FASCICLES OF FLORA OF INDIA

FASCICLE 23
Alliaceae
Liliaceae
Trilliaceae
Uvulariaceae

Edited by
N.P. Singh
M. Sanjappa

BOTANICAL SURVEY OF INDIA
FASCICLES
OF
FLORA OF INDIA

FASCICLE 23

Edited by
N.P. Singh
M. Sanjappa
with assistance of
G.V.S. Murthy
P. Singh

BOTANICAL SURVEY OF INDIA
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1. *Allium carolinianum* DC
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(Photos: Courtesy Northern Circle, BSI, Dehra Dun)
ALLIACEAE
J. Agardh., Theoria Syst. Pl. 32. 1858 (nom. cons.)
Syamali Dasgupta*

Herbs, perennial, bulbous or rhizomatous, often strongly smelling. Leaves radical or cauline, filiform, cylindrical, semi cylindrical, linear, lanceolate to ovate, fistular or non fistular, sheathing at base. Inflorescence terminal, cymose umbel or cylindrical spike, enclosed by 1 or more valved spathe when young. Flowers bisexual, hypogynous, pedicellate. Tepals 6, in 2 whorls, free or connate at base, 1-7-nerved. Stamens 6, in 2 whorls, free or connate, epitepalous; anthers dehiscing longitudinally inwards. Ovary tricarpellary syncarpous, trilocular; 2 or more ovules per locule; stigma simple or trilobed. Fruit a loculicidal capsule. Seeds compressed or globose, winged or not.

About 30 genera and 850 species, (Mabberley, The Plant Book, 1997) cosmopolitan excluding Australia; 2 genera and 35 species in India.

KEY TO THE GENERA

1a. Inflorescence cymose umbel; flowers polyphyllous
   1. Allium

1b. Inflorescence cylindrical spike; flowers gamophyllous
   2. Milula

1. ALLIUM


Herbs, perennial, bulbous; bulbs solitary or aggregate on rhizome, strongly smelling, ovoid or cylindrical, rarely with bulblets. Stem solid or hollow. Leaves radical or cauline, sheathing at base, filiform, linear, fistular or not, lanceolate to oblanceolate. Inflorescence terminal, umbel, few-many-flowered, rarely with bulblets; spathe 1-or several valved, persistent or caducous. Flowers bisexual, regular, polyphyllous. Tepals 6, in 2 whorls, free or connate at base, variously coloured. Stamens 6 in 2 whorls free or connate at base, inserted at base of tepals; filaments entire or toothed or cuspidate; anthers elliptic to oblong, dorsifixed. Ovary subglobose or ovoid; style linear or filiform arising from base; stigma subglobose or 3-lobed. Capsule loculicidal. Seeds 3 or 6 or more; testa black, non lustrous.

About 700 species distributed in N. hemisphere; 34 species in India.

*Central National Herbarium, Botanical Survey of India, Howrah
### KEY TO THE SPECIES

1a. Bulbs cylindrical often inconspicuous  
1b. Bulbs ovoid or oblong or globose  
2a. Mature umbels bigger (6-9 cm diam.). Pedicels 2-5.5 cm long  
2b. Mature umbels smaller (2-5 cm diam.). Pedicels up to 2 cm long rarely 2.5 cm in fascicle  
3b. Flowers campanulate. Tepals not truncate. Ovary without apical swelling. Filaments shorter than tepals  
4a. Bulbs reticulate fibrous. Leaves basal  
4b. Bulbs not reticulate fibrous. Leaves 5-16 cm above the base  
5a. Bulbs fibrous  
5b. Bulbs not fibrous  
6a. Filaments similar, not cuspidate  
6b. Filaments dissimilar, 3 cuspidate  
7a. Filaments connate at base  
7b. Filaments free  
8a. Bulbs bigger (more than 4 cm long), not profuse rooting  
8b. Bulbs smaller (less than 4 cm long), profuse rooting below  
9a. Flowers tubular, purple  
9b. Flowers campanulate  
10a. Filaments more than ½ the tepals  
10b. Filaments less than ½ the tepals  
11a. Bulbs reticulate fibrous, umbels many flowered  
11b. Bulbs not reticulate fibrous. Fascicle few flowered  
12a. Bulbs parallel fibrous  
12b. Bulbs reticulate fibrous  
13a. Flowers lilac purple or blue. Tepals oblong. No fusiform roots  
13b. Flowers white or greenish white. Tepals lanceolate irregularly coiled on maturity. Many fusiform roots  
14a. Leaves basal, 2 mm broad. Filaments included  
14b. Leaves not basal, 1-4 cm broad. Filaments exserted  
15a. Filaments exserted, connate at base. Bulbs reticulate fibrous  
16. A. macranthum  
14. A. gilgiticum  
31. A. wallichii  
29. A. tuberosum  
3. A. barczewskii  
17. A. humile  
2. A. auriculatum  
22. A. mairei  
26. A. sikkimense  
11. A. fasciculatum  
23. A. orcoprasum  
30. A. victorialis  
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15b. Filaments included, connate 2/3 portion at base. Bulbs parallel fibrous...16
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   1. A. atrosanguineum

16b. Tepals yellow, elliptic lanceolate (8-13×2-3 mm) 12. A. fedscchenkoanum
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   25. A. schoenoprasum

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   13. A. filifolium

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25b. Flowers white. Filaments connate

7. A. chitralicum

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   10. A. farcatum

26b. Tepals equal. Filaments more than 1/2 the tepals, connate at base only
   18. A. jacquemontii

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29a. Filaments dissimilar 30
29b. Filaments similar 19. A. loratum

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32. A. cepa
Fig. 1. **Allium atrosanguineum** Shrenk 1a. Habit. 1b. Flower. 1c. Dissected Flower.  
**A. filifolium** Regel 3a. Habit. 3b. Dissected Flower.

31b. 3 alternate filaments with 2 threadlike lateral cusps (3-4 mm long), exceeding tepals. Bulbs with bulbels inside. Internodes distinct. **33. A. porrum**

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33a. Leaf base sheathing, Pedicel longer than flower (7-15 mm long) **9. A. consanguineum**

33b. Leaf base not sheathing, Pedicel smaller than flowers (3-5 mm long) **28. A. stracheyi**


Herbs 12 - 30 cm high with strong smell; bulbs gregarious, cylindrical, 4 - 6 x 1 cm, coats brownish-black, fibrous. Leaves 2 or 3, arising from about the middle, linear, c. 5 mm broad, fistular, basal one c. 2.5 cm long, top one 10 - 16 cm long, broadly sheathed at base, internode 2 - 4 cm long. Umbels hemispherical, c. 2 cm in diam., many-flowered; spathe 2-fid, ovate, c. 1.5 x 1.5 cm. Flowers campanulate; pedicels c. 8 mm long. Tepals dark purple or olive green with brown veins, broadly oblong, 7 - 8 x 4 mm, obtuse, midvein present, connate up to 1.5 mm at base. Stamens and pistil half the perianth. Filaments c. 3 mm long, connate at base to form a ring, c. 1 mm free above, inner 3 minutely toothed and outer 3 indistinctly bi-cuspidate; anthers broadly oblong. Ovary pyriform, c. 2.5 x 2 mm; style c. 1 mm long.

*Fl. & Fr.: June July.*

*Habitat:* Swamp alpine pasture slopes from 3690 m to 4200 m.

*Distrib.:* INDIA: Jammu & Kashmir (Kashmir); PAKISTAN, C. ASIA, CHINA.

*Specimens examined:* Jammu & Kashmir: Gilgit, Nittar Valley, 21.8.1892, Duthie 12389 (BM, CAL); Kashmir, Alampi la, Duthie 12178
(CAL, E, BM, K); Astore to Rongo, Winterbottom 789 (CAL); Astore, Duthie 171 (K).


Fig.1.2a – 2d

Herbs 12 – 35 cm high; bulbs cylindrical, 5 8 x 1 1.5 cm, coats fibrous, reticulate; root c. 1 mm in diam. Leaves 3 or 4, arising from basal half of stem, linear, 12 - 20 x 0.3 - 0.5 cm, flat, obtuse; internodes 1 – 5 cm long. Umbels hemispherical 1.5  2.5 cm in diam., many-flowered; spathe lanceolate, bifid, 1 2 x 0.5 cm. Flowers campanulate; pedicels 2 8 mm long. Tepals red or purple, broadly lanceolate, 4.5 10 x 1.5 3 mm, acute, with midvein, scarious, pouched at base. Filaments subulate, 3.5 7 mm x 1 mm, connate up to 1 mm at base. adherent to the perianth: anthers ovoid or oblong, 1 1.7 mm long. Ovary obovoid, 1.5 - 2 x 1 1.7 mm, triquetrous, stipitate, ovules 6; style 2 3.5 mm long. Capsules obovoid, 5 x 4 - 5 mm, light-yellow; pericarp papery. Seeds 6, oblong, concavo-convex, 2.5 4 x 1 2 mm, black, non lustrous.

