



TAXONOMIC AND MORPHOLOGICAL ANALYSIS OF THE FAMILY PAPILIONACEAE IN GARBHANGA RESERVE FOREST OF ASSAM, INDIA

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ABSTRACT:

Papilionaceae, the third largest family of species worldwide, comprises both annuals and perennials with a diverse range of growth habits. The present study aims to explore and conduct a comprehensive taxonomic and morphological analysis of Papilionaceae in Garbhanga Reserve Forest (GRF) of Assam, India. Field survey was carried out across various habitats in GRF and the collected specimens were processed for herbarium preparation and then identified. Detailed morphological examinations on leaf structure, floral morphology, and fruit characteristics were conducted. Taxonomic keys followed by a detailed description together with phenology, distribution, information on type specimens, voucher specimen examined and IUCN status of the taxa are given. The result highlights the documentation of a total of 21 taxa under 16 genera, where climbers are represented by seven species, herb and undershrub by six species, and shrub and tree by one species each. Significant morphological variations were observed in leaves, flowers and fruits characters, providing critical insights into species differentiation. These findings enhance the understanding of Papilionaceae diversity in GRF and emphasize the importance of

morphological studies in taxonomy, serving as a valuable resource for future botanical research and conservation strategies.

KEY WORDS: *Diversity, Exploration, Morphology, Papilionaceae, Taxonomy.*

INTRODUCTION:

Papilionaceae, alternatively recognized as the legume or bean family comprises dicotyledonous plants and is considered to be the climax family of the order Leguminales (Ullah et al., 2022 & Tidke, 2001). Members of Papilionaceae can be annuals or perennials and show diversity in habit including herbs, shrubs, undershrubs, trees, twiners and climbers. They are found everywhere except Antarctica and high-altitude Arctic regions (Ali & Nasir, 1995-2008). Cowen (1952) mentioned that tropical regions are often home to trees, whereas herbaceous plants and shrubs are dominant in warm temperate extra-tropical regions. The family has a worldwide distribution comprising of 1200 species under 480 genera (Maitreya, 2015 & Anwar et al., 2015). About 345 species under 59 genera belonging to 8 tribes have been recorded from South India (Gamble, 1918). Hooker (1961) reported 657 species under 95 genera from India. Barooah and Ahmed (2014) reported around 50 genera and 197 species of Papilionaceae from Assam. About 181 species under 40 genera have been recorded in Flora of Assam (Kanjilal et al., 1938). Bentham and Hooker (1865) considered this family as a sub family under Leguminosae along with the other two sub families i.e. Caesalpinieae and Mimoseae. Hutchinson (1959) regarded this family as highly successful among angiosperms because of its significant economic contributions. It produces pulses, cereals, fruits, vegetables, oils, fibers, fodder, medicines, and natural fertilizers, making it indispensable from an economic standpoint. Members of Papilionaceae can be recognized easily in having flowers with papilionaceous (butterfly shaped) corolla differentiated into vexillum, wings and keel.

However, no taxonomic investigation has yet been carried out on this important family from GRF. Therefore, the present study aims to explore, identify and document the Papilionaceae in GRF of Assam.

STUDY AREA:

Garbhanga Reserve Forest covering an area of 110 sq km is located between the geographical location of longitudes 91°35.406' E to 91°47.517' E and latitudes 25°56.528' N to 26°06.584' N (Tamuli, 2018 & Barua et al., 2004) and situated adjacent to greater Guwahati and Southern bank of the river Brahmaputra (Saikia & Saikia, 2015). The reserve forest has a distinct topographical position and bounded by the Meghalaya hill ranges on the Eastern and

Southern side, Rani reserve forest on the Western side, Guwahati city and Deepor Beel wildlife sanctuary on the Northern side. The area lies at an altitude of 100-200 m (Barua et al., 2004). The climate of this area is pre-monsoon, monsoon, post-monsoon and winter (Lahkar et al., 2010).

METHODOLOGY

An extensive field survey to different parts of GRF was carried out between 2022 and 2023 to record the occurrences of Papilionaceae and to observe their morphology and phenology. Samples were collected for laboratory analysis. GPS locations of the taxa were noted in the field. The collected specimens were processed for herbarium preparation following the standard herbarium techniques (Jain & Rao, 1977). Taxonomic determination of the species was done based on relevant taxonomic literatures and consultation with authentic specimens housed in different Herbaria. Taxonomic keys to the genera and species were prepared based on the morphology of the species. Alphabetic arrangement of the species was maintained, where description of the species was followed by information on flowering and fruiting period, distribution, type specimens, voucher specimen examined and IUCN status. For updated nomenclature of the species, online databases like World Flora Online and International Plant Names Index were consulted. Voucher specimens were deposited in the Herbarium of the Department of Botany, Cotton University.

RESULT:

A total of 21 taxa under 16 genera of the family Papilionaceae were recorded from the study area. Among which climbers are represented by seven species, herbs and undershrubs by six species each, whereas shrubs and trees by one species each. Three species were recorded under the genera *Crotalaria*. Genera found to contain two species are represented by *Aeschynomene*, *Desmodium* and *Uraria* followed by genera *Abrus*, *Clitoria*, *Codariocalyx*, *Dysolobium*, *Erythrina*, *Grona*, *Indigofera*, *Lablab*, *Mucuna*, *Neustanthus*, *Pueraria* and *Sohmaea* with one species each..

Taxonomic enumeration

Key to the genera:

- 1a. Plants tree or shrub.....2
- 1b. Plants undershrubs, herbs or climbers.....3
- 2a. Leaflets pinnately compound and 3-foliate, ovate-rhomboid.....*Erythrina*
- 2b. Leaflets simple or 3 foliolate, elliptic-lanceolate.....*Codariocalyx*
- 3a. Leaves paripinnate.....*Abrus*

3b. Leaves imparipinnate.....	4
4a. Climbers.....	5
4b. Herbs or undershrubs.....	10
5a. Leaves 3 foliolate.....	6
5b. Leaves 5-7 foliolate.....	<i>Clitoria</i>
6a. Style slender.....	7
6b. Style not slender.....	8
7a. Keel exceeding standard.....	<i>Mucuna</i>
7b. Keel not exceeding standard.....	<i>Dysolobium</i>
8a. Style longer than ovary, legume oblong falcate.....	<i>Lablab</i>
8b. Style not longer than ovary.....	9
9a. Legume linear or cylindric.....	<i>Neutranthus</i>
9b. Legume long elliptic.....	<i>Pueraria</i>
10a. Fruit jointed.....	11
10b. Fruit not jointed.....	15
11a. Coiled within the calyx.....	<i>Uraria</i>
11b. Not coiled.....	12
12a. Leaflets many.....	<i>Aeschynomene</i>
12b. Leaflets 1-3 foliolate.....	13
13a. Standard shortly clawed.....	14
13b. Standard long clawed.....	<i>Grona</i>
14a. Upper lobes of calyx divided into 2 at apex.....	<i>Desmodium</i>
14b. Upper lobes of calyx not divided into 2 at apex.....	<i>Sohmaea</i>
15a. Stamen diadelphous.....	<i>Indigofera</i>
15b. Stamens monadelphous.....	<i>Crotalaria</i>

Abrus melanospermus* subsp. *melanospermus

Climber. Stem aerial, weak, branched, hairy, solid, cylindrical. Leaf compound, alternate, petiolate, petiole hairy, stipulate, leaf base pulvinate, leaflets petiolulate, petiolule hairy, leaflets oblong, apex acuminate, base cordate, leaf surface hairy. Flower pedicellate, bracteate, bracteolate, bract and bracteoles hairy. Calyx hairy, 5-toothed. Petals 5, pink. Stamens 9, monadelphous. Ovary hairy, superior.

