

PATTERN OF MORPHOLOGICAL DIVERSITY WITHIN *ACONITUM HETEROPHYLLUM*
WALL. EX ROYLE (RANUNCULACEAE) IN INDIA

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ABSTRACT

Aconitum heterophyllum exhibits a wide range of inter and intra population variability throughout its natural range of distribution. Three distinct geographical and ecological groups have been recognised within the species which constitute 3 varieties. These are *A. heterophyllum* var. *heterophyllum*, *A. heterophyllum* var. *bracteatum* and *A. heterophyllum* var. *roylei*. An exhaustive account of the morphological variation within the species and a diagnostic key to the varieties with an enumeration have been presented. Each species has been provided with correct name and citation, synonyms, type specimen, distribution, list of specimens examined and notes.

INTRODUCTION

The genus *ACONITUM* L. comprises ca 300 species in the world (Kadota, 1987) and 27 species (31 taxa) in India (Rau, 1993). *ACONITES* exhibit great diversity in their morphological characters wherever they occur (Hardin, 1964 ; Brink, 1980, 82 ; Kadota, 1981). Like any other species of *ACONITUM*, *Aconitum heterophyllum* Wall. ex Royle is a highly variable species found in subalpine and alpine zones of Himalaya mainly from 3000-5200 m above m.s.l. The herbaceous plant body arises from a biennial underground tuber which is highly medicinal. The species flowers from late July to September and fruits from September to October. The species shows variations chiefly in plant height, shape, size and serration of leaves, length of inflorescence, colour and number of flowers, length of pedicels, pubescence of sepals, nature of bracteoles and nature of pubescence in carpels.

By using these morphological characters Chaudhary & Rao (1998) have recognised 3 distinct varieties including a new one, *A. heterophyllum* var. *roylei* Chaudhary & Rao and treated *Aconitum heterophyllum* var. *bracteatum* of Stapf (1905) as distinct contrary to Kadota (1997) who did not recognise any infraspecific taxa in *A. heterophyllum*. They (Chaudhary & Rao, 1998) have differentiated these varieties (var. *heterophyllum*, var. *bracteatum* and var. *roylei*) by bracteoles and carpels.

The most closely allied species of *A. heterophyllum*, *A. kashmiricum* was described by Coventry (1930) from Kashmir (Killenmarg) based on a dwarf plant (4-12" long) with long petioled-leaves, bright blue flowers, suborbicular lateral sepal and ovary with yellowish long hairs. These characters which are being influenced by habitat conditions are unstable and fall under the range of natural

variation within *A. heterophyllum* and a number of intermediate forms are also available between these two species. In a recent work on *ACONITUM* of N.W. Himalaya, the authors (Chaudhary & Rao, 1998) reduced *A. kashmiricum* as synonym under *A. heterophyllum*. However, Kadota (1997) has treated *A. kashmiricum* as distinct species and observed that it differs from *A. heterophyllum* by flowers colour (blue to brilliant bluish purple with indistinct veins), helmet shape (hemispherically conical with prominent beaks), lateral sepal shape (roundish) and nectary shape (knobed spurs with strongly incurved claws). However, further field study particularly in Jammu & Kashmir Himalaya is very much essential to provide a clear status of *A. kashmiricum*.

MATERIALS AND METHODS

In the present study, natural populations of *Aconitum heterophyllum* from throughout its range in the Himalaya were sampled for morphological variation. In addition, about 200 plant specimens from different herbaria LWG, CAL, BSD, DD, CIMAP were critically examined for recording the pattern of morphological variations. All the specimens examined are cited under each taxon.

RESULTS

Variation in Morphological character :

Plant Height : Extensive variations with respect to the height of the plants are noticed. At higher altitudes (alpine zone) the plants tend to become gradually smaller with or without branches. Taller plants are recorded from some alpine populations of Lahul (Keylang, Kardang) and Kumaon (Shijuya bugyal) with well developed branches. Generally, the plants give branches in the upper part but the populations of Gulmarg (Jammu & Kashmir), and S.W. of Srinagar the branches develop from the lower part of the plant. (Fig. 4).

Tuber : Tubers show little variation in length while in thickness they exhibit considerable variation in different populations, varying from 3 mm to 15 mm as in the population of Kedarnath (Uttar Pradesh) at the altitude of 4200 m. Mehra and Puri (1968) reported largest tuber from Keylang (7.5×0.6 cm) and Gulmarg (6×1.5 cm) populations. In some populations of Rahlam forest (Himachal Pradesh, alt. 3000 m), Pinakar (Himachal Pradesh, alt. 4000 m) the tuber is poorly developed forming almost a linear structure. In Gulmarg (Jammu & Kashmir, alt. 3000 m) populations, the tubers show intra population variation in length and thickness. In almost all populations, the number of tubers is generally one while in some areas of Har-Ki-Dun (Uttar Pradesh, alt. 4000 m) plants are seen with more than one (2) tuber. In Panikhar (Jammu & Kashmir, alt. 4000 m) population the number goes up to 3 but in such populations the thickness of tubers decreases.

