 other homonyms
In nepalensis Wall ex Lindl and *I. nepalensis* Wall ex D.Don) as doubtful species in Flora of British India and thereby complicated the issue. In fact these homonyms are variants of *L germanica* L. Foster (1936) attempted to clarify the nomenclature problem by stating that - “One year before the description of Don’s species *I. nepalensis* Wall, was described (in Lindley’s *Botanical Register* t. 818. 1824). To judge from the figure and description this plant is merely a form of *L germanica* L. Inspite of certain differences in description and the colouring, Don’s plant seems conspecific with *I. decora* Wall. (Pl.Asiat Rar 1: 77, t. 86. 1830), and probably should take that name as the earliest available synonym”.

**ii.** *I. collettii* from the adjoining Myanmar and China is morphologically very close to *I. decora* and their characters are so overlapping that it is very difficult to distinguish them in the herbarium. Although, Hooker (1903) considered dwarfness and early leafing of *I. collettii* are distinguishing characters, Dykes (1913) doubted its distinctness but on page 14 of his monograph he considered it to be a subspecies of *I. decora* which Lawrence (1953) ultimately merged under *I. decora*. A critical examination of the specimens of both the species reveals that *I. decora* has narrower leaves, usually long scape (short or nearly obsolete in *I. collettii*) and shorter perianth tube.

Baker (1876) considered Bhutanese specimen (gathered by Griffith) with stout stem and broader leaves as apparently distinct, which Noltie (1994) remarked it to be a probable subspecies of *I. decora*. Rodionenko (1961) reported monocolpate pollen grains with regular reticulum in the specimens of western Himalayas while Schulze (1964) and Chuma (1970) described inaperturate pollen grains with interrupted reticulum in the specimens from Bhutan. The present study of pollen of the species from the Himalayas including Bhutan and NE India conforms these observations supporting the distinctness of Bhutanese specimens.
iii. The controversy on the systematic position of this species and its subgenus is mainly due to the unique rootstock, which is neither truly rhizomatous nor bulbous, rather a small disk-like reduced rhizome enclosed in a thick covering of fibrous remnants of the leaf bases. The fleshy roots attached to the base of this disk are unique to *Indaceae* or to some extent similar to that of the bulbous *Juno*. Baker (1892) emphasising the crest character of the falls assigned this species and its variety to subgenus *Evansia* (now sect. *Lophiris*). Dykes (1913) separated this species from Baker's *Evansia* on the basis of tuberous root character to a new section, *Nepalensis*, which was followed by Diels (1930). Lawrence (1953) accommodated this as subgenus under genus *Iris* and this was followed in all subsequent classifications.

iv. The characteristic fusiform roots and coarse-reticulate verrucate pollen of *I.decora* is somewhat similar to bulbous *Juno aitchisonu*. The presence of crests on falls, coarse-reticulate monocolpate pollen with conspicuously verrucate lumina and chromosome number $2n=28$ of the species comes close to those of *Iris* sect. *Lophiris*. Again, scattered growth habit, maturity of leaf before flowering, reduced rhizome and elongated aril in ellipsoid seeds are the characters common to this species and *I.goniocarpa* (subsect. *Pseudoregelia*). Wu & Cutler (1985) and Rudall & Mathew (1993) observed mesophyll arrangement in the leaves of subgenus *Nepalensis* and *Juno* to be similar. Recent molecular analysis by Tilie et al. (Mss.) reveals that *Ins* subgenus *Nepalensis* comes under a group containing all *Ins* species with a beard or crest and *I.milesii* (*Lophiris*) forming a sister pair with *I.decora* Wall and that by Hall et al. (Mss.) indicates that *Juno* is closely allied to subgenus *Nepalensis*. All the above observations suggest that the subgenus *Nepalensis* and hence *I.decora* is intermediate between the rhizomatous *Iris* sect *Lophiris* and bulbous species of *Juno*.

v. This species occurs between 1500 – 2500 m altitude like the species of *Lophiris*. At some places it occurs at the altitude as high as 3500 – 4300 m
It prefers moist habitat, where the basal region macerate to leave behind short and dense fibres around the disk-shaped rhizome and the base of young leaves. It grows on stony hillsides in open slopes, in pastures and scrub, rock crevices, clearings of Rhododendron forests. The plants never grow in clumps. The aerial shoot die back to the small growing point in winter. Dykes (1913) mentions "it was Foster’s experience that *I. collettii* was easier to manage than *I. nepalensis* (now *I. decora* Wall.) stands apart from all other Irises in its needs. True to its habit in its native home *I. nepalensis* (=*I. decora*) lies dormant for six months during the time when the dry north-east winds would be blowing and only grows during the period of heavy rains of the south west monsoon. Thus, even in England the leaves die down late in October and do not appear again until April or May. When growth once begins it is rapid (like *Pseudoregetia*), and the plants are usually in flower during the later part of June or the first half of July."

