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***Aristolochia* L. in Darjeeling and Sikkim Himalayas**

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Abstract

Present investigation reports the distribution of eight species of *Aristolochia* L. in Darjeeling and Sikkim Himalayas along with their systematic enumeration, key to the identification, flowering and fruiting periods etc.

INTRODUCTION

The Darjeeling and Sikkim parts of the Eastern Himalaya are contiguous and are located between 26°31' and 28°07' N latitude, 87°59' and 89° E longitude. These hills are covering only 9020 sq km area out of the total 1,22,802 sq km area of the Eastern Himalaya (Negi, 1990). Due to the great variation of altitude, width of the hill system etc. wide array of climatic conditions are available in its different parts and most of which generally favour the growth of vegetation cover. The richness of the flora of this region is well known and is having innumerable rare, endangered and interesting plants (Hooker, 1849; Hara, 1966, 1971; Ohashi, 1975; Grierson and Long, 1983, 1984, 1987; Das, 1984, 1995; Das and Chanda, 1987).

Aristolochiaceae is being a chiefly tropical family, represented in India only by the genus *Aristolochia* L.. Hooker (1886) recorded eight of its species from the British India of which *A. atropurpurea* is from Myanmar and *A. bracteolata* is from South India (Deccan). The rest are either widely distributed or are restricted to some parts of the Eastern Himalaya.

A recent survey in Darjeeling and Sikkim Himalayas has recorded all the eight of its species from this area.

MATERIALS AND METHODS

Recent (1994-1996) survey in known and numerous new and probable habitats for *Aristolochia* were visited in different seasons covering an altitudinal range of 110m to 3670m in Darjeeling and Sikkim Himalayas. Only aerial parts of the plants were collected as most of its members are extremely rare and endangered. Specimens were primarily identified in the Taxonomy and Environmental Biology Laboratory of this Department, matched at CAL and are now preserved at North Bengal University-Herbarium.

A.K. Samanta *et al.*

ENUMERATION

Eight species of *Aristolochia* L. have been recorded from Darjeeling and Sikkim Himalayas and are enumerated below along with their references to different floras, distribution, flowering period, local names etc.

Key to the species

Aristolochia L.

1. Leaves unlobed.....2
1. Leaves palmately and deeply 3-lobed *A. platanifolia*
2. Flowers many, in axillary racemes; plants glabrous.....3
2. Flowers axillary, solitary; plants appressed pubescent or glabrous.....4
3. Perianth tube curved; seeds deltoid- ovate, flat, not winged..... *A. indica*
3. Perianth tube straight; seeds triangular flat, narrowly winged.....*A. acuminata*
4. Right handed (dextrorse) twiner.....5
4. Left handed (sinistrorse) twiner*A. cathcartii*
5. Plants glabrous; lamina broader than length, nearly rounded.....*A. elegans*
5. Plants thickly hairy; lamina much longer than breadth6
6. Base of lamina shallowly cordate with lobe wide spaced, never curved back towards the petiole..... *A. nakaoi*
6. Base of lamina deeply cordate with lobes narrowly spaced and generally slightly curved towards the petiole.....7
7. Lamina small, acute, generally 5.0-17 x 3.0-10 cm.....*A. griffithii*
7. Lamina much larger 16-32 x 10-21 cm, acuminate, sometimes slightly caudate.*A. saccata*

Abbreviations used

BP = Bengal Plants (Prain, D.); Bot. Bih. & Ori. = The Botany of Bihar and Orissa (Haines, H.H.); EFPN = An Enumeration of the Flowering Plants of Nepal. (Hara, H. *et al.*); FA = Flora of Assam (Kanjilal *et al.*); Fl. Bho. = The Flora of Bhopal [Oommachan, M.]; FB = Flora of Bhutan (ed. Grierson, A.J.C. & D.G. Long); FEH = Flora of Eastern Himalaya (ed. Hara, H.); FPK = An Enumeration of the Flowering Plants of Kurseong (Matthew, K. M.); Fl. Sikk. Him. = Spring Flora of Sikkim Himalaya (Hara, H.); KB= Kew Bulletin; TNB = Trees of North Bengal (Cowan, A.M. & J. M. Cowan) ; TSDD = Lists of Trees, shrubs and large climbers found in the Darjeeling District, Bengal (2nd ed., Gamble, J.S.).

