Research Progress Report
Southern Region Small Fruit Consortium

Title: Use of phosphite materials for control of *Pythium* and other root rot species in high-density blueberry production systems

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Objectives: Test phosphite materials for suppression of the *Phytophthora*/*Pythium*/*Rhizoctonia* disease complex observed in high-density, bark-bed plantings of southern highbush blueberries.

Justification: Southern highbush blueberry varieties mature during a market window which allows for high profitability. However, the southern highbush varieties are often poorly adapted for soils with low organic matter. As a result, high-density bark beds are utilized as an alternative, circumventing the organic matter issue. This system also has issues that have not been observed in traditional blueberry production. Plants often die within a relatively short period of time (1-3 years), and replants are generally necessary. We have recently identified some of the causal organisms associated with this root-rot decline, and as far as we know at this time, these are unique as major blueberry pathogens to the bark-bed system; *Pythium* and *Rhizoctonia* spp. have been found in constant association with the disease, and initial tests (Cameron Whiting; *personal communication*) have shown these to be pathogenic. These pathogens are thought to act in a disease complex, with the *Pythium* spp. acting as root "nibblers," allowing for secondary infections of *Rhizoctonia* spp., as observed in cotton and other plant systems. In addition, classic *Phytophthora cinnamomi* has also been isolated from bark beds (Phil Harmon; *personal communication*). Due to the high value of the commodity in question, extension of the productive life of plants would be of incredible value to the blueberry industry.

No materials were registered which had been tested and promoted for control of *Pythium* or *Rhizoctonia* root rot in blueberry. Aliette and Ridomil Gold are registered for blueberry, and these would likely

provide control of *Pythium* spp., but neither product is specifically labeled for *Pythium* on blueberry, and both products are very expensive, making producer adoption an issue. Phosphite products, such as ProPhyt and Agrifos, have been reported to have efficacy and mode of action that is similar to that of Aliette, at a fraction of the cost. We had in fact confirmed that such materials were equivalent to Aliette and Cabrio for control of Septoria and anthracnose leaf spots of blueberry. These materials may be logical rotation partners for mefenoxam, the active ingredient for Ridomil Gold. However, sufficient efficacy data had not been obtained to recommend the use of these materials for bark beds.

Methodologies: Bark beds were established prior to transplant at Griffin and Alapaha, GA (Univ. of Georgia research station sites). At each location, the test was conducted on both new bark and old bark in which blueberries had been recently planted (two separate test runs per location). Plants (Star) were transplanted in March, and treatments were applied after leaf development (see Table 1 for treatment list and application dates). Treatments were applied twice in the spring and twice in the fall – treatment timings that roughly corresponded to root flushes which occur in blueberry. Each treatment was replicated four times. Each plot consisted of three (Alapaha) or four (Griffin) newly transplanted (gallon pot) blueberry plants planted in rows (4 ft apart with a 4-ft spacing between plants). For assessment of root rot severity, plants were rated subjectively (0 = dead plant, 1 = partial death of the plant with extreme stunting, 2 = extreme leaf discoloration (reddening and yellowing) and plant stunting, 3 = moderate reddening of leaves and plant stunting, 4 = limited symptoms and very minor plant discoloration, 5 = healthy plant. Initial data were collected in late-summer (August). Roots were collected randomly from the untreated plots to confirm root damage and the presence of *Phytophthora* , *Pythium* and *Rhizoctonia* spp.

Treatments consisted of the following:

(1) Untreated Control (no fungicides)
(2) Control, Cabrio for leaf spot (potential covariant treatment if leaf spot was a confounding problem)
(3) Ridomil Gold @ 0.4 gal/acre, drench, 4 applications
(4) Prophyt @ 4 pints/acre, foliar spray, 4 applications
(5) Agrifos @ 5 pints/acre, foliar spray, 4 applications
(6) Ridomil Gold 2 applications, Prophyt 2 applications (alternating)
(7) Ridomil Gold 2 applications, Agrifos 2 applications (alternating)

Application timing: Fungicides were applied immediately after transplanting. A total of four applications were applied – two spring applications and two fall applications with approximately one month between applications within seasonal blocks.

