

Species Diversity of the genus *Lindernia* All. (Linderniaceae) in Bodoland, Assam

Bidyut Bikash Deka

Assistant Professor, Deptt of Botany, Barama College, Baksa, BTAD, Assam

Abstract:

The present study reports 8 species of *Lindernia* All. belonging to family Linderniaceae from Bodoland, Assam. The taxonomic description, distribution, flowering and fruiting period, habitat, association and uses of species are also discussed. A key is prepared based on morphological characters of flower, leaf and stamen.

Key Words: *Lindernia*, species, Bodoland, Linderniaceae, Assamese

I. Introduction

Bodoland which is located in the North bank of river Brahmaputra in Assam is inhabited predominantly by Bodo speaking ethnic group. Bodoland includes four districts namely Baksa, Chirang, Udalguri and Kokrajhar. At present Kokrajhar town serves as the head quarter of Bodoland. The area under these four districts has been estimated as Kokrajhar 3169.2Sq.Km., Chirang 1069.96Sq.Km., Baksa 3056.89 SqKm and Udalguri 1673.93 SqKm. The geographic boundary of BTC lies between $26^{\circ} 7'12''N$ to $26^{\circ} 47'50''N$ latitude and $89^{\circ} 47'40''E$ to $92^{\circ} 18'30''E$ longitude and is situated at the North Western part of Assam. The provisional geographic area of BTC is 8795 Sq Km. The region is rich in biodiversity.

The genus *Lindernia* is a group of herbaceous plant and belongs to the family Linderniaceae. It includes about 100 species all over the world. Previously the genus was included in the family Scrophulariaceae. At present this genus is treated as a member of the new family Linderniaceae. It was accepted by APG III(2009). They are native to warm regions in both the Eastern and Western hemisphere.

The stems of the species are generally creeping, procumbent or diffuse, rarely suberect or erect, sometimes long stoloniferous. Leaves opposite; margin often toothed. Flowers often pedicellate. Bracteoles absent. Lower lip of corolla larger than upper. Upper lip erect. Stamens 4, all fertile or 2 anterior reduced and filaments appendaged. Style 2-lamellate.

Though Kanjilal et al. (1939) and Choudhury (2005) recorded only 4 and 6 species of *Lindernia* respectively from Assam, the present study has reported the presence of 8 species from Bodoland of Assam.

Though different species of *Lindernia* have been considered as the worst weeds of the world, these are used in the treatment of various diseases in the study area. The genus has been chemically and pharmacologically studied and found of antioxidant property and rich source of flavonoid. *Lindernia* species are one of the major sources of herbal preparation in several medicines practiced in various nations including China and India (Umakrithika, 2021).

The present paper has focused on the 8 species of *Lindernia* which are distributed in different districts of Bodoland. These are discussed along with their taxonomic description, distribution, habitat, association, flowering and fruiting period and uses if any.

II. Materials & Methods

The plant specimens have been collected at their flowering and fruiting stages at regular intervals covering all the seasons of the year. Herbarium Sheets (42 cm X 28 cm) were prepared following Jain & Rao (1977). Plants are identified by comparing Voucher specimens with the collection of herbarium sheets of GUBH, ASSAM, CAL. Regional and National Flora were collected for identification. The identified species are correctly named through the consultation of literature (Bennet, 1987) and web site (<http://www.theplantlist.org/>).The local uses of plant resources of the areas have been analyzed as per the process suggested by Jain (1987), Martin (1995) and Cotton(1996).The nomenclature was verified through www.theplantlist.org.

III. Enumeration

The 8 species are enumerated below alphabetically along with taxonomic description. A dichotomous artificial key to the species has been prepared using morphological characters specially of flower, leaves and stems.

Key to the species

Lindernia Allioni, Melanges Philos. Math. Soc. Roy.

Turin 3(1): 178-181, pl. 5, f. 1 1766.

