

TAXONOMIC STUDY OF THE GENUS *PISONIA* L. (NYCTAGINACEAE) IN INDIADebasmita Dutta Pramanick*, G. G. Maiti¹ and M.S. Mondal²

Botanical Survey of India, Headquarter, CGO Complex, SaltLake City, Kolkata-700064, India

¹Department of Botany, Kalyani University, Kalyani-741235, West Bengal, India²Ex-Addl. Director, Central National Herbarium, Howrah-711302, West Bengal, India

Received: July 30, 2015;

Revised: August 12, 2015;

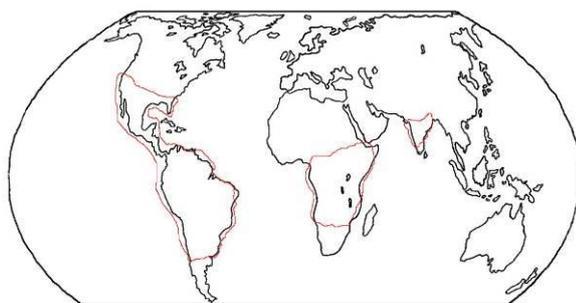
Accepted: August 24, 2015.

Abstract: The family Nyctaginaceae Juss. is represented by 6 genera and 14 species in India of which the genus *Pisonia* L. is the most significant one due to its woody, arborescent habit, differential leaf arrangement pattern, presence of unisexual, hermaphrodite and polymorphic flowers in same and or different plants, unique characters of anthocarps and distinct types of pollen grains. The present paper deals with brief taxonomic account of the species of *pisonia* L. in India along with their ecology, distribution and uses. A key has been provided to help in easy identification of the species.

Key words: India, *Pisonia* L., Systematic account

INTRODUCTION

The genus *Pisonia* L., the name of which is derived from the Dutch Physician, Willem Piso (1611-1678), is comprising of c. 40 species in world [1], mostly of tropical and subtropical distribution. Most of the species are reported from tropical America, few from continental S.E. Asia and only one from E. Africa (**Map. 1**). In India the genus is represented by only three species viz., *P. aculeata* L., *P. grandis* R.Br. and *P. umbellifera* (Forst.) Seem. of which the later one is reported from Andaman & Nicobar Islands. *P. aculeata* L. is of rather wide distribution whereas *P. grandis* R.Br. is mostly cultivated in India.



Map 1. World distribution of the genus *Pisonia* L.

The genus *Pisonia* L. was first described by Linnaeus (1753) where he treated the taxa as having two species, viz. *P. aculeata* L. and *P. mitis* L.[2]. Roxb.(1932) enumerated the genus as having only one species viz., *P. aculeata* L.[3]. Hook. f. (1885) in “Flora of British India” treated the genus *Pisonia* L. as having three species viz., *P. aculeata* L., *P. alba* Span. and *P. excelsa* Bl.[4]. Afterwards the genus has been critically reviewed and enumerated by different workers time to time [5][6][7][8][9][10][11][12][13].

The genus *Pisonia* L., comprising of three species in India, is a very interesting one for its woody vine to tree habit as well as rather restricted distribution. The genus is quite different and unique in the family Nyctaginaceae in terms of the development of sexuality, anthocarp morphology and

Corresponding Author:*Dr. Debasmita Dutta Pramanick**

Scientist

Botanical Survey of India

Kolkata, India.

dispersal mechanism. Due to presence of tri-polycolpate pollen grains, multi- traced petiolar and medullary traces, the genus has been considered as derived one despite of their otherwise woody habit.

MATERIALS AND METHODS

The present study is primarily based on thorough scrutiny of herbarium specimens deposited at the major National herbaria such as Andaman and Nicobar Circle, Port Blair (PBL), Southern Circle (MH), Tropical Botanic Garden and Research Institute, Pachapalode (TBGT), Rapinat Herbarium and Centre for molecular systematics, Tiruchirapalli (RHT), Central National Herbarium (CAL), Howrah, Blatter Herbarium (BLATT), and herbarium of National Botanical Research Institute, Lucknow (LWG) and on the basis of few live collections from different geographical regions of India. The cibachrome photographs of types provided from Royal Botanic Garden Herbarium (K) were consulted. Identification of taxa has been done with the help of authentic literature. For studied species, a key is furnished along with correct nomenclature, description, phenology, ecology, distribution and uses.