Aristolochia cathcartii Hook. f. in FBI 5:77.1886; FB 1 (2) :353. 1984.

Medium shrub by sinistrorse twiner. Stem many ridged, wirey with matted brown appressed sericeous hairs, internodes upto 10 cm long, villous. Lamina 5.0-11.1x2.5-6.5 cm, ovate or oboate

***Aristolochia* in Darjeeling**

to lanceolate, entire, acute, base rounded to cordate or acute, brown, membranous, setose above, densely silky brown below. Flowers axillary solitary; perianth sigmoid, covered with long hairs; tube 3.0-4.0 cm long, upper part straight; inflated lobes of limbs square, broad, spreading covered with long purple pappilose hairs; stamens 12 in 3 concentric columns. Capsules 4.0-6.0 cm, ovoid, 6-angled with deep furrows.

Specimen cited : Jalapaharh, Darjeeling, 2250m, 07.05.1994, *Das et Samanta*, 0196.

Aristolochia elegans Mast. in Gard. Chron. 2:301.1885; Fl.Bho. 333.1977.

A medium shrubby glabrous dextrorse twiner. Stem shallowly ribbed, solid yellowish-green; internodes upto 10 cm long. Petioles 0.5-2.5 cm long, terete, yellowish-green, with auriculate or rounded- cordate leaf of an undeveloped bud at the axil; lamina 2.5-5.5 x 2.5-6.5 cm; reniform to cordate, entire, obtuse to rounded, base rounded or dilated, deep upward, membranous, whitish green below, pedately 3-5- nerved. Flowers axillary, solitary; pedicels 5.5-6.5 cm long, slightly ribbed; perianth dark purple or violet- brown; tube elongate and inflated at base, rounded, greenish- yellow, 3.0 x 1.5 cm., nerves parallel, white; limb dilated 1.5-2.0 cm., obliquely 2-lipped, 5.0x 4.5 cm, brown-reticulate. Stamens 6+6, yellow, 0.5 x 0.5 cm. Style very short, lobes 3. Capsule septicidal, 6-valved; seeds numerous, 0.6 x 0.4 cm, broadly ovoid, narrowly winged, gland dotted at base.

Specimen cited : Kalimpong, Darjeeling 1500m, 20.11.1995, *Das et Samanta*, 1062.

Aristolochia griffithii Hook.f. & Thoms. ex Duch. in DC. Prodr. 15 (1) : 437.1864; FBI 5: 77.1886; Fl. Sikk. Him. f. 173.1963; FEH 1:66.1966 & 2:21.1971; EFPN 3: 180.1982; FB 1(2): 353.1984.

Isotrema griffithii (Hook.f. et Thoms. ex Duch.) Fish. in KB 1940:98.1940.

Large woody dextrorse much branched twiner. Young stem articulated, densely wooly, brown, obscurely ribbed, sparsely hairy on rims. Petioles 1.5-5.0 cm long, terete, thickly brown hairy; lamina 5.0-17x3.0-10 cm, broadly ovate to orbicular, entire, acute to shortly acuminate, base auriculate to cordate, membranous, sparsely pubescent above and densely brown tomentose below, young matted with brown-villous throughout, pedately 7-9 nerved at base. Flowers axillary, solitary; pedicels 1.5-4.5 cm long, with two leafy bracteoles 1.0-1.5x0.5-0.7 cm. Perianth sigmoid, closely pubescent; lower tube 3.5-4.5 cm, upper inflated; mouth constricted, rhombic-orbicular with a strongly greyish-brown striations within, thickly villous outer; Column 3-lobed, 0.3 x 0.2 cm. Stamens 12, 4 each in 3- whorls; anthers sessile. Ovary cylindric, 2.5-5.0 cm, subsessile; ovules numerous, in 4-rows. Capsules 18x2.5 cm, folded at base with 6 strong ribs; seeds 0.4-0.6 cm, ovoid.