Fl. & Fr.: July September.

Habitat: Abundant on rocky slopes at 3350 5480 m.

Distrib.: INDIA: Himachal Pradesh, Jammu & Kashmir (Kashmir); NEPAL.

Note: New record for Nepal.

Specimens examined: Himachal Pradesh: September 1964, Cleghorn (E); Lahul, Kunlung, 21.7.1941, N.L. Bor 16498 (E); South of Taklingla, D. Stoliczka s.n. (CAL); Neighbourhood of Chikkim station, D. Stoliczka s.n. (CAL); Pangli, 1879, A.W. Heyde s.n. (CAL); Jammu & Kashmir: Ladakh, 5.8.1976, B.M. Wadhwa 59612 (BSD); Rupshu, 12.7.1931, Walter Koelz 2279 (L); Ladakh, Zanskar, 22.7.1973, U.C. Bhattacharyya 52146 (BSD).


Asia, Karategin, Barsczewskii glacier, 3800 m, 3.8.1896, W.H. Lipsky
s.n. (LE).

Plants 16 - 23 cm high, slender; bulbs cylindrical, 4 - 7 x 1.5 2 cm,
gregarious, attached to rhizome profusely rooting at base; roots c. 1 mm in
diam., outer tunics reticulately fibrous. Stem 1 1.5 mm in diam., glabrous;
ternodes 1 3 cm long. Leaves 2 or 3, arising from basal part of the stem,
5 25 x 0.1 cm, upper longer, semiterete, slender, not fistular. Umbels
hemispherical, 2.5 3.5 cm in diam., 15 20 flowered; spathe ovate, bifid,
10 - 15 x 7 10 mm, membranous, persistent. Flowers tubular or narrowly
campanulate; pedicels 6 10 mm long, glabrous, ebracteate. Tepals purple
pink, lanceolate, 6 7 x 1.5 2 mm, inner 3 slightly longer, connate and
pouched at base, acuminated, midvein prominent. Filaments linear or
subulate, c. 5 mm long, 1.5 mm at base, connate and adnate to the perianth
to form a ring; anthers ovoid-oblong, 1 1.5 mm long. Ovary ovoid, 1.5
2.5 x 1 1.5 mm, apex tricrenulate; style c. 3 mm long, included; stigma
prominent, globose. Capsules obovoid-globose, c. 4 x 4 mm, with persistent
tepals, light brownish-yellow. Seeds 3, one in each locule, obovoid, c. 3.5 x
1.7 mm, compressed, black, non lustrous.

Fl. & Fr.: May - August.

Habitat: 1980 3000 m on very dry ground among Artemisia.

Distrib.: INDIA: Jammu & Kashmir (Kashmir); PAKISTAN, C.
ASIA. New record for India.

Specimens examined: Jammu & Kashmir: Astor. 22.7.1892, Duthie
12202 (CAL).

Note: Bowes-Lyon 767 was identified as A. tenuicaule Regel in Fl.
W. Pakistan (1975) with 6 - 10 mm long pedicels and filaments nearly as
long as or slightly shorter than tepals, this specimen belongs to A.
barsczewskii.

W. Pakistan 83: 16. 1975.Type: Afghanistan, Badakhshan, Giles 210
(holo, K). A. kachrooi G. Singh in Geobios 4 : 166. 1977. Type : Manasbal,
Kashmir 6. 6. 1974 (Kashmir Univ. Herbarium, DD)

Herbs 15 - 30 cm high, small; bulbs ovoid, 1.5 2 x 1 cm, scaly,
outer coats white, membranous. Leaves 1 or 2, arising 3 5 cm above the
Fig. 2. Allium barsczewskii Lipsky 1a. Habit. 1b. Flower. 1c. Stamens and Pistil. 1d. Capsule. A. mairei H. Lev. 2a. Habit. 2b. Flower. 2c. Dissected flower.
Fig. 3. *Allium caesioides* Wendelbo 1a. Habit. 1b. Dissected flower.
*A. chitralicum* Wang & Tang 2a. Habit. 2b. Dissected flower
*A. farcatum* Wendelbo 3a. Habit. 3b. Dissected flower.
bulb, filiform, 10 - 16 x 2 mm, fistular. Umbels hemispherical, 2.5 - 3.5 cm in diam., 18 - 30 flowered; spathe bifid, 7 - 8 x 3 mm. Flowers broadly campanulate; pedicel 1 - 1.5 cm long, angular; bracteate. Tepals purple, ovate-lanceolate, 5 - 6.5 x 1 - 1.5 mm, membranous, midvein prominent, connate up to c. 1 mm at base. Stamens and pistil included. Filaments 3.5 - 4.5 mm long, connate up to 1 mm at base, outer 3 subulate, 1 mm broad at base, inner 3 with toothed bases. 1.5 mm broad; anthers ovate-oblong, c. 0.7 x 0.5 mm, mucronate. Ovary ovoid, 2 x 1.5 - 2 mm, trilobed; ovules 2 in each locule; style 1 - 1.5 mm long. Capsules globose-oblong, 4 x 3 mm. Seeds ellipsoid, brownish-black, c. 2 x 1 mm.

Fl. & Fr.: June.

Habitat: Rocky slopes from 2700 to 4000 m. altitude.

Distrib.: INDIA: Jammu & Kashmir and Himachal Pradesh; PAKISTAN, AFGHANISTAN.

Specimens examined: Himachal Pradesh: Lahul, 9500 - 13000 ft., June, 1868, D. Stoliczka (CAL); June 1864, Dr. Brandis (CAL); 19.6.1976, J.D.A. Stainton 7606 (BM); Jammu & Kashmir: Kashmir, Chenab Valley, 14.6.1881, Ellis 1259 (CAL); Gilgit, 1885, Giles s.n. (CAL).

Note: The species is very near to A. caesium Schrenk. In India, this species was collected from 4 localities in 19th century and only one locality in 20th century indicating its rarity.

1875; Hook. f., Fl. Brit. India 6: 340. 1892. Type: China, Kansu, Przewalski s.n. (LE); Tibet occ. Regel s.n. (CAL!).

Herbs 14 - 52 cm high, pungent; bulbs brown, gregarious, oblong or narrowly ovoid, 4 7 x 1.5 - 3.5 cm, produced into a long neck; scales fibrous, papery. Stem leafy below the middle, internodes prominent, glabrous, terete, ribbed. Leaves 4 - 6, flat, thick, lower portion sheathing completely encircling the stem, abruptly linear to lanceolate above, 12 - 25 x 0.5 - 1.5 cm, falcate, obtuse at apex, shorter than scape, glabrous. Umbel globose or hemispherical, 2 - 4 cm in diam., many-flowered; spathe ovate, 1 x 1 cm. Flowers campanulate; pedicels 6 - 10 mm long. Tepals purple to pink, broadly oblong or elliptic, 5 - 8 x 1.5 - 4 mm, unequal, outer little shorter, inner longer, concavo-convex, coherent below, puckered at base, midvein prominent. Filaments subulate, 9 - 12 mm long, exserted, at base coherent and adherent to perianth, tube 1 - 1.5 mm long; anthers oblong, 1 - 1.5 x 0.7 mm, dorsifixed in the middle. Ovary globose or ellipsoid, 2 - 3 x 1.5 - 3 mm, trilobed; style 5.5 - 11 mm long, trisulcate, exserted; stigma obscure. Capsule obovoid-globose, c. 4 x 4 mm, light brown with persistent perianth and style. Seeds deep brownish-black, ovoid, c. 3 x 2 mm, triquetrous, granulate.

Fl. & Fr.: July - August.

Habitat: Gregarious on dry, shady rocks or on alpine steppes between 2700 and 4200 m altitude.

Distrib.: INDIA: Jammu & Kashmir (Kashmir), Himachal Pradesh and Uttarakhand; NEPAL, CHINA, BHUTAN, AFGHANISTAN, C. ASIA.

Note: Name "carolinianum" was given by De Candolle with the impression that it had been introduced from Carolina, by L.A.G. Bosc. S. Watson pointed out (Proc. Amer. Acad. Arts. & Sci. 14: 234. 1879) that the species is not known in America. Schrenk (1841) did not mention occurrence of A. platyspathum in India. Regel (1875) proposed new variety A. platyspathum var. falcatum Regel for specimens collected by Przewalski from Kansu and by himself from "Tibet prov. occidentalis" (CAL). The description of this variety completely matches with that of A. carolinianum and therefore treated here as synonym.

Specimens examined: Himachal Pradesh: Takling nala, 29.7.1972, U.C. Bhattacharyya 49117 (CAL); Spiti, 25.7.1972, U.C. Bhattacharyya
Fig. 4. *Allium carolinianum* DC. 1a. Habit. 1b. Flower. 1c. Stamens and Pistil.


