

Cisgenesis and intragenesis as new strategies for crop improvement

ABSTRACT

Cisgenesis and intragenesis are emerging plant breeding technologies which offer great promise for future acceptance of genetically engineered crops. The techniques employ traditional genetic engineering methods but are confined to transferring of genes and genetic elements between sexually compatible species that can breed naturally. One of the main requirements is the absence of selectable marker genes (such as antibiotic resistance genes) in the genome. Hence the sensitive issues with regard to transfer of foreign genes and antibiotic resistance are overcome. It is a targeted technique involving specific locus; therefore, linkage drag that prolongs the time for crop improvement in traditional breeding does not occur. It has great potential for crop improvement using superior alleles that exist in the untapped germplasm or wild species. Cisgenic and intragenic plants may not face the same stringent regulatory assessment for field release as transgenic plants which is a clear added advantage that would save time. In this chapter, the concepts of cis/intragenesis and the prerequisites for the development of cis/intragenesis plants are elaborated. Strategies for marker gene removal after selection of transformants are discussed based on the few recent reports from various plant species.

Keyword: Cisgenesis; Intragenesis; Crop improvement; Gene modification; GMO; Genome editing; CRISPR/Cas9; Stacking genes