**vi.** Roots reported to possess diuretic, aperient and deobstruent properties and are considered to be especially useful in removing bilious obstructions. It is also used as an application to sores and pimples (Kirtikar & Basu, 1933 & Wealth of India 5: 255.1959); tuberous roots used in angling fishes (*R.S.Rao 7476, CAL*).

**vii.** This species although has a wide range of distribution in the Himalayas, it is poorly represented in herbaria. From the herbarium and field studies it is found to be very rare. Attempts to locate the species from known localities (Mussoorie, Jabberkhet, Deoban, Nagtibba) were futile. Very recently, B.P.Uniyal and B.Ghosh have collected the species on their way from Sela to Bungling in Pithoragarh district (Uttaranchal). During the course of present work the species was found to be threatened in its known localities in Khasi hills mainly due to the pernicious practice of Jhum cultivation. If proper conservation measures are not taken then this species may become endangered.
Figure 24. *Ins decor*a Wall. a. habit; b. fall; c. fruits; d. seed
(source: Wall Cat. 5049 & D.D.Bahali s.n., ASSAM)
Plate 63. *Iris decora* Wall.: a. type specimen; b. whole plant (from western Himalayas).
Plate 64. *Iris decora* Wall, from Khasi hills: a. close view of plant; b. close up of flower; c. whole plant with fleshy roots.
6. **Juno Tratt.**


Bulbs tunicated, with fleshy scales attached to basal plate, tunics membranous; roots fleshy and/or slender. Leaves distichous, channelled, suberect or flaccid, often with hyaline margin. Scape short or long, usually leafy over the whole length, bearing flowers in axils of cauline leaves or 1 or 2 flowers at apex. Flowers funnel-shaped, perianth tube well developed; falls crested, unguiculate, obliquely erect, deflexed at apex, crests often low, sometimes cockscomb like prominent, often yellow; standards much reduced, sometimes bristle-like, patent or deflexed; stamens opposite the falls; style arms petaloid, with two large lobes and small flap-like pendant stigma. Capsule thin walled, trigonous, obtusely angled. Seeds subglobose-angular, arillate or ex-arillate, wrinkled.

The genus comprises of about 55 species, distributed mainly in central Turkey and the south Caucasus to southern Israel and Jordan to NW Himalayas and Pamir in Central Asia; one in Mediterranean Europe and north Africa.

This genus is better known as 'Juno Irises'. In all earlier classifications (except Spach, 1846) it is treated as section **Juno** under **Iris** Spach (1846) treated it as **Iris** subgenus 'Scorpins' based on **I.persica** L. This
name was followed in many subsequent works. Rodionenko (1961) separated *Scorpiris* from *Iris* and re-established them as genus 'Juno' and subdivided *Juno* into 3 sections viz., *Juno, Physcaulon* and *Acanthospora*. This is followed in the present work.

*Juno* is unique in *Indaceae* in having entirely bifacial leaves, persistent fleshy roots and much-reduced standards. The affinities of this genus has always been considered obscure. The most recent molecular analysis by Tillie et al. (mss.) and evaluation of bulbous Irises by Hall et al. (Mss.) reveal that *Juno* form a large and distinct monophyletic group forming a part of much larger natural assemblage of dry land or mesic Irises. Wu & Cutler (1985) and Rudall & Mathew (1993) observed identical mesophyll arrangement in the leaves of both *Iris* subgenera *Nepalensis* and *Scorpiris (Juno)*. Present work supports this view as *Juno* has fleshy roots attached to rudimentary basal plate like those in the subgenus *Nepalensis* and pollen of *J. aitchisonii* is very similar to that of *Iris decora* (subgen *Nepalensis*) in having monocolpate coarse reticulate pollen with conspicuously verrucose lumina and colpus extending beyond pole.

In Flora of British India, only one species, *Iris aitchisonii* (*J. aitchisonii*) was recorded from the Salt range of Punjab, presently in Pakistan. Kirn et al. (1998) have recently recorded it from Rajouri district of Jammu & Kashmir in India. *Iris persica* L. [*Juno persica* (L.) Tratt.] recorded by Graham (1839) as an introduction in India could not be traced from any Indian herbaria.

