

Project Title: Timing of field transmission of Grapevine red blotch associated virus

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Reporting Period

The work reported here are from July 1, 2016 through February 28, 2017

Abstract

The goal of this project is to determine when Grapevine red blotch virus (GRBV) is spreading in the vineyard. Knowing when the virus is spreading will provide important information on effective management of GRBaV and help focus the efforts to identify additional vectors. This information will also help target control measures to times of the season when the virus is being transmitted in the field. Three vineyards where GRBV has been spreading are being used in this study. One vineyard has an adjacent riparian zone, with most virus spread occurring near that edge of the vineyard nearest the riparian zone. In this case the trap plants are placed in a grassy area between the riparian zone and the vineyard. The second vineyard has an adjacent alfalfa field and since the one vector reported to transmit the virus is the Three Cornered Alfalfa Hopper, the plants were placed perpendicular to the alfalfa field, and within vineyard rows. The third vineyard has most spread adjacent to a recently disturbed wooded area. In each vineyard, every plant has a unique number and the location of each plant is being mapped so that where virus spread occurs in each vineyard can be determined. Fifteen plants are placed in each vineyard each month starting April 15 through Sept 15, after one month in the field the plants are returned to Corvallis, treated with a systemic insecticide and maintained in a screenhouse. All 300 plants were tested for GRBV the first week of November and all were negative. The plants are being overwintered and will be retested in spring of 2017 and 2018 and in September of 2017. Plants, soil, pots, have been ordered for the 2018 season.

Summary

The goal of this project is to determine when Grapevine red blotch virus (GRBV) is spreading in the vineyard. Knowing when the virus is spreading will provide important information on effective management of GRBaV and help focus the efforts to identify additional vectors. This information will also help target control measures to times of the season when the virus is being transmitted in the field. Three vineyards where GRBV has been spreading are being used in this study. One vineyard has an adjacent riparian zone, with most virus spread occurring near that edge of the vineyard nearest the riparian zone. In this case the trap plants are placed in a grassy area between the riparian zone and the vineyard. The second vineyard has an adjacent alfalfa field and since the one vector reported to transmit the virus is the Three Cornered Alfalfa Hopper, the plants were placed perpendicular to the alfalfa field, and within vineyard rows. The third vineyard has most spread adjacent to a recently disturbed wooded area. In each vineyard, every plant has a unique number and the location of each plant is being mapped so that where virus spread occurs in each vineyard can be determined. Fifteen plants are placed in each vineyard each month starting April 15 through Sept 15, after one month in the field the plants are returned to Corvallis, treated with a systemic insecticide and maintained in a screenhouse. All 300 plants were tested in November of 2016 will be tested for GRBV in spring of 2017 and 2018 and September of 2017. Plants, soil, pots etc. have been ordered for the 2017 season and should arrive the week of March 20, 2017.

Introduction

In 2012, a new virus was identified in 'Cabernet franc' in the New York's Finger Lakes region and also in 'Cabernet sauvignon' plants in the Napa Valley. These plants exhibited leafroll-like symptoms but tested negative for leafroll viruses. At a meeting of the International Committee on the study of Viruses and Virus-like Diseases of Grapevine in October of 2012, the name Grapevine red blotch associated virus (GRBaV) was agreed upon for this new virus.

This research aims to determine when Grapevine red blotch associated virus (GRBaV) is spreading in the field. So far, the three cornered alfalfa hopper has been shown to transmit GRBV, but this vector is very minor in many vineyards where the virus is spreading. Movement of GRBV in vineyards after planting has been documented and can be quite rapid, which clearly indicates the presence an efficient vector, or a vector that is present in very high numbers. An increase in the incidence of GRBV over time in young, healthy vineyards that are adjacent to infected vineyards also suggests the existence of a vector. There has been much work done on trying to identify the vector(s) of GRBaV. Efforts looking at suspected vectors in California have resulted in the identification of the Three Cornered Alfalfa Hopper as a vector early in 2016. Regardless if this is the only vector or one of multiple vectors, the timing of transmission will be important information in developing a vector management plan.

If we know when the virus moves, efforts at vector control can be targeted to a specific time frame rather than throughout the growing season. Also, knowing when the virus is moving in the vineyards will help focus on transient insects, which may be present in vineyards for only a short period of time, or insects that feed on grapevines by have other preferred hosts. In either case these vectors could escape detection and identification in standard insect surveys. If transmission is more efficient in riparian areas adjacent to vineyards it will provide clues as where one should look to identify potential vectors.