Table 1. Detailed treatment and application information.

Timing of Applications				
Treatment Overview	1st Application Date (10 April)	2nd Application Date (8 May)	3rd Application Date (4 September)	4th Application Date (Griffin, 9 October; Alapaha, 16 October)
1. Untreated Control (no fungicides)	Untreated Control (no fungicides)	Untreated Control (no fungicides)	Untreated Control (no fungicides)	Untreated Control (no fungicides)
2. Control, Cabrio for leaf spot (foliar spray)	Cabrio @ 14 oz/A	Cabrio @ 14 oz/A	Cabrio @ 14 oz/A	Cabrio @ 14 oz/A
3. Ridomil Gold @ 0.4 gal/A (drench)	Ridomil Gold @ 0.4 gal/A (drench)	Ridomil Gold @ 0.4 gal/A (drench)	Ridomil Gold @ 0.4 gal/A (drench)	Ridomil Gold @ 0.4 gal/A (drench)
4. ProPhyt @ 4 pints/A (foliar spray)	Prophyt @ 4 pts/A	Prophyt @ 4 pts/A	Prophyt @ 4 pts/A	Prophyt @ 4 pts/A
5. Agrifos @ 5 pints/A (foliar spray)	Agri-Fos @ 5 pts/A	Agri-Fos @ 5 pts/A	Agri-Fos @ 5 pts/A	Agri-Fos @ 5 pts/A
6. Ridomil Gold and Prophyt alternation treatments	Ridomil Gold @ 0.4 gal/A (drench)	Prophyt @ 4 pts/A	Ridomil Gold @ 0.4 gal/A (drench)	Prophyt @ 4 pts/A
7. Ridomil Gold and Agrifos alternation treatments	Ridomil Gold @ 0.4 gal/A (drench)	Agri-Fos @ 5 pts/A	Ridomil Gold @ 0.4 gal/A (drench)	Agri-Fos @ 5 pts/A

Results: Initial results from both the Griffin (Figure 1) and Alapaha (Figure 2) field trials have clearly shown the benefit of root rot control in bark beds, without regard to whether fresh bark is utilized. Ridomil, phosphites (ProPhyt or Agrifos), or Ridomil/phosphite rotations provided significant improvement in vigor and survival in the initial year of planting. Disease severity was greater at the Alapaha location, resulting in greater clarity. When all data were combined from the August rating at both locations and across bark types, the need for root rot control becomes even more obvious (Figure 3). Additional data was collected in November (after the second block of fall applications), but this data has not been analyzed to date. However, vigor differences were still very apparent, as indicated by side-by-side comparison of plant growth and vigor (Figure 4). Plant samples from the untreated control plots are currently being analyzed by Dr. Phil Harmon (University of Florida) for pathogen identification. Bud counts and plant weight data will be collected this winter.

