

## THE TAXONOMIC INVESTIGATION ON GENUS *ALPINIA* ROXB. (ZINGIBERACEAE) FROM THE SIANG VALLEY, ARUNACHAL PRADESH

Tatum Mibang\*<sup>1</sup>, Arup K. Das<sup>2</sup>

<sup>1</sup>Department of Botany, J.N. College, Pasighat- 791103, Arunachal Pradesh, India

<sup>2</sup>Department of Botany, Rajiv Gandhi University, Itanagar, Arunachal Pradesh, India

E-mail: tatummibang.tm@gmail.com

### Abstract

The Genus *Alpinia* Roxb. distributes in the tropical and sub-tropical regions of the world. The Siang Valley of Arunachal Pradesh is favorable for the growth of the Genus *Alpinia*. The extensive taxonomic investigation on the Genus *Alpinia* in the Siang Valley resulting to 5 (five) species. For better description and understanding, a color photograph of each species are given.

**Keywords:** *Alpinia*; Taxonomic investigation; Siang Valley

### INTRODUCTION

The Genus *Alpinia* Roxb. consists of 241 species (The Plant List, 2010) in World, mainly distributed in the tropical and sub-tropical region of South Asian countries. The Genus is characterized by the tall leafy shoot, distichous leaves, the plane of distichous is transverse to the rhizome, terminal inflorescence with large spectabilis labellum and the staminode absent or rudiment tooth like or well elaborated horn like arching over the basal part of labellum.

The genus was estimated to 230 species in Indian sub-continent (Baker, 1890-1892). S. K. Jain and Ved Prakash estimated 11 species in India (1995). Of these, in North East India, only 5 species have been reported. Rao and Verma (1972) also reported 5 species from the region. In south India, 8 species were reported (Mangaly and Sabu, 1992). In Arunachal Pradesh, only 3 species has been reported so far (Chowdery, Giri and Pramanik, 2009). After Rao and Verma (1972), the taxonomic investigation on the Genus is considered to be progressing at the snail speed.

The Siang Valley of Arunachal Pradesh falls under tropical to sub-tropical evergreen

forest crisscrossed with rivers and streams which is favorable for growth of Zingiberaceae species in the Valley. The geographical parameters like altitudes ranges from 130 - 900 m (Ruksin - Pekii Modi), temperature range from 16 - 34 °C, relative humidity 54 - 98 % and sandy loamy soil enhance the luxurious growth of various Zingiberaceae species in the Valley. Out of 10 Genera reported (Tatum, 2016) of the family Zingiberaceae from the Siang Valley, *Alpinia* is one of the interested genera in the family Zingiberaceae. After extensive exploration of the family Zingiberaceae in the Siang Valley, only 5 species of *Alpinia* has been enumerated so far.

Detailed taxonomic description, keys, habitats and ecology of each species has been provided. Photographs of the recorded species from Siang Valley have also been provided for better understanding and identification.

### Taxonomic treatments

#### Key to Species

**1a** Inflorescence panicle; bracteoles small not completely enclosing floral buds.....go to 2  
**2a** Leaves linear, capsule pubescence and pink (mature).....*Alpinia calcarata*

**2b** leaves oblong-lanceolate, capsule globose, glabrous and black (mature).....*Alpinia nigra*

**1b** Inflorescence raceme, bracteole large and enclosing floral buds.....go to 3

**3a** Bracteoles and calyx purplish brown.....*Alpinia kwangsiensis*

**3b** Bracteole green, calyx pale green.....go to 4

**4a** Leaves beneath glabrous, leafy stem slender and glabrous.....

.....*Alpinia blepharocalyx* var. *glabrior*

**4b** Leaves densely stiff pubescence beneath, leafy stem stout and robust.....

.....*Alpinia blepharocalyx* var. *blepharocalyx*.

