

NOTES ON SOME NEW DISTRIBUTIONAL RECORDS OF PLANTS FROM ARUNACHAL PRADESH

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Abstract

The paper highlighted eleven species which are having a new distributional records from Arunachal Pradesh, viz. *Delphinium viscosum* Hook.f.; *Ranunculus trivedii* Aswal & Mehrotra; *Berberis angulosa* Wall. ex J. D. Hook. & Thom.; *Berberis virescens* Hook.f. & Thomson; *Mahonia pycnophylla* (Fedde) Takeda; *Corydalis diphylla* Wall.; *Cardamine flexuosa* With.; *Cardamine griffithii* Hook.f. & Thomson; *Lepidium didymum* L.; *Crucihimalaya wallichii* (J.D. Hooker & Thomson) Al-Shehbaz *et al.*, and *Cleome rutidosperma* DC. The scrutiny of literature ascertained that the occurrence of these species in the state was not known and they were misidentified and kept in ARUN herbarium, Botanical Survey of India, Itanagar.

Keywords: Diversity; Distribution; New records; Arunachal Pradesh

INTRODUCTION

Arunachal Pradesh, by virtue of its geographical position, climate conditions and altitudinal variations, is a biodiversity rich region in North East India, with large zone of tropical wet evergreen, subtropical, temperate and alpine forests. The state is recognized as one among the 200 globally important regions (Olson and Dinerstein, 1998). The flora of Arunachal Himalaya comprises well over 4055 species of flowering plants (Hajra *et al.*, 1996).

During the course of critical studies and consultation of herbarium specimens at CAL for the exploration under the project "Flora (Angiosperms) of East Kameng District" (2015-2019) of Botanical Survey of India, the author has come across an old collections are kept as unidentified or wrongly identified in Herbarium (ARUN). After a critical study and examinations it is turned out to as new records for the state (Sharma *et al.*, 1993; Hajra *et al.*, 1996; Grierson and Long 2001; Das and Mao 2011; Bhaumik and Satyanarayana 2014). A critical examination of the literature revealed that so far these plants species were not been reported from the state of Arunachal Pradesh. Therefore, these plants are reported here with

complete description, herbarium image and relevant notes based on collector's information provided to facilitate easy identification.

TAXONOMIC ENUMERATIONS

1. *Delphinium viscosum* Hook.f. & Thomson [RANUNCULACEAE] (Figure 1)

Erect herb; stem 15-80cm, glandular-pubescent above; leaves suborbicular, 5-12cm broad, divided to middle into 6-10 lobes, toothed at apex, petiole up to 20cm long; flower dull purple; 1-5, lax raceme; bracts oblong, 3-5cm, entire or lobed; bracteoles similar, 1-2cm, born near flowers; lamina of upper sepals 18-23mm long and broad; spur *ca* 10-15 × 5-8mm; lateral sepals 22-25 mm long and broad; lamina of upper petals divided into 2 narrow lobes *ca.* 3mm at apex; lamina of lower petals oblong 10-3mm, bifid to below middle into linear lobes, stiffly pubescent.

Specimens examined: INDIA: Arunachal Pradesh, Tawang district, on the way to B.J. Gompa 2118 m, 09.09.2003, *Bipin Balodi 13077!* (1 accession) (ARUN).

Phenology: April-August.

Distribution and habitat: This species occur in alpine cliff edges, screes and gravels. In India: Sikkim (Sharma et al., 1993) & Arunachal Pradesh; Nepal and Bhutan (Grierson & Long 1984).

2. *Ranunculus trivedii* Aswal & Mehrotra
[RANUNCULACEAE] (Figure 2)

Synonyms: *Ranunculus salsuginosus* D. Don [Illegitimate]; *Ranunculus lobatus* Jacquem. ex Cambess. [Illegitimate]; Type: Kunawar, *Jacquemont 677* (K!)