Leaves : The leaves show maximum variation particularly in size, shape and serration and this depends upon the position on the plants. In lower part of the plant leaves are almost sessile and amplexicaule in all populations and exhibit morphological variations (fig.1). The margin of leaves is irregularly serrate to laciniate (Simthan, Uttar Kashi). In some populations of Simthan (Jammu & Kashmir, alt. 3000 m) and Chamoli (on way to Neelkant Parbat-Uttar Pradesh, alt. 4000 m), the leaves are distinctly 5-lobed due to deep incision of margins while they are almost without any lobes in some others. The base of the leaf also varies considerably in different populations.

Inflorescence : The variations observed in inflorescence are mainly with reference to length, number of flowers and density of hairs. The number of flowers generally decreases with altitude and at alpine areas the plants are also

shorter, while at temperate and subalpine zones in Lahul (Keylang), Ladakh (Zozilla, Kargil to Panikhar) the number of flowers varies from plant to plant in one and the same population. Many flowers are observed in population at Banihal ridge, Amarnath, Zozila, Daawan (Jammu & Kashmir), Kedarnath, Bhojbasa (Uttar Pradesh) and Keylang (Himachal Pradesh) whereas only few flowers are seen in the populations of Kargil to Panikhar, Sarbal (Jammu & Kashmir), Birodh, Kalyani (Uttar Pradesh), Inchu pass, Keylang, Khoksar (Himachal Pradesh) Kutti gangti valley (Uttar Pradesh), Mahagunas and Liddarwat (Jammu & Kashmir). The longest (about 69 cm long) inflorescence was recorded from Liddarwat and Gulmarg (Jammu & Kashmir) populations. Usually, the many-flowered racemes are lax while in Banihal ridge (Jammu & Kashmir) a population with flowers compactly arranged on rachis is noticed.

Bracteoles : Among all morphological characters studied the bracteoles are the most variable ones. They chiefly vary in shape, size and position. The variation in bracteoles is complex and the three distinct populations (groups) can be recognised based on characters of bracteoles. In the first group (*i.e.*, var. *heterophyllum*), the bracteoles are filiform, linear, narrowly oblong, narrowly lanceolate, lanceolate or ovate with entire or dissected margins (fig. 2 a-j). These variations are found on the same plant or in the same population. Such populations have been observed in Lahul, Chenab valley, Chitkul, Inchu pass, Rahlam forest (Himachal Pradesh) Amarnath, Ladakh, Sarbal (Jammu & Kashmir), Kalyani, Birodh, Kedarnath and Pindari (Uttar Pradesh). In these populations usually the lower bracteoles are lanceolate or ovate gradually reducing in size and became filiform in uppermost flowers. The position of bracteoles is variable. Either they are situated in the middle of pedicel or towards

the tip of pedicel.

In the second group in Salf-ul-mukul lake, Narang and Kaghan Deon (Jammu & Kashmir) the bracteoles are glabrous, stalked and distinctly lobed (fig. 2k-n) and situated at the top of pedicel. The other feature which is associated with this group is glabrous nature of the ovary. Stapf (1905) has given a varietal status to this group of plants which are also distinctly geographically isolated.

In the third population of Baramula, Gulmarg, Marri and Jhelum valley (Jammu & Kashmir) the bracteoles are very prominent (size bigger) and give a different look to the plant. Here they are almost rounded with completely entire margins (fig. 2 o-r) and situated at the top of pedicel (supporting the flower). Due to their large size they completely conceal the flower bud and appear like calyx. Another important characteristic of these bracteoles is their uniformity in shape/structure from lower flowers to the flowers at top. This group of plants has been described as a variety by Chaudhary & Rao (1998).

Flower : The floral parts in *A. heterophyllum* show both inter and intrapopulation variations, particularly in colour, length of pedicels and pubescence of sepals. Usually, the colour is pale green and greenish white but in Zozilla and Pir Panjal (Jammu & Kashmir) populations the flowers are blue. Between these two extremes the intermediate forms (light blue, purple blue, bluish purple, dull grayish purple) are common in Panikhar, Sarbal, Dagwan, Amarnath and Darbar populations. There are some populations in Keylang where flowers show variation in colour within the same populations.

Variation in length of pedicels is another trait. The lower pedicels are longer and gradually decreasing in length towards apex.

