On-farm testing of new fungicide spray regimes for managing Exobasidium leaf and fruit spot of blueberry

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Southern Region Small Fruit Consortium

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Objectives: (1) Monitor disease development on selected rabbiteye and southern highbush blueberry cultivars; (2) conduct replicated trials to repeat, validate and expand fungicide options, and (3) coordinate and monitor grower use of new fungicide spray regimes.

Justification and description: Exobasidium fruit and leaf spot is an economically significant disease of blueberry in the southeastern US. The causal fungus has been identified as a new and unique species (*Exobasidium maculosum*) that causes a distinctive spot on leaves and fruit. Infected areas on fruit appear as highly visible spots (2-10 mm dia) that do not ripen. These green, unripe spots on otherwise sound, ripe blue fruits are unsightly and render the berries unmarketable (Fig 1). Hand-removal of affected berries during commercial sorting and packing is not feasible due to the impossibility of seeing and removing every affected berry. Even automated lines with computerized color sorters cannot remove all of the affected berries.

Figure 1. Symptoms on blueberry fruit (*image enlarged*), upper leaf surface and lower leaf surface

Previous studies funded by the SRSFC led to taxonomic classification of the pathogen and information on fungicide efficacy and timing. The biology of the fungus is still not clearly understood – we still do not know where or how it overwinters, but we do know (i) when and where the symptoms become visible, (ii) the efficacy of some fungicides, and (iii) the importance of early sprays in the budbreak-to-bloom window. Some fungicides have given variable efficacy in different locations and years, and this may be due to resistant populations of the pathogen in those locations. There is also a single year of experimental data showing good efficacy from a delayed-dormant spray of lime-sulfur.

Methodology
Fungicides trials in North Carolina were applied in early season (from delayed dormant through blossom drop) in three on-farm trials. Results of two of the on-farm experiments comparing single sprays of lime-sulfur vs Sulforix were inconclusive due to low disease pressure; however the third on-farm trial was in an area leaf unsprayed by the grower, with high disease incidence that provided useful data. This experiment was conducted on mature (est. 15-yr-old) bushes planted on 5 × 12 ft spacing at a grower site in Bladen County, NC. Plots consisted of three adjacent bushes in a row. A randomized complete block design was used with five replications, for a total of 15 plots. Spray treatments were applied using a CO2-powered backpack sprayer delivering the equivalent of 50 gallons per acre (gpa) at approx. 40 psi. A hand-held spray boom with two hollow cone nozzles spaced 20 inches apart was used. At each spray date, applications were made in a single timed pass down one side of each plot, and evaluations were made from the sprayed side. Treatments were applied once, on 11 Mar. Percent leaves diseased infected (incidence) and average number of lesions per leaf (severity) were visually estimated 22 May. A one 1-pint sample of ripe berries was collected randomly from the sprayed side of the center bush in each plot on 18 Jun and sorted visually based on the presence or absence of green spots on ripe berries. Statistical analysis was performed using PROC ANOVA (wwww.sas.com).

Results (NC)
Disease pressure was adequate for testing at a single site in North Carolina. Fruit infection data do not reflect total yield loss for the season, but only the percent infected fruit on a single date at the beginning of harvest. Infected berries were often smaller and tended to fall off prematurely. The side-by-side comparison below shows the difference between fruit infection expressed as berry weight (column one) versus fruit infection expressed as berry number (column two), where berry number is the more accurate measure. No phytotoxic effects were noted from any treatments. Both treatments were effective in reducing disease.

	fruit infection		leaf infection	
Treatment and Rate/A	% infected (by weight)	% infected (by number of berries)	% leaves with one or more spots	Avg. no. spots per leaf
Untreated check	22.0 a	28.0 a	46.8 a	3.0 a
Lime Sulfur 4 gal	4.7 b	5.6 b	14.8 b	0.3 b
Sulforix 1 gal	2.2 b	2.5 b	7.6 b	0.1 b

*Means within a column followed by the same letter are not significantly different, LSD, (α=0.05).

Additional Results (GA)
Additional results comparing Sulforix, Lime-Sulfur and Captan are provided in a separate report (see SRSFC report no. 2014-10)

Conclusions
The active ingredient in both lime-sulfur and Sulforix is calcium polysulfide(s) at 29 or 27 percent, respectively. Both products were equally effective in reducing disease, even though there is a 4-fold difference in the labeled use rate that we tested in 2014 (lime sulfur at 4 gal/acre vs Sulforix at 1 gal/acre). This suggests that lime-sulfur might be just as effective at a much lower rate of 1 gal/acre. Lime-sulfur is labeled for organic use while Sulforix is not, so the implications for organic control of Exobasidium are significant. Comparisons should be made in 2015 testing both products at the low (1 gal/acre) rate, and at the high (4 gal/acre) rate.

Impact statement
Growers continued to suffer significant loss due to Exobasidium leaf and fruit spot in 2014, and in some ‘Premier’ rabbiteye blueberry fields the disease was severe enough to prompt loss assessments by insurance adjustors. Lack of adequate control was noted even where conventional fungicides were applied earlier than normal, and disease losses were seen in fields of cultivars like ‘New Hanover’ that were previously unaffected. This research provides additional data on lime-sulfur and Sulforix that will enable growers to time and apply a delayed-dormant treatment, reduce disease incidence, and increase marketable yields in 2015.