

Control of pistillate flower abortion in ‘Serr’ walnuts in Chile by inhibiting ethylene biosynthesis with AVG

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Summary

Pistillate flower abortion (PFA), induced by excessive pollen load on female flowers and leading eventually to their abscission, affects severely fruit set and potential fruit yield in ‘Serr’ walnut variety. Such variety, owing to its nut quality, is extensively planted in Chile and in other walnut-producing areas in the world (California). During two seasons, trials were carried out to define possibilities of control of PFA by applying AVG (aminoethoxyvinylglycine), an ethylene biosynthesis inhibitor. In the first season, AVG concentrations of 62.5, 125 and 250 mg/l were evaluated, using either 1000 or 2000 liters per hectare. Fruit set that season averaged 25% in the untreated controls. Application of AVG at 125 and 250 mg/l increased fruit set up to 80%, with AVG applied at 125 mg/l (i.e. 125 ppm of AVG) and with a spray coverage of 1000 liters per hectare being rated as the most appropriate treatment. During 2005/2006 season, AVG applications using 125 ppm of AVG were performed in several orchards. Natural fruit set in the untreated controls ranged from 35 to 83%. Despite less incidence of PFA in the latter season as compared with the previous one, in most of the orchards AVG application led to increased fruit set, particularly when PFA was high, resulting, thus, in significant improvements in yield potential in such cases. These results are indicating that AVG can be a powerful tool to overcome PFA and subsequent yield losses in ‘Serr’ walnut orchards under Chilean Central Valley conditions.

1. Introduction and Methodology

‘Serr’ walnut variety presents pistillate flower abscission (PFA), induced by excessive pollen load. This problem is common to other walnut varieties, but less intense. It has been postulated that when pistillate flowers receive high pollen load, this results in high rate of ethylene biosynthesis inducing flower/fruitlet abscission. Therefore, it seemed relevant to assay effects of the ethylene biosynthesis inhibitor AVG (aminoethoxyvinylglycine) on PFA. Consequently, the commercial formulation ReTain (a.i. 15% AVG, Valent BioSciences Corp.) was studied as a tool to increase walnut fruit set from season 2004/2005 onwards. In 2004, rates of 62.5, 125 and 250 mg/l of AVG were applied at 20% female flower receptivity stage, using either 1000 or 2000 liters per hectare on three adult ‘Serr’ orchards in the Chilean Central Valley area. Fruit set and nut quality were measured on treated trees, being compared with untreated ones as control (UTC). Subsequently, a rate of 125 ppm of AVG applied with 1000 liters per hectare was used in season 2005/2006.

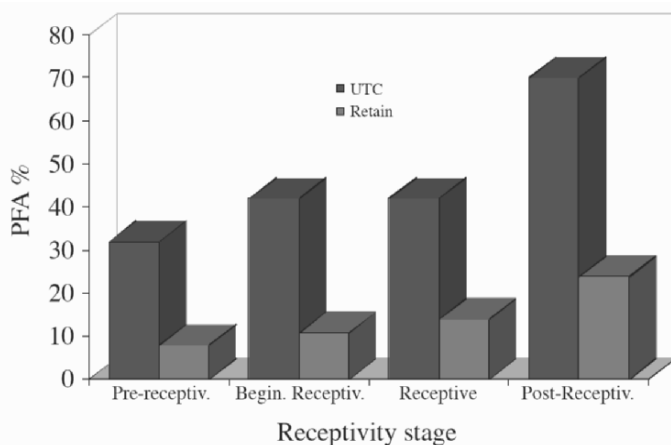


Fig. 1. Pistillate flower abortion (%) in different receptivity stages. Buin, Chile, 2005/2006. ReTain: applied with AVG, UTC (untreated control).

2. Results

In the season 2004/2005, AVG increased fruit set in average from 35 to 83%, according to the chemical's concentration. Although, control of PFA was obtained with AVG being applied in all flower stages (Fig. 1), owing that only a single treatment is desired, our data suggests that an early application is to be recommended. Further, AVG applications were effective in the entire tree canopy by decreasing PFA along all the positions on