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Seed coat polymorphism in *Vigna* section *Aconitifoliae* in India

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ABSTRACT

The seed coat polymorphism of 50 accessions representing five species of *Vigna* section *Aconitifoliae* (subgenus *Ceratotropis*) was investigated using scanning electron microscopy (SEM) in order to evaluate the interspecific and intraspecific variations of various morphoanatomical seed traits. Seed shape, hilum structure aril and testa pattern were examined. The seed coat pattern was found to be a significant character for species delimitation. The testa cell size and ornamentation showed distinctive intra- and interspecific variations across the examined species. The results revealed that the wild accessions of *V. aconitifolia* (I-aco and II-aco), *V. indica* (I-ind and II-ind), *V. stipulacea* (I-sti, I-sti, II-sti, III-sti and VI-sti) and *V. trilobata* (I-tri, II-tri) have different seed coat types. In the present study, only a single seed coat pattern was recorded for the endemic, threatened species *V. khandalensis*. Finally, the congruency of seed coat patterns optimized onto an rDNA-ITS phylogeny was discussed.

1. Introduction

Vigna Savi is a pantropical genus that comprises 104 species (Lewis et al., 2005). The species of *Vigna* are known as an important source of food worldwide (Smart, 1990). The genus is divided into five subgenera, among which *Ceratotropis* (Piper) Verdc. is widely distributed in Asia and is also known as the Asian *Vigna* (Tomooka et al., 2002b). India is rich in species diversity and has 24 species of the subgenus *Ceratotropis* (Babu et al., 1985; Sanjappa, 1992; Bisht et al., 2005; Yadav et al., 2014). The subgenus *Ceratotropis* exhibits diverse morphological characteristics based on which it is divided into three sections, namely *Ceratotropis* Tomooka & Maxted, *Aconitifoliae* Tomooka& Maxted and *Angulares* Tomooka & Maxted (Tomooka et al., 2002a). Morphological and molecular phylogenetic studies of the species belonging to the subgenus *Ceratotropis* have confirmed the sectional classification proposed by several authors (Maréchal et al., 1978; Tomooka et al., 2002b; Bisht et al., 2005; Yadav et al., 2014; Takahashi et al., 2016; Umdale et al., 2017a, 2017b).

Vigna section *Aconitifoliae* consists of six species viz. *V. aconitifolia* (Jacq.) Maréchal, *V. aridicola* N. Tomooka et Maxted, *V. indica* T.M. Dixit, K.V. Bhat & S.R. Yadav, *V. khandalensis* (Santapau) Raghvan et Wadhwa, *V. trilobata* (L.) Verdc. and *V. stipulacea* (Lam.) Kuntze, among which two have been domesticated (*V. aconitifolia* (Jacq.) Maréchal and *V. stipulacea* Kuntze (Dixit, 2014). The species of section *Aconitifoliae* have been delimited on the basis of wide morphological variations. *Vigna aconitifolia* has linear to lanceolate lobed leaflets, *V. stipulacea* consists of large stipules and *V. khandalensis* shows foliaceous stipules and erect habit, which distinguish them from the other species of section *Aconitifoliae*. The seeds of *V. trilobata* possess a protruding hilum and a well-developed aril, whereas those of *V. indica* have rough, substriate testa and undeveloped aril (Dixit et al., 2014; Umdale et al., 2017a).

The wild relatives of cultivated plants serve as potential genetic resources for improving crops. This requires to evaluate the intrinsic diversity and valuable genes of different populations. However, the inadequacy of information pertaining to the intraspecific micro-morphological polymorphism in section *Aconitifoliae* hampers the improvement and effective utilization of wild *Vigna* species. Hence, it is imperative to comprehensively assess the intraspecific diversity amongst the species of section *Aconitifoliae*.

The micro-morphological characters of the seed have offered unique and reliable data for species delimitation (Lersten et al., 1979; Kumar and Ranganswamy, 1984; Ghaderi et al., 2011; Nath and Dasgupta, 2015; Umdale et al., 2017a) and intraspecific polymorphism in the

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