Occurrence and distribution of *Tobacco streak virus* in cranberry

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Outline

• Identification of TSV in commercial cranberry plantings and association of TSV with fruit scarring

• Distribution of TSV within cranberry uprights

• “Recovery” of cranberry uprights infected with TSV

• Distribution of TSV throughout cranberry beds
Tobacco streak virus (TSV)

- First reported on tobacco in WI: 1936
- First detection in WI cranberries: 2001
- First reported on cranberry: 2012

- Type member of *Ilarvirus* genus
- Family *Bromoviridae*
- Broad host range (>80 plant spp.)
- ID by DAS-ELISA, RT-PCR, coat protein sequence, TEM
Berry scarring reported mid-July

- Scarring on every berry on an upright
- Every upright on a runner was affected

Sampling and virus testing

- TSV was detected
Berry scarring
Hail damage associated with TSV
Not all berry scarring is associated with TSV.

LeMunyon, TSV-negative, BlShV-positive

Mullica Queen, TSV-positive, BlShV-negative
Distribution of TSV within cranberry uprights

- Throughout the growing season
  - Current season leaves
  - Previous season leaves
  - Terminal buds
  - Pollen
  - Flowers
  - Berries (scarred and non-scarred)
  - Roots
Distribution of TSV within a cranberry upright that produces scarred fruit

Pre-bloom  Bloom  Early fruit set  Late fruit set  Harvest
All plant parts test positive for TSV in the year following scarring.

0/73 uprights produce scarred berries in the year following scarring!
Uprights become tolerant to TSV the year following symptoms
Distribution of TSV within a cranberry upright that produces non-scarred fruit

Pre-bloom  Bloom  Early fruit set  Late fruit set  Harvest
Effect of TSV on yield components in symptomatic and “recovered” cranberry uprights

- Number of flowers per upright
- Number of berries per upright
- Percent fruit set
- Berry weight
Does TSV have an effect on yield components?

Average percent fruit set per upright
(# berries/# pedicels)*100

Marsh 1

Marsh 2
Incidence of TSV throughout an affected cranberry bed

~ 450 ft.

~ 108 ft.
2014 incidence of TSV in a bed (cv. Mullica)

67% of uprights sampled were TSV-positive in 2014

Significant (p< 0.001) clustering of TSV-infected uprights at the local scale
2015 incidence of TSV in a bed (cv. Mullica)

= TSV-positive
= TSV-negative

71% of uprights sampled were TSV-positive in 2015

Significant (p<0.001) clustering of TSV-infected uprights at the local scale

This end of bed not sampled
2014 incidence of TSV in a bed (cv. Mullica)

= TSV-positive

= TSV-negative

= lost sample

1% of uprights sampled were TSV-positive in 2014

Significant ($p \leq 0.05$) clustering of TSV-infected uprights at a larger scale
2015 incidence of TSV in a bed (cv. Mullica)

- TSV-positive
- TSV-negative

2% of uprights sampled were TSV-positive in 2015

Random distribution (p ≥ 0.05) of TSV-infected uprights at local and larger scales
Summary

- TSV is associated with berry scarring in cranberries
- Distribution of TSV within cranberry uprights is uneven
- TSV does not negatively affect yield components tested in uprights that have developed tolerance to the virus
- Evidence of clustering of TSV-infected uprights within affected beds exists at a local scale at some locations
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Questions?
Distribution of TSV within a cranberry upright that produces scarred fruit

Distribution of TSV within a cranberry upright that produces non-scarred fruit
Incidence of TSV throughout an affected cranberry bed

• 10’ x 10’ squares
  – Divided into 16 small squares
  – One upright collected from each small square

Sampled 1,440 uprights total per bed
Analysis on multiple scales using Moran’s I

- Per upright
- Per 4 uprights
- Per 16 uprights
- Per 64 uprights
- …
Stevens, TSV-negative, BlShV-positive

Mullica Queen, TSV-positive, BlShV-negative
- 10’ x 10’ squares
  - Divided into 16 small squares
  - One upright collected from each small square

Sampled 1,440 uprights total per bed
The “recovery” phenomenon

• Associated with various viruses (often Ilarviruses)
  – Blueberry shock virus in blueberries
  – Prunus necrotic ringspot virus in Prunus spp.

• Necrotic shock reaction followed by recovery
  – Seemingly little or no long term effects on plants (yield, longevity, etc.)