Perennial herbs forming clumps with fine fibrous roots; stem several decumbent, 5-7 cm high, bearing leaf rosettes. Radical leaves 1-2.5 cm in diam., long petioled; lamina, rounded, sub orbicular, cordate at base, margins teeth rounded, sometimes deep forming lobes, coriaceous, nearly glabrous, dark green above, pale green beneath; cauline leaves, 3-lobed, shorter petioled; peduncle 3.5-7.0 cm long, appressed hairy. Flowers solitary, 1.5-2.5 cm in diam., yellow. Sepals ovate to ovate-oblong, 4-5 mm long, glabrous, rounded at apex. Petals obovate to ovate-oblong, 4-7 cm in diam. Achenes ca 1.5 mm in oval head, slightly compressed, terminated by the long straight style as beak.

Specimens examined: INDIA: Arunachal Pradesh, Lower Subansiri district, on way to Talle Valley 2600m, 19.04.1980, *G.D. Pal 77726!* (4 accessions) (ARUN).

Phenology: June - August.

Distribution and habitat: This species occur in marshy places. In India: Jammu & Kashmir (Ladakh), Himachal Pradesh, Uttarakhand, Sikkim, Arunachal Pradesh; Pakistan; Nepal; Bhutan; China (W. Tibet).

3. *Berberis angulosa* Wall. ex J. D. Hook. & Thom. [BERBERIDACEAE] (Figure 3)

Shrubs, deciduous, upto 2 m tall. Branches dark brown, pubescent, sulcate; shoots yellow-brown, puberulous; spines simple or 3-fid, 7-12mm, slender, rarely puberulous. Leaf blade abaxially shiny, pale yellow-green, adaxially shiny, yellow-green, obovate, 1.5-2.5 × 0.7-1.4 cm, papery, both surfaces glabrous, inconspicuously veined, base cuneate, margin entire, apex obtuse or acute. Flowers solitary. Pedicels pendulous, 3-5 mm, pubescent; bracteoles ovate, ca. 3.5 × 2 mm, apex acuminate. Sepals in 2 whorls; outer sepals elliptic, ca. 5.5 × 3.5 mm; inner sepals obovate, ca. 9.2 × 6.1 mm. Petals obovate, ca. 6 × 4.8 mm, base clawed, glands separate and oblong, apex entire, rounded. Stamens ca. 4 mm; anther connective slightly prolonged, rounded. Ovules 6, subsessile. Berry shiny, red, subglobose, 10-12 × 9-12 mm, not pruinose, style persistent or not. Fl. May-Jun, fr. Jul-Aug.

Specimens examined: INDIA: Arunachal Pradesh, West Siang district, on way to Lamang 3000 m, 16.06.2012, *M. Bhaumik 278157!* (3 accessions) (ARUN); Tawang district, on way to Tawang Top 3900 m, 22.06.2002, *Bipin Balodi 11649!* (1 accession) (ARUN).

Phenology: June-October.

Distribution and habitat: This species occur alpine meadows. In India: Sikkim (Sharma et al., 1993) & Arunachal Pradesh; Nepal, Bhutan and China (Grierson & Long, 1984). Sparse forests, thickets, grasslands; 3500-4500 m.

4. *Berberis virescens* Hook.f.
[BERBERIDACEAE] (Figure 4)

Shrubs, deciduous, 1-1.5m tall. Branches dark purplish red or dark gray, terete, scarcely verruculose; shoots pale red, angulate; spines simple or 3-fid, 7-17mm. Leaves subsessile;

leaf blade abaxially pale yellow-green, adaxially dark green, oblong-obovate, 1.5-2.7 cm × 6-10 mm, papery, midvein flat, lateral veins 2 or 3 pairs, abaxially not pruinose, midvein inconspicuous, base cuneate, margin entire, apex obtuse or mucronate. Inflorescence a subumbel or umbellate raceme, 4-6-flowered, 1.5-2.7cm including peduncle 6-8 mm, sometimes with 1 or 2 fascicled flowers at base. Pedicels 6-11 mm; bractlets oblong-lanceolate, ca. 4 × 2 mm. Flowers pale yellowish green. Sepals in 2 whorls; outer sepals obovate, ca. 6 × 4 mm; inner sepals broadly obovate, ca. 6 × 5 mm. Petals obovate, ca. 5 × 3 mm, base clawed, with separate glands, apex entire. Stamens ca. 3.5 mm; anther connective prolonged, conical-apiculate. Ovules 4 or 5. Berry red, ovoid, 8-10 × 3.5-4.5 mm, not pruinose; style persistent, short. Fl. May-Jun, fr. Jul-Sep.

