Progression of Symptoms on Blueberry Infected with Blueberry shock virus

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ABSTRACT


A half acre of blueberries, planted in 1999, was free of virus symptoms until 2004 when Blueberry shock virus (BlShV) was first identified in a single plant. The progression of shock symptoms and recovery of plants was monitored until all plants were free of shock symptoms in 2013. The disease was greatest in 2008 with 53% of the plants expressing a shock reaction of blossom blight and no yield. Of the 408 plants, 53 expressed symptoms for 2 years in a row, 4 plants expressed symptoms 3 years in a row, 10 plants expressed shock symptoms after full recovery, and 8 never showed shock symptoms. Letting the disease run its course in small blocks will result in years in which growers may suffer up to 53% yield loss. In the years before and after this peak, growers may experience an average yield loss of 18%.

INTRODUCTION

Blueberry shock virus (BlShV) has been confirmed in Oregon (from Eugene northward), Washington, and British Columbia (1,4). Flowers and young vegetative leaf shoots suddenly die in spring when flowers are just about to open. These symptoms represent the plant’s “shock reaction” to infection. Symptoms are similar to a more devastating virus, Blueberry scorch virus (BlScV), except with BlShV infection, a second flush of leaves is produced (1,2,3). By late summer, plants infected with BlShV look normal except they produce little fruit (1). Plants that have recovered from the shock phase appear to produce a full crop in subsequent years.

The disease cannot be eliminated by removing and destroying plants with symptoms once it appears in a field (4). Transmission occurs the previous year when pollinators, especially foraging honeybees, transfer infected pollen to flowers on healthy plants. Recovered plants are still infected and can continue to serve as an inoculum source for nearby plants and new plantings.

Recommendations encourage growers to let the disease run its course since the disease is widespread, plants recover, and early detection and removal of plants is difficult in the Pacific Northwest (4).

Although the number of infected plants increases rapidly in some cultivars, it is unclear how many plants are showing shock symptoms at any one time (1). Plants may show shock symptoms for 2 to 3 years before full recovery. This study was initiated to give growers a better perspective on symptom progression in a susceptible blueberry field after BlShV is first detected.

STUDY SITE AND RESULTS

A 0.47 acre field of ‘Bluette’ and ‘Berkeley’ highbush blueberries, planted in 1999 on 5 x 10-ft spacing near Corvallis Oregon, was free of virus symptoms until 2004 when BlShV was first identified on a single ‘Bluette’ plant. Initial testing showed this plant only had BlShV and not BIScV (Bob Martin, personal communication). ‘Bluette’ and ‘Berkeley’ highbush blueberries are equally susceptible to BlShV and the virus spreads rapidly in these cultivars (1). The progression of shock symptoms and recovery of plants was monitored each year until all plants were free of shock symptoms in 2013. All 408 plants were examined at flowering every year in mid April to mid May, depending on the timing of flowering, for shock symptoms. Virus testing was only conducted the first few years to confirm symptoms were due only to BlShV.

Spread of the disease throughout the planting was very similar to that found by Bristow et al. (1). Logarithmic increase in plants showing symptoms occurred 3 years after initial detection (Fig 1 and 2). Recovery of plants lagged one to two years behind shock symptoms (Fig 1). The disease spread randomly from several foci in the field (Fig. 2). The disease was greatest in 2008 with 53% of the plants expressing a shock reaction of blighted blossoms and no yield.

FIGURE 1

The percent of highbush blueberry plants in a small field of ‘Berkeley’ and ‘Bluette’ showing shock symptoms, recovery from shock symptoms and infected with the Blueberry shock virus (BlShV) each year.
Of the 408 plants examined, 53 expressed symptoms for 2 years in a row, 4 plants expressed symptoms 3 years in a row, 10 plants expressed a second cycle of shock symptoms a year after recovery, and 8 never showed shock symptoms. In general, many of the plants showing symptoms multiple years in a row had partial plant symptoms (one or two branches) in at least one of the years. Plants that showed shock symptoms after full recovery, recovered the next year.

Once plants recovered, they continued to show leaf discolorations including spots, line patterns, blotches, and/or reddening for several more years (2). These “after shock” symptoms were intense on leaves formed during the cool wet spring of 2010 but lessened on leaves produced after warm dry conditions that prevailed that summer. The entire field was examined for leaf symptoms on 17 June 2010. Of the 8 plants that never showed shock symptoms, they all had “after shock” symptoms.

**IMPLICATIONS**

Yield loss (shock symptoms) in this block was as high as 53% during the course of this epidemic. Bristow and Martin reported plant infection instead of symptom expression (1). Assuming similar dynamics, their Albany and Deming commercial blocks may have had up to 37% and 69% yield loss, respectively. Using all three situations, letting the disease run its course in small blocks will result in years were growers may suffer up to 53% yield loss in cultivars in which BlShV spreads rapidly. During the year before and after this peak, growers may experience an average yield loss of 18%. Although plants may show shock symptoms after recovery the occurrence is extremely low.

**LITERATURE CITED**