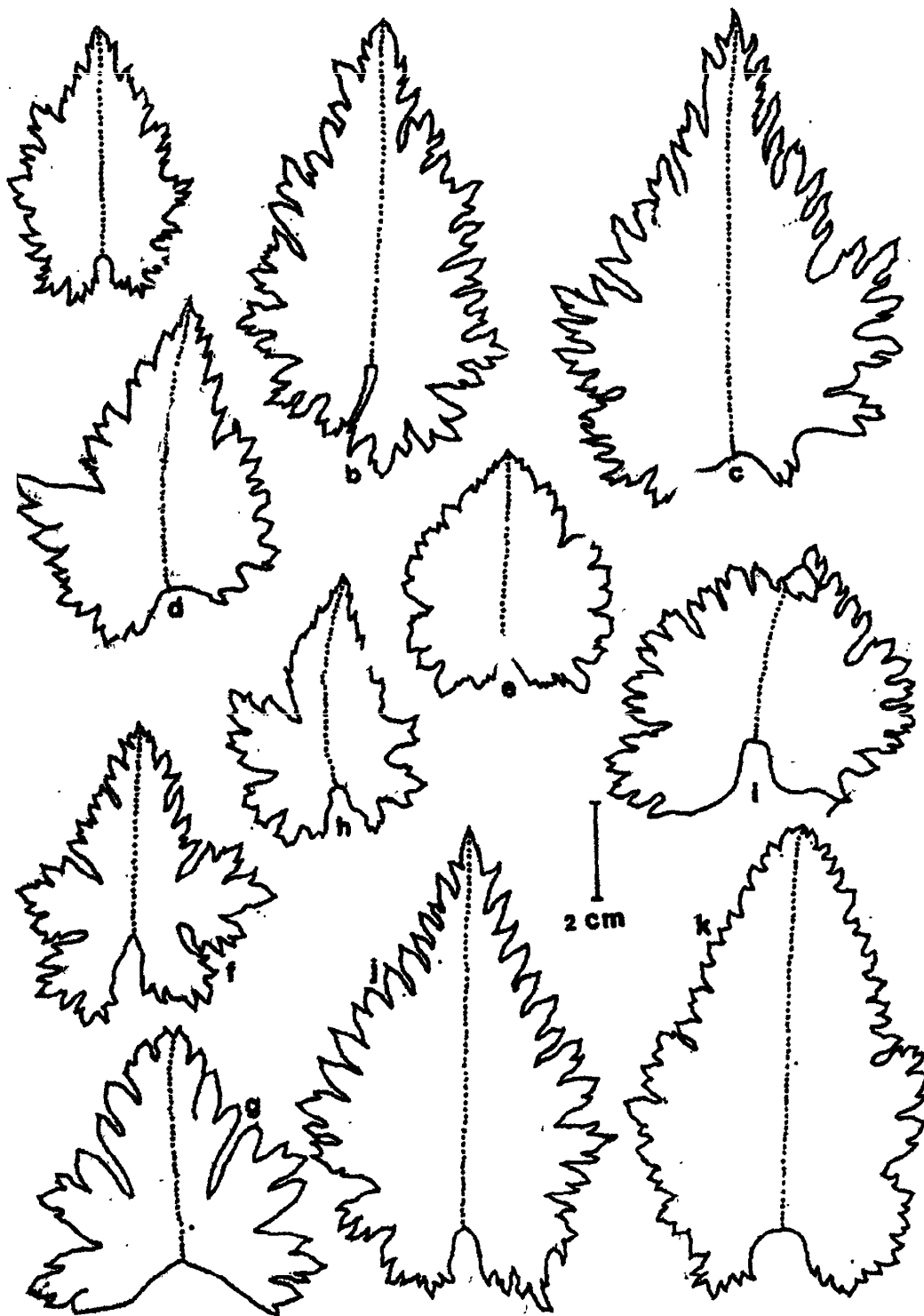


Fig. 1. Variation in leaf (Upper cauline) morphology in different populations : a. Har ki dun, *Saklani* 206220; b. Yammunotri, *Majumdar & Singh* 88075 ; c. Simthan, *Saran & Party* 30129; d. Gurdanda, *Abrol* 3970 ; e. Deoban range, *Singh* 1033 ; f-g. of Neelkanth Parbat *Kapoor & Party* 70318 ; Lahul, *Bhattacharyya* 45217; i. Sarbal, *Wadhwa* 84137 ; j. Kedarnath, *Rau* 8700 ; k. Lahul, *Bhattacharyya* 40736.