**1. *Alpinia blepharocalyx* K. Schumann var. *blepharocalyx* T.L. Wu**

*Alpinia blepharocalyx* K. Schumann var. *blepharocalyx* T.L. Wu Acta Phytotax. Sin., 16(3):35, 1978. *Alpinia bracteata* Roxburgh (1820); *Alpinia malaccensis* (Burm.f.) Rosc. Rao & Verma, Material toward the Fl. Assam-II, 140, 1972; Wu Delin & Larsen, Fl. China, 24:339, 2000; *Alpinia malaccensis* (Burm.f.) Rosc., Chowdery *et al.*, Material for Fl. Arunachal Pradesh, 3:169, 2009.

**Type:** *Alpinia blepharocalyx* K. Schumann var. *blepharocalyx* T.L. Wu (1978).

**Taxonomic description:** Culm forming tall herb with minute stiff pubescence. **Root stock-** *rhizome-* woody, fleshy, inner fibrous, 0.5 cm wide; *root-* primary root prominent, branched, woody. **Leafy stem-** culm consists of 8-10 plants, stout, green, tomentose, slender, base covered with 3- bladeless sheaths, 300-400 cm x 2-3 cm wide. **Leaves-** distichous, 8 cm apart, pubescence beneath especially along mid-vein, mid-vein striated; *ligule-* bi-lobed, 1.5 cm long x 1.6 cm wide; *petiole-* dirty pubescence, 6 cm long x 0.8 cm wide and chaniculate; *blade-* base sometime oblique (lower leaves) or rounded (upper

leaves), beneath densely pubescence, oblong (lower leaves) or elliptical-lanceolate (upper leaves), margin pale dull with undulate, apex acuminate, mucronate, 60-118 cm long x 15-26 cm wide (old leaves). **Inflorescence-** raceme, terminal, emerge from upper most leafy bract, erect or slightly bent up right; *leafy bract-* ovate, green then later on dry, minute pubescence, enclosed inflorescence part, 28-36 cm long; *peduncle-* cylindrical, pale greenish-yellow pubescence, pale green, 9 cm long x 2 cm wide, curved perpendicularly at 45-90 degree, flowers arrange in spirally on rachis, rachis five ridges with densely pubescence.

**Flower-** *pedicel-* green, tomentose, cylindrical, slightly elongate during fruiting, 0.5 cm long x 0.3 cm wide; *flower-* large, white and showy; floral tube pale purple and pubescence. *Bracteole-* tubular/navicular, pale green turn to dull brownish later on, dry and brittle, open at one side, coarse with dull-brownish stiff pubescence, apex 3-dentate, early deciduous, 1-flowered, apical part with dense stiff hairy, 3.5-4 cm long x 1.2 cm wide. *Calyx-* base tubular, pale greenish white, apex 2-3-lobed, apex ciliate at the margin, open at one side, pubescence, 2.5 cm long x 2 cm board (open). *Corolla-* petal 3-lobes, white, pubescence, ciliate at margin; *anterior lobe-* larger, lanceo-sub-orbicular, watery strips prominent, apex cuspidate/hooded, 3-4.5 cm long x 2.5-3.5 cm wide; *lateral lobe* -oblong-lanceolate, watery strips presence, lateral lobe adnate to labellum at basal part, 3-4.5 cm long x 2-2.5 cm wide. *Staminode-* two, horn-like, subulate, deep red, adnate to labellum base, inner deep red while outer pale red, arch over the filament, 0.7 cm long x 0.1 cm wide. *Labellum-* ovate-sub-orbicular, lower part deep red with yellow band, yellow band part branched at apex, base and mid part thicker, margin thinner and crisp, margin of lower part pale white to pale yellow, margin of upper part

