Results of Research Supported by the Indiana Vegetable Growers Association
Year of Support: 2012 Amount: $500.00

A Search for Weedy Sources of Virus Infection in Indiana Cucurbits

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Cucurbits in the Midwest are vulnerable to four virusess: *Cucumber mosaic virus* (CMV), *Watermelon mosaic virus* (WMV), *Zucchini yellow mosaic virus* (ZYMV), and *Papaya ringspot virus* (PRSV). The viruses are transmitted by aphids via contaminated mouthparts, and infections can manifest as distortion and mottling in leaves and fruit, bud abortion and reduced fruit set. It is very difficult to find the source of a CMV, WMV, ZYMV, or PRSV infection, in part because there may be many different crops or weeds acting as "reservoirs" by harboring one or more of the viruses, making it difficult to discern what infected plants the aphids are bringing viruses from.

To identify potentially important weed reservoirs, surveys and sample collections were conducted in Indiana pumpkin fields throughout the growing seasons of 2010 and 2011. Fourteen fields were visited in 2010, and sixteen in 2011. Samples of 25 weeds per field were collected and stored for subsequent analysis of virus infection. Two additional symptomatic fields were sampled in 2012, and one in 2013. Virus infection in pumpkins was also monitored by taking random leaf samples from 20 pumpkin plants taken late August – early October. Lastly, a multiplex reverse transcriptase PCR assay was developed to simultaneously detect plant infection with *Cucumber mosaic virus* (CMV), *Watermelon mosaic virus* (WMV), *Zucchini yellow mosaic virus* (ZYMV), and *Papaya ringspot virus* (PRSV).

WMV and PRSV were both prevalent in pumpkins, but only WMV was found in weed samples surveyed. All pumpkin fields tested positive for WMV from 2010–2013, except for one site in 2011. Pumpkin field infections of PRSV were more variable, with 12/14 sites infected in 2010, 10/16 sites infected in 2011, and 1/2 sites infected in 2012. Only pumpkins in one field in 2012 tested positive for CMV, which was part of a triple infection with WMV and PRSV. Weed species were pooled for analysis, and carpetweed (*Mollugo verticillata*), eastern black nightshade (*Solanum ptycanthum*), ivyleaf morning glory (*Ipomoea hederacea*) and crabgrass (*Digitaria sanguinalis*) tested positive for WMV. No other viruses were present in weed samples. To our knowledge, this is the first observation of WMV infecting carpetweed, ivyleaf morning glory, and crabgrass. Although upwards of 40 difference species of weeds were identified and sampled, five of the top seven most commonly encountered weeds in pumpkin fields are hosts of cucurbit viruses, including common lambsquarters (*Chenopodium album*), which is a known host to all four of the aphid-vectored viruses in cucurbits, ivyleaf morning glory, carpetweed, eastern black nightshade, and crabgrass. While the extent to which weedy virus reservoirs in the field impact cucurbit infection rates is not known, it is possible that these five common species of weeds may be contributing to the pervasiveness of WMV, and to a lesser extent PRSV, in Indiana pumpkins.