

# TAXONOMY OF *IXORA COCCINEA* L. (RUBIACEAE-PAVETTEAE) IN INDIA

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## Abstract

The present paper enumerates three varieties of *Ixora coccinea* L. with several forms. Morphological, distributional, ecological and leaf epidermal data have been appended to show that the varieties—*coccinea*, *bandhuca* (Roxb.) Kurz and *lutea* (Hutch.) Corner are in fact distinct.

## Introduction

*Ixora coccinea* L. is mainly distributed in Western Ghats and South India, and is also grown for its beautiful cluster of flowers throughout India as well as in other tropical countries. It is closely related to *I. chinensis* Lam., a native of Moluccas and China. Corner (1941) recognized five varieties and several forms within this polymorphic species, of which three are cultivated in Singapore and Malaya, the remaining two, i.e. var. *bandhuca* and *lutea* are distributed in India and are dealt here. The main purpose of this paper is to exhibit that the different varieties and forms in *I. coccinea* are morphologically quite distinct and worthy of taxonomic recognition.

## Description

*Ixora coccinea* Linn., Sp. Pl. 110. 1753; Roxb., Fl. Ind., ed. Carey & Wall, 1: 375. 1820; Wight & Arn., Prodr., 1: 427. 1834; Wight, Ic.t. 1(8) : 153. 1839; Dalz., & Gibs., Bomb. Fl. 112. 1861; Kurz, For. Fl. Burma 2 : 86, 1977; Hook, f., Fl., Brit. Ind. 3 : 145. 1880; Koord. & Val., Bijdr. Booms. Java 8 : 167. 1902; Gamble, Fl. Madras 2 : 445, 1902; Prain, Contr., Ind. Bot 275. 1906; Talbot, Fl. Bomb. 2 : 115. 1911; Merrill, Fl. Manila 452. 1912; Haines, Bot. Bihar and Orissa 4 : 434. 1922; Merrill, Phillip. flow. Plants 3: 547. 1923; Corner, Gard. Bull. Sing. 11 : 185. 1941; Bor & Raizada, Some beaut. Ind. Clim. & Shrubs 86. 1954; Cooke, Fl. Bombay 2 : 40 (Rep. ed.) 1958; Thothathri, Bull. Bot., Surv. India 2 : 365. 1960; Prain, Beng. Pl. 1 : 418. (Rep. ed.) 1963; Maheshwari, Fl. Delhi 183; Back. & Bakh. f., Fl. Java 2 : 327. 1965; Shah, Fl. Guj. State 1 : 354. 1978; Rao & Razi, Fl. Mysore Dist., 7 : 535. 1981.

*Ixora arborea* Lodd., Bot. Cab. t. 609, 1822. Type: Bot. Cab. t. 609, 1822.

*Ixora incarnata* DC., Prodr. 4 : 486. 1830.

*Ixora propinqua* R. Br., Wall. Num. list no. 6119. 1831. (*nom. nud.*) Type: Nees in Wall., Num. list 6119 G (CAL); Brown in Wall., Num. list 6119 (CAL).

*Ixora grandiflora* Br., Bot. Reg. 2: 294, t. 154, 1816-1817; Wight, in Hook. Bot. Miscel. 3 : 294, t. 35. 1833; DC., Prodr., 4(2) : 486. 1857.

*Ixora fraseri* Hort. ex Gentil. Pl. Cult., Serres Jard. Bot. Brux. 103. 1907.



*Ixora morsei* Hort. ex Gentil, Pl. Cult. Serres Jard. Bot Brux. 103, 1907.

*Type*—Ceylon, herb. Linn. (LINN 131.1 not seen).

*Vernacular names*—Tnetti, Vedchi: Tam; Bakora, Pendgul: Mar., Gudde-dasal: Karnataka; Pathali: Kon.; Rangan, bandhuca: Beng.

