A4147

S. Thomas-Sharma and P.S. McManus

Blueberry shock virus in cranberry

Viruses cause economically important diseases on almost all crop plants. Viruses have not been a major problem in cranberry production, but in 2012 scarred berries were observed in Wisconsin cranberry beds, and the scarring was associated with *Tobacco streak virus* (TSV; see UW-Extension publication A4110, *Tobacco Streak Virus in Cranberry*[1]). Soon after that, a second virus, *Blueberry shock virus* (BlShV), was associated with berry scarring symptoms in Wisconsin and Massachusetts. BlShV and TSV belong to the same family of viruses, but unlike TSV, which has been reported on many crops, BlShV was previously reported only on blueberry. BlShV has been reported most frequently in mature beds of the variety 'Stevens', but it has also been confirmed in the cultivars 'Mullica Queen', 'Norman LeMunyon', and 'Pilgrim'. However, the relative susceptibility of cranberry cultivars to BlShV is not known.

UW Extension
University of Wisconsin-Extension

Symptoms

BlShV is associated with a range of symptoms on berries, from ringspots to etching and scarring (figure 1, images A–F). BlShV and TSV (figure 1, image G) cause identical berry scarring symptoms on cranberry and cannot be distinguished in the field. Scarred berries turn red prematurely, making it relatively easy to identify "hotspots" of disease in the field, especially during the early stages of fruit development (mid- to late July). Insect feeding may also cause reddening, but the scarring symptom is characteristic of virus infection. By late summer and toward harvest, symptomatic berries have aborted or are shriveled and therefore difficult to find.

Although brown, dried flowers are sometimes observed in close proximity to symptomatic uprights, we have not established that BlShV causes this symptom. There are no foliar symptoms of the disease, making scarred, shriveled berries the only confirmed symptom of BlShV infection. Because BlShV is systemic, it is common to see every fruit on an infected upright showing symptoms. Unlike chemical burn from pesticides, which typically appears on exposed berry surfaces near the top of the canopy, scarring from viruses occurs anywhere on a berry and throughout the canopy.

FIGURE 1. Ringspot and berry scarring symptoms associated with *Blueberry shock virus* (A–F) are indistinguishable from symptoms associated with *Tobacco streak virus* (G).