Key to the Species:

1a. Stem pubescent

2a. Stem rigid; flowers pinkish ----- *L. pusilla*

2b. Stem spongy; flowers yellowish ----- *L. viscosa*

1b. Stem glabrous

3a. All 4 stamens fertile

4a. Pedicel longer than subtending leaf -----*L. procumbens*

4b. Pedicel shorter than subtending leaf----- *L. crustacea*

3b. Only 2 stamens fertile

5a. Blades sharply aristate-serrate

6a. Corolla 7 mm long-----*L. ciliata*

6b. Corolla 9 mm long -----*L. ruellioides*

5b. Blades not sharply aristate-serrate

7a. Corolla with bluish spot-----*L. rotundifolia*

7b. Corolla without bluish spot----- *L. dubia*

1. *Lindernia ciliata* (Colsmann) Pennell, Brittonia 2(3): 182. 1936; Deb, Fl. Tripura 2: 274. 1983. *Gratiola ciliata* Colsmann, Prodr. Descr. Gratiol. 14-15. 1793. *Bonnaya brachiata* Link and Otto, Icon. Pl. Select. 2: 25. 1821; Hooker f., Fl. Brit. India 4: 284. 1885; Prain, Beng. Plants 2: 573. 1903. *Ilysanthes ciliata* Kuntze, Revis. Gen. Pl. 2: 461. 1891; Kanjilal *et al.*, Fl. Assam 3: 380. 1939.

Xaru Kasipotiya (Assamese name).

Annual herbs, 10-20 cm tall. Stems erect, much branched; branches decumbent. Leaves sessile; leaf blade oblong, 2-4 x 1-1.2 cm, glabrous, base amplexicaul, margin densely aristate-serrate. Racemes terminal; bracts lanceolate. Calyx ca. 6 mm long, with a spine like tip. Corolla light purple, ca. 9 mm long; middle lobe larger than other lobes. Fertile stamens 2, posterior; reduced stamens 2, anterior. Carpel 6 mm long. Capsule cylindrical, ca. 1.8 cm long.

Flowering and fruiting period: July-October.

Distribution: Sri Lanka, Phillipines, Malaya; India: Throughout; Assam: Barak Valley, Kokrajhar, Baksa.

Association: *Lobelia heyneana*, *Murdannia nodiflora*, *Cyperus* sps

Specimen Examined: Kokrajhar, Kamandanga Beel, 07/07/2019, N. Deka 276.

2. *Lindernia crustacea* (Linnaeus) F. Muell, Syst. Census Austral. Pl. 1: 97. 1882. *Vandellia crustacea* Benth, Scroph. Ind. 35. 1835; Hooker f., Fl. Brit. India 4: 279. 1885; Prain, Beng. Plants 2: 572. 1903; Bora and Kumar, Flor. Diver. Assam 242. 2003. *Capraria crustacea* Linnaeus, Syst. Nat. ed. 12. 2: 419. 1767.

Khar (Assamese name).

Annual herbs, 10-20 cm tall. Stem much branched, prostrate. Branches widely spreading, subquadrangular, glabrous. Petiole 5-8 mm long; leaf blade triangular-ovate, 1-2 x 0.8-1 cm, margin shallowly crenate. Flowers axillary and solitary. Pedicel slender, 1-2 cm long. Calyx urnlike, 4-5 mm long, shallowly lobed. Corolla purple, 6-7 mm long; lower lip 3-lobed; upper lip shallowly 2-lobed. Stamens didynamous. Carpel 6 mm long; style fugacious. Capsule ellipsoid, 5 mm long.

Flowering and fruiting period.: June-October.

Distribution: Tropics of Old World; India: West Bengal, Andhra Pradesh, Rajasthan; Assam: Kamrup, Barak Valley, Baksa, Udalguri, Kokrajhar.

Association: *L. procumbens*, *Mecardonia procumbens*, *Cynodon dactylon*

Specimen Examined: Baksa, Barama, 30/08/2019, N. Deka 070.

