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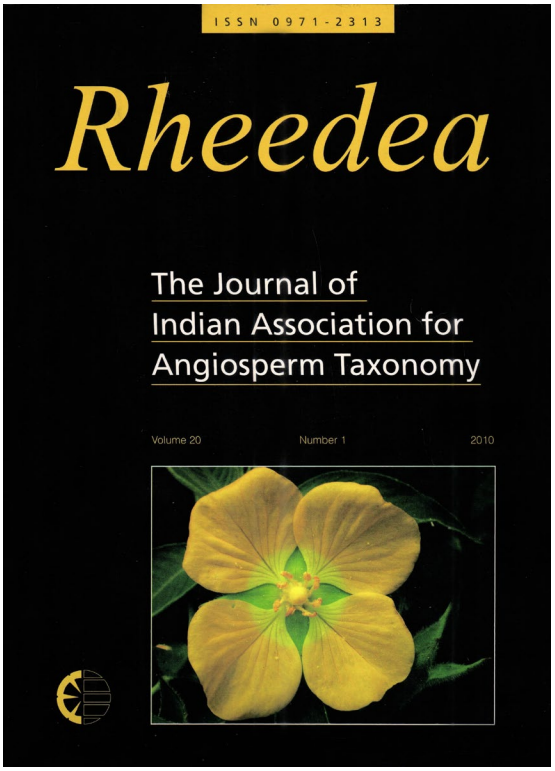

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Vigna indica, a new name for *Vigna trilobata* var. *pusilla* and a note on section Aconitifoliae in India

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Abstract

Vigna trilobata (L.) Verdc. var. *pusilla* Naik & Pokle is elevated to the rank of species and a new name, viz., *V. indica* T.M. Dixit, K.V. Bhat & S.R. Yadav is proposed based on critical field and herbarium studies. An amplified description of taxon is provided. A comparison of selected characters that distinguish closely related species belonging to section Aconitifoliae is given along with a taxonomic key for identification of species.

Keywords: Aconitifoliae, India, New Status, *Vigna indica*, *Vigna trilobata* var. *pusilla*

Introduction

Vigna Savi is a pantropical genus with *c.* 82 species (Maréchal *et al.,* 1978). India, with 24 species of *Vigna* (Sanjappa, 1992), partly represents centre of species diversity for all the three sections of subgenus *Ceratotropis* also known as Asian *Vigna*. As part of revisionary study on subgenus *Ceratotropis* in India, the authors have carried out extensive field and herbarium studies and also reviewed relevant literature. Based on these, authors have confirmed that the 'annual form' or 'agricultural population' (Babu *et al.,* 1987) of *V. trilobata* (L.) Verdc. mentioned in various earlier literature is *V. stipulacea* (Lam.) Kuntze as reported by Tomooka *et al.* in 2002. Moreover, study of herbarium specimens at BAMU revealed that *V. stipulacea* was misidentified as *V. trilobata*. Probably, this led to reduction in number as well as magnitude of differences between the two taxa from their point of view. Critical observation on morphology reveals that there are considerable differences between *V. trilobata* var. *trilobata* and *V. trilobata* var. *pusilla* collected from various localities in Rajasthan, Maharashtra and Karnataka. Therefore, *V. trilobata* var. *pusilla* is raised to the rank of species and an amplified description is provided accounting for all the variations.

Vigna indica T.M. Dixit, K.V. Bhat & S.R. Yadav, **nom. et stat. nov.**

V. trilobata (L.) Verdc. var. *pusilla* Naik & Pokle, J. Econ. Taxon. Bot. 7: 670. 1986. – Type: INDIA, Maharashtra, Beed, Sautada, 27.10.1983, *Rothe* 6229a (Holotype, BAMU!), non *V. pusilla* A. Chev. (1944). **Fig. 1a – m; Fig. 2Ba – g; Fig. 3a, b**