RESULTS**Taxonomic Enumeration**

Pisonia L., Sp. Pl. ed.1:1026. 1753; Roxb., Fl. Indica (ed. Carey) 2: 217. 1832; Choisy in DC., Prodr. 13(2): 440. 1849; Hook. f. in Hook. f., Fl. Brit. India 4: 711. 1885; Prain, Bengal Pl. 2: 864. 1903; Gamble, Fl. Pres. Madras 2: 815. 1956 (Rep. ed.); Cooke, Fl. Pres. Bombay 2: 566. 1958 (Rep. ed.); Haines, Bot. Bihar Or. 793. 1961; Stemm. in van Steenis (ed.), Fl. Malesiana Ser. 1,6:457. 1964; Nasir in Nasir & Ali (ed.), Fl. West Pak. 115:12. 1977; Dequan & Gilbert in Zhengyi, *et al.* (eds.), Fl. China 5: 430. 2003.

The genus *Pisonia* L. is characterized by dioecious, or monoecious shrubs, trees or vines, sometimes overhanging climbers, unarmed or with axillary recurved thorns, upto 30 m high. Bark soft, brittle, pale cream in colour. Leaves opposite or alternate, or ternate or conferted to the end of the twigs, chartaceous or leathery or papery or

membranous. Inflorescence many-flowered in umbelliform or corymbosely thyriform, pedunculate cymes. Flowers unisexual or bisexual or polymorphic, bracteate; bracts caducous. Male and female flowers of different shapes. Stamens 6-10 in male flowers. Carpel rudimentary. Staminode as long as ovary, with rudimentary anthers in female flowers. Anthocarp (fruit) dry, indehiscent, utricle with coriaceous perianth base, obscurely or distinctly 5-angled, with or without monoserial to biserial prickles.

Type species: Pisonia aculeata L. (Lectotype; Vide Standl., N. Amer. Fl. 21: 186. 1918).

Key to the studied species:

- 1a. Overlapping woody climber, mostly with recurved axillary thorns; male and female flowers of different shape; anthocarps with 5 biserial rows of viscid prickles.....**1. P. aculeata**
- 1b. Unarmed shrubs or trees; dioecious plants, male and female flowers of similar shape; anthocarps otherwise.....(2)
- 2a. Leaves with distinct dark veins contrasting with lighter coloured intercostal veins; lateral and intercostal veins hairy beneath; anthocarps with monoserial prickles.....**2. P. grandis**
- 2b. Leaves without distinctly contrasting dark veins; veins glabrous beneath; anthocarps glabrous, neither prickled nor muricate.....**3. P. umbellifera**

1. Pisonia aculeata L., Sp. Pl. ed. 1:1026. 1753; Roxb., Fl. Indica (ed. Carey) 2: 217. 1832; Hook.f., in Fl. Brit. India 4:711. 1885; Parkinson, Forest Fl. Andaman Is. 222.1923; Banerjee & all., Diversity Coastal Plt. Comm., India 326. 2002. (**Map 2; Fig. 1 & 2; Plate 1**)

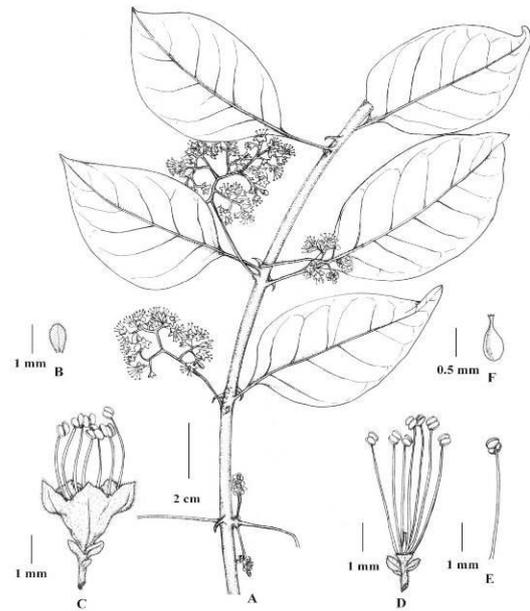


Fig.1. Pisonia aculeata L.: A. Portion of flowering twig (male plant); B. Floral bract; C. Flower; D. Stamens surrounding rudimentary carpel; E. Stamen; F. Rudimentary carpel [A-F: R.K.Premnath 8451 (CAL)]

