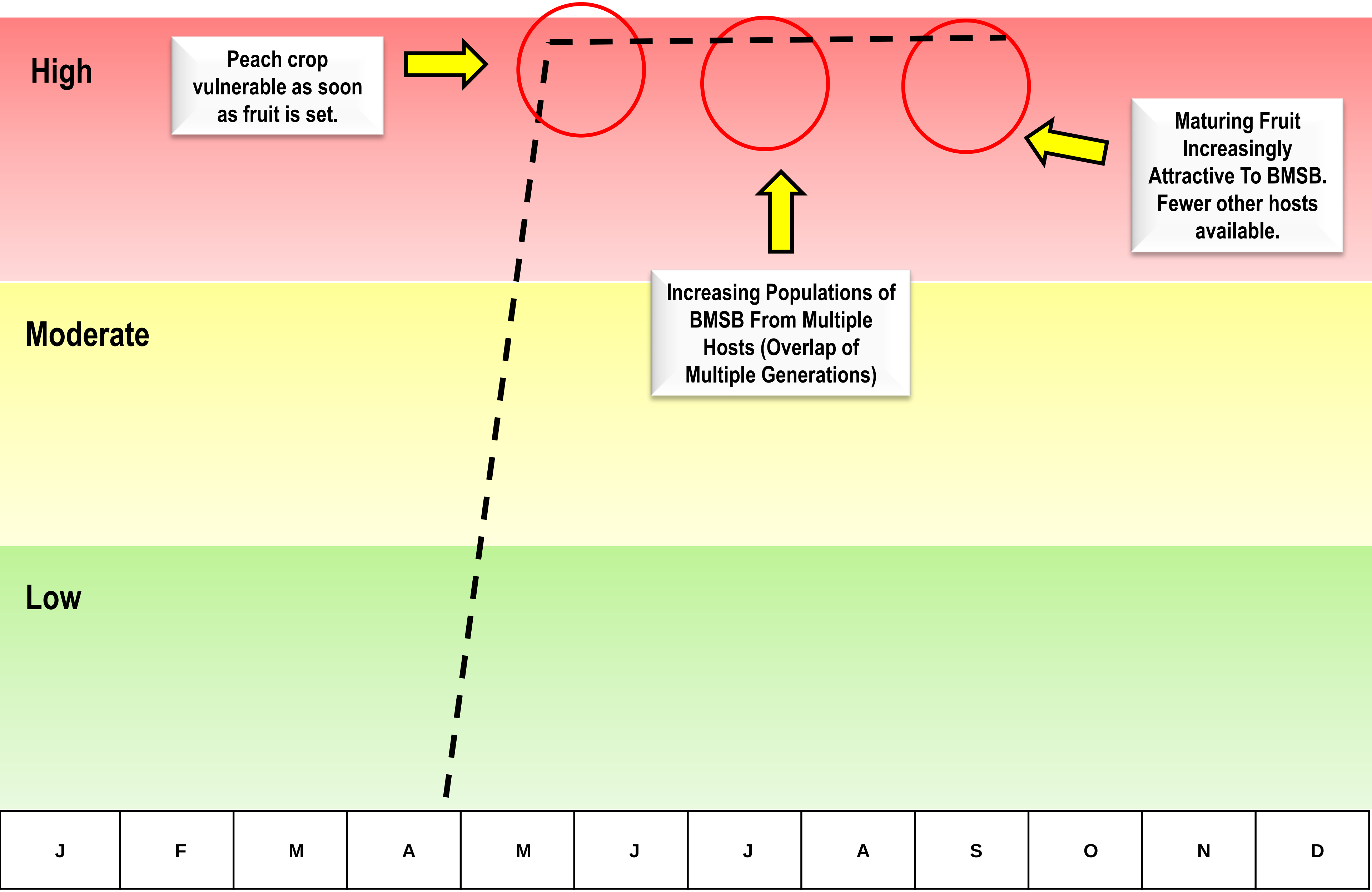
BMSB Injury To Tree Fruit: Symptoms and Phenology