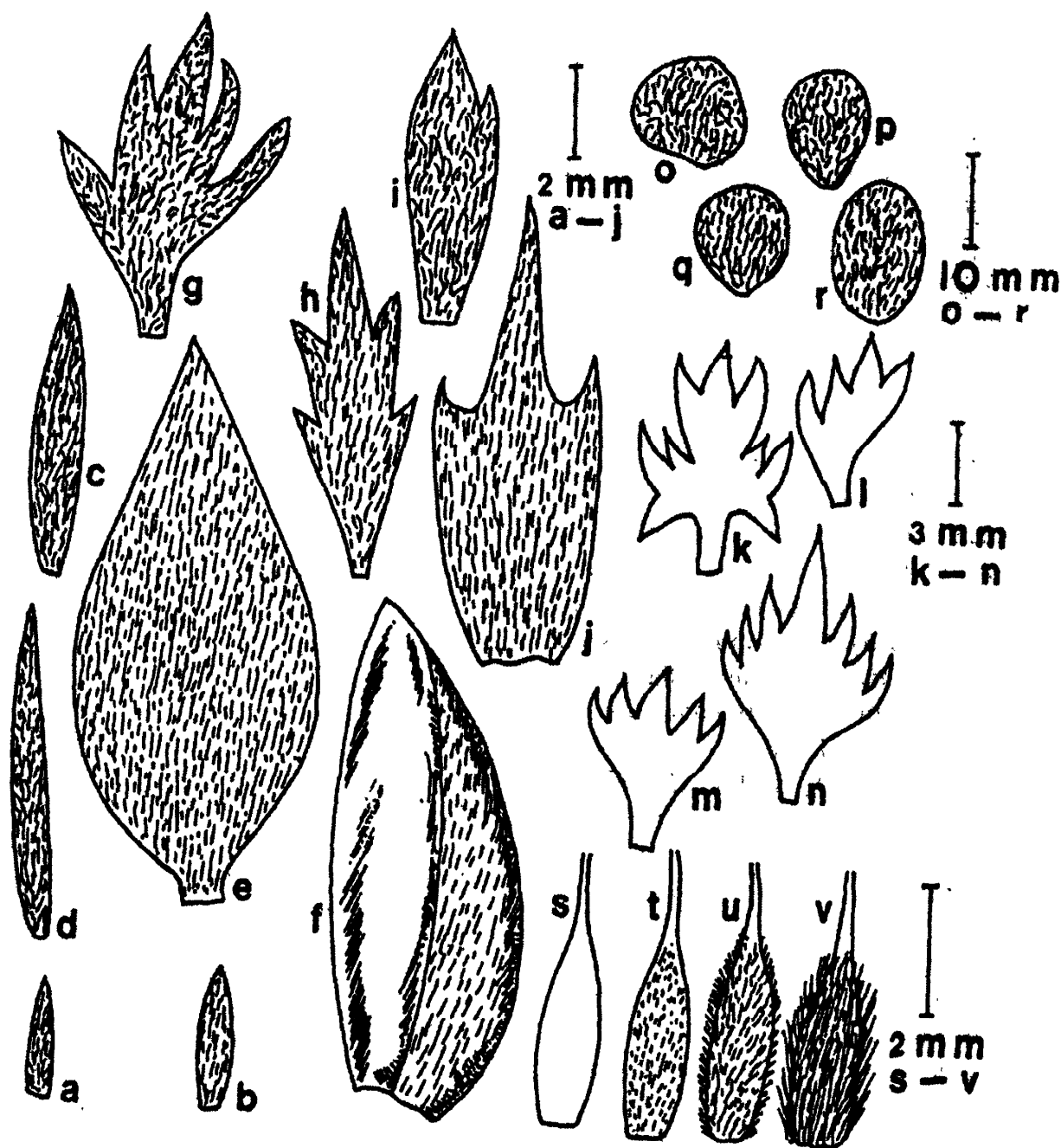


Fig. 2. Variation in bracteole and carpel morphology in different populations : a-r. bracteoles : a-j. *A. heterophyllum* var. *heterophyllum* : a Maralkanda, Sharma & Badola 944 ; b-c. Har ki dun, Saklani 206220 ; d. Har ki dun, Rana & Saklani 210139 ; e. Budha-Madh Maheshwar, Balapure 106447 ; f. Sarbal, Wadhwa & Murti 84085 ; g. Chitkul, Janardhanan 53638 ; h. Har ki dun, Saklani 206220 ; i. Badrinath, Kapoor & Party 70318 ; j. Budha-Madh Maheshwar, Balapure 106448. k-n. *A. heterophyllum* var. *bracteatum*, k-n. Kaghan Deon Bagchee s.n. o-r. *A. heterophyllum* var. *roylei* ; o-r. Simla Dist. 1203 A. s-v. carpels : s. *A. heterophyllum* var. *bracteatum*. Kaghan Deon, Bagchee s.n. ; t-v. *A. heterophyllum* var. *heterophyllum* : t. Ladakh. Wadhwa 59873 ; u. Sarbal, Wadhwa & Murti 84085 ; v. Lahul, Bhattacharyya 45217.

