

Preliminary study of Morphological Characters of Three species of *Indigofera* L. from Amravati Region

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Abstract

Indigofera L. is a dicotyledonous plant and is a member of Fabaceae family. It is a family of largely herbs, shrubs and trees with a great variety of habitat. *Indigofera* is a large genus consisting of over 800 species all over the world. The species of *Indigofera* are creeping, prostrate or erect. They are annual, biannual herb or semi woody under shrub and trees. *Indigofera* is a dye yielding plant and hence, the common name of *Indigofera* is Nilini or Nil. Natural dyes are ecofriendly and one of the most important dye is 'Indigo dye' derived from *Indigofera*, is just one example of the usefulness and commercial importance of *Indigofera* species. *Indigofera* is the variable genus in respect to its morphological characteristics. In *Indigofera* there are many morphological variations within the species though it represent from the same location and it wildly growing in the University campus of Sant Gadge Baba Amravati University, Amravati. Therefore, the present work is to compare the morphological diversity among the three species of *Indigofera* namely, *I. linifolia*, *I. cordifolia* and *I. trita* from the University campus of Amravati District.

Keywords: Morphodiversity, *Indigofera linifolia*, *Indigofera cordifolia* and *Indigofera trita*

Introduction

In *Indigofera* there are many morphological variations within the species in different regions of the world. In India about 60 species and 10 varieties of *Indigofera* are found [1] (Hajra *et al.*, 1995). There are thirty-five species of *Indigofera* that are reported from Maharashtra [2] at different places.

Out of these 35 species, 11 Species are present in Amravati district [3]. Indigofera species are grown in many countries of the world as ornamental, for production of indigo dye and also as a herbal medicine [4-7].

Indigo plant may be used as a cover crop and for green manure and erosion control in coffee, tea and rubber plantations [8]. They are having edible and medicinal value. Indigofera, one genus of the Papilionoideae subfamily, is easily recognizable by its major characteristics: flowers in axillary racemes, clustered flowering, butterflyed flowers, whole plant is covered in inbiramous trichomes and cylindrical legume types of fruit [9]. *Indigofera* species mostly found in open grasslands, fields, frequent on open waste lands, bunds of fields, along railway tracks and roadsides. All species shows morphological diversity. *Indigofera* is the variable genus in respect to its morphological characteristics. Generally, it is an erect or spreading, much branched, viscous, annual occurring among grass in open places, after the rains. Average height of plant ranges from 20 cm to 1.5 - 2 m high, much branched, trailing or erect, extent of primary, secondary and tertiary branching of the stem. The whole plant is densely clothed with minute gland, tipped hairs. Leaves are compound and alternate, simple, linear-lanceolate (1- or 3- foliate) or imparipinnate with 5 many leaflets. Leaflets are entire, usually opposite, elliptic, oblong, thinly pubescent, stipules present, sometimes spinescent. Inflorescence axillary racemes, flowers rosy bright, scarlet, red, deep pink to rosy-purple. Calyx teeth subequal or the lowermost longer, stamens diadelphous, anthers apiculate. Ovary usually pubescent, style glabrous, stigma capitate, ovules 1, 2 or numerous pods globose to linear and teret, cylindrical, short glabrous mostly several seeded. Seeds reddish, yellowish brown, elliptic, oblong, cylindric, truncate and smooth. Seeds separated by out growths of the endocarp [3]. According to Paoulino et al [10] *Indigofera* species bear a usual inflorescence type among legumes, the raceme, which comprises flowers initiated in acropetal succession, each with a subtending bract and no bracteoles initiated. Therefore in the present investigation there is preliminary study is carried out to

differentiate the morphological characteristics in three species of *Indigofera*.

Methodology

Collection of Experimental Material

For the morphological analysis three different species of *Indigofera* i.e. *I. linifolia* (Linn.f.) Retz, *I. cordifolia* Heyne ex Roth, *I. trita* Linn. were collected from Sant Gadge Baba Amravati University Campus, Amravati. The plants were collected during November to December and were brought to the laboratory and for the morphological analysis the herbarium of three species also prepared.

Morphological Analysis

The morphological parameters of each plant taxon were studied and were identified with the consultation of different floras. The specimens that could not be identified were shown to the renowned taxonomist personally in order to confirm the botanical identity of the plant.

Results & Discussions

Morphological characters

It is observed that all the four species belonging to the genus *Indigofera* show large variation in morphological characters.

1) *Indigofera linifolia* (Linn.f.) Retz.

Indigofera linifolia (Linn.f.) Retz. is prostrate or erect annual herb. The height of this species is 10-40 cm long. It shows angular or sometimes compressed branching. Roots are tap root type. The stem is herbaceous. Leaves are simple linear, lanceolate, ovate elliptic, sub acute or obviate, obtuse, 6-12 mm long and 1-3 mm broad with mucronate apex. The flowering period of this species is November to May. The flowers are salmon red or pinkish red 3-4 mm long. Calyx ad pressed hairy outside 1mm long, teeth 1-1.5 cm long, narrowly triangular. The staminal sheath is 3 mm long, anthers 0.3 mm long. The ovary is globose glabrous, initially becoming densely hairy 1 ovuled. The fruits are globose, beaked ad pressed

white silky somewhat keeled along the line of dehiscence 1 seeded endocarp blackish brown shiny. The seeds are globose minutely tuberculate, dark brown.