Specimens examined: INDIA: Arunachal Pradesh, West Siang district, on way to Lamang 3000m, 16.06.2012, *M. Bhaumik 27807!* (3 accessions) (ARUN).

Phenology: June-October.

Distribution and habitat: This species occur in alpine meadows. In India: Sikkim (Sharma et al., 1993) & Arunachal Pradesh; Nepal and Bhutan (Grierson & Long 1984).

5. *Mahonia pycnophylla* (Fedde) Takeda [BERBERIDACEAE] (Figure 5)

Synonyms: *Mahonia nepalensis* var. *pycnophylla* Fedde (Type: Meghalaya: Khasia Hills, Tserra, 1600-2000m., Griffith 450 (K).

Leaves 31 × 16 cm., oblong, with 5-6 pairs of mostly contiguous leaflets; the basal pair 3.5-4 × 3 cm., set 5-10 mm. above the base; the internodes of the remainder decreasing from 8 to 3-7 cm. passing up the rachis. Leaflets thick, rigid; apart from the basal pair, ovate and fairly equal in size 9-11 × 4-5-5 cm.; bases

truncate subcordate; margins 3-5-spinose, serrate 1-5-3mm.; apical cusp inconspicuous, 2-5 × 1.5 cm. ; above sublustrous with indistinct sub-elevated reticulation; below scarcely paler, dull, with venation branched and scarcely even subreticulate. Racemes 12-22 cm. fascicled c. 10; bracts of the inflorescence c. 12 × 7 mm. Pedicels slender, 5-7 mm.; bracts 1-5-2 mm. Outer sepals 2-2.5 × 2 mm, ovate-obtuse. Median sepals 5-6 × 3 mm, ovate. Inner sepals 7 × 3-5 mm., elliptic. Petals 5-5.5 × 2-5-3 mm., narrowly obovate, with distinct glands. Stamens 3.5 mm., conical apiculate. Ovules 2. Style very short.

Specimens examined: INDIA: Arunachal Pradesh, Lower Subansiri district- Talle valley, 2500m, 18.04.1980, *G. D. Pal 77704!* (3 accessions) (ARUN) and Subansiri district, 2400m, 02.12.1964, *A.K. Sastry 41020!* (1 accession) (ARUN).

Phenology: May-August.

Distribution and habitat: Species occur along steam in open slopes from 1500-2000m. In India: Arunachal Pradesh & Meghalaya and China.

6. *Corydalis diphylla* Wall.

[FUMARIACEAE] (Figure 6)

Synonyms: *Corydalis rutifolia* auct. non (Sibth. & Sm.) DC.; *Corydalis pauciflora* auct., non (Steph. ex Willd.) Pers.

Herbs, perennial with tuberous rootstock; aerial stem 15-40cm tall, erect, usually unbranched, glabrous, subglaucous, without radical leaves. Cauline leaves 2, usually opposite, 5-25cm long, 2-3-ternate, compound, petiolate with petiole usually longer than petiolules; ultimate segments or lobes (leaflets) usually elliptic-oblong, entire or subentire, subfleshy, unequal to subequal in size, terminal or middle lobe of each group of

