CHAPTER III

RESULTS
3.0 **Morphology**

The classification of the family Acanthaceae of Valley district follows Scotland & Vollensen (2000). In the revision work, 37 species and 1 variety was found to be distributed under 19 genera. A key to the identification of the family is provided as follows.

3.1 **General characters of acanthaceae**

Erect, prostrate or rarely climbing, annual or perennial herbs, shrubs or under shrubs, or rarely small trees; cystoliths usually present on leaves; Stems leaves type isophyllous or anisophyllous. Stems decussate, terete, hexagonal, often swollen nodes, sometimes spinose with spines derived from reduced leaves, glabrous to hairy, green or pink coloured, bracts (2 - 5) large and showy or minute, sometimes spiny, glabrous or hairy, and bracteoles two minute, hairy to glabrous. Stipules absent. Leaves opposite, opposite decussate; lamina margin, entire, crenate, sinuate, dentate, or rarely pinnatifid. Inflorescences in terminal or axillary spikes, racemes, panicles, or dense clusters, rarely of solitary flowers; bracts 1 per flower or dichasial cluster, large and brightly colored or minute and green, sometimes becoming spinose; bracteoles present or rarely absent, usually 2 per flower. Flowers pedicellate or sessile, bisexual, zygomorphic to subactinomorphic. Calyx synsepalous (at least basally), usually 4- or 5-lobed, rarely (Thunbergia) reduced to an entire cupular ring or 10–20-lobed. Corolla sympetalous, sometimes resupinate 180° by twisting of corolla tube; tube cylindric or funnelform; limb subactinomorphic (i.e., subequally 5-lobed) or zygomorphic (either 2- lipped with upper lip subentire to 2-lobed and lower lip 3-lobed, or rarely 1-lipped with 3 lobes); lobes ascending or descending cochlear, quincuncial, contorted, or open in bud. Stamens epipetalous, included in or exerted from corolla tube, 2 or 4 and didynamous; filaments distinct, connate in pairs, or monadelphous basally via a sheath (Strobilanthes); anthers with 1 or 2 thecae; thecae parallel to perpendicular, equally inserted to superposed, spherical to linear, base muticous or spurred, usually longitudinally dehiscent; staminodes 0–3, consisting of minute projections or sterile filaments. Disk annular and nectar-producing at base of ovary. Ovary
superior, 2-locular, placentation axile, with 2 to many ovules per locule; style filiform, simple; stigma funnel-shaped or 2-lobed (one lobe sometimes suppressed), one or both lobes sometimes recurved or recoiled. Fruit a loculicidal, stipitate or not, 2-valved, explosively dehiscent capsule [rarely drupaceous], 2- to many seeded, apex with or without a beak; septa remaining attached to or separating from inner wall of mature capsule. Seeds usually borne on hooklike retinacula, or retinacula lacking, surface smooth or roughened, pubescent or lacking trichomes, sometimes with hygroscopic trichomes that expand when moistened

3.1.1 Habitat

Plants of this family are widespread inhabiting varied ecological habitats from tropical to subtropical and few species in temperate areas. They occur in moist evergreen forests, tropical dry deciduous forests, and scrubby lands. Barleria cristata, Ruellia brittoniana, Asystasia gangetica, Hygrophila polysperma, H. salicifolia, H. erecta, H. pholomoides etc, occupy waste lands and grow as weeds in cultivated fields, road sides, garden etc. acanthus species in shaddy areas near streams. Hygrophila species are mainly seen in marshy areas as hydrophytes. Variation based on ecological conditions of habitats exits in Barleria cristata, Lepidagathis incurva, Eranthemum suffruiticosum, Justicia procumbens.

3.1.2 Morphology

Habit, there is a great range of habit displayed by members of this family, plants are herbs, shrubs, under shrubs or perennial climbers but trees are found in Manipur. Shrubby forms are common eg. Species of Strobilanthes, Barleria, Phlogacanthus, Justicia, etc. they are perennial and highly branched, hence some species are cultivated as ethno-medicinal plants. Acanthus leucostachys, Barleria prionitis show xerophytic adaptation, having reduced spinescent stem and leaves. Species of Strobilanthes show variation in habit eg. S. asymmetrica, S. clarkei and S. torrentium are found in high altitude in shaddy areas. Whereas, S. auriculata, S. affinis and S. cusia, were, grown in open areas. Based on ecological conditions, Barleria cristata show variation in vegetative parts showing prostate, small leaves
and shady areas in erect and large leaves and internodes length and flower size. *Lepidagathis incurva* show variation in leaf size, pink colour of stem and internodes length. *Rungia pectinata* shows variation in leaf sizes, internodes length and plant height. *Justicia procumbens* also shows variation in leaf sizes based on ecological conditions. *Thunbergia* species are perennial, woody climbers the only exception is *T. alata*.

### 3.1.3 Stems

The stem provides a set of useful characters which are very important in infrageneric and infraspecific delimitation. Stems may be terete or sub-terete or tetragonous. The presence of absence of dark reddish or purplish colour on stem is an important distinguishing character in species of *Andrographis paniculata* and *Asystasia gangetica*. In many members, the stem is clothed with hard scale-like or hirsute, pubescent of glandular hairs. In some others, it is glabrous. Stems of climbing species show anomalous secondary thickenings. Cystoliths are commonly present in epidermal cells. One of the distinguished features of this family is the pulvinate nodal region.

### 3.1.4 Leaves

The leaf characters like the general sizes, shape, margin, base, apex and texture contributes towards specific and infraspecific delimitations. The arrangement of leaves is important in delimiting the genera. Opposite decussate, exstipulate conditions is common in this family. In *Strobilanthes*, isophyllous and anisophyllous type of leaves is encounter. *Hygrophila* have hetrophyllous leaves whereas *Phlogacanthus* have opposite decussate. Shape of the leaves may be lanceolate, elliptic, ovate and hastate as in *Thunbergia* species. Leaf base may be attenuate, acute, cuneate or decurrent, obtuse or rounded. Leaf apex may be acute, acuminate, obtuse, mucronate and attenuate. Margins may be entire, acuminate, serrate, crenate, crispate or undulate, pinnatifid, toothed and spinescent as in *Acanthus leucostachy*. Many of the *Strobilanthes* species have serrate margin.
3.1.5 **Inflorescence**

The structure of the inflorescence of Acanthaceae is an important character and has been used taxonomically at specific level by Heine (1962). The flowers may be in axillary whorls as in *Hygrophila* and *Barleria* species, or solitary as in *Strobilanthes torrentium*, or pendent raceme as in *Thunbergia coccinea* etc. in *Andrographis paniculata*, flower are in unilateral, branched or unbranched, axillary and terminal racemes. In *Lepidagathis incurva* and *Phaulopsis imbricata* species, flowers are sessile, in one sided spikes or densely crowded at the base of the plant. In *Asystasia gangetica*, flowers are in lax or dense flowered, capitates spikes are found. In *Ruellia brittoniana* species normally flowers are axillary, solitary or sometimes in cymes. In *Strobilanthes* species, the inflorescences are capitates or strobililate or interrupted bracteates spikes or panicles. In *Rungia pectinata* and *Justicia* species inflorescences are axillary or terminal spikes. Flowers are perfect, hermaphrodite, sub-actinomorphic or zygomorphic and hypogonous. Bracts and bracteoles are usually present and are often well developed and coloured.

3.1.6 **Bracts**

Bracts are often used as taxonomic characters in Acanthaceae (Nees). Bracts may be narrow filamentous as in *Andrographis paniculata, Asystasia gangetica*, etc. these are very prominent in almost all others other genera of the family. They are usually lanceolate, foliaceous or spathulate. In *Acanthus leucostachys*, they oblanceolate, mucronate. They may or may not be present in *Barleria* species. In *Eranthemum* species, the bracts are foliaceous and prominently veined which is a distinguished feature of that genus. In *Justicia*, bracts are lanceolate with scarious margins, in *Phaulopsis imbricata*, they are orbicular and closely villous. The strobiloid, inflorescence in *Strobilanthes* is due to imbricate arrangement of bracts. Bracts have frequently been used taxonomic character within the genera *Peristrophe roxburghiana, Dicliptera roxburghiana* and *Hypoestes* species. They may consist of primary, secondary and tertiary bracts. Primary bracts are foliage leaves that subtended inflorescence axis, so that variation in size, shape and texture is same as that of leaves. Secondary bracts are green, narrow and lanceolate in these...
three genera. Size of the tertiary bracts is diagnostic feature for identification feature for identification of many species of some genera.

3.1.7 **Bracteoles**

Bracteoles are linear, lanceolate and small in almost all genera. In Thunbergia species, the bracts are small and bracteoles spathaceous coloured and appear lock involucres which enclose the flower in bud condition.

3.1.8 **Calyx**

The putatively primitive form of the calyx in the family Acanthaceae is sub-actinomorphic, with the tube shorter than the free lobes. It is mostly 5- partite and segments are linear-lanceolate and imbricate or valvate in bud. In *Thunbergia* species the calyx is annular or 12-16 toothed. In *Barleria* and *Acanthus leucostachys*, lobes are 4 (2 + 2), unequal and imbricate. In *Barleria* species, outer pair larger. Foliaceous and sometimes spine-tipped and inner pair smooth, linear-lanceolate or subulate. This character is considered as a delimitation factor for identification of the species in this genus. In *Phaulopsis imbricata*, lobes are 5 unequal, imbricate, free and the outer lobes are large and ovate. In *Lepidagathis incurva*, lobes are unequal, free, the upper one is large, and median lobes are connate. In *Strobilanthes*, the lobes are unequal and sometimes emarginated. In *Justicia* species, lobes are 4 or 5 and almost free. Variation in number, size, arrangement, presence of glandular and non-glandular hairs, margin etc. are important in infrageneric and infraspecific delimitation.

3.1.9 **Corolla**

Corolla is gamopetalous with a long or short tube. In *Thunbergia, Ruellia britoniana, Barleria*, etc. the limb is almost equally 5 – lobed. In *Justicia*, *Rungia pectinata, Andrographis paniculata*, etc. the corolla is bi-lipped. In this condition, the upper lip is usually erect and bifid and lower lip is horizontal and tri-fid. In *Acanthus leucostachys* upper lip is obsolete and lower lip is prominently developed. Aestivation of corolla is imbricate or contorted. In *Thunbergia* species, corolla
exhibits left contorted aestivation with a narrow or widely infundibuliform or curved tube ending in five sub-orbicular lobes. In *Strobilanthes* species, corolla tube is ventricose, corolla lobes are sub-equal with left contorted aestivation. *Ruellia brittoniana*, *Hygrophila* species also have left contorted aestivation. In *Barleria* species the tube is longer than the lobes, consisting of imbricate or quincuncial aestivation. In *Hypoestes*, *Peristrophe roxburghiana* and *Dicliptera roxburghiana* species, the corolla is resupinate through 180°, placing the tri-fid corolla lip in the upper position and not in the lower position as in most bi-labiate genera in Acanthaceae. According to him, corolla ontogeny revealed the important development differences in relative rate, timing and extent of the growth of corolla lobes. These differences may prove useful for taxonomical studies at lower hierarchical levels within this family.

3.1.10 **Androecium**

Stamens are more often four and didynamous. In *Acanthus leucostachys*, *Justicia* species, *Rungia pectinata*, etc. the stamens are only two. The missing stamens are frequently represented by staminodes. The stamens are inserted on the corolla – tube or they are exserted, alternate with its lobes eg., *Justicia*, *Rungia* species etc. filaments are quite free, long and stout. Anthers are ditheccous or monothecous. *Hypoestes* species, the anthers are monothecous by reduction. In *Strobilanthes*, *Barleria* and *Ruellia brittoniana* species the anthers-thecae are equal and lie at same level. In *Justicia* and *Rungia* species, the anther thecae are separated by the development of connective and they are unequal in size and lower one is often spurred or with abasal appendage. In *Andrographis paniculata*, *Acanthus leucostachys*, *Thunbergia* species anther-thecae are the distinguished character of *Andrographis*. The anther thecae usually open by longitudinal slits. The pollen exhibits a great variety of pattern, which are useful in generic distinction. For eg. Lindau (1895) subordinated as a section of the genus *Justicia*, because of his misconception of pollen morphology.
3.1.11 **Gynoecium**

The gynoecium is bi-carpellary and syncarpous with a superior, bi-locular ovary having one or more anatropous ovules in each locule. Placentation is axile, style long and filiform, stigma, capitates, bifid or funnel shaped as in *Thunbergia*. A hypogonous nectar secreting disc is present at the base of the ovary.

3.1.12 **Pollination**

Pollination in acanthaceae is entomophilous, with the insects visiting flower for the nectar secreting by a hypogonous disc. The androecium is generally protandrous. In bi-lipped forms, corolla –lobes are 3 +2 in arrangement, 3-lobed lower lip of the corolla forms the platform for alighting insect vector. The insect enter the corolla tube to reach the nectar at the base, first touches the stigma, which projects from the mouth of the corolla tube with its back and then the anthers. In species of *Barleria* and *Ruellia brittoniana* etc., flowers have a long and wide corolla tubes. The pollinating agents are large hive and bumble bees which creep into the corolla tube and touch anthers and stigma with their back. In *Thunbergia* species, the construction of flower is such that only insects with certain characteristics are suitable for pollination. The bodies of the aces just fit the antrum of the flower and the proboscis is sufficiently long to reach the honey. Dorsal surface of the insects gets dusted with pollen on their emergence from the flower. Stigma has two lips, lower is non receptive. This lip touches the back of the insect and drags down the upper receptive lobe (funnel shaped) which collects the pollen. *Thunbergia* flower can be divided into three portions, a lower conical portion which directly surrounds the ovary and nectar secreting disc. The tubular ventricose basal portion of the corolla carries 4 stamens in a groove and upper portion the spreading lobes. Spreading lobes are coloured and attracts the insects. On the lower surface of the ventricose portion inside is a bulge corresponding to the groove. The bulge ensures that the back of any visitor presses well up against the anther in groove. Anthers are bearded with long thin hairs and bear or two bong hooks on their posterior margin. The insects come in contact with the hooks on the anther resulting in the shaking
down of pollen on their backs. These are carried away by the insects and pollinate another flower (Remadevi & Bijoy kumar 2009).

3.1.13 **Fruits**

Fruits are always bilocular capsules. In shape they are ellipsoid, ovoid, oblong. Strap-shaped or cylindrical, often compressed at right angles to the septum. The apex is often beaked or not beaked. Dehiscence is loculicidal, splitting through the septum, up to the base. Valves are often recurved, leaving the central axis.

The placentae may be elastic or inelastic. The distinction between capsule with elastic placentae and those with inelastic placentae has been frequently used to explain the relationships among genera of Acanthaceae, especially amongst the sub tribes of Justicieae. In species of *Peristrophe roxburghiana*, *Hypoestes* etc, placental bases are in elastic. The capsules with elastic placental bases represents the only character that reliably separates *Dcliptera* from *Peristrophe roxburghiana* (Balkwill *et al.* 1985).

3.1.14 **Opening Mechanisms of Fruits**

The mechanics of seed explusion in Acanthaceae studied by Witztum & Schuigasser (1995). At the moment of opening, the septum in the middle of the fruit splits and allows the valves to separate. The opening itself is brought about by water. The tip (beak) of the fruit plays a most important part in the opening mechanism of the fruit. The slid part of the tip act more or less as a tie, which chains the two valves together, and prevents their springing apart. This may be weakened by the absorption of water, and tends to drive the valves apart. Sclerenchymatous tissue in the solid tip appears as a compact mass of cells firmly sticking together. By absorption of water, the middle lamellae between the cells swell up and the binding force between the cells decreases. Cuticle on the tip of the fruit also plays an important role in the dehiscence of the capsule bursting by the swelling of the tissue inside.
In *Dicliptera* the capsule wall is thin and the spetum separates along the tow thickened raphes and a pair of placentae. The raphe outward and placentae upward the time of capsule dehiscence. In *Thunbergia, Nelsonia canescens* etc seed ejecting mechanism is absent, bit the pointed tips of the capsule valves may acts as an effective mechanisms by clinging to the furs of animals and causing the seeds to be jerked out. In the tribe of *Acanthoideae*, the funicle forms a hook-like projection, the jaculator, in which the seed rests and when the woody capsule opens elastically, the two valves separate to the base springing backwards, causing an oscillation of the longer and shorter stiff stalk. As a result the seeds are thrown out, jaculators which is slightly twisted to the side, directing the seeds in a lateral direction, so that seeds from the 4 rows are sent cross wise in four directions.

3.1.15 **Seeds and Seeds Dispersal**

Each capsule contains 2 to 10 seeds. Seeds are ovoid or compressed, non – endospermic or exalbuminous and with a large embro. The taxonomic importance of seed shape and surface features in Acanthaceae was recognized by Nees (1847). Seed shape was used by Bremekamp (1965) as a character useful in the delimitation of acanthaceae and the characters of the testa were used at the level of tribe and sub-tribe. Balkwill & Norris (1985) found that the features of the seed surface can be effectively used at the species level separation. In *Ruellia brittoniana* species, the seeds are dispersed by explosive mechanisms or by special adoptions of the seed coat. Testa of the mature seed consists of an outer epidermis lignified or cutinized, from this, closely lying scales or tubercles originate. Theses spinescent structures become erect and mucilaginous when damp and helps the seeds to adhere on the feather or fur of birds and animals, as in *Dicliptera roxburghiana*, in some other genera, the silky white hairs are closely appressed on the seed surface. When in dry condition, they lie close and form a smooth coat but when wetted stand up and become mucilaginous and stick on the body of the dispersing medium. Theses hairs may be associated with dispersal and dormancy of seeds eg. *Barleria*, *Nelsonia canescens* species, *Acanthus leucostachys* species and seeds are dispersed by water.
General Floral formulae of Acanthaceae

3.2 Classification and Key.

1a. Vines; calyx cupular with 10–20 lobes or reduced to an entire ring; capsule with a prominent apical sterile beak; seeds not borne on hooklike retinacula .................................................................19. Thunbergia

1b. Prostrate or erect herbs, shrubs, or rarely small trees; calyx 4- or 5-lobed; capsule lacking a prominent apical sterile beak; seeds borne on hooklike retinacula or not.

2a. Cystoliths absent; retinacula absent (except Acanthus).

3a. Seeds laterally compressed, borne on hooklike retinacula; corolla 1-lipped (upper lip absent), lobes not with descending cochlear aestivation; anthers 1-thecouis................................................................................................................1. Acanthus

3b. Seeds subspherical or blocky, not borne on hooklike retinacula; corolla 2-lipped, lobes with descending cochlear aestivation; anthers 2-thecouis.................................................................11. Nelsonia

2b. Cystoliths present; retinacula present, hooklike.

4a. Corolla large (mostly > 3 cm), upper lip usually appearing 4-lobed and lower lip appearing 1-lobed.................................................................4. Barleria

4b. Corolla small (< 3 cm), upper lip 2-lobed and lower lip 3-lobed.

5a. Corolla to 1 cm; anther thecae usually lacking basal appendages; capsule 4–7 mm ..............................................................................................................10. Lepidagathis

5b. Calyx lobes homomorphic (or nearly so; sometimes partially fused to form a bipartite or tripartite calyx in Strobilanthes), not as described above; corolla lobe aestivation not quincuncial.

6a. Corolla lobes contorted in bud; stamens (stamens + staminodes) 4

7a. Style held in place by trichomes on one side of corolla tube; stamens monadelphous (by a sheath) at base ...............................................18. Strobilanthes

7b. Style not held in place by trichomes on one side of corolla tube; stamens not monadelphous at base.
8a. Inflorescence secund strobilate spikes with orbicular to reniform bracts; ovules 2 per locule; seeds to 4 per capsule; corolla ca. 0.6 cm; septa with attached retinacula separating from inner wall of mature capsule

........................................................................................................................................................................................................................................................................................................13. Phaulopsis

8b. Inflorescence not as described above; ovules 4 to many per locule; seeds 4 or more per capsule; corolla 0.6–5.5 cm; septa with attached retinacula not separating from inner wall of mature capsule

9a. Corolla limb distinctly 2-lipped, lobes usually not equal; calyx tube often rupturing in weak hyaline regions between lobes...........................................7. Hygrophila

9b. Corolla limb nearly regular, lobes equal to subequal; mature calyx tube not rupturing in weak hyaline regions between lobes; pollen otherwise.

10a. Fertile stamens 2, staminodes 2 .................................................................6. Eranthemum

10b. Fertile stamens 4. Stems elongate; leaves cauline; anther thecae not separated by a broad connective .................................................................16. Ruellia

6b. Corolla lobes ascending cochlear in bud; stamens 2 (except 4 in Asystasia), staminodes 0 or 2.

11a. Ovules 3 to many per locule; seeds 6 to many per capsule; pollen with apertural margins conspicuously thickened.

12a. Capsule compressed perpendicular to septum; seeds subglobose, glabrous.........................................................................................................................2. Andrographis

12b. Capsule linear and 4-angled, not compressed perpendicular to septum; seeds strongly compressed, glabrous or pubescent.................................15. Phlogacanthus

11b. Ovules 2 per locule; seeds 4 per capsule; pollen with apertural margins not thickened........................................................................................................3. Asystasia

13a. Anthers 1-thecous..........................................................................................8. Hypoestes

13b. Anthers 2-thecous.

14a. Flowers subtended by involucre of 2 or more pairs of floral bracteoles; corolla resupinate 180° (i.e., lip in upper position 3-lobed and lip in lower position entire to 2-lobed).

15a. Septa with attached retinacula separating from inner wall of mature capsule..................................................................................................................5. Dicliptera
15b. Septa with attached retinacula remaining attached to inner wall of mature capsule .................................................. 12. Peristrophe

14b. Flowers subtended by a single pair of bracteoles (or bracteoles rarely lacking); corolla not resupinate 180° (i.e., upper lip entire to 2-lobed and lower lip 3-lobed).

16a. Staminodes 2. Corolla ± salverform (i.e., tube slender and cylindric, limb spreading and inconspicuously 2-lipped), tube conspicuously longer than limb, not or only slightly widened distally .......................................................... 14. Pseuderanthemum

16b. Staminodes absent.

