Research Update Meeting 2006 - SARE Project, Water and Plant Canopy Management: Sanding, Pruning, Irrigation, Drainage

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Water and plant canopy management: sanding, pruning, irrigation, drainage

SARE Project
C. DeMoranville, H. Sandler, J. Vanden Heuvel, A. Averill, M. Sylvia, F. Caruso
UMass Amherst Cranberry Station
SARE Project

- Funder requires grower participation and documentation of ‘outcomes’ (change in behavior or practice)
- Grower team helped to develop the project
- Primary theme is management of water and the plant canopy
- Identifying practices, integrating practices
- Demonstrating to other growers
The primary goal is to develop, demonstrate, and implement grower-identified practices to:

- Improve water and canopy management
- Reduce costs and improve pest management
Low-cost practices with potential to increase fruit quality and contribute to pesticide reduction

- pruning (and use as an alternative to sanding)
- irrigation scheduling
- drainage improvement
- bed sanitation
- integrated nutrient management

Integrated approach
Primary goal is to see how the practices fit together

Example – design nutrient management to avoid excess vine growth and as a result need less sanding/pruning, improve air circulation, etc.
Anticipated outcomes of adoption

- A more open, drier canopy
- Improved air circulation
- Decreased duration of wetness events (reducing need for fungicides)
- Improved penetration of biorational pesticides
- Better fruit color
- Enhanced yield
- Eliminating or reducing the need for sanding
Demonstration sites – sanding and pruning

Pruning and sanding being studied separately as presented earlier today.

The focus of these demonstration sites is to look at integrating a cycle of pruning into the sanding cycle to extend the interval between sanding.
Grower Demonstration Plots

SARE GRANT
Side-by-Side Comparisons

- Sanding, followed by pruning at some set interval
  - 2 yr, 3 yr, or 4 yr+

- **Goal:** 4 sites for each combination

- ‘Stevens’ preferred
Sanded whole piece in 02-03

EXAMPLE
Sanded whole piece in 02-03

Prune half in 2006

3 - yr interval
Side-by-Side Comparisons

- Beds should be managed similarly
  - Drainage, fertilizer, pest pressures, irrigation, etc.

- Prefer treatments on same bed, but could be 2 sites located in same general area.

- Stevens preferred
Data Needed

You provide:
- Irrigation records
  - water level float
- Fertilizer records
- Pesticide records
- Harvest and TACY records

We collect:
- Weight of prunings removed
- Light bar data
- Vine samples
- Harvest samples
Plots in Hand

- **2-yr interval**
  - Sanded 02-03; pruned in 2005 (1)

- **3-year interval**
  - Sanded 00-01; pruned in 2004 (1)

- **4-yr + interval**
  - Sanded 95-96; pruned in 2003 (1)
Please call if you would like to participate

Carolyn  x25
Hilary    x21
Sanding vs. Pruning Experiment
Question

Can pruning be used as an alternative to sanding?
Plan

- Replicated study at Rocky bog
- 2-3 years
- MS Student Brett Suhayda
- Establish in Spring 2006

**Figure 1: Split-plot design for Pruning vs. Sanding experiment**

- **P** = Pruning
  - p0 = control
  - p1 = low pruning
  - p2 = moderate pruning
  - p3 = severe pruning
- **S** = Sanding
  - s0 = control
  - s1 = low sanding
  - s2 = moderate sanding
  - s3 = heavy sanding
Evaluation of pruning/sanding

- Vegetative vine growth
- Yield
- Fruit quality
- Canopy microclimate
- Spray penetration into canopies
Economic Analysis

- Costs of pruning and sanding
- Economic return on yield (including color incentive)
- Reduced cost of pesticides
Irrigation scheduling

- Use of methods other than the inch-a-week rule
Why is it important?

- Saturated conditions (especially in spring)
  - Poor root development
  - Poor nutrient uptake
  - Poor release and utilization of nitrogen
Too little water
- Water stress
- Decreased fruit size and quality
- Poor plant stand
- Plant death
Irrigation research
Lampinen and DeMoranville

- When beds are too wet yield is less
- Part of the reason is poor fruit set and retention
Yield (bbl/a) in irrigation treatments. Differences in 2000 and 2001 were statistically different.