Herb, trailing, perennial with a stout taproot. Stem slender, 30 − 150 cm long, obscurely 4 − 6-angled, sparsely to densely pubescent with 0.5 − 1.5 mm long, more or less retrorse white hairs; initial stem with short internodes and a rosette of leaves at base; secondary internodes long. Leaves 3-foliolate, 1 − 7.5 cm long (including petiole), sparsely to densely pubescent with 0.8 − 1.5 mm long white hairs; rachis 4 − 12 mm long; stipules ovate to lanceolate, 3.3 − 8 × 1.2 − 1.8 mm, peltate, submedifixed, prolonged below the point of insertion, sparsely pubescent and ciliate at margins with 0.5 − 1.2 mm long white hairs, acute at apex, 4 − 6-nerved. Leaflets membranous, pubescent especially on nerves and at margins with 0.8 − 1.5 mm long white hairs; terminal leaflet ovate to rhomboid with 3 − 5, deep to shallow spathulate lobes or nearly entire, 1.5 − 4 × 1.2 − 3.8 cm, obtuse or rounded at base, acute or obtuse at apex; lateral leaflets

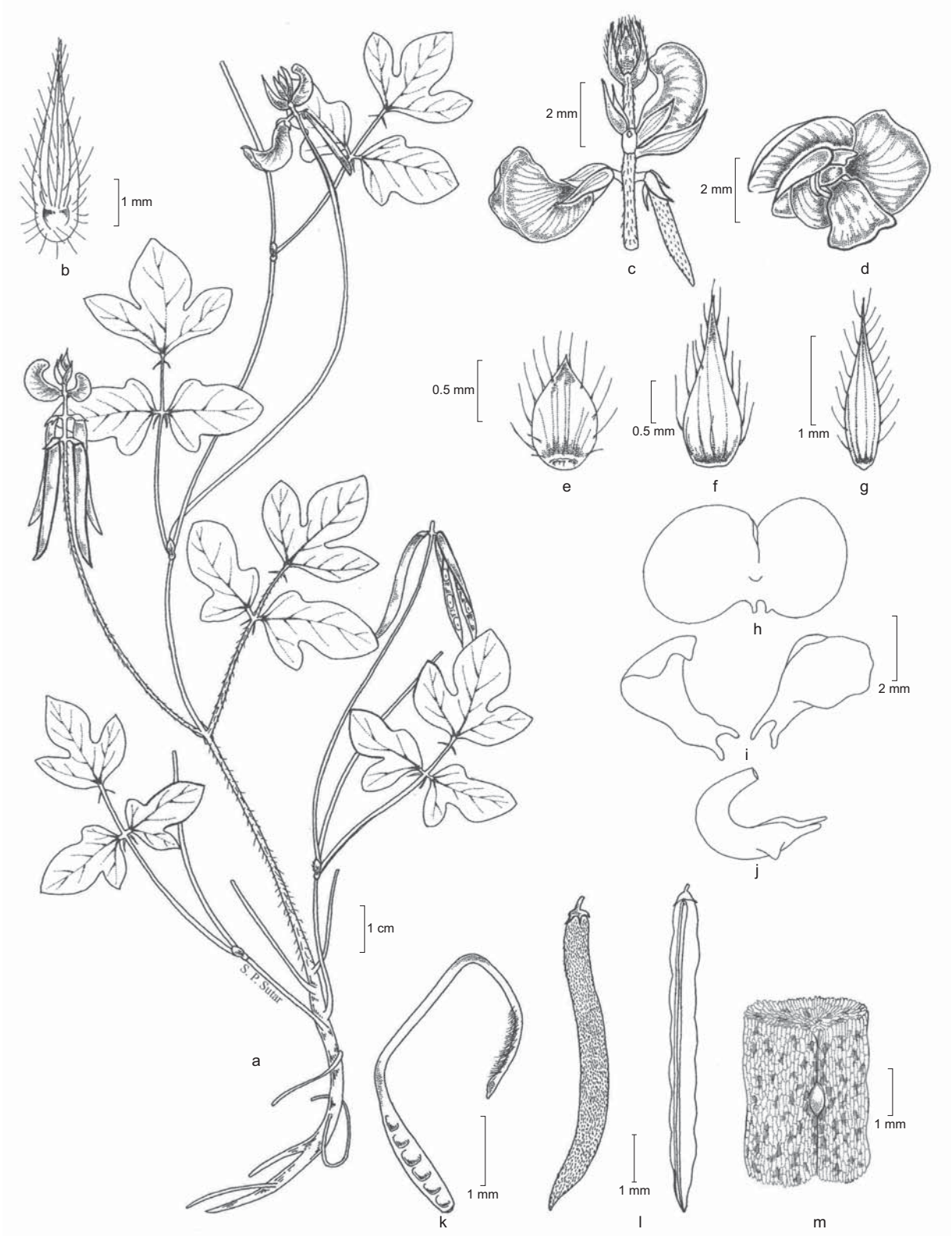
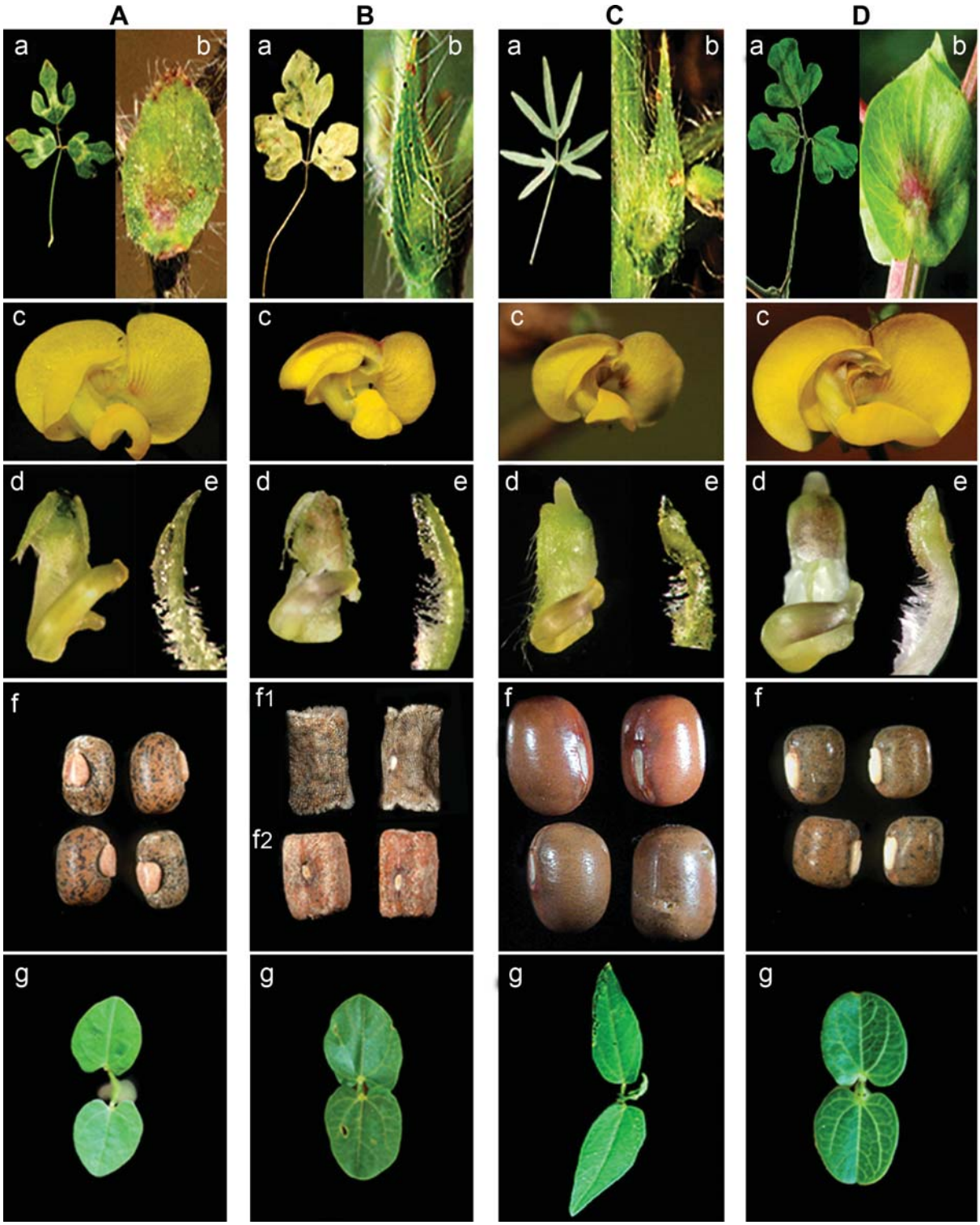


Fig. 1. ***Vigna indica*** T.M. Dixit, K.V. Bhat & S.R. Yadav, nom. et stat. nov.: **a**. Habit; **b**. Stipule; **c**. Inflorescence; **d**. Flower; **e**. Primary bract; **f**. Secondary bract; **g**. Bracteole; **h**. Standard petal; **i**. Wing petals; **j**. Keel petals; **k**. Pistil; **l**. Pods; **m**. Seed.



