



Effects of different dwarfing interstocks on key enzyme activities and the expression of genes related to malic acid metabolism in Red Fuji apples

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ABSTRACT. In this experiment, the test materials were 'Red Fuji' apple trees grafted onto three interstocks (No. 53, No. 111, and No. 236), which were chosen from SH40 seeding interstocks. The content of malic acid, the enzyme activities, and the expression of genes related to malic acid metabolism were determined during fruit development. The results showed that malic acid content in the ripe fruit on interstock No. 53 was higher than that in the interstock No. 111 fruit. The malate dehydrogenase (NAD-MDH) activity in apples on interstock No. 53 was highest on Day 30, Day 100, and Day 160 after bloom, and the malic enzyme (NADP-ME) activity in apples on interstock No. 111 was higher than in the interstock No. 53 fruit from Day 70 to Day 100 after bloom. The relative expression of NAD-MDH genes in interstock No. 53 fruit was higher than in No. 236 fruit on Day 100 after bloom, but the relative expression of NADP-ME in No. 236 interstock fruit was lower than in No. 53 fruit. The relative expression of NAD-MDH genes in No. 53 interstock fruit was highest on Day 160 after bloom. This might have been the main reason for the difference in the accumulation of malic

acid in the ripe apples. There was a positive correlation between the relative expression of phosphoenolpyruvate carboxylase (PEPC) and the malic acid content of the fruit, and the content of malic acid in the apples was affected by the PEPC activity during the early developmental stage.

Key word: Red Fuji; Dwarfing interstocks; Malic acid; NAD-MDH; Reverse transcription-PCR