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Testing a Warning System for Anthracnose Fruit Rot on Day-neutral Strawberry–Year 4

Xiaoyu Zhang
Iowa State University

Jean Batzer
Iowa State University, jbatzer@iastate.edu

Mark Gleason
Iowa State University, mgleason@iastate.edu

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Abstract

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

Keywords

Plant Pathology and Microbiology

Disciplines

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Xiaoyu Zhang, PhD student
Jean Batzer, assistant scientist
Mark Gleason, professor/extension plant pathologist
Department of Plant Pathology and Microbiology

Introduction

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

In Florida, a disease-warning system for AFR is used effectively by local strawberry growers, saving several fungicide sprays and controlling disease. Disease-warning systems are tools that help growers optimize control while reducing fungicide and labor expenses. This strawberry AFR warning system uses in-field measurements of leaf wetness duration (LWD) and temperature to predict the risk of an AFR outbreak. Because the environmental conditions in Iowa are different from Florida, we need to test this warning system under local conditions before Iowa growers can use it.

Some of the older, broad-spectrum fungicides used in the strawberry industry may pose human health concerns. Thus this study compares the effectiveness of an alternative reduced-risk pyraclostrobin fungicide, Cabrio, to the older fungicide Captan.

This is the last year of the 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 25, 2014, about 900 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.

Five treatments were evaluated: two spray timing methods (warning-system and calendar), two fungicides (Captan and reduced-risk fungicide Cabrio), and one unsprayed control (Table 1). Each treatment was replicated four times in a randomized complete block design, with four replications. No spray was applied in any treatment before inoculation. On the evening of July 23, all plants were inoculated with a suspension of *C.*

acutatum (5×10^6 conidia/ml) using a backpack sprayer. Overhead irrigation was applied for 30 minutes before and after the inoculation to encourage disease development, then one application of all fungicide treatments were made July 29, five days after inoculation.

Fruits were harvested three times weekly when the weather allowed, from August 5 to September 26. Weight and number of marketable fruit, culls, and anthracnose fruit rot (AFR) were recorded. Disease incidence, marketable yield, AFR yield, and cull yield were compared to evaluate the effect of treatments.

In order to maintain yield quality, 11 lb/acre of urea was applied before planting. When the plants began bearing fruit, a mixture of 20-10-20 plus urea (0.31 lb and 1.07 lb/acre, respectively) was applied using fertigation.

Tarnished plant bug was controlled with two sprays of Dannitol (0.2 lb/acre) and one spray of Assail (2.8 oz/acre).

Results and Discussion

All fungicide treatments significantly ($P < 0.05$) controlled the disease and reduced the disease incidence compared with the unsprayed treatment, which reached 100 percent disease loss during some bi-weekly harvests. The warning system treatments saved one fungicide spray and were as effective as the calendar-based treatments ($P > 0.05$). Cabrio treatments (the reduced-risk fungicide) resulted in slightly better, but not significant, control than the conventional Captan fungicide treatments. When the disease was evaluated with Area Under the Disease Progress Curve (AUDPC), calendar-based spray with Cabrio was significantly better than warning-system spray with Captan only ($P < 0.05$). All the sprayed treatments had less AFR and higher marketable weight than the unsprayed treatment ($P < 0.05$), whereas damage on the fruit caused by other reasons, such as rot, sunburn, animal, or insect, did not differ among treatments.

The very wet, cool growing season of 2014 contributed to heavy disease pressure and slow plant growth. Under these stressful conditions, the warning system treatments effectively controlled AFR as well as calendar-based treatments.

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Table 1. Treatments, anthracnose fruit rot (AFR) incidence, and yield data summary at the ISU Horticultural Research Station.

								Yield per 20 plants (g)		
Trt	Fungicide	Rate lb/A	Timing schedule	Period	Spray #	AFR[a] incidence %	AUDPC[b]	Marketable wt[c]	AFR wt	Cull wt[d]
1	Captan 80WP	3.75	10 days	July 1 to Sept 15	6	13.55 A	638.5 AB	170.08 A	26.01 A	15.30 A
2	Captan 80WP Cabrio 20EG	3.75 0.88	10 days 10 days	July 1 to July 31 Aug 1 to Sept 15	6	8.24 A	352.3 A	191.65 A	12.14 A	15.71 A
3	Captan 80WP	3.75	Warning system	July 1 to Sept 15	5	13.59 A	644.6 B	157.55 A	25.50 A	15.73 A
4	Captan 80WP Cabrio 20EG	3.75 0.88	Warning system; alternated fungicides	July 1 to Sept 15	5	8.33 A	638.5 AB	170.21 A	10.21 A	12.93 A
5	None	NA	NA		0	57.30 B	2898.7 C	44.71 B	91.51 B	13.39 A

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