*A. consanguineum* Kunth 3a. Habit. 3b. Dissected flower.

**Fl.**: July September.

**Habitat**: 1220–1830 m altitude.

**Distrib.**: INDIA: Meghalaya and Uttarakhand; BANGLADESH, CHINA, JAPAN.

**Uses**: Culinary onion of importance.

**Specimens examined**: Meghalaya: Khasia, Lartankota, 30.9.1886, C.B. Clarke 44859 A & B (BM, CAL); Khasia, Hooker f. & Thomson s.n.


Herbs 13  50 cm high; bulbs ovoid, 1  2 x 1  1.5 cm, scaly, outer scales brownish, inner white. Leaves 1  6, arising little above the base of the scape, linear, 15  20 x 0.3  1.2 cm, glabrous. Umbels globose or hemispherical, 2.5  3 cm in diam., 25  30-flowered, congested; spathe 2 - 3-fid, ovate, c. 1 x 0.5 mm, pale rose coloured, scarious. Flowers broadly campanulate or stellate; pedicels 1  2 cm long. Tepals pink, lanceolate, 4 - 6 x 1 mm, obtuse, free, membranous. Filaments linear, c. 4 mm long, as long as tepals, adnate to base of tepals, broad at base, abruptly linear above; anthers broadly oblong, c. 1.2 x 1 mm. Ovary ovoid, c. 1  1.5 mm, stipitate, verrucose; style 2 - 3 mm long, linear. Capsules ovoid, c. 4 x 4 mm, deep brown, nonlustrous. Seeds oblong, c. 2 x 1.5 mm, light brown, compressed.

*Fl. & Fr.*: April - June.

*Habitat*: High altitude plant, between 2200 and 3300 m altitude.

*Distrib.*: INDIA: Himachal Pradesh and Jammu & Kashmir (Kashmir); AFGHANISTAN, PAKISTAN.


*Note*: According to Wendelbo (1971) this species is endemic to Afghanistan and Pakistan. The capsule and seeds are described for the first time here based on *Stainton* 2673 (BM).


Herbs 20 - 50 cm high; bulbs 4  10 x 1  1.5 cm, insignificant, with leaf bases, brownish. Leaves 2 or 3, more or less basal, arising from a single point, linear, 20  40 x 0.3  0.5 cm, fistular. Umbels subglobose,
2.5  3.5 cm in diam. with numerous, congested flowers; spathe ovate, c. 2 x 2 cm. Flowers narrowly campanulate; pedicels c. 5 mm long, glabrous. Tepals yellow, elliptic-lanceolate, 4  6 mm long, midvein prominent. Filaments linear, 4  9 mm long, adnate at base; anthers oblong, c. 1 x 0.5 mm. Ovary oblong, c. 1.5 x 0.8 mm, black; style c. 2.5 mm long, slender.

Fl.: July  October.

Habitat: Alpine meadows between 3800 m and 4876 m altitude.

Distrib.: INDIA: Jammu & Kashmir (Kashmir) and Himachal Pradesh; CHINA.

Specimens examined: Himachal Pradesh: Pangi, 1879, Hegde s.n. (CAL); Jammu & Kashmir: Kashmir, Pajroti, July 1848, Strachey & Winterbottom 6 (CAL); Tajong, 20.4.1848, Strachey & Winterbottom 9 (CAL).

Note: Stearn (1960) reported the species from S.E. Tibet on the basis of Kingdom Ward 12278 in addition to China, Prezwalski 256. Occurrence in India was not known earlier.


Fig.4.3a & b

Herbs up to 70 cm high; bulbs elongated ovoid, 2  7 x 0.8  2 cm, outer coats fibrous. Internode distinct on maturity. Leaves 2  4, arising 2  7 cm above the base, linear to lanceolate, falcate, 8 - 40 x 0.4 - 0.5 cm, obtuse at apex, completely sheathing at base, glabrous. Umbels hemispherical, 1.5 - 4 cm in diam., 12 - 40-flowered, often congested; spathe bivalved, elongated ovate, 13  17 x 6  12 mm. Flowers campanulate; pedicels 7  15 mm long, equal or longer than flowers. Tepals creamy to golden yellow, ovate-oblong, 4  6 x 3 mm, acute to obtuse, margin in rolled, pouched at base; midvein prominent. Filaments 5  7 x 0.7 mm, adherent and adnate to tepals at base; anthers oblong, c. 1 x 0.7 mm. Ovary subglobose to obovoid, 1.5  2.5 x 1  1.5 mm, trilobed, sulcate at base; styles c. 6 mm long, exerted. Capsules light brownish yellow, globose, c. 4 x 4 mm. Seeds black, angular-oblong, c. 3 x 1 mm.
Fl. & Fr.: July September.

Habitat: Near moraine, in open fields or in crevices of rocks at an altitude of 2440 - 3050 m.

Distrib.: INDIA: Jammu & Kashmir (Kashmir) and Himachal Pradesh; PAKISTAN.

Specimens examined: Himachal Pradesh: Songla, 25.9.1964, N.C. Nair 34265 (BSD); Chamb, Sauch Valley, 17.8.1899, Harsukh (CAL); Jammu & Kashmir: Gilgit, 1885, G.M. Giles (CAL); Minimarg, August 1905, A. Meebold 4009 (CAL); Sonemarg, 17.8.1893, J.F. Duthie 13611 (CAL); July 1956, T.A. Rao 806 (CAL); T. Thomson 17 (CAL); Sonemarg to Baltal, Sept. 1880, A.P. Young s.n. (BM); Pahalgaon, 23.8.1956, Polunin 56/448 (BM); Ladakh, 25.7.1988, H.J. Chowdhury & B.P. Uniyal 85719 (BSD).


Fig.3.3a & b

Plants 40 130 cm high; bulbs reddish brown, ovoid-oblong, 3.5 x 2 2.5 cm, coats scaly. Leaves 3 or 4, arising at 5 6 cm above the bulb, fistular, 20 30 x 0.2 0.5 cm, much shorter than the stem. Umbels hemispherical, 2 - 3 cm in diam., densely flowered; spathe bivalved, ovate, c. 8 x 5 mm. Flowers campanulate; pedicels 8 15 mm long. Tepals white, elliptic, oblong, ovate, c. 4 x 1 mm, obtuse. Filaments linear, c. 3.5 x 1 mm, connate up to 1 mm at base, cup-like; anthers yellow, oblong, c. 1.2 x 0.7 mm. Ovary ovoid, c. 1.5 x 2 mm, deeply trilobed; style linear, c. 2 mm long. Capsules ovoid, 4 - 5 mm broad, 3-seeded, wrinkled. Seeds brown, wrinkled.

Fl.: April. Fr.: June

Habitat: In crevices of steep rocky boulders at an altitude of 2000 - 3000 m.

Distrib.: INDIA: Himachal Pradesh; PAKISTAN, AFGHANISTAN.


Note: First record for India.
Fig. 6. *Allium fasciculatum* Rendle. 1a. Habit. 1b. Flower. 1c. Dissected flower.  

Herbs 10 - 35 cm high; bulbs ovoid, 1 - 3 x 0.5 - 2 cm, or insignificant, surrounded with coarse parallel fibres; roots 6 - 8, fleshy, fusiform or cylindric, 2 - 3 x 0.5 cm. Stem fistular, glabrous, often shorter than leaves. Leaves 2 - 5, basal or arising from a common point; c. 4 cm above the base. linear, 10 - 25 x 0.2 - 0.4 cm, margin scabridulous. Umbels globose to subglobose, 2 - 3 cm in diam., compact, numerous-flowered; spathe broadly ovate, c. 2 cm long, acute. Flowers campanulate; pedicels 5 - 10 mm long. Tepals white or greenish-white, lanceolate or linear-lanceolate, 5 - 7 x 1 - 1.5 mm, acute, irregularly coiled at maturity. Filaments linear, 2.5 - 5 mm long, subequal; anthers yellowish-green, oblong, c. 0.7 x 0.5 mm. Ovary obovoid, 1 - 1.5 x 0.7 - 1.2 mm, base narrowed to form a stipe, conspicuously 3 furrowed; style 1 - 2.5 mm long. Capsules obovoid, 3 - 4 x 3 - 4 mm, trihedral, light brownish yellow, pericarp papery, locules 2-seeded. Seeds ovoid or obovoid, c. 2.5 x 1.5 - 1.7 mm, concavo-convex, convex side reticulate.

*Fl. & Fr.*: July - September.

*Habitat:* Open rocky slopes or sandy river beds between 2700 - 4800 m altitude.

*Distrib.:* INDIA: Nagaland and Sikkim; NEPAL, BHUTAN, CHINA (TIBET).

