Title Inheritance of the Md-ACS1 gene and its relationship to fruit softening in apple (*Malus x domestica* Borkh.)

Author N. C. Oraguzie, H. Iwanami, J. Soejima, T. Harada and A. Hall

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Abstract

The 1-aminocyclopropane-1-carboxylic acid synthase (ACS) gene is a member of the ACS gene family that is involved in apple (*Malus* × *domestica* Borkh.) fruit ripening. Presence of an allele (*Md-ACS1-2*) of this gene is associated with low internal ethylene concentration in some apple cultivars. In this study, inheritance of *Md-ACS1* was determined for 50 apple cultivars/advanced selections and 101 F_1 seedlings from five populations. Following this, the softening pattern of apples stored at 20°C for up to 40 days was examined using 35 fruiting cultivars/selections of defined *Md-ACS1* status. *Md-ACS1* is inherited in a Mendelian fashion and was found to be linked to fruit softening. Maturity season of genotypes also significantly affected fruit softening. Late-season genotypes in the *Md-ACS1-2/2* class had the slowest rate of softening, while early-season *Md-ACS1-1/1* genotypes had the most rapid softening rate. The implications of these results are discussed in relation to parental selection and breeding for storage ability in apple.