NORTHEASTERN IPM CRANBERRY FRUIT ROT WORKING GROUP

MEETING SUMMARY

DATE

Wednesday, August 26, 2015.

LOCATION

Conference Room, Best Western Inn at Face Rock. Bandon, Oregon.

GOAL

Revise and identify needs and research priorities for the cranberry industry focusing on fruit rot management.

MEETING FACILITATORS:

Peter Oudemans, Rutgers University

Erika Saalau Rojas, UMass-Amherst

ATTENDEES

Stakeholders representing academia, cranberry growers, not-for-profit organizations, and fruit handlers across major cranberry growing regions.

LAST	FIRST	INSTITUTION	STATE/REGION
1. Mauza	Brian	Ocean Spray	British Columbia
2. Wilson	John	Cranberry Institute	MA
3. Porter	John	Makepeace	MA
4. Nolte	David	Ocean Spray	MA
5. Nolte	Barrie	Ocean Spray	MA
6. Serres	Rod	Ocean Spray	MA
7. DeMoranville	Carolyn	UMass	MA
8. Saalau	Erika	UMass	MA
9. Schiffhauer	Dan	Ocean Spray	NJ
10. Oudemans	Peter	Rutgers	NJ
11. Vorsa	Nick	Rutgers University	NJ
12. Kloft	Don	Ocean Spray	OR
13. Bouska	Cassie	Oregon State University	OR
14. Deland	Jean-Pierre	Ocean Spray	Quebec
15. Bellamy	Dave	Ocean Spray	WA
16. Caruso	Frank	Private	WA
17. Metzger	Chase	Washington State University	WA
18. Patten	Kim	Washington State University	WA
19. Wells-Hansen	Lindsay	University of Wisconsin	WI

AGENDA

The meeting was convened at 8:00 a.m. at the conference center for the morning session, followed by a plant disease field trip in Bandon, OR commercial cranberry beds. Lunch was provided by Ocean Spray. The afternoon session opened at 1:45 p.m. in the conference center and the meeting was adjourned at 4:30 p.m. Working Group members and meeting attendees were invited to continue discussions and socialize at dinner, expenses covered by the NE-IPM Cranberry Fruit Rot Working Group grant.

ITEMS DISCUSSED

Major cranberry diseases

A list of cranberry diseases, including fruit rot, was distributed among attendees to be ranked from most to least relevant in each of the representatives' region.

- Fruit rot (field)
- Fruit rot (storage)
- Cottonball
- Virus diseases (TMV, BBShV)
- Phytoplasma (false blossom)
- Phytophthora root rot (*P. cinnamomi*)
- Phytophthora root rot (other)
- Upright dieback
- Twig blight
- Fairy ring
- Rose Bloom
- Cranberry Gall
- Other

Ranking of major disease by region

A list of cranberry diseases, including fruit rot, was distributed among attendees to be ranked from most to least relevant in each of the representatives' region.

MASSACHUSETTS

Field fruit rot
Storage rot
Phytophthora root rot (all sp.)
Upright dieback
Fairy ring
Virus diseases and Phytoplasma
Undiagnosed diseases

NEW JERSEY

Field fruit rot
Phytophthora root rot (*P. cinnamomi*)
Storage fruit rot
Virus diseases and Phytoplasma

OREGON

Twig blight
Field and storage rot
Cottonball, virus diseases, and undiagnosed diseases
Upright dieback

WASHINGTON

Storage fruit rot
Field fruit rot
Twig blight
Phytophthora root rot (*P. cinnamomi*) and Rose bloom
Cottonball, Phytophthora root rot (other) and Upright dieback

WISCONSIN

Virus diseases
Field fruit rot
Upright dieback
Storage fruit rot
Cottonball

BRITISH COLUMBIA

Field fruit rot
Storage fruit rot
Upright dieback
Rose bloom
Twig blight
Cottonball
Virus diseases

QUEBEC

Storage fruit rot
Field fruit rot
Cottonball
Upright dieback
Virus diseases
Rose bloom

OCEAN SPRAY

Field and storage fruit rot
Cottonball — HIGH PRIORITY
Virus diseases
Phytophthora root rot (all sp.)
Upright dieback — MEDIUM PRIORITY
Phytoplasma
Twig blight
Fairy ring — LOW PRIORITY
Rose bloom
Cranberry gall

Research priorities summary

Research priorities published 1998-2002 from national and regional crop profiles for cranberry and the Northeastern Cranberry Pest Management Strategic Plan (PMSP) were reviewed by meeting attendees.