Vigna trilobata (L.) Verdc. | *V. indica* T.M. Dixit, K.V. Bhat & S.R. Yadav | *V. aconitifolia* (Jacq.) Maréchal | *V. stipulacea* (Lam.) Kuntze

Fig. 2. *Vigna* species of section Aconitifoliae. **a.** Leaf; **b.** Stipule; **c.** Flower; **d.** Keel petals with pocket (top view); **e.** Upper portion of style with stigmatic surface and style beak; **f.** Seeds; **f1.** Seeds with persistent remains of perisperm; **f2.** Seeds with perisperm removed; **g.** First and second seedling foliage leaves (top view).

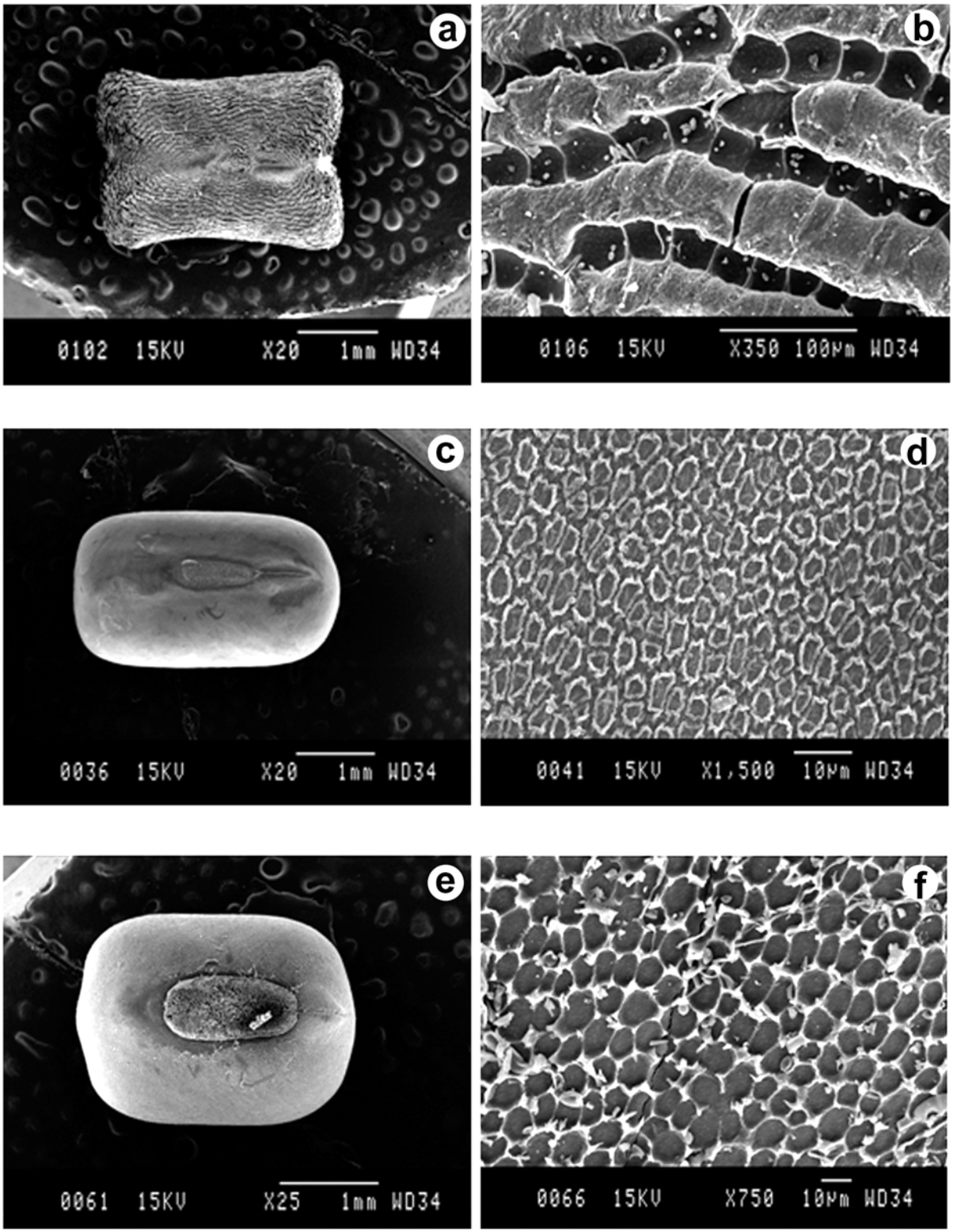


Fig. 3. SEM images of seeds (a, c, e) and their surface ornamentation (b, d, f) of *Vigna* species of section Aconitifoliae: a, b. *V. indica* T.M. Dixit, K.V. Bhat & S.R. Yadav; c, d. *V. aconitifolia* (Jacq.) Maréchal; e, f. *V. stipulacea* (Lam.) Kuntze.

somewhat oblique with 3 − 5 spathulate lobes or entire, 1.5 − 3.5 × 1 − 3 cm; stipels lanceolate, 2 − 2.5 mm long. Inflorescence a pseudoraceme, axillary, 5 − 10-flowered; peduncles slender, 5 − 18 cm long, sparsely to densely covered with 0.8 − 1.5 mm long retrorse white hairs; rachis 0.3 − 1.5 cm long. Primary bracts peltate, broadly ovate, 1 − 1.4 × 0.6 − 0.8 mm, acute or obtuse at apex; secondary bracts basifixed, narrowly ovate to lanceolate, 1.9 − 2.3 × 0.5 − 0.7 mm; bracteoles lanceolate, 1.8 − 2.1 × 0.4 − 0.6 mm; pedicels ascending, 0.3 − 0.6 mm long in flowers; 0.6 − 1.8 mm in fruits. Flowers pale yellow with purplish keel apex. Calyx campanulate, 1.6 − 2.1 mm long; tube 1 − 1.2 mm long; lobes 3 − 