The longest pedicels were observed in Rahlam, Chitkul populations and smallest in Moralkanda (Himachal Pradesh).

The sepals exhibit little variation in nature of pubescence. Generally, they are glabrescent to densely pubescent while in some populations of Gulmarg they are almost glabrous. Helmets show slight variation in size (1.5-2.8 cm) and shape (fig.3).

Although, petals (nectaries) vary considerably among different species of *ACONITUM*, exhibit little variation without any taxonomic significance in this group.

Like bracteoles the carpels also play an important role in differentiating the geographical variants of *A. heterophyllum*. The populations of Saif-muluk lake, Narang and Kaghan Deon reveal completely glabrous (fig. 2s) and black carpels at maturity. Such populations have been placed under the variety *bracteatum* by Stapf (1905). In populations of Banihal ridge, Ladakh-Panikhar, Birodh (Jammu & Kashmir), Kedarnath, Kush, Kalyani, Bhojbasa (Uttar Pradesh) and Keylang (Himachal Pradesh) the carpels are hairy with adpressed hair (fig. 2t) whereas in some populations of Baramula near Shibu in Daruna, Amarnath, Dagwan, Sarbal, Kutti and Marri (Jammu & Kashmir), the ovary is densely tomentose with spreading hair (fig. 2u). Between these two forms the third type also occurs in Zozilla, Keylang and S.W. Srinagar where the ovary is covered with dense,

comparatively longer and adpressed hair (fig.2v).

Habitat, Phenology and Distribution :

Although *A. heterophyllum* has been recorded in alpine and subalpine zones of Himalayas (Stapf, 1905 ; Chakravarty and Chakravarty, 1954) the present investigation reveals its occurrence only in alpine zones particularly near glacier. The species is found in moist situations in irrigated meadows, open pastures, shady slopes, open hill slopes and irrigated fields. The main associates are *Aconitum balfourii*, *GERANIUM*, *ANAPHALIS*, *IMPATIENS*, *PODOPHYLLUM*, *SENECIO*, *SEDUM*, *CYNOGLOSSUM*, *SALIX*, *RHODODENDRON* etc.

The flowering period of the species is usually in the late rainy season which starts from mid July to August. Fruiting starts from September to October. The plants thrive till snowfall in November. The seedlings appear in following June.

Although *A. heterophyllum* is distributed from Kashmir to Nepal the populations are scattered. Habitat destruction and exploitation of tubers by local people for commercial purposes have greatly threatened the species. Although the entire species cannot be conserved in its entire range, priority can be fixed for *insitu* conservation of certain most "desirable" populations. The results of the present study can greatly aid in such an assessment.

The following three distinct varieties can be recognised within *Aconitum heterophyllum*.

KEY TO THE VARIETIES

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|--|-----|------------------------------|
| 1a. Ovary glabrous, bracteoles glabrous, stalked and dissected | ... | 2. var. <i>bracteatum</i> |
| b. Ovary pubescent, bracteoles pubescent, sessile and entire or dissected | ... | 2 |
| 2a. Bracteoles almost rounded, entire, situated near the base of flowers | ... | 3. var. <i>roylei</i> |
| b. Bracteoles filiform to ovate, entire or dissected, situated in the middle or towards the top of pedicel | ... | 1. var. <i>heterophyllum</i> |

Aconitum heterophyllum Wall. (Cat. 167, no. 4722, 1831, *nom. nud.*) ex Royle, *Illustr. Bot. Himal.* 56, t. 13. 1834; Hook.f. & Thoms., *Fl. Ind.* 58. 1855 & in Hook.f. *Fl. Brit. India* 1:29. 1872 *pp*; Stapf in *Ann. R. Bot. Gard. Calc.* 10:151, pl. 100, f. 1-12. 1995; Coventry, *Wild. Fl. Kashmir* 23. 1930, *pp*; Mukerjee in *Bull. Bot. Surv. India* 3:100. 1962; Hara in Hara & Williams, *Enum. Flow. Pl. Nepal* 2:10. 1979; Rau in Sharma *et al.*, *Fl. India* 1:15. 1993; Kadota in *Nat. Envir. Sci. Res.* 10:1. 1997, *pp*; Chaudhary & Rao in *Feddes Rept.* 109:531. 1998.

1. var. **heterophyllum**

A. atees-Royle in *J.As. Soc. Bengal* 1:459. 1832, *nom. nud.*

A. cordatum Royle, *Illustr. Bot. Himal.* 56. 1834.

A. ovatum Lindl. in *Bot. Reg.* 26:53. 1840.

A. heterophyllum ssp. *pauciflorum* Qureshi & Chaudhri in *Pakist. Syst.* 3:6. 1987.

Lectotype (Qureshi & Chaudhri, 1988) : N.W. India, Kumaon, *R. Blinkworth* 4722 a, *Wallich's collection* (K-W); *isolectotype* : (K, E-GL, CAL!).