- New pesticide research, particularly with strobilurin fungicides
- Timing and biology of fungi
- Storage quality forecast models.
- Implementation of new controls in fruit rot spraying schedule
- Innovative floods
- Biopesticides
- Sanding/ fairy ring /flea beetle interaction
- Harvesting and storage technology for improving quality
- Need work done on virus and virus-like diseases including false blossom phytoplasma
- General disease (including nematodes) etiology

CRANBERRY FRUIT ROT WORKING GROUP MEETING ATTENDEES AT A COMMERCIAL BOG IN BANDON, OR.

Revision and Identification of Research Priorities

Research priorities were divided into eight different topics, each topic was discussed as a group, and the conversation was finalized by classifying each topic as high, medium, or low priority. The following summary covers the research topics discussed in addition to revisions, suggestions, and comments made by the group.

Research Topics 1: Biology of Fruit Rot Fungi

There are 10 major fruit rotting species that cause fruit rot on cultivated cranberry. Commercial growers treat cranberry fruit rot as a single disease and recommendations support this strategy. Several of the pathogens have identifiable life—history stages (*Physalospora, Colletotrichum*) whereas others are poorly elucidated (*Coleophoma, Phyllosticta*). Under this objective we have identified a need to elucidate the life histories of all cranberry pathogens.

a) Understand life cycles of individual fruit rot fungi
b) Develop tailored recommendations for each fruit rot sp.
c) *Timing and biology of fungi (old priority)*
d) Develop and apply improved identification methods
e) Monitor for development of fungicide resistance
f) Incorporate weather data into investigation of disease cycles (added by group)
g) Do fungal population shifts (added by group)
h) ***How do fungi affect skin integrity (added by group)***

Research Topics 2: Fruit Quality

Fruit quality has traditionally been emphasized by fresh fruit growers where keeping quality and appearance have been critical for marketing. New products, such as sweet and dried cranberries, require fruit that must meet new quality parameters. These include color, firmness, size, uniformity, and brix. Under this objective the group has identified priorities aimed at understanding and achieving new fruit quality targets.

a) Identify preharvest factors that affect fruit firmness (heat, fungal infection)
b) *Re-examine and test storage quality forecast models.*
c) *Harvesting and storage technology for improving quality*
a) What preharvest parameters affect fruit quality? (added by group)
b) Storage quality prior to freezing and impact on SDC quality (added by group)
c) ***What is physiological breakdown? (added by group)***

Research Topics 3: Climate Change

Changes in climate can alter the life histories and phenological development cranberry pathogens and thereby change disease severity across the geographical range of commercial cultivation. Under this section we identify areas where farming practices must adapt to accommodate climate change.

a) Develop models to predict fruit rot in areas which typically don't have fruit rot losses
b) Examine the need for berry cooling and best practices for reducing over heating

The group suggestion:

a) These priorities will be better placed in the biology section
b) Study extreme and isolated weather events and climate patterns (e.g., El Niño, tropical storms, drought, etc.).

RESEARCH TOPICS 4: IMPROVING EFFICACY

PREVIOUSLY:
RESEARCH TOPICS 4: NEW FUNGICIDES
RESEARCH TOPICS 6: APPLICATION METHODS
RESEARCH TOPICS 8: FUNGICIDE ALTERNATIVES

Research topics regarding chemical control against fruit rot, fungicide use, and fungicide alternatives were initially presented as different research topics. While discussing these priorities the group identified that several research areas overlapped and that were considered repetitive. As a result, research topics 4, 6, and 8 were merged into a broader research priority encompassing all areas where research is needed.

Protection methods

a) Screen new fungicides and new fungicide programs for efficacy
b) Emphasize on testing novel modes of action
c) *Implementation of new controls in fruit rot spraying schedule*
d) Low risk fungicides (new fungicide regimes) and MRL compliance
e) Research and discover novel biological control methods (added by group)
f) Investigate impact of fungicides on fruit quality parameters (added by group)

Application methods (previously topic 6)

a) New application methods
b) Improve methods for evaluating existing application systems
c) Can UAS be used for fungicide applications?