Flowering and fruiting : Oct-Nov

Distribution: India (NE India, Andhra Pradesh, Karnataka, Kerala, Tamil Nadu, Uttarakhand, Himachal Pradesh, Jammu and Kashmir, Andaman and Nicobar Islands), Bangladesh,

Bhutan, China, Jawa, Myanmar, Nepal, New Guinea, Philippines, Sri Lanka, Thailand, Vietnam.

Specimen examined: **BRAZIL**: Santarem, 1 Apr 1850, R. Spruce 786 (K000328206). **SRI LANKA**: Ceylon, 1854, G.H.K. Thwaites 1467 (BM000946839). **INDIA**: West Bengal, Ambik to Paachpokhri, [2 Oct 2018](#), [V. Ranjan, G. Krishna & A. Kumar 77986](#) (CAL0000212729); Andaman & Nicobar island, East Island Wildlife Sanctuary, 24 Dec 2011, alt. 40 m, M.Y. Kamble 29288 (PBL0000029091); Kerala, way to Anakulam, 9 Nov 1991, P. Bhargavan 98409 (BSID0008378); Assam, Kamrup District, Garbhanga Reserve Forest, B.Das 272.

IUCN status: Not Evaluated (NE).

***Aeschynomene*:**

Key to the species:

1a. Flower purple *Aeschynomene americana*

1b. Flower yellow *Aeschynomene indica*

***Aeschynomene americana* L.**

Herb. Stem branched, hairy, solid, cylindrical. Leaf compound, petiolate, petiole hairy, leaf base pulvinate, apex acuminate, arrangement of leaflets alternate. Flower bracteate, bracteolate, pedicellate, pedicel hairy. Sepals 5, bilipped, hairy. Stamens 10, diadelphous (5+5). Ovary superior, hairy. Fruit jointed, hairy.

Flowering and fruiting: Oct-Nov

Distribution: India (Assam, Karnataka, Kerala, Maharashtra, Odisha, Tamil Nadu), Central America, Philippines, Thailand, Myanmar, Vietnam.

Type: Holotype: **COLOMBIA**: Rio Cabrera ca. 18km Northeast of Illavieja, Upper basin of Rio Magdalena, Depto. Huila, alt 450 m, 12 Jul 1950, S.G. Smith 1200 (K001477555).

Specimen examined: **BRAZIL**: Am Barchufer Bei der Serra do Mel., 1 Sep 1909, E. Ule 8156 (K000920064). **DOMINICAN REPUBLIC**: San Cristobal, Villa Altagracia, 23 Oct 1965, B. A. Lavastre 1992b (NYBG 1615551). **MEXICO**: Vera Cruz, latitude 19 11 25.00 N, longitude 096 09 12.00 W, William Houstoun (BM001217978). **INDIA**: [Andaman & Nicobar Islands](#), [Kimus, Car Nicobar, North Nicobars](#), [16 Nov 1975](#), [N. G. Nair 3158](#) (PBL0000006491); Assam, Kamrup District, Garbhanga Reserve Forest, B.Das 275.

IUCN status: Not Evaluated (NE).

***Aeschynomene indica* L.**

Herb. Stem aerial, branched, cylindrical, hairy. Leaf compound, alternate, petiolate, petiolulate, petiole hairy, base pulvinus, leaflets base unequal, apex acuminate, vein inconspicuous. Flower bracteate, bracteolate, margin of bract toothed. Sepals 5, 2-lipped, lobes apex acuminate. Standard yellow, spot present, petals veined. Stamens 10, monadelphous. Ovary superior, hairy.

Flowering and fruiting: Oct-Nov

Distribution: India (Andhra Pradesh, Assam, Karnataka, Kerala, Maharashtra, Odisha, Tamil Nadu), Australia, North America, Tropical Africa, Tropical and subtropical Asia.

Type: Holotype: **ANGOLA**: Welwitsch 2172 (K000417968).

Specimen examined: Gangachara/Ratanganj, S.Coll. 5667 (K001121646). **USA**: Mississippi, Harrison Co., (NYBG2503336). **INDIA**: [West Bengal](#), [HBC \(Calcutta Herbarium\)](#), Collection Number: [5667 E](#) (CAL0000067252); [Andhra Pradesh](#), [Kalasamudram](#), [26 Jan 2014](#), alt. 369 m, [K.R.K. Swamy 42025](#) (BSID0011509); Assam, Kamrup District, Garbhanga Reserve Forest, B.Das 269.

IUCN status: Least Concern (LC).

***Clitoria ternatea* L.**

Climber. Stems slender, twinning. Leaves imparipinnate, petiolate, 3 – 7 foliolate, leaflets petiolulate, elliptic ovate, apex retuse, base cuneate. Flower bracteate, bracteolate, complete. Sepals 5, united, lobes apex acuminate. Stamens 10, diadelphous. Ovary superior, hairy, 1-loculed, style hairy.

Flowering and fruiting: Oct-Nov

Distribution: India (Assam, Andhra Pradesh, Karnataka, Kerala, Maharashtra, Odisha, Tamil Nadu, Telangana, Uttarakhand), Tropical and South Africa, Arabian Peninsula.

Type: Holotype: **COLOMBIA**: Santa Marta, alt. 457 m, 1 Jan 1898, H.H. Smith 291(K001474901). Lectotype: **NETHERLANDS**: George Clifford s.n. (BM000646600).

Specimen examined: **BRAZIL**: Mato Goasso, 1 Jul 1845, H.A. Weddell 3326 (K000920457). **SRI LANKA**: Paul Hermann, alt. 144 m (BM000628235). **PARAGUAY**: Boqueron, Paratodo, Colonia Menno, 16 Mar 1974, P. Arenas 493 (NYBG 585913). **INDIA**: [Odisha](#), [Jaipur: Amiyajhar, Sukinda](#), [17 Sep 2013](#), [A. C. Halder, N.R. Siddabatula, A.D. Pandey 32951](#) (CAL0000194567); [Andaman & Nicobar Islands](#), [Viper Island, South Andamans](#), [21 Mar 1974](#), [N. P. Balakrishnan 991](#) (PBL0000006633); Assam, Kamrup District, Garbhanga Reserve Forest, B.Das 269.

IUCN status: Not Evaluated (NE).

***Codariocalyx motorius* (Houtt.) H. Ohashi**

Shrub. Stem erect, branched, cylindrical. Leaf simple or compound, alternate, petiolate and petiolulate, leaflets elliptic lanceolate, base cuneate. Flower orange. Corolla much longer than calyx. Stamens diadelphous. Ovary superior, hairy. Legume 5-9 jointed, falcate, hairy.

Flowering and fruiting: Sep-Nov

Distribution: India (Assam, Andhra Pradesh, Kerala, Odisha, Tamil Nadu), Sri Lanka, Himalayas, Pakistan, Nepal, Southeast Asia, Australia, China, Malaysia.

Specimen examined: **MYANMAR:** Moulmein, 1 Jan 1827, N. Wallich 5725 (K001121881).

