

Research Paper

***Brownea* Jacq. (Leguminosae-Caesalpinioideae): a plant of high horticultural and medicinal value**

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Received: March 15, 2019

Accepted: March 30, 2019

Abstract

Brownea Jacq. belonging to subfamily Detarioideae (earlier in Caesalpinioideae) of family Leguminosae, is commonly known as Scarlet Flame Bean, Mountain Rose, Rose of Venezuela and Cooper Hoop. This genus is very popular due to its beautiful red flowers assembled in nodded head inflorescence like *Rhododendron* and canopy in umbrella-shape. Several species of *Brownea* are frequently used as ornamental trees in gardens, parks and along avenues. *Brownea* species have also been used traditionally for the treatment of diseases of women, birth control, wound healing, dysentery, diarrhoea etc. It is also used as anti-oxidant, analgesic, anti-fibrinolytic and anti-venom. Sometimes the wood is used as a source of timber and for making different kinds of handicrafts. Four to five species are widely cultivated as ornamental throughout India. The present paper highlights how ornamental plants increase the aesthetic value and eco-development of the surroundings besides beautification of the avenues. Moreover, they can be used for other purposes for the benefit of the society.

Key words: *Brownea*, ornamental, medicinal, aesthetic, eco-development.

Introduction:

The economically and ecologically important family Leguminosae is the third largest angiospermic family with about 770 genera and 19,500 species. The family is categorized traditionally into three subfamilies, Caesalpinioideae DC., Mimosoideae DC. and Papilionoideae DC (Polhill, 1997) [Recently the family has been divided into six subfamilies (Azani *et al.*, 2017)]. The Caesalpinioideae include 171 genera and 2,251 species (Doyle *et al.* 2000; Bruneau *et al.* 2001; Herendeen *et al.* 2003; Lewis *et al.* 2005). In India the family Caesalpinioideae represented with 31 genera and 169 species (Chaudhary and Rao, 2002)

India has the largest number of flowering trees in the world, indigenous as well as exotic species which are generally utilized for beautifying cities and avenues. *Brownea* is an evergreen neotropical genus which contains 30–32 species (Kumar and Sane, 2003). It is native to tropical America. However, it has been introduced in many parts of the world for its ornamental value. Species of *Brownea* are under storey trees or shrubs, occurring from humid tropical low land to premontane forest from sea level to 1300 m altitude (Klitgaard 1991; Klitgaard *et al.* 2013). They are further characterized by their large, red, globose, nodded flower heads with tubular nectiferous flowers with protruding stamens. Moreover, this group has handsome

hanging foliage and umbrella-shaped canopy which is another prominent feature for attraction.

The closest relative of *Brownea* is *Browneopsis*, but both differ in their mode of pollination and inflorescence morphology. In *Brownea* the flowers are adapted for humming bird pollination except one species *B. leucantha* (pollinated by bat or moths), while on other hand in *Browneopsis*, the flowers are creamy to pinkish in brush like inflorescence which is adapted for bat and moth pollination. In addition, the most distinguish features that separates *Browneopsis* from *Brownea* are absence of bracteoles, rudimentary petals and 9–26 stamens.

Enumeration of Species:

In India about four to five species of the genus are grown in different parts of the country (Sanjappa, 1992; Kumar and Sane 2003). These species are - *B. coccinea* Jacq., *B. grandiceps* Jacq., *B. hybrida* Backer and *B. rosa-de-monte* Bergius. A comparative synopsis of these species is furnished below.

Brownea coccinea Jacq., Enum. Pl. Carib. 26. 1760; Benthall, Trees Calc. 180. 1946; Sanjappa, Legum. India 8. 1992; Kumar & Sane, Legum. South Asia: checkl. 68. 2003.

Synonym: *Hermesias coccinea* Kutze.

Flowering: December-February; Fruiting: March - April

Brownea grandiceps Jacq., Collect. 3: 287, t. 22. 1791; Sen & Naskar, Bull. Bot. Surv. India 7: 37. 1965; Sanjappa, Legum. India 8. 1992; Kumar & Sane, Legum. South Asia: checkl. 68. 2003.

Synonyms: *Brownea amplibracteata* Pittier, *B. araguensis* Pittier, *B. ariza* Benth., *Hermesias grandiceps* (Jacq.) Kuntze

Flowering: Round the year with intervals.