A shrub or small tree 60 cm-4m high; stem solid, rounded; internodes 1-7 cm long; stipule 4-11 × 2-4 mm, inside hairy, outside glabrous; cusp 2-7 mm long. Leaf-blade 2.9-11.8 × 1.5-5.4 cm, obovate to elliptic ovate or oblong, apex mucronate, rounded or apiculate, base rounded or cordate, sessile or shortly stalked, glabrous; petiole 0-4 mm long; lateral nerves 8-14 pairs; upper pair of leaves at the base of the peduncle smaller, 1 × 0.5 cm. Corymbs 5-10 cm wide, sessile or with a short peduncle, branches puberulous, articulate; bracts 1-11 mm long, pubescent. Flowers 27-37 per head red, bright or scarlet red, Jasper or brick red, spanish orange, claret rose, yellow, yellowish orange or lemon yellow, in trichasia, central flowers in the trichasia sessile, ebracteolate, laterals pedicelled, bracteolate; pedicel 1-4 mm long, pubescent; bracteole 0.5-1.5 mm long, pubescent, acute, tips green, claret rose or pinkish. Calyx-tube 1-2 mm long, pubescent; lobes 0.5-2 mm long, triangular, acute, pubescent, claret rose, red or greenish. Corolla-tube 12-45 mm long, pubescent all over; lobes 7.5-20 × 3-9 mm, lanceolate-elliptic or ovate-elliptic, acute, pubescent; filaments 0.8-2 mm long; anthers 3-4.5 mm long; style 22-46 mm long; stigmatic arms 1.5-3 mm long. Fruit 5-7 × 5-6 mm, globose, crimson or red.

#### Key to the varieties of *I. coccinea*

1. Flowers red, Jasper-red, brick red or claret rose; calyx-lobes reddish; stigma reddish.
  2. Corolla-lobes 3-7 mm wide; tube 21-37 mm long.....a. var. *coccinea*
  2. Corolla-lobes 7.5-9 mm wide; tube 38-41 mm long.....b. var. *bandhuca*
1. Flowers yellow, lemon yellow, yellowish orange, spanish orange; calyx-lobes light green; stigma yellowish green.....c. var. *lutea*

*Notes*—(a) According to Corner (1941) *Ixora coccinea* L. is confused with *I. chinensis* Lam. (Type: Sonnerat, spec. sinense, in Herb. Lam.-not seen). Our observations indicate that *Ixora coccinea* can easily be separated from *I. chinensis* on the following points: (i) *Ixora coccinea* has the young branches, the outer side of the stipules and the abaxial leaf surfaces glabrous, in *I. chinensis* the stipules and abaxial surfaces of the leaves are pubescent, (ii) Number of flowers per head 27-37 and corymb branches green in *Ixora coccinea*, number of flowers per head 80-90 and corymb branches red in *I. chinensis* and (iii) corolla-lobes acute in *Ixora coccinea*, rounded or obtuse in *I. chinensis*,

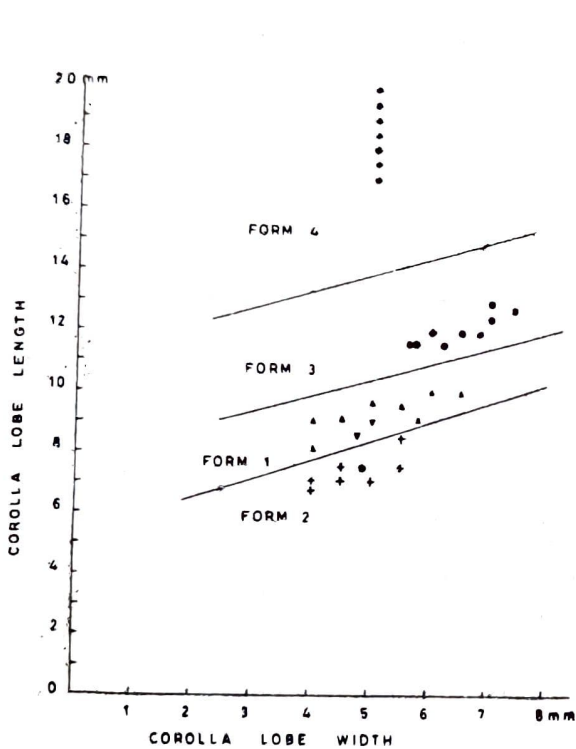
(b) Wight's (1839) plate number 184 (as *I. stricta*) and Curtis (1791) plate number 169 (as *I. coccinea*) are wrongly identified drawings of the same species, i.e. *I. chinensis* Lam. *I. stricta* Roxb. is now treated as a synonym of *I. chinensis*. The leaves in both these plates are shown as having cuneate base and are oblong and the flowers have rounded or obtuse corolla-lobes. Curtis (1791) plate number 169 clearly shows red corymb branches. Contrary to this, *I. coccinea* has rounded or cordate leaf bases, pointed or acute corolla-lobes and green corymb branches. Wight's (1839) plate number 153 is a good representation of *I. coccinea* and the differences between *I. coccinea* and *I. chinensis* can be easily found out by comparing the above three plates.