5-nerved. Standard asymmetric, obliquely and transversely broadly elliptic, 3.2 − 3.5 × 5.8 − 6 mm, emarginate at apex; right wing petal conceals the upper portion of the keel petals, clawed; claw 0.6 − 0.9 mm long; lamina obliquely ovate, 3.3 − 3.6 × 1.9 − 2.2 mm, auricled; auricle 0.6 − 0.8 mm long; left wing petal spreading, clawed; claw 0.7 − 0.9 mm long; lamina 3.3 − 3.7 × 2.3 − 2.5 mm, auricled; auricle 0.5 − 0.7 mm long; keel petals spirally incurved through *c.* 240°, 5.5 − 5.8 mm long; pocket on the left keel-petal deltoid, *c.* 1 mm long, flattened. Pistil 6 − 6.8 mm long; ovary *c.* 2 mm long, clothed with 0.15 − 0.35 mm long white hairs; ovules 4 − 7, marginal; style filiform, *c.* 4.5 mm long, very shortly beaked beyond stigma; beak 0.05 − 0.07 mm long. Pods linear, cylindric, 1.5 − 3.8 × 0.2 − 0.3 cm, with upwardly pointing 0.15 − 0.3 mm long white hairs, spreading when young, drooping and buff to light brown at maturity; seeds 4 − 7, cylindrical to subtetragonous, 3 − 4 × 1.8 − 2.1 mm; testa rough with persistent remains of perisperm, brown to maroon; hilum ovate, *c.* 0.5 mm long, non-protruding; aril not well developed, with only cushion without a rim. Germination epigeal; the first and second foliage leaves simple; lamina broadly ovate to orbicular, 1.2 − 1.8 × 0.9 − 1.5 cm; petioles 5 − 10 mm long.

Flowering & Fruiting: July – October.

Habitat: Grasslands of drier parts.

Distribution: India, widely distributed in western, central and northern regions.

Etymology: The species is named after India.