pale yellow, apex acute with minute emarginate, 3.5-4.5 cm long x 4-5 cm wide; *claw*- short, deep red, deflexed, 1cm long x 0.5 cm wide. *Stamen*- fertile stamen I; filament-short, lower deep red, upper pale red, adaxially sparsely pubescence, 1 cm long x 0.3 cm wide; *anther*- 2-cell, each cell linear, pale yellow, diverge apically, 1.5 cm long x 0.3 cm wide, theca sparsely pubescence. *Pollen grain*- pale whites, many, spherical with radiating spines. *Gynoecium*- *ovary*- oval, pedicellate, pale green, densely grey pubescence, tri-locular with many oval ovules in axile placentation, 0.5 cm long x 0.4 cm wide; *glands*- 2, short, board, pale yellow, clavate, 0.5 cm long x 0.3 cm wide; *style*- filiform, reddish up to mid-part, apical part pale yellow, 4 cm long x 0.1 cm wide; *stigma*- funnel shape, exerted above anther, pubescence and margin ciliate. *Capsule/fruits*- globose-oval, densely pubescence, green-pale yellow, red on ripening, 3-valves, 2-3 cm long x 1.8-2 cm wide; *seeds*- ovoid, many, grey yellow-dull brown, aromatic.

**Phenology:** Flowering March-June, fruiting April-December.

**Ecology:** The plant naturally occurs in primary forest in wet-shady area along the slope of stream side. It prefers to grow in mountainous loamy soil at altitude 400-500 m.

**Distribution:** North East (India), China, Thailand, Vietnam.

**Note:** The species is almost similar to *A. blepharocalyx* var. *glabrior* except leaf blade is densely pubescence abaxially, especially along the mid-rib.

**2. *Alpinia blepharocalyx* var. *glabrior* (Handel-Mazzetti) T.L. Wu.**

*Alpinia blepharocalyx* var. *glabrior* (Handel-Mazzetti) T.L. Wu, Acta Phytotax. Sin., 16(3):35, 1978; *Alpinia bracteata* Roxb. Fl. Ind., 1:63. 1820; K. Schumann in Engler,

Pflanzenr., 20(46):334, 1904; *Alpinia bracteata* Roxb. Rao & Verma, Material toward the Flora of Assam-II, 139, 1972; Wu Delin & Larsen, Fl. China 24:339, 2000; Pantilunglu Daimeil and Yogendra Kumar, Pleione, 7(2):567-570, 2013.

**Type:** *Alpinia blepharocalyx* var. *glabrior* (Handel-Mazzetti) T. L. Wu.

**Taxonomic description:** Robust and culm forming plant. **Root stock**- *rhizome*- woody/semi-woody, fibrous, 0.5 cm wide; *root*- primary root prominent, long, branched, semi-woody. **Leafy-stem**- culm consists of 20-40 plants, green, glabrous, slender, base covered with 3- bladeless sheaths, 100-400 cm x 2-3 cm wide. **Leaves**- 12-15 per plant, 1-2 smaller leaves at base, 8-45 cm leaves apart/distance, usually concentrate at apical part; *ligule*- unequal bi-lobed, inner surface with deep green blotch, 0.8-1 cm long x 1.5-1.7 cm wide, sparsely minute pubescence; *petiole*- chaniculate, sparsely minute pubescence, lower leaves with shorter and bigger petiole, 0.4-4 cm long x 0.4-0.7 cm wide; *leaf blade*- lower leaves ovate, upper leaves oblong-lanceolate, base rounded/attuneate, margin entire and undulate, upper surface glabrous with conspicuous strips especially near the margin, beneath pale green and glabrous, apex acuminate, 24-76 cm long x 15-20 cm wide.

**Inflorescence**- raceme, terminal; *peduncle*- green, tomentose, base dilated, stout; *rachis*- pale green, pubescence, 4-5 ridges, 20-30 cm long x 0.8-1 cm wide; *Bracteole*- navicular with 2-3 prominent ridges, obovate, tubular, open at side opposite to labellum, inner surface with prominent strips, minute ciliate at apical margin, 4 cm long x 1 cm wide (closed), green and glabrous (when in young), dry and open during floral blossoming; *pedicel*- 0.4-0.8 cm long, villous, slightly elongate during fruiting.