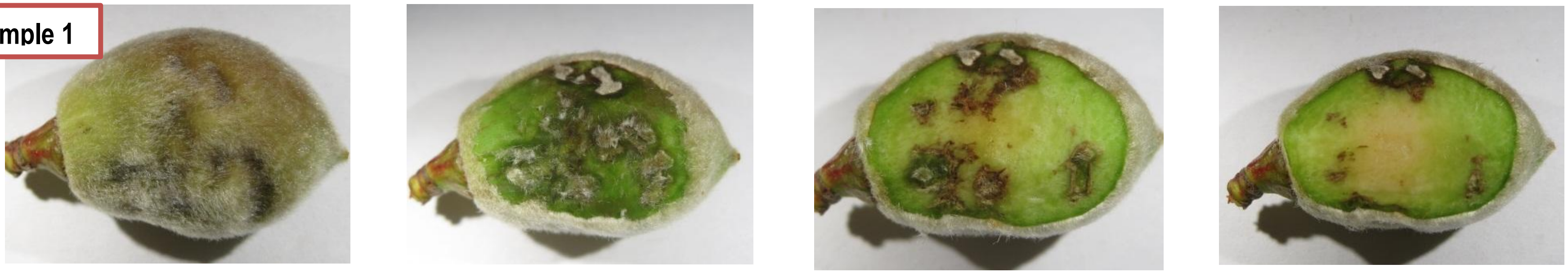
BMSB Threat To Peaches



Brown Marmorated Stink Bug Feeding Injury

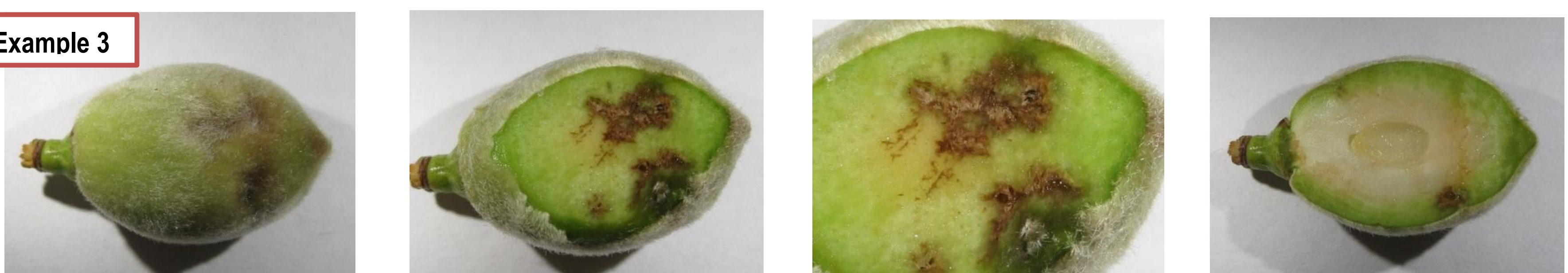
Surface and Internal Injury
'Loring' Peach at ~15 mm
Appalachian Fruit Research Station
Kearneysville, WV 25430
16 May 2011