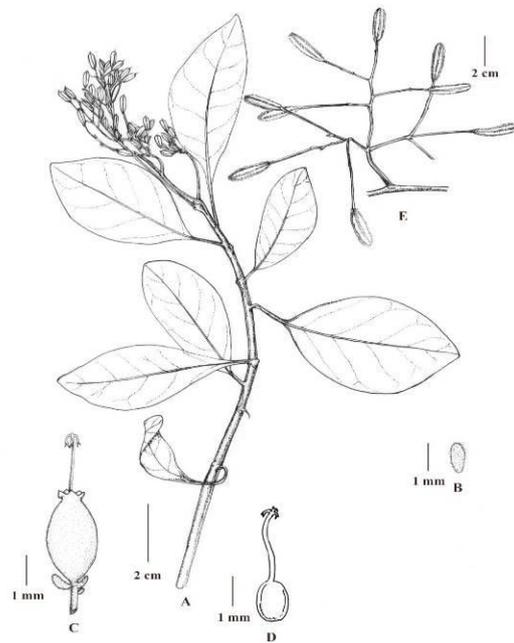
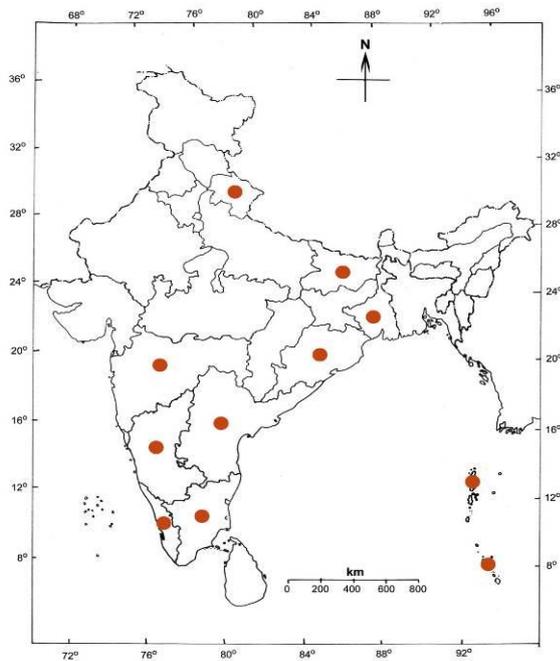


Fig.2. Pisonia aculeata L.: A. Portion of fruiting twig (female plant); B. Floral bract; C. Female flower; D. Carpel; E. Infructescence [A-E: D. Hooper & M.S. Ramaswami 39273(CAL)]



Map 2. Indian distribution of *Pisonia aculeata* L. (●).



Plate 1. Fruiting twig of *Pisonia aculeata* L.

Type: Lectotype (Smith, Fl. Vitiensis Nova 2: 269. 1981): [Icon] “*Pisonia*” in Plum., Nov. Pl. Amer.: 7. t. 11. 1703.

Vern. names: **Beng.:** Baghachura; **Kan.:** Antuhannu gida, Sule soppu; **Tam.:** Karindu, Murukkalli, Muruvillicodi, Pisangi, Turattuma, Udappu; **Tel.:** Embudi, Konki, Konakaraputri, Pisangi; **Ori.:** Hati-ankusa.

Woody overhanging thorny climber, or shrub, to 6 m tall; bark smooth, olive green. Stems terete, slightly striated; branches pubescent, with numerous thorns as abortive shoots, 0.5-1 cm long, axillary, recurved, sharp, glabrous or rusty pubescent. Leaves subopposite or opposite, sometimes fascicled, elliptic-ovate to obovate or elliptic-lanceolate, or lanceolate or elliptic or ovate, 2.5-8 x 1.2-4 cm, shortly bluntly acuminate to obtuse at apex, entire at margin, base tapering or cuneate, or rounded, thick-chartaceous, lateral nerves 5-6 pairs on each side, puberulous or nearly glabrous above, thinly pubescent beneath, abaxially green, adaxially dark green; petioles stout, 0.5-2.5 cm long, glabrescent; exstipulate. Inflorescences dense axillary and terminal corymbose cymes; male flowers in compact corymbose cymes; female flowers in lax divaricate cymes, brown, short hairy; peduncles 1-4.5 cm long, glabrous. Flowers unisexual. Male flowers incomplete, monochlamydous; pedicels 1-2 mm long, finely pubescent; bracts 2-3, at the base of receptacle on the pedicel, ovate-oblong, obtuse, entire, thick-coriaceous, unicostate-reticulate, hairy, brown, caducous. Perianth corolliform, gamocorolline, campanulate or infundibuliform, green or greenish-white. Stamens 6-10; filaments far exserted, glabrous; anthers 2-celled, sub-globose, dorsifixed, orange or red. Carpel rudimentary. Female flowers incomplete, monochlamydous; pedicels 1-2 mm long, glabrescent to finely pubescent; bracts 2-3, at the base of pedicel, ovate to oblong, obtuse, entire, unicostate-reticulate, puberulous, caducous. Perianth monochlamydous, corolliform,

gamocorolline, ovoid, or tubular, or urceolate, obscurely 5-lobed, green or cream coloured. Androecium completely abortive. Carpel 1; ovary superior, oblong-globose, spatulate in outline, seated on a disk, glabrous, green, 1-loculed; ovule solitary in basal placentation; style 1, terminal, rather stout, exserted, glabrous; stigma lacerate or bifid, exserted. Anthocarp (Fruit) simple, dry, indehiscent, narrowly oblong or clavate-oblong or clavate, 1-3 x 0.4-0.6 cm, with 5-biseriate rows of viscid prickles, tomentose between the ribs, rounded at apex, narrowed at base, thinly coriaceous; fruiting pedicels elongated, 2-5 cm long; seed one, cylindrical, brown.

