**Impact of Fungal Gummosis on Peach Trees**

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Abstract. Peach tree fungal gummosis caused by Botryosphaeria dothidea [(Moug.:Fr.) Cos & de Not.] is widespread throughout the southeastern United States. Until recently, its economic impact on peach [Prunus persica (L.) Batsch] has been impossible to estimate, since no effective controls were known. Significant, though not total, suppression of gummosis on ‘Summergold’ peach trees was achieved with an intensive 5-year spray program with captalalf. Captan was far less effective than captalalf. In both effective treatments, yield of mature fruit on treated trees was 40% to 60% higher than that of untreated ones. Following termination of the spray program after 5 years, disease severity gradually increased on both captalalf- and captan-treated trees. However, through eight growing seasons, disease severity was significantly lower on captalalf-treated trees. This study demonstrates that peach tree fungal gummosis significantly depresses tree growth and fruit yield on susceptible peach cultivars.

Peach tree fungal gummosis first appeared in Georgia during the 1960s. The disease is characterized by numerous gum extrusions on trunks, limbs, branches, and twigs. Symptoms include sunken lesions around lenticels and blisters on surfaces of shoots and twigs. Severely affected trees exude large amounts of gum from these lesions, especially following extended periods of rainfall. Infected trees are weakened, exhibiting dieback of twigs, shoots, and even limbs. Trees may die during prolonged stress periods (Daniell and Chandler, 1982; Weaver, 1974). The causal agent has been identified as Botryosphaeria dothidea (Weaver, 1974). Since that time, it has spread throughout the southeastern U.S. peach production areas (Pusey et al., 1986; Reilly and Okie, 1982). Scientists and growers alike feared it would be the end of the peach industry if fungal gummosis was not controlled (Reilly and Okie, 1982; Weaver, 1976). Despite its dramatic appearance, many growers have come to regard it as a nuisance that can be “pruned out” of trees during the dormant season and is of no economic significance other than increased pruning costs. However, literature lacks data to support this position.

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Materials and Methods

Trees of ‘Summergold’/‘Lovell’ peach were planted in Feb. 1990 at a spacing of 6.1 × 6.1 m at the Southeastern Fruit and Tree Nut Research Laboratory, Byron, Ga. Experimental plots were established in a randomized complete-block design with 10-three-tree replicates of each fungicide treatment (row = block). Trees were maintained according to standard commercial recommendations (Myers, 1989), and they received no supplemental irrigation. ‘Summergold’ was selected as the scion cultivar because of its known susceptibility to gummosis (Britten et al., 1990).

Work by several researchers (Pusey, 1989a; Pusey et al., 1985; Weaver, 1979) indicated that inoculum may enter a new orchard either as airborne ascospores or through rain splash from nearby infected trees. Therefore, ‘Redglobe’ trees of the previous orchard were left intact to provide an inoculum source. The experimental block was surrounded by severely diseased 15-year-old ‘Redglobe’ peach trees (two rows on each side).

Experimental fungicidal treatments are outlined in Table 1. With the exception of Whiton powder, fungicide treatments commenced 30d postbloom (typically mid-late April) and were repeated at 2-week intervals for a total of 8–10 treatments each year. Each spray was applied to the trunk and scaffold limbs to runoff. Whiton powder was applied to the trunks and scaffolds once annually prior to budbreak. An additional control treatment differed from the water control in that Botryosphaeria-infected prunings were placed in the canopy each spring to provide additional inoculum pressure. Infected prunings were prepared by spraying peach prunings to runoff with a spore suspension of B. dothidea (10⁵ spores/mL). Isolate was a known virulent strain (PI-5) collected from peach in Georgia (Pusey, 1989b; Pusey et al., 1986). Following inoculation, prunings were piled for at least a 3-week period at the edge of a wooded area before use. Treatments were applied from 1990 through 1994 during each growing season and were then suspended thereafter to determine whether the disease suppression achieved would persist in the absence of a spray program. This decision was based on the apparent relationship between bark age and disease susceptibility. Weaver (1979) artificially inoculated peach bark varying in age from 1- to 3-years-old and noted reduced symptom expression on the older bark. Similarly, in an orchard study to determine when peach trees were infected, it was noted that the portion of the trunk of peach trees that had been protected with covers for the first 2 years following planting were still essentially free of gummosis at 5 years of age; unprotected portions displayed severe symptoms (Pusey and Bertrand, 1993; Pusey and Okie, 1994). Hence, it appeared possible that control of fungal gummosis might be necessary only during the first few years following orchard establishment.

Each fall, trunk diameter was measured 30 cm above the soil line. Previous work had demonstrated that symptom development following inoculation required 12–18 months (Pusey, 1993; Pusey et al., 1986; Weaver, 1974). Therefore, starting in Fall 1991, tree trunks and scaffolds were evaluated for gummosis severity using the rating scale shown in Table 2. Disease ratings were based on visual observation of the trunk and the main scaffold.
Table 2. Rating scale used to evaluate trunk and scaffold gummosis (1991–97, Byron, Ga.).

| Rating | Description |
|--------|-------------|
| 0      | No gum sites |
| 1      | 1 or 2 gum sites or lesions on trunk or scaffolds |
| 2      | 3–10 gum sites or lesions on trunk or scaffolds |
| 3      | 11–25 gum sites on trunk or scaffolds |
| 4      | 26–50 gum sites on trunk or scaffolds |
| 5      | 51 or more gum sites on trunk or scaffolds |