(c) One sheet from BM consists of five specimens. The two upper left hand specimens C. B. Clarke 20060 from Dacca; the upper right hand specimen R. H. Beddome 3894 from Calicut; the central one Heyne s.n. and the bottom one is of Helfer 13. The latter two

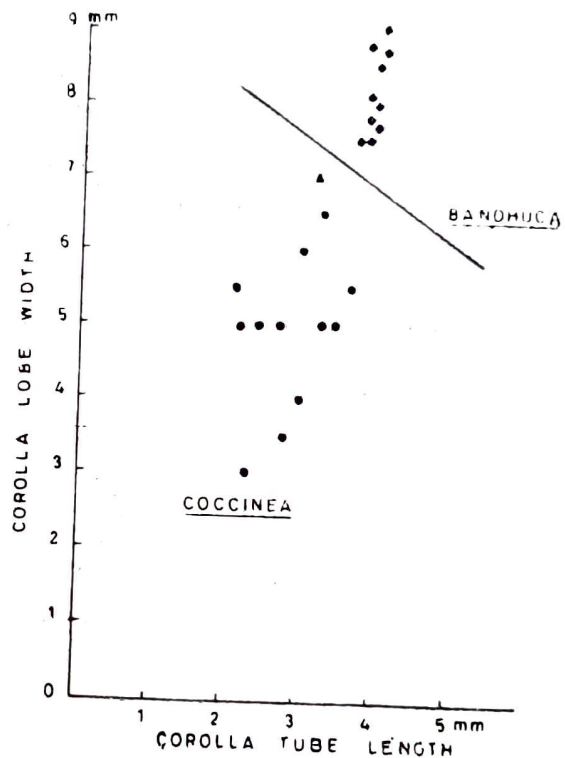
has no indication of their locality. They are all variable with respect to leaf shape and size of corolla-tube and are interconnected through several intermediate forms from specimens of other regions.

(d) Leaf trichomes are completely lacking and the outer periclinal walls of the abaxial leaf epidermis are flat in the three varieties (Pl. 1, figs. A-C). The abaxial surface of the leaf-blade in var. *coccinea* shows striate to smooth cells; the elliptical to globose stomata are situated at the same level as other epidermal cells (Pl. 1, fig. A); peristomal rims around the stomata are present and the guard cells are raised above the subsidiary cells. Wax is present.

(e) Four well marked forms (Text-fig. 1) are recognised within the typical variety differing in leaf shape, flower colour, anther length, and the length and the width of the calyx and corolla-lobes.



Text-fig. 1



Text-fig. 2

Text-fig. 1—Scatter diagram showing corolla-lobes length plotted against corolla-lobes width for flowering specimens of the different forms of var. *coccinea* with red calyx-lobes; ● : Flowers claret rose; anthers 4.1-4.5. mm long; ◆ : Flowers claret rose; anthers 4 mm long; ▲ : Flowers red; anthers 3.5-4 mm long; ▼ : Flowers red; anthers 3-3.2 mm long; ○ : Flowers Jasper red or brick red; anthers 3.5-4 mm long; + : Flowers Jasper red or brick red; anthers 3-3.2 mm long.