JAMAICA: Saint Andrew, Temple Hall., 22 Aug 1915, W. H. Harris 12133 (NYBG1617026). **INDIA:** [Tamil Nadu](#), Seetharam Odai, Thandikudi hills, [3 Dec 1989](#), alt. 850 m, K.R. Kumar 92339 (BSID0008900); Assam, Kamrup District, Garbhanga Reserve Forest, B.Das 327.

IUCN status: Not Evaluated (NE).

Crotalaria:

Key to the species:

1a. Leaves simple.....2

1b. Leaves compound *Crotalaria* sp.

2a. Stipules wing like, decurrent on stem *Crotalaria alata*

2b. Stipules linear *Crotalaria juncea*

***Crotalaria alata* Buch.-Ham. ex D. Don**

Herb. Stem aerial, erect, branched, hairy, winged, solid, cylindrical. Leaf simple, alternate, petiolate, petiole hairy, apex acuminate, base cuneate, margin hairy, surface hairy. Flower pedicillate, pedicel hairy, bracteate, bracteolate, bract and bracteoles hairy, calyx hairy, five, united. Standard yellow, wings yellow. Stamens 10, monadelphous. Ovary superior, style and stigma hairy.

Flowering and fruiting: Sep-Oct

Distribution: India (Assam, Andhra Pradesh, Kerala, Tamil Nadu), Southeast Asia.

Type: Holotype: **NEPAL:** Francis Buchanan Hamilton s.n., 19 Jul 1802 (BM000521598).

Paratype: **INDIA:** Kerala, Nedikama to Nedamballi, Wynaad, C. A. Barber 5627, 14 Jan 1903 (CAL0000024571). Isolectotype : **NEPAL:** collection no. s.n. (CAL0000024592).

Specimen examined: **NEPAL:** 1 Jan 1820, N. Wallich 5356 (K001120665). **INDIA:** [Andhra Pradesh](#), [Minumuluruto Koppakonda](#), [24 Dec 1967](#), [G.V.S. Rao 29632](#) (BSID0008551);

Assam, Kamrup District, Garbhanga Reserve Forest, B.Das 270.

IUCN status: Not Evaluated (NE).

***Crotalaria juncea* L.**

Undershrub. Stem aerial, erect, branched, quadrangular, hairy, solid. Leaf simple, alternate, petiolate, petiole hairy, leaf blade narrowly ovate or lanceolate, apex acuminate, leaf surface and margin hairy. Flower pedicillate, bracteate and bracteolate, bract and bracteoles hairy. Sepals 5, hairy, united. Petals 5, yellow, standard spotted at back. Stamens 10, monadelphous. Ovary superior, hairy, styles hairy.

Flowering and fruiting: Nov-Dec

Distribution: India (Assam, Andhra Pradesh, Karnataka, Kerala, Maharashtra, Odisha, Tamil Nadu, Telangana), Afghanistan, Bangladesh, Bhutan, Myanmar, Pakistan, Thailand, Vietnam.

Type: Holotype: **COLOMBIA:** Cordillera Central-Antioquia, Medellin, alt. 1560, 21 oct 1947, M.J. Kleven & F.A. Barkley 17C321 (K001474011).

Specimen examined: **MYANMAR:** Irrawaddy river, 1 Jan 1826, N. Wallich 5363 (K001120678). **JAMAICA:** Saint Andrew, on way to Jack's Hill, 13 Feb 1958, T. G. Yuncker 18170 (NYBG1617184). **INDIA:** [Odisha, Ganjam: Rajnapalli, Digapahandi, 27 Feb 2014, A. C. Halder, N.R. Siddabhatula & A.D. Pandey 35064](#) (CAL0000194244); 1813, Latitude 22 53 00.52 N, Longitude 079 36 58.33 E, alt. 2600m, Roxburgh (BM000900961); Assam, Kamrup District, Garbhanga Reserve Forest, B.Das 296.

IUCN status: Not Evaluated (NE).

***Crotalaria* sp.**

Undershrub. Stem aerial, erect, branched, solid, pubescent. Leaf petiolate, green, cauline and ramal, alternate, palmately compound, trifoliate, leaflets shortly petiolulate, petiole and petiolule base pulvinus, leaflet apex retuse, obtuse or rounded, margin entire, venation unicostate reticulate, mid vein prominent on dorsal side, leaflets lanceolate or rhombate elliptic, base cuneate. Flower pedicillate, pedicel hairy, complete, bisexual, pentamerous, cyclic. Sepals 5, gamosepalous, light greenish, hairy, 2-lipped with longitudinal lines, lobes narrowly triangular, lobes apex acuminate. Corolla polypetalous, standard yellow, ovate elliptical with maroon coloured venation, venation more prominent on dorsal side, apex 2 lobed, standard hairy; wings yellow, base hairy, veined; margins of keels united above and free below, hairy, veined, base portion vein free. Stamens 10, monadelphous, filaments unequal, 5 short stamens with long oblong anther alternating with 5 longer stamens with round anthers, anthers yellow. Style curved, ovary superior, unilocular, hairy, stalked, placentation marginal. Fruit hairy, oblong, seeds reniform.

Flowering and fruiting: Dec-Jan

Specimen examined: **INDIA:** Assam, Kamrup District, Garbhanga Reserve Forest, B.Das 109.

Desmodium:

Key to the species:

1a. Prostrate herbs *Desmodium heterophyllum*

1b. Undershrubs *Desmodium* sp.

***Desmodium heterophyllum* Hook. & Arn.**

Herb. Stem aerial, branched, soft, hairy, cylindrical. Leaf compound, alternate, petiolate, leaflets prtiolulate, petiole and petiolule hairy, leaflets obovate elliptical, apex retuse, base cordate, surface hairy. Flower pedicillate, pedicel hairy, complete, bisexual, pentamerous. Sepals 5, united, hairy. Keels united above. Ovary hairy. Calyx persistent in fruit.

Flowering and fruiting: Feb-Mar

Distribution: India (Assam, Kerala, Odisha, Tamil Nadu), Sri Lanka, Myanmar, Bangladesh, Thailand, China, Taiwan, Malesia, Australia.

Specimen examined: **TAIWAN:** Tamsuy, 1 Jan 1864, R. Oldham 162 (K000858815). **USA:** Hawaii Co. Puna District, 1km W on Pakaka Rd, 18 Jan 1998, C.R. Annable & R. E. Palmer 3754 (NYBG 190747). **JAMAICA:** William Wright (BM000931654). **INDIA:** [Andaman & Nicobar Islands](#), [Towards Head Quarter, Car Nicobar, North Nicobars](#), 3 Oct 1976, [N. G. Nair 4574](#) (PBL0000006782); Assam, Kamrup District, Garbhanga Reserve Forest, B.Das 200.

IUCN status: Not Evaluated (NE).

***Desmodium* sp.**

Under shrub. Stem aerial, erect, branched, solid, hairy. Leaf compound, trifoliate, alternate, petiolate and petiolulate, petiole and petiolule hairy, leaflets apex retuse, base cuneate, surface hairy, margin hairy. Flower pedicillate, pentamerous, bisexual, complete, bracteate, bract hairy. Sepals 5, united, hairy. Standard purple, wings and keel clawed, keels united above. Stamens 10, diadlepous. Ovary superior, style curved above. Fruit jointed, hairy, calyx persistent in fruit.

