

Genotyping for Male Sterility (MS) and MS Gene Mapping with RAPD Markers in Citrus, Especially with Precocious Flowering Seedlings from a Cross of 'HY16' x Grapefruit

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Abstract	Seedlings obtained from crosses with Citrus species and cultivars showed precocious flowering in spring after seed germination in autumn. Male-sterile anthers were observed in the flowers of seedlings from seven crosses. On the basis of segregation analysis for male sterility in these progenies, male-sterile genotype was estimated to be (S) r(1)r(1)R(2)r(2)r(3)r(3) for male sterile 'HY16', (S) r(1)r(1)r(2)r(2)R(3)r(3) for male sterile 'Kiyomi' and (F) r(1)r(1)R(2)R(2)R(3)r(3) or (F) R(1)r(1)R(2)R(2)r(3)r(3) for male fertile 'Foster Pink' grapefruit. Here, male sterility is a recessive character; r(2) and r(3) are complementary genes with upper stream expression of r(1), and r(1) is an epistatic gene to r(2) and r(3) genes. Male sterile seedlings appear when r(1) is recessive homozygous (r(1)r(1)) and either r(2) or r(3) is recessive homozygous (r(2)r(2) or r(3)r(3)). A population of 101 individuals from the cross of 'HY16' x 'Foster Pink', in which male sterile and male fertile seedlings segregated in a 1: 1 ratio, was chosen for mapping the R gene with RAPD markers. Reproducible polymorphisms of amplified DNA fragments were obtained; 260 RAPD primers were tested by means of bulked segregant analysis. Five RAPD markers amplified in most of male-fertile individuals and 'Foster Pink'. On the other hand, two RAPD markers were found in most of male-sterile individuals and 'Foster Pink'. The linkage analysis showed that the five markers flanked with R-1 or R-3 gene with the closest distance of 8.4 cM in grapefruit and the two markers flanked with r(1) or r(3) gene with the closest distance of 15.5 cM in grapefruit.
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