Text-fig. 2—Scatter diagram showing corolla-lobes width plotted against corolla-tube length for flowering specimens of *Ixora coccinea* with red calyx-lobes: ● : petals lanceolate-elliptic, acute; ◆ : petals ovate-elliptic, suddenly pointed; ▲ : petals ovate-elliptic, acute.

**Key to the forms of var. *coccinea***

1. Flowers red, Jasper red or brick red
  2. Calyx-lobes 0.5-0.1 mm long ..... Form 1
  2. Calyx-lobes 1.4-1.6 mm long ..... Form 2



## 1. Flowers claret rose

3. Corolla-lobes 11.5-13 × 5.6-7 mm.....Form 3  
 3. Corolla-lobes 17-20 × 5 mm.....Form 4

## FORM 1

Calyx-lobes reddish ; corolla-tube 23-37 mm long ; anthers 3-4 mm long.

*Specimens Examined*—Uttar Pradesh : Lucknow, N.B.R.I., 14 March 1978, *R. S. Ojha* s. n. (LWG). West Bengal : Hort. Bot. Calc., *Wallich* s. n. (BM) ; Calcutta, 3 April 1960, *M. Kani*, *G. Murataj* & *T. Tuyama* 6031 (BM). Assam : *Griffith* 2115 (BM). Maharashtra : Thana, Mumbra hill, *K. V. Billore* 116615 (CAL) ; Uran, 5 Sept., 1960, *P. Divakar* 1358 (BLAT) ; Malad, Marve-Mudh Road, 31 Dec. 1955, *G. L. Shah* 6660 (BLAT) ; Bombay, 27 June 1937, *Andrews* 282 (BM) ; Bombay, Marvi, 18 April 1937, *Andrews* 337 (BM). Karnataka : Londa, Banks of Kali Nadi, 21 April 1950, *H. Santapau* 10826 (BLAT) ; Jog Falls, 18 May 1954, *H. Santapau* 18580 (BLAT) ; North Kanara, April 1883, *W. A. Talbot* s.n. (BSI) ; Balicop forest, Siddapur, 19 Nov. 1957, *S. D. Mahajan* 1262 (BSI) ; Kanara, 1847, *Hohenacker* 7, 7a, 7b (BM). Andaman & Nicobar Islands : S. Andaman, Port Blair, 13 April 1964 *K. Thothathri* 10202 (CAL) ; Dhani Khasi Hill Jungles, 4 April 1894, *King's Collector* s.n. (BSI) ; Viper Islands 29 July 1978, *P. Basu* 6685 (BSI, CAL). Unknown Locality : India Orientalis, *Roxburgh* s. n. (BM) ; India Orientalis, *Hove* s.n. (BM) ; India, *Wallich* 5855A (L). Bangla Desh : Dacca, 10 April 1873, *C. B. Clarke* 20060 (BM).

## FORM 2

Calyx-lobes reddish ; corolla-tube 21-27 mm long ; anthers 3-4 mm long.

