

Accepted Manuscript

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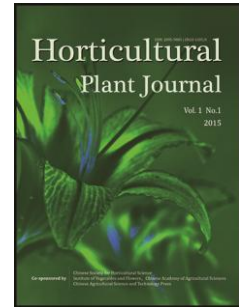
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PII: S2468-0141(17)30003-1

DOI: <http://dx.doi.org/doi: 10.1016/j.hpj.2017.01.002>

Reference: HPJ 39

To appear in: *Horticultural Plant Journal*



Please cite this article as: Yanhong He, Yalin Sun, Riru Zheng, Ye Ai, Zhe Cao, Manzhu Bao, Induction of Tetraploid Male Sterile *Tagetes Erecta* by Colchicine Treatment and Its Application for Interspecific Hybridisation, *Horticultural Plant Journal* (2017), <http://dx.doi.org/doi: 10.1016/j.hpj.2017.01.002>.

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Induction of Tetraploid Male Sterile *Tagetes erecta* by Colchicine Treatment and Its Application for Interspecific Hybridisation

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Received ; Received in revised form ; Accepted

Available online date

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Abstract

Tagetes erecta is an annual multifunctional plant which can be cultivated under a broad range of climatic conditions. Polyploidisation and interspecific hybridisation are applied to facilitate breeding cultivars of *T. erecta* with improved ornamental qualities. Colchicine treatment to the germinating seeds was proved to be a useful tool for chromosome doubling of the male sterile two-type line 'M525AB', with the resulting frequency of polyploid seedlings ranging from 88.89% (following 0.05% w/v colchicine applied for a 3–6 h exposure period) to a maximum of 100.00% (following 0.1% for 3–6 h, or 0.2% for 3 h). Morphological observation, stomatal size and density analysis, flow cytometric analysis and chromosome counting were conducted to identify the tetraploid plants. Distinctive morphological changes were observed in a notable proportion of polyploid plants. The colchicine-treated polyploid *T. erecta* plants showed dwarfed and more robust growth, thicker, larger and greener leaves, larger inflorescences and florets. The mutant plants identified through morphological observation all aligned as polyploid plants, thus morphological observation could be an effective method for the detection of polyploidy. The polyploid plants had significant larger stomata size over the abaxial leaf surface, whereas the density of stomata distribution was remarkably reduced. The survival rate of tetraploid cuttings (i.e. 38%) was greatly reduced compared to that of diploid plants. The fertility of tetraploid plants was also decreased, as shown by cross-pollination yields. Interspecific hybridisations between colchicine-induced tetraploid plants of a male sterile *T. erecta* line and the naturally tetraploid fully fertile *T. patula* species resulted in hybrid progeny. Most of these hybrids displayed the dwarfed growth stature and compact, larger-flower morphology which is the typical ideotype of herbaceous flowers. Thus, polyploidisation may be employed effectively as a means to facilitate interspecific hybridisation, thereby contributing significantly to the improvement of quantitative traits of *Tagetes* spp.

Keywords: *Tagetes erecta*; *Tagetes patula*; chromosome doubling; colchicine; tetraploid; interspecific hybridisation

doi.

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