*Specimens examined:* Sikkim: Dongdong, 10.7.1906, *J.C. White s.n.* (CAL); Kambajang, Sept. 1903, *Prajin s.n.* (CAL); Lhonak. 5.8.1909, *Smith & Cave* 2130 (CAL); *Smith & Cave* 2132 (CAL); 15.8.1882, *King’s collector* (CAL); Nathula, Sept. - Oct. 1809, *Ribu & Rhomo 2771* (CAL). Nagaland: Kohima, July 1886, *D. Prain* (CAL).

*Note.* Swollen fleshy roots also serve as storage organs. The reduction in size of the bulbs probably due to their occurrence in moist areas in E. Himalayas.


Robust herbs 18 40 cm high; bulbs gregarious, cylindrical, 3 6 x 1 1.5 cm or insignificant, outer coats membranous, fibrous when matured. Leaves 2 - 5, arising in the middle of stem, broadly linear, 5 10 mm broad, fistular, lowest 3 - 8 cm long and topmost 8 - 25 cm long; broadly sheathed at base. Umbels globose 3 - 3.5 cm in diam., 20 - 30-flowered; spathe bifid, ovate, 1.5 1.8 x 1 1.5 cm, acute, pink when dry. Flowers campanulate; pedicels unequal, 3 10 mm long. Tepals yellow, elliptic-lanceolate, 10 - 13 x 2 - 3 mm, often unequal, inner smaier, acute, connate up to 2 mm at base, midvein prominent. Stamens & pistil nearly half the length of the tepals. Filaments 3 - 4 mm long, connate at base to form a ring, 1 mm free above, alternate 3 obtusesl toothed on either side; anthers oblong, 1 x 0.5 mm. Ovary globose or pyriform, 2 3.5 x 2 2.5 mm, 3-lobed; style 1 2 mm long; stigma 3-lobed. Capsules brownish-yellow with persistent perianth, obovoid, 5 6 x 4 5 mm, 12-seeded, 4 in each locule. Seeds black, elliptic, 2 2.5 x 1 1.2 x 0.2 0.3 mm, planococonvex, granulate.

Fl. & Fr.: June September.

Distrib.: INDIA: Jammu & Kashmir (Kashmir), Himachal Pradesh and Uttarakhand; PAKISTAN, AFGHANISTAN, C. ASIA, CHINA.

Specimens examined: Himachal Pradesi: Pangi, August 1911, Inamud Din 103 (CAL); Chamba, Pangi, 4.9.1897, J.H. Lace 1659 (CAL); 14.7.1964, N.C. Nair 32454 (BDS); Simla hill states, Rupin Pass, Dhaoladhar Range, 7.7.1939, G. Sherriff 7409 (BM); Him. Bor. Occ, Kistwar, T. Thomson 13 (CAL, L). Jammu & Kashmir: Bhotkopa, July 1905, A. Meebold s.n. 4100 (CAL); Baltistan, Barila, 11.7.92, J.F. Duthie s.n. (CAL, K); K. Burzil, 28.7.1876, C.B. Clarke 29719 (CAL); Gilgit, Dr. Giles 183 (CAL); Kangila, July 1905, Meebold 4097 (CAL); Chenab Valley, Phonduru, 15.6.1881, R.M. Ellid 1224 (CAL); 13.7.1841, Winterbottom 789 (CAL); 21 June 1847, Winterbottom 509 (CAL); Dras, 31.7.1891, Gammie (CAL); Astor, 21.7.1892, Duthie 12178 (CAL, BM).
Notes: The original descriptions of A. semenovii Regel, A. fedschenkoanum Regel and A. atrosanguineum Schrenk are based on the specimens collected from W. China, S. Russia & Himalayas show minor differences like filaments 1/4 of tepals in A. semenovii, flowers yellowish in A. fedschenkoanum and pinkish in A. atrosanguineum. The types of A. fedschenkoanum and A. atrosanguineum have not been seen. On examination of the syntypes of A. semenovii Regel (Kistwar, T. Thomson 13 and inter Baltal & Dras, Henderson CAL) show 2 or 3 leaves, c. 1 cm broad, arising from lower half of the plant with broad sheath, flowers c. 12 mm long, filaments c. 5 mm long of which c. 4 mm connate at base and 3 alternate obscurely cuspidate on either side. So, in A. semenovii filaments are 1/2 - 1/3 of the tepals, not 1/4 as described by Regel in protologue, thus showing similarity with A. fedschenkoanum and A. atrosanguineum.

All the specimens examined from India and adjoining regions have obscure bulbs, membranous outer coats becoming fibrous with age; leaves 2 5, 5 10 mm broad, lowest shorter and topmost longer with broad sheathing base, rising all over the scape forming long prominent internode; filaments nearly half the tepals and nearly three-fourth of its length connate at base. In some specimens flowers are c. 12 mm with inner tepals smaller than outer, yellow, and in others flowers are c. 8 mm, deep brown or purple; thus the present study supports Nasir (1975) in merging A. semenovii with A. fedschenkoanum on the basis of larger, yellow flowers and keeping A. atrosanguineum as a distinct species.


Fig.1.3a & b

Herbs 10 -20 cm high; bulbs cylindrical, 5 11 x 1.5 cm, gregarious, tunics coriaceous, laciniate apex. Leaves 2 4, basal, linear, filiform, 15 x 0.2 cm, smaller or longer than scape, margin and base finely scabridous. Umbels 1.5 cm broad, fascicled, 5 12-flowered; spathe ovate, 12 15 x 8 10 mm. Flowers campanulate; pedicels 4 - 6 mm long, glabrous. Tepals pale yellow or greenish white, oblong lanceolate, 4 5 x 2 mm, midvein prominent. Filaments filiform, 5 mm or longer, exserted after anthesis, connate at the base only; anthers oblong, 1.5 x 0.7 mm. Ovary oblong, 2 x 1.7 mm, trilobed; style 2-7 mm long, filiform, elongating with age. Capsules subglobose.
Fl. & Fr.: July - August.

Habitat: Rock crevices at an altitude of 3700 m.

Distrib.: INDIA: Jammu & Kashmir (Kashmir); PAKISTAN, AFGHANISTAN.

Specimens examined: Jammu & Kashmir: Gilgit, Duthie 12424 (CAL); Baltistan, 13.7.1892, Duthie 12026 (CAL); Nagarstate, Karakorum, Minapin glacier, 1861, Lloyd & Megaw 3 (BM).

Note: This is a new record for India. It extends from Russia through Hindukush and Karakorum mountains to Pakistan, Afghanistan and India. In protologue the flowers are reported as pink soon turning to white. The scabridous nature of leaf margin and base is not reported earlier. This may be due to drier ecological condition.


Herbs 50 - 60 cm high; bulbs rhizomatous, cylindrical, 2.5 x 1 cm, outer coats reticulate, fibrous. Leaves 5 - 6, basal, linear, 30 - 35 x 1 - 2 cm, obtuse, glabrous. Umbel hemispherical, 5 - 9 cm in diam., laxly 20 - 30-flowered; spathe broadly ovate, shorter than pedicel. Flowers campanulate; pedicels 2 - 5.5 cm long, unequal, glabrous, ebracteate. Tepals purple, lanceolate, 1 - 1.2 cm long, acute. Filaments shorter than tepals, linear. Ovary globose, c. 2 mm in diam., style longer than ovary; stigma 3, recurved.

Fl.: June.

Habitat: At about 3050 m altitude.

Distrib.: INDIA: Jammu & Kashmir (Kashmir).

Notes: Known from type collection only. Endemic and endangered in Kashmir.

Herbs 20  30 cm high, slender; bulbs ovoid, 1  2 x 1 – 2 cm, outer coats coriaceous, fibrous, often series of bulbs arranged one above the other with more than one bulbels; bulbels elliptic, 10 - 12 x 4 - 5 mm, with outer coats papery and inner ones fleshy, bulbels get separated from the bulbs leaving the papery scales and grow as independent plants; roots few, c. 2 mm dia. Leaves 2 or 3, arising from 2.5 - 5 cm above the bulb, linear, 15 - 17 cm x 2 mm, semiterete, grooved. Umbels 2 - 3 cm in diam., fascicled or hemispherical, 10  30-flowered; spathe bifid, c. 8 mm long. Flowers tubular or narrowly campanulate; pedicels 4  15 mm long, unequal, erect, angular. Tepals whitish or mauve pink, unequal, broadly lanceolate to elliptic, obtuse, appear acute on drying, entire, midvein present, margin inrolled; outer 5  7 x 2  2.5 mm, inner 3  4.5 x 1.5 mm, connate at base, pouched below. Filaments included, 2 - 3 mm long, about 2/3 of base connate and adnate to tepals, 1 mm above, free; often inner filaments broader; anthers ovate-oblong, 1  1.5 x 0.5 mm. Ovary globose or ovoid-oblong, 1  2.5 x 1  1.5 mm, often with 3 glands at base; style linear, 1 - 5 mm long. Capsule not seen.