*Specimens examined*—Uttar Pradesh : Lucknow, N.B.R.I., 3 May 1984, *T. Husain* 13705, 13707 (LWG). West Bengal : Howrah, Indian Bot. Gard., 29 May 1913 ; *P. M. Debbarman* 12261 (CAL) ; Calcutta, 20 March 1878, *s.l.* s.n. (CAL). Laccadive Islands : Minicoy, 6 Dec. 1891 *s.l.* s.n. (CAL). Minicoy Islands, 26 Nov. 1960 *B. M. Wadhwa* 69844 (BSI) ; 18 Feb. 1875, *A. O. Hume*, s.n. (CAL). Maharashtra : Powai Lake 19, Dec. 1959, *Y. A. Merchant* 1426 (BLAT) ; Ratnigiri Dt., Karanji Jungle, 20 Feb. 1970, *B. G. Kulkarni* 120290 (BSI). Goa, Daman & Diu : Daman, Debal chowky, 4 May 1963, *Rolla Seshagiri Rao* 9007 (BSI). Karnataka : Mysore, Oct. 1908, *A. Meebold* 9717 (CAL) ; Tirthalli, *B. S. Ahuja* 50073 (BSI) ; Mysore, Balehalli, 23 May, 1960, *R. Raghawan* 62880 (BSI) ; North Kanara, Karwar, 15 June 1885, *W. A. Talbot* 1855 (MH) ; Someshwar forest t90 m, 28 June 1978, *C. J. Saldanha* & *S. R. Ramesh* 1829 (JCB) Kerala Thrykur, 20 Feb. 1957, *G. S. Puri* 15688 (BSI) ; Palghat Dt., Olavakkot, 75 m, 17 Oct. 1963, *J. Joseph* 17770 (CAL) ; Calicut University Campus, 20 Feb. 1982, *C. J. Saldanha* & *S. R. Ramesh* 14358 (JCB) ; Quilon to Trivandrum, 18 Jan. 1923 ; *M. A. Evershed* s.n. (BM).

## FORM 3

Calyx-lobes claret rose ; corolla-tube 25-33 mm long ; anthers 4.1-4.5 mm long.

*Specimens Examined*—Uttar Pradesh : Pilibhit, 15 May 1970, *C. L. Malhotra* 40285 (CAL) ; Lucknow, N.B.R.I., 3 May 1984, *T. Husain* 13706, 13708 (LWG) ; Lucknow, N.B.R.I., 28 Sept. 1961, *S. Chopra* 62301 (LWG). Maharashtra : Bombay, Victoria Gardens, 23 Aug. 1957, *Y. A. Merchant* 139 (BLAT) ; Bombay, Juhu flats, Dec.



1924, *R. P. Acland* 539 (BLAT) ; Goa, Daman & Diu : Golauli, 27 Sept. 1970, *N. P. Singh* 124670 (BSI) ; Velpoi, 5 Oct. 1964. *R. S. Raghavan* 103299 (BSI). Karnataka : Kumta, 28 Sept., 1978, *K. R. Keshwa Murthy & K. P. Sreenath* 2997 (JCB) ; Shimoga Dist., Hosandgara, 25 Jan. 1981, *C. J. Saldanha, B. Gurdev Singh & B. Ajay Kumar* 12561 (JCB). Tamil Nadu : Kanyakumari Dt., Pemchani, +180 m, 3 Sept., 1976, *A. N. Henry* 48209 (MH).

FORM 4

Calyx-lobes claret rose ; corolla-tube 33-37 mm long ; anthers 4 mm long.

*Specimens examined*—West Bengal : Goghat, Hoogly Dist., Aug. 1902, *D. Prain* s.n. (CAL) ; Malda, 27 April 1966, *R. M. Dutta* 220 (CAL) ; Hort. Bot. Calc., May 1827, *Wallich* s.n. (BM). Maharashtra : Bombay forest Sion Hill, 1 July 1941 *H. Santapau* 154.17 H (BLAT) ; Bombay, Cutch-Saurashtra, Bhavnagar-Motilong, 14 May 1957, *S. K. Jain* 17980 (BSI). Karnataka : South Kanara, Belve, 14 Oct. 1960, *C. Saldanha* 5861 (BLAT) ; Karwar, 15 June 1885, *W. A. Talbot* 1855 (MH). Andaman & Nicobar Islands : Port Blair, 10 m, 13 April 1964, *J. L. Ellis & K. Ramamurthy* 18761 (MH).

b. var. *bandhuca* (Roxb.) Kurz., For. Fl. Burma 2 : 27.1877 ; Corner, Gard., Bull. Sing. 11 : 183. 1941. *Ixora bandhuca* Roxb., Hort. Beng. 10. 1814 (*nom. nud*) et Fl. Ind., ed. Carey & Wall. 1 : 386. 1820 et Fl. Ind., ed. Carey 1. 376, 1832 ; Wall., Num, list no. 6120, 1831-32 ; Wight, Ic., t. 1 : (8) : 149. 1839.