Example 1



Example 2

Example 3



Early and Mid-Season Damage

Internal Damage Can Be Present Even When External Damage Is Not Detectable

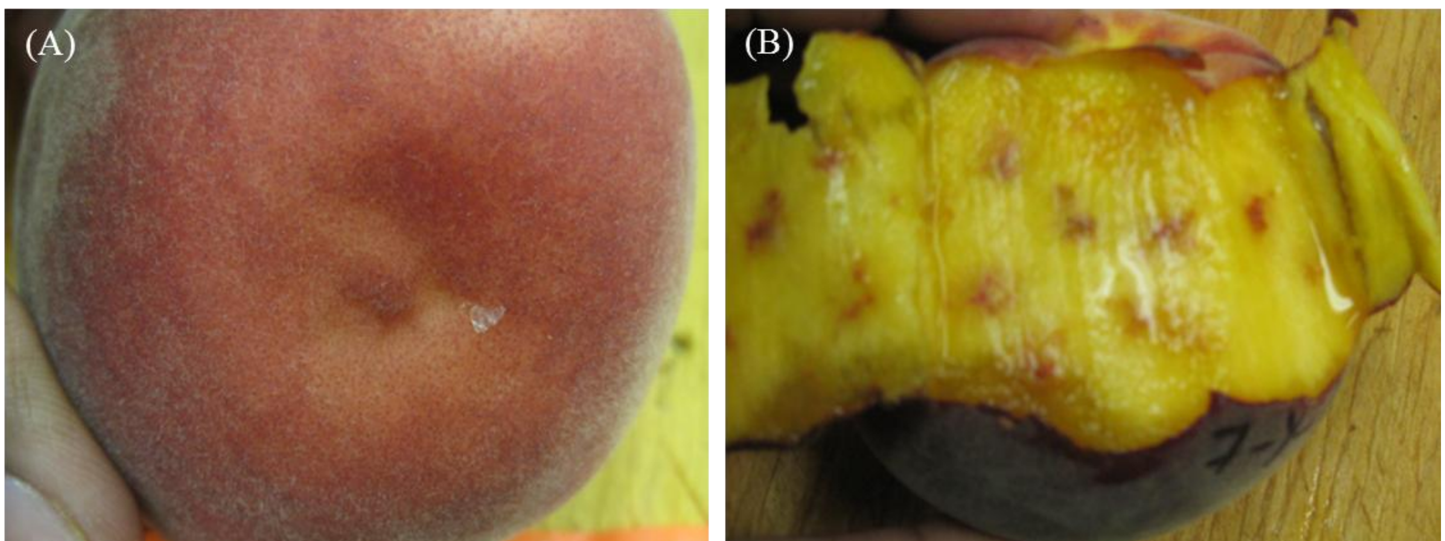
Late-Season Injury on Peach

External Injury
No obvious Injury Sites on Skin

Internal Injury
Corky flesh just beneath the skin

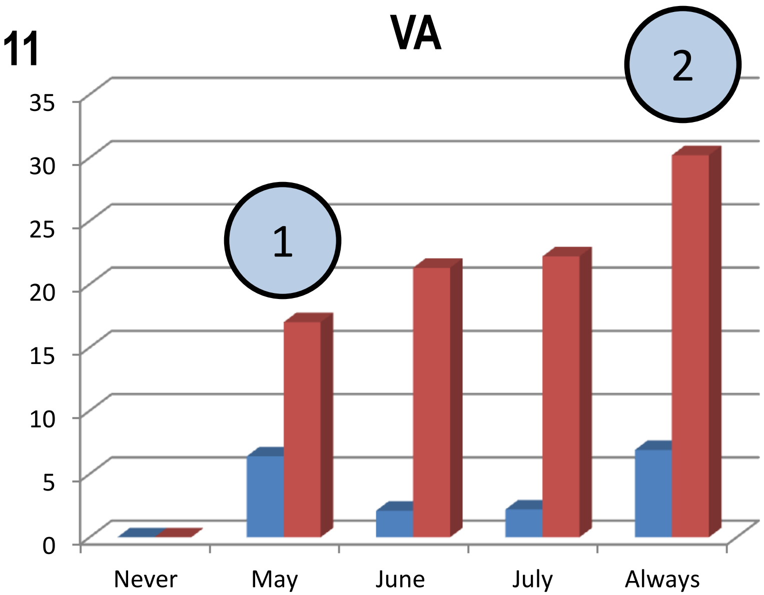
Phenology of Peach Injury (Joseph et al.)