Fl.: March  May.

Habitat: On gravelly soil between 1500 and 2100 m altitude.

Distrib.: INDIA: Punjab and Jammu & Kashmir (Kashmir); PAKISTAN, AFGHANISTAN, C. ASIA.


Local name: Dung Dung /Dudasag (Nep.).

Herbs up to 90 cm high; bulbs indistinct. 10 - 20 x 1 cm, cylindrical, profusely rooting at base. Leaves 4 or 5, arising from the base, linear, 20 70 x 0.3 - 1.4 cm, prominent veins. Umbels 3.5 - 4.5 cm diam., hemispherical,
laxly 12 - 40-flowered: spathe ovate, 3 x 0.8 cm. Flowers campaulate stellate on maturity exposing the ovary; pedicels 1 2 cm long, angular, flat at base, ebracteate. Tepals white, lanceolate, 5 8 x 1 - 2 mm, connate at base, midvein inconspicuous, spreading after anthesis. Filaments 5 8 mm long, elongating on maturity, linear, slightly broader and adherent to the tepals at base; anthers oblong, 1.5 2 mm x 0.7 1 mm. Ovary broadly oblong or obovoid, 1.5 - 3 x 1.5 2 mm, stipitate; styles linear, 1 3 mm long, elongating on maturity; stigma inconspicuous. Capsules globose to subglobose, c. 5 x 5 mm (immature), brown.

Fl. & Fr.: July October.

Habitat: In open or in marshy areas between 1200 and 4100 m altitude.

Distrib.: INDIA: West Bengal, Meghalaya, Arunachal Pradesh and Sikkim; BHUTAN, SRI LANKA, CHINA-TIBET.

Uses: Cultivated as vegetable in China and Eastern India.

Specimens examined: Meghalaya: Khasia, J.D. Hooker 7 (CAL); Shillong, Woodland compound, cultivated, 16.7.1964, H. Deka 37004 (CAL); 22.8.1964, H. Deka 37022 (CAL); Khasia, 1844 Griffith s.n. cultivated (K); Shillong, Woodland garden, 13.8.1963, D.B. Deb 35805 (CAL); West Bengal: Darjeeling, 30.5.1909, R.K. Das 32302 (CAL).

Note: Regel (1875) reduced A. hookeri as a synonym of A. wallichii.


Plants with garlic smell, 8 30 cm high, slender; bulbs cylindrical, 3 - 6 x 0.5 1.5 cm, outer coat reticulate fibrous. Leaves 4 - 6 at the base of the stem, linear, flat, 3 26 x 0.3 0.5 cm, obtuse, glabrous. Umbels hemispherical, 2 3 cm diam., laxly 9 20-flowered; spathe bifid, ovate or lanceolate, c. 15 x 12 mm. Flowers broadly campulanate; pedicels 4 - 15 mm long. Tepals white or yellowish, elliptic or lanceolate, 5 9 x 1.5 3 mm, acute, often margins inrolled, finely nervedit. Filaments subulate, 1.5 3.5 x 0.5 1 mm, unequal, connate up to 1 mm at base forming a cup and adnate to tepals; anthers oblong, 1 mm long. Ovary subglobose, 1 1.5 x
0.7 2 mm, lobes inconspicuous; style filiform, 1 1.2 mm long. Capsules subglobose or broadly obovoid, 3 x 3 - 5 mm; pericarp deep brown, surface uneven, locules 1-seeded. Seeds oblong, c. 3 x 2 mm, brownish black.

Fl. & Fr.: May - July.

Habitat: Between 2740 - 4000 m altitude on open hillsides or shady grassy slopes, gregarious. Vegetatively multiplies by extending horizontally in centrifugal pattern.

Distrib.: INDIA: Jammu & Kashmir (Kashmir), Himachal Pradesh and Uttaranchal; PAKISTAN.

Uses: Leaves used in flavouring curry.

Specimens examined: Himachal Pradesh: Between Larot & Chanchal pass, 23.7.1965, N.C. Nair 36112 (BSD); Chamba, 14.6.1897, J.H. Lace 1581 (CAL); Chamba, 3.7.1899, Harsukh (CAL); Lahul, 6/1865, D. Stoliczka (CAL); Bashaur, 26.6.1891, Lace 950 (CAL); Jammu & Kashmir: Bhotka La, July 1905, Meebold 4095 (CAL); July 1956, T.A. Rao 470 (CAL); Saibal Base, 13.7.13, Capt. F.E. Kobel 51 (CAL); Liddar Valley, 21.7.1873, J.F. Duthie 13145 (CAL); Above Gulmarg, 2.6.1892, J.F. Duthie 11337 (CAL); Pirplayal, 6.7.1876, C.B. Clarke 28831 (CAL); Uttaranchal: Jaunsar, June, 1898, Gamble 27079 (CAL); Jaunsar, 11.6.96, C.C. Roger (CAL); Kankhal Sthan, 20.5.1979, A.K. Goel 66605 (BSD); Tehri Garhwal, 26.5.1894, Duthie 14535 (CAL); 25.6.83, Duthie 4304 (CAL); Horki Dun, Tehri Garhwal, June 1893, Gamble 24375 (CAL).


Plants 4 - 55 cm high, slender; bulbs gregarious, ovoid, 1 - 4 x 1 - 1.5 cm, tunics coriaceous, brownish. Stem angular, particularly at the apex, much longer than leaves, glabrous to scabriduous; internode 1 - 12 cm long. Leaves 2 or 3, arising from 2 - 9 cm above the bulb, linear, fistular, 2 - 20 cm x 1 - 2 mm. Umbels 2 - 4 cm in diam., 8 - 70-flowered; spathe bifid, ovate, 8 - 10 x 5 - 10 mm. Flowers tubular, constricted at the apex;
pedicels 5 10 mm long, up to 12 mm in fruits, erect, glabrous. Tepals purplish-blue or pale purple with dark purple midvein, lanceolate, 4 - 5 x 1 mm, acuminate, membranous, adherent up to 1 mm at base. Filaments included, 3 3.5 mm long, outer little shorter, adnate and adherent to the perianth at base up to 1 mm; anthers pea-shaped, 0.7 x 0.5 mm, dark violet. Ovary ovoid-oblong to globose, 0.7 1.5 mm; style 0.5 2.5 mm long; stigma inconspicuous. Capsules obovoid, light brownish-yellow, c. 3 x 3 mm, with persistent perianth and filaments, 3-seeded; pericarp thin. Seeds black, elliptic, 2.2 x 1.2 mm, plano-convex.

**Fl.:** April - August. **Fr.:** August.

**Habitat:** At foot of high mountains in exposed rocky places between 1200 and 3350 m altitude.

**Distrib.:** INDIA: Jammu & Kashmir, Himachal Pradesh and Uttaranchal; PAKISTAN, AFGHANISTAN, C. ASIA.

**Uses:** Medicinal value, used as sudorific (Chopra et al. 1956).

**Notes:** *A. miserabile* Wendelbo, distinguished as a separate species from *A. jacquemontii* on the basis of pubescent leaf base and obtuse tepals, is not tenable as both pubescent to glabrous leaf sheath and acute to obtuse tepals were observed in the same gathering.

**Specimens examined:** Himachal Pradesh: Trilokinath, 21.8.1971, U.C. Bhattacharyya 45936 (BSD); Lahul, 30.6.1958; M.A. Rau 6010 (BSD); Jammu & Kashmir: Ladak, July 1905, A. Mebold 4098 (CAL); Jammu, T. Thomson (CAL); Karakorum, 24.7.1939, R. Scott Russell 1311 (BM); Balti, 26.7.1847, Winterbottom 727 (CAL); Gilgit, 1885, Giles 233 (CAL); Chenab, October 1864, Brandis 3355 (CAL); Puri, 20.7.1881, R. Ellis 1580 (CAL). Uttaranchal: Tehri, 1.4.1981, A.K. Goel 72868 (BSD); 10.4.1981, A.K. Goel 72968 (BSD).


Plants 10 30 cm high; bulbs ovoid, 2 2.5 x 1.5 2 cm, outer coat membranous. Leaves 2 5, basal, lanceolate or narrowly lanceolate, 15 20 x 1.5 8 cm, often longer than scape, narrowed at base. Umbels hemispherical or globose, 4 5 cm diam., many flowered. Spathe bifid,
shorter than umbel. Flowers broadly campanulate or stellate; pedicels 1 - 2.5 cm long. Tepals white or pink, lanceolate, 3 - 4 x 1 mm, midrib prominent, adherent with each other at base. Filaments 4 - 5 x 0.5 mm, adnate to the tepals up to 1 mm at base; anthers oblong, 1.5 - 0.7 mm. Ovary obovoid or globose, c. 1.5 x 1.5 - 2 mm, triquetrous; style 2 - 5 mm long.