*Notes*—(a) Roxburgh (1820, 1832) distinguished *Ixora bandhuca* from *I. coccinea* by being more branched, with stem clasping, obtuse leaf-blades and ovate-obtuse corolla lobes. Kurz (1877) reduced it to varietal rank under *I. coccinea* and recognized two varieties; var. *linneana* (endemic to Burma) with corolla-lobes ovate-lanceolate, very acute and var. *bandhuca* with corolla-lobes broadly ovate, bluntish, leaves usually all sessile with a cordate base, blunt with mucro. Hook f. (1880) treated *Ixora bandhuca* as a synonym of *I. coccinea*. Corner (1941) followed Kurz (1877) in reducing *Ixora bandhuca* to a varietal rank under *I. coccinea* on the basis of the petals which are 8-10 mm wide, ovate-elliptic rather suddenly pointed and the corolla-tube 35-40 mm long in var. *bandhuca* and petals 2-8 mm wide, lanceolate-elliptic, acute, corolla-tube 20-35 mm long in the typical variety *coccinea* (Text-fig. 2). The difference from *I. coccinea* is well shown in Wight's two plates which are copies of Roxburgh's drawings. The distinction however, is merely varietal. Var. *bandhuca* deviates from the typical variety in having petals ovate-elliptic, rather suddenly pointed (not lanceolate-elliptic, acute).

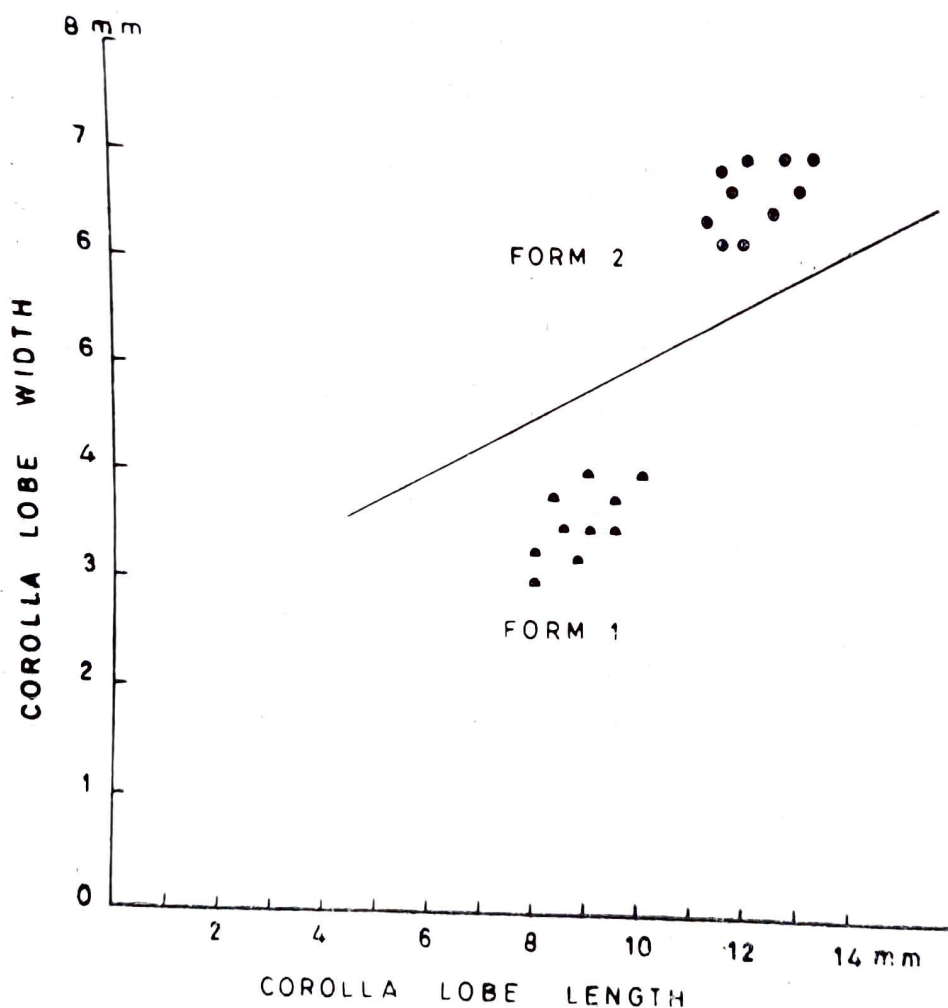
(b) As Wight's plate (t. 149) is a copy of Roxburgh's drawing of *I. bandhuca* (Corner, 1941), it may be accepted as a lectotype.