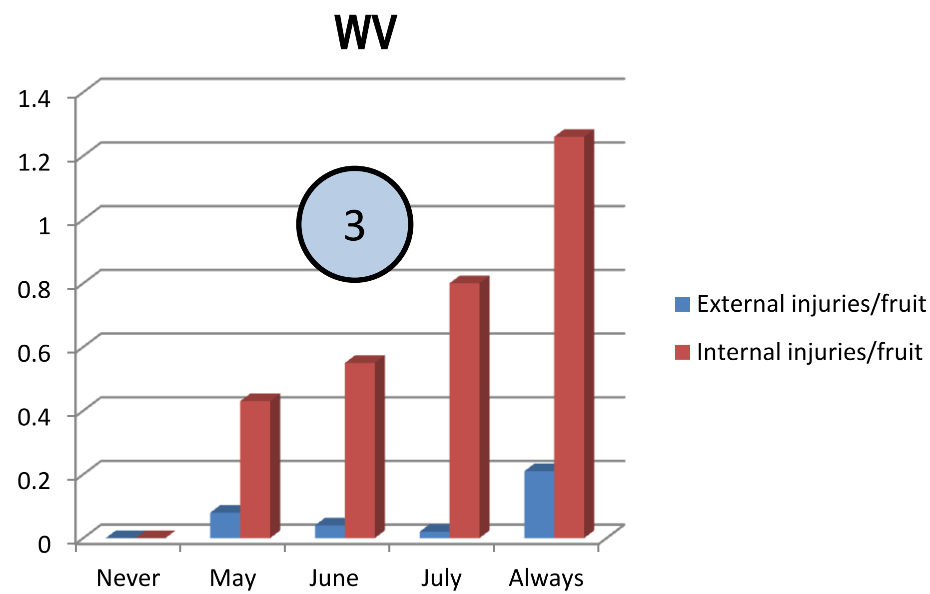
- Developing peaches protected in enclosed sleeves or left unprotected season-long.
- At monthly intervals, groups exposed to natural BMSB populations.
- Evaluated fruit at harvest for external and internal injury.
- Conducted in VA and WV in 2011 and 2012.