17a. Septa with attached retinacula separating from inner wall of mature capsule; inflorescence often dense with imbricate bracts 2- or 4-ranked (but only 2 ranks fertile) .................................................................................................................................................. 17. Rungia

17b. Septa with attached retinacula remaining attached to inner wall of mature capsule; inflorescence not as above .............................................................. 9. Justicia

### 3.3. ACANTHUS Linnaeus, Sp. Pl. 2: 639. 1753.


Herbs stout, 15-40 cm high, erect or decumbent at base, unbranched. Stem brown, ca 6mm in diameter, viscous woolly. Leaves opposite, equal, elliptic, ob lanceolate, ovate-lanceolate, or lanceolate. Lamina 10–20 × 3.5–6 cm, abaxially glabrescent or brown pubescent along veins, adaxially glabrous, secondary veins 6-9 on each side of midvein and netted near margin, tertiary veins inconspicuous, base subcordate to round, sometimes inconspicuously dentate, margin spinose-dentate, apex acute. Petiole 0.8–1.5 cm long, brown pubescent. Inflorescences terminal spikes, to 14 cm, 4-ranked; rachis grayish pubescent. Bracts ovate to obovate, 1–1.6 × 0.5–1 cm, abaxially pubescent, adaxially with dark purple dotted spots, palmately veined, base rounded, margins apically spiny, apex acute to acuminate. Bracteoles 2, lanceolate to oblanceolate, 1.3–2 × 0.2–0.4 cm, abaxially...
pubescent, adaxially hairy with purple spots, base rounded, margin entire and ciliate, apex rounded with a short tip. Calyx ca. 2 cm long, pubescent; lobes unequal, margin ciliate, anterior lobe ca. 1.7 × 0.4 cm, lateral lobes lanceolate and ca.15 × 2.5 mm, posterior lobe oblong-lanceolate and ca. 2 × 0.5cm. Corolla white, ca. 2.1 cm long, villous; lobes orbicular, ca. 5 × 5mm, apex emarginate. Stamens 4, didynamous; filaments ca. 8 mm long, glabrous, upper pair curved; anthers 1-loculed, oblong, beared; theca ca. 4.5 mm long, pilose. Ovary 2-loculed, ca. 3 mm long, ovules 2 in each cell; style ca. 1.1 cm long, glabrous; stigma bifid. Capsule ellipsoid, ca. 10 × 3 mm long, glabrous. Seeds 4, compressed, orbicular, ca. 2 × 2.5 mm, glabrous.

Floral diagram:

Fl. & Fr.: March – July.

Habitat: In marshy areas of dense forest near streams. 650 – 1000 m.

Distribution: In the valley districts [Map.2.1], North East India, China, Laos, Myanmar, Thailand and Vietnam.

Specimens examined: INDIA, Manipur, Imphal East district, Nongmaiching, 835 m, 24° 45' 36.2" and 94° 01' 54.4", dated 25.4.2009, D.S. Ningombam 00272.

Herbarium specimen referred: Accn No. 21515 (BSI).


*Haplantthoides* H. W. Li; *Haplantthus* Nees.


Common name : Kariyat
Vernacular name : Bhupati

Herbs, erect, annual, branched, 50- 70 cm high. Stems quadrangular, glabrous. Leaves lanceolate or elliptic or linear, base attenuate and decurrent onto
petiole, margin entire, apex acute to shortly acuminate. Lamina 3–7.5 × 1–2.5 cm, both surfaces glabrous, abaxially pale green, adaxially green, secondary veins 4–6 on each side of midvein. Petiole 0.8–1.3 cm long. Inflorescences axillary or terminal panicles. Penduncles 5–12 cm long. Flowers 0.6–1.8 cm apart. Pedicles 2–5 mm long, sparsely pubescent. Bracts triangular to subulate, 1–1.5 mm long. Bracteoles 2, linear to subulate, 1–1.5 mm long. Calyx-lobes 5, linear lanceolate, 1 × 0.3 cm long, outside grandular hairy, lobes subulate. Corolla white or pale pink with dark pink spots; tube 0.9–1 cm long, outside gland-tipped pubescent; tube basally funnelform for 4–8 mm long; limb 2- lipped; lower lip with purple dots, deeply 3- lobed, 3–5 mm long, erect, lobes ca. 3 mm long; upper lip, oblong, 5–6 mm long, reflexed, 2-lobed, lobes ca. 1 mm long. Stamens 2, exserted from corolla tube; filament broad, enlarged at base, hairy on the upper part, 3-5 mm long; anther ca 2mm long, dark purple, beared with tuft of white hairs. Ovary oblong, glabrous or puberulous; style 1- 1.2 cm long, sparsely pilose toward base. Capsule ellipsoid-compressed, 1.5– 2 × 0.3–0.4 cm, glandular and sparsely pubescent. Seeds-12-seeded, ca. 1 × 0.5 cm, rugose. Retinacula present.

Fl. & Fr.: November – March.

Habitat: Grown wild along the road sides, waste lands and often planted around houses for its medicinal value.

Distribution: Found in the valley districts [Map.2.2]. Native to India and Sri Lanka; cultivated or naturalized in Cambodia, China, Indonesia, Laos, Malaysia, Myanmar, Thailand, Vietnam, and Caribbean.


Herbarium specimen referred: Accn No. 27886, Coll. No. 37941(NBRI); Accn No. 31499, Coll. No. 42396 (BSI).

3.5. **Asystasia** Blume, Bijdr. 796. 1826.

**Coromandeliana** Wight ex Nees in Wallich, Pl. Asiat. Rar. 3: 89, 1932; FBI 4: 493. 1884; PB. 606. 1903. [Plate 3; Fig. 3]

**Common name**: Ganges Primrose

Perennial herbaceous, erect or procumbent herbs, sometimes climbing on bushes, 35 – 80 cm high; Stem much branched, obtusely quadrangular, swollen at nodes, glabrous; branches sub-glabrous to puberulous. Leaves equal in each pair, petiolated; petioles 0.6 - 3 cm long, puberulous. Lamina 1.9 – 6.5 cm long, 1 - 3 cm wide, subcordate or ovate, apex acute to acuminate, dark green, base obtuse or cordate, margin entire, shortly and minutely puberulent on both surface, punctuate, cystoliths prominent on adaxial. Inflorescence a secund raceme, terminal, 6 - 12 cm long, rachis tetragular, distinctly hairy. Penduncle 5 – 10 cm long. Bracts ca 4.5 mm long, opposite, triangular, 2mm long, inserted at the base of pedicel. Pedicel ca 3 mm long. Calyx ca 7 mm long, 5 deeply partited, slightly connected at the base, segments lanceolate 5-8 mm long, linear, acute to acuminate, glandular hairy. Corolla short, 2.5-3.5 cm across, thinly pubescent outside; tube 1.5-2.5 cm long, upper cream colour; lobes 5, triangular to ovate, apex rounded, ca 5 mm long, lower lip 3- lobed, lobes long ovate, elliptic, centre one ca 10 mm long, the latter ones 7 mm long, two plicae on middle lobe go down to the lower part of tube, plica densely white villous, with purplish red dots. Stamens 4, filaments glabrous, unequal in length, longer ca 6mm, shorter 4mm, a long and a short- coherent into pairs at the base, anthers purple, oblong, dorsifixed, 2 celled unequal in high, with mucrons at the base. Style ca 13 mm long, longly villose at the base; ovary ca 4 mm long, densely and longly villose, disk cup form, plus and minus obtuse, 5- lobed. Capsule elliptical with an apical beak, 3-4 x 0.5 - 1 cm, pubescent; seeds 4, subglobose, 4-5 mm across, glabrous.

**Fl. & Fr.**: February – April.

**Habitat**: Found in lightly shaded habitats along roadside and climbing on bushes

**Distribution**: Found in the valley districts [Map.2.3], India, China, Thailand and Malaysia.
Specimens examined: India, Manipur, Imphal West, Langol hill, 784 m, Latitude 24° 49'4.5" N and 93°54' 08.7" E, dated 16.06.2010, Deshworjit 006.

Herbarium specimen reffered: Accn. No. 15322 (NBRI).


Shrubs, undershrubs, or herbs; armed or unarmed, with cystoliths. Leaves opposite, obovate, ovate, elliptic, entire, petiolate. Flowers showy, axillary cymes, terminal spikes, or flowers solitary in lax. Bracts large, 1 fertile, 1 sterile or sometimes reduced to spines. Bracteoles 2, sometimes becoming spinose. Calyx deeply 4-partite; lobes in opposite pairs; outer 2 lobes larger, anterior lobe often emarginated, bifid or deeply 2-loculed; inner 2 lobes smaller. Corolla funnel-shaped, usually large; limb 5-lobed, usually with upper lip appearing 4-lobed; lobes subequal, quincuncial in bud. Stamens 4, didynamous, 2 fertile, 2 rudimentary staminodes with a little pollen and often a 5th staminode is also present; anthers 2-theecous; thecae equal in size, equally inserted, lacking basal appendages. Ovary with 2 ovules per locule; style long; stigma 2-cleft or subentire. Capsule ovoid or oblong, 2 or 4 seeded below the middle; retinacula present. Seeds ovoid, compressed, pubescent with appressed hygroscopic trichomes.

1a. Margin of calyx lobes (at least outer lobes) serrate or spiny.
2a. Flowers in dense, shortly pedunculate cymes from leaf axils; bracteoles linear to linear-lanceolate, 2.4–6.5cm .............................................................. 1. B. cristata
2b. Flowers usually 2 on leaf axillary and terminal, clustered in dense ovoid spikes; bracteoles lanceolate or linear, 1.5................................. 2. B. cristata var. albida
1b. Margin of calyx lobes entire (apex spine-tipped in B. prionitis).
Plants with spines in at least some leaf axils; calyx lobes apically spinose; corolla yellowish to orange ................................................................. 3. B. prionitis

Common name : Philippine Violet
Vernacular name : Amurei

Subshrubs, 0.8 -1.3 m tall. Stems terete, branched, covered with soft trichomes. Leaves petioled, elliptic, oblong to lanceolate to ovate, acute to acuminate at apex, attenuate at base and decurrent onto petiole, entire. Lamina 2–10 × 1–4 cm, both surfaces villous especially along veins, secondary veins 4–7 on each side of midvein. Petiole 0.5–1.5 cm long. Flowers in 1-4 in short axillary, subsessile or shortly pendunculate. Bracts absent. Bracteoles conspicuous, variable, linear to linear-lanceolate, acute, 1–1.5 × 0.4 cm, membranous, pubescent. Calyx -4 lobed, in 2 opposite pairs; the outer pair larger, ovate, lanceolate, acuminate, bristle-topped, spiny-margined, 2-3.5 cm long, 5-9 mm wide, scarious when dry, with 4-8 raised nerves radiating from base, reticulately, veined between the nerves; inner pair linear-lanceolate, acuminate, 0.5 -1.5 cm long, 1-3 mm wide, ciliate. Corolla purplish blue or pink, 4.5–6.5 cm long, outside pubescent; tube 3-4 cm long, basally narrowly cylindric then gradually widened; lobes -5, ovate-oblong, 4-8 mm across, equal. Stamens 4, didynamous, 2 fertile, 2 sterile and a rudimentary 1 staminode; filaments 2-2.5 cm long, sparsely pilose especially toward base; anthers dithecoous, 1-3 mm long. Ovary oblong-ellipsoid, 2-4 mm long, glabrous; ovules 4 in each loculed; style 3.5 -4 cm long, linear; stigma minutely bifid. Capsule 1.2–1.8 cm, ellipsoid, acute at ends, glabrous. Seeds 4, orbicular, compressed, 4–5 × ca. 3 mm, silky hair at the tip.

Floral diagram :

*Fl. & Fr.*: August – May.

*Habitat:* Common along open areas of hillocks and forest clearings.
**Distribution:** Found in the valley districts [Map.2.4], India, Bhutan, Cambodia, China, Indonesia, Laos, Myanmar, Nepal, Pakistan, Philippines, Singapore, Sri Lanka, Thailand, Vietnam.

*Specimens examined:* India, Manipur, Imphal East, Nongmaiching, 784 m, Latitude 24° 45' 54.1" N and 94°01' 53.4" E, dated 16.10.2008, Deshworjit 00201.

*Herbarium specimen reffered:* Accn. No. 15322 (NBRI).

3.6.2. *Barleria cristata* Linnaeus .var. *albida* Haines Hort. Fl. Of Taiwan Baufford *et al.*, 6 (ed 1); 129. 2003; Bot. Bih. Or. 4: 683. 1922; Karthikeyan *et al.*, Fl. Pl. India-Dicotyl.1: 6. 2009. [Plate 5; Fig. 5]

**English name** : White Philippine violet.

**Vernacular name** : Amurei angouba

Shrubs, erect up to 2 m high. Stems and branches adpressed hairy, densely so at nodes. Petioles c. 1 cm, perennial eaves on long shoots 0.5 – 2 cm long. Leaves blade papyraceous, elliptic, lanceolate or ovate, 5-16 cm x 1.5–5 cm, apex acute, sometimes acuminate, base attenuate, decurrent, covered with long hairs on both surfaces; midrib hirsute above; ciliate at margin, lateral nerves 4 - 7 pairs, leaves on long shoots caduceus leaves on axillary short branches small. Flowers usually 2 on leaf axillary and terminal, clustered in dense ovoid spikes, 4 – 5.5 cm long. Bracts foliose, sessile. Bracteoles lanceolate or linear, 1 - 1.5 cm x 0.1 – 0.2 cm, ciliate and often distantly toothed at margins, acute apex, membranous, pubescent, veined, midrib conspicuous. Calyx two outer segments ovate to lanceolate, subequal, 1.5–2 x 0.5-0.8 cm, brownish white when dry, with veins raised; anticuous broadly lanceolate, spinescent at margin, acute- mucronate at apex; posticus similar but slightly narrow, 1.6 – 1.8 x 0.6 -0.7 cm, spinescent at margins, pubescent; inner sepals linear- lanceolate, 7-8 x 1.5–2 mm, acute at apex, ciliate at margins, glandular- pubescent outside, whitish, veined. Corolla usually 3.5 – 5 cm long, sometimes upto 7.5 cm, pubescent outside with intermixed glandular hairs, white; corolla – tube cylindrical amplified at throat lower tube narrow; upper tube wide;
limb 5-lobed, lobes sub equal, obovate-oblong, 1–1.8 x 0.8–1.8 cm, obtuse at apex; lower lobe emarginated at apex. Stamens 2 fertile, exserted at the base of throat; filaments 2–3 cm long, pubescent. Anthers c. 2 mm long, 2-celled; sterile 2, 4–6 mm long. Staminode 1, opposite median lobe, scaly. Disc copular, covering more than half of ovary, unevenly lobed at the apex. Ovary c. 4 mm long; ovules 2 in each loculed; style terete, 2.5–4.5 cm long, swollen at apex, hairy at base; stigma c. 5 mm long, 2-lobed, pink. Capsule ellipsoid, 1.1–1.9 x 0.3–0.6 cm, 4-seeded. Seeds ovate or suborbicular, 4–5 x 4–4.5 mm, compressed, silky appressed-hairy.

*Fl. & Fr.*: September to March.

**Habitat:** Cultivated, also found as escape.

**Distribution:** In the valley districts [Map.2.5]. India, Myanmar, China, Bangladesh, Philippines, Nepal, India, Srilanka, Pakistan and Vietnam.

**Specimens examined:** India, Manipur, Imphal East, Andro, 903 m, 24° 43’01.41” N and 94°00’ 53.1” E, dated 24.12.2008, Deshworjit 00049.

**Herbarium specimen referred:** Accn. No. 76046, Coll. No. 7703 (NBRI).

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**Common name**: Porcupine Flower  
**Vernacular name**: Hanukhulam

Spinescent shrubs upto 1.8 m tall. Stems much branches, terete, smooth, lenticellate, glabrous. Leaves elliptic to ovate, attenuate at base and decurrent onto petiole, acute and bristly mucronate at apex, margin entire, 4-8 x 2-5 cm, glabrous above, pubescent below. Petiole 1–2.5 cm. Flowers subsessile, solitary in the lower axils of upper leaves and spicate in terminal. Bracts foliaceous, linear-oblong, 2.2 x 0.2–0.8 cm, margin ciliate, apex abruptly acuminate. Bracteoles linear-lanceolate, to 1.4 x 0.2 cm, spinetipped. Calyx-lobes 4 in opposite pairs; outer calyx lobes ovate-
oblong, ca. 1.5 × 0.4 cm, apex mucronate; inner calyx lobes linear-lanceolate, ca. 1.3 × 0.2 cm, apex mucronate. Corolla golden yellow to yellow, 2.4–4 cm, outside pilose; tube with narrow basal portion slightly shorter than throat; lobes-5, ovate-oblong to orbicular, 8–10 × 6–7 mm, recurved. Stamens 4, longer pair ca. 1.1 cm with anthers ca. 3.2 mm, shorter pair ca. 1.5 mm with anthers ca. 1 mm. Ovary ovoid; stigma slightly enlarged, 2-cleft, exserted; style 3.5 cm long. Capsule ovoid, tapering to a solid long beak, 1.5-2 x 0.5-1 cm; Seeds 2, ovate in outline, 4-7 ×3-5 mm, hairy.

*Fl. & Fr.:* November – January.

**Habitat:** Undergrowth in forest and waste lands. 600 m.

**Distribution:** In valley districts [Map.2.6]. India, China, Laos, Myanmar, Sri Lanka, Thailand, Vietnam, Africa, Madagascar.

**Specimen examined:** India, Manipur, Imphal East, Jiribam, 100 m, 24\(^\circ\) 47’ 43.15” N and 93\(^\circ\) 8’ 12.39”E, dated 24.12.2008, Deshworjit 00049.

**Herbarium specimen reffered:** Accn. No. 76050, Coll. No. 7272 (NBRI).


**Dicliptera roxburghiana** Nees in Wallich, Pl. Asiat. Rar. 3: 111. 1832. FBI 4: 555. 1884; BP 822. 1903; Haines, Bot. Bih. Or. 697. 1922; FOA 3: 451. 1939. DPMT 3: 339 1961. [Plate 7; Fig. 7]

Diffuse herbs, 30-80 cm tall with a woody root-stock. Stems subhexagonal, shawolly sulcate, often tugid at the nodes, pubescent. Leaves elliptic, rhomboid, lanceolate-acuminate, secondary veins 4 or 5 on each side of midvein, apex shortly acuminate - acute, base broadly cuneate, margin subentire or obscurely undulate. Lamina 2–6 × 1–2.5 cm, glabrescent above, pubescent beneath, or with 2-celled trichomes. Petiole 0.5-2.5 cm long. Flowers in axillary and subsessile or sometimes terminal clusters often in umbel-like cymes, and shortly pedunculate, one to many flowered, pinkish; peduncle 2–5 mm long. Bracts in 2 involures, broadly obovate or suborbicular, unequal, green, abaxially pubescent, base cuneate, margin entire and ciliate, apex mucronate; larger bract 6-12 x 3-7 mm long; smaller bract 5-9 x ca 3 mm long. Bracteoles 2, green with yellowish margin, lanceolate, ca 5 x 1.5 mm, adaxially pubescent. Calyx 5–partite, ca. 4 mm long; lobes subulate, divided near
to the base, pilose. Corolla light purplish red, 1.2-1.6 cm long, bilipped, outside pubescent; lip in upper position sub-orbicular, ca. 1.5 × 1.5 mm; lip in lower position oblong, ca. 2 × 1 mm, 3-lobed, lobes ovate and ca. 0.3 × 0.3 mm. Stamens 2; anthers dithecoous, 2-loculed; thecae spherical, superposed; filaments ca. 0.8 mm long, hairy. Ovary 2-loculed; pilose at tip; ovules 2 in each locule; style filiform, ca. 1.2 cm long, sparsely pubescent, pink colouration at the base; stigma bifid. Capsule clavate ca. 3 mm long. Seeds 4, ovate or suborbicular in outline, ca. 1 mm long, papillate.

Floral diagram:

Fl. & Fr.: November – June.

Habitat: Often found in shady places of forest, waste lands; 800–1900 m.

Distribution: In the valley districts [Map.2.7]. India, Cambodia, China, Laos, Myanmar, Thailand, Vietnam.

Specimens examined: India, Manipur, Thoubal, Wabagai, 873 m, 24° 30’41.7” N and 93°58’ 72.2” E, dated 31.01.2010, Deshworjit 00317.


*Daedalacanthus* T. Anderson; Pigafetta Adanson; Upudalia Rafinesque.

Shrubs or perennial erect herbs with cystoliths. Leaves petiolate; leaf blade margin entire or crenate. Inflorescences terminal or rarely axillary, spikes, lax, sometimes several forming a panicle; bracts sometimes colored, subleaflike, large; bracteoles small, narrow. Calyx 5-lobed; lobes narrow, subequal. Corolla subsalverform; tube basally cylindric, long, slender, throat sometimes inconspicuous; limb 5-lobed; lobes obovate, subequal, contorted in bud. Stamens 2, inserted below throat; anthers 2-thecoous; thecae parallel, muticous; staminodes 2, clavate or filiform. Ovary with 2 ovules per locule; style filiform, glabrous or pubescent; stigma 2-lobed, lobes unequal. Capsule with a solid stalk at base, clavate, 4-seeded; retinacula present. Seeds discoid, compressed, pubescent with
hygroscopic trichomes. About 15 species: tropical and subtropical Asia; two species (one endemic) in China.

Leaves ovate, elliptic, 2-6 x 2-4 cm, internodes 1.5 -4 cm ........1 E. pulchellum
Leaves oblanceolate, 6 -15 x 3-7 cm, internodes 3 - 8 cm ............2 E. suffruiticosum


Common name : Blue Sage

Herbs or undershrubs, 1.2 -1.5 high; stem glabrous; internodes 1.5 -4 cm long. Leaves ovate, elliptic, acute to caudate-acuminate, entire, 2-6 x 2-4 cm, glabrous; lateral nerves 3-7 pairs; petioles 0.2 -1.5 cm long. Inflorescence terminal or axillary panicles, 3-5 cm long; penduncles 1.5 -3 cm long; bracts of inflorescence foliaceous, lanceolate, elliptic, cuspidate, 2-2.5 x 0.5 – 1 cm, pubescent, with dark green nerves, pale or whitish between the nerves; floral bracts foliaceous, 1-2 x 0.5 -1 cm, glabrous; bracteoles lanceolate, acuminate, 4-8 mm long, ciliate or glabrous along margins; calyx-lobes 5, lanceolate, divided half way down; segments unequal, 0.5 -1 cm long, ca 1 mm wide; corolla deep blue; corolla- tube 2-3 cm long, minutely pubescent; corolla – lobes subequally 5-lobed, oblong or obovate, 1 – 1.5 cm across; stamens 2; filaments 0.5 – 1 cm long, glabrous; anthers-thecae 2 – 4 mm long; ovary ellipsoid, 3 -5 x 1 -2 mm; style 3 -4 cm long, pubescent. Capsules oblong, glabrous.

Fl. & Fr.; November – April.

Habitat: Naturalized in the waste lands and also cultivated in gardens.

Distribution: In the valley districts [Map.2.8], India, Myanmar, Thailand.

Specimens examined: India, Manipur, Imphal east, Singjamei, 850 m, 24° 45’31.8” N and 93°56’ 57.3” E, dated 04.01.2010, Deshworjit 00195.


Herbs or undershrubs, 30 - 85 cm high. Stem rusty pubescent, quadrangular, internodes 3 - 8 cm long. Leaves opposite, equal, oblanceolate. Lamina 6 -15 x 3-7 cm wide, elliptic; apex acute to acuminate; margin entire, undulate or very obscurely crenulate; base cuneate; membranous, dark green above, paler beneath, scaberulous; lateral nerves 5-7 pairs. Petioles 2 -3.5 cm long. Inflorescence terminal or axillary panicles, 2-4 x 0.6 - 1 cm; apex acuminate; base ovate; lateral nerves 5; puberulous at both sides. Pendicles 1 -2 cm long. Bracts of inflorescence foliaceous, obovate - narrow, nervous, bluntly acute, 2-2.8 x 0.5 – 1.5 cm, pubescent, with green nerves, pale between the nerves; floral bracts, 2 in number, foliaceous, 2-4 x 0.5 -2 cm, glabrous. Bracteoles lanceolate, acuminate, 3-7 mm long, glabrous along margins. Calyx-lobes 5, linear lanceolate, divided half way down; segments equal, 0.5 -1 cm long, ca 1 mm wide; corolla purple with a white center. Corolla- tube 3- 4 x 0.4 cm, minutely pubescent; corolla lobes equally 5-lobed, oblong or obovate, 1 – 1.6 cm across. Stamens 2 in number, included; filaments 0.5 – 1 cm long, glabrous; anthers-thecae 2 – 4.5 mm long. Ovary ellipsoid, 3 -4.5 x 1 -2 mm; style 3 - 4 cm long, pubescent, pink colouration at the tip. Capsules oblong, glabrous.