5 lobes largest, 10-45 mm long, 5-10mm broad, excluding the petiolules, sometimes almost sessile, 3-5 somewhat parallel veined. Racemes 5-15 flowered, lax, exceeding the cauline leaves, 5-15cm long; bracts ovate-oblong to lanceolate, 8-20mm long, 3-5 mm broad, entire or subentire, sessile with broad bases, acute. Flowers 15-25mm long (from spur base to the apex of upper petal), showy, purple or bright orange-yellow with violaceous-pink darker tips; spur as long or a little longer than the lamina of upper petal, infundibuliform to sub-cylindrical, usually conspicuously up curved with \pm down curved base. Sepals 1-1.5mm in diameter, sub-orbicular, denticulate. Lamina of upper petal broad, usually 7-10mm wide, somewhat up curved, with emarginate apex; lamina of lower petal \pm similar to that of upper petal. Inner petals narrow, much smaller than outer petals. Pedicels often exceeding the bracts in fruit, spreading to deflexed. Capsules oblong-elliptic to oblong-ovate, 10-15mm long, 4-5mm broad, abruptly narrowed at the apex with 3-4 mm long style, curved above with dilated stigma; valves somewhat tumid, parallel-veined, slightly brownish; seeds biseriate, usually 5-8, *ca* 2 mm in diameter, shining black.

Specimens examined: INDIA: Arunachal Pradesh, West Siang district- Lamlang-Lolla pass, 3200m, 17.06.2012, *M. Bhaumik* 27852! (2 accessions) (ARUN).

Phenology: May-August.

Distribution and habitat: This species occur along wet meadows, near open moist slopes from 2500-3500m. In India: N.W. Himalaya, Arunachal Pradesh and China.

7. *Cardamine flexuosa* With.

[BRASSICACEAE] (Figure 7)

Synonyms: *C. hirsuta* subsp. *flexuosa* (Withering) J. D. Hooker

Herbs annual or biennial, 6-50cm tall, sparsely to densely hirsute basally or throughout, or glabrous. Stems erect, ascending, or decumbent, 1 to several from base, simple or branched, flexuous or straight. Basal leaves not rosulate, often withered by anthesis, petiolate; leaf blade 2-14cm, lyrate; terminal lobe reniform, broadly ovate, or suborbicular, repand or 3-5 lobed; lateral lobes, 1-7 on each side of midvein, petiolulate or subsessile, oblong, ovate, or elliptic, smaller than terminal lobe, entire, repand, crenate, or 3 to 5 lobed. Cauline leaves 3-15, including petiole 2-7cm; petiole base not auriculate; terminal lobe 3-5-lobed; lateral lobes 2-7 on each side of midvein, suborbicular, ovate, oblong, oblanceolate, or linear, similar to or slightly smaller than terminal lobe, sessile or shortly petiolulate, entire, repand, dentate, or 3 to 5 lobed. Fruiting pedicels divaricate or ascending, 5-17mm, slender. Sepals oblong, 1.5-2.5 \times 0.7-1 mm. Petals white, spatulate, 2.5-5 \times 1-1.7 mm. Stamens 6, rarely 4 and lateral pair absent; filaments 2-3 mm; anthers ovate, 0.3-0.5 mm. Ovules 18-40 per ovary. Fruit linear, 0.8-2.8 cm \times 1-1.5 mm; valves glabrous, torulose; style 0.3-1.5 mm. Seeds brown, oblong or subquadrate, 0.9-1.5 \times 0.6-1 mm, narrowly margined or not.

Specimens examined: INDIA: Arunachal Pradesh, West Kameng district- Bomdila, 2700m, 26.03.1994, *G.D Pal* 6156! (3 accessions) (ARUN).

Phenology: April-August.

Distribution and habitat: This species occur alpine cliff ledges, screes and gravels. In India: Sikkim (Sharma et al., 1993) & Arunachal Pradesh; Nepal and Bhutan (Grierson & Long 1984).

8. *Cardamine griffithii* Hook. f. & Thomson

[BRASSICACEAE] (Figure 8)]