Phenology: Fl.-December to February; Fr.- March to April

Ecology: The plant is found to grow along coastal areas, hedges, rain forests and semi-dry places forming impenetrable messes on forest edges, from lowland to 500m.

Distribution: India [Andaman Is., Andhra Pradesh, Bihar, Jharkhand, Karnataka, Kerala, Maharashtra, Orissa, TamilNadu, West Bengal], Africa, America, Australia, Madagascar, Mauritius, Myanmar, Seychelles, Sri Lanka, Vietnam.

Uses: The bark and leaves of the plant are used as a counter-irritant for swellings and rheumatic pains. The juice of the leaves, mixed with pepper and other ingredients, is given to children suffering from pulmonary complaints. Decoction of the fresh leaves is used to wash scabies. The plants make an excellent hedges. The sticky fruits are used to catch birds, small animals, insects etc [14][15].

Specimens examined: **ANDAMAN & NICOBAR IS.:** Nicobars, Battimalo, March 1891, *Prain s.n.* (CAL); Little Andaman, Hut Bay, 11.02.1981, *R.K. Premnath* 8451(CAL).

KERALA: Travancore, Courtallum, 05.12.1913, *Rama Rao* 2054 (CAL, TBGT). **ORISSA:** Khurdah, Feb. 1881, *Gamble* 9269 (CAL). **TAMIL NADU:** N. Arcot Dist., Chandragiri, 19.02.1914, Without any collector's name 9915 (MH); Nilgiri Dist., towards Kutrapattu & Moyar river (Kutrapathi), 450m, 12.03.1972, *Hooper & Ramaswami* 39273 (CAL).

2. *Pisonia grandis* R. Br., Prodr. Fl. Nov. Holl. 1:422. 1810. *P. alba* Span. in Linnaea 15: 342. 1841; Hook.f. in Fl. Brit. India 4:711. 1885. *P. morindifolia* R.Br. ex Wight, Ic. t.1765. 1852. (**Map 3; Fig.3; Plate 2**)

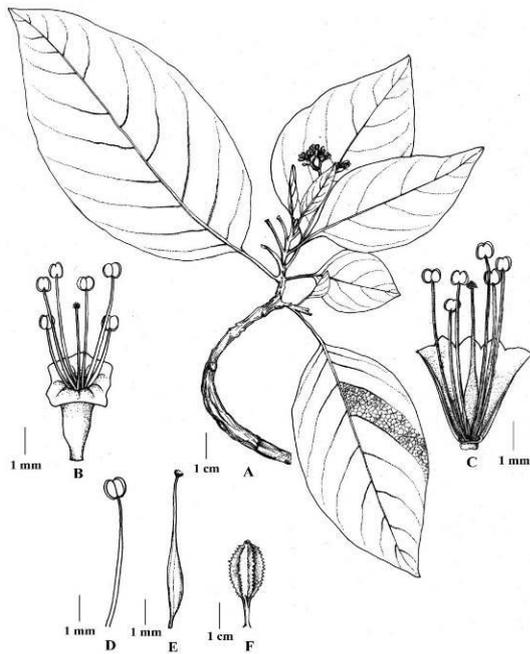


Fig. 3 . *Pisonia grandis* R.Br. : A. Portion of flowering twig; B. Flower; C. Flower splitted open; D. Stamen; E. Carpel; F. Fruit. [A - F: V. Balasubramaniam 1359 (CAL, MH)]