Floral diagram:

*Fl. & Fr.*; November – April.

*Habitat:* Under growth in forest in shady areas.

*Distribution:* In the valley districts [Map.2.9], Northeast India, Myanmar.

*Specimens examined:* India, Manipur, Imphal East, Nongmaiching, 1028 m, 24° 45'54.1" N and 94°01' 53.4" E, dated 17.02.2009, Deshworjit 00116.

*Herbarium specimen referred:* Accn. No. 28291 Coll. No. 26997 (BSI).
3.9 **HYGROPHILA** R. Brown, Prodr. 479. 1810. 
*Adenosma* Nees (1847), not R. Brown (1810); *Asteracantha* Nees; *Cardanthera* Buchanan-Hamilton ex Bentham & J. D. Hooker; *Hemiadelphis* Nees; Kita A. Chevalier; *Nomaphila* Blume; *Physichilus* Nees; *Polyechma* Hochstetter; Santapaua N. P. Balakrishnan & K. Subramanyam; *Synnema* Bentham; *Tenoria* Dehnhardt & Giordano (1832), not Sprengel (1813).

Herbs, annual, usually found in wet places. Leaves opposite, lanceolate to obovate, sessile or shortly petiolate; leaf blade margin entire, crenulate, or sometimes undulate. Flowers sessile, in axillary clusters; bracts elliptic, lanceolate, bracteoles linear-lanceolate or oblong, shorter than calyx. Calyx tubular, 5-lobed; lobes linear-lanceolate. Corolla ventricose; tube dilated above; limb 2-lipped, bluish purple, nearly glabrous; lower lip 3-lobed, upper lip apex shallowly dentate; lobes contorted in bud. Stamens 4, didynamous, posterior pair similar to anterior pair or smaller or rudimentary; filaments glabrous; anthers oblong; 2-theous; thecae equally inserted, divaricate or connate at the base. Ovary oblong, with hairy tip, 2-loculed; ovules with 4 to many in each cell; style slender, hairy; stigma simple or linear. Capsules linear-ellipsoid to narrowly oblong, bearing seeds from base; seeds numerous, rarely few, ovoid, compressed, with hygroscopical hairs; retinacula present. Seeds discoid, covered with long mucilaginous trichomes.

1a. Stamens 2 ............................................................. 1. *H. polysperma*
1b. Stamens 4.
2a. Leaf blade glabrous or slightly pubescent ........................................ 2. *H. ringens*
2b. 3b. Leaf blade densely strigose or hirsute on both surfaces.
   a. Calyx ca. 0.7 cm; corolla ca. 1.5 cm ........................................ 3. *H. erecta*
   b. Calyx ca. 1.1 cm; corolla 1.8–2.2 cm ........................................ 4. *H. phlomoides*

asiat. rar. 3: 80. 1832. *Hemiadelphis polysperma* var. *joshianus* Prak. Rao & S.N. Biswas in Indian Forester 94: 657. 1968. [Plate 10; Fig. 10]

Vernacular name : Ishing langthrei

Herb annual. Stems procumbent, 8 -20 cm high, usually puberulous-hirsute, soon glabrous, ciliate and geniculate, much branched, patent. Leaves cauline, oblong- lanceolate, over 2.5 cm long, soon withered the upwards and downwards 2-2.2 cm long, elliptical – oblong, obtuse, all linear, gradually narrow towards the petioles, glabrous, dark green, inconspicuous crenate. Flower spike short, ca 1.3 cm long, terminal on branches and branchlets, pedicelless. Bracts imbricate, 1.3 x 0.5 cm, usually obovate and ovate, obtuse, herbaceous, pubescent or hirsute. Bracteoles lanceolate, longer than calyx, ciliate. Calyx ca 1 cm long, tubular at base, 5- divided to the middle, segments unequal, equal, linear, acuminate, pubescent. Corolla 1.5-2 cm long, pubescent, purple, upper lip 2-teethed, lower lip 3 lobed, lobes sub-equal, round. Stamens inserted at lower part of corolla-tube, filaments ca 3.3 mm long, bilateral coherent into the base; posterior stamens reduced to teeth. Stigma single, acute. Capsules 1.5 cm long, lanceolate, glabrous, compressed, with 6 cannels, bearing 24-30, seeds from base. Seeds ovate, convex both side. Retinacula shortly hooked at tip.

*Fl.* & *Fr.*: October – February.

*Habitat*: Widely distributed in wetlands and marshes areas.

*Distribution*: In the valley districts [Map.2.10], Northeast India, Thailand, China and Malaysia.

*Specimen examined*: India, Manipur, Bishnupur, Thongjao, 791m, 24° 30' 02.0 "N, 94° 00' 47.3" E, dated 04.11.2010, Deshworjit 00137.

*Herbarium specimen reffered*: Accn. No. 11966, Coll. No. 13840 (BSI)


[Plate 11; Fig. 11]

Vernacular name : Ishing langthrei

Perennials herb, 50-80 cm tall, branched. Stems erect or decumbent at base, quadrangular, striate, slightly pubescent. Petiole 0.5–1 cm long, glabrous. Lamina narrowly lanceolate to oblanceolate, 3– 8 × 0.5–1.5 cm, both surfaces with numerous cystoliths and glabrous or slightly pubescent, secondary veins 8–11 on each side of midvein, base attenuate and decurrent onto petiole, margin entire or slightly undulate, apex acute to obtuse. Flowers (solitary or) 2–10 clustered in leaf axils, sessile; bracteoles narrowly ovate, 3–5 mm, margin pubescent, apex obtuse. Calyx narrowly campanulate, ca. 1 cm, 5-lobed to middle; lobes linear- lanceolate, grayish pubescent or fulvous strigose, apex acuminate. Corolla pale purple, 1–2.5 cm; tube ca. 7 mm, ca. 2 mm wide, glabrous; limb 2-liped; lower lip obovate, ca. 3 mm long, 3- lobed to middle, lobes ovate with an obtuse apex; upper lip elliptic, ca. 3 mm long, shallowly 2-lobed, outside puberulent. Stamens 4, included; filaments glabrous, longer pair ca. 5 mm long, shorter pair ca. 3 mm long; anther thecae 1–2 mm. Ovary glabrous; style filiform, ca. 1 cm long, included; stigma unequally 2-lobed. Capsule narrowly oblong, 0.8–2.2 cm long, ca. 1.5 mm wide, glabrous, 12–18-seeded. Seeds ca. 1 mm long, pubescent.

*Fl. & Fr.:* August – February.

*Habitat:* Along streams, wet places of roadsides and paddy fields; below 1000 m.

*Distribution:* In the valley districts [Map.2.11]. India Bhutan, Cambodia, India, Indonesia, Japan, Laos, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Thailand, Vietnam.

*Specimen examined:* India, Manipur, Imphal west, Howrang sabal, 785m, 24° 51' 67.4 "N, 94° 48' 85.6" E, dated 27.11.2009, Deshworjit 00340.

*Herbarium specimen reffered:* Accn. No. 1536 (NBRI).

Erect or ascending annual herb, ca 1.3 m tall. Stems branched, quadrangular, canaliculate, often white patent, hirsute, much denser upwards; stem roots at the lower nodes. Leaves homomorphic, opposite-decussate, papyraceous, sessile or shortly petiolate; lamina obovate or elliptic, 2.8 – 9.3 cm x 1.8 – 4.5 cm, entire to wavy, rounded or obtuse, base cuneate, both surfaces hirsute, cystoliths conspicuous, lateral nerves thin. Flowers sessile to penduncle of ca 2 cm long, clustered at the axils or whorled upwards. Bracts oblong – lanceolate, 1 x 0.4 cm, as long as or longer than calyx, densely white hirsute. Calyx ca 1 cm long, divided more than half-way down, segments linear, white hirsute. Corolla purple with white purple streaks at throat ca 1.5- 2.0 cm long, pubescent, upper lip triangular, longer, lower lip oblong, palate convex, sparely pilose. Anthers 4, didynamous, anterior ones 0.9 cm long, posterior ones ca 0.4 cm long. Gynoecium 1.2 cm long; ovary glabrous; style pubescent. Seed 1- 1.4 × 0.2- 0.3 cm, ovoid, abruptly acuminate, compressed, marginated slightly puberulous.

*Fl. & Fr.*: November – March

*Habitat*: Plants growing in moist areas near foot hills, paddy fields, streams and other swampy areas between 750 – 940 m.

*Distribution*: In the Valley districts [Map.2.12]. Indonesia, Philippines, Pakistan, China, Myanmar and India.
Specimen examined: India, Manipur, Imphal East, Bamon Kampu, 792 m, 24° 46' 45.84" N, 93° 58' 48"E, dated 12.1.2008, Deshworjit 003502.

Herbarium specimen referred: Accn.No. 12065, Coll.No. 23841. (BSI); 335694 & 1536 (CAL); 49262 & 92746 (NBRI).

3.9.4 *Hygrophila phlomoides* Nees in Wallich, Pl. Asiat. Rar. 3: 80. 1832. *H. phlomoides* var. *phlomoides* FBI 4: 408. 1884. [Plate 13; Fig. 13]

Perennials herb, erect or prostrate at the base, upto 1 m tall. Stems quadrangular, brown strigose. Petiole 0–3 mm long, hirsute; leaves elliptic, obovate, or oblong, 2–9 × 1–3 cm, papery, cystoliths dense, both surfaces hirsute, secondary veins 8–15 on each side of midvein, base usually attenuate and decurrent onto petiole, margin entire or undulate, apex acute to sometimes obtuse. Flowers axillary, several clustered or in whorls upward; bracteoles linear-oblong, ca. 5 × 2 mm, hirsute. Calyx ca. 1.1 cm long, white hirsute, 5-lobed to middle; lobes linear. Corolla 1.8–2.2 cm long, pubescent; lower lip oblong, sparsely pilose, 3-lobed; upper lip triangular, 2-lobed. Stamens 4; filaments glabrous, longer pair ca. 5 mm long, shorter pair ca. 3 mm long; anther thecae ca. 2 mm. Ovary glabrous; style ca. 1.8 cm, pubescent. Seed number 10 -14, ovoid, compressed, 1- 1.2 × 0.2-0.3 cm, apex acuminate, margin puberlous.

Fl. & Fr.: November – February

Habitat: Grown in swampy areas; 700 – 910 m.

Distribution: in the valley districts [Map.2.13], India, Cambodia, China, Indonesia, Laos, Myanmar, Pakistan, Philippines, Thailand, Vietnam.

Specimen examined: India, Manipur, Thoubal, Kakching lamkhai, 777 m, 24° 30' 01.9" N, 94° 00 '44.9"E, dated 03.12.2011, Deshworjit 003183.

Herbarium specimen referred: Accn.No. 22065, Coll.No. 23841. (BSI)
3.10  **Hypoestes** Solander ex R. Brown, Prodr. 474. 1810.

Perennial herbs or subshrubs, decumbent to erect, with cystoliths. Leaves opposite, petiolated; leaf blade margin entire or dentate. Flowers of axillary or terminal bracteate spikes to panicles of spikes or of variously disposed cymes, or sometimes clustered in leaf axils. Bracts usually 4, in 2 togeather, free or united at base, enclosing 1-4 flowers, of which all but one are usually reduced or obsolete; bracteoles shorter than bracts, narrow. Calyx small, usually obscured by bracteoles deeply 5-lobed, scarios or membranous; segments linear-lanceolate. Corolla pinkish, purplish, resupinate 180° by torsion of tube; tube subcylindric to expanded distally into a narrow throat; limb 2-lipped; lower lip ver shortly 3-lobed; upper lip subentire or shallowly 2-lobed; lobes ascending cochlear in bud. Stamens 2, inserted near apex of corolla tube, exserted from mouth of corolla; anthers 1-loculed; muticous. Ovary 4 loculed; ovules 2 per locule; style filiform, exserted from mouth of corolla; stigma bifid, lobes equal or unequal. Capsule ellipsoidal, stalked, 4-seeded. Retinacula present. Seeds ovoid, compressed.

Leaves ovate, 2-4.5 x 1.5 – 2.5 cm, basally obtuse to rounded, most surfaces dotted with numerous pink spots to ca. 4mm in size........................................1. *H. phyllostachya*

Leaves elliptic or oblong, 3–10 x 2–4 cm, base cuneate and green in colour...............................................................2. *H. triflora*


Common name : Polka dot plant

Herb 30-70 cm tall, young basal shoots especially velutinous; internodes between leaf – bearing nodes 2-6 cm long, 1.25-2.0 mm thick, subtetrangular, glandular plus appressed hairs at angles only. Leaves petiolate, lanceolate, elliptic-ovate, appressed hairs on upper surface only. Lamina 2-4.5 cm long 1.5 – 2.5 cm
broad, apex acute, basally obtuse to rounded, margin entire, glabrous to sparingly puberulous on the midrib of both surfaces, most surfaces dotted with numerous pink spots to ca. 4mm in size, cystoliths present on both surfaces. Petioles ca 2.5 cm long. Inflorescence in terminal and axillary spikes, often with a gradual transition from solitary flower to spikes, rachis glandular – puberulous. Bracts 2 per flower, fused for upto half their length, oblong, 12- 15 mm long, 1.4 - 1.5 mm broad, apically acute to obtuse, with one bract slightly longer than the other, velutinous plus glandular hairs. Bracteoles subulate, apically tapered, 10-11 mm long, 1.2- 1.3 mm broad, velutinous. Flower sessile; flower with a pentameres. Calyx, 6-7 mm long, segments equal, subulate, fused for ca, half their length. Corolla magenta, 24-25 mm long, ca. 3mm broad at the mouth, 0.7 mm broad basally, puberulous, upper lip 11-12.5,mm long. 3- lobed, lobes rounded, ca. 1.5 mm broad, lower lip 9.5-11 mm long, ca. 1.7 m long, 0.6 mm broad. Stamens 2, exerted, filaments 7-9 mm long; anthers 1-celled, ca.1.7 mm long with downwardly pointed hairs. Ovary 4 loculed; ovules 2 per locule; style ca 2.7 cm long, filiform, exerted from corolla mouth. Capsules elongated, ellipsoidal, 3-4 x ca 1mm, puberulous towards apex. Seed 4, oval, 1.6-1.8mm long, 1.1- 1.2 mm broad, papillate.

*Fl. & Fr.*: November to February.

*Habitat:* Grown in roadsides, waste lands and thickets; 700 – 1200 m.

*Distribution:* In the valley districts [Map.2.14], India, Madagascar, North America.

*Specimen examined:* India, Manipur, Imphal West, Sekmai, 808 m, 24° 56 '25.5" N, 93° 53 '04.3"E, dated 30.11.2010, Deshworjit 003114.

### 3.10.2  **Hypoestes triflora** (Forsskal) Roemer & Schultes, Syst. Veg. 1: 141. 1817. FBI 4: 557. 1885; FTD 477. 1990. *Justicia triflora* Forsskal, Fl. Aegypt.-Arab. 4. 1775; *Dicliptera riparia* Nees var. *yunnanensis* Handel-Mazzetti. [Plate 15; Fig. 15]

Herbs up to 80 cm tall, decumbent, much branched. Stems quadrangular, cylindrical, sulcate, strigose. Leaves petiolate, ovate, ovate-elliptic, or oblong, equal. Lamina 3–8 × 2–3 cm, both surfaces sparsely pubescent, secondary veins 4–7 on each side of midvein, apex acuminate, base cuneate and decurrent onto petiole,
margin more or less denticulate. Petiole 1–3 cm long, pubescent. Flowers subsessile, pinkish brown, pedunculate in leaf axils or in axils of subleaflike bracts distally or in a terminal cluster, 1-5 flowered. Bracteoles outer pair is elliptic to oblanceolate, 0.7–1.5 × 0.4–0.5 cm, green toward apex, abaxially pilose, apex rounded to acute, base cuneate; bracteoles inner pair is linear-lanceolate to oblanceolate, smaller, apex acute, basally connate. Calyx-5 partite, ca. 6 mm long; lobe ca. 5 mm long, deeply divided upto base, linear-lanceolate. Corolla white to pink with maroon markings, ca. 1.5 cm long, outside pubescent, inside glabrous; tube basally cylindric and ca. 1 mm wide for ca. 1 cm; lip in lower position lanceolate, ca. 8 × 1.5 mm, apex slightly 2-lobed; lip in upper position oblong, ca. 5 × 3 mm. Stamens 2; filament ca 5 mm long, anther 1-loculed, muticous. Ovary 4-loculed, pubescent; style ca. 1.4 cm long, glabrous; stigma unequally 2-lobed. Capsule septicidal, ca. 9 mm long, sparsely pubescent. Seeds black, ovate in outline, winged, ca. 2 × 2 mm, verrucose.

**Fl. & Fr.:** October - January.

**Habitat:** Grown in shady areas, waste lands, thickets and understorey of forest; 650 - 940 m.

**Distribution:** In the valley districts of Manipur [Map.2.15]. India, Bhutan, China, Myanmar, Nepal and Africa.

**Specimen examined:** India, Manipur, Bishenpur, Keibul lamjao, 761 m, 24° 26'51.4" N, 93° 50'25.3"E, dated 27.10.2009, Deshworjit 00389.

**Herbarium specimen reffered:** Accn. No. 43979, Coll. No. 53609 (BSI).


*Adatoda* Adanson; *Adhatoda* Miller; *Calophanoides* Ridley; *Ecbolium* Kuntze (1891), not Kurz (1871); *Gendarussa* Nees; *Mananthes* Bremekamp; *Rhaphidospora* Nees; *Rostellaria* Nees (1832), not C. F. Gaertner (1807); *Rostellularia* Reichenbach.

Herbs, subshrubs, or shrubs, cystoliths present. Leaves opposite, margin usually entire but sometimes sinuate or slightly serrate equal, lanceolate, linear, elliptic or ovate; sessile or petiolate. Flowers sessile or subsessile, in axillary or terminal spikes, racemes, or thyrses, sometimes branched and becoming panicles,
sometimes reduced to a single flower in leaf axils. Bracts variable in shape, sometimes prominent and/or brightly colored, small green. Bracteoles 2, narrow or absent, or similar to or smaller than bracts. Calyx deeply 4- or 5-lobed; linear lanceolate, narrow, lobes equal or subequal. Corolla tubular or funnel-shaped; limb 2-lipped; lower lip 3-lobed; upper lip entire to 2-lobed, internally with a stylar furrow; lobes ascending cochlear in bud. Stamens 2; anthers 2-thecous; thecae equally or unequally inserted, parallel to perpendicular, one or both spurred at base or sometimes lacking basal appendages; filaments often dialated, hairy near the base. Ovary 2-loculed; Ovules 2 per locule; style filiform; stigma shortly 2-fid. Capsule ovoid or ellipsoid, with a sterile basal stalk and a fertile head, 2-4 seeded; retinacula present. Seeds compressed, tuberculate, rugose, not hygroscopically hairy.

Etymology: Commemoarting James Justice (1730-1763), an eminent Scottish horticulturist and botanist.

1a. Calyx equally 4-lobed or unequally 5-lobed (i.e., with one lobe conspicuously smaller than others)

1b. Calyx equally 5-lobed

Flowers in spikes or axillary cymes; only lower anther theca spurred at base.

2a. Corolla 2.5–3 cm

2b. Corolla 2.2 cm or less.

3a. Bracts linear, leaves lanceolate, glabrous

3b. Bracts oblong or linear, leaves ovate, pubescent on the midrib beneath

4. Justicia procumbens

Common name : Water willow.
Vernacular name : Napi tusonbi.

Herbs 20–50 cm tall, procumbent. Stems 4-angled, sulcate, pubescent. Petiole 3–8 mm long, pubescent; leaf blade elliptic, ovate-elliptic, or elliptic-oblong, 1.5–4 × 0.8–1.5 cm, subglabrous to sparsely hispid, cystoliths numerous, secondary veins 3–6 on each side of midvein and prominent, base broadly cuneate to subrounded and slightly decurrent onto petiole, margin entire or slightly undulate, apex acute to obtuse. Spikes terminal or axillary in upper leaf axils, cylindric, 1–6 cm long, dense; peduncle 0.5–7 cm long, densely pilose; bracts ovate to elliptic-lanceolate, 2.5–8 × 0.6–1.3 mm, abaxially pilose, margin ciliate; bracteoles lanceolate, 2.5–5 mm long, abaxially pilose, margin ciliate. Calyx 4–6 mm long, 4-lobed to base; lobes linear, outside pilose along veins, 1-veined, margin yellowish white and ciliate. Corolla pink or white and red-spotted on lower lip, 5–8.5 mm long; lower lip ca. 3 × 3.5 mm, 3-lobed, lobes ovate, middle lobe slightly larger and ca. 1 × 1–1.5 mm; upper lip ca. 3 mm, apex emarginate. Stamens exserted; filaments ca. 4 mm, glabrous; anther thecae superposed, lower one spurred at base, upper one muticous. Ovary pubescent; style ca. 5 mm long, pubescent. Capsule 4–6 mm long, 4-seeded. Seeds ovate in outline, ca. 1 × 1 mm, rugose.

Fl. & Fr.: November – April.

Habitat: Littoral forest, wastelands and thickets; near sea level to 1300 m.

Distribution: In the valley districts [Map.2.16]. India. Bangladesh, Bhutan, Cambodia, China, Indonesia, Japan, Laos, Malaysia, Myanmar, Nepal, Philippines, Sri Lanka, Thailand, Vietnam.

Specimen examined: India, Manipur, Bishenpur, Moirang, 722 m, 24° 30'55.5" N, 93° 47'47.3" E, dated 15.02.2009, Deshworjit 00038.

Herbarium specimen reffered: Accn. No. 12830 (BSI).

Common name  : Malabar nut.
Vernacular name  : Nongmangkha angouba.

Shrubs, 2 to 4 m high. Stems with many long branches, cylindrical to quadrangular, lenticellate, pubescent when young but soon glabrescent. Leaves elliptic, petiolated, attenuate at base, apex acuminate or slightly falcate, margin entire. Lamina ovate to elliptic-ovate, 7–20 × 2–7 cm, abaxially puberulent, adaxially densely tomentose when young but glabrescent except tomentose along veins, secondary veins 9–12 on each side of midvein and meeting near margin. Petiole 0.8–3 cm long, puberulent. Flowers in axillary or terminal, ovoid to broadly ovoid, 3–8 cm long; peduncle 3–7 cm long. Bracts foliaceous, imbricate, ovate-oblong, 2-3 × 1 × 2 cm, puberulent, 3–7-veined, margin ciliate, apex acute. Bracteoles linear-lanceolate, 1–1.5 × 0.4–0.6 cm, puberulent, 3–5-veined, margin ciliate, apex acute. Calyx 5-lobed, equal; lobes linear-oblong, 1-1.5 × 0.3–0.5 cm, slightly connate, acute, margin narrowly scarious and ciliate. Corolla white or pink with purplish or pinkish stripes outside, broadly tubular, 2.5–3 cm, outside pilose; tube basally cylindric and ca. 5 mm wide for ca.5 mm long and then slightly inflated and bent upward; upper lip ovate-oblong, ca. 1.8 cm long, erect, shallowly 2-lobed; lower lip oblong-circular, spreading, 3-lobed, middle lobe subcircular and ca. 9 × 5 mm, lateral lobes ovate and ca. 8 × 4.5 mm. Stamens 2, attached at the throat of the tube, exserted; filaments thick, 1.5 -2.5 cm long, hairy at the base; anther-locules ellipsoid, 3-5 mm long, equal, parallel, minutely apiculate at base, not spurred. Ovary oblong, 3-5 x 3-5 cm, pubescent especially at tip; style 1-3 cm long, recurved, basal part pubescent; stigma minutely 2-fid. Capsule obovoid, 2-2.5 x 0.5-1 cm, shortly or buntly pointed, pubescent, pubescent, solid. Seeds-4, circular in outline, 5-6 mm across, glabrous.