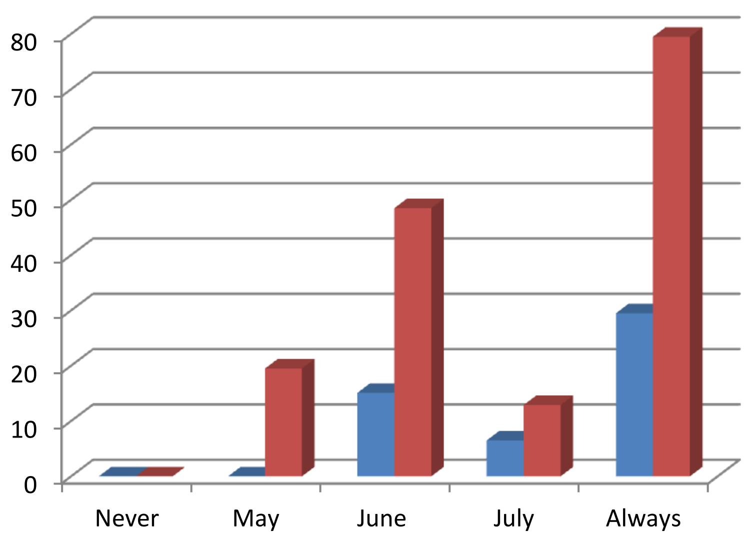
Phenology of Peach Injury

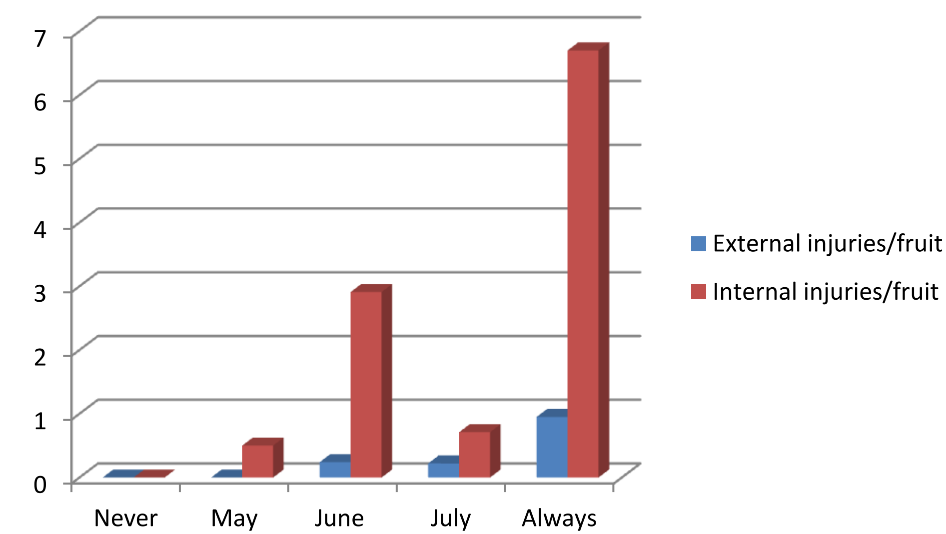
2011





2012



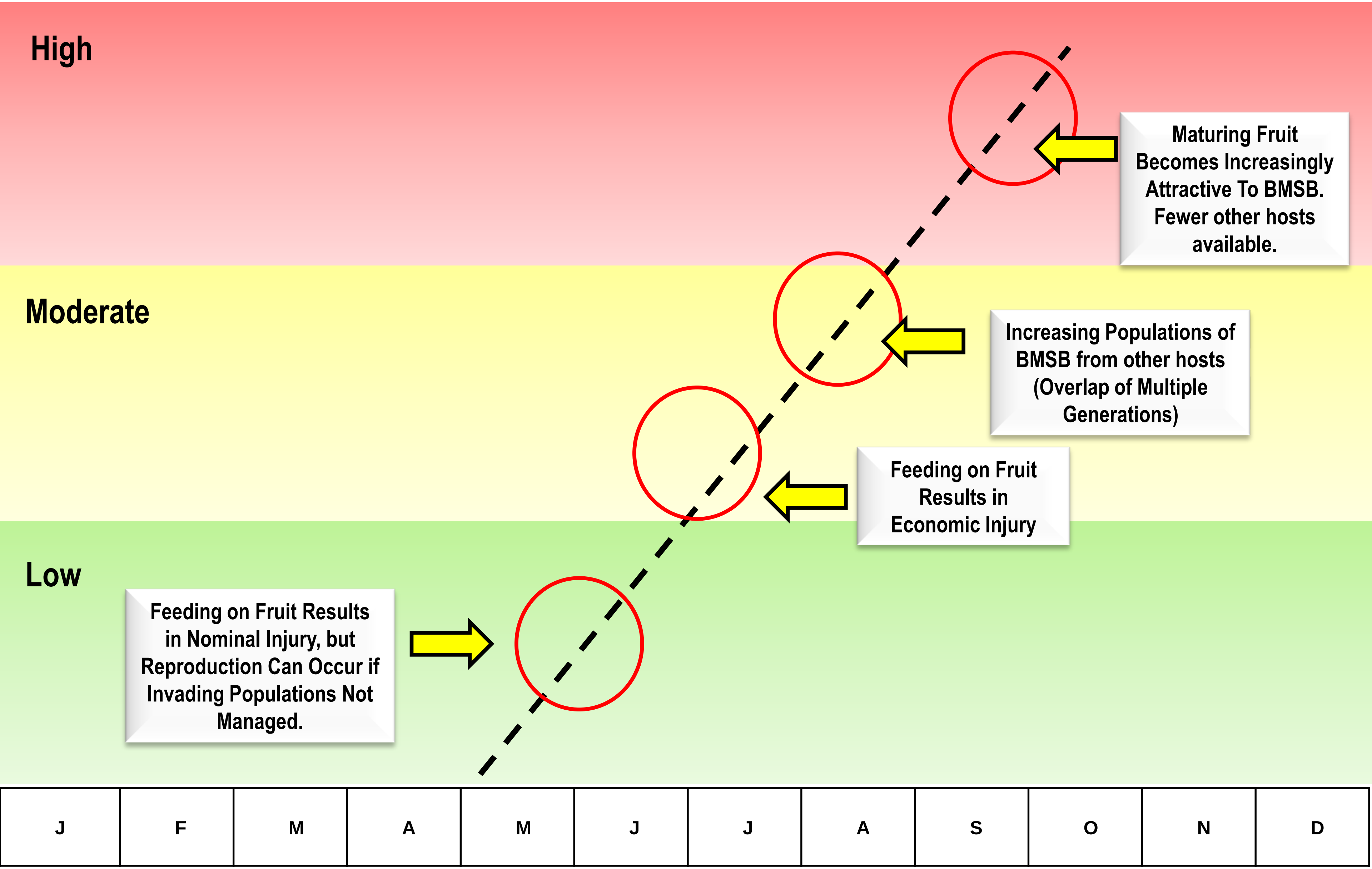


Cold Injury on Loring Peaches

External Injury
Obvious Injury Sites on Skin

No Internal Injury

BMSB Threat To Apples




Early Season Superficial Injury
Early season feeding results in nominal injury with discolored dot and feeding sheath beneath