Herbs perennial, 20-110cm tall, glabrous throughout except for leaflet margin. Rhizomes creeping, without stolons. Stems erect, simple or branched above, striate angled, 9-35 leaved. Leaves sessile, cauline; lower and middle ones 1-11 × 0.7-4.5 cm; terminal leaflet orbicular, broadly ovate, or obovate, 0.5-3.5 × 0.3-2.5 cm, with a petiolule 2-15mm, base subcordate, rounded, or rarely cuneate, margin repand or entire and sparsely ciliate, apex obtuse or rounded; lateral leaflets 2 to 5 pairs, slightly to distinctly smaller than terminal one, base obtuse or rarely slightly oblique, margin entire or repand and sparsely ciliate, apex obtuse or rounded; proximal pair of lateral leaflets auriclelike, attached at or just above node, often giving appearance of amplexicaul leaf base. Uppermost leaves smaller. Fruiting pedicels ascending. or divaricate, 0.4-1.5cm, slender, straight. Sepals ovate or oblong, 2.5-3 × 1.5-2 mm, erect. Petals purple or lavender, spatulate or obovate, 6-9 × 2.5-5 mm, not clawed, apex rounded or subemarginate. Staminal filaments erect, median pairs 3.5-4.5mm, lateral pair 2.5-3mm; anthers oblong, 0.9-1.1 mm. Ovules 10-22 per ovary. Fruit linear, 1.5-4 cm × 0.9-1.2 mm; gynophore 0.5-1 mm; valves smooth, glabrous; style 0.5-2mm; stigma 2-lobed, distinctly broader than style. Seeds brown, oblong, 1.4-1.7 × 0.8-1.1 mm, wingless.

Specimens examined: INDIA: Arunachal Pradesh, West Siang district- Near lolla pass, 3200m, 17.06.2012, *M. Bhaumik* 27866! (2 accessions) (ARUN).

Phenology: May-September.

Distribution and habitat: It has wide range of distribution from India, Nepal, and Bhutan to China. This species occur in slopes, valleys, stream sides, pastures, marshy places, moist forest floor, shady rocky areas; 2400-4500 m.

9. *Lepidium didymum* L. [BRASSICACEAE] (Figure 9)

Synonyms: *Coronopus didymus* (L.) Sm.; *Senebiera pinnatifida* DC.

Herbs annual or rarely biennial, fetid, 10-70cm tall, glabrous or pilose with straight trichomes to 1 mm. Stems procumbent or erect, usually several from base, branched above. Basal leaves not rosulate, pinnatisect or bipinnatisect, 4-10cm; lateral lobes 2-10 on each side of rachis, variable in size, entire, dentate, or incised, acute. Middle cauline leaves similar to basal ones, 1.5-4.5 × 0.5-1.2 cm, progressively smaller and less divided upward, shortly petiolate to sessile; lobes lanceolate to oblong or elliptic, entire to serrate or incised. Racemes terminal or lateral and leaf opposed. Fruiting pedicels slender, ascending to divaricate or slightly reflexed, straight or recurved, 1.5-4mm, glabrous or pubescent. Sepals ovate, 0.5-0.9mm, ascending to spreading, glabrous or pubescent. Petals white, elliptic to linear, 0.4-0.5 mm. Stamens 2 or rarely 4, median; filaments white, dilated at base, 0.3-0.6mm; anthers ovoid, 0.1-0.2 mm. Fruit 1.3-1.7 × 2-2.5 mm, didymous, compressed, emarginate at apex and base; valves subreniform, semicircular, or suboblong, prominently reticulate or rugose, rounded on back; style absent, sometimes obsolete, included in apical notch. Seeds oblong, curved, finely reticulate, 1-1.2 × 0.7-0.8 mm.

Specimens examined: INDIA: Arunachal Pradesh, Anjaw district- Near Kuppa, 15.05.2011, *R. Gogai* 24027! (2 accessions) (ARUN).

Phenology: May-July.

Distribution and habitat: It has wide range of distribution in India, Nepal, Bhutan, China could be naturalized and native of South America. Up to 1000-1200 m.

10. *Crucihimalaya wallichii* (J. D. Hook. & Thom.) Al-Shehbaz et al.

[BRASSICACEAE] (Figure 10)

Synonyms: *Sisymbrium wallichii* Hook. f. & Thoms.