Specimen cited : Alubari, Neora Valley National Park, Darjeeling, 2480m, 23.04.1995, *Das et Samanta* 0596.

A.K. Samanta *et al.*

Aristolochia indica L. Sp. Pl. 960.1753; FBI 5:75.1886; BP 2: 891.1903; Bot. Bih. & Ori. Pt. 5:785.1924.

A. lanceolata Wt., Ic. t.1858.1852.

A medium suffrutescent dextrorse twiner. Stem 4-5, ribbed, solid, greenish, glabrous. Petioles 1.0-1.5 cm long, glabrous; lamina 5.0-9.0 x 0.2.0-4.0 cm, obovate-oblong, with a shallow sinus near base on each side otherwise entire, shortly acuminate to apiculate, base shallowly cordate- cuneate, membranous, nerves 3, glabrous on both surfaces midvein distinct and thick. Bracts opposite to base of peduncle. Flowers 1-5 in a short axillary raceme; pedicels 0.5-2.0 cm, glabrous; perianth slightly curved, base globose, 0.5-0.6 cm in diam, tube slender, curved, 1.5-2.0 cm, with middle notch 0.2-.03 cm, upper portion flat, glabrous. Stamens 6, in a column c 0.2 cm, anthers c 0.15 cm. Ovary cylindrical, ribbed. Capsules 3.0-3.5cm long, globose-oblong, ribbed, 6-valved, with persistent style nearly glabrous, greyish black on ripening. Seeds deltoid-ovoid, flat.

Specimen cited : North Bengal University Campus, 120m, 10.11.1995, *Das et Samanta* 1061.

Aristolochia nakaoui Mackawa in Fauna & Fl. Nep. Himal. 113, f.14.1955; FEH 2:21.1971; EFPN 3: 180.1982; FB 1(2): 353.1984.

Isotrema nakaoui (Mackawa) A. R. Smith in Bot. Mag. Tokyo 178 : sub.t. 576.1970.

Similar to *A. griffithii* with the following differences as: stem and leaves densely tomentose beneath: flowers densely brown-hirsute; perianth tube 3.0-4.0 cm long, folded; sac feebly inflated at base; mouth 4.0-6.0 cm across, subtriangular; anthers 6 in a column.

Specimen cited : Nandugaon (Jorethung), Sikkim. 840m, 21.05.1995, *Das et Samanta* 1123.

Aristolochia platanifolia (Klotz.) Duch. in DC., Prodr. 15 (1): 437.1864; FBI 5: 76.1886; TSDD 64.1896; TNB 104.1929; FPK 88.1981; EFPN 3: 180.1982; FB 1 (2) : 354.1984.

Siphisia platanifolia Klotz. in Monatsb. Akad. Wiss. Berl.1859:603.1859.

Large stout sinistrorse twiner. Stem obscurely 4-ribbed, solid, pubescent. Petioles 5.0-5.5 cm long, pubescent; lamina 15-24x12-20 cm, broadly ovate, digitately 3-lobed, mid-lobe often 3-lobed, dentate, each lobe 1.0-3.0 cm broad, acuminate, base rounded to cuneate, nerves 3 at base, glabrous above, pubescent below, dense on veins. Flowers and fruits not seen .

Specimen cited : North Point, Darjeeling, 1950m, 04.10.1994, *Das et Samanta* 0386; Pungthung, Sikkim, 1900m, 02.11.1995, *Das et Samanta* 1015.