Floral diagram:
$\textit{Fl. & Fr.}$: January – July.

$\textit{Habitat}$: Grown in thickets, roadsides and cultivated as hedge plant in garden for its medicinal value.

$\textit{Distribution}$: In the valley districts [Map.2.17], India, Indonesia, Malaysia, Nepal, Pakistan and Sri Lanka.

$\textit{Specimen examined}$: India, Manipur, Thoubal, Mangthak, 768m, 24° 47’ 34.3” N, 93° 56 ’19.1”E, dated 08.03.2009, Deshworjit 000372.


Common name : Gendarusa.

Vernacular name : Nongpok langthrei.

Subshrubs, erect, 0.8–1.5 m high, much branched. Stems terete, swollen at nodes, glabrous. Leaves linear-elliptic, narrowly lanceolate, petioled. Lamina, 6–10 × 1–1.5 cm, glabrous, lateral veins 5–8 on each side of midvein, attenuate at base, margin subsinuate, apex acute to shortly acuminate, dark brown. Petiole 3–10 mm long. Spikes terminal or axillary, 3–12 cm long, interrupted, usually in a leafy panicle; peduncle 0.5–1.5 cm long. Flowers clustered along the spikes. Bracts linear-lanceolate, 2–6 × 1–2.5 mm, basal ones longer than calyx then gradually smaller with apicalmost ones shorter than calyx, ciliate at margin, apex acute to acuminate. Bracteoles absent. Calyx-lobes 5, almost free, ca. 5 mm long; lobes linear-lanceolate, 3–4 × ca. 0.5 mm, subequal, acuminate at apex. Corolla, bilipped, creamy white, 1–1.2 cm long; tube basally cylindric and ca. 2 mm wide for 8–9 mm long; lower lip greenish white with violet dotted inside, cuneate-ovovate, 6–10 mm broad, 3-lobed, lobes oblanceolate and 3–5 × ca. 3.5 mm; upper lip violet blotched, triangular, ca. 7 × 3.5 mm, 2- cleft. Stamens 2; exserted; filaments 4–6 mm, glabrous or hairy at base; anther thecae oblong, ca. 1.5 mm long, superposed, lower one spurred at base,
upper one muticous. Ovary 2-4 mm long, glabrous; style 1-1.2 cm long, glabrous; stigma capitate, shortly 2-lobed. Capsule clavate, ca. 1.5 cm long, glabrous.

Floral diagram:

*Fl. & Fr.*: November – January.

*Habitat:* Common along thickets and cultivated as hedge plant in garden.

*Distribution:* In the valley districts [Map.2.18], India, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Papua New Guinea, Philippines, Sri Lanka, Thailand, and Vietnam.

*Specimen examined:* India, Manipur, Imphal West, Phayeng, 782m, 24° 51' 67.4" N, 93° 48 '85.6"E, dated 23.12.2010, Deshworjit 003015.


Undershrubs, erect, 0.5–1.2 m tall much branched. Stems terete branched, swollen at nodes, glabrous except at tip. Leaves ovate attenuate at both ends minutely crisped pubescent on the midrib beneath. Petiole 3–5.5 cm long; leaf blade 6-14 cm long; 2.5 x 6.2 cm wide; margin entire; apex acte to acuminate; base attenuate; lateral nerves 7-9; abxail sides Whitish, midrib, veins and vienlets hairy. Inflorescence spikes axillary and terminal 1-3.5 cm long, clustered, secund, pubescent. Bracts linear-lanceolate, 4 – 6 x ca 2 mm, margin papycerous, mostly shorter than the calyx, pubescent. Bracteoles 2 linear lanceolate, equal, 3-4 x ca 1.5 mm, margin papycerous. Calyx sub -5 (4 +1) partite, lanceolate, apex acuminate, divided upto base, smaller (4) ca 4 x 2 mm, bigger (1) 5 x 3 mm long. Corolla bilabiate, upper lip hardly broader than one of the three lobes of the lower, pubescent, yellowish slightly pink spotted, corolla tube cylindrical 1-1.2 x ca 0.5 cm, upper lip 1x 0.2 cm, lower lip 1-1.2 x 0.3 cm long; stamens 2, filaments 5-6 mm long,
anther cells divariate, lower with a minute white appendage at the base, anther thecae 1-2 mm long. Ovary glabrous, style 1-1.2 cm long, pubescent in the lower part. Capsule clavate, ca. 1.2 cm long.

*Fl. & Fr.*: January – May.

*Habitat:* Grown at hill slopes near streams or wet areas.

*Distribution:* In the valley districts [Map.2.19], Northeast India, Laos, Myanmar, Thailand, and Vietnam.

*Specimen examined:* India, Manipur, Imphal East, Andro, 865m, 24° 45' 44.9" N, 94° 01 '47.9"E, dated 14.01.2010, Deshworjit 003137.

*Identification confirmed by:* J.R.I. Wood.

### 3.12 **LEPIDAGATHIS** Willdenow, Sp. Pl. 3: 400. 1800.


*Common name:* Curved lepidagathis.

Herbs 30–80 cm tall, erect or prostrate at the base, base often conspicuously woody, often anisophyllous, rooting at nodes. Stems quadrangular, sulcate, pubescent or soon glabrescent; internodes 5-10 cm long. Leaves ovate to elliptic to narrowly elliptic, base cuneate and conspicuously decurrent onto petiole, margin entire and slightly sinuate, apex acute to shortly acuminate. Lamina 2.5–11 × 1–4.5 cm, 1.7–4.5 × 1.6x 4.5 wide, both surfaces pubescent but soon glabrescent with few trichomes or sparsely pubescent along veins, secondary veins 7–9 on each side of midvein. Petiole 0.5–3.5 cm long. Inflorescence spikes elongate, 1–3.8 cm, terminal a bunch containing 2-4 spikes, second. Bracts foliaceous, oblong-lanceolate, 6–10 × 1.5–2 mm, with a prominent midrib abaxially and marginally pubescent with gland-tipped and non-glandular trichomes, 1-veined, apex long acuminate. Bracteoles similar to bracts except usually smaller. Calyx 8–10 mm long, pubescent with gland-tipped and non-glandular trichomes or glabrescent; limb-5, subequal; posterior
lobe oblong-lanceolate, 8–9 \times 1.5–1.7 mm, 3-veined; lateral lobes lanceolate, 6–7.5 \times 0.7–0.8 mm; anterior lobes connate at base half of their length, distinct segments lanceolate and 4.8–6 mm. Corolla white streaked with purple, 8–10 mm long, outside sparsely pubescent, billiped; lower lip 2.5–3 mm long, lobes 1.5–3 \times 1.3–1.8 mm. Stamens 4, didynamous; filament 1-2 mm long; anthers ca 1 mm long. Ovary 2-3 x ca 2 mm; style filiform, 5-6 mm long, stigma simple. Capsule linear, compressed, ellipsoid, pointed at tip, 4-5 x ca 1 mm long, glabrous or distally pubescent. Seeds 4, subcircular in outline, 1.5–1.8 mm in diameter. Retinacula present.

**Fl. & Fr.**: October – March.

**Habitat**: Common along bamboo brakes, thickets, roadsides and streamsides. 500-1300 m.

**Distribution**: In the valley districts [Map.2.20], India, Bangladesh, China, Myanmar, Thailand, Vietnam.

**Specimen examined**: India, Manipur, Bishenpur, Maibam lokpa ching, 769 m, 24°42' 05.5" N, 93°48 '26.2"E, dated 08.11.2008, Deshworjit 00273.

**Herbarium specimen referred**: Accn. No. 90879, Coll. No. 222255 (NBRI).

3.13 **NELSONIA** R. Brown, Prodr. 480. 1810.


Plant a herbs up to ca. 30 cm tall, annual, trailing flowering branches, prostrate, or decumbent; rootstock woody. Stems suberete, densely villous, often rooting at nodes. Petiole 0.2–4 cm long, villous. Leaves variable, basal leaves larger, elliptic-oblong, apex acute, base cuneate, margin entire, 6–12 \times 3.5–5 cm; basal leaves in whorls of three, pubescent; lateral nerves 4-8 pairs; flowering branches with smaller leaves of 2-5 x 1-1.5 cm, both surfaces villous. Flower in axillary and terminal, with dense, broad spikes 1.5–4 cm long. Bracts imbricate, ovate to oblong, a cute, 5–8 \times 3–4 mm, densely villous, 5–7-veined. Bracteoles absent. Calyx lobes 4, lanceolate, unequal, villous; abaxial lobe ca. 6 mm long, apex 2-lobed; adaxial lobe
ca. 5 mm long. Corolla bluish purple or white, bilipped, externally glabrous; tube cylindric for ca. 1.5 mm long, contracted near midpoint then expanded into throat; lower lip ca. 2.3 mm long; upper lip ca. 2 mm long. Stamens 2, attached above the middle of the corolla tube, exserted; filaments ca. 5 mm long, glabrous; anther thecae divergent, muticous, slightly spurred. Ovary 2-locular, glabrous; ovules 8–10 per locule; style ca 5 mm long. Capsules ovoid, oblong, beaked, ca. 5-8 × 3-4 mm, glabrous, 8–12-seeded. Seeds broadly ellipsoid, rugose.

*Fl. & Fr.*: November –March.

*Habitat:* As undergrowth in littorial forest. 520-1080 m.

*Distribution:* In the valley districts [Map.2.21], India, Bhutan, Cambodia, Indonesia, Laos, Malaysia, Myanmar, China Nepal, Philippines, Thailand, Vietnam and Madagascar.

*Specimens examined:* India, Manipur, Imphal West, Langol, 838m, 24° 49’ 25” N, 93° 52’12.6"E, dated 14.11.2008, Deshworjit 00273.

*Herbarium specimen reffered:* Accn. No. 335193, Coll. No. 4416 (NBRI); Accn. No. 73380 (BSI).


*Common name:* Magenta plant.

Herbs, erect, 25-50 cm tall. Stems subquadrangular, nearly glabrous. Leaves apex acuminate to subacute, base acute or obtuse, slightly oblique, margins entire or shallowly undulate. Lamina 7-15 x 3-6 cm long, glabrous on both surfaces but slightly pubescent along veins on lower surfaces lateral veins 4 – 6 per side. Petiole ca 4 cm long. Flowers terminal, usually clustered cymes, 1 -4 nate, compressed, 1-4 involurces. Bracts of each pair unequal, ovate or ovate- oblong, larger one 2.5 – 3.4 cm long, smaller one 2-3 cm long, obtuse at tip, rounded or cordate at base, both glabrous. Bracteoles linear lanceolate, minute. Calyx 5 lobed;
lobes ca. 3mm long, deeply divided up to base, linear lanceolate with glandular and nonglandular hairs. Corolla reddish violet, ca to 4-5 cm long, with purple spots at the center, puberulent; limb bilabiate, upper lip broadly obovate, lower lip oblong, minutely 3-lobed. Stamens 2, exserted, ca. 1cm beyond mouth of corolla tube; filaments ca 2 x 0.2 cm, retrorsely hirsute; anther 2-loculed, placed at unequal level; anther-thecae linear or ovoid, muticous, not spurred. Ovary 2-loculed, glabrous; ovules 2 in each locule; style ca 4 cm long, filiform; stigma shortly bifid. Retinacula present. Capsule ellipsoidal, stalked, 1.5 - 2 cm long, pubescent; seeds 4, orbicular, slightly tuberculate, lacking trichomes.

Fl & Fr.: October – March

Habitat: Found along streamsides in littoral forest. 850-1200 m.

Distribution: In the valley districts Manipur [Map.2.22], Eastern India, China, Java, Malaysia, Philippines and Taiwan.

Specimen examined: India, Manipur, Imphal East, Nongmaiching, 1118m, 24° 46' 05.2 "N, 94° 01 '44.1"E, dated 09.12.2009, Deshworjit 003006.


Herbs, spreading 30–50 cm tall, slightly anisophyllous; rooting at nodes. Stems as ascending, 4-angled, brown retrorsely pubescent. Petiole 4–6 cm long;
Leaves obliquely ovate to elliptic, apex acute to acuminate, margin entire, base cuneate to attenuate; lamina 7.5–11 × 3.5–5 cm, papery, abaxially pubescent along veins, adaxially hirsute, secondary veins ca. 6 on each side of midvein. Spikes 1-sided, leafy, terminal or axillary, 3–6 cm. Penducles 1-2.5 cm long. Bracts closely imbricate, orbicular to reniform, enclosing 2-3 flowers, ca. 1 × 1.4 cm, gland-tipped pubescent. Calyx 5-lobed, outside gland-tipped pubescent; sepals unequal, imbricate; posterior lobe ovate-elliptic, 6-8 × 4-6 mm, bractlike, other lobes linear to subulate and 5–7 mm long. Corolla white; tube 0.5 -1 cm long; lobes 5, sub equal, obtuse, 2-lipped; lower lip 3-lobed, lobes ovate-oblong and 2-4 × 1-2 mm; upper lip narrow, 2-lobed, 3-4 mm long. Stamens 4, attached at the throat of the tube, didynamous; filaments 0.7-1 cm long, glabrous; anther-thecae oblong, subequal; ovary 2-loculed, 1-3 mm long, 4-ovuled; style filiform, 3-5 mm long; ovary apex sparsely gland-tipped pubescent; style filiform, 3-5 mm thick, pilose. Stigma capitates. Capsule ellipsoid, ca. 7 mm long, ca 3 mm thick, ciliate; seeds 4, orbicular, ca. 2 × 1.5 mm, with hygroscopical hairs.

*Fl. & Fr.*: December – March.

*Habitat:* As undergrowth in bamboo brakes, thickets, roadsides along streams. 300–850 m.

*Distribution:* In the valley districts Manipur [Map.2.23], India, Bangladesh, Bhutan, China, Myanmar, Thailand, Vietnam.

*Specimen examined:* India, Manipur, Imphal East, Nongmaiching, 1118m, 24° 46' 05.2 " N, 94° 01 '44.1"E, dated 01.02.2009, Deshworjit 000340.


### 3.16 **PHLOGACANTHUS** Nees in Wallich, Pl. Asiat. Rar. 3: 76, 99. 1832.

Shrubs, undershrubs or small trees, with cystoliths. Leaves opposite, petioled, equal, ovate to oblanceolate; lamina large, margin entire or obscurely crenate. Inflorescences in terminal thyrses or axillary cymes, pedunculate; bracts small; bracteoles small or absent. Calyx deeply 5-lobed; lobes equal to unequal. Corolla tubular, slightly curved; limb subequally 5-lobed or 2-lipped; lower lip 3-
lobed, lobes ascending cochlear in bud; upper lip 2-cleft. Stamens 2, inserted at middle or basal portion of tube, included or sometimes slightly exserted beyond corolla lip; anthers 2-thecus; thecae equal, base divaricate and muticous; staminodes 2, small. Ovary usually glabrous; stigma subentire. Capsule linear, 4-angled, basal portion solid but lacking a conspicuous basal stalk; retinacula present, 8–16-seeded. Seeds lenticular, glabrous or pubescent.

1a. Inflorescences dense terminal thyrsus
Leaves glabrous or almost so:
   a. Petiole upto 4.5 cm. Inflorescence upto 15 cm, shortly penduncled. Corolla purplish red, upto 6 cm
      ... 1. *P. curviflorus*
   b. Petiole upto 2 cm. Inflorescence upto 15 cm, shortly penduncled. Corolla yellow, ca upto 2.3 cm
      ... 2. *P. thyrsiformis*

1b. Inflorescences short axillary cymes, leaves pubescent, petioles upto 2 cm long, Corolla orange, upto 2.2 cm
      ... 3. *P. pubinervius*


Common name : Wild Nongmangkha.
Vernacular name : Chingi Nongmangkha.

Shrubs large, 3–6 m high. Leaves petioled, equal, obovate or elliptic, sometimes oblique, acute or acuminate, base broadly cuneate and narrowed onto petiole, margin entire to subcrenate, apex acute to acuminate. Lamina 12–30 × 9–15 cm, abaxially puberulent along veins, adaxially glabrous, secondary veins 8–12 on each side of midvein. Petiole 1.5–4.5 cm long. Inflorescence erect, short penduncled, thyrses terminal, 12–15 × 5–7 cm; cymes 3–5-flowered. Pedicel 5–10 mm long, densely tomentose. Bracts subulate to lanceolate, 3–6 mm long. Bracteoles subulate 2–3 mm long. Calyx-5 lobed, 6–10 mm long; lobes subulate to lanceolate, subequal,
outside sparsely pubescent, inside densely brown tomentose. Corolla purplish red, 4.5–6 cm long, outside densely brownish pubescent and sometimes including glandtipped trichomes; tube ca. 4.2 cm; lower lip 3-lobed, lobes oblong and ca. 2 × 1.5 mm; upper lip 2-cleft. Stamens 2, glabrous, slightly exserted; filaments glabrous, thicker as it moves towards base; anther thecae ellipsoid, 5–5.5 mm long, not extending beyond corolla lips. Ovary 2 celled; 6-8 ovules in each locule; style filiform, glabrous, Stigma simple. Capsule ellipsoidal, quadrangular, 3.5–5 cm long, 8–10-seeded. Seeds lenticular, 5.5– 6.3 × 4.2–4.5 mm, pubescent.

*Fl. & Fr.*: December - May.

*Habitat:* Grown in thickets, forest margins, ravines; 500–1250 m.

*Distribution:* In the valley districts [Map.2.24], India, Bhutan, China, Laos, Myanmar, Thailand and Vietnam.

*Specimen examined:* India, Manipur, Imphal East, Nongmaiching, 1028m, 24° 46' 09.5 "N, 94° 01 '24.3"E, dated 26.03.2010, Deshworjit 003300.

*Herbarium specimen reffered:* Accn. No. 341617, Coll. No. 4020. (CAL); 49262 & 92746 (NBRI); Acc. No. 71622 (BSI).


Common name : Nongmangkha.

Vernacular name : Nongmangkha.

Evergreen shrub 2-4 m high. Bark yellowish-brown, striate. Branchlets quadrangular. Leaves ob lanceolate to elliptic-obl 6-20 x 3-6 cm, apex acute or acuminate, entire, closely punctuate, dark glossy green above, pale beneath; lateral nerves 10-12 on either half, arcuate; base tapering towards petiole. The leaves on short branches smaller, at lower portion caducous. Cymes axillary, 1-4 fld, penduncle short, quadrangular, ca 10-15 cm long, pubescent. Bract small 1.8 x 0.5
cm, linear, apiculate, caducous. Calyx 5-partite, spilited towards the base 1 x 0.1 cm, linear-lanceolate, pubescent outside, with one distinct mid-rib. Corolla yellow, ca 2.3 cm, pubescent outside, slightly two lipped, tube ca 1.8 cm long, minutely curved, upper lip 2-fid, lower lip deeply 3-fid, densely pubescent outside. Stamens 2, inserted near tube base, filaments ligulate, glabrous, ca 2.1 cm long, much exerted from the tube, anthers 2-celled, oblong, parallel, longitudinal dehiscence. Ovary 2 celled; ca 8 ovules in each locule, glabrous; style ca 2.2 cm terete, stigma extended. Capsule elongated, clavate, obtuse, long and glabrous, 1–2 cm long, 8-14 seeded.

*Fl. & Fr.*: December – April.

*Habitat*: Grown in forest margins and as hedge of garden. 450–1200 m.

*Distribution*: In the valley districts [Map.2.25], India, Bhutan, Bangladesh, Myanmar and Thailand.

*Specimen examined*: India, Manipur, Imphal East, Sawombung, 783 m, 24°52'03.5"N, 94°00'27.6"E, dated 30.02.2009, Deshworjit 000398.

*Herbarium specimen referred*: Accn. No. 93544 (CAL).

### 3.16.3 *Phlogacanthus pubinervius* T. Anderson, J. Linn. Soc., Bot. 9: 508. 1867. FOA 3: 444. 1939. DPMT 3: 340. 1961. *Aeschynanthus dunnii* H. Leveille; Lonicera menelii H. Leveille. [**Plate 26; Fig. 26**]

**Common name**: Red Nongmangkha.

**Vernacular name**: Lamgi Nongmangkha.

Shrubs, 3-5 m tall, much branched. Stem quadrangular, bark light chocolate brown or greyish. Leaves shortly petioled, elliptic-oblong to oblong, base attenuate, margin undulate, apex acute to acuminate. Lamina 8–16 × 3.5–4.5 cm, abaxially puberulent along veins, adaxially scabrous, secondary veins 5–7 on each side of midvein. Petiole 0.5–2 cm long. Cymes axillary, 1–4-flowered; peduncle 0.8–1.3 cm long, 4-angled, pubescent. Bracts small, caducous. Bracteoles subulate, ca. 1.3 × 0.3 cm, caducous. Pedicel 0.8–1.5 cm long. Calyx 0.7–1.2 cm long; lobes linear-lanceolate, unequal, outside pubescent, inside gray tomentose. Corolla orange, ca. 2.2 cm long, outside pubescent; tube ca. 1.5 cm long, slightly curved; lower lip
deeply 3-lobed, lobes ovate; upper lip 2-cleft. Stamens 2, attached at the base of the tube; much exserted; filaments ca. 2.5 cm long, glabrous; anther thecae oblong, parallel, extending beyond corolla lips. Ovary 2 celled; ca 8 ovules in each locule, glabrous; style ca. 2 cm long, glabrous. Capsule ellipsoidal, 2.5–3 cm long, glabrous, 8-seeded. Seeds not seen.

Floral diagram:

*Fl. & Fr.*: January – April.

*Habitat:* Grown in forest thickets and as hedge of garden. 450–1000 m.

*Distribution:* In the valley districts [Map. 2.26], India, Bhutan, China, Myanmar.

*Specimen examined:* India, Manipur, Thoubal, Mangthak, 808 m, 24° 31' 21.4” N, 93° 58' 16.7”E, dated 11.02.2010, Deshworjit 003225.

*Herbarium specimen referred:* Accn. No. 5186, Coll. No. 5186 (CAL).