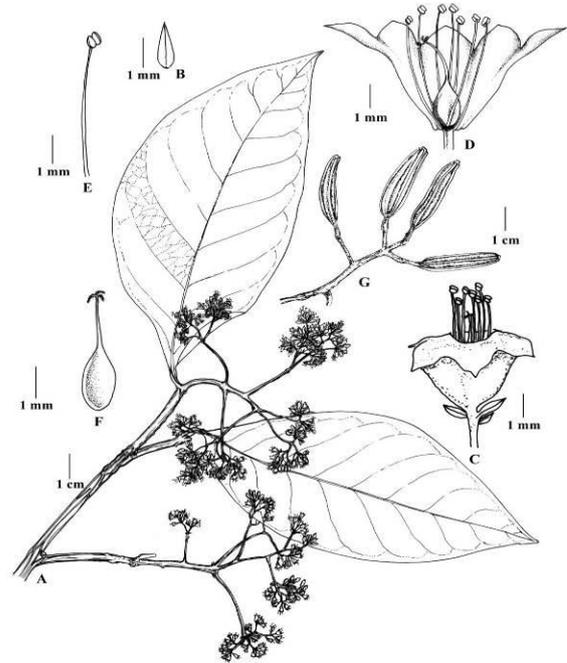
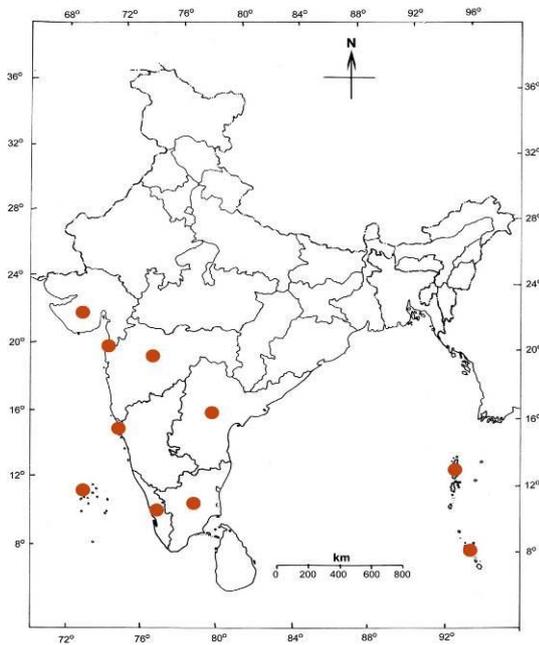


Fig. 4. *Pisonia umbellifera* (Forst.) Seem. : A. Portion of flowering twig; B. Floral bract; C. Flower; D. Flower splitted open; E. Stamen; F. Carpel; G. Anthocarp [A-F: Dr. Prain's Collector 47(CAL); G: N.P. Balakrishnan and N.C. Nair 3591 (CAL)].



Map 3. Indian distribution of *Pisonia grandis* R.Br. (●).



Plate 2. *Pisonia grandis* R.Br. : Habit [Inset:Portion of flowering twig (right below); portion of fruiting twig (left top)]

Type: North Coast of Australia (Iter Australiense), 1810, R. Br. *s.n.* (Isotype BM; B!).

Vern. names: **Guj.:** Velati Salet; **Kan.:** Sulesoppu; **Mar.:** Chinai salit; **Tam.:** Chandu, Illachaikkettayilai, Kottai, Muruval; **Tel.:** Lanchamundaku.

Evergreen, arboreous, unarmed, branched shrub, or a small tree, 8-12 m tall; Bark white-grey with conspicuous furrows and large leaf-scars; lenticels conspicuous. Branches cylindrical; young shoots pubescent, green. Leaves opposite,

simple, broadly ovate to elliptic, or oblong or ovate to oblong-ovate, 7-30 x 5-20 cm, bluntly acuminate to acuminate, sometimes acute at apex, entire at margin, cuneate or rounded or cordate at base and asymmetric, membranous, venation pinnately reticulate, lateral veins 8-10 pairs on each side, red or dark-coloured, contrasting with lighter coloured lamina with rusty puberulous on the veins beneath, older leaves lettuce green, younger ones yellowish-white; petioles stout, 1-8 cm long, glabrous, green; exstipulate. Inflorescences terminal, dense corymbose cymes; peduncles slender, puberulous, brown. Flowers polygamous. Male flowers incomplete, monochlamydous; pedicels 1-1.5 mm long, puberulous; bracts 2-4 at base on upper part of pedicel, deciduous. Perianth corolliform, gamocorolline, infundibuliform or tubular-campanulate to ovoid-oblong, lobed with 5 rows of black glands. Stamens - 8; filaments linear, slender, shortly exserted, glabrous; anthers 2-celled, dorsifixed. Female flowers incomplete, monochlamydous; pedicels 1-2 mm long, puberulous; bracts 2-4, at base or upper part of the pedicel, oblong, deciduous. Perianth narrow, ovoid-oblong, smaller than that of male flower, 1.5-3 mm long. Androecium absent. Carpel-1; ovary superior, 1-loculed; ovule solitary in basal placentation; style scarcely exserted; stigma penicellate. Bisexual flowers incomplete, monochlamydous; pedicels slender, 1-2.5 mm long, puberulous; bracteoles at base or upward, oblong, unicostate -reticulate, deciduous. Perianth corolliform, gamocorolline, tubular to funnel-shaped, 4-6 x 2-4 mm, 5-lobed and with 5-rows of black glands, white or pink. Stamens 8, or 9-12; filaments linear, exserted; anthers 2-celled, monomorphic, dorsifixed, red or orange. Carpel 1; ovary superior, 1-loculed; ovule solitary in basal placentation; style 1, lateral; stigma fimbriate or frilled or capitate, or somewhat peltate, not fringed, oblique, not exserted. Anthocarps (Fruits), simple, dry, indehiscent, narrow, elongated to club-shaped, or clavate, 5-ribbed or angled; each angle with monoserial row of prickles; hairy between ribs; fruiting pedicels 1-1.5 cm long, seed 1.