Herbs annual or biennial, 5-80cm tall. Stems erect, simple or few to many branched at base, densely to sparsely tomentose with finely branched stellate trichomes, often basally hirsute with horizontal, simple or forked trichomes 0.5-2 mm, rarely glabrescent distally. Basal leaves rosulate, petiolate, often lyrate or pinnatifid persistent or withered by fruiting; petiole 0.5-2.5 cm, often ciliate; leaf blade spatulate, oblanceolate, or obovate in outline, 1-12 × 3 cm, densely tomentose with finely branched stellate trichomes, margin coarsely dentate or rarely entire, with up to 8 lobes on each side of midvein; lateral lobes oblong or ovate, increasing in size distally, much smaller than obovate or suborbicular terminal lobe, to 1.5 × 0.8 cm, entire or dentate. Middle cauline leaves oblong, oblanceolate, or linear, sessile, 0.7-7 cm × 1-20 mm, pubescent as basal leaves, rarely glabrescent, base usually minutely auriculate, margin entire, coarsely dentate, or lyrate, apex acute. Racemes ebracteate, lax. Fruiting pedicels slender, straight, stellate pubescent all around or glabrous adaxially, divaricate or rarely ascending, 0.2-2.5cm. Sepals green or pink, oblong, 1.5-3 × 0.7-1 mm, densely pubescent or glabrescent, sometimes narrowly membranous. Petals purple, pink, or white, spatulate, 2-4.5 × 0.4-0.6 mm, attenuate to base. Filaments 2.5-3.5 mm; anthers oblong, 0.3-0.6mm. Ovules 70-150 per ovary. Fruit linear, terete or subcompressed, arcuate or straight, divaricate to recurved or rarely ascending, 2.5-9.5 cm × 0.6-1 mm; valves glabrous, with an obscure or prominent

midvein; style 0.2-1.5mm. Seeds brown, oblong, 0.6-1 × 0.3-0.5 mm.

Specimens examined: INDIA: Arunachal Pradesh, West Kameng district, 26.03.1994, G.D. Pal 6159! (2 accessions) (ARUN).

Phenology: April-September.

Distribution and habitat: It is found on rocky slopes, hillside, crevices and edges. It has a wide range of distribution from India to Nepal, Bhutan, Pakistan, China, Tajikistan, Uzbekistan and Turkmenistan found in between up to 700-4500 m.

11. *Cleome rutidosperma* DC.

[CLEOMACEAE] (Figure 11)

Synonyms: *Cleome guineensis* Hook.f.

Herbs, annual or rarely perennial, 30-100 cm tall. Stems branched, often with decumbent branches, glabrous or glabrescent to slightly scabrous but sometimes glandular pubescent. Stipules ca. 0.5 mm, scalelike or absent. Petiole 0.5-3.5cm, proximally winged; leaflets 3; leaflet blades oblanceolate to rhomboid-elliptic, 1-3.5 × 0.5-1.7 cm, abaxially with curved trichomes on veins especially when young, adaxially glabrous, margins entire or serrulate-ciliate, apex acute, obtuse, or sometimes acuminate. Inflorescences terminal and axillary, 2-4 cm but 8-15 cm in fruit, 3-6-flowered; bracts leaflike, 3-foliolate, 1-3.5 cm. Pedicel 1.1-2.1 cm but 1.8-3 cm in fruit. Sepals yellow, narrowly lanceolate, 2.5-4 × 0.2-0.3 mm, ± persistent, glabrous, margin ciliate. Petals white or speckled with purple, oblong to narrowly ovate, 7-10 × 1.5-2.3 mm; central 2 petals outside with a yellow transverse band. Filaments yellow, 5-7 mm; anthers purplish brown, 1-2 mm. Pistil 2-3 mm, glabrous; style 0.5-1.4 mm. Fruit with a 4-12 mm gynophore; capsule 40-70 × 3-4 mm, striate. Seeds 4-25 per capsule, reddish brown to black with white funicular aril, 1-1.5 mm, slender, striately verrucose.

Specimens examined: INDIA: Arunachal Pradesh, Kane Wildlife Sanctuary, West Siang district, *S. S. Das 32193!* (1 accession) (ARUN).

Phenology: July-October.

Distribution and habitat: It is a weed has distribution across Asia & Australia and found up to 500m.

