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Overview of Tobacco streak virus and Blueberry shock virus in cranberry

Lindsay Wells-Hansen  
*Ocean Spray Cranberries, Inc.*, lwellshansen@oceanspray.com

Sara Thomas-Sharma  
*University of Wisconsin - Madison*, thomassharma@wisc.edu

Patricia McManus  
*University of Wisconsin - Madison*, pmcmanus@wisc.edu

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Andy Witherell
Brooke Weber
Berry scarring associated with BlShV and TSV is identical

<table>
<thead>
<tr>
<th>TSV-positive</th>
<th>BlShV-negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>BlShV-negative</td>
<td>TSV-negative</td>
</tr>
</tbody>
</table>
Recovery of uprights

Year 1

• All plant parts test positive for TSV or BlShV in the year(s) following scarring

Year 2

• Mechanism currently unknown
Distribution of TSV within cranberry uprights with scarred fruit

<table>
<thead>
<tr>
<th>Plant part tested</th>
<th>early fruit set</th>
<th>late fruit set</th>
<th>harvest</th>
</tr>
</thead>
<tbody>
<tr>
<td>previous-season leaves</td>
<td>83</td>
<td>99</td>
<td>98</td>
</tr>
<tr>
<td>current-season leaves</td>
<td>21</td>
<td>83</td>
<td>99</td>
</tr>
<tr>
<td>symptomatic berries</td>
<td>99</td>
<td>33</td>
<td>4</td>
</tr>
<tr>
<td>asymptomatic berries</td>
<td>67</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>roots</td>
<td>79</td>
<td>65</td>
<td>60</td>
</tr>
<tr>
<td>stems</td>
<td>94</td>
<td>100</td>
<td>95</td>
</tr>
<tr>
<td>terminal buds</td>
<td>--</td>
<td>70</td>
<td>96</td>
</tr>
</tbody>
</table>
### Distribution of TSV within cranberry uprights with non-scarred fruit

<table>
<thead>
<tr>
<th>Plant part tested</th>
<th>pre-fruit set</th>
<th>early fruit set</th>
<th>late fruit set</th>
<th>harvest</th>
</tr>
</thead>
<tbody>
<tr>
<td>previous-season leaves</td>
<td>97</td>
<td>94</td>
<td>100</td>
<td>98</td>
</tr>
<tr>
<td>current-season leaves</td>
<td>94</td>
<td>93</td>
<td>97</td>
<td>95</td>
</tr>
<tr>
<td>asymptomatic berries</td>
<td>--</td>
<td>42</td>
<td>18</td>
<td>4</td>
</tr>
<tr>
<td>roots</td>
<td>93</td>
<td>84</td>
<td>71</td>
<td>63</td>
</tr>
<tr>
<td>stems</td>
<td>100</td>
<td>91</td>
<td>88</td>
<td>85</td>
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<tr>
<td>terminal buds</td>
<td>100</td>
<td>--</td>
<td>100</td>
<td>85</td>
</tr>
</tbody>
</table>
Detection of TSV & BlShV in pollen

**TSV**
- 56% of pollen washes TSV-positive
- 100% of pollen extracts TSV-positive
- Transmitted by thrips in other crops

**BlShV**
- NO pollen washes were BlShV-positive
- 66% of pollen extracts BlShV-positive
- Transmitted by pollinators in blueberry
Are TSV and BlShV seed transmitted in cranberries?
Is BlShV seed transmitted in cranberries?

<table>
<thead>
<tr>
<th>Plant material tested</th>
<th>Farm number</th>
<th>Incidence (%) of seeds or seedlings from different upright categories testing positive for BlShV</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Healthy</td>
</tr>
<tr>
<td>Seeds</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Seedlings</td>
<td>1</td>
<td>46</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>64</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>72</td>
</tr>
</tbody>
</table>
Phylogenetic analysis of TSV CP coding region

- Variation among strains in cranberry
  - No grouping by state or cultivar
- Divergence of cranberry sequences from sequences in GenBank
Phylogenetic analysis of BlShV CP coding region

• Variation among strains in cranberry
  - No grouping by state or cultivar

• Shared 90% CP identity with blueberry accessions in GenBank
Summary

• TSV & BlShV symptoms are indistinguishable and variable

• BlShV, but not TSV, can be detected in seedlings

• BlShV is detected only internally in pollen
  – If TSV or BlShV is transmitted via pollen, management is complicated

• Neither TSV nor BlShV isolates group geographically
Summary

• Recovery and lack of impact on yield components help alleviate grower concerns
  – Long term effects?
  – Synergistic interactions?

• No safe time to take cuttings, but by knowing where TSV and BlShV are throughout the year, we have developed sampling protocols