(c) The abaxial surface of the leaf-blade in var. *bandhuca* shows prominent cuticular striations, difficulty distinguished cell boundaries, elliptical to globose stomata situated at the same level as other epidermal cells, peristomatal rims around the stomata and guard cells raised above the subsidiary cells. Wax is present (Pl. 1, fig. B.).

*Specimens examined*—West Bengal : Hort. Bot. Calc., *Wallich* s.n. (BM). Maharashtra : Andheri-Vinalaya, 23 Sept. 1945, *H. Santapau* 7361 (BSIP). Andhra Pradesh : Cocanada, 1932-34, *G.S. Murty* s.n. (BSIP). Karnataka : S. Kanan, Belve, 14 Oct., 1960, *C. Saldanha* 5861 (BLAT) ; Andaman & Nicobar Islands : S. Andamans, Port Blair, 17 Jan. 1958, *K. Thothatri* 9080 (PBL). Without Locality : *G. King* 25(CAL) : India Orientalis, *Heyne* s.n. (BM) : India Orientalis, *Roxburgh* s.n. (BM).

- c. var. *lutea* (Hutch.) Corner, Gard. Bull. Sing. 1 : 186, 1941. *Ixora lutea* Hutch., Bot. Mag. t. 8439, 1912 ; Bor and Raizada, Some beaut. Ind. climb. and Shrubs 92. 1954. Type : Hutch., Bot. Mag. t. 8439, 1912.

Notes—(a) The variability of var. *lutea* is reputedly a difficult taxonomic problem. Hook. f. (1880) observed that a yellow flowering variety is said to be in cultivation. Corner (1941) reduced *Ixora lutea* Hutch. to varietal rank on the basis of colour of corolla. Bor and Raizada (1954) treated *Ixora lutea* and *I. coccinea* as two good species. They observed that *I. lutea* bears a close general resemblance to *I. coccinea*, can readily be distinguished from it not only by the colour of its flowers but also by its laxer inflorescence and by the large ovate-rhomboid corolla-lobes. Two well marked forms are recognised within the var. *lutea* differing in colour of the flower, length of the calyx-lobes and length and width of the corolla-lobes (Text-fig. 3).



Text-fig. 3—Scatter diagram showing corolla-lobes width plotted against corolla-lobes length for flowering specimens of the different forms of var. *lutea* with green corolla-lobes; ○ : Flowers spanish orange; ● : Flowers yellow; calyx-lobes 1.5 mm long; ● : Flowers yellow; calyx-lobes 0.5 mm long.

(b) The abaxial leaf epidermis of var. *lutea* shows prominent cuticular striations difficultly distinguished cell boundaries elliptical to globose stomata are from at the same level of other cells to sunken, peristomatal rims around the stomata and guard cells raised above the subsidiary cells. Wax is prominent and dense (Pl. 1, fig. C).



