University of Massachusetts Amherst

Research Update Meeting 2008 - Slides of the Impact of Flooding on Cranberry Vines

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The impact of flooding on cranberry vines

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Cranberry floods

Late Water (Spring)

Harvest

Winter

Methods

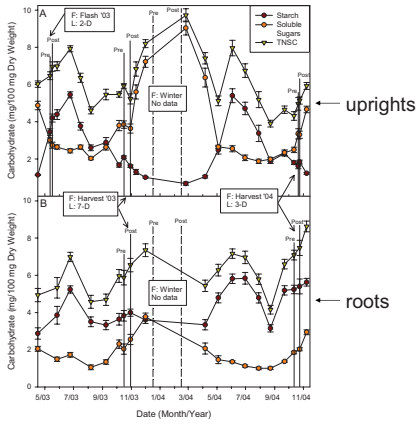
- Flood water measurements:
  - Depth
  - Temperature
  - Dissolved oxygen concentration
  - Light penetration to vines

TNSC

- Total Non-structural Carbohydrates
- Carbohydrates are the product of photosynthesis
- Carbohydrates are the energy source used by the vine for growth and fruit production

TNSC pattern in EB over two seasons

Vertical lines represent floods



uprights

roots

Flash Floods

Cultivar[a]	Year	Duration (d)	Appl. date[y]	Min. temp (°C)[y, x]	Max. temp (°C)	Min. O_2 (mg·L^{-1})[y, x]	Max. O_2 (mg·L^{-1})	Depth (cm)[x]	ΔTNSC (mg/100 mg)[x]	ΔTNSC (% change)
					Flash					
S	2003	2	15 May	19.0	19.5	7.1	8.1	26	0.92	12
EB	2003	2	15 May	19.8	20.5	6.9	7.7	26	0.48	7
EB	2003	2	12 May	14.0	14.4	7.8	8.6	27	–0.32	–5
H	2003	2	12 May	14.2	14.4	7.8	8.5	25	–0.57	–10
H	2004	2	12 May	17.0	22.6	4.5	8.4	68	0.37	5
EB	2004	3	10 May	19.4	20.0	7.3	8.3	23	0.51	8
H	2004	2	10 May	15.8	21.0	5.7	8.5	54	–1.29	–18

Only a significant decrease in TNSC in 1 of 7 flash floods

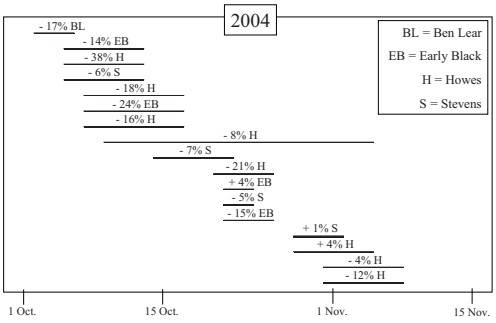
Flooding effects on TNSC

- Late water floods:
  - Δ TNSC between pre- and post-flood uprights from bogs ranged from -31% to +36% (13 floods)
- Harvest floods:
  - Δ TNSC between pre- and post-flood uprights from bogs range from -42% to +4% (29 floods)

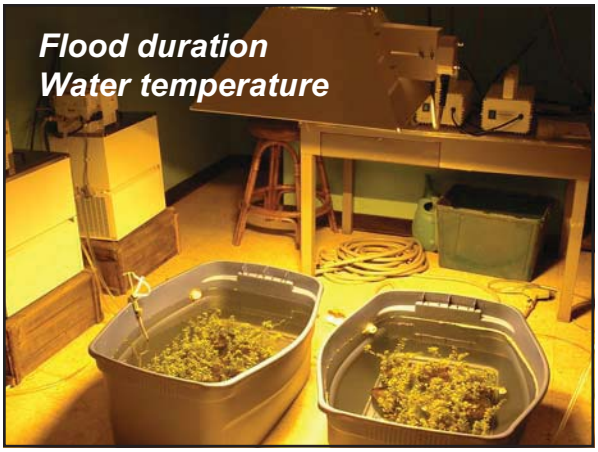
Flood water conditions

- Path co-efficient analysis indicated that actual Δ TNSC (mg/100mg) was significantly affected by:
  - Date of flood application (+0.32)
  - Maximum water temperature (-0.56)
  - Minimum water DO (-0.37)
- Light penetration and water depth had no effect on TNSC

