Abstract

Thesis Title: CYTOLOGICAL AND MOLECULAR MARKER BASED STUDIES OF THE INDIAN Allium L.

The genus Allium, has a 34-40 species in India, many of which are poorly studied. The present study attempted to utilize cytological and DNA marker analyses to complement and supplement morphological characterization of 27 accessions belonging to 19 species of Allium from India. Morphological characterization and numerical analysis of the morphological data of the collected Allium species showed that the subclusters and groups of the present dendrogram broadly corresponded to the accepted Subgenus/Section of the genus proposed by Friesen et al. (2006). Taxonomic affinities of some enigmatic accessions, A. auriculatum, A.x cornutum (cv. Pran), A. fasciculatum, A. macranthum, and Allium 1*, were derived satisfactorily. Cytological analysis of these plants indicated that though most of them were diploids, there were variation in their somatic chromosome numbers (2n=14 to 2n=40), ploidy levels (2x–4x) and basic chromosome numbers (x=7–11). Detailed karyomorphological studies performed on 19 species, including several economically important plants, like, A. cepa, A. sativum, A. tuberosum and A.schoenoprasum revealed that diploids, in general, had lower inter– and intra–chromosomal variability (e.g., A. cepa, A. roylei), while plants with higher ploidy status, showed higher inter– and intra–chromosomal variability (e.g., A. fasciculatum, A. ampoloprasum). Presence of heteromorphic chromosome pairs and shifting centromeric regions were hallmarks of all the plants studied. Novel cytotypes were reported for A. carolinianum and A. fasciculatum, and presence of B chromosome was reported in A. griffithianum. Molecular analysis using arbitrary and semi-arbitrary DNA–markers (RAPD and ISSR) revealed presence of inter– and intra–specific variability among Allium spp., but applicability of these markers for infra-generic problems was limited. Gene specific marker, belonging to the nuclear ITS region, was successfully used for resolving infra-generic relationships. 23 ITS sequences were submitted to NCBI GenBank, of which some were first reports from the species. Affinities of some Indian species of Allium which were not included in any other previous work on the genus were resolved. This study helped emphasize that taxonomic ambiguities could be resolved in Allium when datasets from morphological, cytological and DNA marker based analyses were analyzed together. It was also showed that karyotypic characterization could prove useful in identification of species. Thus, it can be said that a comprehensive study of several Allium species from different parts of India was successfully performed that would help catalogue the diversity of the economically important genus.

More Dutta