**Pseuderanthemum polyanthum** (C. B. Clarke ex Oliver) Merrill, Brittonia 4: 175. 1941. *Eranthemum polyanthum* C. B. Clarke ex Oliver, Hooker's Icon. Pl. 20: t. 2000. 1891. [Plate 27; Fig. 27]

Undershrub or woody herbs, 50 – 70 cm high, erect or decumbent at the base, Stems suberete, grayish, glabrous; internodes 2-7 cm long. Leaves broadly ovate to oblong, both surface glabrous; lamina 7–17 × 4–9 cm, secondary veins 7–9 on each side of midvein, apex acute, margin entire, base cuneate and decurrent onto petiole. Petiole 2- 3 cm long, glabrous. Inflorescence terminal spikes or thyrses, dense, 5–12 cm long. Bracts triangular, 3.5–4 × ca. 1.5 mm, puberulous. Bracteoles ca. 2 × 0.5 mm. Pedicel 1.5–2.5 mm long. Calyx ca. 1 cm; lobes-5, divided upto the base, linear, lanceolate, puberulous at the margin. Corolla bluish purple, tube elongated, cylindrical narrow, widened at the throat; tube 3–3.5 cm long; limb 5-partite, lobes elliptic, flat, unequal, lower lip 3-lobed, lobes oblong and ca. 1.5 × 0.6 cm; upper lip 2-lobed, lobes ca. 11 × 3 mm. Stamens 2; filaments ca 0.3 mm long, distinct, inserted at throat, anthers 2- loculed; thecae oblong, equal, parallel, not
spurred. Ovary 2-loculed, ellipsoid, oblong, pilose; ovules 2 in each locule; style ca 3.6 cm long, basally pilose; stigma spherical. Capsule clavate, ca. 2.5 cm long, pubescent. Seeds ovate in outline, ca. 3 x 3 mm long, verrucose, glabrous. Retinacula present.

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

*Habitat*: Found in forests, thickets and streamsides; 510–1600 m. Guangxi, Yunnan

*Distribution*: In the valley districts [Map.2.27], India, Malaysia, Myanmar, Thailand, Vietnam.

*Specimen examined*: India, Manipur, Imphal East, Nongmaiching, 996 m, 24°45’50.8”N, 94°01’58.8”E, dated 29.06.2010, Deshworjit 003361.


*Blechum* P. Browne; *Cryphiacanthus* Nees; *Dipteracanthus* Nees.


**Common name**: Mexican bluebell

**Vernacular name**: Utonglei.

Undershrub, erect, 60 -90 cm high. Stems quadrangular, erect or decumbent at base, branched with nodes thickened. Leavesopposite, dark green in colour on abaxail, white on adaxial, midrib and nerves prominent; internodes 4 -6 cm long, glabrous. Lamina 6-14 x 0.5-2 cm, margin entire or distantly and shallowly crenate, apex acute to acuminate, base acute, glabrous minutely pubescent. Petiole ca 5mm long. Flowers lavender blue, solitary in axillary, trichotomously branched, dichasial cymes. Penducles 5 -7 cm long. Pedicels 2-3 cm long. Bracts opposite, usually green, margin entire. Bracteoles 2, lanceolate 3 -4 x ca 1mm, glabrous. Calyx deeply 5 - partite, equal, segment lanceolate, 5-8 x 1 mm, glabrous to sub glabrous. Corolla funnel shaped, tube basally with a narrowly cylindrical portion; tube 2.5 – 3.5 cm long, 2-4 mm wide; lobes 5, equal, obovate, 1.5 – 2 x 1-1.5 cm, blue or pale violet. Stamens 4, didynamous, usually included in corolla tube, filaments basally connate
in pairs, 0.5 – 1 cm long; anthers 2-loculed, with equal thecae, 2 -3 x ca 1 mm. Ovary 2 -4 mm long, ovules 10 per locule; style 1.5- 2 cm long, usually included in the corolla tube or slightly exerted; stigma 2-lobed, lobes equal to sub equal. Capsule linear-fusiform, acute, 2– 3 cm long, ca 2 mm thick. Seeds 12 -16, orbicular, 2-3 mm across, compressed, hygroscopic trichomes.

*Fl. & Fr.*: August – December.

*Habitat*: In marshy places along road sides and waste lands.

*Distribution*: In the valley districts [Map.2.28], India, Mayanmar, Indonesia.

*Specimen examined*: India, Manipur, Imphal East, Nongmaiching, 996 m, 24° 45' 50.8 " N, 94° 01'58.8" E, dated 29.06.2010, Deshworjit 003361.


Common name : Comb Rungia.

Vernacular name : Warak chamubi.

Herbs much branched 20–50 cm tall. Stem terete, basally prostrate and rooting at nodes then erect, minutely pubescent; internodes 1-4 cm long. Leaves susessile, elliptic, lanceolate or oblong, apex acute, base cuneate and decurrent onto petiole, margin entire, slightly pubescent. Lamina 1–4 × 0.4–1.4 cm, glabrous except for a few trichomes along veins, secondary veins ca. 4 on each side of midvein. Flowers on axillary or terminal spikes, 0.5–2 cm long, 1-sided, solitary or sometimes 2 or 3 compound. Bracts dimorphic, arranged in 4 rows; sterile bracts green, elliptic, ca. 4 × 0.7 mm, scarious margined, slightly mucronate at apex, ciliate; fertile bracts circular to obovate, 4–5 × ca. 3 mm, broadly scarious along margins,
villous or wooly outside and along margin. Bracteoles-2, smaller, elliptic, 3-5 x ca 1mm, margin ciliate, apex 2-cleft and subacute. Calyx- lobes 5, colorless, pubescent; lobes linear-lanceolate, ca. 3 × 0.5 mm, margin narrowly hyaline, apex mucronulate. Corolla blue or white, ca. 5 mm long, outside pubescent, bilipped; lower lip 3-lobed, lobes triangular; upper lip ovate, 1–2 mm, apex emarginate. Stamens- 2, filaments glabrous, 1-2 mm long; anther-thecae ca 1mm long, lower theca with a basal appendage. Ovary ovoid, acute, 2-4 mm long; style 2-4 mm long; stigma simple. Capsule ellipsoid, compressed, ca. 2.5 mm, glabrous or pubescent at the tip, 2–4x ca 2 mm; seed 4, apex apiculate. Seeds orbicular in outline, ca. 1 mm in diam., minutely verrucose.

Fl. & Fr.: October–April

Habitat: Common found in understorey of bamboo brakes, waste land places, open forest and hill slopes upto 1100 m.

Distribution: In Valley district Manipur [Map.2.29], India, Bangladesh, Bhutan, China, Laos, Myanmar, Nepal, Sri Lanka, Thailand, Vietnam.

Specimen examined: India, Manipur, Imphal East, Yumnam khonou, 773 m, 24° 55’ 31.7 "N, 93° 59’ 19.8”E, dated 14.01.2009, Deshworjit 000377.

Herbarium specimen reffered: Accn. No. 110181, Coll. No. 66995 (BSI); 50699 & 75574 (CAL).

3.20 **STROBILANTHES** Blume, Bijdr. 781, 796. 1826.

Adenacanthus Nees; Aechmanthera Nees; Apolepsis (Blume) Haasskarl; Baphicacanthus Bremekamp; Championella Bremekamp; Diflugossa Bremekamp; Goldfussia Nees; Gutzlaffia Hance; Hemigraphis Nees; Hymenochlaena Bremekamp; Lepidagathis sect. Apolepsis Blume; Parachampionella Bremekamp; Paragutzlaffia H. P. Tsui; Perilepta Bremekamp; Pseudaechmanthera Bremekamp; Pseudostenosiphonium Lindau; Pseudostonium Kuntze; Pteracanthus (Nees) Bremekamp; Pteroptychia Bremekamp; Pyrrothrix Bremekamp; Semnostachya Bremekamp; Sericocalyx Bremekamp; Strobilanthes subg. Pteracanthus Nees; S. subg. Sympagis Nees; Sympagis (Nees) Bremekamp; Tarphochlamys Bremekamp; Tetratoclochidium Bremekamp; Tetragoga Bremekamp.
Shrubs, subshrubs, herbs, isophyllous or weakly to strongly anisophyllous, often gregarious flowering and fruiting only after a period of 2-20 years and then drying off, woody species commonly pliestesial. Stems and branches usually 4-angled, often sulcate, basally becoming woody and hollow with age. Leaves opposite, often unequal, petiolate or sessile; leaf blade adaxially usually with prominent linear cystoliths and sometimes also abaxially, margin variously dentate, serrate, crenate, undulate, or entire. Flowers capitates, or in strobilate or interrupted bracteates spikes, sometimes distinctly secund or panicled, sessile or sometimes pedicellate flowers forming an open panicle, usually with 1 foral bract and 2 bracteoles; sterile bracts usually resembling reduced leaves and often present in compound inflorescences; floral bracts usually different from leaves, persistent or caducous as flowers open, very variable in size and shape, sometimes of two types with basal sterile bracts; outermost bracts in a capitate inflorescence; differing from inner or apical fertile ones; bracteoles 2 per pedicel, lanceolate, usually small, sometimes absent. Calyx 5-lobed to base, commonly accrescent in fruit; lobes equal or unequal with middle one distinctly longer than others, sometimes partially fused to form a bipartite or tripartite calyx, acute to acuminate. Corolla usually large, tubular, ventricose above, straight or curved; nearly always bluish, rarely white, yellow, or pink, tubular or funnel-shaped, inside glabrous; limb 5-lobed; lobes usually ovate, equal or subequal, spreading, twisted in flower, contorted in bud. Stamens usually 2 or 4, didynamous (rarely 2, 2 fertile with 2 staminodes, or 4 fertile with a central staminode), basally monadelphous; usually 2 filaments distinctly longer than other 2; anthers included or exserted, 2-theceous; thecae oblong or subspherical, parallel, erect or incurved, glabrous, basally muticous, rarely with connective extended to a mucronate tip; pollen spherical or ellipsoid, echinulate and/or variously ribbed, usually tricolporate. Ovary oblong to obovoid, 2-loculed, ovules 2 in each locule; style filiform, long, slender, simple; stigma 2-cleft one linear and other suppressed or a mere point. Capsule oblong, elliptic, ovoid, glabrous or hairy, (2–) 4 (–16)-seeded; retinacula strong, long curved. Seeds usually ovate or orbicular in outline and lenticular by being flattened,
usually pubescent with appressed mucilaginous trichomes which become spreading when wetted; areola usually very small over much of seed surface.

1a. Inflorescence broad; persistent bracts which rarely exceeds 8 mm in length; relatively small funnel shaped corolla, colour white; seeds in capsule reduced from four to two. .......................................................... 1. S. asymmetrica

1b. Inflorescence varied; persistent or caducous bracts which generally exceeds 8 mm in length; corolla relatively large, colour blue; seeds generally four to many.

2a. Inflorescences subcapitate or capitellate, with flowers densely clustered in groups of 4 or more, heads occasionally becoming subsapicate in fruit.

a. Anthers incurved but shorter ones sometimes reflexed, ± as broad as long so subspherical or ellipsoid; bracts and bracteoles if present caducous. .......................................................... 4. S. clarkei

b. Anthers erect, oblong, ca. 2 × as long as broad; bracts persistent at least until fruit is formed. Bracts subrhomoidal-ovate, tips erect; pollen type 3. .................................................................................. 6. S. torrentium

2b. Inflorescences spicate or flowers in leaf axils or arranged singly or in opposite pairs in a panicle.

3a. Flowers in axillary spikes, with basal persistent expanded leaflike bracts; flowers not imbricate; spikes sometimes reduced so flowers are solitary in leaf axils, not aggregated into a terminal panicle. ..................................................... 5. S. cusia

3b. Flowers in axillary or terminal spikes but if axillary without leaflike bracts; flowers imbricate or not; spikes aggregated into a terminal panicle or not.

a. Leaves sessile; leaf blade oblong; spikes axillary as well as terminal. .......................................................................................... 2. S. auriculata

b. Leaves petiolate; leaf blade ovate or elliptic; spikes all terminal on leafy branches or main stem. Anthers strongly exserted from corolla. .................................................................................. 3. S. affinis
3.20.1  *Strobilanthes asymmetrica* J. R. L. Wood & J. R. Benn. sp. nov. 162.  
*Kew Bull.* 58(1). [Plate 30; Fig. 30]

Gregarious, perennial, plietesial, bushy undershrub at least 0.3-1 m high. Stems glabrous, reddish-brown, zigzag above, sulcate. Leaves unequal in each pair, the smaller about half the size of the larger, petiolate. Petioles 0 - 4.5 cm long. Lamina 1.4 - 16 x 0.9 - 7.6 cm, ovate, acuminate, rounded and truncate or rounded and shortly decurrent at the base, commonly basally asymmetric, margin serrate, glabrous on both surfaces, paler and violet-tinged beneath. Inflorescence of short, terminal spikes 1 - 4 cm long; flowers imbricate. Bracts at base of spike sessile, resembling small leaves. Floral bracts 5 - 8 x 4.5 - 7 mm, obovate-spathulate with a broad petiolelike base and undulate margin, somewhat concave below, stiffly silvery-white pubescent on the dorsal surface, glabrous within. Bracteoles 5 x 2 mm at apex, oblanceolate to spathulate, ciliate-margined, pubescent on dorsal surface. Calyx 7 - 10 mm long, slightly exceeding bracts and bracteoles, the lobes narrowly oblanceolate, pale- and ciliate-margined, the two lower free to just above the base, the three upper equal but fused in the lower third, obtuse. Corolla c. 2.5 cm long, pale sulphur, pubescent on the exterior of the tube, pilose with stiff, white hairs on exterior of the lobes, the tube with a short, straight, cylindrical, basal part 7 - 8 mm long, then sharply bent through 900 and widened after 11 - 12 mm to c. 12 mm at the mouth, lobes 4 x 6 - 7 mm wide, broadly ovate, rounded. Fertile stamens 4; filaments ca. 1.3 cm long, glabrous except for a few hairs near the base, inserted just above the cylindrical part of the tube, the longer pair 10 - 12 mm long, the shorter pair 8 - 9 mm long; anthers exserted 5 - 10 mm, the cells glabrous, c. 1 mm long. Style ca. 2.6 cm long, glabrous, shortly exserted. Ovary comose. Capsule 1 x 0.3 mm long, narrowly ellipsoid, comose, hairy at the apex. Seeds pubescent.  

*FL. & Fr.:* October – January.  

*Habitat:* Forest clearings and thickets. 980 – 1300 m.  

*Distribution:* In Nongmaiching hill [Map.2.30], Manipur and North east India.
Specimen examined: INDIA, Manipur, Imphal East, Nongmaiching, 996 m, 24° 45' 50.8" N, 94° 01' 58.8" E, dated 26.11.2011, Deshworjit 0039400.

Identification confirmed: J.R.I. Wood.

Notes: It is reported distributed in Mizoram, South Lushai, 1150 - 1300 m, Sept. 1928, Wenger 234 (K); Manipur, Sirhoi, 1300 - 1700 m, 11 Oct. 1948, Kingdon Ward 18203 (BM, NY). *Strobilanthes asymmetrica* so named because of the strikingly asymmetric leaf bases but also in reference to the two different kinds of hair on the corolla. The asymmetric leaf bases are not unique to this species but they are unusual in Strobilanthes. However, the two different hair types on the corolla, where the pubescent tube contrasts with the stiff, white, spreading hairs of the lobes, is extremely unusual if not unique to this species. The inflorescence is formed of imbricate spikes of persistent, bracteates flowers, and the anthers are strongly exserted from the corolla as is typical of the Sympagis group. However the corolla is larger than in other species and the basal cylindrical part of the tube is bent through 90°. The pollen of *Strobilanthes asymmetrica* is unique in Strobilanthes. While the globose grain is clearly similar to the typical Sympagis type, it differs from all other species in 3 pletesial is a term used extensively by Bremekamp (1944) to describe a perennial monocarpic species. (J.R.I. Wood, 2003)

3.20.2  
*Strobilanthes auriculata* Nees in Wallich, Pl. Asiat. Rar. 3: 86. 1832.  
*Perilepta auriculata* (Nees) Bremekamp; *P. edgeworthiana* (Nees) Bremekamp; *P. siamensis* (C. B. Clarke) Bremekamp; *Strobilanthes auriculata* var. *edgeworthiana* (Nees) C. B. Clarke; *S. auriculata* var. *siamensis* C. B. Clarke; *S. edgeworthiana* Nees; *S. siamensis* C. B. Clarke. *Strobilanthes auriculata* BP 600. 1903; FOA 3: 421, 1939; DPMT 3: 340. 1961. [Plate 31; Fig. 31]

Common name: Eared Leaf *Strobilanthes*.
Vernacular name: Kumtrukpee.

Subshrubs 0.10-1.5 m tall, much branched, weakly to strongly anisophyllous. Stems quadrangular, sometimes zigzag, glabrous or sparsely hirsute, geniculate at
node. Leaves sessile; lower leaves nearly equal, lanceolate- oblong, acuminate at apex, cuneate, angulate, auriculate at base, pubescent; the upper leaves unequal, cordate, perfoliate, margin serrate or entire, the smaller ones cordate, 3-4 cm long, the larger obcordate-cuneate, emarginated at tip, divaricate, mucronate, recurved, longly ciliate, twice longer than the shorter; both surfaces sparsely pilose, abaxially pale green, adaxially green, secondary veins 9-15 on each side of midvein. Inflorescences axillary or terminal, spikes 5-9 cm long, sometimes branched; peduncle 2-5 cm long, 4-angled, sulcate, bracteates; flowers on inflorescence dense in on a axis and interrupted, remote towards base; bracts the low most 2-3 pairs sterile and remote, nearly cordate, acute, reflexed, 1-2 × ca. 1.5 cm; floral bracts imbricate, broadly ovate to obovate-spatulate, 7-9 mm long, often becoming recurved, persistent, pilose and hairy at margin, apex usually apiculate but sometimes rounded or emarginate, those near the top upto 6 mm wide, emarginated, lobes rounded, with micron in emarginated place, reflexed, base cuneate, pubescent inside, long hirsute outside, margin long ciliate; Calyx 5-8 mm long, gland-tipped pilose, 5-lobed almost to base; lobes linear, unequal with 2 slightly shorter than others, margin usually ciliate, apex sub-acute. Corolla pale purple to violet, funnel-shaped, 1.5-2 cm long, curved, outside hairy, inside pilose at the middle; tube basally cylindrical and narrow for ca. 4 mm then weakly to strongly bent, abruptly inflated, and widened to ca. 1 cm at mouth; limb weakly 2-lipped, lower lip 3-lobed, upper lip 2-lobed; lobes ca. 4 mm. Stamens 4, included; filaments glabrous, shorter pair ca. 2 mm long, longer pair ca. 4 mm long; anther thecae oblong, ca. 1.2 × 1 mm long. Ovary glabrous; style ca. 3.2 cm long. Capsule as long as calyx, lanceolate, narrowed towards base, ca 8 × ca. 2 mm, glabrous, 4-seeded at the middle, apex apiculate.

Fl. & Fr.: September - February.

Habitat: In all the open areas of hill slopes of whole state. 300-1300 m.

Distribution: In the valley districts [Map.2.31], North east India, China, Bangladesh, Malaysia, Myanmar, Vietnam, Cambodia, Nepal, Pakistan and Thailand.
Specimen examined: INDIA, Manipur, Imphal east, Nongmaiching, 1290 m, 24° 46’22.0"N, 94° 01' 30.4"E, dated 16.10.2011, Deshworjit 003396.


Note: Strobilanthes auriculata is reported to flower irregularly in some part of its range. In Manipurt it flowers after a period of 8 years.


[Plate 32; Fig. 32]

Herbs to 60 cm tall, isophyllous. Stems 4-angled, sulcate, white pubescent with large-celled trichomes. Petiole 0.5–1.5 cm long, pubescent; leaf blade ovate to ovate-elliptic, 3–8 × 2–4.5 cm, both surfaces sparsely strigose, abaxially yellowish green, adaxially dark green and densely covered with subulate cystoliths, secondary veins 5–7 on each side of midvein, base subrounded to cuneate and decurrent onto petiole, margin crenulate, apex acute. Inflorescences axillary or terminal, dense spikes, 2–6 cm; peduncle 0.5–2 cm, densely gland-tipped pubescent; sterile bracts sometimes present, sessile, suborbicular to ovate, 5–10 × 5–10 mm, strigose; floral bracts imbricate, broadly obovate, rhomboidal, or elliptic, 6–7 × 3–4 mm, glandtipped pilose with large-celled trichomes, 5-veined, margin ciliate, apex sometimes reflexed; bracteoles oblong-linear, ca. 5 × 1.2 mm, slightly shorter than calyx, gland-tipped pubescent, margin ciliate. Calyx 5–7 mm long, 5-lobed almost to base; lobes linear, one slightly longer than others, gland-tipped pubescent, 1-veined, margin ciliate, apex obtuse. Corolla purplish blue to violet, ca. 1.5 cm long, curved, outside pilose, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 1mm wide for ca. 7 mm then gradually widened to ca. 7 mm at mouth; limb somewhat 2-lipped, lower lip 3-lobed, upper lip 2-lobed; lobes
orbicular, ca. 3 × 3 mm, unequal. Stamens 4; shorter filament pair ca. 4 mm long, glabrous; longer filament pair ca. 6 cm long, hirsute; anther thecae oblong, ca. 2 × 1.2 mm, strongly exserted. Ovary pilose; style pilose, ca. 1.2 cm. Capsule oblong, 7–9 mm long, pubescent, 4-seeded. Seeds brown, ovate to suborbicular in outline, ca. 1.5 × 1.5 mm, pubescent, glabrescent; areola small, glabrous.

Fl. & Fr.: September - February.

Habitat: In all the littoral areas of hill slopes. 700-1300 m.

Distribution: In the valley districts [Map.2. 32], North-East India, China, Myanmar, Vietnam.

Specimen examined: INDIA, Manipur, Imphal east, Ngarian, 903 m, 24°43'01.41"N , 94° 00' 53.1"E, dated 29.10.2011, Deshworjit 003427.


Strobilanthes rhombifolia sensu C.B. Clarke in J. Linn. Soc., Bot. 25: 54. 1889. FBI 4: 461. 1884. Goldfussia sessiles Nees in D.C. Prodr. 11. 172. [Plate 33; Fig. 34]

Anisophyllous subshrubs, ca 1.2 m high. Stems quadrangular, erect, sub-glabrous. Leaves subsessile, unequal in each pair, the smaller about a third to a quarter the size of the larger. Petiole 0–10 mm long, but apical leaves sessile. Lamina rhomboidal-elliptic, 2–15 × 1.5–10 cm long, both surfaces green and with abundant cystoliths, secondary veins ca. 6 on each side of midvein, base cuneate and shortly decurrent onto petiole, margin serrate, apex acute. Inflorescences axillary, capitula borne on simple or 2-3, furcately branched, ultimately branchlets very delicate, sometimes with 1 or a few distant flowers. Peduncles, 2–10 cm long; peduncle sulcate, bifariously pubescent with trichomes in sulci. Sterile bracts leaflike, ovate, ca. 0.5 × 0.5 mm, relatively persistent; floral bracts obovate to oblong-ovovate, ca. 6 × 1.5 mm, soon scarious and caducous before the flowers open. Bracteoles absent. Calyx cupshaped, subequally 5-lobed divided upto base, strongly accrescent in fruit; lobes linear-elliptic, 7–12 × ca. 1.2 mm, pubescent and with sessile glands. Corolla blue, 4–4.5 cm long, slightly curved, outside sparsely
gland-tipped pilose but glabrescent, inside glabrous except for trichomes retaining style; tube basally cylindric and ca. 2 mm wide for ca. 1 cm then widened to 1.2–1.7 cm long at mouth; lobes suborbicular, ca. 6 × 7 mm long. Stamens 4, included, the two inner reduced to staminodes, 0.5-1 mm long; filaments often unequal, glabrous, shorter pair ca. 6 mm long, longer pair ca. 9 mm long; anther thecae obliquely ovoid, ca. 1.5 × 1.2 mm, incurved. Ovary narrowly ovoid, apically gland-tipped; style ca. 2.7 cm long, slender, glabrous apart from a few trichomes on basal part. Capsule clavate, ca. 1.2 cm long, glandtipped pubescent, 4-seeded. Seeds suborbicular in outline, ca. 3 mm in diameter, pubescent or silky.