***Aristolochia* in Darjeeling**

Aristolochia saccata Wall., Pl. Asiat. Rar. 2, t. 103. 1830; Graham in Bot. Mag. 65: t. 3640. 1839; FBI 5: 76. 1886; EFPN 3: 180. 1982.

Siphisia saccata (Wall.) Klotz. in Monatsb. Akad. Wiss. Berl. 1859: 603. 1859.

Large woody dextrorse twiner. Stem terete, appressed villous; internodes 10-15 cm long. Petioles upto 10 cm long, shallowly ribbed; lamina 16-32x10-21 cm, broadly ovate or ovate-lanceolate, entire, acuminate, base deeply cordate, membranous, glabrous above except on veins, densely matted sericeous brown beneath. Flowers axillary, solitary, blackish-brown, villous; pedicels very short; perianth tube 1.5-2.0 cm long, mouth rounded, rows of purple veins distinct, venation reticulate, yellow within. Capsules obovoid, many-angled.

Specimen cited : Samsing, Darjeeling, 400m, 29.01.1995, *Das et Samanta* 0513.

Aristolochia acuminata Lam., Encycl. Meth. 1: 254. 1783.

A. tagala Cham. in Linnaea 7: 207. t. 5, 3. 1832; TNB 103. 1929; FA 4: 28. 1940; FEH 3: 29. 1975; EFPN 3: 180. 1982; FB 1 (2): 354. 1984.

A. roxburghiana Klotz. in Monatsb. Akad. Wiss. Berl. 1859: 596. 1859; FBI 5: 75. 1886; FA 4: 28. 1940.

Large shrubby dextrorse twiner. Stem 4-6 ribbed, hollow, nearly glabrous, shiny, internodes upto 12 cm long. With auriculate undeveloped bud at axil. Petioles 2.0-5.0 cm long, ribbed, glabrous; lamina 11-16x5.5-8.0 cm, broadly ovate, entire, acuminate to caudate, base broadly and spreadingly cordate, membranous, glabrous on both surfaces, greenish-yellow, veins pectately 6-7-nerved. Bracts subulate. Racemes axillary, 5.0-9.0 cm; peduncles glabrous; pedicels 0.5-0.8 cm long. Perianth 1.5-2.0 cm, tubular, straight, basal 0.3-0.5 cm, globose; mouth oblique, notched; lower lip elongate, 2.0-2.5 cm, oblong, nearly glabrous, deep purplish. Stamens 6; anthers 4-lobed. Capsules 3.0-7.0x2.5-3.0 cm, oblong, with 3.0-4.5 cm long stalk, 6-chambered, septicidal. Seeds 0.7x0.8 cm, triangular, flat, narrowly winged, c 0.1 cm, tubercle.

Specimen cited : Mongpoo, Darjeeling, 1300m, 13.12.1994, *Das et Samanta* 0465.

DISCUSSION

Table 1 has summarized the recorded information on species of *Aristolochia* L. from Darjeeling and Sikkim Himalayas. Out of recorded eight species *A. indica* was never before spotted in these areas which is generally known to grow in warmer parts of the country. *A. nakaoui* was earlier recorded from Nepal (Hara, 1971; Hara *et al*, 1982), Sikkim and Bhutan (Grierson and Long, 1984); Bhujel (1996) have recorded it from Gairibas in Darjeeling.

A.K. Samanta *et al.*Table 1: Summary of informations on flowering, fruiting and distribution of eight species of *Aristolochia* L. reported from Darjeeling and Sikkim Himalayas.

Abbreviations used: Categories: CE = Critically Endangered; E = Endangered; V = Vulnerable. Distribution: Aruna = Arunachal Pradesh; Asa = Assam; Bhu = Bhutan; Ind = India; Mg = Meghalaya; Nep = Nepal; S = South; Sk = Sikkim; Sri = Sri Lanka; W = West; WB = West Bengal. Local Name: B = Bengali; H = Hindi; N = Nepali. Months: Jan = January; Feb = February; Mar = March; Apr = April; Jun = June; Jul = July; Aug = August; Sep = September; Oct = October; Nov = November; Dec = December. Status: C = Common; LC = Less common; R = Rare. Miscellaneous: Alt = Altitude; Gen = General; m = Meter; Trop = Tropical; NR = Not recorded.