Phenology: Fl.- January-February; Fr.-March-April

Distribution: India [Andaman & Nicobar Islands, Kerala, Maharashtra, Tamil Nadu], Australia, China, Laccadives, Madagascar, Maldives Islands, Malesia, New Caledonia, Polynesia, Pakistan, Sri Lanka.

Ecology: The plant is found to grow in dry to semi-dry places, along coasts, sandy or rocky habitat, up to 50m, on oceanic islands and often dominant. This species is also cultivated as an ornamental edible plant in gardens.

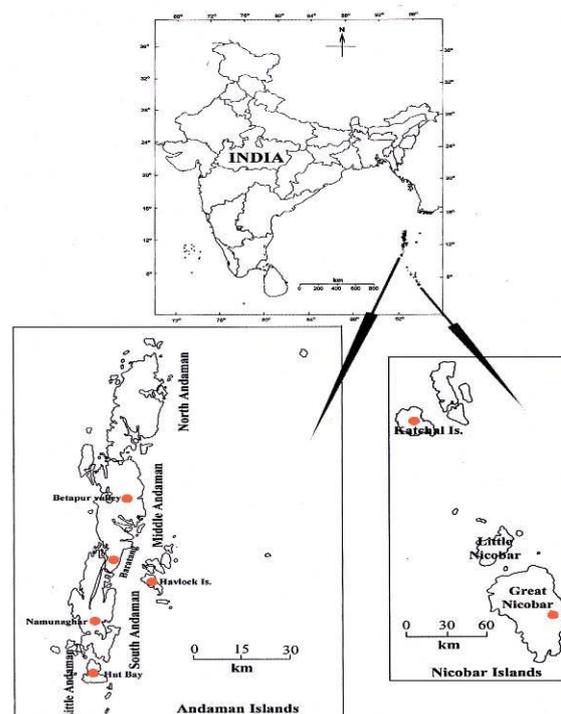
Uses: The fresh leaves, moistened with Eau-de-cologne, are used to subdue inflammation of a filarioid nature in the legs and other parts. Plant is used as diuretic. The root is considered as purgative. Leaves are taken as green vegetable. The plant also serves as a good hedge. Native people sometimes use the sticky fruits to catch birds. In several islands the leaves are used as vegetables specially the cultivated race with creamy or yellowish chlorotic leaves described as so-called "Moluccan Cabbage tree" or "Lettuce tree".

Specimens examined: **ANDHRA PRADESH:** West Godavari Dist., Ellore, Sea level, 25.01.1958, *Subramanyam* 5127 (CAL, MH); **KERALA:** Quilon, July 1914, Without any collector's name 2485 (TBGT); **TAMIL NADU:** Ramanathapuram Dist., Devipattanam, 50 m, 27.09.1987, *Balasubramaniam* 1359 (CAL, MH).

Notes: Stemmerik (1964) considered *Pisonia alba* Span., *P. morindifolia* R.Br. and *P. grandis* R. Br. conspecific and accepted the last name as a valid one on the basis of priority. However, Hook. f. in the Hook. f., Fl. Brit. India (1885) cited *Pisonia mitis* L. (1753) as an unambiguous synonym of *P. alba* Span. Therefore *P. mitis* L. has the priority over *P. alba* Span. But according to Van Rheede (1688), the species *P. mitis* is appearing a different plant as having spines [16].

P. grandis is a characteristic component of the *Barringtonia* formation; associated plants are frequently *Calophyllum*, *Cocos*, *Cordia*, *Erythrina*, *Guetarda*, *Pandanus*, *Scaveola* and *Thespesia*, etc.

3. *Pisonia umbellifera* (Forst.) Seem. in Bonplandia 10: 154. 1862. *Ceodes umbellifera* Forst., Char. Gen. 71, t. 71. 1776. *Pisonia excelsa* Bl., Bijdr.735.1825; Parkinson, Forest Fl. Andaman Is. 222.1923. *P. brunoniana* Endl., Prodr. Fl. Norfolk 43. 1833. *Heimerliodendron brunonianum* (Endl.) Skotts. in Svensk. Bot. Tidskr. 35: 364. 1941. *Bugainvillia racemosa* Blanco, Fl. Filip. 307. 1837. (Map 4; Fig. 4; Plate 3)



Map. 4. Indian distribution of *Pisonia umbellifera* (Forst.) Seem. (●).



Plate 3. *Pisonia umbellifera* (Forst.) Seem.: Habit [Inset: Portion of the flowering twig with buds (Left below); Flowering twig (right below)].