Distrib. : N.W. Himalayas (India, Pakistan, Nepal).

Specimens examined : HIMACHAL PRADESH : Lahul : Khoksar, Jispa, 3200 m, *Bhattacharyya* 40520 (BSD, CAL) ; Khoksar, 3200 m, *U.C. Bhattacharyya* 44997 (BSD, CAL) ; Khoksar 3425 m, *Nair* 17038 (BSD) ; Keylang (upper), 3200 m, *Bhattacharyya* 45217 (BSD, CAL); Keylang, Kardang, 3500 m, *Bhattacharyya* 40736 (BSD CAL); Sissu, *Bor* 9916 (DD); Pinkar 12000 ft., *Bor* 15481 (DD); Billing lumpa, 14000 ft. *Bor* 16593 (DD); Chitkul near yak farm, 16000 ft., *Janardhanan* 53638 (BSD); Inchu pass 16000 ft.,

Janardhanan 52769 (BSD); Dalhousie, Kalatop proper, 8000 ft., *Drummond* s.n. (DD) ; Dalhousie, *Clarke* 22626 D (DD), 22626 E (CAL); Dalhousie, Sept. 1880, *Coll ?* 89 a (CAL) ; between Dalhousie and Chamba, 6000 ft., *Gammie* 18106 (DD); Panj, *Ellis* 353 (DD); Sach pass, *Lace* 1227 (CAL); Upper Chenab, 8000ft. *Baden-Powel* 55 (CAL); Simla Narkanda, *Drummond* 1020 (DD); Narkanda Govt. Forest, 19.6.1885, *Nanath* s.n. (DD); above Narkanda, *Raizada* s.n. (DD); Simla, Jagu, 8500 ft., *Collect form Gamble* 5455 A (DD) ; Simla, Wahaoa, 9000 ft., *A. Meebold* 8657 (CAL) ; proper Simla, *Drummond* 1019 (DD); Simla 8000 ft., *T.T.* s.n. (CAL); Kull valley, Chanderkhani, 12500 ft. *Vaid* 24686 (DD) Kangra valley, 12000-14000 ft., *Vaid* 24287 (DD); Bashahr State, Chaura, *Raizada* 19831 (DD); Upper Bashahr Forest Div., through O/C M.F.P. Branch s.n. (DD); Rahlam forest, 2800 m, *Rau* 12791 (BSD); Muralkanda (N.E.), 12000 ft. *Sharma & Badola* 944 (LWB).

JAMMU & KASHMIR : Ladakh, Kargil to Panikhar, *Chowdhury & Uniyal* 85903 (BSD); Zozilla, *Hajra*, 74002 (BSD); Panikhar, Suru valley, 3300-4000 m, *Wadhwa* 59873 (BSD); Sarbal, *Wadhwa* 84137 (BSD); Sarbal/Seera Sar, *Wadhwa, Murti & Pant* 84504 (BSD); on way to Amarnath, 3600 m, *Rau* 50318 (BSD, CAL), 4 km from Baltal on way to Amarnath, *Hajra* 74218 (BSD); Gulmarg, *Zambert* 139, 240 (DD); Near Gulmarg, 8000-9000 ft., *Duthie* s.n. (CAL); Gulmarg, 3600 m, *Rao* 238 (BSD); Aliabad, Pir Panjal, 9000 ft., 19.8.1891, *Gammie* s.n. (DD); Hirpar, 6000 ft., *Gammie* s.n. (DD); Dagwan, 3500 m, *Wadhwa* 66957 (BSD); Pir Pass, Banihal ridge 3330-3850 m, *Rao* 7681 (BSD); Near Mahagunas, 13000 ft., *Vaid* s.n. (DD); Liddarwat, 9000-10000 ft., *Duthie* 13536 (DD); Kolhoi glacier, 3500 m, *Wadhwa & Vohra* 299 (CAL); S.W. of Srinagar, *Falconar* s.n. (DD); Near Shibu in Daruna, 12-