**Flower**- large, white and showy. *Calyx*- pale

green with white silky pubescence, base tubular (0.8 cm long x 0.5 cm wide), apex with minute 3-lobes, open at one side parallel to labellum, upper part dilated, leathery, margin entire, two prominent greenish ridges present, apex dry during floral blossoming and later on fall off, 2.5 cm long x 2 cm wide (open). *Corolla*- base pale greenish, tubular (1.5 cm long x 0.5 cm wide) and glabrous, apex 3-lobes inserted below the labellum, margin ciliate, prominent strips presence; *anterior lobe*- fleshy white, ovate, larger with prominent mid-vein, pubescence, two pale yellow blotches at basal part, parallel to labellum, insert slightly below the lateral lobes, apex hooded, 3.5-3.8 cm long x 2.5-2.8 cm wide; *lateral lobes*- fleshy white, pubescence, oblong-obovate, 3.5-3.7 cm long x 1.5-1.7 cm wide, *Staminode*- two, deep red, horn like adnate to basal part of labellum and arching over the filament, 1cm long x 0.1 cm wide. *Stamen-filament*- pink, grooved, 1.7-1.8 cm long x 0.4 cm wide; *anther*- 2-celled, fleshy yellow, apex diverged, each cell 1.7-1.8 cm long x 0.2 cm wide; very negligible spur (0.2 cm long x 0.2 cm wide); *pollen grain*- many, fleshy white, spherical with radiating spines. *Labellum*- ovate, base deep red, apical part pale yellow running up to apical cleft, thick and prominent mid-vein, ventral surface with alternating white and pink strips, margin fleshy yellow with reddish strips and incurved, apical cleft 0.3 cm long x 0.2 cm wide, 4.5 cm long x 4.5 cm wide (basal part). *Gynoeceium-ovary*- oval, grey pubescence, ovules 2-3 in each locule, spherical and axile placentation, 0.5 cm long x 0.5 cm wide; pedicel- green with white silky pubescence; *glands*- 2, board, clavate, grey, each gland with two lobes and each lobe 0.2 cm long x 0.2 cm wide; *style*- fibril, lower part pale pink and upper part pale yellow, 4.8 cm long x 0.1 cm wide; *stigma*- funnel shape with fimbrous apical margin.

*Capsule*- many, globose-ovoid, aromatic, pedicilate, 1-3 cm long x 2 cm wide, stiff pubescence, green (in young) to pinkish red (in mature capsules).

**Phenology:** Flowering March-May; fruiting July-November.

**Distribution:** NE India (Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram and Tripura), Bangladesh, South China, Laos, Myanmar, Thailand, Vietnam.

**Ecology:** The plant naturally grows in forest margin, ditches, river banks and luxuriously grow in wet sandy loamy soil area at 400-760 m.

**Note:** The plant is culm forming with large showy inflorescence; the leafy stem is green, tall and glabrous. The leaves are glabrous in both the surfaces with strips on adaxial surface. The plant is almost similar to *Alpinia malaccensis* (Burm.f) Rosc. but it differs by glabrous leafy stem, glabrous leaves and bracteole pale green.

### 3. *Alpinia calcarata* (Haworth) Rosc.

*Alpinia calcarata* (Haworth) Rosc, in Trans. Lin. Soc., 8:347, 1807; Baker In Hook. f. Fl. Brit. Ind. 6:254, 1892; Mitra, A. *calacrata* Rosc. The Flowering pl. East Ind., 1:256, 1958; Rao and Verma, A. *calcarata* (Haworth) Rosc. Bull. Bot. Surv. Ind., 14(1-4):139, 1972; Wu Delin & Larsen, Fl. China, 24:340, 2000; Sabu, Zingiberaceae and Costaceae of S-India, 1:50, 2006.

**Type:** *Alpinia spicata* Roxb, Asiat. Res., 11:356, 1810.

**Taxonomic description:** Slender, glabrous, culm forming and aromatic herb. **Root stock**- fleshy rhizome, sympodial branching, aromatic, 0.8-1.5 cm wide and root fibrous.

