Tolerance of tipworm injury in cranberry: mechanisms and tradeoffs

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http://www.itsaruby.com/
Recap of past results....

- The key finding of my past work is that majority of cranberry uprights (95%) with tipworm feeding injury at the end of growing season, do not produce flowers in the next growing season.

- This result was consistent between Maine and Massachusetts.

Photo credit: Charles Armstrong, UMaine Extension
Recap continued…
Also, majority of flowering uprights injured early in the growing season do not produce side-shoots before the end of growing season (Howes & Stevens).

Question: What is the flowering and growth response of uprights that produce side-shoots after tipworm-injury (in the next growing season)?
What about flowering and growth (next growing season) in uprights that produce side-shoots after tipworm injury?

No flowering

?
Howes / Stevens commercial planting

Study Design...

60 m (200 ft)

Transect 1
10 m

Transect 2
10 m

Transect 3
10 m

Transect 4
10 m

June 2010

25 tipworm injured flowering uprights were tagged

50 intact flowering uprights tagged

25 control uprights

25 uprights with artificial apical meristem injury mimicking tipworm injury

100 control uprights
100 tipworm injured uprights
100 artificially injured uprights
Result 1
Uprights of Howes are more likely to produce side-shoots than Stevens. No difference in side-shoot production between the two types of injuries.
**Result 2**: uprights with side-shoots were just as likely as intact uprights to flower in the next growing season.
**Result 3:** Uprights with side-shoots were more likely to resume growth in the next growing season as compared to those without side-shoots.

* → $p = 0.001$

** → $p = 0.024$
Important Questions

- We have established that side-shoots are important in recovering from tipworm injury.

- However, majority of tipworm-injured uprights do not produce side shoots before the end of growing season (MA – Howes and Stevens).

Question 1: Do flowering and vegetative uprights differ in production of side-shoots after injury?

Questions 2: Does the presence of developing flowers/fruits suppress side-shoot production in flowering uprights?
Result (Part 1): After tipworm-injury, vegetative uprights were more likely to produce side-shoots.

* → p < 0.0001
Production of side-shoots: vegetative vs. flowering uprights

Cultivar (Howes & Stevens)

Transect 1
10 m

Transect 2
10 m

Transect 3
10 m

Transect 4
10 m

June 2011

Tagged 15 tipworm injured vegetative uprights

Tagged 15 tipworm injured flowering uprights

September 2011

Proportion with side-shoots

Proportion with side-shoots

60 tipworm injured vegetative uprights

60 tipworm injured flowering uprights
Do flowers/fruits suppress production of side-shoots?

Cultivar (Howes & Stevens)

60 m (200 ft)

15 m (50 ft)

Transect 1
10 m

Transect 2
10 m

Transect 3
10 m

Transect 4
10 m

June 2011
Tagged 20 tipworm injured flowering uprights

10 tipworm injured flowering uprights with flowers intact

10 tipworm injured flowering uprights with all flowers removed

September 2011
Proportion with side-shoots

Proportion with side-shoots

40 tipworm injured flowering uprights with flowers intact.

40 tipworm injured flowering uprights with all flowers removed.
Result: Uprights with all the flowers removed were more likely to produce side-shoots.

- The results demonstrate plasticity in regrowth response of injured flowering uprights.
- Evidence of tradeoff between vegetative and reproductive growth following tipworm injury.

* → p < 0.0001
Mechanism and potential costs of tipworm injury tolerance

- Work done in Massachusetts has shown that cranberry cultivars (*Howes, Stevens, and C. Queen*) can tolerate tipworm injury without a negative impact on fruit biomass.

- I was interested in finding out if the current season growth on an injured upright produces all the resources for the developing fruits or if some of these resources come from other parts of the cranberry vine?
Background

Source 1
- Current season leaves acropetal to fruits

Source 2
- One year old leaves basipetal to fruits

Source 3
- Leaves on adjacent vegetative upright
- Tipworm feeding injury

Runner

soil surface

Roots
Materials and Methods

Girdling treatment

Control
Comparing girdled vs. non-girdled tipworm injured uprights

Weight of berries was 50% lower in girdled uprights (Howes & Stevens)
Conclusions

- In tipworm injured uprights, sources other than the current season growth contribute significantly to developing fruits.

- More questions: Does this mean that tolerance of tipworm injury comes at a cost to stored reserves?
Thank you !!!

ANY QUESTIONS/COMMENTS ?