Testing a Warning System for Anthracnose Fruit Rot on Day-neutral Strawberry

RFR-A1104

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Introduction

Anthracnose fruit rot (AFR) of strawberry is caused by three *Colletotrichum* spp. In the Midwest, however, only *Colletotrichum acutatum* is found. This fungus can attach itself to apparently healthy plants and spread throughout without causing symptoms on the foliage. When fruit begin to ripen and weather conditions are rainy and warm, AFR can suddenly cause great damage to the fruit. To protect against AFR where it has appeared in the past, growers need to spray every 7 to 10 days beginning at the start of bloom until harvest.

A disease-warning system for AFR was developed in Florida by Natalia Peres and colleagues. Disease-warning systems are tools that help growers optimize control while reducing fungicide and labor expenses. The strawberry AFR warning system uses in-field measurements of leaf wetness duration (LWD) and temperature to predict the risk of an AFR outbreak. This warning system has been demonstrated to be effective and economical in controlling strawberry AFR and saving fungicide sprays in Florida. Since the environmental conditions in Iowa are different from Florida, we need to test the warning system under local conditions before it can be adapted by Iowa growers.

Some of the older, broad-spectrum fungicides used in the strawberry industry may pose human health concerns. As a result, this study will be comparing the effectiveness of an alternative reduced-risk pyraclostrobin fungicide, Cabrio, to the older fungicide Captan.

Our 2011 field trial was the first year of a 4-year research project including five states: Florida, South Carolina, North Carolina, Ohio and Iowa. The objectives of the research in Iowa were to determine 1) whether the warning system can control AFR as well as a calendar-based fungicide program in Iowa, and 2) compare the performance of the reduced-risk fungicide Cabrio to that of the broad-spectrum fungicide Captan.

Materials and Methods

On May 10, 2011, crowns of day-neutral strawberry cultivar Tristar were planted in double rows 1 ft apart in 90-ft-long rows on white-on-black plastic mulch spaced 6 ft apart. Treatment rows were alternated with unsprayed guard rows. Within treatment rows, 10-ft-long subplots containing 20 plants each were separated by 10-ft-long gaps. Cornstalk mulch was placed between rows after planting. Plants were drip irrigated. A weather station (CR10) was placed in the center of the field on June 1 to record hourly LWD and temperature. The data were downloaded twice weekly and used to calculate disease risk.

On the evening of July 21, all plants were inoculated with a suspension of *C. acutatum* (5×10^5 conidia/ml) using a backpack sprayer. Overhead irrigation was used for a few days to encourage disease development after inoculation.

Five treatments (Table 1) included two fungicides (Cabrio and Captan), two spray timings (calendar-based vs. the AFR warning system), and an unsprayed control. Each treatment was replicated four times.

Fruit were harvested twice weekly from July 25 to September 15. Weight and number of marketable fruit, culls, and number of fruit with AFR symptoms were recorded. Disease incidence, marketable yield, and cull yield were compared to evaluate the effect of treatments.

Results and Discussion

Captan and Cabrio performed equally well (P>0.05). However, the warning system did not perform as well as the 10-day calendar spray. Percent disease incidence using the warning system was half that of the unsprayed control, whereas the percent disease incidence of the calendar-based spray treatments was reduced by 80 to 90 percent compared with the unsprayed control.

The calendar-based sprays were applied one day after inoculation according to the spray calendar, but the disease-warning system sprays were applied four days after inoculation and the warning. The heavy dose of inoculum coupled with the 3-day difference in fungicide application timing may have contributed to a substantial difference in pathogen survival and colonization, and influenced the differences in disease development that occurred between treatments that differed by only one spray.

In 2012, we plan to alter our methods by applying the fungicides at the same time after inoculation in every sprayed treatment, and then base the timing of subsequent sprays on the treatment criteria.

Acknowledgements

Thanks to Nick Howell, the ISU Horticulture Farm crew and the 312 Bessey field crew for crop planting, maintenance and harvest.

Table 1. Treatments, anthracnose fruit rot (AFR), and yield data summary.

Treatment	Fungicide	Rate lb/acre	Timing schedule	Period	Number sprays	AFR[a] % incidence	Yield per 20 plants (g) Marketable weight[a,b]	Cull weight[a,c]
1	Captan 80WP	3.75	10 days	July1 to Sept 15	6	5.1 c	294.5 a	46.1 b
2	Cabrio 20EG Captan 80WP	0.88 3.75	10 days 10 days	July1 to July 31 Aug1 to Sept 15	6	2.4 c	303.3 a	55.1 b
3	Captan 80WP	3.75	Warning system	July1 to Sept 15	5	13.8 b	236.6 b	87.9 a
4	Cabrio 20EG Captan 80WP	0.88 3.75	Warning system; alternated fungicides	July1 to Sept 15	5	13.2 b	239.0 b	87.6 a
5	None	NA	NA		0	24.9 a	174.2 c	97.9 a

[a]Means followed by the same letter are not significantly different within column according to Fisher's protected LSD at P≤0.05.
[b]Marketable yield is the average yield of marketable fruit per 20-plant subplot.
[c]Cull yield is the average weight including fruit damaged by AFR, other rots, and insect pests per 20-plant subplot.

Figure 1. Strawberry field showing subplots. Weather station was placed in the center of the field.