**Leafy stem**- erect, slender, green, glabrous, aromatic, 100-200 cm long x 0.5-0.7 cm wide.

**Leaves**- sessile, distichy, 5-8; *ligule*- oblong,

membranous, 8-15 mm, glabrous, apex obtuse/rounded; *blade*- linear-lanceolate, narrower, glabrous, base attenuate, margin entire, apex acuminate/caudate, 20-60 cm long x 2-3.5 cm wide. **Inflorescence**- terminal, peduncle green and glabrous, rachis minute villous, proximal branches 3-4 flowered; *leafy bracts*- *primary bracts*- ovate-oblong, green except basal part pale pink, margin entire, apex acute, 10 cm long x 2.5 cm wide; secondary bracts- ovate- oblong, basal margin pale pink, apex rounded, membranous, 5 cm long x 1.2 cm wide. *Bracteole*- oblong, navicular, membranous, basal part deeper pink, margin thin and entire, apex rounded, 1.8 cm long x 0.8 cm wide. **Flower**- large, showy with large purple labellum. *Calyx*- pale green, base tubular (0.8 cm long x 0.4 cm wide), apex 3- lobes, funnel shape, slit at one side, 1.3 cm long x 0.5 cm wide. *Corolla*- base dilated tubular (fleshy white, 0.5 cm long x 0.3 cm wide), apex 3-lobes inserted just below the staminal tube; *anterior lobe*- ovate-oblong, fleshy white, rounded/ hooded apex, 2.5cm long x 1 cm wide; *lateral lobes*- ovate, fleshy white, smaller, insert above the anterior lobe, rounded apex, 2.3 cm long x 0.7 cm wide. *Staminodes*- deep pink, horn like and arching over filament, adnate to basal part of labellum, 0.5 cm long x 0.1 cm wide. *Stamen*- 1; *filament*- basal part pink, long, grooved, 1.5 cm long x 0.2 cm wide; *anther*- 2-celled, apex diverged, fleshy, each cell 1 cm long x 0.1 cm wide, crest absent. *Labellum*- ovate, thicker mid-vein with radiating pink and yellow bands throughout the labellum, mid-vein divided in to numerous veinlets at apex, yellow central band runs to a mid-part, constrict at upper part, basal margin entire while apical crenulate, apex minutely lobed and deflexed, 3.5 cm long x 3 cm wide. *Gynoecium*- pedicel grey pubescence and 0.2 cm long x 0.2 cm wide; *ovary*- green- grey, oval, 3-locular,

pubescence, 0.5 cm long x 0.5 cm wide; *glands*- 2, yellowish grey, apex bi-lobed, 0.2 cm long x 0.2 cm wide; *style*- fibril, 3.5 cm long x 0.1 cm wide, basal part pink and apical part yellowish grey. *Capsule*- pedicillate, immature green, mature pale red, globose, minute pubescence, 3-valves, 1-2 cm long x 0.5-0.8 cm wide; seed- many, oval, aromatic.

**Phenology:** Flowering May-July, fruiting August-October.

**Ecology:** It prefers to grow naturally in sandy loamy soil at the altitude 200-400 m in shady area.

**Distribution:** India, Myanmar, Thailand and Indonesia. It is considered to be the native of S-India (Sabu, 2006).

**Notes:** The plant resembles to *Alpinia smithae* Sabu & Mangaly but differ by their linear and glabrous leaves, small flowers and absence of crest. The plant is generally cultivated for commercial purposes as its capsules are used as spices.

#### 4. *Alpinia kwangsiensis* T.L. Wu & S.J. Chen,

*Alpinia kwangsiensis* T.L. Wu & S.J. Chen, Acta Phytotax. Sin., 16(3):35, 1978. Wu Delin & Larsen, Fl. China, 24:339, 2000.

