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A and *MdMYB1* allele-specific markers controlling apple (*Malus* x *domestica* Borkh.) skin color and suitability for marker-assisted selection

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ABSTRACT. Pre-selection for fruit skin color at the seedling stage would be highly advantageous, with marker-assisted selection offering a potential method for apple pre-selection. A and *MdMYB1* alleles are allele-specific DNA markers that are potentially associated with apple skin color, and co-segregate with the *Rf* and *Rni* loci, respectively. Here, we assessed the potential application of these 2 alleles for marker-assisted breeding across 30 diverse cultivars and 2 apple seedling progenies. The red skin color phenotype was usually associated with the *MdMYB1-1* allele and A^1 allele, respectively, while the 2 molecular markers provided approximately 91% predictability in the 'Fuji' x 'Cripps Pink' and 'Fuji' x 'Gala' progenies. The results obtained from the 30 cultivars and 2 progenies were consistent for the 2 molecular markers. Hence, the results supported that *Rf* and *Rni* could be located in a gene cluster, or even correspond to alleles of the same gene. Our

results are consistent with the hypothesis that red/yellow dimorphism is controlled by a monogenic system, with the presence of the red anthocyanin pigmentation being dominant. In addition, our results supported that the practical utilization of the 2 function markers to efficiently and accurately select red-skinned apple cultivars in apple scion breeding programs.

Key words: Apple; Fruit coloration; Marker-assisted selection; A-alleles; *MdMYB1* marker