Fungicide alternatives (previously topic 8)

a) Bio control
b) Synergism of chemicals
c) Delivery methods
d) *Stickers and adjuvants (added by group)*

RESEARCH TOPICS 5: PLANT RESISTANCE

Breeding programs in New Jersey and Wisconsin are leading the development of cranberry varieties currently being introduced into major cranberry-growing regions. The evaluation of these varieties and their susceptibility to fruit rot is challenging, primarily due to the diversity of environmental conditions and cropping practices in each state and region.

a) Develop methods for evaluating host resistance on individual plants to improve throughput of fruit rot resistance screening
b) Genomic approaches for resistance breeding (added by group)
c) Changes in plant phenology and impact on disease expression (added by group)

RESEARCH TOPICS 5: CULTURAL CONTROL

Fruit rot is a complex disease and as a result, disease control has traditionally relied on the use of fungicide applications in spring and early summer. The impact of cultural practices on disease incidence and severity, as well as fruit quality remains unknown. The working group highlighted the importance of focusing on fungicide alternatives, such as implementing cultural practices that enhance disease control.

a) Canopy management. Can the canopy be optimized for reducing heat stress to fruit?
b) Canopy cooling. Can irrigation for cooling be optimized for reducing or managing fruit rot?
c) What are the best methods for inoculum reduction?
d) Trash flood
e) Reduced irrigation
f) Innovative floods
g) Impact of sanding, mowing and pruning practices on fruit rot control (added by group)
h) Biopesticides (group decided to move to research topics 4)

RESEARCH TOPICS 9: INFRASTRUCTURE **(ADDED BY THE GROUP)**

Currently, there is not a system in place that facilitates access to information by stakeholders in academia, industry, growers, and non-for-profit organizations. Over the course of the meeting the working group identified several gaps and needs regarding communication across regions and among stakeholders. Members expressed a deep interest in the creation and development of communication platforms that would enable sharing regional updates and research results, with the main purpose of delivering unbiased information and a coordinated message to growers in the U.S. and Canada.

a) Database to share regional research results
b) Communication, disease management recommendations, and updates shared with all stakeholders (electronic)
c) MRL communication and updates shared across regions
d) Coordinated regional registration of chemical products including Canada

RANKING OF NEEDS AND PRIORITIES

After discussing all research topics and needs, meeting attendees classified each item as a high, medium, and low priority. A final list was generated based on majority votes assigning each topic into a major category (i.e., high, medium, or low). Percentages represent the total votes submitted by 19 attendees.

Fruit Quality	**HIGH**
Identify preharvest factors that affect fruit firmness Re-examine and test storage quality forecast models. Harvesting and storage technology for improving quality Preharvest parameters that affect quality Storage quality prior to freezing and impact on SDC quality Investigate physiological breakdown	72%
Biology of fruit rot fungi	**HIGH**
Understand life cycles of individual fruit rot fungi Develop tailored recommendations for each fruit rot sp. Timing of infection and biology of fungi Develop and apply improved identification methods Monitor for development of fungicide resistance Incorporate weather data into investigation of disease cycles Population biology and population shifts Fungal infection and fruit skin integrity	67%
Infrastructure	**HIGH**
Database to share regional research results Electronic communication and media for disease management recommendations, updates, and extension outputs MRL communication and updates shared across regions Coordinated regional registration of chemical products including Canada	41%

Improving chemical control efficacy	MEDIUM
Screen new fungicides and fungicide programs for efficacy	
Emphasize on testing novel modes of action	
Implementation of new controls in fruit rot spraying schedule	
Low risk fungicides and MRL compliance	
Research and discover novel biological control methods	
Investigate impact of fungicides on fruit quality parameters	
Application methods	
New application methods	61%
Improve methods for evaluating existing application systems	
Can UAS be used for fungicide applications?	
Fungicide alternatives	
Bio control	
Synergism of chemicals	
Delivery methods for fungicide applications	
Stickers and adjuvants	
Cultural control practices	**MEDIUM**
Canopy management. Can the canopy be optimized for reducing heat stress to fruit?	
Canopy cooling. Can irrigation for cooling be optimized for reducing or managing fruit rot?	
Cultural practices to reduce inoculum pressure	61%
Determine impact of trash flood, sanding, mowing, and pruning practices on fruit rot	
Reduced irrigation and sub-irrigation methods	
Innovative floods to enhance fruit rot control	
Plant resistance	**MEDIUM**
Develop methods for evaluating host resistance on individual plants to improve throughput of fruit rot resistance screening	50%
Genomic approaches for resistance breeding	
Changes in plant phenology and impact on disease expression	

Climate Change	LOW
Develop models to predict fruit rot in areas which typically don't have fruit rot losses	
Examine the need for berry cooling and best practices for reducing over heating	44%
Study extreme and isolated weather events (e.g., El Niño, tropical storms, drought, etc.).	