

Pre- and post-harvest γ -aminobutyric acid application in relation to fruit quality and physiological disorder development in ‘Honeycrisp’ apples

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Abstract

γ -Aminobutyric acid (GABA) can accumulate in apple fruit in response to stress, but little is known about the responses of fruit to GABA treatments. The hypothesis that GABA would inhibit physiological disorder development in ‘Honeycrisp’ apples has been tested in a three-year study. In 2015, ‘Honeycrisp’ apple trees were sprayed with 40 mM GABA 2 and 4 weeks before harvest, and harvested fruit stored at 0.5 °C, a chilling injury-inducing temperature, or 3 °C, for 4 months. In 2016, the same GABA concentration was sprayed on trees at 1 and 2 weeks before harvest and fruit stored at 0.5 °C for 5 months. In the 2017 season, trees were sprayed with 40 mM GABA and 0.12% CaCl₂, either alone or in combination, at 1, 2, and 3 weeks before harvest. Postharvest treatments were also applied by dipping fruit in 100 mM GABA and/or 2% CaCl₂ at harvest. Fruit were stored in air at 3 °C after 1 week of conditioning at 10 °C, or at 0.5 °C continuously for 5 months. In the first two years, GABA field treatments had little effect on harvest indices, but inhibited soft scald development depending on spray timing. In year 3, GABA provided no benefit, either alone or in combination with CaCl₂. Bitter pit incidence was increased by the GABA/CaCl₂ combination in fruit from one orchard block, but at times decreased in fruit from a second orchard block. Treatment of fruit by dipping with GABA after harvest decreased soft scald, bitter pit or senescent breakdown incidence in one orchard block, and in combination with CaCl₂ inhibited bitter pit to the same extent as CaCl₂ alone. Further research is warranted to better understand the effects of GABA on apple fruit metabolism.