Growth regulators on quality traits and volatile organic compounds profile of ‘Royal Gala’ apple at harvest and after dynamic controlled atmosphere storage

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Abstract

Growth regulators are widely used by apple growers, however there is few information about the effect on fruit stored under new dynamic controlled atmosphere. The aim of this study was to evaluate the effects of naphthalene acetic acid (NAA) and aminoethoxyvinylglycine (AVG), isolated and combined, on the quality and volatile organic compounds profile of ‘Royal Gala’ apples at harvest and after 9 months of storage under controlled atmosphere (CA), dynamic controlled atmosphere with chlorophyll fluorescence (DCA-CF) and dynamic controlled atmosphere with respiratory quotient 1.3 (DCA-RQ1.3) conditions. Pre-harvest treatments were: [1] Control: water only; [2] NAA (0.04 kg ha^{-1} of NAA - Fruitone™) applied 7 d before harvest (BH); [3] AVG (0.83 kg $ha^{-1}$of Retain at 15 % a.i.) 30 d BH; [4] AVG + NAA (30 + 7 d BH, respectively). Each pre-harvest treatment was stored under the following conditions: [1] CA (1.2 kPa O_2 + 2.0 kPa CO_2); [2] DCA-CF with 1.2 kPa CO_2; [3] DCA-RQ1.3 + 1.2 kPa CO_2. AVG + NAA application in pre-harvest caused an increase in some important volatile organic compounds such as 2-methylbutyl acetate, hexyl acetate and butyl acetate in ‘Royal Gala’ apples after long-term storage under CA, when compared to DCA-CF and DCA-RQ1.3 storage. These growth regulators showed fruit with higher titratable acidity. DCA-RQ1.3 had reduced mealiness incidence in fruit with NAA application, in spite of did not differ from DCA-CF. ‘Royal Gala’ apples with AVG + NAA application and stored under DCA-CF or DCA-RQ1.3 had higher flesh firmness, reduce physiological disorders and higher percentage of healthy fruit. However, NAA and AVG did not increase the concentration of volatile compounds in ‘Royal Gala’ apples stored under DCA-CF and DCA-RQ1.3. AVG and NAA applied isolated maintain higher total esters after CA storage. DCA-CF and DCA-RQ1.3 reduces the negative impact of NAA application on quality maintenance of ‘Royal Gala’ apples.