Date of flood application



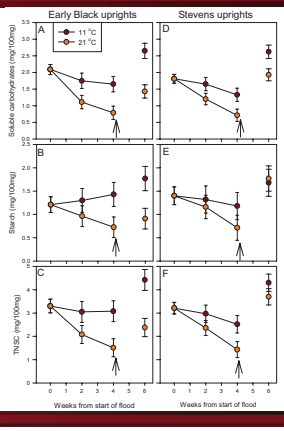
More reduction in TNSC with earlier floods



Late water flood – uprights

Arrows indicate end of flood

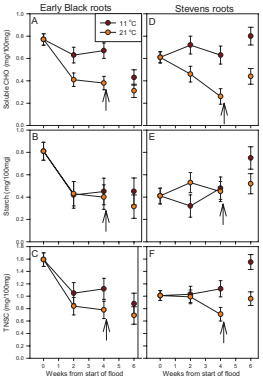
Temperature differences still there in EB two weeks later, but not as much in Stevens



Late water flood – roots

Arrows indicate end of flood

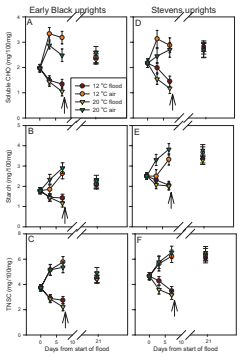
Temperature differences still there in Stevens two weeks later, but not as much in EB



Harvest flood – uprights

Arrows indicate end of flood

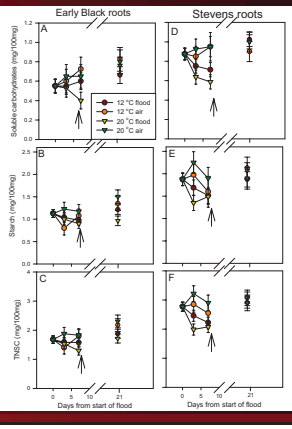
Temperature doesn't have as great an effect as in spring – all flooding was bad!



Harvest flood – roots

Arrows indicate end of flood

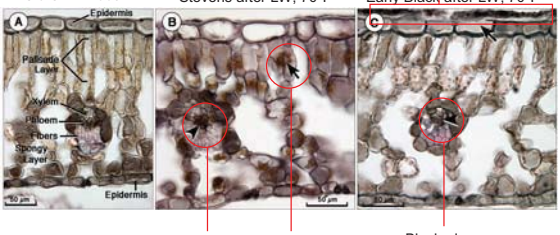
Few significant impacts on roots



Cross sections of leaves

• Fungal mat on leaf surface
• Erosion of epidermis

Before LW flood | Stevens after LW, 70ºF | Early Black after LW, 70ºF

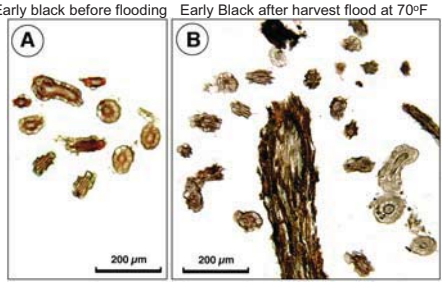


Blocked xylem | Clumped chloroplasts | Blocked xylem

Photo courtesy of Martin Goffinet

Roots

Early black before flooding | Early Black after harvest flood at 70ºF



Darker roots are dying or dead

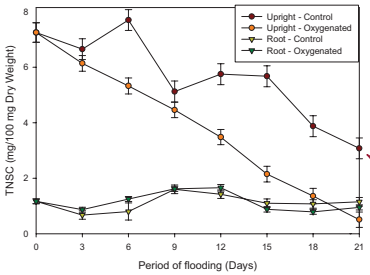
Photo courtesy of Martin Goffinet

Dissolved Oxygen

Simulated Late Water Flood

DO = 6.5 mg/L | DO = 9.0 mg/L

Effect of dissolved oxygen concentration during LW flood



Higher DO resulted in greater loss of TNSC!

Conclusions – Flash Floods

- Good options for pest control
- Use short flood with cool water

Conclusions – Late water floods

- The impact of LW floods is variable – generally fine to use unless water gets warm (>68ºF)
- Keep water cool by maximizing volume on bog and recharging

Conclusions – Harvest floods

- Most dangerous flood!
- Can be very detrimental to vines, although recovery is possible under optimal conditions
- Keep flood as brief as possible, particularly early in the season
- Water needs to be as cool as possible

Conclusions – Winter floods

- Don't worry too much
- Read this: "Winter flooding of cranberry vines." by J. Vanden Heuvel, T.R. Roper, nad J. Altweis. The Fruit Grower News 45(12): 9-11. 2006

Questions?