Effect of gibberellin acid (GA3) and aminooxycvinylglycine (AVG) on late-season peach [Prunus persica (L.) Batsch] varieties in middle Georgia

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Introduction

The peach ripening season in middle Georgia spans five months beginning in the middle of May and concluding in early September. Approximately, 60 different peach varieties are currently being grown in Georgia and ripen throughout this market season in which each variety is available for one to two weeks. Within the season, there are time points when variety ripening times may not overlap thus producing several days in which no fruit is available. This is clearly a problem in peach production in middle Georgia for certain late season varieties. Plant growth regulators (PGRs) are widely used in apples, cherries, and other fruits. Gibberellic acid (GA3) and aminooxycvinylglycine (AVG) treatments in stone fruit have shown to increase fruit firmness, inhibit/decrythene ethylene production, delay maturity and shift harvest windows, and reduce fruit drop (Chen et al., 1997; Cline, 2006).

Objectives

Study the effect of GA3 and AVG on delaying maturity, increasing fruit firmness, and shifting the ripening window of two late season ripening varieties.

Materials and Methods

Plant materials. Trees of ‘Early August Prince’ (850 CU) and ‘Ruston Red’ (850 CU) peaches budded to ‘Guardian’ rootstock were established in 2007 and 2001, respectively. ‘Early August Prince’ variety was used from two farms in Pearson Farms and Lane Southern Orchards, Fort Valley, GA. ‘Ruston Red’ variety was available in one farm in Lane Southern Orchards, Fort Valley, GA. A total of approx. 20 acres per variety were available. Plots were maintained using the recommended procedures in the Southeastern peach, nectarine, and plum pest management and culture guide.

Applications. ProGibb® is 4% gibberellic acid (GA - promotes growth and elongation of cells), liquid formulation and Retarin® is 15% aminooxycvinylglycine (AVG - ethylene inhibitor) soluble powder formulation both produced by fermentation. In 2014, plant growth regulators were applied with an airblast sprayer (333A/A of Retarin®, 200 oz/A of ProGibb® 4% in a 100 gal/A spray volume, and organosilicone adjuvant 0.1% v/v). Applications were made on early-mid June, approximately 4 weeks before fruit harvest. Control plots were left untreated at the same locations for comparisons. A total of three replications, single tree plots, were used for treated and untreated trees. Trees were not commercially harvested until the project was over.

Variables. Sample fruit was harvested from treated and untreated trees and these characteristics were taken. Fruit was harvested on July 8th, 11th, 14th, 17th, 21st, 24th, 28th, 31st, and August 8th for ‘Early August Prince’ and on July 8th, 11th, 14th, 17th, 21st, and 24th for ‘Ruston Red’. Five fruit per plot were harvested and kept in a cooler with ice overnight to be evaluated the following day. Each fruit was rated individually. Fruit were evaluated for several characteristics: blush (%), redness in the flesh (%), peach fuzz (1-9 scale, 1=unnoticeable and 9=almost none), fruit tip (1-9 scale, 1=highly pronounced and 9=almost none), firmness (1-9 scale, 1=soft and 9=hard), kkg, N, NG, split pit, flesh to pit length (mm), weight (g), and perimeter (mm). The subjective 1-9 scale represented value of 1 = undesirable to 9 = optimal. Blush and redness in flesh were rated as percent coverage. Split pit was rated as present or absent. Firmness was measured using a 1-9 scale and the Wagner Model FT 30 fruit penetrometer with the FT 516 tip (8mm diameter).

Data analyses. Data analyses were performed using the PROC GLM procedure in SAS Software (Cary, NC). Mean comparisons for each treatment were performed using Fisher’s protected LSD test, p-value <0.05.

References


Fig. 1. Early August Prince fruit: A) immature, B) before ripening, and C) commercial ripening. D) Firmness measured using the Wagner Model FT 30 fruit penetrometer with the FT 516 tip (8mm diameter).

Fig. 2. Fruit firmness (kgf) measured using a penetrometer in the ProGibb® and Retarin® trial for A) ‘Early August Prince’ in Lane Southern Orchards, Fort Valley, GA; B) ‘Early August Prince’ in Pearson Farms, Fort Valley, GA, and C) ‘Ruston Red’ in Lane Southern Orchards, Fort Valley, GA.

Table 1. ProGibb® and Retarin® trial measured by fruit characteristics in Fort Valley, GA during 2014 peach season.a,b

Table 2. ‘Early August Prince’ in Lane Southern Orchards, Fort Valley, GA.

Table 3. ‘Ruston Red’ in Lane Southern Orchards, Fort Valley, GA.

Results

The effect of locations (Lane Southern Orchards and Pearson Farms) and varieties (‘Early August Prince’ and ‘Ruston Red’) were found to be statistically different. Analyses were carried out per variety and location (Table 1).

Overall, fuzz, tip, and split pit showed no difference between treated and untreated (Table 1).

Percent blush, red flesh, perimeter, and weight for the treated and untreated did show some significant differences; however, these differences were not seen for most harvest dates (Table 1). Differences in fruit firmness were seen for ‘Early August Prince’ and ‘Ruston Red’ in Lane Southern Orchards for almost all plots after the first commercial harvest (Table 1, Fig. 2). The fruit treated with plant growth regulators, ProGibb® and Retarin®, were firmer than the untreated fruit, especially in ‘Ruston Red’.

‘Early August Prince’ firmness in Pearson Farms did not show significant differences among treated and untreated fruit (Table 1).

Results were encouraging, however, they were not consistent across varieties and locations (Additional trials 2015 Season).