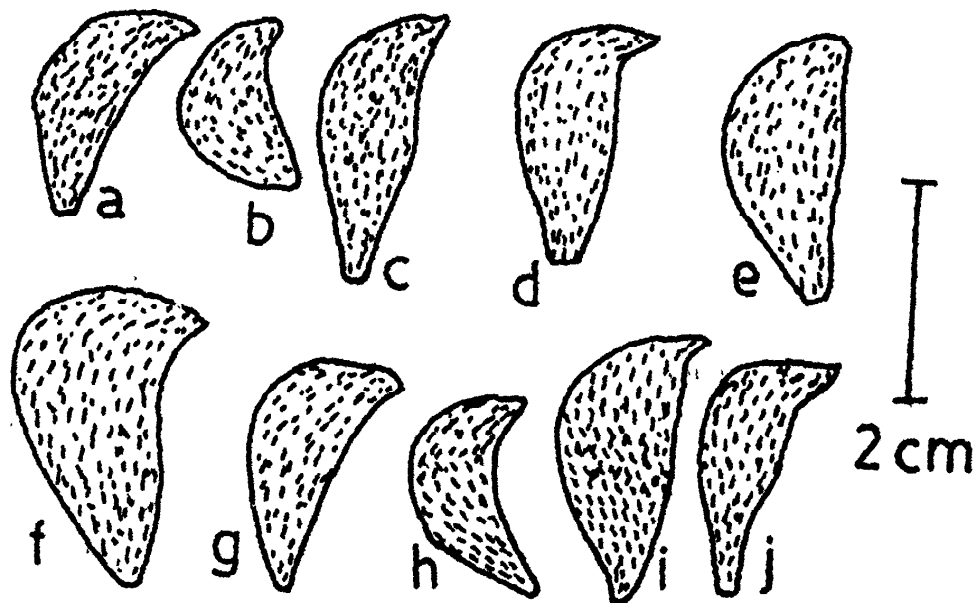


Fig. 3. Variation in helmet morphology in different populations : *A. heterophyllum* var. *heterophyllum*. a. Chitkul, Janardhanan 53638 ; b. Har ki dun, Saklani 206220 ; c. Khoksar, Bhattacharyya 44997 ; d. Keylang, Bhattacharyya 45217 ; e. Kalyani, Goel 67762 ; f. Birodh, Majumdar & Balodi 81526 ; g. Budha-Madh Maheshwar, Balapure 106448, h. Har ki dun, Saklani 206220 ; i. Har ki dun, Rana & Saklani 210139 ; j. Kedarnath, Kapoor & Party 70554.

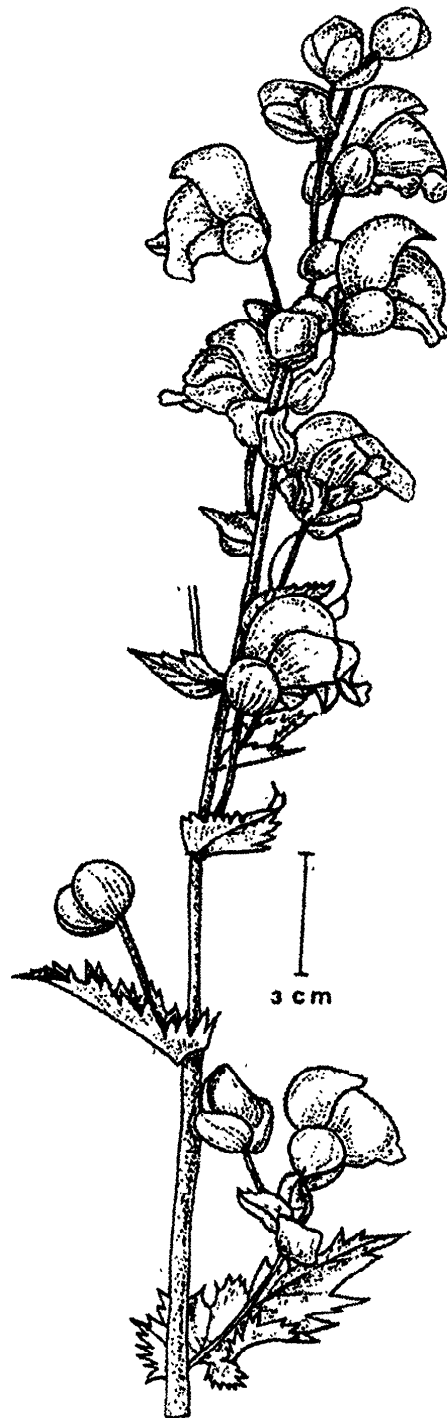


Fig. 4. Habit *A. heterophyllum* var. *heterophyllum*

13000 ft., *Duthie* 2676 (DD); Lowari pan, 9000 ft., *Gataere* 17010, 17013 (DD); Sirmor State, Nahen, 11000 ft., *Forest* s.n. (DD); Upper Munda, 8300 ft., *Saran & Party* 69768 (LWG.).