**Type:** *Alpinia kwangsiensis* T.L. Wu & S. J. Chen sp. nov. Kwangsi, China.

**Taxonomic description:** Culm forming robust and stiff pubescence herb. **Root stock-rhizome**- semi-woody, branched, inner fibrous, 0.8-1 cm wide, root fibrous and long. **Leafy stem**- erect, stout, tall, 15-30 per culm, pubescence, 200-400 cm long x 2-2.5 cm wide. **Leaves**- 6-12 per leafy stem; *ligule*-unequal bi-lobed, densely pubescence, 0.6 cm height x 1 cm wide; *petiole*- long and slender, dirty woody, densely pubescence, channiculate, 4-5 cm long x 0.5-0.6 cm wide; *blade*- oblique base, oblong-linear, adaxial

surface deeper green and glabrous, beneath pubescence, apex acuminate, 120 cm long x 9-18 cm wide; *sheath*- striate, margin and inner surface purple, densely pubescence. **Inflorescence**- terminal, erect, dense flower; *peduncle*- long, pubescence, pale purple, stout, basal part cylindrical while upper part angulated, 90-100 flowers spirally arranged, 50 cm long x 2 cm wide; *leafy bracts*- 2-4 per spike, lower bracts with leaflet at apex and upper bract leaflet absent, pale purple, pubescence; *Bracteole*- base tubular, apex 2-3-toothed, navicular, purple, pubescence, two ridges for folding, 3.5 cm long x 1cm wide. **Flower**- fleshy white, 6 cm long x 1.5-2 cm wide; *pedicel*- purple, ridges, bristle pubescence, 0.5 cm long x 0.3 cm wide; *floral tube*- purple, apically dilated, deflexed, sparsely pubescence at upper part, 1 cm long x 0.5 cm wide. *Calyx*- base tubular, pubescence adaxially, purple, open at side parallel to labellum, apex acute and dilated, 1.8-2 cm long x 0.8 cm wide. *Corolla*- fleshy white with basal part pale purple, 3-lobes, insert equally, minute pubescence adaxially; *anterior lobe*-orbicular, fleshy white with basal part pale purple, larger, 4 cm long x 3.2 cm wide; *lateral lobes*- oblong, white with basal part light purple, apex rounded and hooded, 4 cm long x 2 cm wide. *Staminodes*- 2, purple, subulate, adnate to base of labellum and arching over filament, 0.8-1 cm long x 0.1 cm wide. *Stamen*- 1; *filament*- purple, long, chanculate, adaxial surface pubescence, 1.5 cm long x 0.2 cm wide; *anther*- 2-celled, fleshy yellowish purple, apex diverged, dehiscence longitudinally, 1.2 cm long x 0.6 cm wide (0.2 cm wide each cell); *pollen grain*-many, spherical with radiating spines. *Labellum*- ovate-orbicular, large, thick mid-vein with deep reddish purple run to apical yellow part, apical yellow part intervening with purple bands, apical part with minute

pubescence adaxially, margin yellow crisped and fugacious membranous, apex emarginate, beneath open surface red and overlapped part white, 5 cm long x 4.5 cm wide. *Gynoeceium-ovary*- oval, pale purple or green with tawny pubescence, 3-locular, 0.5 cm long x 0.4 cm wide; *pedicel*- cylindrical, purple, pubescence, 0.5 cm long x 0.3 cm wide; *glands*- 2, clavate and bifurcated into four, greenish yellow, 0.3 cm long x 0.2 cm wide; *style*- pale purple up to mid part, fibril, apical part fleshy yellow and curved, 4 cm long x 0.1 cm wide; *stigma*-simple, funnel shape, pubescence, margin ciliate. *Capsule*- many, occur in dense on the rachis, oval-globose, pubescence, 3-valves, green, persistent calyx, 1-1.5 cm long x 0.8-1 cm wide.