Pakistan Mount Tilla, 26.3.1874, Aitchison 1118 (K- holo, photo !; CAL type number)  
Plate 65, Fig. 25

Bulbs ovate, 3 – 5 cm long, tunicated; tunicas brown, membranous, shining; roots fleshy. Leaves diphyllos, outer cataphylls, inner normal leaves; cataphylls 3 – 4, membranous, whitish, suffused with green, normal leaves 3 – 6, suberect, well developed in flowering, linear 30 – 50 x 0 8 – 1 0 cm, canaliculate, grass green, closely nerved, glabrous, sheathing at base, margin entire and hard. Scape slender 20 – 35 cm long, unbranched or with 1-branch; spathes 1 – 3-flowered; valves 5 – 7 cm long, green, lanceolate, acuminate, with membranous margin, exceeding perianth tube. Flowers purple or yellow, sessile, beardless, 5 – 6 cm across. Perianth tube narrow, infundibular, 2.5 – 3.0 cm long, lilac; falls oblong-spathulate, 4 – 5 cm long, with a yellow median ridge, claw 1.5 – 2 cm long, canaliculate, white with yellow median ridge, blade elliptic oblong, 2.5 – 3 x 1.5 – 2 cm, purple or violet with deeper shade towards apex; standards reduced, spreading, linear to oblanceolate, 2.5 – 3.0 x 0.2 – 0.3 cm, lower 3/4th part canaliculate, trilobed at apex, middle lobe acuminate, c. 3 mm long, lateral lobes much shorter, c. 0.5 mm, obtuse at apex. Stamens 2.7 – 3.5 cm long; filaments 1.2 – 1.5 cm long; anthers 1.5 – 2 cm long; Pollen subspheroidal, 56 – 107 x 52 – 104 μ, monocolpate, coarsely reticulate, with conspicuously verrucate lumina. Ovary sessile, cylindrical, 1 – 1.5 cm long; style arms keeled, bilobed, finely nerved, 3.5 – 4.5 cm long, lobes lanceolate-deltoid, 12 – 16 x 4 – 5 mm, acute; stigma emarginate, crenate. Capsule cylindrical-ellipsoid, 4 – 6 x 1 – 1.7 cm, obtuse at apex. Seeds numerous, subtriangular to pear-shaped, 3 – 4 x 2.5 – 3 mm, wrinkled and rugose, with reduced aril.

Flowering: Feb. – Mar.; Fruiting: April – May
Chromosome number: 2n = 34 (Pl. 39c; Gustafsson & Wendelbo, 1975)
Distribution: India: Jammu & Kashmir (Rajouri).

Afghanistan, Iran and Pakistan.

Specimens examined:
Notes:

i. The species was described by Baker (1875) as a species of *Xiphion (X.aitchisonii)* based on specimens with bright lilac or purple flowers sent by Aitchison from Tilla mountain in Jhelum district of Punjab (Pakistan). Boissier (1884) transferred the species to *Iris* as *Latchingsonii* (Baker) Boiss and Rodionenko (1961) to *Juno (J.aitchisonii)*. Baker (1892) treated the yellow flowered form as var *chrysantha*. The purple form (var. *aitchisonii*) is distributed from Otipore of Afghanistan and all through the salt range and Tilla mountain in Pakistan (c. 1000 m) to Rajouri district of Jammu & Kashmir (800 – 1500 m) in India. The yellow form (var *chrysantha* Baker) is apparently known in cultivation from Rawalpindee (Pakistan).

ii. This species shares some characters like rudimentary basal plate, fleshy roots, monocolpate coarse-reticulate pollen with conspicuously verrucate lumina and extended colpus, and arillate seeds with *Iris* subgen *Nepalensis*. Recent molecular analysis by Tillie et al (Mss.) and evaluation of bulbous Irises by Hall *et al.* (Mss.) support its closeness to *Iris* subgen. *Nepalensis*.

iii. The low altitude (800 – 1500 m) habitat of the species remain free from snowfall and the species flowers earlier like *Iridodictyum reticulatum*. It grows in moist places and grassy slopes (Wendelbo & Mathew, 1975), in seasonally moist areas on grassy slopes at c. 900 m (Mathew, 1997). Dr Kapahi (Pers. Com.) informed that in Rajouri district of Jammu & Kashmir it grows profusely like a grass along the border of India and Pakistan in Thandapani, Saleri, Chani Prat, etc. on sandy loam soil.