3. *Lindernia dubia* (Linnaeus) Pennell, Acad. Nat. Sci. Philadelphia Monogr. 1: 141. 1935. *Gratiola dubia* Linnaeus, Sp. Pl. 1: 17. 1753. *Ilysanthes gratiolooides* Benth, Prodr. 10: 419. 1846.

Annual herbs, 20-25 cm tall, glabrous. Stems purple, quadrangular. Leaves sessile, elliptic, 1-1.5 cm x 3-6 mm, veins 3-5. Pedicel 1-2 cm long. Calyx ca. 3 mm long. Corolla pale blue, ca. 6.5 mm long. Fertile stamen 2, unappendaged. Style ca. 3.5 mm long. Capsule oblong.

Flowering and fruiting period: July-August.

Distribution: China, Pakistan; India: Uttar Pradesh; Assam: Kokrajhar, Udalguri.

Association: *Mecardonia procumbens*, *Veronica. anagallis-aquatica*, *Paspalum sp*

Specimen Examined: Kokrajhar, Silgara, 05/06/2019, *N.Deka* 258.

4. *Lindernia procumbens* (Krocker) Philcox, Taxon 14: 30. 1965; Deb, Fl. Tripura 2: 275. 1983. *Anagalloides procumbens* Krocker, Fl. Siles 2(1): 398. 1790. *Vandellia erecta* Benth, Scroph. Ind. 36. 1835; Hooker f., Fl. Brit. India 4: 281. 1885.

Bak Puspa (Assamese name).

Annual herbs, erect, caespitose, 10-20 cm tall. Stem basally much branched. Leaves sessile, elliptic to oblong, rhomboid, 2-2.5 x 1-1.2 cm, margin entire, 3-5 veined. Pedicel 1.2-2 cm long. Calyx lobes linear lanceolate, 4 mm long. Corolla purple, 5.5-6 mm long. Stamens 4; all fertile filaments of anterior stamens with a small glanduliform appendage. Carpel 4 mm long. Stigma 2-lobed. Capsule globose.

Flowering and fruiting period.: August-November.

Distribution: China, Myanmar; India: Throughout; Assam: Kamrup. Bongaigaon, BTC Area.

Association: *L. pusilla*, *Fimbristylis dichotoma*, *L.crustacea*.

Uses: Leaf extract with curd given to treat stomach pain; Bodo people use two or three drops of leaf extract to treat dysentery.

Specimen Examined: Chirang, Abdaiguri, 12/09/2019, *N.Deka* 158.

5. *Lindernia pusilla* (Willdenow) Bolding, Zakfl. Java. 165. 1916; Deb, Fl. Tripura 2: 275. 1983. *Gratiola pusilla* Willdenow, Sp. Pl. 1(1): 105. 1797. *Vandellia scabra* Benth, Scroph. Ind. 36. 1835; Hooker f., Fl. Brit. India 4: 281. 1885; Prain, Beng. Plants 2: 572. 1903.

Bor Kasipotiya (Assamese name); Samjigo (Bodo name).

Annual herbs, 12-15 cm tall. Stem diffuse, hairy; internodes 6 cm long. Leaves ovate, cordate or orbicular, ca.1.2 x 1cm. Inflorescence 3-5 flowered. Flower 9 mm long. Corolla purple. Base of filaments geniculate. Carpel 7 mm long; stigma 2- lamellate. Capsule ovoid-globose, as long as persistent calyx.

Flowering and fruiting period: August-December.

Distribution: Madagascar, South Africa; India: Tropical Parts; Assam: Barak Valley, BTC Area.

Association: *Lobelia heyneana*, *Commelina diffusa*, *L.crustacea*, *Cyperus sp*

Specimen Examined: Chirang, Abdaiguri, 12/09/2019, *N.Deka* 157.