Mid-Season Economic Injury
Mid season feeding results in possible discolored depressions and flesh surrounding feeding sheath appearing corky


Mid-Late Season Economic Injury
Mid-late season feeding results in discolored depressions with larger, corky areas in flesh

BMSB External and Internal Apple Damage

Early Season Injury on Fuji

External Injury
Feeding Sites Detectable

Internal Injury
Feeding tube can be detectable

Mid-Season Injury on Turley Winesap

External Injury
Evidence of Discolored Depressions

Internal Injury
Corky Tissue Developing

Mid-Late Season Injury on Turley Winesap

External Injury
Evidence of Discolored Depressions

Internal Injury
Corky Tissue Developing

Late Season Damage on Pink Lady

External Injury
Extensive Discolored Depressions

Internal Injury
Corky Tissue Extending Deep
Into Flesh

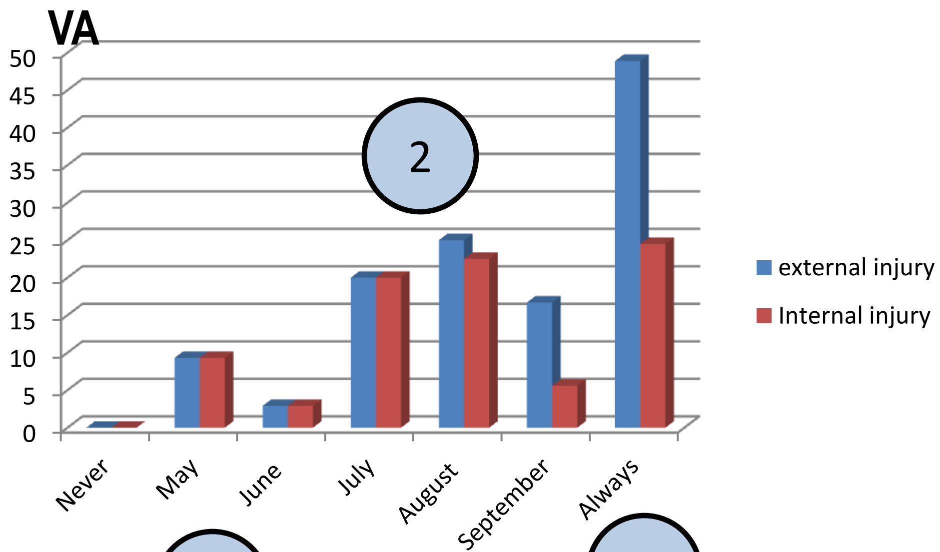
Phenology of Apple Injury (Joseph et al.)

- Developing apples protected in enclosed sleeves or left unprotected season-long.
- At monthly intervals, groups exposed to natural BMSB populations.
- Evaluated fruit at harvest for external and internal injury.
- Conducted in VA and WV in 2011 and 2012.