Type: Tanna, 1862, Forster, *s.n.* (BMI, Isotype).

Vern. names: Hind.: Bania

Evergreen, perennial shrub, or a small-sized tree, up to 30 m high; branches spreading, unarmed; bark smooth, greyish; inner bark pale green; sap wood soft, cream-coloured. Stems cylindrical, glabrous or rusty puberulous. Leaves subopposite to opposite, alternate, ternately whorled, sometimes conferred to the end of the twigs or in pseudowhorls, simple, ovate to elliptic-oblong or obovate or oblong or ovate-lanceolate to elliptic, 7-40 x 4-15 cm, shortly acuminate to acute, often obtuse or rounded at apex, entire at margin, cuneate to rounded or broadly obtuse, mostly unequal at base, papery, glossy, venation reticulate, lateral veins 8-10 pairs, without distinctly contrasting dark veins, dark green, blackish brown when dry, glabrous beneath; petioles stout, 0.5-5 cm long; exstipulate. Inflorescences terminal, compact, multi-branched, many-flowered, compound umbel, sericeous or glabrous; peduncles 3.5-4 cm long; each peduncle divided at or near the apex into a loose umbel, or contracted panicle of 4-8 rays which again bear 3-6 flowers, glabrescent or sparingly tomentose, green. Flowers incomplete, polygamous, monochlamydous; pedicels 1-2.5 mm long, glabrescent, green; bracts 1-3, at the base or higher up of the pedicel, lanceolate, small, acute, membranous, uninerved, glabrous, green, deciduous. Perianth corolliform, gamocorolline, campanulate with reflexed triangular 5-lobes, with short brown hairs, non-glandular, yellow. Stamens 6-14; filaments opposite to tepals, filiform, unequal, base united in a column, exserted; anthers 2-celled, subglobose, monomorphic, dorsifixed, dehiscence longitudinal, orange. Carpel 1; ovary superior, ovoid-ellipsoid, 2-3 x 1 mm, upper portion acuminate, 1-loculed; ovule solitary in each chamber in basal placentation; style 1.5-2.5 mm long; stigma tri-fid. Male flowers: ovary, style and stigma abortive or minute and non-effective. Female flower: style 1, terminal, glabrous,

yellowish; stigma 1, frilled or fimbriate, trifid, exserted. Anthocarps (Fruits) true, simple, dry, indehiscent, cylindrical or clavate, subterete, 2-4 x 0.3-0.5 cm, slightly curved, indistinctly 5-ribbed, coriaceous, enclosed within persistent calyx, black-brown; ribs very viscid, without prickle-like glandular structures; fruiting pedicels 4-10 cm long; seed 1.

Phenology: Fl.-December-February; Fr.-March-April

Ecology: This plant is found to grow often in coastal areas, from low to medium elevations, exposed to winds, both in ever-wet and monsoon forests; also grows along river banks, creeks, on sandy clay, sand and rocks under xeric habitat. It is known to grow up to the altitude of 243 m. Anthocarps of this species being too much viscid and sticky become adhered with feathers of birds and thus they are known to have fallen victim. This species has been commonly named as 'Bird Lime' tree.

Distribution: India [Andaman & Nicobar Islands], S. Africa, Christmas Island (S. of Java); Malesia; Mauritius; New south Wales; North Australia; Pacific Islands (Bonin Island); Micronesia (Palau, Yap, Truk); Melanesia (Bismarck Arch., Fiji, Lord Howe Island, Mangareva, Marquesas, North Island of New Zealand, Norfolk Island, Samoa, Solomon Island, Tanna, Tubuai Island); Queensland.

Uses: In Pacific regions, the sticky-viscid anthocarps of *Pisonia umbellifera* (Forst.) Seem. have been noted to use as bird catcher. The fruits or infructescences hang as fly or bird catcher. The birds disseminate the sticky fruits but due to excessive accumulation of fruits on feathers of small birds render them incapable of further flight and cause their eventual death [17][18][19]. The wood of this plant is soft and full of sap, eaten with relish by elephants [20] and is said that the sheep, which eat it get over their teeth a golden colour and appeared just like gold.

Specimens examined: ANDAMAN & NICOBAR IS.: S. Andamans, Namuna ghar-hilly jungle, 13.12.1890, *King s.n.* (CAL); Andaman Islands, Mount Harett, 800 ft., 02.01.1916, *Parkinson* 836 (CAL); Andaman Islands, 10.02.79, *N.P. Balakrishnan* and *N.C. Nair* 3591 (CAL).

Notes: Kurz (1877) has treated this species as *P. excelsa* Bl. and referred to Seemann's *P. umbellifera* [21] which Bentham (1870) affirms to be Blume's *P. excelsa* [22]. According to Hook. *f.* (1885) only leaves and fruits were seen by him and the rest of the description was taken from Kurz.