UTTAR PRADESH : Uttarkashi dist., Bhojbasa, 3800 m, *Bhattacharyya* 748227 (BSD); on the way to Harkidun, 11200 ft., *Rana & Saklani* 210139 (LWG); Harkidun, 11200 ft., *Saklani* 206220 (LWG); above Yamunotri, *Majumdar & Singh* 88075 (BSD); Tehri dist., Kalyani, 3000 m, *Goel* 6772 (BSD); way to Khatling, 3500 m, *Goel* 64488 (BSD); *Birodh, Majumdar & Balodi* 81526 (BSD); Kushkalyan, 3200-3800 m, *Vishwanathan* 54964 (BSD); above Luni, 10000 ft., *Koelz* 21916 (DD); Chinpul, opposite Bandarpunch, 12000-13000 ft., *Duthie* 723a (DD); Ganges valley, near above Defrali, 9000-10000 ft., *Duthie* 1349 (DD); Dudughi, 14000-15000 ft., *Duthie* 723 (DD, CAL); Panwali Kanta, 11000 ft., *Sahni* 21691 (DD); Chamoli, Badrinath, on way to base of Neelkanth parbat, 12000 ft., *Kapoor & Party* 70318 (LWG); Budha-Madh, Mahaeswar, 11200 ft., *Balapure* 106447, 106448 (LWG); Pushtara, 10000 ft., *Sahni* 21903 (DD); Kedar Kanta, *Jaunson* s.n. (DD); Kedarnath, on way to Chamra Bari, 12000 ft., *Kapoor & Party* 70554 (LWG); above Kedarnath, 3800 m, *Nair* 35884 (BSD); Kedarnath glacial valley, 4200 m, *Rau* 8700 (BSD); Rishiganga valley, 3700 m, *Rau* 10549 (BSD); Amnirtganga valley, 3500 m, *Naithani* 42134 (CAL); Jaunsar, Deoban, ca 9000 ft., *Raizada* 7169 (DD); Hagawa, 9000 ft., *Smythie, Watt* p. 19 (DD); Chakrata div., 9200 ft., *Raizada* 118217 (DD); Chakrata div., *Champion* s.n., (DD); Chakrata forest div., *Champion* s.n. (DD); Chakrata forest div. 8800 ft. *Sahni* 26656 (DD); Deoban range, *Singh* 1033 (DD); Kumaon, Surya Kund, 5200 m, *Rao* 7078 (BSD); Pindari, 4200 m, *Chaudhary* 108123 (LWG); Milan glacier, 12500 ft, Anon. 1(CAL); Kutti Gangti valley,

13-14000 ft., *Duthi* 2680 (DD); Bhaghradhi, 11000 ft, *Schlich* s.n. (CAL); Shujua bugyal, 4200 ft., *Chaudhary* 108121 (LWG). Without Locality : *Drummond* s.n. (DD); Aug. 1838, *Falconer* s.n. (DD); Desai, 12000 ft., *Meebold* 3352 (CAL).

2. *Aconitum heterophyllum* var. *bracteatum*

Stapf in Ann. R. Bot. Gard. Calcutta 10:154, pl. 100, f. 13, 1905; Mukerjee in Bull. Bot. Surv. India 3:100. 1962; Stewart in Nasir & Ali, Fl. W. Pakist. 258. 1972; Qureshi & Chaudhari in Pakist. Syst. 4:48. 1988; Chaudhary & Rao in Feddes Repert. 109:532. 1998.

Holotype : Pakistan, Mansehara dist. Kaghan valley, Galli Musalla, the Siran Range, 18.8.1899, *Inayat* 23296 (K).

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

Specimens examined : JAMMU & KASHMIR: Hazara, Kangan, 12200 ft, *Inayat* 19125 (DD); Chittabat, *Gutacre* 7427 (DD); Saif-ul-mukul lake, Narang, Kaghan Deon, *Bagchee* s.n. (DD); Black mountain, Kahi galli, 8000-9000 ft. *Duthie* 9427 (DD, CAL).

Notes : It is very distinct variety of which Kadota (1997) has merged with *A. heterophyllum* var. *heterophyllum*.

3. *A. heterophyllum* var. *roylei* Chaudhary & Rao in Feddes Repert. 109:532, f. 2 o-r, 3. 1998.

Holotype : Marri, 3000 m, Sept. 1885, *M. Douie* 1204, (DD!); isotype : (DD!).

Distrib. : INDIA : [Jammu & Kashmir, Himachal Pradesh (?)] - Endemic.

Specimens examined : JAMMU & KASHMIR : Baramula, letter 1220 (DD); Near Gulmarg. 89000 ft., *Harsukh* s.n. (DD); Jhelum

valley, Pharkian pass, Lolab forest 8000-10000 ft. *Keshwanand* 476 (DD).

Notes : This variety is closely related to var. *heterophyllum* but can be distinguished from the latter by its almost rounded bracteoles which are situated at the top of pedicels.

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