Table 3. Effect of fungicide treatments on the gummosis ratinga of ‘Summergold’ peach (1991–97, Byron, Ga.).

| Fungicide | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 |
|-----------|------|------|------|------|------|------|------|
| Control   | 2.4  | 3.4  | 4.5  | 4.9  | 4.8  | 5.0  | 4.9  |
| Control + prunings | 2.1  | 3.8  | 4.6  | 5.0  | 4.8  | 5.0  | 5.0  |
| Tenn-copp | 2.3  | 3.6  | ---  | ---  | ---  | ---  | ---  |
| Whiton + Cu | 1.6  | 3.3  | ---  | ---  | ---  | ---  | ---  |
| Captan    | 0.5  | 1.1  | 3.6  | 4.5  | 4.6  | 4.8  | 4.6  |
| Captafol  | 0.1  | 0.2  | 1.2  | 2.3  | 2.4  | 3.1  | 3.1  |
| LSD0.05   | 0.6  | 0.4  | 0.3  | 0.6  | 0.3  | 0.3  | 0.3  |

Rating scale of 0–5 (Table 2).

Table 4. Effect of fungicide treatments on trunk cross-sectional area of ‘Summergold’ peach (1991–97, Byron, Ga.).

| Fungicide | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 |
|-----------|------|------|------|------|------|------|------|
| Control   | 10.3 | 16.6 | 41.7 | 68.6 | 23.7 | 88.2 |      |
| Control + prunings | 13.7 | 15.6 | 44.1 | 71.5 | 23.0 | 91.5 |      |
| Tenn-copp | 12.3 | ...  | ...  | ...  | ...  | ...  |      |
| Whiton + Cu | 10.7 | ...  | ...  | ...  | ...  | ...  |      |
| Captan    | 12.2 | 17.9 | 48.1 | 78.1 | 24.1 | 95.8 |      |
| Captafol  | 11.7 | 15.2 | 58.5 | 82.7 | 39.1 | 119.1|      |
| LSD0.05   | 5.2  | 2.8  | 8.7  | 11.2 | 9.2  | 18.0 |      |

Table 5. Effect of fungicide treatments on fruit yield of ‘Summergold’ peach (1992–94 and 1997, Byron, Ga.).

| Fungicide | 1992 | 1993 | 1994 | 1992–94 | 1997 | 1992–94 + 1997 |
|-----------|------|------|------|---------|------|----------------|
| Control   | 0.20 | 0.25 | 0.46 | 0.46    | 0.20 | 0.20           |
| Control + prunings | 0.28 | 0.23 | 0.48 | 0.48    | 0.20 | 0.20           |
| Tenn-copp | 0.24 | ...  | ...  | ...     | ...  | ...            |
| Whiton + Cu | 0.20 | ...  | ...  | ...     | ...  | ...            |
| Captan    | 0.27 | 0.27 | 0.54 | 0.54    | 0.27 | 0.27           |
| Captafol  | 0.20 | 0.16 | 0.54 | 0.54    | 0.27 | 0.27           |
| LSD0.05   | 0.11 | 0.03 | 0.07 | 0.07    | 0.05 | 0.05           |

Table 6. Effect of fungicide treatments on yield efficiency of ‘Summergold’ peach (1992–94 and 1997, Byron, Ga.).

| Fungicide | Yield efficiency (kg/cm²) |
|-----------|--------------------------|
| Control   | 0.20                     |
| Control + prunings | 0.28 | 0.23 | 0.48 | 0.20 |
| Tenn-copp | 0.24                     |
| Whiton + Cu | 0.20 | ...  | ...  | ...  |
| Captan    | 0.27                     |
| Captafol  | 0.20                     |

Table 2. Rating scale used to evaluate trunk and scaffold gummosis (1991–97, Byron, Ga.).

Table 3. Effect of fungicide treatments on the gummosis ratinga of ‘Summergold’ peach (1991–97, Byron, Ga.).

Table 4. Effect of fungicide treatments on trunk cross-sectional area of ‘Summergold’ peach (1991–97, Byron, Ga.).

Table 5. Effect of fungicide treatments on fruit yield of ‘Summergold’ peach (1992–94 and 1997, Byron, Ga.).

Table 6. Effect of fungicide treatments on yield efficiency of ‘Summergold’ peach (1992–94 and 1997, Byron, Ga.).
Although a few resistant peach lines have been identified (Okie and Pusey, 1996), most of these are “exotic” lines, lacking cultivar quality. Hence, at best, it likely will take several generations before adapted resistant cultivars could become available. Nonetheless, in light of the negative impact of gummosis on tree growth and fruit yield found in this study and the current absence of a proven cost-effective chemical control or management strategy, genetic resistance is a goal worth pursuing. This is especially so given the questionable cost-effectiveness and longevity of any chemical control program developed in the future if it requires a spray application frequency approaching that used in this trial.

In the interim, growers will have to rely on current orchard management practices, hopefully augmented with a chemical control. Taylor and Sherman (1997) recently demonstrated the efficacy of phosphorous acids in providing at least partial suppression of gummosis under field conditions. We recently tested a range of registered fungicides and found several that provided significant suppression of Botryosphaeria dothidea in vitro (Beckman et al., 1999). The most promising of these are currently under trial to determine their efficacy in the orchard.

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