Fl.: May to August.

Habitat: 3000 m - 4000 m altitude.

Distrib.: INDIA: Jammu & Kashmir (Kashmir), Himachal Pradesh and Uttarakhand; AFGHANISTAN.


Local name: "Baadsah salap" (trade name in India).

Plants 25 - 90 cm high; bulbs ovoid, 2.5 - 3 x 1 - 3 cm, outer tunics membranous, greyish-black; roots c. 2 mm in diam. Stem 0.5 - 1.2 cm diam., terete, glabrous, sometimes gland dotted. Leaves 1 - 4, broadly linear to oblanceolate, 26 - 50 x 1.5 - 4.5 cm, acute. Umbels hemispherical or globose, 5 - 7 cm in diam., many flowered; spathe bifid, ovate, 1 - 2.5 cm long, long acute. Flowers campanulate to stellate; pedicels 1 - 5 cm long, 3 - 5 cm in fruit. Tepals rose purple, lanceolate or broadly lanceolate, 5 - 6 x 1.5 - 2 mm, concave, coherent at base, midvein prominent, inner 3 broader. Filaments pale mauve purple, 3 - 6 mm long, 1 - 2 mm broad at base, coherent and adherent to the perianth at base up to 1 mm, inner 3 broader, indistinctly awned, sometimes outer 3 longer, all tapering above; anthers oblong or ovate-oblong, 1 - 1.5 x 0.5 - 0.7 mm, dorsifixed. Ovary obovoid or globose, 1 - 1.5 x 1 - 2 mm, deeply trilobed, stipitate; style 2 - 6 mm long, linear. Capsule pyriform, 3 - 4 x 3 - 5 mm, locules 1-seeded, pericarp thin, scarious. Seeds ovoid-oblong, 2 - 3 x 2 x 2 mm, deep black, notched on one side, wrinkled.
Fl. & Fr.: May - August.

Habitat: Among grasses or stony slopes between 1500 and 4500 m altitudes.

Distrib.: INDIA: Jammu & Kashmir (Kashmir) and Himachal Pradesh; PAKISTAN, IRAN, AFGHANISTAN, NEPAL.

Uses: Bulbs and leaves are edible. Contains neutral saponins.

Specimens examined: Himachal Pradesh: Chenab Valley, Kilar, 9.6.1979, J.D.A. Stainton 8108 (E, BM); Chamba, Pangi, 6.9.1899, Harsukh (CAL); Chamba, August 1880, R. Ellis 74 (CAL); Ind. Or., Kishtwar, T. Thomson 18 (CAL); Kashmir, May 1894, Aitchinson 20 (CAL).


Herbs 22 28 cm high; bulbs narrowly cylindrical, 2.5 5 x 0.5 cm, inconspicuous, with many stout roots; roots 2 - 5 mm broad, often fusiform. Leaves 5 7, basal, linear, 20 22 x 0.2 0.5 cm, flat, acute. Umbels subglobose, 4 12-flowered, loose; spathe 2-3-valved, caducous. Flowers cup-shaped; pedicels 1.5 3.5 cm long, blackish-brown. Tepals purple or red, broadly oblong, 9 11 x 5 6 mm, obtuse to truncate, entire, midvein prominent. Filaments linear, 10 x 2 mm, connate up to 1 mm at base; anthers narrowly oblong, 1.5 0.7 mm. Ovary angularly oblong, 1.5 2.5 x 1 2.5 mm, with 6 apical swellings or crests; style linear, 9.5 mm long, often exerted; stigma slightly broader than style. Capsules obovoid, c. 4 x 5 mm, light yellowish-brown. Seeds black, non-lustrous.

Fl. & Fr.: July September.

Habitat: On damp rocky soils and grassy hill slopes, between 3900 m to 4270 m.

Distrib.: INDIA: Sikkim; BHUTAN; CHINA-S.E. TIBET. Rare.


![Fig.2.2a – 2c](image)

Herbs gregarious, 10-40 cm high, slender; bulbs cylindrical, 3 x 8 x 0.5 cm, outer scales white becoming fibrous, roots less than 1 mm in diam. Stem angular, papilllose. Leaves 3 or 4, basal, filiform, linear, 10 - 25 cm x 2 mm. Umbels 4 - 7-flowered in unevenly maturing fascicles; spathe ovate, 5 x 10 x 3 mm, acuminate. Flowers erect, broadly campanulate; pedicels 2.5 cm long, angular, papilllose. Tepals white or purple with pink midvein, lanceolate or oblanceolate, 8 x 10 x 1.5 mm, obtuse, margin folded. Filaments linear, 4 - 6 x 0.5 mm, adherent to the tepals and connate up to 1 mm at base; anthers linear-oblong, 1 x 1.3 x 0.5 mm. Ovary ellipsoid, 2 x 1.5 x 2 mm; style 1.5 x 3 mm long. Capsules yellowish brown when young, obovoid-globose, c. 3.5 x 3.5 mm.

*Fl.*: August - October.

*Habitat*: In clumps on sunny turf often on cliffs, associated with species of *Roscoea*, *Iris*, *Saxifraga*, *HyPERicum* etc. Abundant in places from 2430 to 3050 m altitudes.

*Distrib.*: INDIA: Arunachal Pradesh; CHINA, MYANMAR.


*Note*: New record for India and Myanmar.


![Fig.9.2a – 2d](image)

Herbs 25 - 30 cm high; bulbs tufted, cylindrical, c. 3 x 1 cm, outer coats finely reticulate fibrous, yellowish, profusely rooting at base, roots 2 mm in diam. Leaves 5 or 6, basal, linear, 7 cm x 2 mm. Umbels hemispherical or fascicled, 2.5 x 3 cm diam., 6 x 12-flowered; spathe bifid,
ovate, 8 10 mm long. Flowers broadly campanulate; pedicels 8 12 mm long. Tepals white, oblong-ovate, 5 7 x 3 4 mm, recurved, acuminate, midrib prominent. Stamens and pistil included. Filaments 2.5 - 4 mm long, base 1.5 - 2 mm broad, connate and adnate to tepals at base; anthers globose-oblong, c. 1 x 1 mm. Ovary subglobose, 1.5 - 2.2 x 1.5 - 2.5 mm; style 1 mm or shorter. Capsules obovoid-globose, c. 5 x 6 mm, brownish yellow with persistent perianth.

*Fl. & Fr.:* July September.

*Habitat:* Among boulders between 3000 and 5160 m altitude.

*Distrib.:* INDIA: Jammu & Kashmir (Kashmir); PAKISTAN, CHINA (TIBET), C.I.S.

*Specimens examined:* Jammu & Kashmir: Ladak, 23.7.1929, Ludlow 551 (BM). Tibet occ. 12000-14000 ft. T. Thomson (L!)

*Note:* The description and figure of *A. oreoprasm* given by Nasir (1975) do not match with its protologue. Regel (1875) identified a collection from Zalung Karpo pass, Himalaya 10 - 17000 ft. *Stoliczka* (LE) as *A. oreoprasm* Schrenk though Hook. f. (1892) stated as “not seen any Indian specimens” In fact duplicate of the above collection available at CAL(!) matches with the description provided by Schrenk (1842) and Regel (1875).


Herbs 22 - 40 cm high. Bulbs ovoid, 3 8 x 1.5 2.5 cm, outer coat membranous, reddish brown. Stem 3 - 4 mm diam. Leaves 1 - 3, at the base of the stem, linear, 4 - 20 x 0.1 - 0.2 cm. Umbels hemispherical, 2.5 - 4 cm diam., 15 - 40-flowered. Spathe bifid, 12 - 15 x 10 cm. Flowers campanulate; pedicels 7 12 mm long; bracteate. Tepals reddish, ovate-lanceolate, 5.5 6 x 2.5 3 mm, acute, often plicate, midvein present. Stamens and pistil exerted. Filaments 6 8 mm long, connate and adherent with perianth up to 1.5 mm at base; 3 alternate filaments subulate, 1 mm broad at base, other 3 broader at base with 1 mm long teeth on either side; anthers oblong,
1.5 2 x 0.7 mm. Ovary globose or ovoid, 2 2.5 x 2 2.5 mm, trilobed, style 5 9 mm long. Capsules obovoid, 4 5 x 4 6 mm, deeply trilobed, pericarp thin, papery, light yellowish brown. Seeds brownish black, orbicular, c. 2.7 x 2.5 x 2 mm, concavo-convex, wrinkled on convex surface.

Fl. & Fr.: July  September.

Habitat: On moist rocky slopes, between 2000 3200 m altitude.

Distrib.: INDIA: Jammu & Kashmir (Kashmir) and Uttaranchal; PAKISTAN AND AFGHANISTAN.