**Phenology:** Flowering April-May, fruiting June-July.

**Ecology:** It grows at low altitude 300-400 m. It grows usually in clay-loamy soil in shady wet forest.

**Distribution:** India, China.

**Note:** The plant resembles to *Alpinia blepharocalyx* var. *blepharocalyx* but it differs by the presence of purple bracteole, purple calyx, purple pedicel and dense capsules.

##### 5. *Alpinia nigra* (Gaertner) Burt.

*Alpinia nigra* (Gaertner) Burt, Notes Roy. Bot. Gard. Edinburgh, 35:213, 1977. *Zingiber nigrum* Gaertner, Fruct. Sem. Pl., 1:35, 1788; *Alpinia allughas* (Retz) Rosc Linn. Soc. London, 8:346, 1807, Roxb. Fl. Ind., 1:60, 1820; Baker in Hook, f., Fl. Brit. Ind., 6:253, 1892; *Heritiera allughas* Retzius Obs. Bot., 6: 17, 1791; *Alpinia allughas* Rao and Verma, Bull. Bot. Surv. of India, 14:(1-4), 114-143, 1972; *Languas allughas* (Retzius) Burkill., Smith, Eden J, Bot., 47:26, 1990; Sabu, Zingiberaceae and Costaceae of S-India, 1:60, 2006.

**Type:** *Alpinia nigra* (Gaertner) Burt, 1977.

**Taxonomic description:** Culm forming tall herbs with prominent panicle. **Root stock-rhizome-** woody, small, profusely branch; **root-** woody, branch, primary root prominent. **Leafy stem-** slender, glabrous, base pale purple and dilated, 1.5-3 m, culm scattered. **Leaves-** sessile or sub-sessile; **ligule-** entire, 4-6 mm, apex round, minute pubescence or glabrous; **blade-** lanceolate or elliptic-lanceolate, 5-8, adaxial surface deeper green and glossy, glabrous or minute pubescence on either side of lower mid-vein, base cuneate, margin entire, apex acute, 25-50 cm long x 6-14 cm wide. **Inflorescence-** terminal, panicle; **rachis-** cylindrical, semi-woody, green, pubescence, lax cincinni, 20-40 cm long; **racheole** bear 3-4 flowers, floral buds pink, 4.5 cm long. **Bracts-** membranous, ovate, upper smaller, lower larger, each substending 4-pedicilate cincinnous flowers; **bracteole-** membranous, tubular, persistent; **flower-** many, small, lower part ob-conic and tubular (1.2 cm long x 0.3 cm wide), pale pink; **pedicel-** green, woody, pubescence, 1cm long x 0.1 cm wide. **Calyx-** base pale green tubular, apical part pale pink, apex 3- toothed, minute pubescence, shorter than corolla, 1.2 cm long x 0.5 cm wide. **Corolla-** base tubular, apex 3-lobes, lobes insert at equally; **anterior lobe-** ovate-oblong, pale pink, larger, apex cucullate with subulate pink, 1.8 cm long x 0.8 cm wide; **lateral lobes-** oblong, pale pink, attach to labellum, apex hooded/capped, 1.7 cm long x 0.6 cm wide. **Staminode-** ovate, adnate to base of labellum, pale pink, 0.1 cm long x 0.2 cm wide. **Labellum-** ob-ovate, base creamy white while apical part fleshy pink, apex clefted into two lobes, each lobe bear central pink band terminating in to two branches, margin entire, 2 cm long x 1 cm wide. **Stamen- filament-** base creamy white, apical part pale pink, 0.5-0.8 cm long; **anther-** 2-celled, diverged apically, each

cell oval, 0.8 cm long x 0.2 cm wide. **Gynoecium- ovary-** pedicillate, oval, green, pubescence, 0.6 cm long x 0.3-0.4; **glands-** 2, pale tawny, 0.4-0.5 cm long x 0.1-0.2 cm wide; **style-** fibril, pink, 2.3-3 cm long x 0.1 cm wide. **Capsule-** black when mature, globose, 1-1.5 cm in diameter, sparsely pubescent, irregularly dehiscent, apex with flower remains; pedicel 0.5-1 cm. **Seeds-** many, black with white aril, 5-6 mm in diam.