<table>
<thead>
<tr>
<th>Irrig. Treat.</th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>Cumulative 3 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;ideal&quot;</td>
<td>207</td>
<td>80</td>
<td>193</td>
<td>472</td>
</tr>
<tr>
<td>wetter</td>
<td>187</td>
<td>50</td>
<td>120</td>
<td>357</td>
</tr>
</tbody>
</table>

Data bears out the observation that most beds are too wet 1999 was the driest year of the three
Distribution of uprights into classes. Zero refers to uprights that flowered but did not support any fruit. Numbers one through three refer to uprights that supported that number of fruit. *indicates significant difference within row. 1999 and 2000 data were similar.

<table>
<thead>
<tr>
<th>Upright type</th>
<th>2001 Ideal (%)</th>
<th>2001 Wetter (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-flowering</td>
<td>61.9</td>
<td>63.1</td>
</tr>
<tr>
<td>Zero</td>
<td>18.1*</td>
<td>23.5*</td>
</tr>
<tr>
<td>One</td>
<td>17.6*</td>
<td>11.2*</td>
</tr>
<tr>
<td>Two</td>
<td>2.2*</td>
<td>1.4*</td>
</tr>
<tr>
<td>Three or more</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Failure to retain even one fruit accounted for decreased yield in standard (wetter) irrigation plots.
Yellow vine

- Soil moisture is key
- Too wet or too dry
- Poor rooting
- Produced greenhouse symptoms if water table was too high or too low
Important practices

- Drainage, drainage, drainage
- Insure adequate moisture into the fall, especially in drought years
- Properly schedule irrigation to avoid over- and under-watering
Both the calendar and 1”/week rule can lead to excess or deficiency
Evaporation gauge was installed at State Bog during the summers of 1999 and 2000
1999
High = 1.65
Low = 0.47
Average = 0.92

2000
High = 1.21
Low = 0.28
Average = 0.82

deficit or surplus following 1"/week rule
How much should I irrigate?

- Simple answer- enough to bring water table up to an adequate level without flooding root zone
- You need to know where the saturation level is – you must monitor soil moisture to know this
Tensiometer

**Advantages**
- Capable of measuring midday depression in soil moisture in root zone
- Useful with or without a water table present

**Disadvantages**
- Relatively insensitive to water level changes
- Relatively expensive
- Requires foot traffic on bed to read
Water level float
Water level float

**Advantages**
- inexpensive to build (fact sheet available)
- low maintenance, not susceptible to freezing damage
- do not require walking on bed to read
- more sensitive to changes in water table than tensiometer

**Disadvantages**
- doesn’t register midday depression in root zone
- only useful on beds with water table present
Water level float workshop in 2005
More in 2006?
Questions?
Grower survey

- Fill it out now
- Help us to evaluate these practices
- This is the “before”
General Information

How many acres do you own or directly manage or work on? ______________

Are you the decision maker for this acreage?  Yes  No
What method(s) of **sanding** have you used in the last 5 years?

**Check all that apply and circle preferred method**

- Ice sanding
- On the vine
- Rail sanding
- Barge sanding
Sanding

What method(s) of sanding do you expect to use in the next 5 years? **Check all that apply and circle preferred method**

- [ ] Ice sanding
- [ ] On the vine

**[X]** Rail sanding

- [ ] Other?________________

When you sand, what is your planned target depth?

- [ ] ¼ inch
- [ ] ½ inch
- [ ] 1 inch
- [ ] Other?________________
How well do you think you achieve the planned target depth?
- Consistently close to target depth
- Variable depending on location
- Not even close

Do you have beds that you sand but never prune?
- YES
- NO

How often do you hope to sand an individual piece (weather permitting)?
- Every year
- Every other year
- Every 3 years
- Every 5 years
- Never
What do you hope to accomplish with your sanding? **Circle all that apply**

- Pest management
- Improved vine growth
- Increased light penetration
- Increased pesticide penetration
- Ease of harvesting

Other? ______________________
Pruning

Do you have beds that you prune but never sand?  YES  NO

If yes, how often do you typically prune such a bed?
   Every year  Every other year  Every 3 years
   Every 5 years  When necessary  Never
Pruning

Do you have beds that you sometimes prune and sometimes sand?    YES    NO

If yes, how often do you typically prune such a bed?
Every year   Every other year   Every 3 years
Every 5 years   When necessary   Never
Pruning

What is the typical intensity of your pruning?