iv. Cultivation of the species in India is not known. According to Mathew (1997) it is fairly amenable to cultivation in deep pots in an alpine house or planted out in bulb frame.
Figure 25. *Juno aitchisonii* (Baker) Klatt: a. habit; b. fall; c. standard, d. stamen; e. style arm; f. fruit; g. seed (source: B.K.Kapahi 17314, JRL)
Plate 65. *Juno aitchisonii* (Baker) Klatt: a. type specimen; b. close-up of flower
II. Tribe **Mariceae** Pax


Rootstock rhizomatous; rhizomes grow oblique; leaves distichous ensiform; scape foliaceous, with a cluster of lateral inflorescence; spathes many-valved, many-flowered; flowers actinomorphic, perianth segments in two planes, outer spreading, inner erect with convolute blades; style arms thick, petaloid, longitudinally fused.

The tribe comprises of 3 genera (*Pseudotrimezia*, *Trumezia* and *Neomarica*) with c. 40 species and distributed in tropical America. Only *Neomarica* is cultivated in India.

This tribe is close to the subtribe Gpurinae in its distribution (in tropical America) and characters of inflorescence arising from foliaceous flat scape, flowers lacking perianth tube, smaller inner tepals and thuck style arms but differs from them as the rootstock is not a bulb and leaves are not plicate and foliate.


Rhizomatous herbs. Leaves distichous, linear or ensiform. Scape a flat leaf, with a subsessile or peduncled flower cluster arising laterally towards apex. Spathe many-flowered, bloom in succession. Flowers fugitive, actinomorphic, pedicellate, white, blue, yellow or mixture of colours; pedicel shorter than spathe valves. Perianth tube absent; perianth whorls dissimilar; outer patent, ovate or oblong; inner narrower, with an erecto-
patent claw and convolute blade. Stamens adhering to style arms, filaments filiform with a broadened base, anthers linear, ovary clavate, trigonous, style filiform at base, divided into 3 thick-petaloid arms, style arms longitudinally fused, with dentate or lanceolate lobes and subterminal transverse stigma. Capsule oblong, loculicidally 3-valved. Seeds subglobose.

This genus was established as a result of splitting of the genus *Manca* Schreb ex Ker Gawl., which was originally proposed by Schreber (1789) to replace the valid name *Cipura*. Herbert (1840) revived the generic name ‘*Cipura*’ from the generic complex of *Marica* Schreb. ex Ker Gawl. but retained the generic name *Marica* for a group of 5-6 species with *Manca northiana* (Schneev.) Ker Gawl. as type species. Sprague (1928) proposed new name *Neomanca* to Herbert’s sorted out species.

The genus comprises of c. 15 species; native to North America. 3 species reported to be under cultivation in India. Only one species was available for study in the present work.


Plate 66

Rhizome stout, dark brown, growing obliquely, c. 2 cm thick. Leaves 30 – 60 x 2 – 3 cm, bright green. Scape leaf-like, 60 – 70 x 2 – 3 cm, with a peduncled flower fluster arising laterally towards apex; peduncle 3 – 4 cm long, subtended by bracts at base; spathe many-flowered, bloom in succession; valves green, lanceolate, c. 3 cm long, clasped. Flowers fugitive, 7 – 9 cm across. Perianth tube absent; perianth whorls dissimilar; outer tepals spreading, elliptical-ovate, 4 – 4.5 x 2 cm, white, with purple strips on yellow ground at base; inner tepals shorter, narrower, claw diagonally erect, c. 2 x 1 cm, yellow with transverse purple stripes towards margin blade outwardly convolute, nearly equalling claw, bluish with dark blue.

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towards tip, veined with blue, keeled at middle. Stamens c. 1.3 cm long, filaments free, 0.5 – 0.6 cm long; anthers adherent to style arms, c. 0.8 cm long. Ovary oblong-obovoid, c. 10 x 4 mm, greenish yellow, trigonous, angles round; style arms c. 2 cm long, fused longitudinally except the lanceolate crests.

Flowering: April – May; Fruiting: not seen.

Chromosome number: 2n = 14 (M. Suto, 1935)

2n = 21 (Present work, PI 39 d)

Distribution: India: cultivated in gardens from sea level to 1800 m.

Native of tropical America.