Note: *Vigna indica* can easily be distinguished from all other species of section Aconitifoliae by its cylindrical to subtetragonous seeds with truncate ends. It is allied to *V. aridicola* from which it differs in having smaller flowers; buff to light brown pods; ovate, non-protruding hilum and petiolate seedling leaves. *Vigna aridicola* is endemic to Sri Lanka. Among the species of section Aconitifoliae reported from India, *V. indica* is more closely related to *V. aconitifolia* from which it differs in having narrowly to broadly spathulate lobes of leaflets and ovate hilum. *Vigna indica* is also similar to *V. trilobata* and *V. stipulacea* from which it differs in having smaller, pale yellow flowers with flattened, deltoid keel pocket; obscure style beak; non-protruding hilum and obscure aril lacking a rim. *Vigna khandalensis,* a robust species of higher altitudes with an erect habit and large foliaceous stipules is very distinct from all other species of the section Aconitifoliae mentioned above. Hence, a comparison of selected characters is made to distuinguish closely related species of section Aconitifoliae excluding *V. khandalensis* (Table 1; Fig. 2).

The plants of Rajasthan population are usually larger than those from Karnataka and Maharashtra. Variations mostly in the size and lobation of leaflets, pubescence, length of pod and number of seeds were observed in these geographical population which do not deserve any infraspecific status. Distribution of *V. trilobata* and *V. indica* does not overlap to a greater extent. Most of the collections of *V. trilobata* are from southern and eastern India while those of *V. indica* are from western, central and northern parts of India.

Specimens examined: INDIA**, Karnataka**, Belgaum district, Belgaum, October 2009, *N.V. Malpure* 3942 (SUK). **Madhya Pradesh**, Indore district, Manpur, 18.10.1962, *A.S. Rao* 83830 (BSI). **Maharashtra**, Kolhapur district, Shivaji University Campus, 31.12.2010, *T.M. Dixit* SUK104 (SUK); Nanded district, Ambadi, 30.9.1975, *B.R. Zate* 9; Nanded town, 18.10.1983, *Madhukar* 5788; Osmanabad district, Papnas, 5.8.1962, *V.N. Naik* 216; Papnas, 26.8.1962, *V.N. Naik* 260 (BAMU); Pune district, Parvati hill, 5.8.1960, *K.N. Subramanian* 64502; Shivneri fort, 10.10.1962, *Rolla Seshagiri Rao* 83523 (BSI); Katraj, 22.10.2009, *T.M. Dixit* SUK40 (SUK); Sangli district, Dandoba hill, Miraj, 28.9.1989, *A.N. Londhe* 170037 (BSI); Satara district, Sarkhal, November, 1992, *M.P. Bachulkar* 5499 (SUK); Solapur district, Kugaon, 4.9.2000, *S.K. Das Das* 182012; Yavatmal district, Durg tank, 21.9.1978, *S. Karthikeyan* 156502 (BSI). **Rajasthan**, Chittorgarh district, Bansi, 3.10.2009, *T.M. Dixit* SUK32; Udaipur district, Airport road, Udaipur, 3.10.2009, *T.M. Dixit* SUK34 (SUK).

Table 1. Comparison of selected characters to distinguish closely related species of section Aconitifoliae