- Light (less than 1/3 ton/a)
- Medium (1/4 to 3/4 ton/a)
- Heavy (1 or more ton/a)

When do you prune?

- Spring
- Fall
- Other (list)________________
Pruning

What **pruning** equipment have you used in the last 5 years?  **Circle all that apply**

NONE      Dry harvest machine
Modified water harvester       Manual knife rake
Other (please describe)    ________________________________

What **pruning** equipment do you expect to use in the next 5 years?

NONE      Dry harvest machine
Modified water harvester       Manual knife rake
Other (please describe)    ________________________________
Pruning

What do you hope to accomplish by pruning?

**Circle all that apply**
- Pest management
- Improved vine growth
- Increased light penetration
- Ease of harvesting
- Increased pesticide penetration
- Provide vines for planting
- I don't prune

Do you have bogs where you have intentionally alternated sanding and pruning in the last 10 years (in a planned way)?
- YES
- NO
Do you use slow release fertilizers?

- YES
- NO

If yes,

a) what type (brand) of slow release fertilizer do you use? (e.g. IBDU, osmocote)

__________IBDU 10-12-24________________

b) when do you apply slow release fertilizer?

___early May or bud break_____
Nutrient Management

Do you use custom blend fertilizers?

YES  NO

If yes, what is the NPK ratio in the custom mix?
(e.g. 18-10-12) ______ 20-8-10 ______________
Irrigation Scheduling

How do you decide when to irrigate?
**Check all that apply and circle preferred method**
Water level float  Inch-a-week rule
Tensiometer (gauge)  Touch test
Other monitoring device (probe, etc.)

In mid-summer, if there is no rain during a week, how often would you irrigate?
Once  Twice  3 times  More than 3 times
Irrigation Scheduling

Approximately how long do you run sprinklers during an irrigation event?
1 hour  2 hours  3 hours  **4 hours**  Longer than 4 hours

When do you typically irrigate?
- **During the night**
- Early morning/before 6 AM
- **Evening/after 7 PM**
- Mid-day
- other?________________
Irrigation Scheduling

If the Cranberry Station hosts a hands-on workshop on the construction and installation of water level floats in the Spring of 2006, how likely are you to attend?

Definitely  Very likely  Maybe  Probably not  Would not
Drainage

Have you filled in interior ditches in the last 10 years?  
[ ] YES  [ ] NO

If yes, why? ________ easier harvest ________________

In the last 10 years have you installed any submerged drainage?  
[ ] YES  [ ] NO

**If yes, circle type installed**

[ ] Tile  [ ] Pipe  [ ] Gravel ditch

[ ] other?? (list) _____________________________
Drainage

In the next 5 years, do you intend to install any submerged drainage? YES NO
**If yes, circle type you intend to install**
Tile Pipe Gravel ditch
other?? (list) _____________________

If you use submerged drainage, what reasons do you have for installing it?
**Check all that apply and circle primary reason**

Eliminate wet spot Bog too wet Replace surface ditches Disease management
other?? (list) _____________________
Have you visited the UMass Cranberry Station website? YES NO

If so, how often do you visit the website? Daily Weekly Monthly Yearly

What pages do you visit on the Station site? **Check all that apply and circle preferred**

- Newsletters
- IPM message
- Calendar
- Station personnel
- Research programs
- Chart Book
- Weather updates
- Links
- Recipes
Followup

Would you be willing to participate in a further interview regarding these practices and their costs?

[ ] YES  [ ] NO

If yes, please give us your name and phone number

__________________________________________________________________________________
See you after lunch

Be back here at 1:00