Specimens examined: Jammu & Kashmir: Sanjhi-Chat-Bhairan temple, 11.9.1989, B.P. Uniyal 86703 (BSD); Uttaranchal: Garhwal, 18.9.1870, G King s.n. (CAL); Mussoorie, 18.8.1870, G King s.n. (CAL); Shali, 1.7.1886, E.R. Johnson s.n. (CAL).


Local name: ‘Chives’ (English).

Herbs 20 35 cm high; bulbs cylindrical, gregarious, 1.5 2 x 0.5 cm, scales membranous; stem 5 - 6 mm in diam. Leaves 1 3, arising from 4 10 cm above the base, linear, 10 20 cm x 2 6 mm, fistular. Umbels subglobose, 3 - 4.5 cm diam., many-flowered; spathe bifid, ovate, 2 - 2.5 x 1 1.5 cm, acute. Flowers broadly campanulate; pedicels 7 12 mm long, glabrous. Tepals pink or mauve, lanceolate, 9 - 12 x 3 mm, acute. Filaments linear, 6 7 x 1 mm, connate up to 2 mm at base; anthers oblong, 1 x 0.5 mm. Ovary oblong, 2 - 3 x 2 - 2.5 mm, trilobed, base glandular; style linear, 3 3.5 mm, triquetrous.

Fl. & Fr.: June - August.

Habitat: On rocky ground between 3000 3900 m altitude.

Distrib.: INDIA: Jammu & Kashmir (Kashmir) and Himachal Pradesh; ASIA, EUROPE, N. AMERICA. Cultivated as vegetable.

Specimens examined: Himachal Pradesh: Lahul, 2.7.1973, U.C. Bhattacharyya 51706 (BSD); Jammu & Kashmir: Kolohoi valley, 27.8.1956,
Polunin 578 (BM, E); Haramukh, 29.7.1940, Ludlow & Sherriff 7842 (BM); Seshnag, 17.7.1977, J.D.A. Stainton 7956 (E); Musjid valley, 25.7.1893, J.F. Duthie 13213 (K); Kashmir, September, 1894, C.B. Clarke 24253 (K).


Herbs 5 25 cm high, slender; bulbs gregarious, cylindrical, 2 4 x 0.3 0.5 cm, outer tunics with parallel fibres. Leaves 2 or 3, basal, linear, 4 18 cm x 1 2 mm, margins revolute to give a terete appearance, margin and veins muricated beneath. Umbels bent, hemispherical, 1.5 3 cm diam., 10 20-flowered; spathe deltoid, 10 12 x 6 9 mm, 1-valved. Flowers broadly campanulate; pedicels unequal, 2 6 mm long. Tepals lilac purpure or light blue, obovate-oblong, 4 10 x 2 4 mm, boat-shaped, connate at base, pouches below, midvein present. Filaments blue, subulate, 3 8 mm long, free almost from the base, c. 1.5 x 1.5 mm at base; anthers yellow, subglobose, 1 mm long. Ovary globose, 1.5 - 3 mm in diam.; ovules 2 per locule; style 1.5 2 mm long; stigma obscure. Capsules obovoid-globose, c. 4 x 3.5 mm, light brown, with persistent perianth and filaments.

Fl. & Fr.: July October.

Habitat: On open grassy hillsides and on sandy soils along rivers and streams between 3600 and 5200 m altitude.

Distrib.: INDIA: Sikkim; BHUTAN, C. NEPAL, TIBET-CHINA.

Specimens examined: Sikkim: G.H. Cave 134 (CAL); Lhonak, 4.8.1907, Smith & Cave 2105 (CAL); Naku chu, September/October 1909, Lepcha collector 2731 (CAL).


Herbs 10 35 cm high; bulbs cylindrical, 1.5 6 x 0.4 1 cm, outer coat densely reticulate fibrous, often reddish. Stem terete, 1 3 mm in dia., leafy towards base, longer than leaves. Leaves 4 or 5, linear, 2 19 cm x 1 2 mm, acute. Umbel globose or hemispherical, 2 2.5 cm in diam., many-flowered; spathe bifid, ovate, c. 10 x 8 mm. Flowers campanulate; pedicels 3 4 mm long. Tepals violet or pink, ovate-lanceolate, 4 6 x 3 mm, unequal, entire, obtuse, midvein present; inner slightly bigger. Filaments 5.5 - 6 mm long, exserted, connate at base up to 1 mm forming a ring, outer 3 linear, c. 1 mm broad at base, inner 3 oblong, c. 3.5 x 1.5 mm at base, with 1.5 – 2.5 mm long needle and 2 awns on either side; anthers oblong or globose, 1 1.5 x 0.5 1 mm. Ovary obovoid, rarely ovoid, 1.5 2.5 x 1 2 mm, adherent to tepals and filaments at base; styles 4 mm long, upper triquetrous. Capsules obovoid, c. 3 x 4 mm, umbelicate, light brownish yellow, conspicuously trilobed with persistent tepals, splits from the top; locules 2-seeded; pericarp thin, surface uneven. Seeds deep brown, suborbiculate, surface uneven.

*Fl. & Fr.*: July September.

*Habitat:* On Carbonaceous slates or gravel from 3300 to 5191 m. altitude.

*Distrib.*: INDIA: W. Himalayas, Jammu & Kashmir (Kashmir) and Himachal Pradesh; NEPAL, CHINA-TIBET.

*Uses:* Aitchison reported that it grows largely on high hills of Ladakh and used by the natives as condiment. It is sold in the market in the shape of balls. The whole plant is smashed into a semipulp and then made into a ball as big as the fist. The balls are strung through the middle and carried on a string (c.f. Royle, Ill. Bot. Himal. Mts.: 392 393. 1840).

Note: The three species of Regel A. stoliczki, A. jacquemontii (non Kunth) and A. przewalskianum appear to be conspecific as evident from their descriptions and types.

Regel described A. stoliczki on the basis of some incomplete specimens collected from Ind. Or. Prov. Tibet by Stoliczka. Hook. f. (1892) has not mentioned this species, though there were several collections of Stoliczka at CAL. Stearn (1960) also has not seen Stoliczka specimens. In CAL there are two specimens collected by Stoliczka from Ind. Or. Tibet: Karnag, Zalung Karpo Pass 14-17000 ft. 8/65 and Karnag 12-15000 ft., July 65. Both are complete specimens with bulbs, leaves, heads with flowers and both have been collected prior to Regel’s publication. These specimens completely match with the description of A. stoliczki Regel.


Fig.10.3a – 3e

Local name: “Jambu” (Kumaon).

Herbs 20 - 30 cm high, slender; bulbs oblong-ovoid, 3.5 - 5 x 1 1.7 cm, fibrous. Stem leafy at the base, terete, glabrous. Leaves 2 - 4, arising 2 - 8 cm above the bulb, linear, 11 30 cm x 1 - 2 mm. Umbels subglobose or hemispherical, 1.0 - 2.5 cm in diam., 8 - 10-flowered, loose; spathe bifid, ovate, c. 1 x .5 cm, acuminate. Flowers oblong-campanulate; pedicels 3 - 5 mm long. Tepals rosy purple or yellow, often white with pink veins, broadly-oblance or ovate-oblance, 4 5 x 2 2.5 mm, outer slightly shorter, convex, obtuse, midvein prominent, coherent and puckered at base. Filaments purple, linear, 7 - 8 x 0.5 mm, free, adherent to perianth at base up to 1 mm, exserted after anthesis; anthers yellow, oblong, 1 1.5 x 0.5 - 0.7 mm. Ovary oblong, 1.5 - 2.5 x 1.2 mm, deeply trilobed, lobes winged, covered with large nectaral pits by hood like projection; style purple, linear, 3 5 - 8 mm long, trisulcate, stigma obscure. Capsules globose-oblance, c. 4 x 3 mm; pericarp thin, papery, yellow, glabrous, 2 seeds in each locule. Seeds elliptic, plano-convex, c. 3 x 1.7 mm, black, surface uneven.

Fl. & Fr.: July October.
Habitat: On dry open slopes or among rocky boulders, near streams or as an undergrowth in Pinus-Cedrus forests, between 2000 -3800 m altitude.

Distrib.: INDIA: Jammu & Kashmir (Kashmir), Himachal Pradesh and Uttarakhand; NEPAL, PAKISTAN.

Uses: Extensively used as a spice & curry powder.

Note: Nasir (1975) merged A. stracheyi Baker with A. consanguineum Kunth. But it is distinct species for having shorter pedicels (3 – 5 mm long) and narrower leaves (1 – 2 mm broad).