Flowering and fruiting: Aug-Sep

Specimen examined: **INDIA:** Assam, Kamrup District, Garbhanga Reserve Forest, B.Das 257.

***Dysolobium grande* (Wall. ex Benth.) Prain**

Climber. Stem solid, hairy, cylindrical. Leaf compound, trifoliate, petiolate, base pulvinus, leaflets petiolulate, petiole and petiolule hairy, leaflets apex acuminate, margin hairy, surface

hairy, base rounded or slightly cordate, blade ovate, lateral leaflets oblique. Flower bracteolate, bracteoles hairy, pedicellate, pedicel hairy, complete, bisexual, pentamerous. Sepals 5, hairy, gamosepalous, lobes unequal. Petals 5, purple, wings 2, free, keels long clawed, united above. Stamens 10, diadelphous, filaments white, anther yellow. Ovary hairy, stigma brush like, hairy.

Flowering and fruiting: Nov-Dec

Distribution: India (Odisha), Myanmar, China, Nepal.

Type: Syntype: Nearest named place: Asia, N. Wallich 5602b (BM000958618).

Specimen examined: **THAILAND**: 23 Jan 1926, A.F.G. Kerr 10289 (BM013710481).

MYANMAR: 12 Jan 1903 – 1904, C.C. H. Melville 04 (BM013710484). **INDIA**: Assam, Goalpara, 6 Oct 1808, F.B. Hamilton (BM012563777); Kamrup District, Garbhanga Reserve Forest, B.Das182.

IUCN status: Not Evaluated (NE).

***Erythrina variegata* L.**

Tree. Stem erect, branched, with prickles. Leaf compound, alternate, 3-foliate, petiolate and petiolulate, leaflets broadly ovate or rhomboid-ovate. Calyx spathaceous, splitting on one side. Corolla red. Ovary superior, hairy.

Flowering and fruiting: Mar-Jul

Distribution: India (Assam, Andaman and Nicobar Island, Andhra Pradesh, Karnataka, Kerala, Odisha, Tamil Nadu), Malaysia, Madagascar and Polynesia, Sri Lanka, Thailand, Vietnam.

Type: Holotype: **ECUADOR**: Esmeraldas, Canton Atacames, Tonchigue, coastal town, alt. 5 m, 20 May 2000, D. Neill 12742 (K001474243).

Specimen examined: **BRAZIL**: Rio de Janeiro, Guanabara, proximo Itanhangá Golf Club, 13 Aug 1961, G. F. J. Pabst 5693 (NYBG 600951). **AUSTRALIA**: Newcastle Bay, alt. 2000m, F.L. Jardine (K000279264). **INDIA**: [Odisha](#), [Naupada](#): [Chaulmachhi](#), [Khurut sikwan](#), [23 Sep 2016](#), [Dr. H. Singh](#), [R. Saravanan & Dr. P. A. Dhole](#) [39238](#) (CAL0000191811); [Andaman & Nicobar Islands](#), [Peacock Island Wildlife Sanctuary](#), [North Andaman](#), [22 Dec 2011](#), alt. 2m, [M. Y. Kamble](#) [29190](#) (PBL0000028900); Assam, Kamrup District, Garbhanga Reserve Forest, B.Das129.

IUCN status: Least Concern (LC).

***Grona triflora* (L.) H. Ohashi & K. Ohashi**

Herb. Stem aerial, herbaceous, solid, weak, branched, branches prostrate, creeping, rooting at node. Leaf cauline and ramal, alternate, compound, trifoliate, simple, petiolate, petiole hairy,

leaf apex retuse, base cuneate, blade obovate, margin hairy, venation unicostate reticulate. Flower bracteate, bract hairy, ovate, apex acuminate, flower pedicillate, pedicel hairy, complete, bisexual, pentamerous, cyclic. Sepals 5, gamosepalous, hairy, lobes unequal, longer than the tube, calyx persistent in fruit. Corolla purple, petals 5, papilionaceous, free, standard clawed, keels united above and free below. Stamens 10, diadelphous, anther yellow, filament white. Gynoecium hairy, style curved above, ovary superior. Pod hairy, falcate, jointed.

Flowering and fruiting: Jan-Feb

Distribution: India (Andhra Pradesh, Arunachal Pradesh, Assam, Himachal Pradesh, Manipur, Meghalaya, Mizoram, Karnataka, Kerala, Jharkhand, Maharashtra, Nagaland, Odisha, Sikkim, Tamil Nadu, Telangana, Uttarakhand), Bolivia, Brazil, Mexico, Myanmar, Netherlands, South China, Zimbabwe.

Specimen examined: **MYANMAR:** Myitkyina, Nov 1931, F. Kingdon-Ward 9002 (NYBG 2650221). **TAIWAN:** New Taipei, Tamsui, alt. 2000m, 22 May 1903, Urbain Jean Faurie 161 (BM000946780). **INDIA:** [Odisha, Nayagarh: Manibhadra R.F., Gania, 28 Aug 2015, A. C. Halder, P. K. Baske & Dr. P.A. Dhole 37586](#) (CAL0000193814); [Andhra Pradesh, Nedimooru, Kupparam RF, Chittoor, 8 Feb 1999, G.V.S. Murthy 110412](#) (BSID0018540); Assam, Kamrup District, Garbhanga Reserve Forest, B.Das 095.

IUCN status: Least Concern (LC).

***Indigofera linifolia* (L.f.) Retz.**

Herb. Stem solid, branched, hairy, angular. Leaf simple, alternate, petiolate, petiole hairy, blade lanceolate, surface hairy, apex acuminate. Flower shortly pedicillate. Sepals 5, united, hairy. Standard red, apex hairy, acuminate. Stamens 10, diadelphous. Ovary superior, calyx persistent in fruit.

Flowering and fruiting: Oct-Nov

Distribution: Afghanistan, Bangladesh, Cambodia, India, Jawa, Myanmar, Nepal, New Guinea, Pakistan, South Australia, Sri Lanka, Taiwan, Thailand, Vietnam.

Specimen examined: **MYANMAR:** Sagain/Yenangheum, 1 Jan 1826, N. Wallich 5489 (K001121078). **INDIA:** [Odisha, Deogarh: Simloi, Kansar R. F., 3 Dec 2013, Dhole P. A., R. Saravanan, P. K. Baske & Dr. H. Singh 33446](#) (CAL0000193608); Coromandel, J. G. König 1774 (BM000997413); Assam, Kamrup District, Garbhanga Reserve Forest, B.Das 250.

IUCN status: Least Concern (LC).

***Lablab purpureus* (L.) Sweet**

Climber. Flower bracteate, bracteolate, bracteoles hairy, elliptical obovate, flower pedicillate, complete, bisexual, pentamerous, cyclic. Sepals 5, hairy, bilipped, campanulate, lower lip 3 lobed, unequal, triangular, upper lip 2-lobed. Petals 5, polypetalous, papilionaceous, purple. Stamen 10, diadelphous, staminal tube white. Ovary hairy, superior, unilocular, placentation marginal, style curved, hairy. Legume flat.

Flowering and fruiting: Oct-March

Distribution: Bangladesh, Boloivia, Brazil, India, Pakistan, Philippines, Thailand.

Type: Holotype: **CAMEROON**: alt. 340 m, 22 oct 1993, T. Tchouto 935 (K000086094).

Neotype: **FRANCE**: Anon s.n. (BM001134356).