Specimens examined:


Notes:

i. The species resembles *Cipura paludosa* Aubl. by its foliaceous scape, fasciculate inflorescence, shorter inner tepals but differs by its rhizomatous rootstock (bulbous in *C.paludosa*), non-plicate leaves, adherent anthers. It resembles *Iris* by its rhizomatous rootstock, distichous ensiform leaves, tepals disposed in two planes and petaloid style arms. It also shares the characters like rhizomatous rootstock, evergreen leaves, obsolete perianth tube with that of *Dietes*.

ii. This species has developed a unique method of propagation in which the base of the peduncle gradually thickens and the small leaves at its base grow after flowering. As a result of increased load (on the subapical region) the foliaceous scape bend downwards and the base of the peduncle comes in contact with the ground. Then the swollen base of the peduncle strikes roots producing a new plant, which ultimately separates from mother plant.

iii. The plant cultivated at Shillong is a triploid with 2n=21 observed in the present work. This is further confirmed by its non-setting of fruits.
Plate 66. *Neomarica northiana* (Schneev.) Sprague: a - e; close up of inflorescence in different angles.
III. Tribe **Tigridieae** Baker


Bulbous herbs. Bulbs tunicated. Leaves distinctly plicate and foliate. Scape like a foliate leaf, producing inflorescence at the junction of petiole and lamina. Spathe many-valved, many-flowered. Flower very fugitive; perianth tube usually obsolete; inner tepals often reduced; style branches simple, thickened, linear, alternating with stamens.

The tribe comprises of about 125 species in c. 18 genera. The members of the tribe are native of Andean South America and Mexico; 2 genera with one species each cultivated and naturalised in India.

The tribe is very poorly understood. It is unique in having plicate and foliated leaves. It is allied to *Mariceae* in having foliaceous scape and thickened style arms. Goldblatt (1990) and Rudall (1991) have admitted on satisfactory status of *Tigridieae*.

The tribe *Tigridieae* described by Baker (1877) included *Moraea* with petaloid style arms and *Tigridia* and allies with linear style arms. Pax (1888) transferred the genera of the subtribe *Cipureae* Benth. & Hook.f. (of tribe *Sisyrinchieae* Benth. & Hook.f.) to this tribe and divided *Tigridieae* into two subtribes viz., *Tigridinae* and *Cipurinae*. Goldblatt (1990) circumscribed *Cipurinae* with monosulcate pollen grains, generally simple thickened style branches and base number $x=7$, and *Tigridinae* with pollen grains bisulcate, style branches deeply divided into filiform arms and stamens united and basic chromosome number $x = 14$. 

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Subtribe **Cipurinae** (Benth. & Hook.f) Pax


Bulbs subglobose or ovoid, tunics membranous. Leaves foliate, plicate, linear-oblancoate, irregularly branched in cross section, scape with a subterminal leaf, bearing a fascicle of flower heads or peduncled compound cyme at the axil of cauline leaf; spathe many-flowered, 2 - ∞-valved, bloom in succession; flowers very fugitive, with unequal or subequal whorls of tepals, style filiform, with simple thickened branches; pollen monosulcate, sometimes operculate; basic chromosome number x=7.

The subtribe comprises of about 86 species in c. 13 genera; mainly distributed in America. 2 genera with one species each are cultivated and naturalised in eastern India.

**KEY TO THE GENERA**

1a. Bulbs subglobose; cross section of leaf irregularly branched, inflorescence a fascicle of subsessile heads; perianth segments unequal, inner much shorter and connivent, outer larger, fruits prismatic-oblong, angles acute, without a ring-mark on head. ....... .......... ...1. **Cipura**

b. Bulbs ovoid; cross-section of leaf zigzag; inflorescence a peduncled compound cyme; perianth segments subequal; fruits subglobose, trilobed, apex and angles round, with a ring-mark on head ................................................................. ... .......... ................. ..2. **Eleutherine**

1. **Cipura** Aubl.

Small herbs Bulbs subglobose, tunicated Radical leaves few, narrow, plicate, with a pseudo-petiole. Scape simple, narrow, aphyllous below the inflorescence, subtends a long sessile leaf at apex Inflorescence a fascicle of spathaceous heads. Perianth tube very short, outer segments obovate cuneate, patent; inner segments very small, concave, connate at base Stamens inserted at the base of the inner segments, filaments filiform, free, anthers linear-oblong, as long as filaments. Ovary clavate, 3-locular; style filiform, arms longer than anthers. Capsule obovoid or oblong, obtuse or truncated at apex, membranous, loculicidally 3-valved, exserted above spathe. Seeds many, small, globose or angled.

