

Managing Orchards to Reduce the Occurrence of Nectarine Pox

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In some years, growers report a higher incidence of nectarine pox than usual, and in many cases, cool spring temperatures and above-normal rainfall in June are prevailing factors. The following is a review of what causes this physiological disorder and ways you can manage orchard conditions to reduce its occurrence.

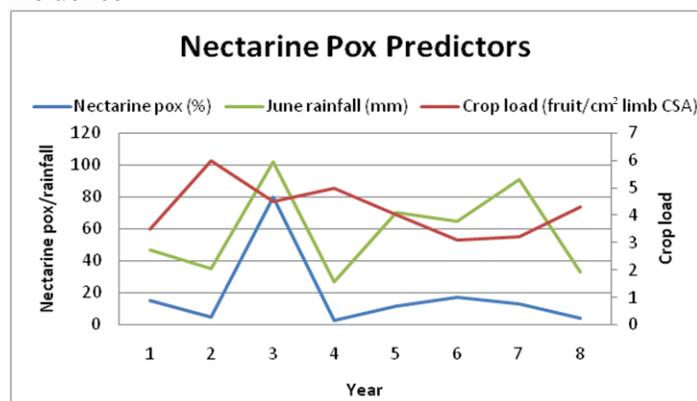
Background on Nectarine Pox

USDA scientists Harold Fogle and Michael Faust (1975, 1976) conducted studies in the early 1970s that helped explain the morphology of superficial disorders of nectarines. They reported that nectarine growth does not follow the three-phase sigmoid curve typical of peaches and that occasionally the skin does not grow at the same rate as the flesh. Also, they studied fruit surfaces with scanning electron



microscopy and suggested that clonal differences in surface conformation (ridging, stomatal cracking, stomatal suberization) may explain varying susceptibilities to skin disorders. The unprotected surface of nectarines makes them more susceptible than peaches to fruit blemishes. In addition to the lack of pubescence, nectarines have only a slight tendency to form flakes of wax, and there are no wax platelets such as those observed on Delicious apple.

Following a flare-up of nectarine pox in the 1980s, Penn State scientists Larry Hull and George Greene conducted studies on possible management strategies (personal communication, 1999). Hull caged limbs to isolate insect damage symptoms and found no insects associated with nectarine pox. Greene tested calcium treatments but found no effects on nectarine pox incidence.



Nectarine pox incidence is positively correlated to June rainfall and negatively correlated to crop load.

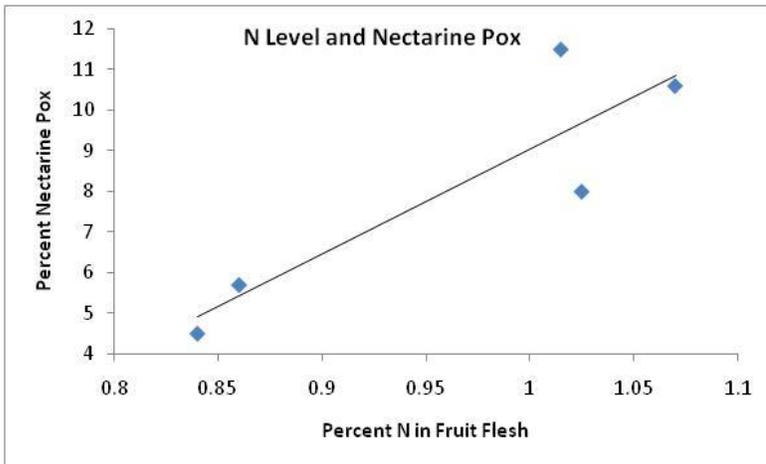
First Description of the Disorder

Nectarine pox was first described in the literature in 1991 (Auxt Baugher and Miller, 1991a). The disorder is characterized by superficial warty outgrowths and in some years may occur on 20 to 80 percent of the fruit in an orchard block. The symptoms at harvest are similar to beady wart (caused by aphid feeding) but in early stages are distinct eruptions of the epidermis rather than sunken depressions associated

with insect feeding. Studies conducted in West Virginia (Auxt Baugher and Miller, 1991b) showed that nectarine pox incidence is positively correlated to June rainfall, terminal shoot length, and fruit flesh nitrogen level and that root pruning two weeks after full bloom reduces the disorder.

Research Conducted in Pennsylvania Orchards

Additional studies were conducted in Pennsylvania following a high incidence of nectarine pox in 1996. With the cooperation of four growers, we ruled out virus as a causal factor and corroborated the importance of managing tree vigor. Bill Howell (National Clean Plant Network, Washington State University, Prosser) and Ruth Welliver (Pennsylvania Department of Agriculture) screened symptomatic Firebrite and Summer Beaut nectarine trees for viruses and only Peach Latent Mosaic Viroid (PLMVd) was detected. PLMVd is widely distributed in “clean stock” and is latent in most situations.