Fl. & Fr.: August – November.

Habitat: Found on mountain slopes and forest margin. 1000 –1300 m.

Distribution: In the valley districts [Map.2.33], North east India, Bhutan, China and Nepal.

Specimen examined: INDIA, Manipur, Imphal East, Nongmaiching, 1200m, 24° 46' 41.5" N, 94° 01' 58.7" E, dated 11.12.2011, Deshworjit 003508.

Identification confirmed: J.R.I. Wood.


*Goldfussia cusia* Nees in Wallich, Pl. Asiat . Rar. 3: 88. 1832; *Baphicacanthus cusia* (Nees) Bremekamp; *Dipteracanthus calycinus* Champion; *Ruellia indigofera* Griffith; *R. indigotica* Fortune; *Strobilanthes balansae* Lindau; *S. championii* T. Anderson; *S. flaccidifolia* Nees; FOA 3: 430, 1939; DPMT 3: 340. 1961. [Plate 34; Fig. 34]

Common name: Assam Indigo.

Vernacular name: Kum.

Subshrubs upto 0.5–1.5 m tall, erect or decumbent at base, branched, drying blackish, isophyllous to weakly anisophyllous. Stems circular, glabrous or minutely brown puberulent. Leaves elliptic to ovate, abaxially paler green, adaxially dark green, attenuate at base, margin serrate, acute to acuminate at apex. Lamina 4–18 × 2–8 cm, glabrous or abaxially minutely puberulent along veins, lateral nerves 7–9
on each side of midvein. Petiole 0.5–7 cm long. Inflorescences terminal or axillary, bracteate spikes, 1–6 cm long, often aggregated to form a leafy branched panicle; peduncle 1–12 cm long. Bracts leaflike, petiolate, oblanceolate to obovate, spatulate, 1.2–2.8 cm long, basally usually sterile. Bracteoles linear-oblanceolate, 2–8 mm long, deciduous before bracts. Calyx 5-lobed, 2-3 cm long, accrescent in fruit, minutely puberulent; lobes divided almost to base, unequal (4+1), 4 lobes linear-lanceolate, apex acute to obtuse; 1 lobe oblanceolate and much longer. Corolla blue, 3.5–4.8 cm long, straight to slightly bent, outside glabrous; tube basally cylindric and ca. 3 mm wide for 1–1.5 cm then slightly curved and gradually widened to ca. 1.5 cm at mouth; lobes oblong, ca. 9 × 9 mm, subequal. Stamens 4, didynamous, stamens attached at near the base, included; filaments long, glabrous, shorter pair ca. 4 mm long, longer pair ca. 8 mm long; anther thecae 2 loculed, oblong, ca. 3 mm long, muticous. Ovary 2-loculed, oblong, apex puberulent with few gland-tipped trichomes; ovules 2 in each locule; style ca. 3.2 cm long, glabrous; Stigma simple. Capsule 1.3–2.4 cm long, glabrous, 4-seeded. Seeds ovate in outline, ca. 3.5 mm long, covered with appressed trichomes; areola small.

*Fl. & Fr.*: January–April.

*Habitat*: Rarely grown in moist shady areas or sometimes cultivated; 520–1000 m.

*Distribution*: In the valley districts [Map.2.34], India, Bangladesh, Bhuta, China, Laos, Myanmar, Thailand, Vietnam.

*Specimen examined*: INDIA, Manipur, Imphal East, Andro, 800m, 24° 45' 03.3" N, 94° 02' 15.8" E, dated 04.02.2010, Deshworjit 000541.


*[Plate 35; Fig. 35]*

Plant subshrubs, 1-1.5 m high, isophyllous or slightly anisophyllous, rooting at the nodes. Stems quadrangular, erect, dark green, sulcate, bifariously pubescent. Leaves petiolate, equal, hairy, dark green above with scattered large, with white spreading hairs. Petiole 0.5–4.5 cm long, pubescent and slightly hispid. Lamina
ovate to elliptic, 8-15 × 3.5-6 cm, abaxially densely yellow pilose along the veins, adaxially sparsely pubescent, hispid, and with numerous cystoliths, secondary veins 5-7 on each side of midvein, apex acuminate and slightly falcate, margin serrate, base narrowly cuneate and decurrent onto petiole. Inflorescences an axillary or terminal, compact, capitate spikes, 1.5-5 cm, densely covered with long silky rufous trichomes; bracts variable in size and shape; outer bracts leaflike, obovate to subrhombic, 2-3 × 0.8-1.5 cm, distinctly angled, densely villous, apex acute; inner bracts obovate, ca. 10 × 5 mm, angled, villous, apex subacute; bracteoles ob lanceolate, ca. 7 mm, margin pilose, apex obtuse. Calyx 1-1.3 cm long, densely villous, 5-lobed 3 × 0.3 cm, unequal, divided half way down; larger 3-lobes linear-oblong 7-8 × ca. 1 mm; smaller 2 2.7 × 0.3; margin ciliate, apex obtuse, fleshy or succulent at the base. Corolla 3-4.5 cm long, curved, tube white, sparsely pubescent outside, basally cylindric and narrow for 8-10 mm then gradually widened to 1-1.2 cm at mouth; lobes blue to violet, outside sparsely pubescent, inside glabrous, ovate, ca. 3 × 5 mm, apex obtuse. Stamens 4, didynamous, included; filaments pilose, shorter pair ca. 2 mm long, longer pair ca. 5 mm long; anther thecae oblong, ca. 2.5 mm long. Ovary villous; style 2.8 - 3 cm long, basally glabrous, apically pubescent, trichomes present. Capsule oblong, ca. 9 mm long, pilose at tip, 4-seeded. Seeds unknown.

Fl. & Fr.: August – March.

Habitat: Grown in forest streamsides or shady areas. 1100-1300 m.

Distribution: In the valley districts [Map.2.35], India, China and Myanmar.

Specimen examined: INDIA, Manipur, Imphal East, Andro, 1118 m, 24° 46’ 10.2” N, 94° 01’ 27.9” E, dated 15.10.2010, Deshworjit 003025.

Identification confirmed: J.R.I. Wood.

Climbers or erect subshrubs. Leaves opposite, often cordate at base, petiolate, hastate, apex acute to acuminate, margin entire or lobed to dentate, 3-5 nerved from the base. Flowers solitary or in pairs, axillary or in terminal, stout racemes, pedunculate. Bracts 2 at base of the pedicles, leaf-like. Bracteoles large, paired, spatheaceous, enclosing the flower buds, coherent at margins, at when young, usually persistent. Calyx bowl shaped, much shorter than bracteoles, with 10–16 subulate teeth or reduced to a rim. Corolla conspicuous; limb oblique; equally 5-lobed, rounded, twisted to the left in bud; corolla tube with short cylindric or ventricose, base then widened. Stamens 4, didynamous, inserted near base of corolla tube, included; filaments stout, usually hairy; anthers 2-loculed; thecae oblong or ovoid, parallel, oblique, spurred or not at base, sometimes bearded. Disk cushion shaped or annular. Ovary fleshy; ovules 2 in each locule, collateral; style glabrous or pubescent; stigma entire, capitate or funnel-shaped. Capsules globose, suddenly narrowed into a barren sword-shaped beak. Seeds 4, compressed to spherical, globose, lacking trichomes; rectinacula absent.

1a. Calyx reduced to an entire ring.
2a. Corolla bluish; capsule pubescent .........................................................1. *T. grandiflora*
2b. Corolla red; capsule glabrous .................................................................2. *T. coccinea*
1b. Calyx bearing 10–20 slender subulate lobes........................................3. *T. alata*


Common name: Bengal Clock Vine.
Woody perennial vines up to ca 6 m; internodes 5 -10 cm long. Stems quadrangular, sulcate, pubescent. Leaves opposite, on swollen nodes; leaf blade ovate to triangular-ovate, 6–10 × 4–8 cm, papery, both surfaces pubescent, palmately 4–7-veined, base subcordate to truncate, margin undulate, irregularly angular on basal half, or rarely entire, apex acuminate to acute. Petiole 1–6 cm long, grooved, pubescent, twisted at the base. Flowers solitary, paired in leaf axils, or arranged in terminal racemes with 2–4 flowers per node; peduncle 4–7.5 cm long, sulcate, pubescent; rachis pubescent with large cyathiform glands; apical inflorescence bracts subulate to linear-subulate, 2–6 × 1–1.5 mm, pubescent; bracteoles 2, oblong to ovate, 2.5–4 × 1.5–2.5 cm, both surfaces pubescent, 5–7-veined, base truncate, margin entire or ciliate, apex acute with a short mucro. Calyx ca 2 mm long, annular, unlobed, densely pubescent. Corolla white with a yellowish throat, 4–6 cm long, outside glabrous; tube basally cylindric and ca. 3 mm wide for ca. 7 mm then gradually widened to ca. 5 cm at throat; limb subactinomorphic; lobes ovate, ca. 3 × 2.5 cm. Filaments 1-2 cm long, thick, fleshy, flattened; anther thecae 0.5 -1.5 cm long, bearded, purple; ovary 2-4 mm long, pubescent. Style 2-4 cm long; stigma funnel shaped, flattened, fringed or floled along the margins, large disc present. Capsules 1.2–1.5 cm, pubescent, basal part globose 1.3–1.8 cm in diam., beak ca. 2.5 cm. Seeds ovate in outline, compressed, verrucose.

Fl. & Fr. August–March.

Habitat: Wet places, open forests or in moist deciduous forest.

Distribution: In valley districts [Map.2.36], India, Myanmar, Thailand, Vietnam.

Specimen examined: India, Manipur, Imphal East, Gnarian, 785 m, 24° 42' 57.3 " N, 94° 00'49.3"E, dated 07.06.2009, Deshworjit 003016.

Herbarium specimen reffered : Accn. No. 47560, Coll. No. 51338 (NBRI); 334872 & 32802 (CAL); Accn. No. 109618 (BSI).

Common name: Scarlet Clock Vine.

Perennial woody climber, ca upto 5 m high. Stems 9-angled, subglabrous, pubescent at nodes; internodes twisted, 6-10 cm long. Leaves broadly ovate, ovate, or lanceolate, truncate, rounded to acute at base, acuminate at apex, crenulate along margin; lamina 7–14 × 3.3–10 cm, both surfaces pubescent, palmately 3–5-veined. Petiole 2–7 cm long, grooved. Flowers showy, light red, pendulous racemes axillary or terminal, ca upto 35 cm. Pedicels 1–2 cm, pubescent. Bracts small lanceolate, abaxially pubescent, adaxially glabrous; bracteoles 2, oblong, spathaceous, ovate lanceolate, apex acute, cohering along margin in bud, enclosing the corolla tube, 2.2–3 × 1–1.5 cm. Calyx ca. 2 mm, reduced to a minute rim. Corolla red; tube basally cylindric for 5–6 mm, throat 1.5–1.6 cm long; lobes suborbicular, ca. 7 mm in diam. Stamens 4, attached at the throat of the tube; filaments thick, flattened 1.2–2 cm long, glabrous but with a tuft of trichomes at base; anther oblong, thecae parallel, unequal with longer one ca. 5.5 mm long, shorter one ca. 4.5 mm long, spurred at base. Ovary 3–4 x 2-3 mm long; glabrous, with a fleshy disc below the ovary; style 1–3 cm long, glabrous, exserted; stigma 2-cleft. Capsule glabrous, basal part 1–1.2 × 1.5–2 cm long, beak 1.5–2.3 cm long. Seeds compressed, ovate in outline, verrucose.

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

**Habitat:** Open forests margins and also cultivated as ornamental. 550 -1000 m.

**Distribution:** In the valley districts [Map.2.37], India, China, Laos, Myanmar, Thailand.

**Specimen examined:** India, Manipur, Imphal East, Gnarian, 810 m, 24° 42’ 12.5 " N, 94° 01’21"E, dated 24.10.2009, Deshworjit 003285.

**Herbarium specimen reffered:** Accn. No. 114482, Coll. No. 68455 (BSI).

3.21.3 **Thunbergia alata** Bojer ex Sims in Curtis, Bot. Mag. 52: t. 2591. 1825. FBI 4: 391; BP 795. 1903; DPMT 3: 340. 1961; FTDM 770. 1987. **[Plate 38; Fig. 38]**

Common name: Balck Eyed Susan Vine.

Vernacular name: Sambal Khudop Lei.
Twining, herbaceous climbers, slender, with hairy shoots; internodes 4-8 cm long. Stems 4-angled to flattened, bisulcate, pubescent. Leaves opposite, with two broad teeth on either side. Petiole 1.5–3 cm long, winged, sparsely pubescent; lamina sagittate to deltoid ovate, 2–7.5 × 2–6 cm, abaxially hirsute, adaxially sparsely strigose, palmately 5-veined, base hastate to cordate, margin entire or undulate, apex acute. Flowers solitary or paired, axillary; pedicles 2.5–3 cm long, sparsely strigose; bracts leafy; bracteoles spatulate, ovate-lanceolate, 1.5–2.5 × 1–1.5 cm, abaxially hirsute, 5–7-veined, apex acute, acuminate, or obtuse. Calyx annular, very short; unequally 10–13-lobed, subulate, villous. Corolla orange or bright yellow with dark purple glandular eye in throat, 2.5–4.5 cm long; tube 1.5–3 cm long; lobes spreading, obtuse, 1.5–2 cm across; stamens 4, attached at the throat of the tube; filaments pairs 4–6 mm long, flattened, brown; anther oblong, bearded, 2–4 mm long, unequal, pubescent at margin and base. Ovary 2–4 mm long, glabrous; style ca 1 cm long, glabrous; stigma funnel-shaped, unequally 2-lobed, lower lobe spreading, upper lobe erect, folded or fringed along margins. Capsule pubescent, basal part ca. 7 × 10 mm, 2-seeded; beak 1.5–2.5 x 0.5–1 cm. Seeds closely appressed, 3–4 mm across, reticulate on dorsal surface.

Fl. & Fr.: December – May.

Habitat: Found near river banks and roadsides. 550–960 m

Distribution: In the valley districts [Map.2.38], India, China, Myanmar and Africa.

Specimen examined: India, Manipur, Imphal East, Kongpal, 789m, 24° 45' 24.7 " N, 93° 58'49.6"E, dated 22.03.2010, Deshworjit 003397.

Herbarium specimen referred: Accn. No. 56148, Coll. No. 81750 (NBRI); 334819 & 1588 (CAL); 33141 & 309 (BSI).
3.3 CLADISTIC AND PHENETIC ANALYSES OF RELATIONSHIP AMONG GENERA AND SPECIES OF ACANTHACEAE FOUND IN VALLEY DISTRICTS.

The family Acanthaceae comprises approximately 4000 species distributed in pantropical and sub-tropical, with a few species in temperate regions. The only taxonomic study of the whole family based on relative recent molecular studies, pollen morphology, corolla aestivation and other potentially informative morphological homologues was undertaken by Scotland & Vollesen (2000). Using three item analysis of 11 morphological homologues a new classification of Acanthaceae was introduced. Some of the morphological homologues are presence and absence of rectinacula, explosive fruits, cystoliths, articulated stems, exalbuminous seeds, porate pollen, colpate pollen, four monothecate anthers, depth of recticulation in pollen, stamina filaments curtains, unicellular bristles on anthers, poricidal thecae, corolla aestivation, daubenpollen with thickened aperature margins and Rahmen-spangen-knotchen-gurtelpollen.

3.3.1 Cladistic of Genera of the Acanthaceae

This 11 characters are used for the analyses of the 19 genus recorded in the present study. The data matrix consisting of the 11 diagnostic characters for the relationship among the genus is shown in [Table 3.3.1]. The character states are of two states (binary or presence-absence). The two states are coded as 0 and 1 for alternate states. The coded data is enter in the form of a matrix with $t$ numbers of rows (OTUs) and $n$ numbers of columns (characters) with the dimension of the matrix (and the number of attributes) being $t \times n$. 
The data after being codified and entered in the form of a matrix, the degree of resemblances between every pair of OTUs is calculated. The taxonomic distance (similarity or dissimilarity) between the OTUs is directly calculated using Euclidean distance using formula proposed by Sokal (1961). The similarity [Table 3.3.2] and distance [Table 3.3.2] between every pair of OTUs has been calculated, the data are presented are presented in a second matrix with $t \times t$ dimensions where both rows and columns represent OTUs [Table 3.3.2] It is must be noted that diagonal $t$ value in the matrix represents self–comparison of the OTUs and thus 1 or 100% similarity. These values are redundant as such.

Table 3.3.1: The data matrix with hypothetical $t$ OTUs and $n$ characters. Binary coding involves 1 for state a and 0 for state b. REC (retinacula), EXP( explosive fruits), CYS (cystoliths), COL (Colpate pollen), FOU (four monothecate anthers), STA (stamina filament curtains), UNI (unicellular bristles on anthers), POR (poricidal thecae), QUI (quincuncial corolla aestivation),DAU (Daubenpollen, thickened aperature margin) and RAH (Rahmen/spangen/knotchen/gurtelpollen).

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Thunbergia 0 0 0 0 0 0 1 1 0 0 0 0

Table 3.3.2: Similarity matrix of the representative hypothetical taxa presented as percentage simple matching coefficient.

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Table 3.3.3: Dissimilarity matrix of the representative hypothetical taxa based on the similarity matrix in Table 2.
Cluster analysis is one such method in which the OTUs are arranged in the order of decreasing similarity. For clustered analysis software IBM SPSS ver. 15 was used, this is a program which can perform an efficient cluster analysis and help in the construction of clustered diagrams or phenograms. Selecting the complete linkage clustering method of agglomerative, the hierarchical classifications result is recorded following steps Levesque (2007).

![Dendrogram](image)

Fig. 39: Phenograms or dendogram of 19 genera using complete linkage clustering method strategy.

The first main clade (I) consists of genera from seventeen genera: 
*Ruellia, Strobilanthes, Eranthemum, Hygrophi, Phaulopsis, Peristrophe, Rungia, Asystasia, Justicia, Pseuderanthemum, Dicliptera, Hypoestes,*
Barleria, Lepidagathis, Andrographis and Phlogacanthus. The second main clade (II) includes genera: Nelsonia and Thunbergia.

The first clade (I) is supported by three characters: presence of retinacula, explosive fruits and cystoliths. The second clade is supported by two characters unicellular bristled anthers and poricidal thecae.

The first clade clusters into two subclades. Subtribe Ruellinae, Barleriinae, Andrographinae, Justiicinae as sister taxa and the only genus Acanthus which form the two subclades: Ruelliae and Acantheae respectively.

The third subclade-1: Ruellinae consists of five genera Ruellia, Strobilanthes, Eranthemum, Hygrophila and Phaulopsis as sister taxa. Third subclade-2: Justiicinae consists of seven genera Peristrophe, Rungia, Asystasia, Justicia, Pseuderanthemum, Dicliptera and Hypoestes as sister taxa. The third subclade-3: consist of two genera Barleria and Lepidagathis as sister taxa. Again the third subclade-4: Andrographinae consists of two genera Andrographis and Phlogacanthus as sister taxa.

The position of third subclade (Ruellinae) is supported by two characters Left-contort aestivation and filament curtain. Justiicinae is supported three characters Ascending cochlear aestivation, 2-4 ovules, Rhamen/ Spangen/Knotchen/ gurtel pollen. Barleriinae is supported by a single character Quincuncial aestivation. Andrographinae is supported by three characters Daubenpollen, ascending cochlear aestivation and usually many ovules.

3.3.2 Phenetic analysis among the species of the same genus.

Variation of 66 morphological characters was analyzed in 37 species and 1 variety of the Acanthaceae species recorded from the valley districts of Manipur [Appendix 1] using cladistic and phenetic methods for studying
the relationship amongst the species of same genus. The data matrix of the morphological characters used for the cladistic and phenetic analyses is shown in [Appendix 2]. Additional, the matrix consist only 11 characters used by Scotland & Vollensen (2000). The remaining others characters were additional diagnostics characters of Acanthaceae species and some were also followed form Leht (2005) for Fabaceae species cladistic and phenetic analysis and new with slight modification.

The morphological characters in this study (Appendix 1) were selected from the species description of the present study. For compiling the morphological data matrix, characters of pollen were referred from published papers (Scotland & Vollesen 2000)

The phenetic analyses of the morphology data were same as above. Among the 19 genera recorded for the present study those genera which have more than three species are used for this study.

3.3.2.1. *Barleria*

The first clade consists of *Barleria cristata* var. *albida* and *Barleria cristata* as sister taxa and the second clade is represented by *Barleria prionitis*.

The first clade is supported by two character: filament surface (39) and staminode (40). The second clade is supported by a single character, bract (20). The first clade is cluster into two subclades: subclade-I is based on a single character of stamens number (36) between the sister taxa.
Fig. 40: Phenogram of three OTUs (*Barleria* species) using complete linkage clustering method.

### 3.3.2.2. *Hygrophila*

The first clade consists of *H. erecta*, *H. phlomoides* and *H. ringens* and the second clade is represented by *H polysperma*.

The first clade is supported by four characters: flower whorl (18), calyx lobes (26), stamen type (37) and seed outline (53). The second clade is supported by five characters: inflorescence type (14), bract type (20), stamen type (35), stamen no (36) and staminode (40).

The first clade clusters into two subclades: subclade-I represented by *H. ringens* and subclade-II consists two sister taxa of *H erecta* and *H. phlomoides* which is supported by three characters: leaf shape(8), leaf apex (11) and leaf base (12). Subclades-11 is divided into two clades of *H erecta* and *H. phlomoides* is supported style surface (48).
Fig. 41: Phenogram of four OTUs (*Hygrophila* species) using complete linkage clustering method.

### 3.3.2.3. *Justicia*

The first clade consists of *J. gendarussa*, *J. procumbens* & *J. vasculosa* and the second clade is represented by *J. adhatoda* the only shrub in *Justicia* species collected.

The first clade is supported by four characters: corolla length (30), stamen length (38), style length (41) and fruit length (52). The second clade is supported by corolla type (27).

The first clade clusters into two subclades: subclade-I represented by *J. vasculosa* which is supported by a single character of spike type (16) and subclade-II consists two sister taxa *J. gendarussa* and *J. procumbens* which is supported by three characters leaf shape (8), bract type (20) and ovary length (50). Subclade-II is again divided into two clade *J. gendarussa* and *J. procumbens* supported by four characters: life span (1), habitat (2), height of plant (3) and leaf surface (9).
3.3.2.4. **Phlogacanthus**

The first clade consists of *P. pubinervious* and *P. thyrsiformis* and the second clade represented by *P. curviflorus*.