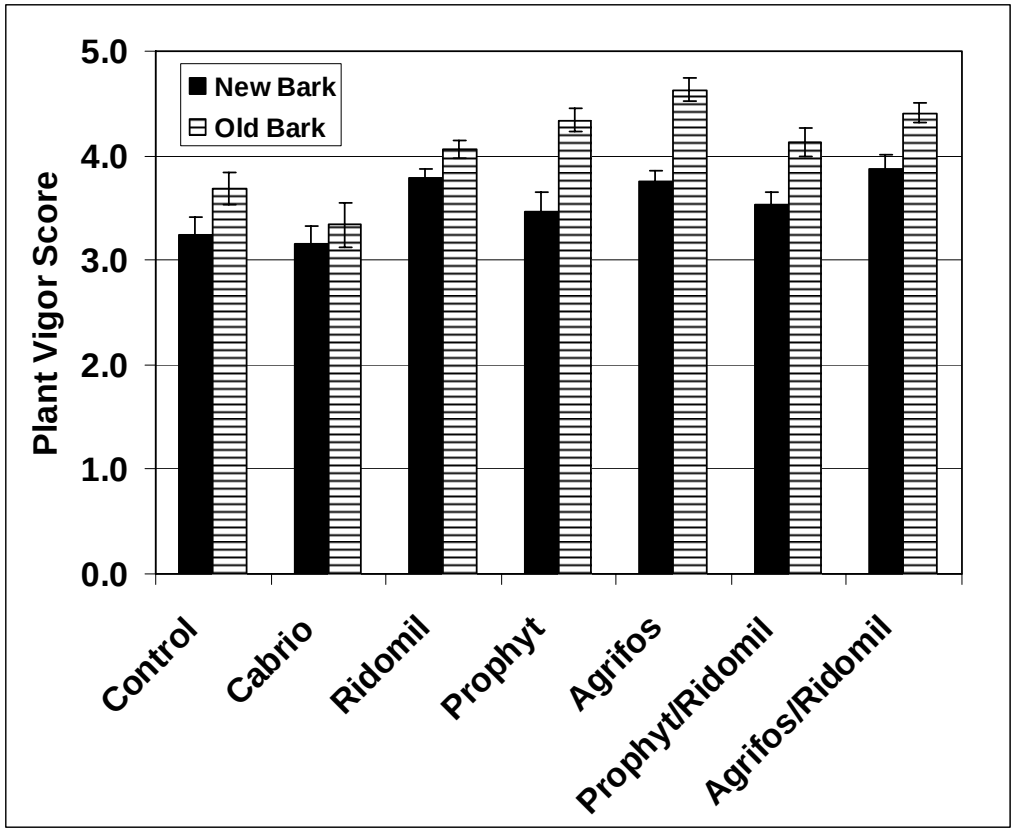

Figure 1. Plant vigor score for Griffin 2006 bark bed fungicide trial. Data were collected mid-August.

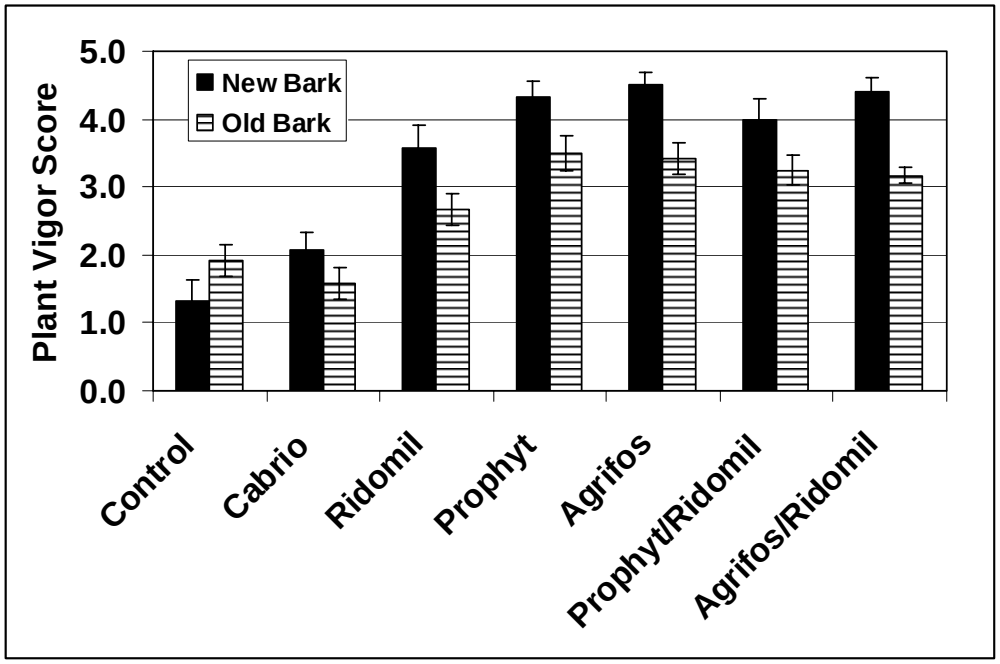

Figure 2. Plant vigor score for Alapaha 2006 bark bed fungicide trial. Data were collected mid-August.

