

Great Lakes Fruit, Vegetable & Farm Market EXPO

December 5-7, 2006

DeVos Place Convention Center, Grand Rapids, MI



Carrot

Wednesday morning 9:00 am

Where: Gallery Overlook (upper level) Room C

Recertification credits: 1 (1A, 1B, Comm CORE, Priv CORE)

CCA Credits: NM(0.5) PM(1.0)

Moderator: Norm Myers, Oceana Co. MSU Extension

9:00 a.m. Nitrogen Management: Effects on Carrot Yield, Quality and Disease Severity

Sean Westerveld, Muck Crops Research Station, University of Guelph, Ontario, Canada

9:45 a.m. Carrot Disease Update

Mary Hausbeck, Plant Pathology Dept., MSU

10:20 a.m. Carrot Weed Control Update

Bernard Zandstra, Horticulture Dept., MSU

10:40 a.m. Aster Leafhopper Infectivity Sentinel Plots

Beth Bishop, Entomology Dept., MSU

Carrot Disease Update

Dr. Mary K. Hausbeck (517-355-4534), Brian Cortright, and Stevie Glaspie
Michigan State University, Department of Plant Pathology

High humidity and frequent rainfall or irrigation are common during the growing season and yield-threatening foliar blights are a recurring problem. Each year, foliar blights caused by fungi (*Alternaria dauci*, *Cercospora carotae*) and/or bacteria (*Xanthomonas campestris* pv. *carotae*) reduce photosynthetic area and weaken leaves and petioles. Michigan growers harvest carrots mechanically and weakened foliage can disrupt harvest due to carrot tops breaking off during lifting. In situations where foliar disease is severe and not controlled, the tops may be compromised to the extent that the crop cannot be harvested.

Bacterial Blight

Bacterial blight was a problem in several carrot fields in 2006. Initial symptoms of bacterial blight are somewhat similar to those of the fungal blights, especially *Alternaria*. However, bacterial blight is not controlled by the fungicide sprays used to manage *Alternaria* and *Cercospora*. While copper sprays may be helpful, the bacteria may become resistant. To maximize the efficacy of copper, sprays would need to be applied early and frequently and initiated prior to disease symptoms.

Carrot Weather Forecasting Project for *Alternaria* and *Cercospora* Control

The Carrot Weather Forecasting Project's purpose is to compare the TOM-CAST system using either on-site weather data or weather data received via a satellite. The satellite weather information was sent by email each morning from Skybit, Inc.®. In each set of information sent, there were the weather data that were collected for the past twenty-four as it was observed through the satellite. Global positioning system (GPS) was used to determine exact locations of our experimental sites in order to obtain the most accurate account of weather data. The emailed weather data were copied into the WS4SM program, which formatted and summarized the data, and predicted TOM-CAST spray application dates. The on-site weather data comparison was collected using Spectrum Technologies® leaf wetness sensors and spray application dates predicted using TOM-CAST.

The Carrot Weather Forecasting Project had two experimental locations. Large scale trials were located on the Michigan State University Muck Farm and on a grower cooperator's farm in Oceana County.