The first clade is supported by two character: leaf apex (11), leaf base (12). The first clade clusters into two subclades; subclade-I is represented by *P. pubinervious* and subclade-II represented by *P. thyrsiformis* which is supported by fruit length (52).
Fig. 43: Phenogram of three OTUs (*Phlogacanthus* species) using complete linkage clustering method.

3.3.2.5: *Strobilanthes*

The first clade consists of *S. torrentium*, *S. asymmetrica*, *S. auriculata*. *S. cusia* and *S.clarkei* and the second clade represented by *S. affinis* which is supported by three characters: stem surface (5), Stem colour (6) and stamen type (35).

The first clade clusters into three subclade-I which consists of *S. torrentium*, *S. asymmetrica*. Subclade-II represented by *S. auriculata*. Subclade-III consists of *S. cusia* and *S. affinis*. Subclade-I is supported by corolla surface (29) and Subclade-II is supported by calyx lobes (26). The Subclade-I is again divided into two represented by *S. torrentium* and *S. asymmetrica* based on stamen length (38). Subclade-III is divided into two clade represented by *S. cusia* and *S. clarkei* based on a single character height of plant (3).

**Dendrogram**

```
* * * HIERARCHICAL CLUSTER ANALYSIS * * *

Dendrogram using Average Linkage (Between Groups)

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<th>10</th>
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<th>20</th>
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<tbody>
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</table>
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Fig. 44: Phenogram of six OTUs (*Strobilanthes* species) using complete linkage clustering method.
3.3.2.6.  **Thunbergia**

The first clade consists of *T. alata* and *T. grandiflora* and the second clade consists of *T. coccinea*.

The first clade is supported by three character: life span (1), flower whorl (18) and corolla tube (28) and the second clade is supported by a single character inflorescence (14). The first clade clusters into two subclades of *T. alata* and others subclade of *T. grandiflora* which is supported by single character bracteoles (22).

**Dendrogram**

* * * HIERARCHICAL CLUSTER ANALYSIS * * * *

**Dendrogram using Average Linkage (Between Groups)**

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<td>Thunbergia coccinea</td>
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<td>+</td>
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</tbody>
</table>

Fig. 45: Phenogram of three OTUs (Thunbergia species) using complete linkage clustering method.

The diversity of results obtained from the cladistic and phenetic analysis of genera and among the species of same genera suggests the relationship within the family and genus. The cladistic analysis amongst the 19 genera recorded from the present study, correlates with Scotland & Vollensen (2000) classification of Acanthaceae.

The phenetic analysis of among the 6 genera having more than two species was selected for the analysis. The dendrogram present shows their relationships based on the similarity and dissimilarity of the 66 characters used for this analysis.
Finally, the results obtained is based on the character coding of the 66 morphological variation used, as it is pointed out by Hawkins (2000) there are many distinct ways to code morphological variation resulting different results. Nevertheless, it is a preliminary attempt of organizing data that could help in better understanding and to produce an entirely phenetic classification of maximum predictivity based on morphological characters (Farres 1972; Scotland et al. 2003; Singh 2004)).
3.2 DISTRIBUTION OF ACANTHACEAE IN THE VALLEY DISTRICTS OF MANIPUR.

The spatial heterogeneity of the environment increases the number of different habitats, permitting a greater number of different resources and hence may result into higher diversity use strategies species. The state Manipur encompasses high degree of variability in climatic, distinct landscape characterization in terms of patch size, shape and neighborhood, altitude resulting in spatial heterogeneity of the environment providing different microhabitats. Apart from this, the forest ecosystem have long history of distribution in term of jhuming cultivation, grazing, fire, felling, deforestation etc. therefore, the natural heterogeneity coupled with spatial distinct disturbance regimes brings complexity in habitats, which leads to the formation of different species assemblages.

In the current study, floristic distribution of Acanthaceae species in the valley districts of Manipur state was assessed during the research period. A total of 37 species and one variety under to 19 genera of naturalized Acanthaceae were recorded.

The following table shows broad information about the 19 genera recorded in the present study. The distribution of the genus; no of species globally; no of species in India; no of species in Manipur (Dev 1961; Singh 1987; Singh 1990) and the valley is represented by the no of species collected or recorded in the present study [Table 3.2.1]. Four genera *Andrographis*, *Asystasia*, *Pseuderanthemum* and *Ruellia* are new additions to the state flora. *Acanthus leucostachyus*, *Dicliptera roxburghiana*, *Lepidagathis incurva*, *Nelsonia canscenens*, *Phaulopsis imbricata* and *Rungia pectinata* are same as reported before.
Table 3.2.1: Table showing the status of the genera globally, India, Manipur and present study (Valley).

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<th>Distribution</th>
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<th>Manipur</th>
<th>Valley</th>
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<td>Tropical and subtropical regions</td>
<td>18</td>
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<td>5</td>
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<td>Hypoestes</td>
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<tr>
<td>Justicia</td>
<td>700</td>
<td>Tropical and temperate regions</td>
<td>50</td>
<td>5</td>
<td>4</td>
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<td>Lepidagathis</td>
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<td>Tropical to sub tropical regions</td>
<td>23</td>
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<td>Nelsonia</td>
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<td>Tropical Africa, Asia, Australia and South America</td>
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<td>Tropical Africa, SE and S Asia</td>
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</table>
In the present study, distribution of each species recorded in the valley districts of Manipur state were recorded using Global Positioning System (GPS). In each study site occurrence of Acanthaceae species is recorded. Altogether, 136 survey sites belong to Imphal East (IE), 39 sites, Imphal West (IW), 35 sites, Bishenpur (BH), 30 sites and Thoubal (TH), 32 sites. The following table shows the occurrence of Acanthaceae species in each study site according to descending order [Table 3.2.2].

Table 3.2.2: Table showing the study site, district and species recorded. (IE= Imphal East, IW= Imphal West, TH = Thoubal and BH = Bishenpur)

<table>
<thead>
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<th>Species</th>
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<tr>
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<td>40 Tropical and Sub tropical Africa, Asia and Madagascar</td>
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</table>

While certain species showed a distribution throughout the study area, the presence of other species was found to be restricted to single phyto-geographic territory in particular, or to a restricted number of them. The Nongmaiching ching of Imphal east district is the most important site. A maximum number 21 of species was recorded from this site where diverse habitat prevails. This site has an approximately area of 76.90 km² with a maximum altitude of 1583 m. Most of the rare species of *Acanthus leucostachyus*, *Eranthemum suffruiticosum*, *Justicia vasculosa*, *Peristrophe roxburghiana*, *Phlogacanthus curviflorus*, *Pseuderanthemum polyanthum*, *Strobilanthes affinis*, *S. clarkei*, *S. torrentium* are recorded form this site. Moreover, the two pliestial species *S. auriculata* and *S. asymmetrica* were also recorded.

Species like *Hygrosphila erecta*, *H. ringens*, *Hygrophila polysperma* and *Hygrophila erecta*, have relatively restricted near swampy areas in around the
valley districts having altitude range of 650 to 850 msl. *Justicia procumbens, Nelsonia campestris, Thunbergia alata, Lepidagathis incurva, Phlogacanthus thyrsiflorus* species have widespread distribution in all the districts. *Justicia adhatoda, J. gendarussa, Andrographis paniculata, Phlogacanthus thyrsiformis, Ruellia brittoniana* and *Thunbergia coccinea*, were found wild and also cultivated. *Strobilanthes species* and *T. grandiflora* F. Ham ex D. Don have limited or restricted distribution. *Barleria cristata var. albida* and *Strobilanthes cusia* (Nees) Kuntze were very rarely distributed leading towards rare category. So, immediate steps for conservation should be taken up for the species whose population is depleting day by day from this state.

The identification of geographic areas will assist in the proactive conservation of areas harbouring large number of endemic Acanthaceae species, and these data provide the first step towards an interactive understanding of the evolutionary ecology of endemic floras. Situated in the both Myanmar and Indian plate contained larger number and also rare species centre of endemism and more species of Southeast Asian origin are inflow towards the Indian plate. Since it is observed that the spatial distribution of Acanthaceae species is inflow towards the Indian plate which latter shows door. It can be concluded that Acanthaceae species of Southeast Asia origin are more available and there is an inflow of species from Myanmar plate to Indian plate.
3.4 ETHNOBOTANY OF ACANTHACEAE SPECIES

To take care of the wild plants by transplanting them in kitchen was started by the inhabitants of Manipur state is an age long tradition. Among the kings of Manipur, The then King Naophangba (428-518 A.D) (Meitei 2004) may be the first person who started systematically use of folk medicine. However, the first application of herbal medicine was started under the leadership of the then King, Meidunga senbi Kiyamba (1467-1508) (Meitei 2004). The Meitei king introduced the use of Ponheiton (Guava) as a medicine for treatment of diarrhoea. A mature stage of the use of herbal medicine reached its climax in the history of Manipur during the king Meidunga Chingthangkhomba (1763-1798 A.D.), he appointed his personal maiba (Herbal practioners) like Konnok Thengra and Meidunga Lalhamba as their maibas respectively, (Meitei 2004). From time immemorial the knowledge continues upto the present day, which latter on modern scientific has got its amendments, even though it is still practiced in the meitei community and it is a most popular one. There are even so many others opinion on cultural, religious and communal point of view, but the indigenous herbal medicinal system practiced by maibas and the general masses of the meitei community till today.

The maibas through ages recorded the experiences in the old book edited by them known as Puyas. Puyas are old books maintained by the maibas during king time. Some of the presently available Puyas are in traditional script with or without the name of the author. The indigenous knowledge system of the herbal medicine practioners can be seen from various schools of thoughts as evidence by the old Puyas of the meitei community. Some of Puyas are Hidaklon (Folk medicine) in five volumes viz. Kanglei saglen puba puya, Shingligi maram, Laimuron, Taorinai yangbi and Thepalon.

Traditional use of some specific folk-medicine has been practiced in Manipur. It is worth to be mentioned that some of the wild edible plants used as herbal medicine is still follows by this country. The herbs and wild edible medicinal
plants have got great mythological significance during the pre-historic days known as Moirang Kangleiron, a legendary history of Khamba and Thoibi and Kabui salai amaiba, a well known local herbal physician for his miraculous treatment using herbal medicine with mystic incarnation. The valuable indigenous knowledge for precautionary measures and maintenance of good health gives inspiration to researches in this field. In the recent years, there are several publications and published books.

The present survey work provides an introduction to ethno-botany of the family Acanthaceae in Manipur. This family locally known as Nongmangkha (Phologacanthus) family has several plants of myths, taboos, folk-medicine, wild edible and socio-religious and cultural significance. The plants of the Acanthaceae were as enumerated below accordingly to their maximum ethno-botanical significance:

3.4.1. **Phologacanthus thyrsiformis** (*Nongmangkha*)

*Myths and folktales*

The story, origin and naming of the plant was given in the puyas. The then king Nongpok Ningthou wife was in love with another god. One night king’s queen Panthoibi ran away to alove with the god at a particular place as fixed, she was quietly left the place but the king realized and was after her in a close range. Knowing the distance she hides at a shrub bushes and thus escaped. At that instance she just chews one leaf of the plant which was bitter in taste, so she named the plant as nongmangkha, nong= one day, mang = bussy and kha = bitter, the present Phologacanthus thyrsiformis.

*Taboos*

Superstitious beliefs of botanical folklore are still in practiced by local people. There is belief which is still very much in practiced about this plant is that local people do not to pluck any part of the plant on Sunday and any days on midnoon. There is a saying that on this restricted day or time period devil sits on the plant. If someone happens to pluck the plant or used it for any purpose, it cause evil
effect on the human health or may cause bad effect on health. Majority, 90% of the people population both in urban and rural are still practicing it and nobody dares to break it. It is a significant approach to investigate to the indigenous cultural practiced of this plant as it was revealed that this might be a system of conserving biodiversity through ancestors by following superstitious folklores.

Witchcraft or Sorcery

The art of witchcraft or sorcery is still practiced as evidence by presence of witchcraft doctors in the society. The plant is used on different purposes to evade or to tame evil spirits.

*Alocosia macrorrhiza* (L.) Schott. rhizome (*Hangoo*), *Cynodon dactylon* Pers. leaf (*Tennou*) with *Phlogacanthus thyrsiformis* Nees leaf is used to tame spiritual evil spirits.

*Phlogacanthus thyrsiformis* leaf with *Oryza sativa* L. (*Changhee*) rice infusion is also used to tame evil spirits.

*Phlogacanthus thyrsiformis* leaf with *Bambusa nutans* Wall. *ex.* Munro (*Ootang*) rhizome for evading away evil spirit.

Cultural rituals

On rituals of the *meitei* customs, a traditional lunch is a must to serve guest who came for the giving blessing to the host. Before that food items are offered previously to the god. One such compulsory food item is of called *suktane* which is prepared from the plant leaves, fried adding with sugar. It is revealed that the purpose of serving the food item is it neutralizes all the effects of the food and helps digestion.

Food recipes

The flower with young inflorescence is fried and taken as favorite food item by the community. The young leaf is mixed with powdered dal and fried in vegetable oil to prepare a special item called *bora* which is commonly taken in Manipur. Again, the boiled leaf, fermented fish, salt and chili is mixed definite proportion to prepare an
item called *kangshu* and serve the flower are sold in the markets, one patch cast 10-15 rupees.

**Recreational purposes**

The plant is planted as fencing boundary for house and as well as hedge in gardens simultaneously for source of food and medicine. It is found commonly grow in kitchen garden for medicinal and food items. There is also a psychological approach that growing this plant in the campus/ courtyard protect from evil spirit.

**Folk-medicinal uses**

<table>
<thead>
<tr>
<th>Name of Local health tradition</th>
<th>Health condition</th>
<th>Part used/ ingredients used</th>
<th>Mode of preparation</th>
<th>Mode of administration &amp; Dosages</th>
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</thead>
<tbody>
<tr>
<td>Agang mayoknaba</td>
<td>Easy deliver of child birth</td>
<td>Root</td>
<td>Powdered 200 gm is mixed with water and made paste</td>
<td>The porridge is applied externally on sex organ, buttock and abdomen. 50 ml of the decoction is taken orally for 3-4 days 100 ml of the mixture is orally taken twice daily.</td>
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<tr>
<td>Angang yeithaba</td>
<td>Abortion</td>
<td>Leaf</td>
<td>35-45 leaves into 1 liter is boiled upto 1/3 of the volume</td>
<td>50 ml of the decoction is taken orally for 3-4 days</td>
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<tr>
<td>Khonghamt haba</td>
<td>Diarrhoea, dysentery &amp; cholera</td>
<td>Leaf, rhizome of <em>Zingiber officinalis</em></td>
<td>Leaves crushed mixed smashed rhizome of Zinger with little salt is dissolved in water.</td>
<td>100 ml of the mixture is orally taken twice daily.</td>
</tr>
<tr>
<td>B.P control</td>
<td>High Blood pressure control</td>
<td>Leaf &amp; <em>Clerodendron colebroekiana</em> leaf</td>
<td>Leaf of both plants decoction is taken</td>
<td>250 ml of the decoction is orally taken daily is for 3 days</td>
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<tr>
<td>Yairong</td>
<td>Boils</td>
<td>Young shoot, salt &amp; rhizome of zinger.</td>
<td>Young shoots is smashed with ginger and little salt is added</td>
<td>The porridge is applied on the affected area.</td>
</tr>
<tr>
<td>Nupi thage khongkap</td>
<td>Irregular menstruation</td>
<td>Leaf</td>
<td>Leaf decoction of plants is taken</td>
<td>300 ml of the decoction is orally taken twice daily for 3 days</td>
</tr>
<tr>
<td>Malaria</td>
<td>Malaria</td>
<td>Leaf</td>
<td>30 grams of dry leaf powdered is dissolved in water</td>
<td>100 ml of the decoction is taken orally</td>
</tr>
<tr>
<td>Disease</td>
<td>Cause</td>
<td>Treatment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------</td>
<td>------------------</td>
<td>---------------------------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lai thokpa (Small pox &amp; Skin problems)</td>
<td>Leaf decoction of leaf taken bath for 4 days.</td>
<td>Leaf decoction is taken bath for 4 days. Decoction of leaf thrice for 7 days.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lok khouba (Cold &amp; cough)</td>
<td>Boiled / Decoction mixed in 2:1 with honey</td>
<td>The steam is inhaled twice daily for 5 days / 50 ml three times daily for 3 days.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lok laihou (Viral influenza)</td>
<td>Boiled in a container and covered with banana leaf making a hole to make the steam out.</td>
<td>A cotton cloth is made to cover for some time and the cloth is pressed on chest, shoulders and back for several times before sleep for 5 days.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meina pokpa (Burns)</td>
<td>Crushed juice of leaf</td>
<td>Cool fresh water is applied first then the Juice applied at the affected area 3-5 times daily.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chickpanaba (Sprains and body ache)</td>
<td>The leaf is boiled and smashed</td>
<td>The poultice is applied to the affected area.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Khongham ba yanaba (Constipation)</td>
<td>The fried is leaves and smashed</td>
<td>30 gm put inside the anus.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3.4.2. *Strobilanthes cusia* (Kum).

*Strobilanthes cusia*, locally known as “kum” in *manipuri* language is the most important plant used in the dyeing of clothes by various communities in Manipur. The Kharam tribe of Manipur used to barter *S. cusia* leaves and fruits of walnuts (*Juglans regia* L.) with Thadou tribe. Different tribes like the Maring, Thangal, Chothe, Makhan used *S. cusia* as a tribute to the meitei kings from the reign of the King Khagemba (Bahadur 1997, 2000). Before, the advent of the chemical dyes, the meitei communities had used the leaves of *S. cusia* for dyeing unique blue black and indigo colour.
Amongst the **meiteis**, the production and maintaining the quality of kum dye fabrics are believed to be the blessing of the goddess **kum lairemma**. A strict taboo is associated with the Kum dye preparation whoever broke the taboo is believed to be stricken with a disease called **kumlaichuba** (Bahadur 1997). The extraction of dye and dyeing clothes and fabrics are considered as an important culture erstwhile **meitei** sovereign country by assigning a particular clan for dyeing a particular colour. With the global acceptance and revival of natural dyes, there is an urgent need to bring back to life the use of traditional knowledge of dyes. The case study focuses on three aspects i) to document the traditional way of **S. cusia** fermentation (kum fermentation) and dyeing technique, ii) to explore the reasons behind the disappearance of Kum dye (**KD**) and iii) assessment of the drawbacks, commercial value and promotion for revival of Kum dye phanek (**KDP**).

Open ended schedule type questioner was prepared and semi-structured knowledge holders interview was taken by visiting the house for each knowledge holder. The method of collecting information was done by following (Martin 1995) with some modifications. Knowledge about **S. cusia** or **kum** plant, mode of preparation of **KD**, dyeing technique, weaving methods, **KDP** characteristics, popularity, demand and revival was interviewed in **manipuri** language which is common in all the three villages. Some of the criteria included in the questioner for statistical analysis are age intervals of the artisans (20 - 40, 41 - 60 & 60 and above), gender, occupation (**kum** fermentor, dyer, weaver, dyer cum weaver), characteristics (lustrous after every wash, comfortable and flexible, black and indigo, pleasant smell), popularity (social value, traditional attire, unique quality), year of replacement (before 1970, 1971-1980 & 1981-1990), limitations (unavailability of plant, lack of skilled labour, cumbersome process, easy availability of chemical dye), source (wild, market and other sources), knowledge of **KD** making process (expertise, heard, no idea), draw backs in weaving (brittleness of the thread, dependency on weather conditions, time consumption, no idea), decline of **S. cusia** (shrinkage of habitat, overexploitation, pollution or forest fires). Data are analyzed (Kottak 1991, Brim *et al.* 1974) with the help of IBM SPSS Version 15. Opportunistic discussion, group discussion of the results of the interviews and
market surveys was conducted by the authors, which served to assist in the interpretation and contextualization of the results. Based on previous research and a familiarity with cultural norms, we began this survey with the assumptions that: 1) the KDP is no longer existing at present but a chemical dye phanek, 2) knowledge of traditional KDP increase with the increase in age.

Traditional dyeing Process

The preparation of KD and subsequent dyeing process is a tedious one requiring strong attention. The generalize process of the traditional KD technology. The steps can be briefly summarized in the following manner.

*Preparation of Kum leaf and shoot paste*

Mature leaves and young shoots of S. cusia are collected between the months of January to March and put inside an earthen pot as much as possible. The pot is then filled up with water and allowed to ferment in the sunlight for 3 days. When the plant materials had fermented, a thick dark colored liquid mass is formed. Then the material is transferred to a new pot.

*Preparation of lime solution or paste*

For traditional kum dyeing, a special lime paste, locally known as kum-sunu, is used. The oyster (Unio sp) shells collected, particularly from the Kongba River, are used as the main source of this paste. For about 500 empty shells, a straw bed (90 x 7 cm), dried cow-dung cakes (5 to 7 cm) are spread over the straw bed. The shells are sandwiched between cow-dung cakes and covered with straws and further covered with cow dung-cakes. A fire is then lighted on the top as well as on both sides and the whole heap is burnt for 5 to 6 hours. After allowing the whole thing to cool, the brittle and dark grey remains of the oyster shells are collected by hand and powdered with a mortar and pestle. The powder is sieved through a gamsha (muslin cloth) and is then stored in a metal tin for further use. For making the lime solution, an earthen-pot or a metal-pot is taken with some amount of water and boiled. Necessary amount of lime powder is added and heated on a low flame of firewood, when fairly hot it is transferred to the heated lime powder pot slowly by stirring vigorously with a long bamboo ladle. Usually 1/3 proportion of a pot of
burnt shell powdered is heated and treated slowly with hot water, filling the pot almost to the brim to give a thin lime paste.