ACKNOWLEDGEMENTS

The first author is thankful to Dr. M. Sanjappa, Former Director, Botanical Survey of India for providing multifarious facilities. Greatful acknowledgement is expressed to Dr. S.K. Srivastava, Ex Indian Liaison Officer, Royal Botanic Garden, Kew, Richmond, Surrey TW9 3AB, United Kingdom., for sending cibachrome materials and protologues of the species of the genus *Pisonia* L.

REFERENCES

- Mabberley DJ, The Plant-Book. A Portable Dictionary of the Vascular Plants, (ed. 3), Cambridge University Press, Cambridge, 2008, pp. 590-591.
- Linnaeus C, Species Plantarum, Vol.II, Laurentius Salvius, Stockholm, 1753, pp.1026-1027.
- Roxburgh W, Flora Indica, (ed. W. Carey and N. Wall.) Vol.1, Mission Press. Serampore, Howrah, 1820, pp. 148.

4. Hooker JD, Nyctagineae in Flora of British India, [Hook. J.D.(ed.)], Vol. 4. L. Reeve & Co., London, 1885, pp. 708-711.
5. Choisy JD, Nyctaginaceae in Prodrromus Systematis Naturalis Regni Vegetabilis, de Candolle (ed.), Vol. 13 (2), Sumptibus Sociorum Treuttel et Wurtz, Paris, 1849, pp. 425-458.
6. Heimerl A, Nyctaginaceae in (Die) Natürlichen Pflanzenfam., Engler, A. and Prantl, K. (ed.), Vol. 16C, Berlin, 1934, pp. 86-134.
7. Prain D, Bengal Plants: A list of the Phanerogams, Ferns and Fern-allies Indigenous to, or commonly cultivated in the lower Provinces and Chittagong. vol. 2, Botanical Survey of India, Calcutta, 1903, pp. 861-864.
8. Standley PC, Allioniaceae. North Amer. Flora, Vol. 21, The New York Botanical Garden, New York, 1918, pp. 171-254.
9. Gamble JS, Flora of the Presidency of Madras, (repr. ed.), Vol. 2(2), Botanical Survey of India, Calcutta, 1956, pp. 813-815.
10. Haines HH, Botany of Bihar and Orissa, (repr. ed.), Vol. 2, Botanical Survey of India, Calcutta, 1961, pp. 793-795.
11. Stemmerik JF, Flora Malesianae Precursores, Notes on *Pisonia* L. in the Old World, Blumea, 1964, 12, 275-284.
12. Nasir YJ, Nyctaginaceae in Flora of West Pakistan, Nasir, E. and Ali, S.I. (ed.), Vol. 115, National Herbarium, Agricultural Research Council, Islamabad, 1977, pp. 1-16.
13. Dequan L and Gilbert MG, Nyctaginaceae in Fl. China, Zhengyi et al.(ed.) Vol. 5, Missouri Botanical Garden Press (St. Louis), 2003, pp. 430-434.
14. Kirtikar KR and Basu BD, Indian Medicinal Plants, (2nd ed.), Vol. III Allahabad, India, 1918, pp. 2045-2048.
15. Anonymous, The wealth of India-Raw Materials. Vol. VI, Council of Scientific and Industrial Research, New Delhi, 1962, pp. 392-393.
16. Rheede Van, (rep.ed.) Hortus Malabaricus, (rep.ed.), Vol. 7, Bishen Singh Mahendra Pal Singh, Dehradun, Uttarakhand, 1688, pp 34. t.17.
17. Govett RH, A Bird-Killing Tree, Trans. Proc. Royal Society New Zealand, 1883, 16, 364-366.
18. Kirk T, Botanical Notes, Trans. Proc. Royal Society New Zealand, 1883, 16, 367-368.
19. John St H, The distribution of *Pisonia grandis* (Nyctaginaceae): Pacific Plant Studies, Webbia, 1951, 8 (1), 225.
20. Parkinson CE, A Forest Flora of the Andaman Islands, Superintendent, Government Central Press, Shimla, 1923, pp. 221-222.
21. Kurz S, Forest Flora of British Burma, Vol. 2, The Superintendent Government Printing, Calcutta, 1877, pp. 278-280.
22. Bentham G, Flora Australiensis, Vol. V, Novell Reeve & Co., London, 1870, pp. 279-281.

CITE THIS ARTICLE AS:

Debasmita Dutta Pramanick, G. G. Maiti and M.S. Mondal. The Taxonomic Study of the Genus *Pisonia* L. (Nyctaginaceae) In India. *Annals of Plant Sciences* 4.8 (2015): 1179-1184.

Source of support: Nil

Conflict of interest: None Declared