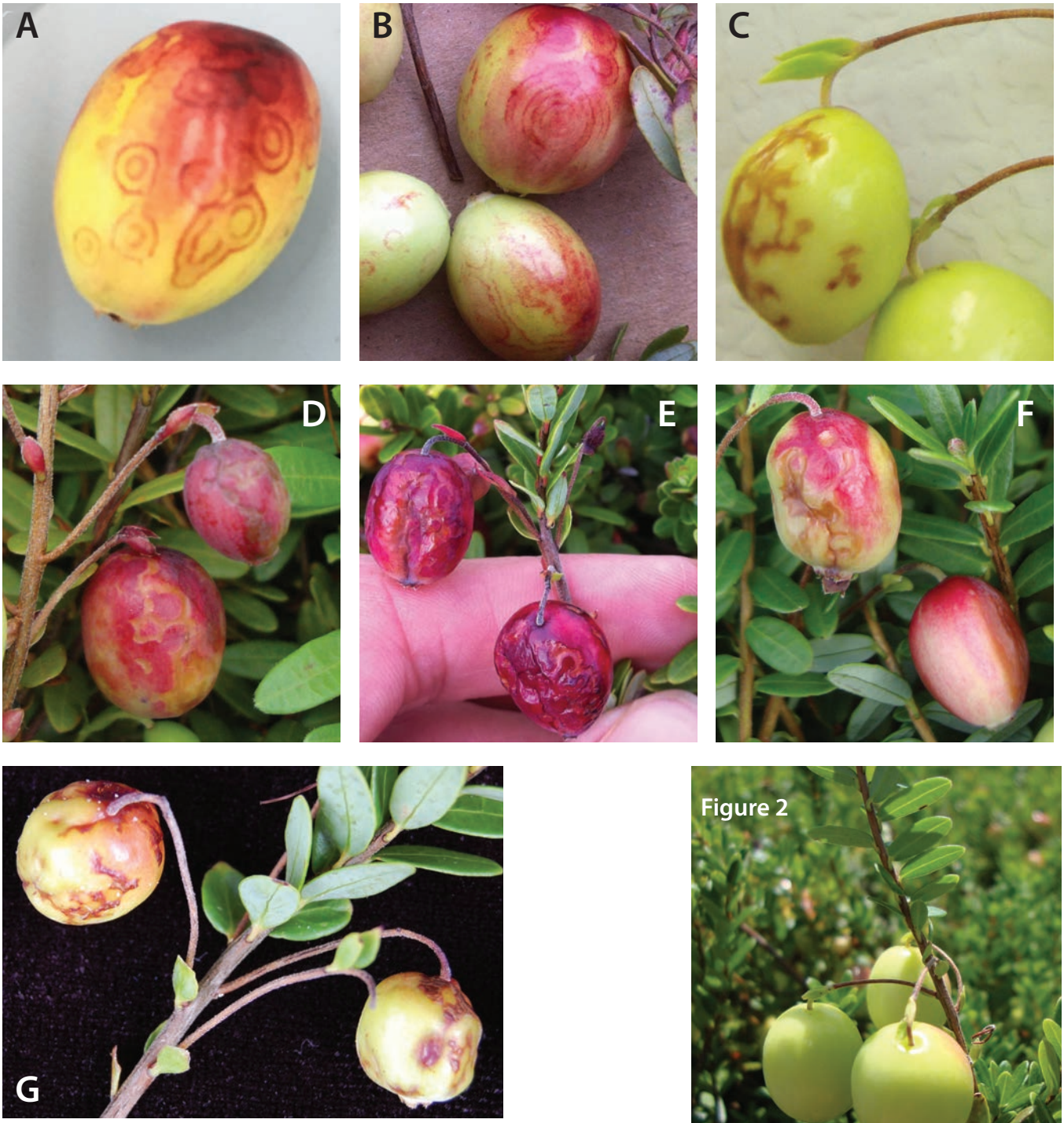

FIGURE 2. Cranberry upright that has recovered from berry scarring symptoms associated with *Blueberry shock virus*, but continues to test positive for the virus. Tag at lower right was used to mark the upright the previous year when its berries showed symptoms.

Recovery and yield effects

Uprights that produce scarred berries in one year produce only healthy looking berries in subsequent years (figure 2). This phenomenon is called *symptom recovery* or just r*ecovery* and occurs with both BlShV and TSV. The return bloom on these recovered uprights is variable among years and farms, but it does not appear to be negatively affected by BlShV. Although berries on recovered uprights look healthy, the recovered uprights continue to test positive for BlShV for at least 3 years and probably longer. Thus, in the field, both healthy and recovered uprights lack symptoms, but the latter remain BlShV-infected.

Research on the 'Stevens' cultivar indicates that flowering and fruit set are comparable among healthy, symptomatic, and recovered uprights. By harvest, however, symptomatic uprights bear shriveled berries with greatly reduced berry weight and fewer marketable berries. The weight and appearance of berries on recovered uprights are comparable to berries on healthy uprights. Thus, recovery limits the negative short-term impact of BlShV on yield. The long-term impact of virus infection in recovered cranberry plants is not known. In blueberry, mixed virus infections can cause more severe symptoms and are possibly more detrimental to yield than infection by one virus alone.

Sources and spread in the field

BlShV is known to infect only cultivated blueberry and cranberry. BlShV has not been detected in wild blueberry (*Vaccinium angustifolium*) or leatherleaf (*Chamaedaphne calyculata*) near cranberry beds infected with BlShV. The narrow host range of BlShV is consistent with the fact that there is little genetic difference in the virus in cranberry samples obtained from Wisconsin and Massachusetts. This suggests that BlShV in the two states originated from a common source, that the virus evolves slowly, or both. However, BlShV in cranberry is genetically different from BlShV previously reported in blueberry in the Pacific Northwest region of the United States. Thus, there is no evidence that blueberry plants or blueberry pollen carried by bees are the source of BlShV in cranberry.

Infective BlShV is present in pollen of cranberry plants that have recovered from BlShV symptoms. In blueberry (and likely in cranberry), bees aid in the spread of virus-infected pollen. However, in research trials, we have not been able to transmit the virus to healthy cranberry plants using infected pollen. BlShV is detected in seeds and in seedlings that grow from infected seeds. Although cranberry is not propagated from seed in commercial plantings, birds and other animals can disseminate infected fruit and seeds, and infected "volunteer" seedlings could establish the virus in new locations. Because BlShV is systemic and persists over years in cranberry vines, it is spread in infected vine cuttings. There is no reason to suspect that foot or machinery traffic in infected beds can directly spread the disease to uninfected areas. In summary, pollen, which may be spread by bees; infected seeds that may germinate in the field; and cuttings sourced from infected beds are the potential sources of BlShV.