A small genus of c. 8 species from tropical America; one species naturalised in India.

The name *Cipura* Aubl. (1775) is the earliest and validly published for the genus with *C.paludosa* Aubl. as type. But it was renamed as *Marica* by Schreber (1789) with *Marica paludosa* Schreb. as type. This superfluous generic name was subsequently adopted by Ker-Gawler (1803) in broad sense encompassing about 8 other genera (which were subsequently recognised as distinct). Herbert (1840) revived the generic name *Cipura* from the generic complex of *Manca* Schreb. ex Ker-Gawl. and retained the generic name *Marica* for a group of 5 - 6 species with *Marica northiana* (Schneev.) Ker-Gawl. as type. Perhaps, this work went unnoticed and the name 'Marica Ker' prevailed during nineteenth century. Sprague (1928) suggested *Cipura* Aubl. as a distinct genus and proposed a new name "Neomanca" to Herbert's sorted out-group of 5 - 6 species. In the present work Sprague (1928) is followed.

**Plate 67; Fig. 26**

Bulbous herbs. Bulbs subglobose, tunicated, c. 1 cm across; tunics numerous, brown, membranous. Scape slender, solid, erect, simple, terete, leafless below the inflorescence, terminated by a fascicle of flowers. Radical leaves 2–3, sheathed at base, erect, grass-green, glabrous, plicate, linear-oblancoate, 30 – 50 x 1.2 – 1.8 cm, overtopping the scape, acuminate at apex; branched outline in cross section; cauline leaf solitary, terminal, shorter than radical leaves, lanceolate, 20 – 30 x 1.2 – 1.8 cm. Inflorescence a fascicle of 1–3 subsessile heads at the apex of scape and axil of cauline leaf; spathe many-flowered, bloom one at a time in succession; valves stiff, green, lanceolate, acute at apex, outer shorter, clasping or conduplicate, 2–3 cm long, inner 3.5 – 4.5 cm long. Flowers small, very fugitive, blue or white; pedicel short, elongating to 1 cm in fruits. Perianth tube very short or obsolete; outer tepals, obovate-cuneate, 1.2 – 1.8 cm long, patent, inner much shorter, connivent, more or less rounded, concave on sides and distinctly contracted at mouth, recurved at apex. Stamens inserted at the base of inner segments, filaments filiform, free; anthers oblong-linear, as long as the filament; pollen subspheroidal, 35 – 56 x 35 - 49 μ, monocolpate, apparently operculate. rugulate, irregular; lumina apparently with a few verruca; ovary clavate, trilocular, many-ovuled, style filiform, arms longer than anthers. Capsule 12 – 18 x 3 – 6 mm, prismatic, flat sides with shallow longitudinal groove, obtuse at apex, dehiscence loculicidal. Seeds less than 1 mm across, globose or angled.

Chromosome number 2n = 14 (12, 13) (Sharma & Talukdar, 1959)

Distribution: Naturalised in Eastern India (West Bengal)

Native of tropical America from Cuba and Mexico to South Brazil ascending to 6000 feet in the Andes, in moist meadows (Savannahs)

Specimens examined:


Notes:

i. Baker (1892) considered plants with narrower leaf and single fascicle of inflorescence as var. cubensis. But the type of the species shows both the single as well as many-fascicled inflorescence.

ii. Pradeep (1995) confused between Eleutherine bulbosa and Cipura paludosa treated by Prain (1903) and reduced the later to a synonym of the former. In fact Prain’s specimen at CAL and DD and his description of C. paludosa is distinct from E. bulbosa by having subglobose bulbs of c. 1 cm diameter (ovoid bulbs of 2.5 – 5 x 1.5 – 3 cm in E. bulbosa), branched cross section outline of leaf (zigzag in E. bulbosa), fascicled inflorescence (peduncled compound cyme in E. bulbosa), tepals unequal in two whorls (subequal in E. bulbosa), pollen subspheroidal (prolate in E. bulbosa).

iii. Sharma & Talukdar (1959) reported structural heterozygosity in Cipura paludosa. They observed 2n=12, 13 (trisomic) and 14 (tetrasomic) in this species and also supported that cytologically it is very close to Eleutherine bulbosa.

iv. This is reported as a naturalised species near Calcutta and Central Bengal (Prain, 1903, Mitra 1958). All the collections of this species in Indian herbaria date back to nineteenth century and it could not be collected during the course of study.
Figure 26. Cipura paludosa Aubl.: a. habit; b. outline of leaf; c. fruits
(source. S.Kurz s.n, CAL)
Plate 67. Cipura paludosa Aubl.: a. type specimen; b. representative specimen
2. **Eleutherine** Herb. *nom. cons.*