Character	*V. indica*	*V. trilobata*	*V. aconitifolia*	*V. aridicola*	*V. stipulacea*
Stipule	Ovate or lanceolate, 3 − 8 mm long	Ovate or oblong, 3 − 7 mm long	Narrowly elliptic, 6 – 13 mm long	Narrowly elliptic, 3.5 − 5 mm long	Broadly ovate, 8 − 22 mm long
Stipel	Lanceolate, 2 − 2.5 mm long	Narrowly ovate, 1 − 2 mm long	Linear, 4 − 6 mm long	Narrowly ovate, *c*. 2 mm long	Ovate, 1 − 3 mm long
Bracteole	Lanceolate, as long as calyx (1.8 − 2.1 mm long)	Narrowly ovate, longer than calyx (1.8 − 3.5 mm long)	Narrowly elliptic, twice as long as calyx (2.5 − 3 mm long)	Narrowly ovate, as long as or a little longer than calyx (2 − 2.5 mm long)	Narrowly ovate, much longer than calyx (3.4 − 4.5 mm long)
Flower colour	Pale yellow; keel dull with purplish tinge at apex	Golden yellow	Bright yellow	Pale yellow; keel with purplish tinge at apex	Shiny, clear yellow; keel with dull purplish tinge
Breadth of Standard petal (mm)	*c*. 6	*c*. 11.1	*c*. 5.5	7.3 − 7.4	*c*. 12.3
Keel pocket	*c*. 1 mm long	*c*. 1.3 mm long	*c*. 0.5 mm long	*c*. 0.9 mm long	*c*. 1.3 mm long
Style beak length (mm)	0.05 − 0.07	*c*. 0.4	*c*. 0.1	*c*. 0.06	*c*. 0.2
Peduncle length (cm)	< 20	< 12	< 8	< 15	< 40
		Mature Pod			
a) Colour	Buff to light brown	Brown	Brown	Blackish brown	Blackish brown
b) Length (cm)	1.5 − 4	1.5 − 3	4 − 5	1.5 − 2.8	4 − 5
c) Orientation	Spreading to pendulous	Spreading	Spreading to pendulous	Spreading	Spreading
d) Trichomes	Short white hairs	Glabrescent to short white hairs	Glabrescent	Brown bristle-like hairs	Brown short hairs
Seeds per pod	4 − 7	6 − 8	6 − 8	5 − 7	12 − 14
		Seed			
a) Dimensions: Length × breadth (mm)	*c*. 3.5 × 2	*c*. 2.3 × 1.8	*c*. 4.1 × 2.5	*c*. 2.6 × 2.1	*c*. 2.7 × 2
b) Shape	Cylindrical to subtetragonous	Ellipsoidal	Ellipsoidal	Ellipsoidal	Ellipsoidal
c) Hilum	Ovate, not protruding, *c*. 0.5 mm long	Broadly ovate or orbicular, protruding, 0.5 − 0.8 mm long	Linear, not protruding, 0.8 − 1 mm long	Narrowly elliptic, protruding, 1.1 − 1.3 mm long	Oblong, protruding, 1.2 − 1.6 mm long
d) Aril	Not developed (only cushion)	Well developed (both cushion and rim)	Not developed (only cushion)	Not developed (only cushion protrudes)	Moderately developed (cushion with little rim)
Germination	Epigeal	Epigeal	Epigeal	Epigeal	Intermediate

Table 1. contd.

Character	*V. indica*	*V. trilobata*	*V. aconitifolia*	*V. aridicola*	*V. stipulacea*
First and second leaves/seedling leaves	Petiolate (petioles 5 − 10 mm long); lamina elliptic to orbicular, 12 − 18 × 8 − 15 mm, truncate to cordate at base, obtuse to rounded at apex	Petiolate (petioles *c*. 11 mm long); lamina orbicular, *c*. 12 mm, cordate at base, rounded at apex	Petiolate (petioles 10 mm long); lamina narrowly elliptic to lanceolate, *c*. 28 × 10 mm, cordate at base, attenuate at apex	Sessile; lamina narrowly ovate, *c*. 8 × 6 mm	Petiolate (petiole *c*. 7 mm long); lamina broadly elliptic to ovate, *c*. 13 × 11 mm, cordate at base, retuse at apex
Distribution	India	India, Sri Lanka	India, Pakistan	Sri Lanka	Madagascar, Yemen, South and SE. Asia

(Partly after Tomooka *et al.*, 2002)

Key to the species of section Aconitifoliae

1. Plants erect; stipules foliaceous, 1.5 − 4 cm long; bracteoles large, boat-shaped, entirely enclosing the calyx ……..…..…… **V. khandalensis**

1. Plants trailing (except cultivars); stipules not foliaceous, up to 1.5 cm long; bracteoles otherwise 2

2. Bracteoles as long as calyx; flowers pale yellow, with flattened, deltoid keel pocket; seeds cylindrical with truncate ends …….. **V. indica**

2. Bracteoles distinctly longer than calyx, if as long as calyx then flowers golden yellow with horn-like keel pocket; seeds ellipsoidal with rounded ends ….…… 3

3. Lobes of leaflets linear to lanceolate; seeds without well developed aril having only cushion; hilum not protruding .....…….. **V. aconitifolia**

3. Lobes of leaflets rounded to elliptic or spathulate; seeds with well developed aril having both cushion and rim, if rim is inconspicuos then hilum protruding …..... 4

4. Keel tip dull, with purplish tinge; opening at keel tip distinctly oblique and transversely elliptic up to 1.5 mm long; hilum lanceolate to linear ……..... **V. stipulacea**

4. Keel tip yellow, without purplish tinge; opening at keel tip scarcely oblique and rounded up to 0.7 mm long; hilum orbicular …….. **V. trilobata**

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