**Key to the forms of var. *lutea***

1. Flowers yellow ; Calyx-lobes 0.5 mm long ;  
corolla-lobes 8-10 × 3-4 mm.....Form 1
1. Flowers spanish orange or yellowish orange ; calyx-lobes 1.5 mm long ; corolla-lobes 11.2-13.2 × 6.2-7 mm .....Form 2.

**FORM 1**

The specimens ((S. R. Paul 107545, 107550 and 107547) are variable with respect to the length of corolla-tube, length and width of the corolla-lobes. Corolla-tube length is from 33-76 mm and corolla-lobes 9-9.5 × 5 mm (S. R. Paul 107545 and 107550), whereas corolla-tube from 23 to 30 mm and corolla-lobes 8-8.5 × 3.5-4mm (S. R. Paul 107457).

*Specimens examined*—Uttar Pradesh : Lucknow, N.B.R.I., 27 Feb. 1977, S. R. Paul 107547, 107556, 107550, 107545, 107551 (LWG) ; Maharashtra : Bombay, Victoria gardens, 12 Aug. 1957, Y. A. Merchant 125, 534, 438, 444 (BLAT) ; Poona, B.S.I. Gardens, 6 June 1966, N. P. Singh 106511 (BSI). *Cultivated* : Lucknow ; Cult., in the National Botanical Research Institute as *Ixora* 'Rosy Morn'. flowers yellow, S. L. Kapoor 43345 (LWG).

**FORM 2**

*I. coccinea* var. *lutea* form 2 differs from form 1 in the smaller anthers (3.9-4 mm) but longer corolla-lobes (11.2-13.2 mm). Long corolla-lobes variant having smaller anthers has been found in var. *coccinea* from 4.

*Specimens examined*—Uttar Pradesh : Lucknow, N.B.R.I., 3 May 1984, T. Husain 13704, 13710 (LWG) ; Lucknow, N.B.R.I., Garden, 27 Feb. 1977, S. R. Paul 107552 (LWG). *Cultivated* : Lucknow ; Cult. in the N.B.R.I. as *I. sanguinea* 'orange', S. L. Kapoor 42344 (LWG) ; Lucknow : Cult. in the N.B.R.I. as *I. lancesteri* (*I. coccinea* 'magnificia' × *I. coccinea* 'crocata') flowers yellowish orange, S. L. Kapoor 43342 (LWG).

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**References**

BOR, N. L. & RAIZADA, M. B. (1954). *Some beautiful Indian Climbers and Shrubs*. The Bombay Natural History Society, Bombay.

CORNER, E. J. H. (1941). Notes on the systematy and distribution of Malayan Phanerogams, IV : *Ixora*. *Gard. Bull. Singapore*. **11** : 185-188.

CURTIS, W. (1791). *The Botanical Magazine*, Volume 5, t. 169. London.

HOOKE, J. D. (1880). *The Flora of British India*. Volume 3, 145 pp. L. Reeve & Co., London.

KURZ, S. (1877). *Forest Flora of British Burma*, Volume 2, 26-27 pp. Government Printing, Calcutta.

LINNAEUS, C. (1753). *Species Plantarum*, Volume 1.

ROXBURGH, W. (1820). *Flora Indica* (ed.) Carey & Wall. Volume 1. 385 pp. Parbury, Allen & Co., London.

ROXBURGH, W. (1832). *Flora Indica* (ed.) Carey. Volume 1. 375 pp. Parbury, Allen & Co., London.

WIGHT, R. (1839). *Icones Plantarum Indiae Orientalis*. Volume 1, t. 153 : 181.

**Explanation of Plate**

**Plate 1**

Scanning electron micrographs of the abaxial surface of leaf in *Ixora coccinea* L.

- A. *I. coccinea* L. var. *coccinea* (Bar=10  $\mu\text{m}$ )
- B. *I. coccinea* L. var. *bandhuca* (Bar=10  $\mu\text{m}$ )
- C. *I. coccinea* L. var. *lutea* (Bar=10  $\mu\text{m}$ )