Brownea hybrida Hort. ex Backer, School Fl. Java 418. 1911; Sen & Naskar, Bull. Bot. Surv. India 7: 37. 1965; Sanjappa, Legum. India 9. 1992; Kumar & Sane, Legum. South Asia: checkl. 69. 2003.

Flowering: February - March; Fruiting: April -May

Brownea rosa-de-monte Bery., Phil. Trans. 171, t. 8, 9. 1771.

Synonyms: *Brownea antioquiensis* Linden, *B. princeps* Otto, *B. rosa-del-monte* Pittier, *B. rosa-montis* Pittier, *B. rosea* Otto, *Hermesias rosa* (pers.) Kuntze.

Flowering: February - March

These species are chiefly grown as ornamental tree in India. They can be differentiated by height of the plants, leaflets number, inflorescence size, flowers and number of stamens (Table - 1). Out of these, the most common species which is grown in gardens is *Brownea grandiceps*. The description of *B. grandiceps* is provided here as a key.

Description of *Brownea grandiceps* :

Tree up to 6 m high; young branchlets densely covered with short hairs.; **Stipules** caducous, conspicuous, quite variable. **Leaves** compound, alternate, peripinnate; petiole 0.2–0.5 cm long, swollen at base, pubescent; rachis 8.2–26.5 cm long, tomentose; leaflets 6–12 pairs, size of leaflets increases from proximal to distal end of leaf, adaxial surface of leaf is lighter green while abaxial surface is dark green. proximal leaflets 3.5–7 x 1.9–6 cm, ovate, cordate at base, entire undulate/wavy along margins, acuminate at apex, glabrous on both surfaces, distal leaflets 4.7–10 x 3.6–9 cm,

ovate, oblong, wavy or undulate along margins, acuminate at apex, glabrous on both surfaces. **Inflorescence** globular head, 10–17 cm in diameter, terminal or axillary, 35–40-flowered; peduncle 1.7 cm long, woody, glabrous, floral rachis 2.3 cm long. **Bract** 2.5–3.4 x 0.8–1.7 cm, deciduous, creamish-pink, ovate, entire and wavy along margins, rounded at apex, tomentose. **Bracteoles** 2.2–0.6 cm long, persistent, creamish, sheath like, enclosing flower bud, densely hairy outside, less hairy inside. **Flowers** deep red-orange-coloured, 5.7–6.8 cm long, with projected stamens and style, open centripetally; pedicel 0.2–0.7 cm long, tomentose. **Sepals** 4, light red-orange, 0.7–1.8 x 0.3–0.7 cm, ovate, entire along margins, rounded at apex, glabrous. **Petals** 5, 2.5–3.5 x 0.3–0.5 cm, reddish-orange, spatulate, attenuate at base, entire undulate/wavy along margins, rounded at apex, glabrous. **Stamens** 11–13, 5–8 cm long, connate at base; staminal sheath 0.2–0.3 cm long, tomentose; filaments unequal in length, united at base, 4.3–7.2 cm long, red in upper portion, whitish-yellow in lower portion; anther 0.2–0.4 cm long, yellow, dithecal, oblong, dorsifixed, glabrous. **Pistil** 5.2–6.7 cm long; stipe 1.6 cm, white hairy; ovary 1.3 cm long, white hairy; style one 2.3 cm long, filiform, red, glabrous; stigma dotted pin head like black coloured. **Pod** 9–13.5 x 3.5cm, light brown at maturation, nearly spindle-shaped, woody, shortly stipitate, entire along margins, shortly beaked at apex, feathery, 2–4-seeded.

Seeds 1.8–2.2 x 1.5–1.6 cm, oval, brown coloured, glabrous, veined (Figure -1).

Flowering: March-April; **Fruiting:** April-July.

Uses:

Ornamental/Horticultural/Environmental - Chiefly three species i.e., *B. coccinea*, *B. grandiceps* and *B. rosa de-monte* are grown throughout their range as ornamental. Their beautiful attractive red flowers with protruding stamens and dense canopy are the main reasons of popularity for planting in parks and gardens. *Brownea* species are also planted along the roadsides for greening, shade and cooling effect for

Table 1: Comparative analysis of morphological characters of *Brownea coccinea*, *B. grandiceps*, *B. hybrida* and *B. rosa-de-monte*

