

SURVIVAL OF VERTICILLIUM DAHLIAE IN PEPPERMINT STEMS AS AFFECTED BY PROPANE FLAMING AT VARIOUS GROUND SPEEDS

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Abstract

Research by C. E. Horner, Oregon State University plant pathologist during the 1960s in the Willamette Valley, indicated that post-harvest propane flaming of peppermint could assist in the control of verticillium wilt. An internal stem temperature of 60 °F was necessary, but could be achieved by flaming at 2.5 to 3 mph at 30 psi, 10-12 inches above the ground. The objective of this project in central Oregon was to reinvestigate optimal tractor speed. Due to an inadequate number of plants tagged for symptoms of verticillium, there were no statistical differences between speeds from 2 to 5 mph (at 0.5 mph increments) and untreated plots. However, the trend indicates that percent control decreased with increase in tractor speed, and that speeds above 2.5 mph may not provide adequate control of verticillium wilt.

Introduction

During the 1960s Oregon State University plant pathologist, C. E. Horner conducted research in the Willamette Valley on post-harvest propane flaming as a method of controlling verticillium wilt in peppermint. He reported that an internal stem temperature of 60°F was necessary to kill 85-100 percent of *Verticillium dahliae* in infected stems. The propane flaming recommendation to achieve this temperature was 2.5 to 3 mph at 30 psi, 10-12 inches above the ground.

An informal evaluation conducted in central Oregon by Fred Crowe and Mark Hagman raised the possibility that similar control could be achieved at ground speeds up to 5 mph. As flaming speeds increase, the cost of flaming decreases, providing an incentive for growers to identify the highest speed that will still provide adequate control of verticillium wilt. The objective of this research was to revisit the subject of flaming speed in an effort to identify, under central Oregon conditions, the optimal speed for flaming when considering cost effectiveness and desire for a high level of wilt control.

Methods and Materials

The trial was established with H & T Farms on a 5-year old field of Redefined Murry Mitchum peppermint, near Culver, OR. The eight treatments included speeds from 2 to 5 mph at 0.5 mph increments, and an untreated check. The 30 x 30 ft plots were replicated 3

times in a randomized complete block design. Ten plants per plot, exhibiting symptoms of verticillium wilt, were tagged with Stake Chaser brush type flags. Three-inch stem samples were taken from each flagged plant on August 23 prior to swathing on August 24. Unfortunately, during the swathing process an average of half the flags got caught in the swather and were removed, with some plots having as low as two tagged plants remaining. This reduced the number of plants identifiable for comparison of presence of *V. dahliae* prior to and after flaming. Plots were flamed on August 31 with a Rears 30 ft flamer operating at 40 psi. Post-flaming samples from flagged plants were taken on September 1. Sets of paired samples from some flagged plants were identified as either vertical or horizontal to determine if stem position affected flaming effectiveness.

Stem sections were stored temporarily under refrigeration, then surface disinfected with 5 percent household bleach in water. Ten one-millimeter high sub-sections per stem were placed onto sterile plain agar in Petri plates in the laboratory. Stem sub sections and surrounding agar were visually screened for fungal structures characteristic of *V. dahliae* after one to two weeks. Any stem sub-section with presence of *V. dahliae* was sufficient for the stem to be labelled as infected with the pathogen.

Results and Discussion

Table 1 provides a summary of percent kill of *V. dahliae*, based on companion stems from the same plant from which *V. dahliae* was isolated prior to flaming. The decreased number of samples per plot, due to flag removal by the swather, and pre-samples that appeared to have verticillium symptoms that tested negative, reduces confidence in the results. Decreased number of samples also influenced the statistical analysis, and although the trend is for the percent control of verticillium to decline as tractor speed increases, there are no statistically significant differences ($P < 0.05$) between treatments. However, the data suggest that speeds above 2.5 mph may not give adequate kill and there may be a 10 percent drop in kill with every 0.5 mph increase in speed. No differences were detected in presence of *V. dahliae* between vertical stems and those lying horizontal on the ground.

A second year study, perhaps focused on the 2 to 3.5 mph range, is needed to refine the data and increase confidence in the results. Nevertheless, these data support C. E. Homer's original reports and do not support usage of higher ground speeds.

Table 1. Percent kill of *Verticillium dahliae* in stems by flaming with speeds from 2 mph to 5 mph, at 40 psi, near Culver, OR, 1993.

Treatments	Reduction of <i>V. dahliae</i> in infected stems
(tractor speed)	(percent)
2 mph	94
2.5 mph	90
3 mph	77
3.5 mph	44
4 mph	59
4.5 mph	58
5 mph	44
Untreated	42

Differences between treatments are non-significant (P 0.05).

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