**Phenology:** Flowering May-July, fruiting July-November.

**Distribution:** India, China and other SE Asian countries.

**Ecology:** It grows along the road side ditches at low altitude 150-300 m. It usually grows in sandy loamy soil in wet open area. It rarely occurs at high altitude (500-700 m).

**Notes:** The plant is closely resembles to *Alpinia galanga* L. but it differs by tall and glabrous plant body, long lanceolate glabrous leaves, persistent tubular bracteole and ripped capsules black.

## REFERENCES

- Baker, J.G., 1892.** The Flora of British India, Vol. 6. Hooker, J.D., (Eds.), Reeve and Co., London, pp. 243-249.
- Chowdery, H.J., Giri, G.S., Parmanik, A., 2009.** Material for Flora of Arunachal Pradesh, Vol 3. Botanical Survey of India, Calcutta.
- Jain, S.K., Prakash, V., 1995.** Zingiberaceae in India: Phytogeography and Endemism. Rheedea. 5(2), 154-169.
- Kumar, S., 2001.** Zingiberaceae of Sikkim. Deep Publication, New Delhi.
- Mangaly, J.K., Sabu, M., 1992.** A Taxonomic Revision of South Indian *Alpinia* Roxb. (Zingiberaceae). Rheedea. 2(1), 38-51.
- Holtum, J.E., 1950.** The Zingiberaceae of Malay Peninsula. The Gardens' Bulletin Singapore. 13(4), 1-249.

**Rao, A.S., Verma, D.M., 1972.** Materials toward a Monocot Flora of Assam-II (Zingiberaceae & Marantaceae). Bulletin of Botanical Survey of India. 14(1-4), 114-143.

**Roxburgh, W., 1810.** Description of several of the Monandrous Plants of India. Asiatic Researches.11, 318-362.

**Roxburgh, W., 1820.** Florica Indica, Vol. 1-3. Serampur, Hooghly, West Bengal.

**Sabu, M., 2006.** Zingiberaceae and Costaceae of South India. Indian Association for Angiosperm Taxonomy, Calicut University, India.

**Schumann, K., 1904.** Zingiberaceae. In: Engler, Das Pflanzenreich. 4, 46.

**Wu, T.L., Chen, S.J., 1978.** *Alpinia kwangsiensis* sp. nov. Kwangsi, China. Acta Phytotaxonomica Sinica. 16(3), 35.

**Wu, D., Larsen, 2000.** Flora of China, Vol. 24, pp. 322-377.



Fig. 1: *Alpinia blepharocalyx* K. Schumann var. *blepharocalyx* T.L.



Fig. 2: *Alpinia blepharocalyx* var. *glabrior* (Handel-Mazzetti) T. L. Wu

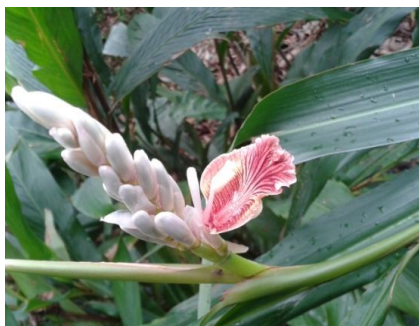


Fig. 3: *Alpinia calcarata* (Haworth)



Fig. 4: *Alpinia kwangsiensis* T. L. Wu & S. J. Chen

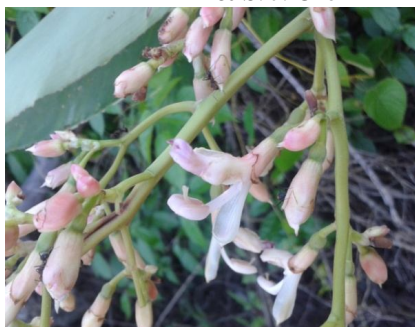


Fig. 5: *Alpinia nigra* (Gaertner) Burtt.