Herbs. Bulbs red, tunicated. Leaves few, basal and cauline; basal leaves petiolate, plicate, with a lanceolate blade, cauline leaf solitary, subterminal, subtending inflorescence. Scape terete, comprising one long internode. Inflorescence a one sided compound cyme or a pseudo panicle; spathes many-flowered, many-valved, subequal; as long as pedicel outer green; inner scarose. Flowers actinomorphic, very fugitive, white; pedicels as long as spathes. Perianth tube lacking; tepals 6, free, subequal, spreading from base or patent. Stamens free; anthers extrorse. Ovary ovoid, style short and branched; branches filiform, extending between the anthers, alternating with outer tepals. Capsule globose to oblong-cylindric, truncate, seeds ellipsoidal to angular.

The genus has 2 species distributed in Mexico, West Indies, Central and South America; one species cultivated in India and naturalised.

Greek word *'Eleuthernne'* means free, referring to free stamens (Bailey, 1928). According to Goldblatt & Snow (1991) "**Eleutherine** is a derived genus and accords well with *Tigradieae* in having a true bulb and plicate foliage leaves, two important synapomorphies for the tribe. The genus is primitive within *Tigradieae*, in which a more complex flower structure is the rule. The flowers of **Eleutherine** appear to be relatively simple and comparable with those of the most primitive genera of *Iridaceae*. It seems more parsimonious to interpret the flower of **Eleutherine** as derived by a process of reduction in complexity associated with self-compatibility and autogamy, a derived type of reproductive biology in *Tigradieae* that is basically self-incompatible".


Plate 68; Fig. 27

Herbs 20 – 50 cm high. Bulbs red, ovoid, fleshy, 2.5 – 5 x 1.5 – 3 cm. Leaves both basal and cauline, plicate, petiolate, lanceolate, zigzag in cross section; radical leaves 3 – 4, 30 – 50 x 1.5 – 3 cm; cauline leaf solitary, subterminal, 10 – 20 x 1.5 – 2 cm. Inflorescence a one sided compound cyme. Spathes 4 – 8-flowered, many-valved; outer green, ovate-lanceolate, 12 – 15 x 6 – 8 mm, acute to obtuse at apex; inner scarious, narrowly obovate, subequal. Flowers bloom in succession during evening, fugacious, white, actinomorphic, c. 2 cm across; pedicels semiterete, as long as spathe, articulated below ovary. Perianth tube absent; tepals subequal, rotate, narrowly obovate, outer c. 1.5 x 0.8 cm, inner c. 1.3 x 0.7 cm. Stamens free, extrorose, yellow to orange; filaments c. 2 mm long; anthers linear, 3 – 3.5 mm long; pollen prolate or subspheroidal, dimorphic, 24 – 36 x 17 – 28 μ, monocolpate, operculate, micro-retticulate. Ovary green, trigonously obovoid, c. 2 x 1 – 1.5 mm; style greenish yellow, branched above c. 3 mm from base, branches linear, subulate, 3 – 4 mm long, alternating with anthers, stigmatic apically Capsule exserted from spathe, subglobose, 3 – 5 x 6 – 7 mm, trilobed, angles round, showing outline of seeds from outside, with a
circular ring like mark on head, roundish at apex. Seeds reddish brown, ellipsoidal to subspheroidal, c. 2 mm in diameter

Flowering: April – June; Fruiting: July

Chromosome number: 2n = 12 (Zaman et al., 1985, Goldblatt & Snow, 1991; Present work, Pl 39. e – g)
2n = 14 (12, 13, 15) (Sharma & Talukdar 1959)

Distribution: India: Naturalised in eastern India (Bihar & West Bengal)
Native of tropical America, which extends across South America from Bolivia and south-eastern Brazil to the West Indies and also Cultivated and naturalised in tropical Africa and Malesia.