6. *Lindernia rotundifolia* (Linnaeus) Alston, Handb. Fl. Ceylon 6 (Suppl.): 214. 1931. *Ilysanthes rotundifolia* (Linnaeus) Benth, Prodr. Sys. Nat. Reg, Veg. 10: 420. 1846; Hooker f., Fl. Brit. India 4: 284. 1885. *Gratiola rotundifolia* Linnaeus, Mant. Pl. Alt. 2 : 174. 1771.

phutuki phul(Assamese name); Samjigo (Bodo name).

Annual decumbent herbs, 10-15 cm tall, rooting at lower nodes; branches weak. Leaves sessile, orbicular, 8-12 x 7-10 mm, margins entire, 4-5 veined. Corolla white with bluish spot, 9-10 mm long. Calyx 3 mm long. Fertile stamens 2; staminodes 2. Carpel 6 mm long. Capsule ellipsoid, 2.5-3 mm long.

Flowering and fruiting period: July-October.

Distribution: China; India: NE India; Assam: BTC Area, Kamrup.

Association: *Dentella repens*, *Oldenlandia diffusa*.

Specimen Examined: Baksa, Kharua, 20/08/2019, *N.Deka 0043*.

7. *Lindernia ruellioides* (Colsmann) Pennell, Brittonia 2: 182 1936; Deb, Fl. Tripura 2: 276. 1983; Bora and Kumar, Flor. Diver. Assam 242. 2003. *Gratiola ruellioides* Colsmann, prodr. Descr. Grat. 12. 1793. *Bonnaya reptans* Sprengel, Syst. Veg. 1: 41. 1824; Hooker f., Fl. Brit. India 4: 284. 1885; Prain, Beng. Plants 2: 573. 1903; Kanjilal *et al.*, Fl. Assam 3: 380. 1939.

Bor Kasipotiya (Assamese name); Samjigo (Bodo name).

Annual herbs, 10-15 cm tall. Stem prostrate, rooting from nodes. Stolons to 30 cm long. Petiole 1-2 cm long; leaf blade oblong or orbicular, ca. 3.5 x 1.5 cm, base subamplexical, margin densely serrate. Racemes terminal, 4-8 flowered. Calyx ca. 6 mm long, glabrous. Corolla purple, 1.5-2 cm long; lower lip 3 lobed; upper lip 2 lobed. Fertile stamens 2, posterior, unappendaged; sterile stamens 2, anterior. Carpel 1 cm long; stigma flattened. Capsule conical, ca. 1.2 cm long.

Flowering and fruiting period: August-December.

Distribution: Myanmar, Java; India: North East India, Eastern India; Assam: BTC Area, Kamrup, Nalbari, Darrang.

Association: *Paspalum conjugatum*, *Drymaria cordata*, *Alternanthera sessilis*.

Specimen Examined: Baksa, Barama, 30/08/2019, *N. Deka 069*.

8. *Lindernia viscosa* (Hornem) Merrill, Sp. Blancoan 14. 1918; Deb, Fl. Tripura 2: 276. 1983. *Gratiola viscosa* Hornemann, Enum. Pl. Hort. Hafn. 19. 1807. *Vandellia hirsuta* Benthham, Scroph. Ind. 36. 1835; Hooker f., Fl. Brit. India 4: 280. 1885; Prain, Beng. Plants 2: 572. 1903; Kanjilal *et al.*, Fl. Assam 3: 539. 1939.

Lahi potiya (Assamese name.); Samjigo (Bodo name).

Annual herbs, with short stolons. Stem sparsely diffuse, striate, with long hairs. Leaf blade ovate-oblong, ca. 7 x 3 cm, hairy, margin undulate and toothed. Raceme tax, 6-10 flowered. Calyx 4 mm long; margin hairy. Corolla yellowish, 5-6 mm long. Stamens 4, all fertile. Carpel 5 mm long. Capsule as long as persistent calyx, globose, ca. 4 x 3 mm.

Flowering and fruiting period: July-October.