Species	Local name	Alt Distrib in m	Darjeeling	Sikkim	Flowering	Fruit ripening	Categories/ status	General Distribution
<i>Aristolochia acuminata</i>	-	110-1600	+	+	May- Jun	Dec-Feb	V/C	Ind: WB, Sk, Mg; Nep, W&S China, Sri, Philippines, Malagasy
<i>A. cathcartii</i>	-	1500-2300	+	+	Mar-Apr	Apr-Aug*	V/LC	Ind: Sk, WB, Mg; Bhu
<i>A. elegans</i>	B: Hansalata	-1500	+	-	Nov-Dec	Dec-Jan	LC	A native of Trop America
<i>A. griffithii</i>	-		+	-	Apr- May	Jan- Aug	CE/LC	Ind: Aruna (NEFA); Nep, S. Tibet
<i>A. indica</i>	B & H: Ishermul	-150	+	-	Aug-Oct	Oct-Dec	R	Ind, Nep, Sri
<i>A. nakaoi</i>	-	800-3000	+	+	Mar- Jun	Jun- Aug	CE/R	Ind: Sk; Nep, Bhu
<i>A. platanifolia</i>	-	1500-2000	+	+	Spt- Oct*	Dec- Jan*	E/R	Ind: WB, Sk, Asa, Aruna (Mismi Hill); Nep
<i>A. saccata</i>	N: Tenga Lahara	400-2500	+	-	Mar*	Jul- Aug	E/LC	Ind: WB, Asa; Nep, Bhu

* from previous records.

Aristolochia in Darjeeling

Except *A. acuminata* and *A. indica* (in foot-hills) all other species are extremely rare. *A. griffithii* was found in different parts of Neora Valley National Park and rarely around Meghma in Darjeeling Hills. *A. nakaoi* was collected from a place near Jorethung; *A. cathcartii* and *A. platanifolia* were recorded from the vegetation around Darjeeling only. *A. saccata* too prefers a warmer habitat and was collected from Samsing (400m) and Latpunchor (1200m) only, though Bhujel (1996) found it in Neora Valley National Park (2500m). All these five species [*A. cathcartii*, *A. griffithii*, *A. nakaoi*, *A. platanifolia* and *A. saccata*] appear to be extremely rare and are represented by solitary or few plants only.

Many species of *Aristolochia* are favourite ornamentals for their beautiful swan like or horn like flowers (Bailey, 1949; Lawrence, 1951) and species like *A. elegans*, *A. ornithocephala*, *A. ringens* etc. are sometimes grown in gardens in this locality of which *A. elegans* is recorded in seminaturalised condition.

The known antiserpentine property of *A. indica* helped its introduction in the medicinal plants gardens.

Analysis on the distribution of all the recorded species revealed that only *A. nakaoi* is endemic to Eastern Himalaya; *A. cathcartii* has extended its distribution in North East India (Meghalaya) and the distribution of *A. griffithii*, *A. platanifolia* and *A. saccata* are almost restricted in the Himalayas. While *A. indica* is widely distributed in Indian subcontinent. The distribution of *A. acuminata* is much wide in the hilly regions of Southern India (Deccan), Sri Lanka, Philippines, etc.

However, the concentration of all these species, intraspecific variabilities and their pattern of distribution indicates that differentiation within the genus is active in this part of the Himalayas. Probably species under section *Diplolobus* (*A. indica* and *A. acuminata*) are migrated into this region and of section *Siphisia* (*A. cathcartii*, *A. griffithii*, *A. platanifolia* and *A. saccata*) are original Himalayan plants.

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A.K. Samanta et al.

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