EFFECT OF RETAIN® ON REDUCING PISTILLATE FLOWER ABORTION IN SERR WALNUT

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ABSTRACT

Retain®, a commercially available ethylene inhibitor developed by Valent BioSciences, has been widely tested on stone fruit for improving post harvest shelf life. This season, a simple test of its effect on Serr PFA was conducted in Kings County. A nine-year old block of Serr walnuts south of a Chandler orchard was selected. Ten fruiting shoots in each of twenty trees 120 to 150 feet south of the Chandler orchard were then tagged. The selected shoots each had two female walnut flowers in an early stage of pollen receptivity. Five of the shoots on each tree were treated with the equivalent of 11.7 ounces per acre of Retain®. The other five shoots per tree were left untreated. On May 5, 2003, the number of fruit set per shoot were recorded and analyzed as a randomized complete block. The shoots within each tree were treated as subsamples and the trees were evaluated as replications. Visual and statistical results showed a consistent improvement in fruit set from the Retain® application. Overall, Retain® treatment resulted in 89.0 percent set of the potential 200 flowers. Only 21.5 percent set was recorded in the untreated shoots. Counts taken in August confirmed similar percent nut retention for each treatment. This was highly significant statistically. Unfortunately, no water-only control was included in these non-funded tests.

OBJECTIVES

For over thirty years, scientists with the University of California Pomology Department at Davis, in cooperation with their colleagues in Cooperative Extension, have researched the cause and solution for pistillate flower abortion (PFA) in walnut (Polito et al.). Included in this dedicated team are Dr. Vito Polito, Pomology Department Chair and Professor, Dr. Peter Catlin, Professor Emeritus who spent much of his career studying multiple cultural factors suggested as the cause for PFA, and Farm Advisors Steven Sibbett (Tulare County, retired and Emeritus), Joe Grant (San Joaquin County) and Kathy Kelley (Stanislaus County).

PFA is the loss of nut-producing pistillate flowers early in the season, typically 2 to 3 weeks after bloom. This was first noted in the Serr cultivar soon after the earliest plantings came into production in the early 1970’s. Originally referred to as the Serr drop problem, flower loss due to this phenomena sometimes exceeded 90 percent in certain orchards and years. Determining the cause of the disorder proved extremely difficult. By the late 1980’s the above researchers had eliminated mites, walnut blight, numerous nutritional deficiencies including nitrogen, calcium, and boron, tree age, shading, pruning practices, water stress, intratree competition for nutrients, incompatible pollen and lack of pollination. Cherry Leafroll virus, the cause of Blackline, was also studied as a possible cause and eliminated (Polito et al.).

Researchers then turned their attention to testing the possibility that excessive pollen might be the cause. Early tests with flowers receiving high pollen doses were promising. In the 1990’s, field-based research lead by UC Davis Pomology faculty confirmed from detailed tagging of
flowers and collection of yields from individual trees varying in distance from a pollen source that PFA is always associated with high numbers of pollen grains present on the receptors (stigmas) of female flowers. PFA also decreased with distance from a pollen source. Reduction of the pollen load in test orchards by catkin removal decreased PFA and increased yield. Tests on cultivars other than Serr (Chandler, Vina and Chico) showed the presence of PFA but not at levels which typically resulted in economic loss.

This UC research changed the routine practice of planting pollenizers in most new walnut orchards unless they were isolated from surrounding pollen sources or the cultivar suffered consistently from poor overlap between female receptivity and catkin bloom. The discovery of excessive pollen affecting walnut flower abortion also lead to the UC recommendation that Serr growers remove the pollenizer trees from their orchards and shake the catkins from the remaining Serr trees during the early bloom period. Growers accomplish this with the mechanical shaker normally used for harvest.

During the early years of PFA study, Serr growers in northern California became so frustrated with the poor yields received from this potentially high-producing variety that most orchards were removed. This left the majority of the state Serr acreage in southern California where it enjoyed popularity as an early maturing, high edible yield variety which helped extend the harvest period and set marketing conditions. However, from 1998-2003, Serr has yielded very poorly in orchards that typically produced about two ton of in-shell walnuts per acre. Use of the catkin shaking recommendation has also been met with frustration because a single shake has been insufficient to adequately reduce the pollen load. Many Serr growers also do not own shakers and therefore find timely coordination of this practice difficult. Growers who have shaken also report mixed results depending upon their proximity to surrounding orchards with varieties adding to their pollen load.

Research by Dr. Polito (unpublished) showed that the excessive pollen tubes growing down the style of the female walnut flower produce excessive amounts of ethylene, a natural plant hormone associated with organ senescence. Elevated ethylene levels are likely the cause of flower abortion. Polito also field tested non-commercial compounds which either promoted or inhibited ethylene production and observed corresponding increases and reductions in PFA.

Recently, Retain®, a commercially available ethylene inhibitor developed by Valent BioSciences, has been widely tested on stone fruit for improving post harvest shelf life. During the 2003 season, a simple test of its effect on Serr PFA was conducted in Kings County.

**PROCEDURES**

A nine-year old block of Serr walnuts south of a Chandler orchard was selected. Ten fruiting shoots in each of twenty trees 120 to 150 feet south of the Chandler orchard were then tagged. The selected shoots each had two female walnut flowers in an early stage of pollen receptivity. Five of the shoots on each tree were treated with the equivalent of 11.7 ounces per acre of Retain®. The other five shoots per tree were left untreated. On May 5, 2003, the number of fruit set per shoot were recorded and analyzed as a randomized complete block. The shoots within each tree were treated as subsamples and the trees were evaluated as replications.
RESULTS AND DISCUSSION

Visual and statistical results showed a consistent improvement in fruit set from the Retain® application. Overall, Retain® treatment resulted in 89.0 percent set of the potential 200 flowers. Only 21.5 percent set was recorded in the untreated shoots. Counts taken in August confirmed similar percent nut retention for each treatment. This was highly significant statistically.

Although exciting, much additional field work must be done to confirm these initial results and demonstrate that the response is consistent from year to year and among orchards with varying PFA levels. Growth regulators have long been likened to witchcraft, but there are several examples such as gibberellin in table grapes (Weaver 1959), NAA in apples (Wash. State), and Dormex® (George) in cherries where they significantly benefit the grower. Hopefully, Retain® is the product Serr walnut growers have been waiting for to recover orchard productivity and fiscal soundness.

LITERATURE CITED