Recommendations

Recommendations for managing BlShV are similar to those for managing TSV in cranberry beds. Cranberry plants infected with BlShV or TSV cannot be cured of the virus. With either virus, it is not practical to selectively remove infected plants from a bed, because healthy and recovered plants are indistinguishable in the field. Because the incidence of scarred fruit is typically low in any given year, and cranberry recovers from symptoms and goes on to yield normally, impacts of BlShV and TSV on yield are limited. Over time, it is expected that all plants in a bed will become infected and then recover, although the rate at which this occurs is not known for either BlShV or TSV. Additionally, since we do not know the long-term impact of these viruses, it is best to prevent their introduction into new areas. Growers can take the following actions to minimize the risk of virus infections:

1. Use virus-free planting stock to establish new beds. Do not use virus-infected beds as the source of cuttings for new beds.
2. To prevent possible spread and establishment of BlShV, re-flood beds after harvest to remove remaining berries that might contain infected seed.
3. Scout for BlShV infection during early fruit set (mid- to late July) when disease hotspots are easier to locate in the bed. While there is little a grower can do to slow the spread of BlShV or TSV after they become established in beds, it is important to differentiate virus infection from other problems, for which there might be remedies.

4. To test if BlShV is present in a bed, follow the recommendations below. Information on labs that will test the samples can be obtained from UW-Extension.

If you see scarred fruit

- Collect about 10 uprights with scarred fruit from an affected bed.
- 1 upright = 1 sample.
- Place each sample (1 upright) into a single plastic bag.
- Refrigerate (do not freeze!) samples until shipping.
- Request that berries and leaves be tested from each upright if collection is during early fruit set. Request that leaves be tested if collection is during late fruit set or near the time of harvest.

If you do not see scarred fruit

- Collecting more samples and more uprights per sample will improve the accuracy of test results.
- Collect about 10 uprights from 10 locations representative of a bed.
- 10 uprights = 1 sample.
- Place each sample (10 uprights) into a single plastic bag.
- Repeat until you have at least 8 samples, placing each sample of 10 uprights in its own bag.
- Refrigerate (do not freeze!) samples until shipping.
- Request that leaves be tested from each sample.

Reference

1. Wells-Hansen, L.D. and P.S. McManus. *Tobacco Streak Virus in Cranberry*. UW-Extension publication A4110. **https://learningstore.uwex.edu/Tobacco-Streak-Virus-in-Cranberry-P1796.aspx**.

University of Wisconsin-Extension

Authors: S. Thomas-Sharma is a postdoctoral fellow of plant pathology, College of Agricultural and Life Sciences, University of Wisconsin–Madison. P.S. McManus is a professor of plant pathology, College of Agricultural and Life Sciences, University of Wisconsin–Madison and University of Wisconsin-Extension. Cooperative Extension publications are subject to peer review.

University of Wisconsin-Extension, Cooperative Extension, in cooperation with the U.S. Department of Agriculture and Wisconsin counties, publishes this information to further the purpose of the May 8 and June 30, 1914, Acts of Congress. An EEO/AA employer, University of Wisconsin-Extension provides equal opportunities in employment and programming, including Title VI, Title IX, and the Americans with Disabilities Act (ADA) requirements. If you have a disability and require this information in an alternative format (Braille, large print, audiotape, etc.), please contact **oedi@uwex.uwc.edu**. For communicative accommodations in languages other than English, please contact **languageaccess@ces.uwex.edu**.

If you would like to submit a copyright request, please contact Cooperative Extension Publishing at 432 N. Lake St., Rm. 227, Madison, WI 53706; **pubs@uwex.edu**; or (608) 263-2770 (711 for Relay).

This publication is available from your county UW-Extension office (**counties.uwex.edu**) or from Cooperative Extension Publishing. To order, call toll-free 1-877-947-7827 or visit our website at **learningstore.uwex.edu**.

Blueberry Shock Virus in Cranberry (A4147) I-06-2017