Specimen examined: **UGANDA**: Kasese, Kilembe (Nyamwamba valley), 18 Dec 1934, G. Taylor 2457 (BM013712811). **MEXICO**: Michoacan, Mpio. de Tuzantla. Puerto de los Cirianos, 26 Sep 1976, M. Parra 564 (NYBG 607934). **INDIA**: [Bihar](#), [Kaimur: Badap Village](#), [19 Nov 2018](#), [Dr. H. Singh](#), [Dr. M. Mishra & Dr. P. A. Dhole](#) [41111](#) (CAL0000191059); 25 km Southeast of Ooty, 1 Feb 1989, Y. Muthanna 03 (K000731475); Assam, Kamrup District, Garbhanga Reserve Forest, B.Das 022.

IUCN status: Not Evaluated (NE).

***Mucuna bracteata* DC. ex Kurz**

Climber. Stem climbing, solid, hairy, cylindrical. Leaf comound, alternate, petiolate, base pulvinus, leaflets petiolulate, lateral leaflets unequal at base, margins slightly hairy, hairs present along mid vein. Flower pedicillate, complete, bisexual. Sepals 2-lipped, hairy, united. Petals 5, papilionaceous, dark violet, keels united above. Stamens diadelphous. Ovary superior.

Flowering and fruiting: Mar- April

Distribution: Bangladesh, Cambodia, Southeast China, East Himalaya, Hainan, India, Myanmar, Thailand, Vietnam.

Type: Syntype: **MYANMAR**: Pegu, Bookee ridges, S. Kurz 1712 (CAL0000012143).

INDIA: Meghalaya, Nungpo, Khasia, C.B. Clarke 37300, 20 feb 1885 (CAL0000012137).

Specimen examined: **THAILAND**: 10 Dec 1911, Kerr 1572B (BM000928321). **INDIA**: Tura Garo Hills, 11 Feb 1889, C.B. Clarke 43057 (K000797546); Assam, Kamrup District, Garbhanga Reserve Forest, B.Das 187.

IUCN status: Least Concern (LC).

***Neustanthus phaseoloides* (Roxb.) Benth.**

Climber. Stem hairy, branched, slender. Leaf compound, stipulate, trifoliate, petiolate and petiolulate, petiole and petiolule hairy, leaf margin and surface hairy. Flower pedicillate,

pedicel hairy, bracteolate, bracteoles hairy. Calyx bilipped, hairy. Stamens 10, diadelphous. Ovary superior, hairy, style hairy.

Flowering and fruiting: Sep-Oct

Distribution: Bangladesh, China, India, Nepal, Philippines, Sri Lanka, Taiwan, Thailand.

Specimen examined: **PHILIPPINES**: Bataan, Lamao River, Mt. Mariveles. Province, 15 Nov 1905, R. S. Williams 158 (NYBG 3791637). **INDIA**: Nepal, 1 Jan 1820, N. Wallich 5559 (K001121289); [Arunachal Pradesh](#), [Dahung](#), [3 Oct 1964](#), [J. Joseph](#) [40463](#) (CAL0000216073); Assam, Kamrup District, Garbhanga Reserve Forest, B.Das 271.

IUCN status: Not Evaluated (NE).

Pueraria montana (Lour.) Merr.

Climber. Stem solid, cylindrical, hairy. Leaf compound, trifoliate, petiolate, petiole hairy, base pulvinate, leaflets petiolulate, petiolule hairy, blade ovate, lateral leaflets unequal, leaflets margin hairy, surface hairy. Flower pedicillate, bracteolate, bracteoles hairy. Calyx united, hairy. Corolla purple. Stamens 10, monadelphous. Ovary superior, hairy.

Flowering and fruiting: Sep-Oct

Distribution: Bangladesh, China, India, Malaya, Myanmar, Taiwan, Tibet, Vietnam.

Specimen examined: **INDIA**: [Andhra Pradesh](#), [Horsley Hills](#), [11 Oct 1970](#), [Dr. B. Suryanarayana](#) [3716](#) (BSID0012832); Assam, Kamrup District, Garbhanga Reserve Forest, B.Das 273.

IUCN status: Not Evaluated (NE).

Sohmaea laxiflora (DC.) H. Ohashi & K. ohashi

Undershrub. Stem branched, hairy, solid, cylindrical. Leaf simple or trifoliate, stipulate, petiolate, petiole hairy, base pulvinus, leaflets petiolulate, petiolule hairy, margins and surface of leaflets hairy. Flower pedicillate, pedicel hairy. Sepals 5, hairy, bilipped, upper lip with two lobes. Petals 5, purple. Stamens 10, diadelphous (1+9). Ovary superior, hairy, style curved. Fruit hairy, jointed, calyx persistent in fruit.

Flowering and fruiting: Feb-Mar

Distribution: Andaman and Nicobar Islands, Bangladesh, Bhutan, China, India, Myanmar, Nepal, New Guinea, Taiwan.

Specimen examined: **MYANMAR**: Moulmein, 19 Oct 1875, C. E. O. Kuntze 6277 (NYBG 2650227). **NEPAL**: 1 Jan 1832, Wallich 5715 (K000858812). **INDIA**: West Bengal, [Ambik to Kabertar](#), [3 Oct 2018](#) [Vinay Ranjan, Gopal Krishna & Anant Kumar](#) [79325](#), (CAL0000212650); Assam, Kamrup District, Garbhanga Reserve Forest, B.Das 277.

IUCN status: Not Evaluated (NE).

***Uraria*:**

Key to the species:

1a. Stem sticky *Uraria crinita*

1b. Stem not sticky *Uraria rufescens*

Uraria crinita (L.) Desv. ex DC.

Undershrub. Stem sticky, erect, solid, hairy, cylindrical. Leaf simple or pinnately compound, petiole and petiolulate, petiole and petiolule hairy, petiole base pulvinus, leaflets apex acuminate, base cordate, hairs and spots present on leaf surface. Flower bracteate, bract hairy, pedicillate, pedicel hairy. Calyx densely hairy, united, sepals 5. Stamens 10, diadelphous. Ovary superior, hairy, style curved.

Flowering and fruiting: Aug-Sep

Distribution: India (Arunachal Pradesh, Assam, Sikkim), Bangladesh, Cambodia, China, Bhutan, Hainan, Jawa, Laos, Malaya, Myanmar, Sumatera, Taiwan, Thailand, Vietnam.

Specimen examined: **MYANMAR**: [Tavoy](#), [W. Gomez 5675H](#) (CAL0000067401). **BANGLADESH**: [Sylhet](#), [F. De Silva 5675 E](#) (CAL0000067402). **INDIA**: Assam, Kamrup District, Garbhanga Reserve Forest, B.Das 323.

IUCN status: Not Evaluated (NE).

Uraria rufescens (DC.) Schindl.

Undershrub. Stem branched, hairy, solid, cylindrical. Leaf simple or trifoliate, stipulate, petiolate and petiolulate, petiole and petiolule hairy, petiole base pulvinate, leaf base cordate, surface and margins of leaflets hairy. Flower pedicillate, bracteate, bract hairy. Calyx hairy, bilipped. Ovary superior, hairy. Fruit hairy.