Phenology of Apple Injury

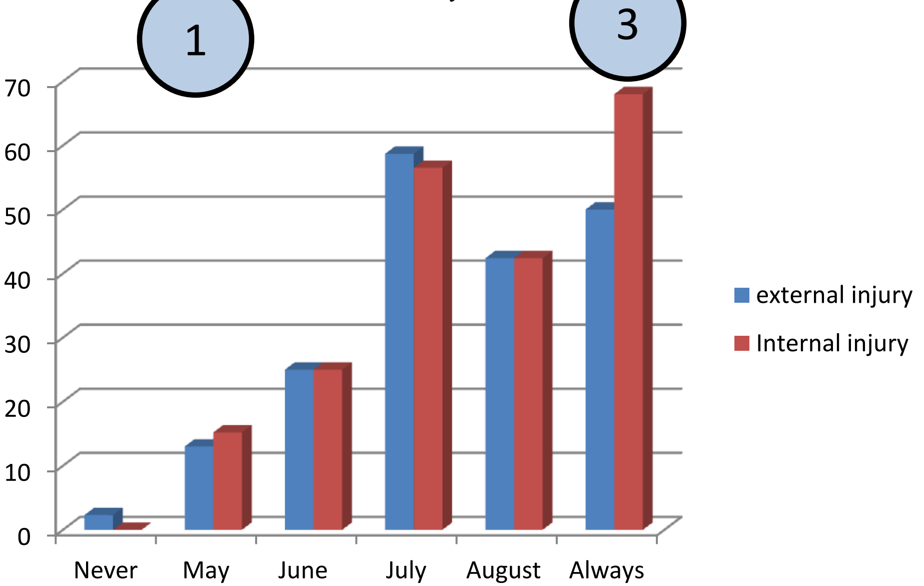
2011

Golden Delicious

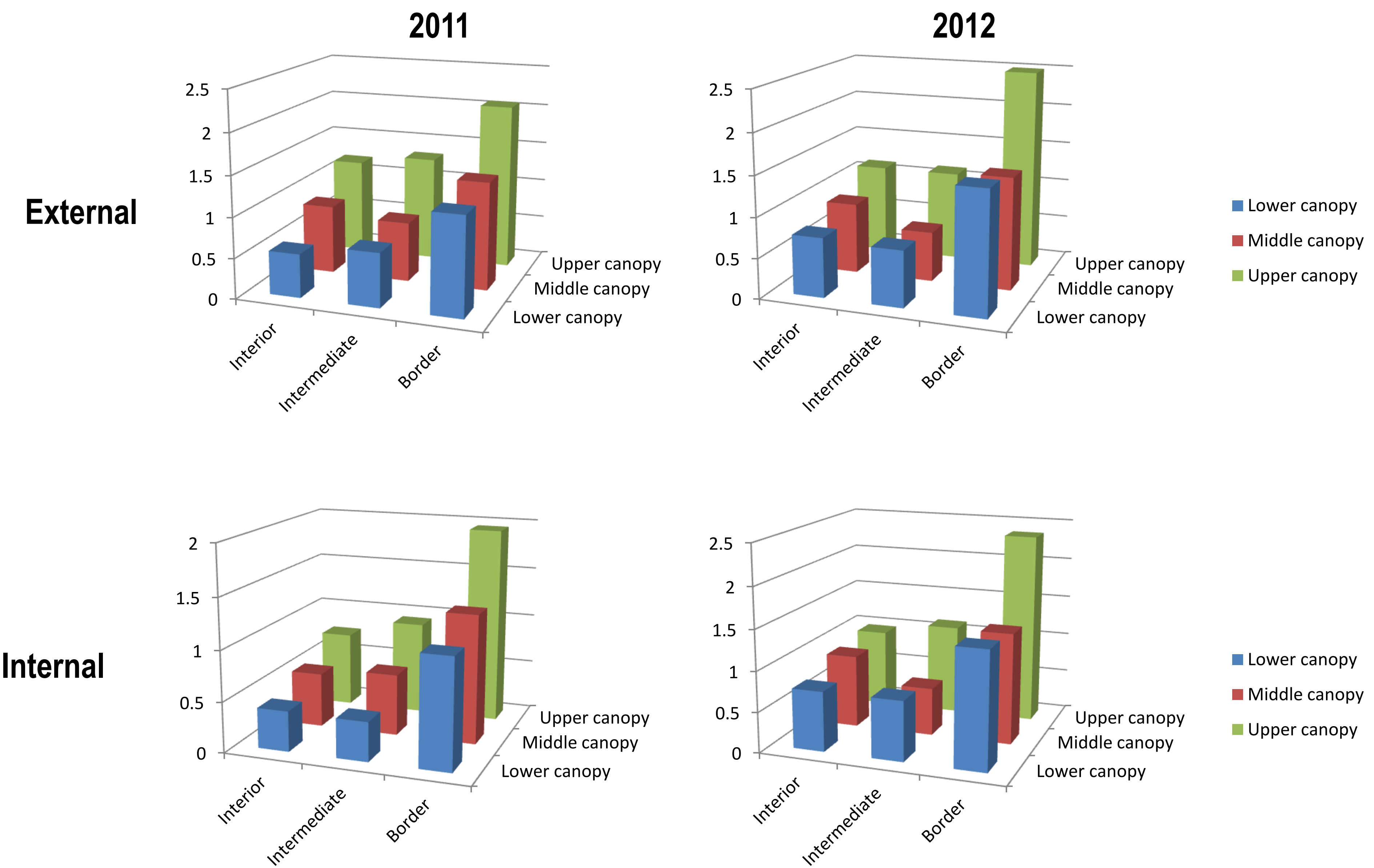