This project was started in March using in-house (ARS) funds to ensure we could get the first year of field work done in 2016. Funding from CDFA Pierce's Disease Control Program became available July 1, 2016 and is being used for the remainder of the project. Three hundred grapevines, Merlot on 3309 rootstock, were obtained (donated by) from Duarte nursery, repotted into three gallon pots and held in a screenhouse until being used in the field, or held in a canyard near Corvallis isolated from any vineyards. Plants were tested for Grapevine red blotch virus (GRBV) prior to use in the field experiment and all plants tested negative for GRBV in PCR assays using two sets of primers. Beginning in April 15 plants were placed in each of three vineyards, for a one month period (45 plants each month total). Then in mid-May these plants were returned to Corvallis, treated with a systemic insecticide and stored in a screenhouse. The second set of plants were taken to the vineyards in mid-May, the process repeated each month through September. The last set of plants will be collected from the vineyards in mid-October, there are a total of six sets of plants in each vineyard for a total of 270 trap plants with an additional 30 plants that have not been taken to a vineyard and remained in the screenhouse or canyard during the summer. The last set of plants was collected in mid-October and all 300 plants were tested for GRBV the first week of November.

Objective:

Determine timing of field transmission of Grapevine red blotch virus

Results:

Three hundred plants were provided by Duarte Nursery for this work. All plants were tested for GRBV prior to the start of the experiment. Plants were potted in 3 gallon pots, and maintained in a canyard prior to taking them to the field. When plants were brought back to Corvallis from the fields, they were treated with a systemic insecticide and maintained in a screenhouse.

The three vineyards were selected because of documented spread of GRBV in these vineyards in previous years. Vineyard #1, was near Jacksonville in southern Oregon and has a small riparian area adjacent to the east edge of the vineyard. The trap plants were placed in a grassy area between the riparian zone and the vineyard. Vineyard #2 was near Medford in southern Oregon with the trap plants placed within the vineyard between every third plant in three rows near the west edge of the vineyard. There was an alfalfa field along the west edge of the vineyard. The third vineyard is in the Willamette Valley near Yamhill, Oregon. In this vineyard the spread is occurring throughout the vineyard, with high rates of spread along the east edge of the vineyard where there has been recent removal of adjacent woodlands. In this case the trap plants were placed between plants in a single row of the vineyard near the edge of where symptoms were observed.

Each plant was numbered, 1-300 and the location of each plant and the month it was in the vineyard has been recorded. Thus, if GRBV spread is happening from the alfalfa field, we will know which plants were nearest the source as well as which month the plants were in the field and exposed to potential GRBV transmission.

All 300 plants were tested for GRBV the first week of November and all were negative in this initial screening. The plants are being held in a screenhouse overwinter and will be tested again in June of 2017. 15 of the control plants were taken to a vineyard with nearly 100% infection with GRBV during pruning and a potted plant was pruned after 10 field plants. These 15 plants were left in the field overnight and then returned to the screenhouse. This was done since we often are asked if GRBV can be spread by pruning. These plants will be tested along with the other plants from tests this first year in June of 2017 and 2018 and in Sept. of 2017.

The experiment will be repeated in 2017, with new trap plants. The next set of plants are scheduled to arrive in the third week of March. They will be tested for GRBV, potted and prepared for the 2017 field season. We have additional sites to work with in 2017, since we will be getting 200 additional plants.

Discussion

The experimental setup went according to plan and plant rotation went smoothly. We had feeding damage similar to that observed with Three Cornered Alfalfa Hopper in one vine during the course of exposure in the vineyards. We placed sticky cards in the vineyard in the Willamette Valley and did not catch any Three cornered alfalfa hoppers or any other treehoppers throughout the season. The last set of plants was collected from the field the week of October 11. All 300 plants tested negative for GRBV in Nov. of 2016. We did use 15 of the 30 control plants to test pruning transmission of GRBV even though it is very unlikely to be transmitted on pruners since no other viruses of grapevines are known to be transmitted in this way. But it is one of the most common questions we get from growers. With the much cooler spring we are having in 2017 compared to 2016, the timing of the initial set of plants going to the field may be later than in 2016, it will depend on the development of the grapevines in the field.

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