Flowering and fruiting: Sep-Oct

Distribution: India (Andhra Pradesh, Arunachal Pradesh, Assam, Himachal Pradesh, Karnataka, Kerala, Maharashtra, Odisha, Sikkim, Tamil Nadu), Bangladesh, Bhutan, Cambodia, China, Hainan, Jawa, Malaya, Myanmar, Thailand, Tibet.

Specimen examined: **INDONESIA**: 1 Jan 1802, F. Adema 70 (K000263307). **INDIA**: [Bihar](#), [West Champaran: Gonauli, 08 Jan 2019](#), [Dr. H. Singh, Dr. M. Mishra & Dr. P.A. Dhole 41365](#) (CAL 0000190123); Assam, Kamrup District, Garbhanga Reserve Forest, B.Das 276.

IUCN status: Not Evaluated (NE).

A summary of the similarities and differences in key morphological characters of the taxa are presented in Table 1 and Table 2.

DISCUSSION:

Detailed examinations of the taxa revealed key characteristics, such as variations in leaf type, leaflet shape and size, flower structure, flower color and fruit morphology which are important for distinguishing between species.

Regarding the vegetative morphology observed among the taxa (Table 1), the arrangement of the leaves are alternate to opposite. The leaves are petiolate in all the taxa. The leaf type is simple and compound and variable in size. The leaf and leaflet shapes vary significantly among the taxa. Surface of the leaf and leaflet may be hairy or glabrous. The apex ranges from acute, acuminate, mucronate, retuse and obtuse to rounded. The bases are found cordate, oblique, cuneate, truncate or rounded.

Regarding the reproductive morphology (Table 2), the floral characters show similarities and differences among the taxa. The inflorescence is raceme in all the taxa varying in form and size and the flowers are hypogynous and zygomorphic. The length of the pedicel varies among the taxa. Bracts are hairy and show variations in shape and size. Calyx is united and hairy in all the taxa, the calyx hairs vary in color; for instance, calyx is covered with dense white hairs in *Uraria crinita*, white hairy in *Abrus melanospermus* subsp. *melanospermus* and with yellow brown hairs in *Mucuna bracteata*. Corolla color ranges from pink, purple, blue, orange, red to yellow. Standard, wings and keels of the taxa show differences in shape and size. Stamens show monadelphous and diadelphous types of fusion. Ovary is hairy in all the taxa and the fruit is a legume and vary in shape and size. The fruits are jointed in species of *Abrus*, *Desmodium*, *Neustanthus* and *Uraria* and not jointed in *Crotalaria* and *Indigofera*. The two species of *Aeschynomene* can be differentiated mainly in having different corolla color and fruit morphology. Corolla color in *A. americana* is purple, while in *A. indica*, it is yellow. The size (Table 3) of the floral parts varies greatly among the taxa.

CONCLUSION:

The morphological variations documented in this study are significant for the identification and classification of Papilionaceae species. A detailed taxonomic description together with phenological data, distribution, voucher specimen examined, IUCN status and information on type specimens of the taxa are provided here. As no study on Papilionaceae has been carried out before from Garbhanga Reserve Forest, this morphological analysis significantly contributes to the taxonomy of the Papilionaceae family and provides a valuable resource for future botanical research and conservation efforts in Garbhanga Reserve Forest of Assam, India.

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LIST OF FIGURE CAPTIONS:

Figure 1. Location map of the study area

Figure 2. Pie chart depicting habit diversity of the species recorded from the study area

Figure 3. Habit: A) *Abrus melanospermus* subsp. *melanospermus*; B) *Aeschynomene americana* L.; C) *Aeschynomene indica* L.; D) *Codariocalyx motorius* (Houtt.) H. Ohashi; E) *Crotalaria alata* Buch.-Ham. ex D. Don; F) *Crotalaria juncea* L.

Figure 4. Habit: G) *Indigofera linifolia* (L.f.) Retz.; H) *Mucuna bracteata* DC. ex Kurz; I) *Neustanthus phaseoloides* (Roxb.) Benth.; J) *Pueraria montana* (Lour.) Merr.; K) *Sohmaea laxiflora* (DC.) H. Ohashi & K. ohashi; L) *Uraria rufescens* (DC.) Schindl.; M) *Uraria crinita* (L.) Desv. ex DC.

Figure 5. Floral parts of *Abrus melanospermus* subsp. *melanospermus* : A) inflorescence; B) & C) flower; D) bract; E) bracteoles; F) calyx; G) standard; H) wings; I) keel; J) androecium; K) gynoecium; L) fruit

Figure 6. Floral parts of *Aeschynomene americana* L. : A) & b) flower; C) bract; D) bracteoles; E) calyx; F) standard; G) wings; H) keel; I) gynoecium; J) fruit

Figure 7. Floral parts of *Aeschynomene indica* L. : A) & b) flower; C) bract; D) bracteoles; E) calyx; F) standard; G) wings; H) keel; I) androecium; J) gynoecium; K) fruit

Figure 8. Floral parts of *Crotalaria alata* Buch.-Ham. ex D. Don : A) flower; B) bract; C) bracteoles; D) calyx; E) & F) standard; G) wings; H) keel; I) androecium; J) gynoecium; K) fruit

Figure 9. Floral parts of *Crotalaria juncea* L. : A) inflorescence; B) & C) flower; D) bract; E) bracteoles; F) calyx; G) & H) standard.; I) wings; J) keel; K) androecium; L) gynoecium

Figure 10. Floral parts of *Desmodium heterophyllum* Hook. & Arn. : A) flower; B) bract; C) calyx; D) standard; E) wings; F) & G) keel; H) gynoecium; I) & J) fruit

Figure 11. Floral parts of *Desmodium* sp. : A) flower; B) bract; C) calyx; D) standard; E) wings; F) keel; G) gynoecium; H) fruit

Figure 12. Floral parts of *Dysolobium grande* (Wall. ex Benth.) Prain : A) inflorescence; B) flower; C) bracteoles; D) calyx; E) & F) standard; G) wings; H) keel; I) androecium; J) gynoecium; K) fruit

Figure 13. Floral parts of *Indigofera linifolia* (L.f.) Retz. : A) flower; B) bract; C) calyx; D) & E) standard; F) wings; G) keel; H) androecium; I) gynoecium; J) fruit

Figure 14. Floral parts of *Mucuna bracteata* DC. ex Kurz : A) & B) flower; C) calyx; D) standard; E) wings; F) keel; G) androecium; H) gynoecium

Figure 15. Floral parts of *Neustanthus phaseoloides* (Roxb.) Benth. : A) & B) flower; C) bracteoles; D) calyx; E) standard; F) wings; G) & H) keel; I) androecium; J) gynoecium; K) fruit

Figure 16. Floral parts of *Pueraria montana* (Lour.) Merr. : A) & B) flower; C) calyx; D) standard; E) wings; F) & G) keel; H) androecium; I) gynoecium

Figure 17. Floral parts of *Sohmaea laxiflora* (DC.) H. Ohashi & K. Ohashi : A) & B) flower; C) Bract; D) calyx; E) standard; F) wings; G) keel; H) gynoecium; I) fruit

Figure 18. Floral parts of *Uraria crinita* (L.) Desv. ex DC. : A) flower; B) & C) Bract; D) calyx; E) standard; F) wings; G) keel; H) gynoecium; I) fruit

Figure 19. Floral parts of *Uraria rufescens* (DC.) Schindl. : A) flower; B) Bract; C) calyx; D) standard; E) wings; F) keel; G) gynoecium; H) fruit.