The dark colour liquid mass of *S. cusia* is mixed with the lime paste slowly stirring all the time with bamboo ladle. For about 18 to 20 litres of the fermented *kum* mass about 4 handful of the lime paste (about 200 g) is required. The mass of lime is vigorously stirred continuously. Production of effervescence is controlled by the application of mustard oil in the mixture. When the paste becomes deep black it is allowed to settle down leaving an upper clear liquid. Then the liquid layer is removed by decantation leaving only the black paste at the bottom of the pot. The latter is collected using a cotton cloth to drain the excess liquid. The thick dark paste collected serves as the *kum* dyeing paste which should kept moist all the time.

Dry paddy straw (*Oryja sativa* L.) or dry banana leaves (*Musa paradisiaca* L.) are burnt and ash is collected. The ash is dissolved in water and filtered through bamboo basket several times. This process in continued until adequate alkaline solution is collected in an earthen pot. This, alkaline solution is used to fasten the dye to the thread or acts as mordant.

Barks of *Pasania pachyphylla* (Kurz) Schottky, locally called *kuhi* are collected and boiled in water until deep brown colored liquor is obtained. The *kuhi* extract can be kept for fairly long time (few months) water being added from time to time to keep the level of the liquor. The *kuhi* extract is used to improve the take up ability of the fabric and also help to improve colour.

Dyeing of cloth yarn with kum dye paste

The *kum* paste, *kuhi* solution, lime solution and alkaline solution are mixed with some molasses in an earthen pot. The *kum* paste is first added in the mud pot and other solutions are added later in any order. The mixed solution is stirred thoroughly and kept overnight. A successful mixed solution attained a pale yellowish colour. Three pots 15 - 20 l of equal size were arranged in a row where solution is transferred from the stock solution.
The dyeing is done usually in the morning, beforehand in the evening, before the actual dyeing is done these pot of KD stock are replenished with fresh lime solution of different ingredients. For 4 knots (about 300 g) of cotton yarn, a quarter of the kum paste in a mud pot mentioned earlier i.e. about ½ litre is required for two to three dyeing. Thus, the stock of 2 litres of KD paste can be used for 8 to 12 dyeing of about 300 g of cotton yarn. There may be twice or triple dyeing per day according to convenience. The optimum colour is obtained in about 8 or 12 dyeing. For every 2 to 3 dyeing solutions of fresh ingredients are added. Lime solution of about 100 to 150 mg, alkaline solution about 400 to 500 ml and liquid molasses about 200 to 250 g were required for every 2 to 3 dyeing. Yarns to be dyed are put in the KD mixed solution, taken out, squeezed and air-dried for about 2 to 3 minutes. The process is repeated in the second and third pots also. Then the fabrics are hung in the open yard for some time for partial drying. A deep bluish black colour is developed in the yarn usually after repetition of 8 or more dyeing process. Before, the final dyeing step, the yarn after proper squeezing and drying is treated in the kuhi bark solution. Then, it is dipped in the KD solution for the last time to give a very deep bluish black shade. After the final dyeing the yarn is washed thoroughly and allowed to dry which gives the final shade.

Examining the interview, the KDP with the presently available chemical dye phanek characteristics was very distinct different. The pattern observed supported our hypothesis. We saw the artisans using chemical dye only for dyeing the presently available phanek and moreover the KDP started declining since 1970s and almost lost in 1990s mainly due to the unavailability of the plant. With the loss of the habitat, extensive harvesting with others factors such as cumbersome process, lack of skilled man power and easily availability of chemical dye, the practice of kum dyeing has ceased to exist. The presently available KDP is not the original one. However, majority of the knowledge holders proposed that they should be called kum-shabee which means the imitation of KDP. Interestingly, all the artisans or knowledge holders' likes to prefix the word "kum" as this bring the commercial mileage of the loin cloth. Still now, common people were under the impression that KDP exist and purchasing the duplicate or chemical dye phanek as
original KDP. The present practice is to apply the chemical dye (Sulphur black) to the cloth and then use the kum leaf paste to provide its characteristic smell to claim the loin cloth as KD ones and is sold in high prices (Bahadur 1997).

Our result suggests that KDP is closely associated with the socio-cultural aspects of meitei community. Women folk must wore phanek for all sort of formal outings, religious ceremonies, marriages and it is the identity of meitei women in India. We also have the privileged to see the original KDP, posses by some of the artisans as their personal belongings. Regarding the popularity of the KDP, it was evident that the majority of knowledge holders (41 aged - above) credited it for unique quality that is lustrous after every wash, comfortable, black blue shade with pleasant smell. While, the younger generation 20 to 40 aged groups were less aware of the quality and they were more conscious about the traditional attire as it is closely associated with meitei culture.

Again, the age and gender –based pattern of traditional knowledge on KD were very distinct. The Spearman's rho co relationship is -6.51 which is significant at the 0.01 level indicating gradual loss of traditional knowledge when progressing from older to younger generations. The pattern observed also supported our second hypotheses. We saw a greater command of traditional kum knowledge with increased age and also with experience acquired irrespective of the present occupation of the artisans. Majority of the kum related was done by the women folks and traditional knowledge of kum was also able recorded mainly from women folk and men folk recorded in the study were also the heirs of kum-subis (women working in KD making process). There is gradual loss of the traditional knowledge among the kum artisans as many experienced persons had expired. Moreover, there is no sharp distinction of labour for dye making, dyeing threads and weaving as chemical dye had replaced completely the vegetable dye.

Age interval with knowledge of traditional KD making were analyzed and it is found that the informants whose ages are above 60 were more refined and have better specific knowledge and precise knowledge about their KD making and fermentation process. Amongst the artisans under the category of kum fermentor,
71.30% of artisans have actual experience of practical KD making process and 28.69% of the artisans have the knowledge of KD making process without practical experienced. Age interval 41-60 of artisans belongs to category of weavers and dyers. It was recorded that 22.72% of the artisans have practical experience, 63.63% knowledge without practical experience and 13.63% with no knowledge of KD making process. Lastly, the age interval 20-40 were mostly weavers which were following their parental footsteps except one woman knowledge holder Tampaklei Devi (39 years), who happens to be the kinsfolk of Keina Devi (KD making mother) have experienced of KD making process under this category.

Though there is feeling for revival of the kum culture, limitations and drawbacks in the traditional method hamper the process. Its main drawbacks were source of plant material, cumbersome process, lacked of skilled artisans and brittleness of thread. However, we are suggesting that KD can be revived. An initiative proposal is made by the authors to solve the main drawbacks to make the original KDP available in the market. The major drawback for source of plant material can be solve, as the multiplication of plant can be easily by layering method of vegetative reproduction and large scale cultivation can be done. Secondly, the drawback of cumbersome process can reduce by hastening the KD making process by adopting new bio-technology methods. Bahadur (1997) had reported addition of soda (Sodium bi-carbonate) hastens the fermentation process.

Thirdly we are able to draw out some knowledge holders which were highly skilled and expertise in each division of work KD making process, dyer and weavers. We, must take initiative that support and training for local artisans in community by this skilled artisans before the expired as they were elderly persons. Finally, brittleness of the thread can be solved by increasing threads strength by using recent methods like boiling, scouring and bleaching techniques. Expertise in the textiles and vegetable dyeing should be organized and the artisans participation and specialist on the marketing of handicrafts. As these people were directly involved in sale of KDP and they also know the demand of the product by the customers. Our study reveals that the demand of KDP will increase manifold if it is made available in the market.
Since localized or specialized traditional knowledge is more prone to loss than common knowledge. The study comes out with some guidelines that might enable to revive the original KDP to generate sustainable and supplemental income for the grower, fermentors, dyers and weavers.

It is concluded from the present case the study indicates KDP started declining since 1970s and discontinued in the year 1990s mainly due to the unavailability of the plant. The loss of this traditional management practices and uncontrolled harvest of kum plant lead to subsequent loss of the species from wild. It also reveals a formal recognition that KDP is almost lost and the presently available is a duplicate of KDP. The traditional knowledge holder of dyeing technology is slowly disappearing. A proper documentation of KD making, kum dyeing and kum weaving can yield practical benefits for community, including support from developmental agencies, integrating handicrafts into national economic strategies and raising the status and productivity of kum dye workers. Considering its feedbacks, demand and commercial value, it is high time for the revival of KD and also the conservation of kum plant species.

**Folkmedicinal uses**

<table>
<thead>
<tr>
<th>Name of Local health tradition</th>
<th>Health condition</th>
<th>Part used/ ingredients used</th>
<th>Mode of preparation</th>
<th>Mode of administration &amp; Dosages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phingou chatpa</td>
<td>White discharge</td>
<td>Leaf</td>
<td>20-30 leaves in 1 litre up to 1/3 rd mixed with 2 teaspoon sugar candy</td>
<td>40-50 ml decoction is orally taken thrice daily for 12 days</td>
</tr>
<tr>
<td>Phuri</td>
<td>Ringworm and skin diseases.</td>
<td>Leaf</td>
<td>Leaves smashed</td>
<td>The juice is applied to the affected area till recovered</td>
</tr>
<tr>
<td>Hueina Leina chickpa</td>
<td>Dogs and snake bites</td>
<td>Leaf</td>
<td>Leaves crushed</td>
<td>The porridge is applied to the bitten area for 7 days.</td>
</tr>
</tbody>
</table>

Strobilanthes cusia is grown by conservationist or museum authority to conserve this plant because as it is closely related with cultural and social values of the meitei community in Manipur.
### 3.4.3. *Justicia adhatoda* (*Nongmangkha angouba*)

**Folkmedicinal uses**

Same uses for white discharge, cold and cough and bronchial congestion

<table>
<thead>
<tr>
<th>Name of Local health tradition</th>
<th>Health condition</th>
<th>Part used/ ingredients used</th>
<th>Mode of preparation</th>
<th>Mode of administration &amp; Dosages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lok laihou</td>
<td>Cough and fever</td>
<td>Leaf</td>
<td>20 -30 leaves in 3 litres of water upto 1/3 rd</td>
<td>100 ml decoction is orally taken twice daily for 7 days.</td>
</tr>
<tr>
<td>Hara thungba</td>
<td>Asthma</td>
<td>Leaf</td>
<td>100 gm dried leafpowder</td>
<td>Smoked as cigarette twice daily for whenever required</td>
</tr>
<tr>
<td>Thongnak</td>
<td>Jaundice</td>
<td>Leaf</td>
<td>Leaves extract</td>
<td>50 ml orally taken twice daily for 10 days</td>
</tr>
<tr>
<td>Khanow anaba</td>
<td>Tonsillitis</td>
<td>Leaf and <em>Piper longum</em> seeds</td>
<td>Crushed leaves mixed, 20 gm powdered seeds mixed in ½ litre water</td>
<td>The mixture is used to gargling for 4 times daily for 10 - 15 days</td>
</tr>
</tbody>
</table>

### 3.4.4. *Andrographis paniculata* (*Bhupati*)

**Folk-medicinal uses.**

<table>
<thead>
<tr>
<th>Name of Local health tradition</th>
<th>Health condition</th>
<th>Part used/ ingredient used</th>
<th>Mode of preparation</th>
<th>Mode of administration &amp; Dosages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mahu panbana chickpa</td>
<td>Poisonous bites</td>
<td>Leaf</td>
<td>Smashed leaves</td>
<td>The porridge is applied on the bitten area. 20-30 ml of the extract is orally taken three times daily for 3 days 300 ml orally taken daily for 10 days</td>
</tr>
<tr>
<td>Khong hamthaba</td>
<td>Loose motion</td>
<td>Leaf</td>
<td>Leaves crushed extract</td>
<td></td>
</tr>
<tr>
<td>Khom thoknaba</td>
<td>To promote lactation of mother</td>
<td>Tuber</td>
<td>The crushed leaves mixed with milk</td>
<td></td>
</tr>
<tr>
<td>Meina pokpa</td>
<td>Boils</td>
<td>Leaves</td>
<td>Fried leaves mixed with ghee</td>
<td>The porridge is applied on the affected area. 300ml is orally</td>
</tr>
<tr>
<td>Indrigee</td>
<td>Increase of</td>
<td>Leaves</td>
<td>Decoction is mixed</td>
<td></td>
</tr>
</tbody>
</table>
panghal sexual potential
hanguthunba honey taken daily for 7 days.

3.4.5. *Justicia gendrassusa* (Nongpok langthrei).

*Folk-medicinal uses.*

<table>
<thead>
<tr>
<th>Name of Local health tradition</th>
<th>Health condition</th>
<th>Part used/ingredients used</th>
<th>Mode of preparation</th>
<th>Mode of administration &amp; Dosages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loo-tang chickpa</td>
<td>Rheumatism</td>
<td>Tender shoots &amp; leaves</td>
<td>Boiled in 1 litre upto $\frac{1}{2}$ th</td>
<td>100 ml of the decoction is orally taken twice for 15 days</td>
</tr>
<tr>
<td>Maheik-matang changdana ba</td>
<td>Antiseptic / minor injuries</td>
<td>Root</td>
<td>The root crushed and juice taken</td>
<td>2-3 drops is applied to the cuts and wounds.</td>
</tr>
<tr>
<td>Singli naowrere punghaba Piles</td>
<td>Paralysis</td>
<td>Leaves / sesame oil</td>
<td>The infusion mixed with sesame oil</td>
<td>The mixture is applied rubbing the affected area.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Leaves</td>
<td>The 5-8 leaves is crushed and little edible oil.</td>
<td>The extract is applied to the anus</td>
</tr>
</tbody>
</table>

*Socio-cultural aspects*

The plant is also used in religious ceremonies of the *Khuman* clan of the meitei community. It is also used as a hedge in the garden to protect from evil spirits.

3.4.6. *Barleria cristata* (*Amurei*).

*Folk-medicinal uses.*

<table>
<thead>
<tr>
<th>Name of Local health tradition</th>
<th>Health condition</th>
<th>Part used/ingredients used</th>
<th>Mode of preparation</th>
<th>Mode of administration &amp; Dosages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shingli chickpa naba</td>
<td>Muscular swelling</td>
<td>Twigs and Leaf</td>
<td>Smashed leaves</td>
<td>The extract is applied the affected area</td>
</tr>
<tr>
<td>Ee khucknaba</td>
<td>Cuts and wounds</td>
<td>Leaf</td>
<td>Smashed leaves</td>
<td>The extract is applied to the affected area</td>
</tr>
</tbody>
</table>
Gough Gough Leaves and root The infusion of leaves & root 100 ml orally taken daily for 7 days

3.4.7. *Barleri cristata var albida* (Amurei angouba).

**Folk-medicinal uses.**

<table>
<thead>
<tr>
<th>Name of Local health tradition</th>
<th>Health condition</th>
<th>Part used/ ingredients used</th>
<th>Mode of preparation</th>
<th>Mode of administration &amp; Dosages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ounshage leina</td>
<td>Skin infections</td>
<td>Whole plant</td>
<td>15-20 leaves boiled in 1 litre of water upto 1/5 th</td>
<td>The decoction is applied to the affected area</td>
</tr>
</tbody>
</table>

3.4.6. *Hygrophïla ringens* (*Eshing langthrei*)

**Folk-medicinal uses.**

<table>
<thead>
<tr>
<th>Name of Local health tradition</th>
<th>Health condition</th>
<th>Part used/ ingredients used</th>
<th>Mode of preparation</th>
<th>Mode of administration &amp; Dosages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chakkhou naba</td>
<td>Stomach complaints</td>
<td>Whole plant</td>
<td>The whole plant extract</td>
<td>50 ml of the juice is taken orally twice for 15 days</td>
</tr>
<tr>
<td>Thongnak</td>
<td>Jaundice</td>
<td>Whole plant</td>
<td>Boiled in 1 litre of water upto ½ th .</td>
<td>250 ml of decoction is taken orally thrice daily for 10-12 days.</td>
</tr>
</tbody>
</table>

3.4.7. *Justicia procumbens* (*Napi tunshonbi*).

**Folk-medicinal uses.**

<table>
<thead>
<tr>
<th>Name of Local health tradition</th>
<th>Health condition</th>
<th>Part used/ ingredients used</th>
<th>Mode of preparation</th>
<th>Mode of administration &amp; Dosages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chakkhou naba</td>
<td>Stomach complaints</td>
<td>Whole plant</td>
<td>Boiled in 1 litre of water upto ½ th mixed with 1 teaspoon honey</td>
<td>100 ml of the mixture is taken orally daily in the morning for 10 days.</td>
</tr>
<tr>
<td>Sokpa panba</td>
<td>Cuts &amp; wounds</td>
<td>Leaf</td>
<td>3-5 leaves is smashed and made paste</td>
<td>The porridge is applied on injuries.</td>
</tr>
</tbody>
</table>
### 3.4.7. *Rungia pectinata* (*Warak khamubi*).

**Folk-medicinal uses.**

<table>
<thead>
<tr>
<th>Name of Local health tradition</th>
<th>Health condition</th>
<th>Part used/ingredients used</th>
<th>Mode of preparation</th>
<th>Mode of administration &amp; Dosages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hueina lina chakpa</td>
<td>Dog and Snake bite</td>
<td>Whole plant/Oryza sativa grain</td>
<td>Whole plant is crushed with rice grains and made paste</td>
<td>The porridge is applied several times on the bitten area.</td>
</tr>
<tr>
<td>Ee-ashengba changba</td>
<td>Bruises and swelling</td>
<td>Whole plant</td>
<td>The plant is smashed and made into paste</td>
<td>The porridge is applied for every 3 hour on the affected area.</td>
</tr>
<tr>
<td>Agange lai thokpa</td>
<td>Small pox</td>
<td>Whole plant</td>
<td>The whole plant is crushed and the juice is taken mixed with honey</td>
<td>30 ml of the mixture is given orally four times daily for 3 days.</td>
</tr>
</tbody>
</table>

### 3.4.8. *Justicia vasculosa*

**Folk-medicinal uses.**

<table>
<thead>
<tr>
<th>Name of Local health tradition</th>
<th>Health condition</th>
<th>Part used/ingredients used</th>
<th>Mode of preparation</th>
<th>Mode of administration &amp; Dosages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meina pokpa</td>
<td>Inflammation</td>
<td>Leaves</td>
<td>3-4 leaves are crushed and made paste</td>
<td>The porridge is applied several times on the affected part.</td>
</tr>
</tbody>
</table>

### 3.4.9. *Phlogacanthus curviflorus* (*Chingi nongmangkha*).

**Folk-medicinal uses.**

<table>
<thead>
<tr>
<th>Name of Local health tradition</th>
<th>Health condition</th>
<th>Part used/ingredients used</th>
<th>Mode of preparation</th>
<th>Mode of administration &amp; Dosages</th>
</tr>
</thead>
</table>
| Loklai hou                     | Cold & fever     | Leaves                      | 15-20 leaves are boiled in 2 litres of water upto for 30 minutes. | 250 ml of decoction is taken orally twice daily for 7
Huckchangt hindokpa
Muscular pain with slight fever after a long journey
Leaves
About 20 leaves is boiled added with salt is boiled in water
The decoction is taken bath.

3.4.10. *Nesonia canescens*

*Folk-medicinal uses.*

<table>
<thead>
<tr>
<th>Name of Local health tradition</th>
<th>Health condition</th>
<th>Part used/ingredients used</th>
<th>Mode of preparation</th>
<th>Mode of administration &amp; Dosages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indrugi pangal hanguthunba</td>
<td>Aphrodisiac</td>
<td>Root/milk</td>
<td>The 50 ml root extract is added with 350 mlk</td>
<td>The mixture is taken orally daily before sleep.</td>
</tr>
</tbody>
</table>

3.4.11. *Thunbergia coccinea*

*Folk medical uses:*

<table>
<thead>
<tr>
<th>Name of Local health tradition</th>
<th>Health condition</th>
<th>Part used/ingredients used</th>
<th>Mode of preparation</th>
<th>Mode of administration &amp; Dosages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Puck nungaitaba</td>
<td>Stomach disorders</td>
<td>Tender leaves</td>
<td>The leaves are crushed and the juice is extracted</td>
<td>50 ml of juice is orally taken thrice daily for 3 days</td>
</tr>
</tbody>
</table>

*Recreational purposes.*

The plant is widely used as ornamental plants.

3.4.12. *Thunbergia grandiflora*

*Folk-medicinal uses.*

For the stomach problems the uses is same with *Thunbergia coccinea.*
### Folkmedicinal uses.

<table>
<thead>
<tr>
<th>Name of Local health tradition</th>
<th>Health condition</th>
<th>Part used/ingredients used</th>
<th>Mode of preparation</th>
<th>Mode of administration &amp; Dosages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kokgnouba &amp; kokchickpa</td>
<td>Headache</td>
<td>Leaf</td>
<td>The leaves are smashed.</td>
<td>Leaf poultice is applied to forehead for several times</td>
</tr>
<tr>
<td>Lok tin chanba</td>
<td>Expectoration</td>
<td>Leaf &amp; tender shoots and Honey</td>
<td>Parts smashed and the juice is added with honey.</td>
<td>50ml mixture is taken twice daily</td>
</tr>
</tbody>
</table>

#### 3.4.13. Barleria prionitis *(Hanukhulam).*

#### Folk-medicinal uses.

<table>
<thead>
<tr>
<th>Name of Local health tradition</th>
<th>Health condition</th>
<th>Part used/ingredients used</th>
<th>Mode of preparation</th>
<th>Mode of administration &amp; Dosages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laihou</td>
<td>Intermittent fever</td>
<td>Leaf and raw sugar</td>
<td>10-15 leaves boiled in water with raw sugar for 30 minutes.</td>
<td>200ml mixture is taken thrice daily for 3 days.</td>
</tr>
<tr>
<td>Hueina &amp; linna chickpa</td>
<td>Dog and snake bite</td>
<td>Whole plant/Oryza sativa grain.</td>
<td>The macerated plant mixed with flour of rice and made paste</td>
<td>The paste is applied as porridge on the bitten part for several times.</td>
</tr>
</tbody>
</table>

### Recreational purposes.

The plant is also used as potted ornamental plant.

#### 3.4.14. Peristrophe roxburgiana

#### Folkmedicinal uses.

<table>
<thead>
<tr>
<th>Name of Local health tradition</th>
<th>Health condition</th>
<th>Part used/ingredients used</th>
<th>Mode of preparation</th>
<th>Mode of administration &amp; Dosages</th>
</tr>
</thead>
</table>
3.4.15. *Strobilanthes auriculatus* (*Kum-trook-pee*)

The plant is used as a wild edible plant. The inflorescence is steam in water and taken as food for increasing stamina. The inflorescence is also used as flavouring with indigenous small fish curry (*Gnatakpa thongba*) and steam fish (*Paknam*).

3.4.16. *Thunbergia alata* (*Sambal Khudop lei*)

Folkmedicinal uses.

<table>
<thead>
<tr>
<th>Name of Local health tradition</th>
<th>Health condition</th>
<th>Part used/ingredients used</th>
<th>Mode of preparation</th>
<th>Mode of administration &amp; Dosages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lok tin chanba</td>
<td>Expectorant</td>
<td>Leaf &amp; tender shoots &amp; Honey</td>
<td>Parts pounded and the juice is added with honey.</td>
<td>50ml mixture is taken twice daily</td>
</tr>
</tbody>
</table>

3.4.17. *Eranthemum suffruiticosum*

Folkmedicinal uses.

<table>
<thead>
<tr>
<th>Name of Local health tradition</th>
<th>Health condition</th>
<th>Part used/ingredients used</th>
<th>Mode of preparation</th>
<th>Mode of administration &amp; Dosages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mahupanba tinna chichpa</td>
<td>Poisonous insect bite</td>
<td>Leaf &amp; tender shoots</td>
<td>The leaves are pounded</td>
<td>The porridge is applied on the bitten area for several times. The powdered is mixed with water and taken orally in different concentrations.</td>
</tr>
<tr>
<td>Angana thugaiba</td>
<td>Abortion</td>
<td>Roots</td>
<td>The dried and grounded roots is powdered</td>
<td></td>
</tr>
</tbody>
</table>

3.4.18. *Lepidagathis incurva*

Folkmedicinal uses.
<table>
<thead>
<tr>
<th>tradition</th>
<th>used</th>
<th>Dosages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unsha-gee leina</td>
<td>Skin diseases Leaves</td>
<td>3-4 leaves are crushed and made paste The porridge is applied several times on the affected part.</td>
</tr>
</tbody>
</table>

During the present study, 21 species were recorded as on ethno-botanical impotence plants. These plants were used by the different communities residing in the valley districts. The most used plant is *Phlogacanthus thyrsiformis* which is used as home remedies for curing different primary ailments. Others globally accepted medicinal plants *Justicia adhatoda, Andrographis paniculata, Justicia gendarrusa* and *Justicia procumbens* were also widely used in Manipur. The most used plant part is leaf and mode of preparation is decoction and mode of taking is orally or internal used. It can be concluded that Acanthaceae is an ethno-botanical very important family in Manipur, especially in the valley districts.