Shoot length, leaf nutrient levels, fruit peel nutrient levels, crop load, soil pH, environmental conditions, and nectarine pox incidence were tracked in 11 orchard blocks over three years (Auxt Baugher, 1999). In Years 1 and 2, nectarine pox initially appeared after shuck fall and gradually increased through the season, with the most severe symptoms developing one to two weeks prior to harvest. In Year 3, some early nectarine pox symptoms appeared to be associated with shuck constriction, and new symptoms did not appear until final swell.

During each year of the study, nectarine pox incidence was positively correlated to percent leaf nitrogen, leaf potassium, and peel nitrogen. Two out of three years, nectarine pox was positively correlated

to terminal shoot growth and percent peel potassium and magnesium. One out of three years, nectarine pox was positively correlated to percent leaf phosphorus and magnesium and percent peel phosphorus and negatively correlated to crop load, percent leaf boron and percent peel calcium. In the third year, an additional tissue nutritional analysis was conducted in May, and percent leaf boron was highly correlated with nectarine pox incidence.

Analyses conducted across the three years of data revealed an inverse correlation between nectarine pox, crop load, and average temperature in May and positive correlations between nectarine pox incidence and percent leaf nitrogen, percent peel nitrogen, and June rainfall. These data are consistent with the relationships reported in a five-year comparison conducted in West Virginia (Auxt Baugher and Miller, 1991a). Cool May temperatures inhibit uptake of boron and sometimes reduce crop load. June rainfall may cause growth spurts at a susceptible developmental stage.

Best Management Practices

Based on studies in Pennsylvania and West Virginia orchards, nectarine producers should:

- Avoid practices that encourage excessive shoot growth (especially spurts of growth in late May/early June or before harvest)
- Utilize management tools that encourage even growth over the season (such as regularly scheduled irrigation)
- Maintain nitrogen, phosphorus, potassium, and magnesium at moderate levels, and
- Maintain calcium and boron at optimum levels.

To assess most nutrient levels, leaves should be sampled in mid-July to mid-August, but boron is best assessed in May.

Research and grower observations indicate that nectarine pox is similar to cork spot on apples in that it is associated with any factor that contributes to an irregular rate of fruit growth. Conditions that appear to predispose trees to nectarine pox include high

nitrogen (and other macronutrients), uneven moisture, and physical constriction. As with cork spot, it also is important to maintain optimum boron and calcium levels.



Influence of growth-suppressing treatments on incidence of nectarine pox, fruit quality, and tree growth				
Treatment	Nectarine pox (%)	Red surface (%)	Fruit diam (cm)	Shoot length (cm)
Root pruning	4.4 a	84 a	6.8 a	82 ab
PGR	8.1 ab	80 a	6.9 a	78 a
Limb girdling	10.8 b	76 b	7.0 a	95 c
Untreated control	11.5 b	70 c	6.9 a	105 d

Special thanks to cooperating fruit producers: Ronald Slonaker, West Virginia, and Mark Rice, Jim Lott, Jim Lerew, Joe Lerew, John Lerew, and Doug Lott, Pennsylvania

Literature Cited

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Practical Suggestions for Managing Nectarine Pox

Recommendations based on research conducted in Pennsylvania and West Virginia Orchards

Long-Term Program for Control of Nectarine Pox

- Plant nectarines on moderately fertile sites.
- Do not plant highly susceptible cultivars, e.g., 'Firebrite'.
- Plant nectarines on sites with excellent air drainage.

Annual Program for Control of Nectarine Pox (Where it is an Occasional Problem)

- Avoid practices that encourage excessive shoot growth, e.g., over-pruning, over-thinning, over-fertilizing. It is especially important to prevent growth spurts during bloom to pit hardening and before harvest.
- Utilize management tools that encourage even growth over the season, e.g., supplemental irrigation on a routine schedule.
- Monitor nutritional levels carefully. Annual leaf analyses are important!
- Maintain N, P, K, and Mg at moderate levels. e.g., maintain leaf N at 2.5-3.0%.
- Maintain Ca and B at optimum levels.

Caution: Do not exceed recommendations provided by the Penn State Plant Analysis Laboratory, as excess B can result in toxicity symptoms. Optimum range for leaves: 31-59 ppm; toxicity range: 81-155 ppm.

Annual Program for Control of Nectarine Pox (Where it is a Severe Problem)

- Avoid practices that encourage excessive shoot growth.
- Determine where nutritional imbalances occur and develop a program to ameliorate the ratio of N, P, K, and Mg levels to Ca and B levels.
- Root prune 2 weeks after full bloom *on two sides of the trunk, between rows, at a depth of 1 foot and a distance of 3 feet from the trunk.* **Caution:** Do not root prune if tree growth is not excessive or if trees are experiencing drought stress.
- Keep good records of climatic conditions, cropping, leaf and soil analysis results, and cultural practices in order to develop site-specific information that will guide you in developing an effective nectarine pox management program.

Do not rely on just one control measure, e.g., application of boron sprays. Develop a comprehensive program that includes all of the above practices.