Local name: Bunga, Gandana (Bengal); Dume (Himachal Pradesh); Naive Leek, Chinese Chives (Eng.).
Herbs 16 45 cm high, odorous; bulbs cylindric, 2.5 x 1 2 cm, often with reticulated fibrous scales, profusely rooting at base. Stem 0.5 cm in diam., glabrous, ribbed. Leaves 3 - 6, arising from 3 - 4 cm above the bulb, linear, 15 17 x 0.4 - 0.6 cm, not fistular. Umbels hemispherical, 3 - 5 cm in diam., 10 - 40-flowered. Spathe bifid, ovate, c. 2 x 1 cm. Flowers campanulate, stellate on maturity; pedicel 1 - 2 cm long. Tepals white, pink veined, oblanceolate, 4 - 7 x 1.5 2 mm, acuminate. Filaments dark brown or white, 2.5 - 4 mm long, connate up to 1 mm at base, deltoid, adherent with perianth; anthers pink or brown, oblong, 1 - 2 x 0.5 - 1 mm. Ovary green, ovoid, 1.5 - 2 x 1.5 - 1.7 mm; style white, 1 - 2.5 mm long; stigma obscure. Capsules broadly ovoid, 3 x 4 x 5 6 mm, trilobed, pericarp light yellow, thin, glabrous. Seeds ovoid, c. 3 x 2 mm, blackish brown, coarsely reticulate.


Habitat: On open rocky slopes, open madows and on moist sandy soils between 1900 and 2600 m altitude.

Distrib.: INDIA: Jammu & Kashmir (Kashmir), Himachal Pradesh, Uttarakhand, Punjab, Meghalaya and Tripura; NEPAL, BANGLADESH, MYANMAR, CHINA, JAPAN. Wild & cultivated.

Uses: It is reported that the whole plant is consumed as a vegetable and widely favoured as salad ingredient. It has medicinal properties and seed is used in Spermatorrhoea.


*Local name:* *Kok-pa* (Bhutia).

Herbs 15–45 cm high. Bulbs gregarious, cylindrical, 0.5-10 x 0.5-2.5 cm, tunics reticulated fibrous, onion scented. Stem slender, longer than leaves, ribbed, glabrous. Leaves 2–4, arising 2–16 cm above the bulb, internode obscure, lanceolate to elliptic, 16-33 cm x 1-4 cm, narrowed at base into petiole, acute, midvein prominent, petiole purple. Umbels hemispherical or subglobose, 15–60-flowered, 2–5 cm in diam.; spathe ovate, 1-4 x 1-4 cm. Flowers campanulate; pedicels 1-2 cm long, angular, longer in fruit. Tepals white to red with various intermediate shades, oblong, 4-6 x 1–2 mm, obtuse or acute. Filaments purplish, linear, 5-6 mm long, exserted, adnate and adherent at base; anthers dark yellow or brown, oblong, 1.5 x 0.5–0.7 mm. Ovary pink or dark green, obovoid, c. 2–1.5 mm, deeply lobed above; style light green, 3–4 mm long; stigma obscure. Capsules obovoid, 3–5 x 3–5 mm, trilobed; 1 seed in each locule. Seeds globose-oblong, C. 2 x 1.5 mm, wrinkled.

*Fl. & Fr.:* May–November.

*Habitat:* On river banks or near glacier, open grassy land amongst bushes, between 2100 m to 4100 m. altitude.

*Distrib.:* INDIA: Jammu & Kashmir (Kashmir), Himachal Pradesh, Uttarakhand and Sikkim; PAKISTAN, NEPAL, BHUTAN, MYANMAR, CHINA, JAPAN, EUROPE, N. AMERICA. Wild and cultivated.

*Uses:* Leaves used for seasoning curries; used as carminative in W. Garhwal.

*Specimens examined:* Himachal Pradesh: Chamba, 10.6.1896, *Lacc* 1420 (ISIM, CAL); Ruturang, 17.5.72, *Janardhanan* 46794 (BSD); Pangi, *Stoliczka* (CAL); Pangi, 10.8.1899, *Harsukh s.n.* (CAL). Jammu & Kashmir:
Muree hills, June 1909, G. Watt (CAL); Sonemarg, 10.8.1913, Cap. F.E. Koebel 96 (CAL). Sikkim: Tangu, 7.7.1903, E. Younghusband (CAL); 31.5.1961, R.S. Rao 1010 (CAL); Thango, 18.10.1901, Prain 168 (CAL); Jongri, August 1887, King's collector (CAL); Chola Pass, 5.8.1877, King's collector 4479 (CAL); Stay Chochoka, 12.7.1906, J.C. White s.n. (CAL); Changu, 4.8.1985, D.C.S. Raju & S. Singh 2846 (BSHC). Uttarakhand: Kumaon, 18.6.1958, T.A. Rao 7030 (BSD); Tehri, 3.6.1978, A.K. Goel 64050 (BSD).

Notes: Baker (1874) recognised *A. victorialis* L. as most widely distributed species, extending from Europe to Japan. But Hook. f. (1892) differentiated Sikkim, Nepal specimens as a variety *A. victorialis* L. var. *angustifolia* Hook. f., having 1.3 - 3.2 cm broad leaves, pale pink flowers against broader leaves and white flowers in *A. victorialis* var. *victorialis*.

Wright (1903) described a new species *A. pratti* on the basis of a specimen collected by E. Pratt from China, having same characters of reticulate bulb coat, linear leaves (1.2 cm broad) and deeply trilobed ovary. Stearn (1947, 1960) after examining E. Himalayan specimens remarked that *A. victorialis* L. var. *angustifolia* Hook. f. and *A. pratti* C.H. Wright ex Forbes & Hemsl. as conspecific. The later is distinct from *A. victorialis* in having 2 linear leaves (1.2 - 3.2 cm broad) and pink flowers against 4 broader leaves and white flowers.

After study of the materials collected from Western and Eastern Himalayas, it is observed that there are two extreme forms of plants, one form bearing 4 robust leaves and white flowers as in *A. victorialis* L., occurring in W. Himalayas to the Kumaon-Nepal border and the other form with smaller plants bearing 2 leaves and pink flowers as in *A. pratti* C.H. Wright in E. Himalayas. These two forms in two different geographical regions and ecological conditions differ greatly indicating taxonomical distinction. But the plants from Bhutan, Nepal, Uttarakhand show intermediate characters like 2 or 3 lanceolate leaves with pink flowers and 2 lanceolate leaves with white flowers. It shows that there is a gradual change from smaller plants with linear leaves to bigger plants with broader leaves. But the change is so gradual that no distinction is possible. Moreover, very broad leaved and purple flowered plants have been collected from Myanmar and narrow leaved from Kumaon, Uttarakhand. This shows that geographical and ecological isolation is not complete and no distinction is possible. Therefore they are merged together in this work.

**Local name:** “Ujnad” (Khasi)

Herbs 40 - 65 cm high; bulbs cylindrical, insignificant, stem base covered by old fibrous leaf bases, profusely rooting at base, strongly smelling like leek. Stem 3 - 8 mm in diam, glabrous, triangularish. Leaves 4 or 5, arising 5 - 16 cm above the base from a single node, linear, 25 - 60 x 0.5 - 2 cm, acute, sheathing at base. Umbels hemispherical, 5 - 7 cm in diam., 5 - 40-flowered; spathe 1 or 2-fid, lanceolate, 2 - 3 x 0.7 - 1 cm, caducous. Flowers broadly campanulate or stellate after anthesis; pedicels 2 - 2.5 cm, elongate to 4 cm in fruits, glabrous, angular. Tepals deep purple or brilliant magenta, ovate-lanceolate, 6 - 10 x 2 - 3 mm, membranous, acute, midvein prominent. Filaments subulate, 4 - 8 x 1.5 mm at base, adherent to the perianth up to 1 mm at base; anthers oblong, 1.7 - 2 x 1 mm. Ovary c. 2 x 1.5 mm; style linear, 2.5 - 4.5 mm long. Capsules globose to ovoid, 4 - 6 x 5 - 8 mm, light brownish yellow, trilobed. Seeds oblong, 3.5 - 4 x 2 mm, brownish black.

**Fl.:** August - November. **Fr.:** October - November.

**Habitat:** Besides running water, hilly slopes or rocky areas in open conifer forests, between 2800 and 3625 m altitude.

**Distrib.:** INDIA: Jammu & Kashmir (Kashmir), Uttarakhand, Sikkim, Assam and Meghalaya; BHUTAN, NEPAL, TIBET-FINLAND. Wild and cultivated.

**Uses:** Cooked with fried fish or roasted meat for flavouring.

**Specimens examined:** Meghalaya: Shillong, May 1918, H.G. Carter 817 (CAL); Uttarakhand: Kumaon, Edgeworth s.n. (CAL); 11.10.1848, Strachey & Winterbottom 2 (CAL); 6.8.1972, C.M. Arora 49674 (CAL); Tehri-Garhwal, August, Duthie 503 (CAL); 30.8.1883, Duthie 505 (CAL).

**Cultivated species:**