Table 1. Vegetative morphology

Taxa	Habit	Leaf characteristics						
		Arrangement	Leaf/ leaflet shape	Leaf/ leaflet Surface	Type of leaf	Leaf/ leaflet apex	Leaf/ leaflet Base	Petiole
<i>Abrus melanospermus</i> subsp. <i>melanospermus</i>	Climber	Alternate	Oblong	Hairy	Compound	Acuminate	Cordate	Petiolate
<i>Aeschynomene americana</i> L.	Herb	Opposite	Linear oblong	Hairy	Compound	Mucronate	Oblique	petiolate
<i>Aeschynomene indica</i> L.	Herb	Opposite	Linear oblong	Glabrous	Compound	Obtuse	Oblique	petiolate
<i>Clitoria ternatea</i> L.	Climber	Alternate	Elliptic ovate	Glabrous	Compound	Retuse	Cuneate	Petiolate
<i>Codariocalyx motorius</i> (Houtt.) H. Ohashi	Shrub	Alternate	Elliptic lanceolate	Glabrous	Simple or compound	Obtuse	Cuneate	petiolate
<i>Crotalaria alata</i> Buch.- Ham. ex D. Don	Herb	Alternate	Elliptic	Hairy	Simple	Acuminate	Cuneate	Petiolate
<i>Crotalaria juncea</i> L.	Undershrub	Alternate	Narrowly ovate to lanceolate	Hairy	Simple	Acuminmate	Attenuate	Petiolate
<i>Crotalaria</i> sp.	Undershrub	Alternate	Elliptic lanceolate	Hairy	Compound	Obtuse or rounded	Cuneate	Petiolate
<i>Desmodium heterophyllum</i> Hook. & Arn.	Herb	Alternate	Obovate elliptical	Hairy	Compound	Retuse	Cordate	Petiolate
<i>Desmodium</i> sp.	Undershrub	Alternate	Obovate elliptical	Hairy	Compound	Retuse	Cuneate	Petiolate
<i>Dysolobium grande</i> (Wall.	Climber	Alternate	Ovate	Hairy	Compound	Acuminmate	Rounded to	Petiolate

Taxa	Habit	Leaf characteristics						
		Arrangement	Leaf/ leaflet shape	Leaf/ leaflet Surface	Type of leaf	Leaf/ leaflet apex	Leaf/ leaflet Base	Petiole
ex Benth.) Prain							cordate	
<i>Erythrina variegata</i> L.	Tree	Alternate	Ovate	Glabrous	Compound	Acute	Cuneate	Petiolate
<i>Grona triflora</i> (L.) H. Ohashi & K. Ohashi	Herb	Alternate	Obovate		Compound	Retuse	Cuneate	Petiolate
<i>Indigofera linifolia</i> (L.f.) Retz.	Herb	Alternate	Lanceolate	Hairy	Simple	Acuminmate	Cuneate	Petiolate
<i>Lablab purpureus</i> (L.) Sweet	Climber	Alternate	Deltoid ovate	Hairy	Compound	Acuminate	Sub truncate	Petiolate
<i>Mucuna bracteata</i> DC. ex Kurz	Climber	Alternate	Ovate rhombic	Hairy	Compound	Acuminate	Cuneate to rounded	Petiolate
<i>Neustanthus phaseoloides</i> (Roxb.) Benth.	Climber	Alternate	Ovate rhombic	Hairy	Compound	Acuminate	Rounded	Petiolate
<i>Pueraria montana</i> (Lour.) Merr.	Climber	Alternate	Ovate	Hairy	Compound	Acuminate	Rounded	Petiolate
<i>Sohmaea laxiflora</i> (DC.) H. Ohashi & K. Ohashi	Undershrub	Alternate	Ovate to broadly lanceolate	Hairy	Simple or comound	Acute	Rounded	Petiolate
<i>Uraria crinita</i> (L.) Desv. ex DC.	Undershrub	Alternate	Oblong ovate	Hairy	Simple or comound	Acuminate	Cordate	Petiolate

Taxa	Habit	Leaf characteristics						
		Arrangement	Leaf/ leaflet shape	Leaf/ leaflet Surface	Type of leaf	Leaf/ leaflet apex	Leaf/ leaflet Base	Petiole
<i>Uraria rufescens</i> (DC.) Schindl.	Undershrub	Alternate	Ovate elliptic	Hairy	Simple or comound	Rounded	Cordate	Petiolate

Table 2. Reproductive morphology

Species	Floral characteristics								
	Inflorescence	Insertion	Symmetry	Pedicel	Calyx surface	Corolla colour	Fusion of stamens	Ovary	Fruit type
<i>Abrus melanospermus</i> subsp. <i>Melanospermus</i>	Raceme	Hypogynous	Zygomorphic	Pedicillate	Hairy	Pink	Monoadelphous	Hairy	Legume oblong
<i>Aeschynomene</i> <i>americana</i> L.	Raceme	Hypogynous	Zygomorphic	Pedicillate	Hairy	Purple	Diadelphous	Hairy	Legume oblong, slightly curved
<i>Aeschynomene indica</i> L.	Raceme	Hypogynous	Zygomorphic	Pedicillate	Hairy	Yellow	Monoadelphous	Hairy	Legume linear- oblong
<i>Clitoria ternatea</i> L.	Solitary axillary	Hypogynous	Zygomorphic	Pedicillate	Glabrous	Blue	Diadelphous	Hairy	Legume linear- oblong, compressed

<i>Codariocalyx motorius</i> (Houtt.) H. Ohashi	Raceme	Hypogynous	Zygomorphic	Pedicillate		Orange	Diadelphous	Hairy	Legume straight or slightly bent
<i>Crotalaria alata</i> Buch.-Ham. ex D. Don	Raceme	Hypogynous	Zygomorphic	Pedicillate	Hairy	Yellow	Monoadelphous	Hairy	Legume oblong
<i>Crotalaria juncea</i> L.	Raceme	Hypogynous	Zygomorphic	Pedicillate	Hairy	Yellow	Monoadelphous	Hairy	Legume cylindric
<i>Crotalaria</i> sp.	Raceme	Hypogynous	Zygomorphic	Pedicillate	Hairy	Yellow	Monoadelphous	Hairy	Legume cylindric
<i>Desmodium heterophyllum</i> Hook. & Arn.	Solitary or two together or in 2-6 flowered lax racemes	Hypogynous	Zygomorphic	Pedicillate	Hairy	Purple	Diadelphous	Hairy	Legume narrowly oblong, straight or curved
<i>Desmodium</i> sp.	Raceme	Hypogynous	Zygomorphic	Pedicillate	Hairy		Diadelphous	Hairy	Legume jointed
<i>Dysolobium grande</i> (Wall. ex Benth.) Prain	Raceme	Hypogynous	Zygomorphic	Pedicillate	Hairy	Purplish blue	Diadelphous	Hairy	Legume sub cylindric
<i>Erythrina variegata</i> L.	Raceme	Hypogynous	Zygomorphic	Pedicillate	Hairy	Red	Diadelphous	Hairy	Legume reniform
<i>Grona triflora</i> (L.) H. Ohashi & K. Ohashi	Axillary fascicles of 1-5 flowers	Hypogynous	Zygomorphic	Pedicillate	Hairy	Purple	Diadelphous	Hairy	Legume slightly falcate, flat
<i>Indigofera linifolia</i> (L.f.) Retz.	Raceme	Hypogynous	Zygomorphic	Shortly pedicillate	Hairy	Red	Diadelphous	Hairy	Legume ovoid
<i>Lablab purpureus</i> (L.) Sweet	Raceme	Hypogynous	Zygomorphic	Pedicillate	Hairy	Purple	Diadelphous	Hairy	Legume oblong falcate
<i>Mucuna bracteata</i> DC. ex Kurz	Raceme	Hypogynous	Zygomorphic	Pedicillate	Hairy	Dark purple	Diadelphous	Hairy	Legume linear