Distribution: Sri Lanka, Philippines; India: West Bengal, Tripura, Odisha; Assam: BTC Area, Kamrup, Bongaigaon.

Association: *Scoparia dulcis*, *Impatiens balsamina*, *Marchantia sp*, fern

Uses: Leaf paste applied in insect bite (Bd.).

Specimen Examined: Kokrajhar, Beladuba, 30/04/2019, N.Deka 135.

IV.Result and Discussion

The species diversity of *Lindernia* is of great attention in Bodoland, as most of the wetland and marshland show their prominent dominance. During the preparation of Key, floral character like number of fertile stamen, stem character whether pubescent or glabrous, margin of leaf, length of capsule are considered.

L. rotundifolia which is endemic to western and southern India has been also reported from this region. During the field work, high variations are observed in size of flower and leaf, colour of stem according to climatic condition and geographical changes.

The study of the habitat shows their dominance in moist and wet places. Out of these 8 species, 2 are semi aquatic and others are found in wet moist places. The flowering and fruiting season vary from species to species in this locality.

The leaves of *L. Procumbens* are used to treat diarrhoea and stomach pain. Bodo community of the area traditionally utilize leaf extract with curd to treat stomach pain. The leaf paste of *L. viscosa* is applied in insect bite.

The species of *Lindernia* namely *L. crustacea*, *L. rotundifolia*, *L. dubia*, *L.pusilla*, are not mentioned in flora of Assam.

The information of the present study will be helpful for the preparation of the flora of Bodoland.

References

- Bennet, S.S.R 1987 *Name changes in flowering plants of India and adjacent regions*. Triseas Publishers, Dehradun, India.
- Chowdhury, S. 2005 *Assam's Flora (Present Status of Vascular Plants)*. Assam Science Technology and Environment Council, Guwahati.
- Cotton, C.M. 1996 *Ethnobotany- Principles and Application*. John Wiley and sons, New York.
- Jain, S.K. 1987 *A manual of Ethnobotany*. Scientific Publishers, Jodhpur.
- Jain, S.K. and Rao, R.R 1977 *A handbook of field and herbarium methods*. Today and Tomorrows Printers and Publishers, New Delhi.
- Kanjilal, U.N, Kanjilal, P.C., Das, A., Purkayastha, C. And De, R.N 1934-1940. *Flora of Assam*. Vol.I-IV, Govt of Assam Press, Shillong.
- Martin, G. (1995) *Ethnobotany – A Method Manual*. Chapman and Hall, London.
- Yishuo Liang, Jenn-che Wang, Chih-hsiung Chen (2012) Taxonomic Revision of *Lindernia* All.(Scrophulariaceae Sensu lato) in Taiwan. *Taiwan Journal of Forest Science* 27(1):95-116.
- Prajapati, K.I and Patel, D. K (2021) *Lindernia dubia*(L.) Pennell (Linderniaceae): A new record for the flora of Gujarat state, India. *International Journal of current. Res. Biosci. Plant Biol.* 8(7), 23-28.
- Prasad, M.G. and Sunoj Kumar, P. (2014). A new species of *Lindernia* (Linderniaceae) from India. *Phytotaxa* 162:57-60

Sivarajan, V.V. and Mathew,P.(1983). The genus *Lindernia* All. (Scrophulariaceae) in India. *Journal of the Bombay Natural History Society* 80:131-140

Tandyekkal, D. And Mohanan, N. (2010) *Lindernia ciliata* ssp *Sivarajanii* (Scrophulariaceae) from India. *Nord. J. Bot.*, 28(2):202-205

Umakrithika, S (2021) A comprehensive overview of plant genus *Lindernia*. *Journal of Pharmacognosy and Phytochemistry*. 10(5): 42-48



L. rotundifolia



L. ciliata



L. crustacea



L. dubia



L. procumbens



L. pusilla

PLATE-I. Different species of genus Lindernia.



L. ruellioides



L. viscosa

PLATE-II. Different species of genus Lindernia.