Specimens examined:
UTTARARANCHAL: Dehradun, cult., 6.7.1953, fl., P.C.Kanjilal s.n., Acc 113438 (DD)
UTTAR PRADESH: Bhira range, Kheri dist., 4.4.1898, fl, Inayat 22820 (DD).
TAMIL NADU; Coimbatore, Botanical Survey of India garden, 476 m, 25.7.1963, fl., E.Vajravelu 17474 (MH); Nilgiris, 1870, fl., Acc. No. 471649
KERALA: Tehnipalam, Malapuram dist., cult. 50 m, 4.11.1995, fl., Sivarajan & Pradeep 5381 (CALI); Cannanore dist, Pahangadi, sea level, 4.5.1980, fl, Kiran 8674 (CALI); Payangadi, Cannanore dist., sea level, 4.5.1980, fl Indradev 9008 (CALI).
UNKNOWN LOCALITIES: S.Kurz. s n., Acc.No. 471648, 471650-51, 471654, Ladak, fl., KK 1334, Acc. 471652.
Notes:

i. The nomenclature of the species is very complicated due to extensive synonymy and uncertain types. The taxon was first described by Linnaeus as *Sisyrinchium palminfolium* in 1767. After a year Miller described it as *Sisyrinchium bulbosum* in 1768. Merrill (1912) transferred it to *Eleutherine palmifolium* (L.) Merr. But, Urban (1918) transferred Miller's taxon as *E. bulbosa* and kept Linnaean taxon as synonym *Ixia americana* Aubl., *Sisyrinchium latifolium* Swartz, *Moraea plicata* Swartz, *Eleutherine anomala* Herb., *E. plicata* Herb., *E. subaphylla* Gagnep. and *E. longifolia* Gagnep. etc., are the other names for this species. Some authors accept *E. palmifolium* (L.) Merr. as correct, while some others recognise *E. bulbosa* (Mill.) Urban to be correct. Two of the 3 microfiches of the type specimens at CAL, Linn. 1064.4 (labelled as: *Sisyrinchium palmifolium* [Sm]? non Verum) and Linn. 1064.5 (labelled as: Br. [Sol?] *Bermudiana palmifolia*) are *Eleutherine palmifoliala* showing foliated plicate leaves and pedunculate compound cymes. But Linn. 1064.3 (labeled as: *Sisyrinchium palmifolia* Ard.) appear to be a species of *Cipura* as it showed fasciculate inflorescence at the axil of cauline leaf. Thus Linn. 1064.4 & 5 are treated as types of this species in this work.

Pradeep (1995) confused between *Eleutherine bulbosa* and *Cipura paludosa* in Bengal Plants by Prain (1903) and reduced the later as a synonym of the former. In fact Prain's description and his collection (*D. Prain s.n* at CAL & DD) is distinct from Pradeep's *E. bulbosa* and should not be confused

ii. Geerinck (1977) recorded some abnormalities like the tepals up to 15, stamens up to 8, ovary 4 - 11 locular with same number of style arms. Backer and Bakhuizen (1968) also noted 4-celled ovary and 4-fid style. Of these abnormalities only 4-fid style was observed occasionally in the present
work. Its flowers were observed to be very short lasting, opening after 4.30 PM and closing before 7.45 PM.

iii. Sharma & Talukdar (1959) reported the chromosome number to \(2n = 14\) (12, 13 & 15), Goldblatt & Snow (1991) reported \(2n = 12\). The numbers \(2n = 12, 13\) and 14 were also observed in the present work from the plants collected from Imperial Nursery, Calcutta with a maximum frequency of \(2n=12\).

iv. It grows well under tropical conditions and easily propagated through bulbs. Verma et al. (1984) reported this species as a weed introduced and naturalised in Santhal Pragana (Bihar). The bulbs appear too hardy to tide over drought.

v. This species is highly medicinal and is reported to have magical and hallucinatory properties. It is an important ingredient of American Indian Pharmacopeia, often cultivated in gardens maintained by Indian tribes and used against bloody diarrhoea, haemorrhage, open wounds, as a vermifuge and even as a contraceptive (Goldblatt & Snow, 1991). In Philippines, macerated bulbs are applied on the stomach of children to relieve gas pains and a decoction is diuretic (Quisumbing, 1951). Geerinck (1977) recorded its use as diuretic, purgative, emetic, use against dysentery, jaundice etc. Medicinal plants of Vietnam (WHO publication, 1990) records the bulbs of *Eleutherine subaphylla* Gagnep (= *E.palmifolia*) are antibacterial, demulcent and haemostatic; they are used in treating sore-throat, pertussis, boils, impetigo (contagious skin disease), jaundice, haemoptysis, uterine haemorrhage, trauma, wounds, abortion, anaemia, headache and photopsia and in inserting intra-uterine devices. It prescribes daily dose is 4 – 12 gm in the form of decoction, infusion powder or pills; the external use of an alcoholic maceration and ointment against impetigo.