II) *Indigofera cordifolia* Hyene ex Roth.

Indigofera cordifolia Hyene ex Roth. is annual prostrate sometime diffuse or erect herb, woody. The height of the

species is 5-35 cm high. Branches many, copiously branched usually more or less clothed long white hairs. Root shows tap root system. The stem is ad pressed or spreading pubescent, biramous hairs with arms unequal. The leaves are simple, 6-15 X 4-12 mm long, sub sessile broadly ovate chordate, sub obtuse, mucronate hairy on both sides, very densely so beneath.



Fig. 1.1: Habitat of *I. linifolia* (L. F.) Retz.



Fig. 2. 1: Habitat of *I. cordifolia* Heyne ex Roth.



Fig. 3.1: Habitat of *I. trita* Linn.



Fig. 1. 2: Twig of *I. linifolia* (L. F.) Retz.



Fig. 2. 2: Twig of *I. cordifolia* Heyne ex Roth.



Fig. 3. 2: Twig of *I. trita* Linn.



Fig. 1. 3: Flower of *I. linifolia* (L. F.) Retz.



Fig. 2. 3: Flower of *I. cordifolia* Heyne ex Roth.

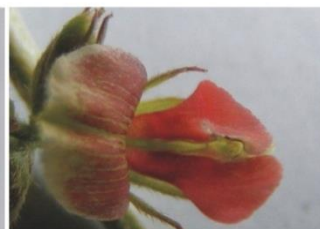


Fig. 3.3: Flower of *I. trita* Linn.



Fig. 1. 4: Fruit of *I. linifolia* (L. F.) Retz.



Fig. 2. 4: Fruit of *I. cordifolia* Heyne ex Roth.



Fig. 3.4: Fruit of *I. trita* Linn.

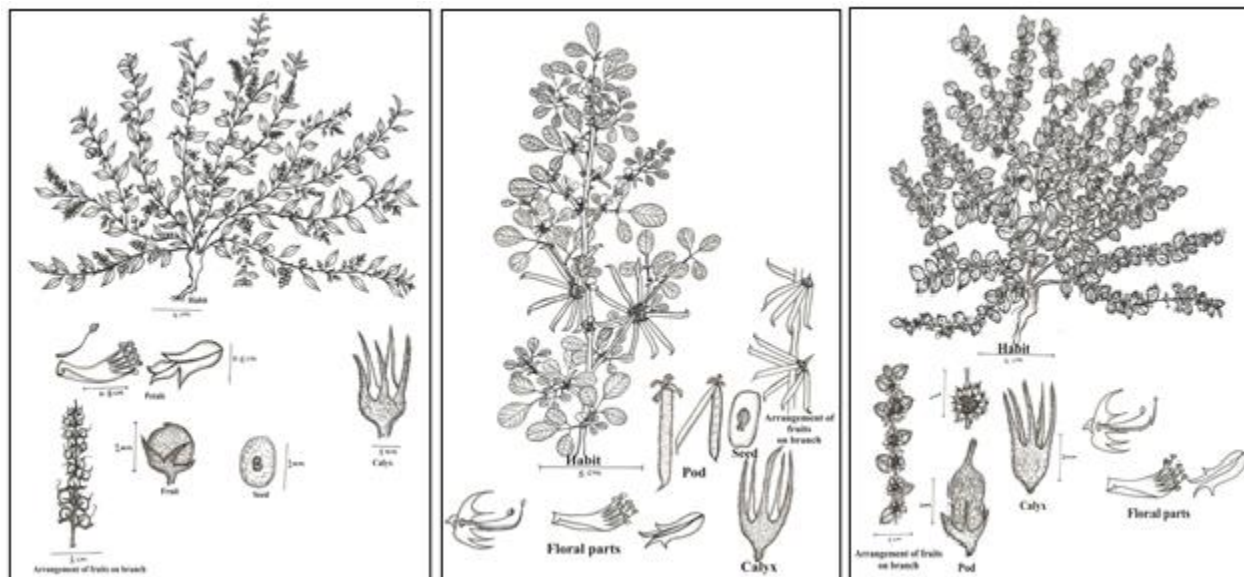
Fig-1.1: Habitat of *I. linifolia* (L.F.) Retz., **Fig-1.2:** Twig of *I. linifolia* (L.F.) Retz

Fig-1.3: Flower of *I. linifolia* (L.F.) Retz., **Fig-1.4:** Fruit of *I. linifolia* (L.F.) Retz.

Fig-2.1: Habitat of *I. cordifolia* Heyne ex Roth., **Fig-2.2:** Twig of *I. cordifolia*

Heyne ex Roth., **Fig-2.3:** Flower of *I. cordifolia* Heyne ex Roth., **Fig-2.4:** Fruit of *I. cordifolia*

Heyne ex Roth., **Fig-3.1:** Habitat of *I. trita* Linn., **Fig-3.1:** Twig of *I. trita* Linn., **Fig- 3.1:** Flower of *I. trita* Linn., **Fig-3.1:** Fruit of *I. trita* Linn.