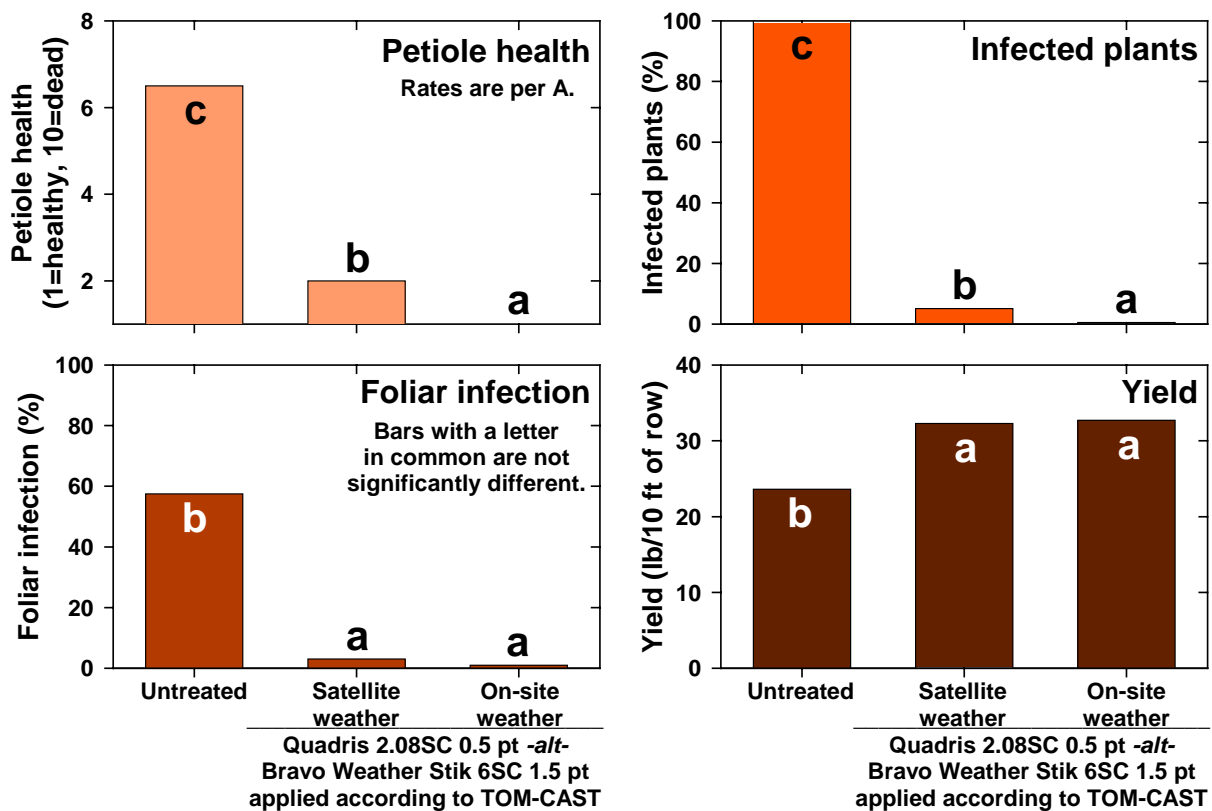
Oceana County Trial

This study was conducted on a grower cooperator farm located in Oceana County, MI near the town of Hart. The soil type in the field was a fine sandy loam that was previously planted to zucchini squash. 'Recoleta' carrot seeds were planted at a density of 8 seeds/ft of row (200M/A) on 21 Apr into three-row beds centered 64 in. apart. Treatment plots consisted of one block of carrots 5 beds wide by 100 ft long. An untreated buffer area consisting of 2 beds 100 ft long were left between forecasting treatment blocks. Fungicide treatments were applied by a tractor mounted boom sprayer equipped with 8003XR nozzles and calibrated to deliver 30 GPA. Weather data were used with the TOM-CAST disease forecaster, 15 disease severity values, to schedule fungicide sprays. Satellite data from the previous 24 hours, used for scheduling hindcast sprays (D-1 corrected), were corrected using a model developed by Iowa State University (Kim, Gleason and Taylor, 2004, Plant Dis. 90:650-656) to reduce errors in the recorded leaf

wetness duration. Six sprays prompted by the 15 DSV D-1 Corrected program using satellite weather data were applied on 3, 18 and 31 Jul, 9 and 23 Aug, 4 Sep. On-site weather data, collected using a Spectrum WatchDog data logger, were used to schedule eight sprays (Spectrum) that were applied on 3, 14 and 25 Jul, 3, 14, 23 and 30 Aug, and 15 Sep. Foliar disease and petiole infection severity assessments were taken using a foliar disease percent estimation and severity rating based on a 1 to 5 scale (1= no lesions, 2=1-10 lesions per petiole, 3=11-20, 4=21-50, and 5>50 lesions per petiole). Petiole infection was determined by counting the number of plants with at least one infected petiole. Overall petiole health of remaining plants was rated on 1 to 10 scale (1=no disease to trace, 10=complete defoliation). After foliar evaluation the carrot tops were removed and root weights were recorded. Data were analyzed using Sigma Stat version 3.1 (Systat Software Inc.) and treatments were compared using the Fisher LSD multiple comparison test.

Both forecasting systems provided significant disease control compared to the untreated control (Fig. 1). The fungicide application scheduled by the Spectrum on-site weather data had significantly better ratings for petiole health, blight severity, and percentage of infected petioles than the block of carrots sprayed using the corrected satellite weather data. Both forecasting plots had similar significant yield increases compared to the untreated control.

Fig. 1. Oceana County Trial



Muck Farm Trial

This study was conducted at the Michigan State University Muck Soils Research Farm located near Laingsburg, MI on a Houghton muck field that was previously fallow. Prior to planting the site was fumigated with Sectagon 42 (75 gal/A) on 1 May. ‘Fontana’ carrot seeds were planted at a density of 8 seeds/ft of row (200M/acre) on 21 May in two seed lines per row with rows centered 16 in. apart on three-row raised beds centered 64 in. apart. Treatment plots consisted of one block of carrots 50 ft long by 200

ft wide. An untreated buffer area consisting of 2 beds 50 ft long were left between forecasting treatment blocks. Fungicide treatments were applied by a tractor mounted boom sprayer equipped with 8003XR nozzles and calibrated to deliver 40 GPA. Weather data were used with the TOM-CAST disease forecaster, 15 disease severity values, to schedule fungicide sprays. Global positioning system (GPS) technology was used to locate the trial site and to obtain local satellite weather data from SkyBit Inc. Satellite data from the previous 24 hours, used for scheduling hindcast sprays (D-1 corrected), were corrected using a model developed by Iowa State University (Kim, Gleason and Taylor, 2006, Plant Dis. 90:650-656) to reduce errors in leaf wetness duration. Six sprays prompted by the 15 DSV D-1 corrected program using satellite weather data were applied on 5, 21 and 31 Jul, 14 and 24 Aug, and 1 Sep. On-site weather data, collected using a Spectrum WatchDog data logger, were used to schedule six sprays (Spectrum) that were applied on 5, 17 and 31 Jul, 11 and 25 Aug, and 8 Sep. Carrots in the center 10 ft of the middle row were hand-harvested and assessed for disease on 7 Sep. Foliar disease and petiole infection severity assessments were taken using a foliar disease percent estimation and severity rating based on a 1 to 5 scale (1= no lesions, 2=1-10 lesions per petiole, 3=11-20, 4=21-50, and 5>50 lesions per petiole). Petiole infection was determined by counting the number of plants with at least one infected petiole. Overall petiole health of remaining plants was rated on 1 to 10 scale (1=no disease to trace, 10=complete defoliation). Do to extensive water damage to the plots, yields were not taken. Data were analyzed using Sigma Stat version 3.1 (Systat Software Inc.) and treatments were compared using the Fisher LSD multiple comparison test.

Both forecasting systems provided significantly better disease control than the untreated (Fig. 2). The plot treated with fungicides applied according to on-site weather data had significantly better ratings for percent infected foliage and plants than the plot treated with fungicides scheduled by the satellite weather data.

Fig. 2. Muck Farm Trial