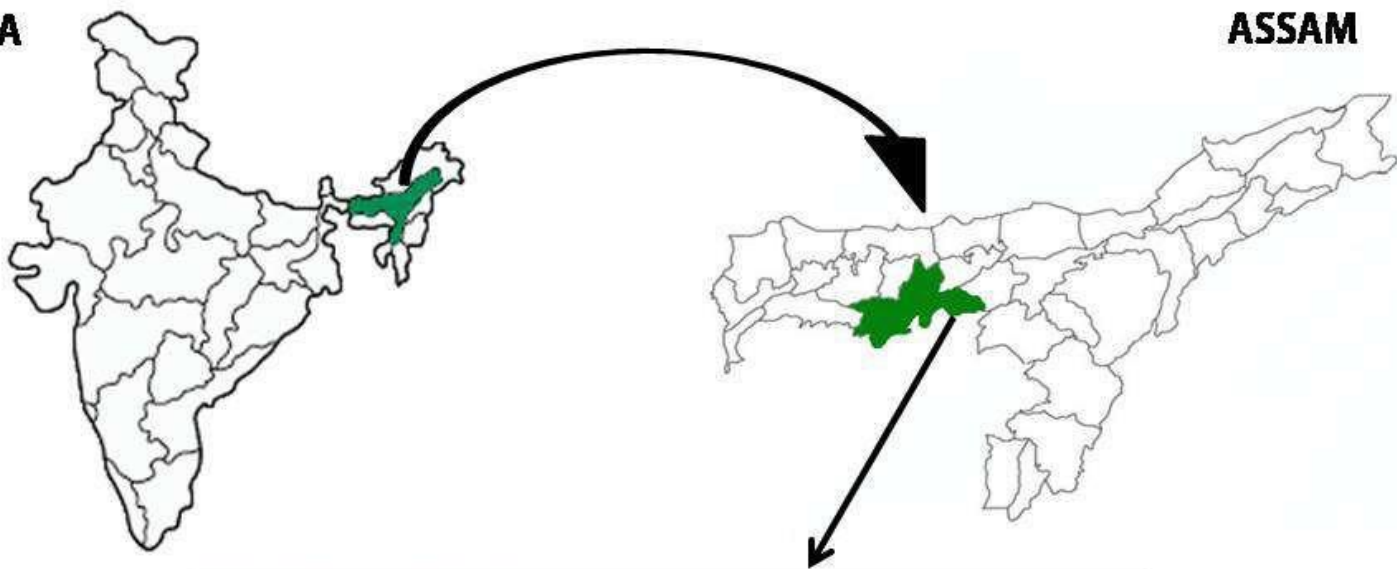
<i>Neustanthus phaseoloides</i> (Roxb.) Benth.	Raceme	Hypogynous	Zygomorphic	Pedicillate	Hairy	Purple	Diadelphous	Hairy	Legume subcylindric
<i>Pueraria montana</i> (Lour.) Merr.	Raceme	Hypogynous	Zygomorphic	Pedicillate	Hairy	Purple	Monodelphous	Hairy	Legume long elliptic
<i>Sohmaea laxiflora</i> (DC.) H. Ohashi & K. ohashi	Raceme	Hypogynous	Zygomorphic	Pedicillate	Hairy	Purple	Diadelphous	Hairy	Legume linear
<i>Uraria crinita</i> (L.) Desv. ex DC.	Raceme	Hypogynous	Zygomorphic	Pedicillate	Hairy	Purple	Diadelphous	Hairy	Legume jointed
<i>Uraria rufescens</i> (DC.) Schindl.	Raceme	Hypogynous	Zygomorphic	Pedicillate	Hairy	Purple	Diadelphous	Hairy	Legume jointed

Table 3. Measurements of flower and floral parts

Taxa	Flower (cm)	Calyx (cm)	Corolla (cm)			Androecium (cm)	Gynoecium (cm)	Fruit (cm)
			standard	wings	keel			
<i>Abrus melanospermus</i> subsp. <i>Melanospermus</i>	1.5	0.4	1.3	1.3	1.3	0.9	0.3	4.9
<i>Aeschynomene americana</i> L.	1.2	0.6	0.7	0.7	0.6	0.8	0.6	2.8
<i>Aeschynomene indica</i> L.	1.1	0.5	0.7	0.9	1	1	0.7	4.8
<i>Clitoria ternatea</i> L.	6	1.5	4.9	2.5	2.2	2.2	2.7	10.2
<i>Crotalaria alata</i> Buch.-Ham. ex D. Don.	1.6	1.5 cm	0.8 cm	0.8	0.8	0.9	0.8	5.2
<i>Crotalaria juncea</i> L.	4.2	1.4	2.6 cm	2 cm	2.1	2.1	1.9	3.8
<i>Crotalaria</i> sp.	1.7	0.8	1.2	1	1.1	1.5	1.3	5.2
<i>Desmodium heterophyllum</i> Hook. & Arn.	2.1	0.3	0.6	0.4	0.3	0.3	0.4	2.4
<i>Desmodium</i> sp.	0.9	0.2	0.6	0.5	0.5	0.3	0.4	2.6
<i>Dysolobium grande</i> (Wall. ex Benth.) Prain	3.9	1.5	3.2	2.9	3.1	2.8	6.5	18.6
<i>Erythrina variegata</i> L.	7.9	1.4	5	1.1	1.8	5.3	5.1	10.2
<i>Grona triflora</i> (L.) H. Ohashi & K. Ohashi	1.1	0.4	0.4	0.3	0.3	0.4	0.3	1.2
<i>Indigofera linifolia</i> (L.f.) Retz.	0.5	0.4	0.3	0.3	0.3	0.4	0.3	0.3
<i>Lablab purpureus</i> (L.) Sweet.	2.6	0.8	1.2	1.7	1.4	2	1.6	4.2
<i>Mucuna bracteata</i> DC. ex Kurz	4.6	1.4	2.3	3.3	4.3	3.9	4.2	8.5
<i>Neustanthus phaseoloides</i> (Roxb.) Benth.	1	0.6	1.4	1	0.9	1	1	8.5
<i>Pueraria montana</i> (Lour.) Merr.	2.9	1.6	2.4	2.1	2.5	2.3	2.2	6.7
<i>Sohmaea laxiflora</i> (DC.) H. Ohashi & K. ohashi	0.8	0.2	0.6	0.4	0.4	0.3	0.4	3.2
<i>Uraria crinita</i> (L.) Desv. ex DC.		0.8	1.1	0.8	0.8	0.9	0.8	1.6
<i>Uraria rufescens</i> (DC.) Schindl.	0.9	0.3	0.7	0.7	0.5	0.5	0.6	1.2

INDIA

ASSAM



■ Climber ■ Herb ■ Undershrub ■ Shrub ■ Tree