*Indigofera linifolia**Indigofera trita**Indigofera cordifolia*

Comparative morphological analysis of three species of *Indigofera*

Characters	<i>I. linifolia</i>	<i>I. cordifolia</i>	<i>I. trita</i>
Distribution	Throughout India	Throughout India	Throughout India
Collection	Amravati University campus	Amravati University campus	Amravati University campus
Habit	Annual herb	Annual herb	Annual herb or shrub
Common Name	Nili	Lal godhali	Nili
Plant Height	10-50 cm long or high	5-35 cm high	30-200 cm high
Leaf	Simple	Simple	Pinnately trifoliate
Shape	Ovate Elliptic	Ovate Chordate	Leaflets Obvoate
Length	5-13 mm	6-15 mm	1-4 cm
Width	1-4 mm	4-12 mm	0.5-2 cm
Colour	Dark Green	Green	Green
Apex	Mucronate Apex	Sub Obtuse, Mucronate	-
Surface	Glaberous	Velvet hairy	Rough
Stem	Herbaceous	Velvet hairy	Erect, heavy with hairs
Inflorescence	Short	Stalkless	Short
Type of inflorescence	Spike Like Raceme	Simple Raceme	Axillary Racemes
Bract	0.5-1mm	0.5-1mm	1-1.5 mm
Flower	Numerous	Numerous	Numerous
Flowering	November to May	October to May	December to June
No. of flower / plant	2-10	4-8	6-12
Flower length	3-7 mm	2-3mm	4-5mm
Colour	Pink or bright red	Pale pink, bright-pink	Brick red

Petals	Long petal with short wings and keel	Corolla-bright red wing petals and keel petals-glabrous	Long petals with wing petals glabrous, ciliate along margin, keel petals adpressed
Calyx	Adpressed hairy outside	Hairy outside	Hairy outside
Length	1mm long	3mm long	3mm long
Stamens	Staminal sheath is 3 mm long	Staminal sheath is 2.5mm long	Staminal sheath 3-4mm long
Length (mm)	0.3 mm long	0.5 mm long	0.5 mm long
Color	Pinkish white	Pinkish white	Pinkish white
Ovary	Globose glabrous densely hairy 1 ovuled	Pilose 1-3ovuled	Glabrous linear up to ten ovule
Fruit	Globose	Globose to cylindrical, oblong,	Deflexed, linear, spreading
Types of fruit	Pod	Pod	Pod
Length	3-5 mm long	4-5 mm long	2-3cm long, linear
Colour	Silky white	Gray	Brownish red
Seeds	Seeds are globose minutely tuberculate	Globose	Subtetragonous
Diameter	1mm	1mm	1-2mm
No of seeds /fruit	1 rarely 2	1-2 seeded	6-10 seeded
Colour	Dark Brown	Yellowish Brown	Yellow and Dark Brown
Roots	Tap Root System	Tap Root System	Tap Root System
Colour	White to cream	Brown	Brownish
Texture	Soft	Slightly hard	Slightly hard

III) *Indigofera trita* Linn.

Indigofera trita Linn. is the erect woody, annual herb or shrub let 30-200 cm high. The branches are heavy with hairs, erect to horizontal, pinkish to light green. The leaves are pinnately trifoliate, dotted with glands leaflets obovate, 1-4 X 0.5-2 sessile, a terminal one stalked, opposite, glabrous. The flowers are pink to brick red, 4-5mm long, bracts narrowly triangular, caducas, 6-12 crowded, in axillary racemes. Calyx 3mm long hairy outside, teeth leaner-lanceolate, corolla salmon colour, 6mm long standard orbicular, hairy on back, wing petals glabrous, ciliate along margin, keel petals adpressed, trigosed, outside towards the tips along margins. The staminal sheath 3-4mm long, anthers 0.5 mm long. The ovary is glabrous, linear up to ten ovule, the pod is deflexed, 2-3cm long, linear, spreading straight, subtetragonous sharply beaked, trigose ash grey to

pinkish, 6-10 seeded. The seeds are subtetragonous, yellow and dark brown, smooth. The plant prefers low pH soil. The plant grows mostly in sandy, loamy moist soil. Propagation is by seeds and vegetative method. In fully exposed habitats this species tends to have prostrate branches with very short internodes, while the plants growing in shaded habitats and among grasses and other herbaceous species show diffuse to erect branches with elongated internodes, comparatively larger leaves and less hairy pods.

It is evident from the foregoing observations all the three species of *Indigofera* are herbaceous, with much branched stem, linear to obovate leaves and rather tap roots. The species shows different morphological characters, habitat and flowering period and germination rate. The analyses were performed from

different plant parts such as leaves, stem flowers and seeds. The morphological characters studied in the present work confirms with the characters of previous work.

Conflicts of interest: The authors stated that no conflicts of interest.

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