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Fig 1: *Delphinium viscosum* Hook.f. & Thomson - Herbarium specimen (Bipin Balodi 13077! - ARUN).

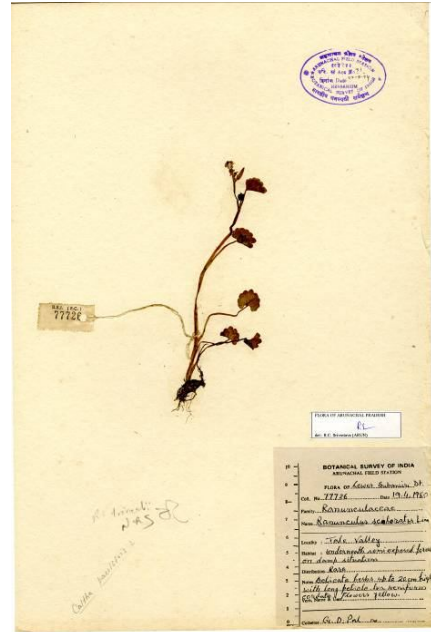


Fig 2: *Ranunculus trivedii* Aswal & Mehrotra - Herbarium specimen (G.D. Pal 7726! - ARUN).

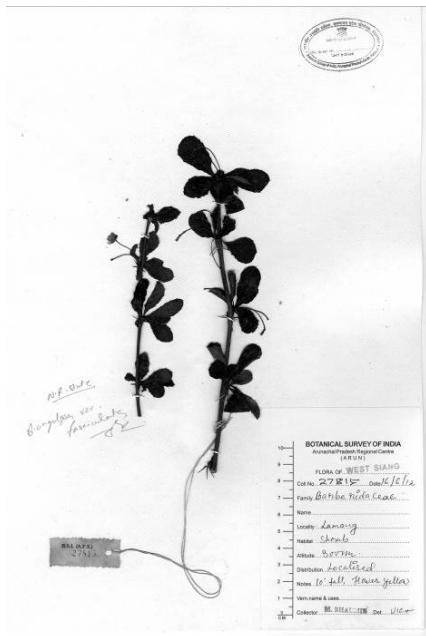


Fig 3: *Berberis angulosa* Wall. ex J.D. Hook. & Thom. - Herbarium specimen (M. Bhaumik 278157! - ARUN).

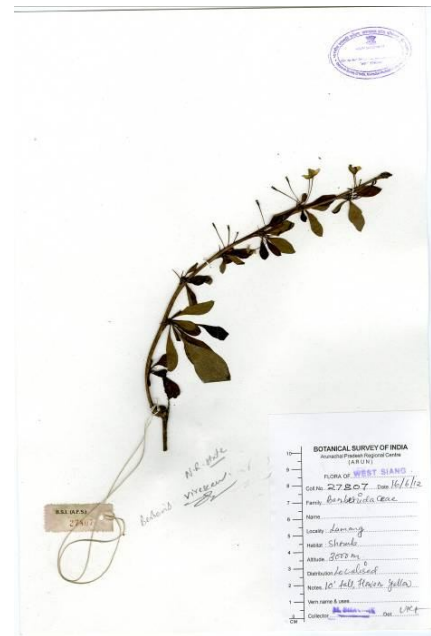


Fig 4: *Berberis virescens* Hook.f. - Herbarium specimen (M. Bhaumik 27807! - ARUN).



Fig 5: *Mahonia pycnophylla* (Fedde) Takeda - Herbarium specimen (G. D. Pal 77704! - ARUN).

