PEACH AND NECTARINE CORKING

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ABSTRACT

Three trials were carried out in 2007. In the first, "Summer Fire" nectarines at Kearney were subjected to the same treatments as in 2006. These included high and low nitrogen regimes; low and heavy crop loads; and no summer pruning or severe summer pruning 45-60 days prior to harvest. Fruit were harvested and kept in cold storage for about 15 days before being peeled and evaluated for corking incidence. The incidence of corking in this block was low, but the results can be explained within the hypothesis that vigorous growth and cool springs are the key to producing corking. In the absence of either, the amount of corking is reduced or eliminated. As in past year's, there was no progression of the disorder during storage.

In the second trial, fruit from additional "Summer Fire" trees were dipped in calcium solutions 5 times at approximately weekly intervals beginning at bloom to determine if fruit calcium concentrations can be effectively raised. The leaves and fruits from these treatments are still being analyzed at the UC Davis analytical laboratory. The results from this trial will be published in next year's CTFA Research Reports and no further discussion of this project occurs in this report.

In the third trial, a block of "August Fire" nectarines with a history of severe corking was heavily summer pruned at 12, 8, and 4-week intervals before harvest. A 50-fruit sample was collected from each treatment just prior to harvest and there was no corking in any of the treatments so no formal harvest data was collected.

The relative lack of corking during this past season can likely be explained by the warm spring temperatures experienced in March/April of 2007.

INTRODUCTION

Fruit corking has been a troublesome malady affecting peaches and nectarines for more than a decade. When corking occurs, it can cause tremendous fruit loss – often 30 to 50% or more. It is made worse by its seeming "progression" in storage after harvest.

Our prior CTFA funded research in 2003 established that corking is worst in seasons with cool, wet springs; under high vigor situations, and on trees that are lightly cropped. In that study we

collected leaf samples from orchards displaying various degrees of corking and found that there was no consistent relationship between orchard nutrient status and expression of corking; however, corked fruit had a higher concentration of total nitrogen (1.15-1.42%) than did fruit displaying no corking (0.88-0.91% total N).

Because corking is associated with cold post-bloom temperatures, the 2006 and 2007 growing seasons provided us an opportunity to better examine this issue. Developmental temperatures in March 2006 were the coldest they have been in the past 25 years, but March 2007 was amongst the warmest (Figure 1). To that end, we designed an experiment to investigate the role of crop load, tree vigor, summer pruning, and their interactions on corking incidence.

Summer Fire Nutrition, Vigor, and Crop Load Trial

This trial was performed in a mature block of Summer Fire nectarine trees growing at the Kearney Ag Center. Our objectives were to determine the effect of the following, and their interactions, on corking severity: 1) tree nitrogen status, 2) crop load, and 3) summer pruning. Four single tree replicates were used. Trees were stripped of fruit on July 24 – about mid-way between the 2nd and 3rd harvests. Fruits were initially evaluated for external corking occurrence and then placed into cold storage at 34 F. Final fruit evaluation was performed on August 8. Leaf and fruit samples were collected from each tree for nutritional analysis.

Treatment Summary and Explanation

- Summer Pruning – Selected trees were heavily summer pruned on June 1 by removing most of the new extension growth using thinning cuts – no heading cuts that could stimulate new growth were used. The hypothesis here was that by reducing vigor, corking incidence would be suppressed.
- Nitrogen Fertilization – Since vigorously growing trees are reported to have more corking, 300 pounds nitrogen per acre was applied to selected trees in mid-April to try to induce corking.
- Crop Load – Large fruit size and light crops are associated with corking incidence, to duplicate this, selected trees were thinned to normal crop loads and light crop loads. Note that 2006 was a light setting year so in most instances the “normal” crop received little, if any, thinning; while the “light” crop trees were thinned additionally.

Fruit Evaluation

Fruit were scanned visually and rated on a 0-5 scale for corking severity, with each category representing approximately 20% occurrence intervals. For example, a fruit with a rating of ‘0’ had no corking, while a fruit with a ‘3’ had about 60% of its surface or flesh affected. The initial evaluation only rated external symptoms. During the second evaluation, all fruits were rated for external symptoms and then were peeled so that initial symptoms could be observed and rated.

RESULTS

Internal corking incidence is shown in table 1. Both crop load and nitrogen status had an effect on incidence of corking, but summer pruning failed to reduce corking. These are virtually exact opposites of the results obtained in 2006, but make sense within the physiological hypothesis of corking as discussed below.

Timing of Summer Pruning to Reduce Corking Trial

In both 2003 and 2006, we observed the beneficial effect for summer pruning on reducing the incidence of corking. In both these years, the trees were pruned approximately 45-50 days prior to harvest. However, we still do not know if the is the best timing for performing this activity.

To help answer this question, a trial was performed on a block of mature August Fire nectarines with a history of severe corking, and growing in the Sultana area. Trees were heavily summer pruned during the fruit developmental period at approximately 12, 8, and 4-weeks before harvest, and compared to non-summer pruned trees. Fruit were monitored during the season for expression of corking and a 50-fruit sample was collected from each tree at commercial harvest to evaluate for corking. There was no corking in any of the treatments so no additional formal harvest data was collected.

DISCUSSION

Our basic premise of the cause of corking is that it occurs because of competition for available resources between developing fruits and growing shoots. Anything that tips the balance toward vigor increases the likelihood of corking. Conversely, anything that reduces vigor reduced the propensity for corking. In cold springs, shoot growth is favored over fruit growth rate and so the potential for corking increases. Likewise, vigorously growing trees will be more prone to corking than those that are less vigorous.

In 2006, summer pruning was effective at reducing corking because the record-cold spring caused fruit to be predisposed to corking. By reducing the vigor of the tree, corking incidence was also reduced.

In 2007, summer pruning failed to provide any benefit, because the warm spring temperatures helped protect fruit from corking by increasing the sink strength of the fruit and preventing them corking. Consequently, the two treatments we suspect of being potentially able to induce corking – by stimulating the vegetative growth component of the equation – reduced crop load and high nitrogen status, were effective in inducing corking even in a year in which corking incidence was otherwise low.

Of the options that are commonly available to growers, proper management offers the greatest possibility of reducing corking expression in orchards. As such, on those varieties and blocks known to have a history of, or problems with corking, growers should avoid stimulating excessive vigor through heavy pruning, excessive thinning, or heavy nitrogen fertilization. Most importantly, in seasons in which March and April temperatures are significantly cooler than normal, trees should probably be summer pruned heavily sometime in May to early June. Note that in our trials, this is drastically earlier than the traditional timing of summer pruning commonly practiced in this area and that even earlier summer pruning might have been more beneficial.

Table 1. Categorical incidence of severe internal corking in 2007, Summer Fire nectarine.

Factor	Corking Incidence (%)
Crop Load (*)	
Normal Crop	9%
Light Crop	19%
Nitrogen Status (*)	
Normal N (~75 lbs/ac)	5%
High N (~300 lbs/ac)	22%
Summer Pruning (n.s.)	
Performed	11%
None	17%

***** Indicates differences are significant at the 5% level.

Figure 1. Annual growing degree-day temperatures in March using 45 F as cutoff. Horizontal line is the 27-year average.