Characters	<i>B. coccinea</i>	<i>B. grandiceps</i>	<i>B. hybrida</i>	<i>B. rosa-de-monte</i>
Height (Tall)	5–11 m	3–15 m	5 m	6–10 m
Leaflet	3–7 pairs	7–12 pairs	5–10 pairs	1–3 pairs
Inflorescence	Loose, pendent, terminal on branches or cauliflorous to trunk base	Compact, pendent, terminal on side branches	Terminal or in the axil of the leaves	Terminal, almost sessile on branchlets often defoliate at blooming time
Diameter of Head	7–12 cm	11–20 cm	14–20 cm	9–10 cm
Flowers per Inflorescence	8–32 flowers per inflorescence	40–90 flowers per inflorescence	35–80 flower per inflorescence	29–50 flower per inflorescence
Flower colour	Vermillion-rose	Bright red	Crimson to cherry-red	Scarlet red
Stamens (nos.)	10–11	11–13	11	10–14

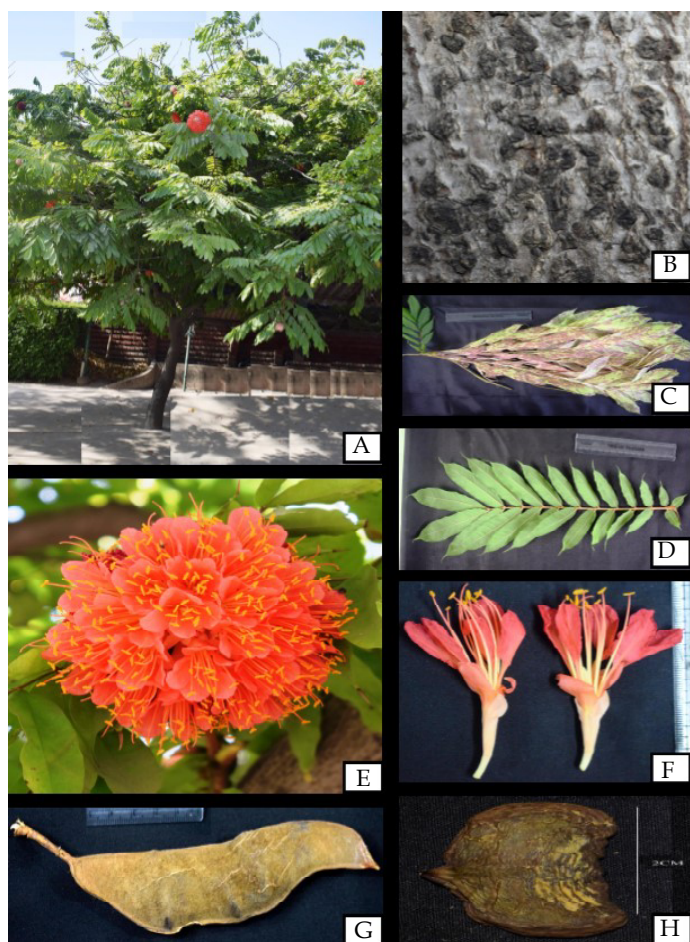


Figure 1. *Brownea grandiceps*: A. Habit, B. Bark, C. Bunch of new laves, D. Leaf, E. Inflorescence, F. Flowers, G. Pod, H. Seed.

pedestrians and travelers. These species can give thermal reduction up to 8°C due to their dense foliage. They also act as biological filter to clean the environmental and noise pollution. Therefore, trees are known as natural purifier.

Medicinal - *B. grandiceps* is used in folk medicine for the treatment of dysentery, diarrhoea, and bleeding (Mohamed *et al.* 2016) and its bark contains a powerful haemostatic. In Guyana, *B. coccinea* is used traditionally for the treatment of gynecological disorders like dysmenorrhea and menorrhagia. In Bangladesh, this plant is known as 'Supti' and is distributed in region of Chittagong and Sylhet. The roots and leaves of this plant are used traditionally by the Chakma tribe of Bangladesh for treating gynecological problems (Sarwal *et al.* 2015). In Venezuela, the decoction of flowers of *B. grandiceps* is used traditionally as anti-haemorrhagic in women with heavy menstrual blood loss (menorrhagia) (Pereira and Brazón, 2015). It is used as anti-

fibrinolytic to reduce bleeding during surgeries with high risk of blood loss such as cardiac, liver, tooth extraction and large orthopaedic procedure as well as for menorrhagia treatment (Pereira, *et al.* 2017). The stem bark of *B. rosa-de-monte* are used against snake bite (Gomes, 2010).

Timber - The wood of *B. grandiceps* is very hard and resistant to termites. Therefore, used for various purposes and preparation of handicrafts.