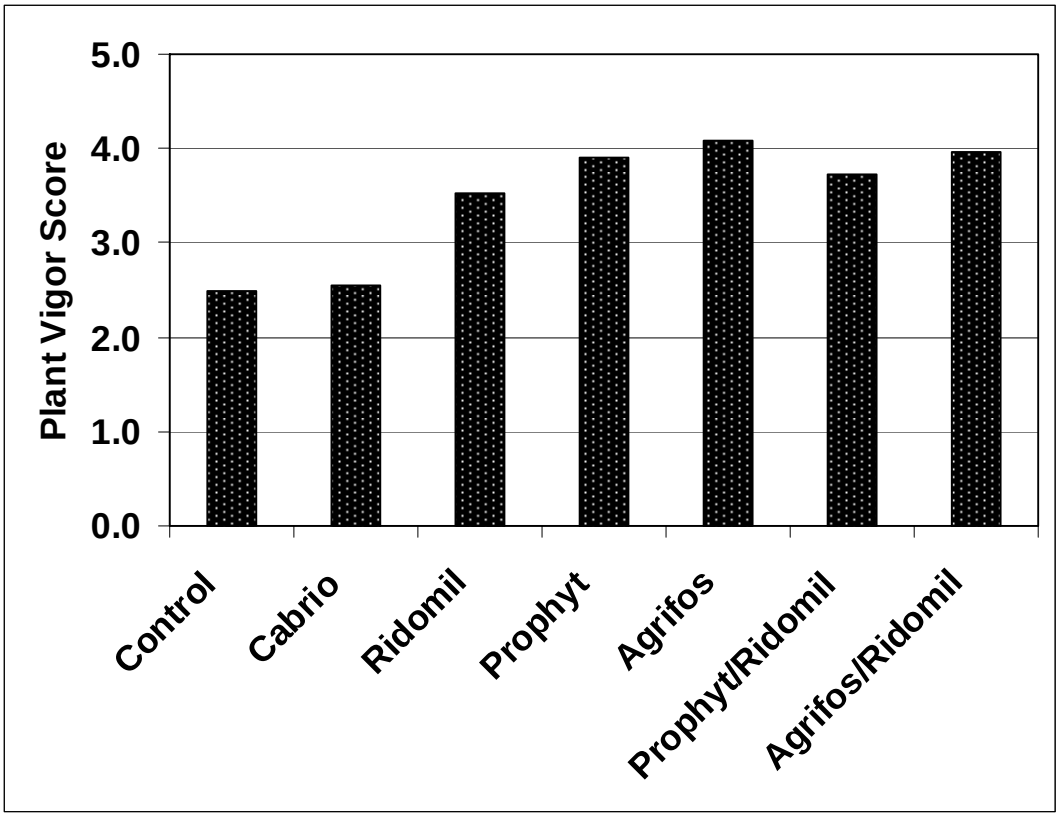

Figure 3. Plant vigor score combined for Griffin and Alapaha 2006 bark bed fungicide trials. Also, data for bark types were pooled. Data were collected mid-August.

Figure 4. Comparison of a representative phosphite-treated plant (left) versus untreated control plants at Griffin, GA site (mid-November).

Conclusions: Without regard to whether blueberries are planted in new or previously utilized bark, there is a need for root rot control in bark bed production. Use of Ridomil (a soil drench) works well, but the application of the phosphites works equally well, if not better, and the phosphites are easily applied through foliar applications. In addition to ease of application, the phosphites cost substantially less than Ridomil Gold.

Impact Statement: This is the first report which clearly indicates that root rot control is essential in bark-bed production, even when new bark is utilized. Due to this research effort, we will now recommend application of either Ridomil Gold or phoshite materials when establishing new pine bark-bed blueberry plantings. The demonstration that phosphites are as efficacious as Ridomil Gold also has additional benefit, in that the phosphites can be more easily applied and at a reduced cost. In addition, phosphites have recently been shown to control the major leaf spot diseases of blueberry, Septoria and anthracnose leaf spots.