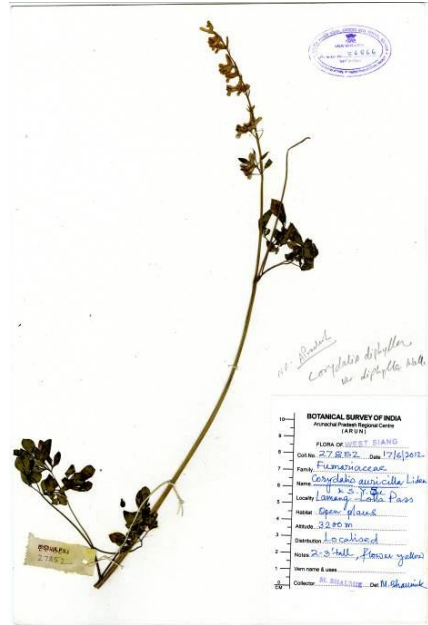


Fig 6: *Corydalis diphylla* Wall.- Herbarium specimen (M. Bhaumik 27852! - ARUN).

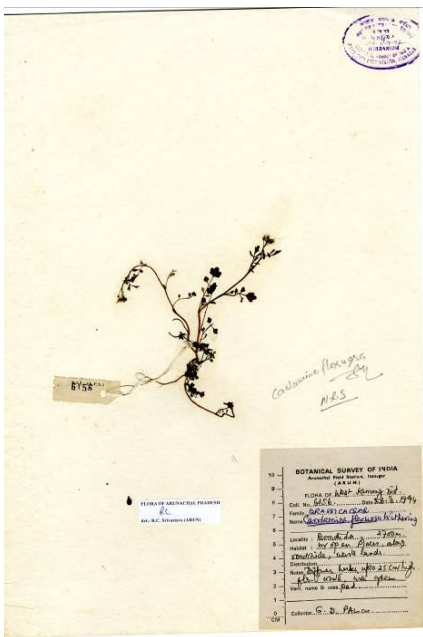


Fig 7: *Cardamine flexuosa* With.- Herbarium specimen (G.D Pal 6156! - ARUN).



Fig 8: *Cardamine griffithii* Hook.f. & Thomson - Herbarium specimen (M. Bhaumik 27866! - ARUN).

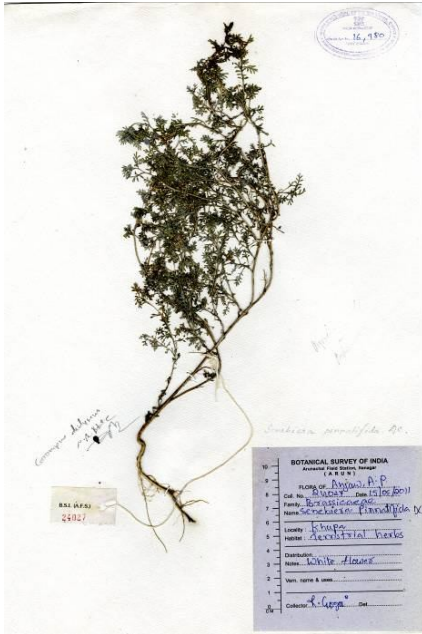


Fig 9: *Lepidium didymum* L. - Herbarium specimen (R. Gogoi 24027! - ARUN).



Fig 10: *Crucihimalaya wallichii* (J.D. Hooker & Thomson) Al-Shehbaz et al.- Herbarium specimen (G.D. Pal 6159! - ARUN).

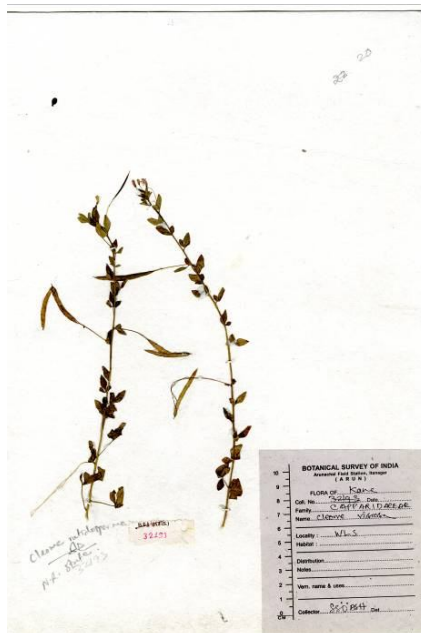


Fig 11: *Cleome rutidosperma* DC.- Herbarium specimen (S. S. Das 32193! - ARUN).