Acknowledgement:

The authors extend their sincere thanks to Director, CSIR-NBRI for providing necessary facilities.

References:

- Azani, N., Babineau, M., Bailey, C. D., Banks, H., Barbosa, A. R., Pinto, R. B., ... & Candido, E. 2017. A new subfamily classification of the Leguminosae based on a taxonomically comprehensive phylogeny The Legume Phylogeny Working Group (LPWG). *Taxon*. 66(1): 44-77.
- Bajpai, O., Kumar, A., Srivastava, A., Kushwaha, A., Pandey, J., & Chaudhary, L. 2015. Tree species of the Himalayan Terai region of Uttar Pradesh, India: a checklist. *Check List*. 11(4): 1-15.
- Gomes, A., Das, R., Sarkhel, S., Mishra, R., Mukherjee, S., Bhattacharya, S., & Gomes, A. 2010. Herbs and herbal constituents active against snake bite. *Indian Journal of Experimental Biology*. 48: 865-878.
- Kumar, S. And Sane, P. V. 2003. *Legumes of South Asia*. Royal Botanical Gardens Kew, vii+536pp.
- Klitgaard, B. B. 1991. Ecuadorian *Brownea* and *Browneopsis* (Leguminosae Caesalpinioideae): taxonomy, palynology, and morphology. *Nordic Journal of Botany*. 11(4): 433-449.
- Larsen, D. H. K. and Larsen, S. S. 1996. Caesapiniaceae (Leguminosae-Caesaplinioideae). In: Steenis, C. G. G. J. and Van Steenis-Kurseman, M. J. (eds.), *flora Malesiana*, Series 1, Spermatophyta. Noordhoff-Kolff, Djakarta, 12(2) pp 409-730.
- Martin, F. W. 1970. The ultraviolet absorption profile of stigmatic extracts. *new phytologist*, 69(2): 425-430.
- Missouri Botanical Garden and Henary Shaw school of botany. Graduate Laboratory. 1951. *Flora of Panama*. Missouri Botanical Press, St. Louis, Missouri, 38(5): pp33-36.
- Mohamed, E. I., Zaki, M. A., Owis, A. I., AbouZid, S., Seida, A. A., & Ross, S. A. (2016). Phytochemical Studies On *Brownea Ariza*. *Planta Medica*, 82(05): PC52.
- Otero, R., Núñez, V., Barona, J., Fonnegra, R., Jiménez, S. L., Osorio, R. G., ... & D'áz, A. 2000. Snakebites and ethnobotany in the northwest region of Colombia: Part III: Neutralization of the haemorrhagic effect of *Bothrops atrox* venom. *Journal of Ethnopharmacology*, 73(1-2): 233-241.
- Pereira, B., & Brazón, J. 2015. Aqueous extract from *Brownea grandiceps* flowers with effect on coagulation and

- fibrinolytic system. *Journal of ethnopharmacology*. 160: 6-13.
- Pereira, B., Brazón, J., Rincón, M., & Vonasek, E. 2017. Browplasminin, a condensed tannin with anti-plasmin activity isolated from an aqueous extract of *Brownea grandiceps* Jacq. flowers. *Journal of ethnopharmacology*. 198: 282-290.
- Polhill, R. M. 1997. Introduction to the Leguminosae. *Bot. Mag.* 14(4): 176-183.
- Rao, R. R., Chaudhary, L. B. 2002. Legume Diversity in India: Current status and future prospects, *Advances in Legumes Research in India*. Bishen Singh Mahendra Pal Singh: Dehra Dun, 1-25pp.
- Rashid, Z. A., Al Junid, S. A. M., & Thani, S. K. S. O. 2014. Trees-cooling effect on surrounding air temperature monitoring system: Implementation and observation. *International Journal of Simulation: Systems, Science and Technology*, 15(2): 70-77.
- Sanjappa, M. 1992. *Legumes of India*. Bishen Singh Mahendra Pal Singh, Dehra Dun, iv+338pp.
- Sarwar, A., Huq, T. B., Malik, T., & Das, B. K. 2015. Antioxidant and analgesic activities of ethanol leaf extract of *Brownea coccinea*. *Advancement in Medicinal Plant Research*, 3(2): 69-74.
- Srivastava, T. N. 1965. *Flora Gorakhpurensis*. Today and Tomorrow's Printers and Publishers, New Delhi, pp 115.