2012

Smoothee Golden



Injury Distribution in Apple Orchards

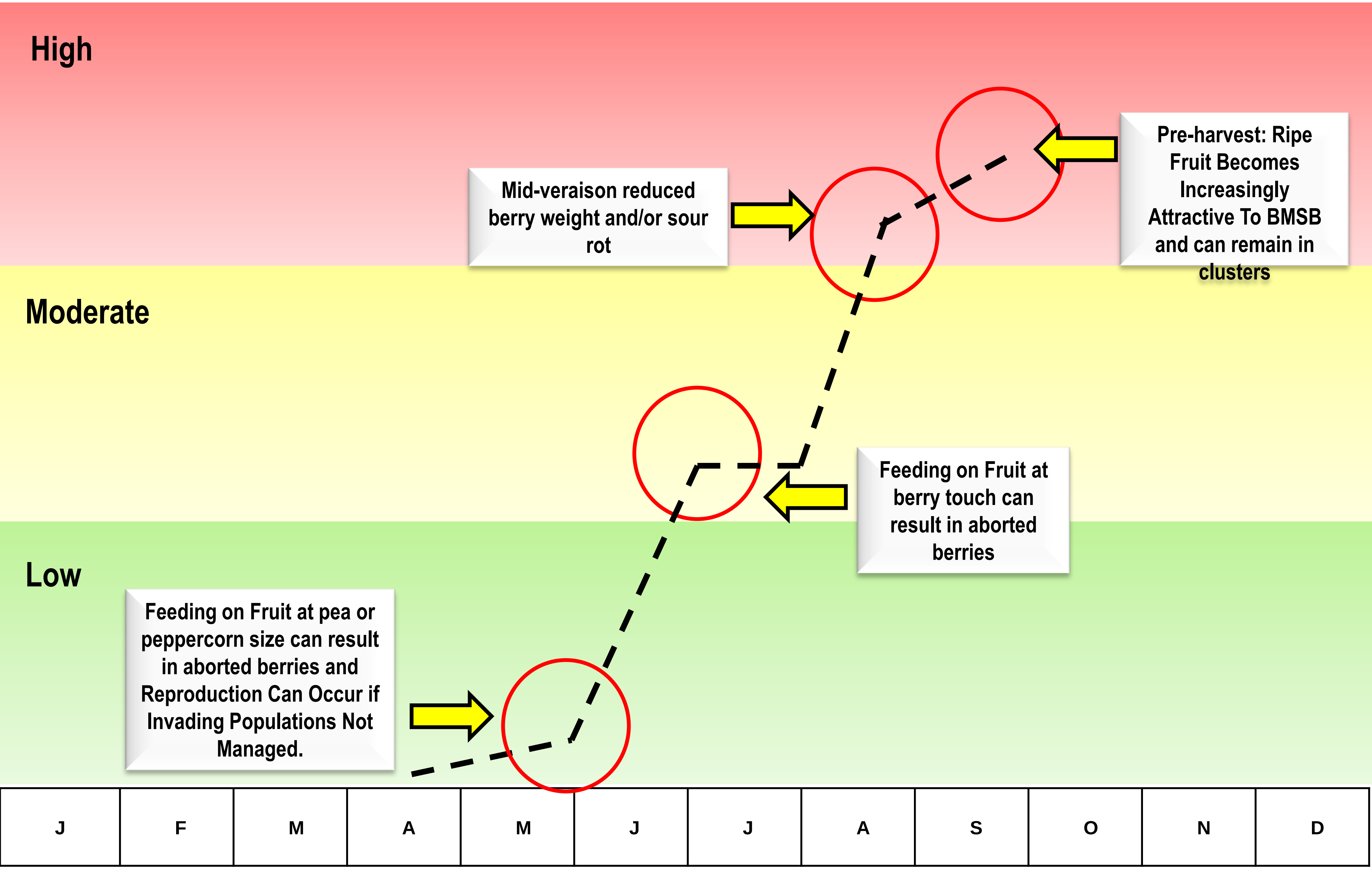


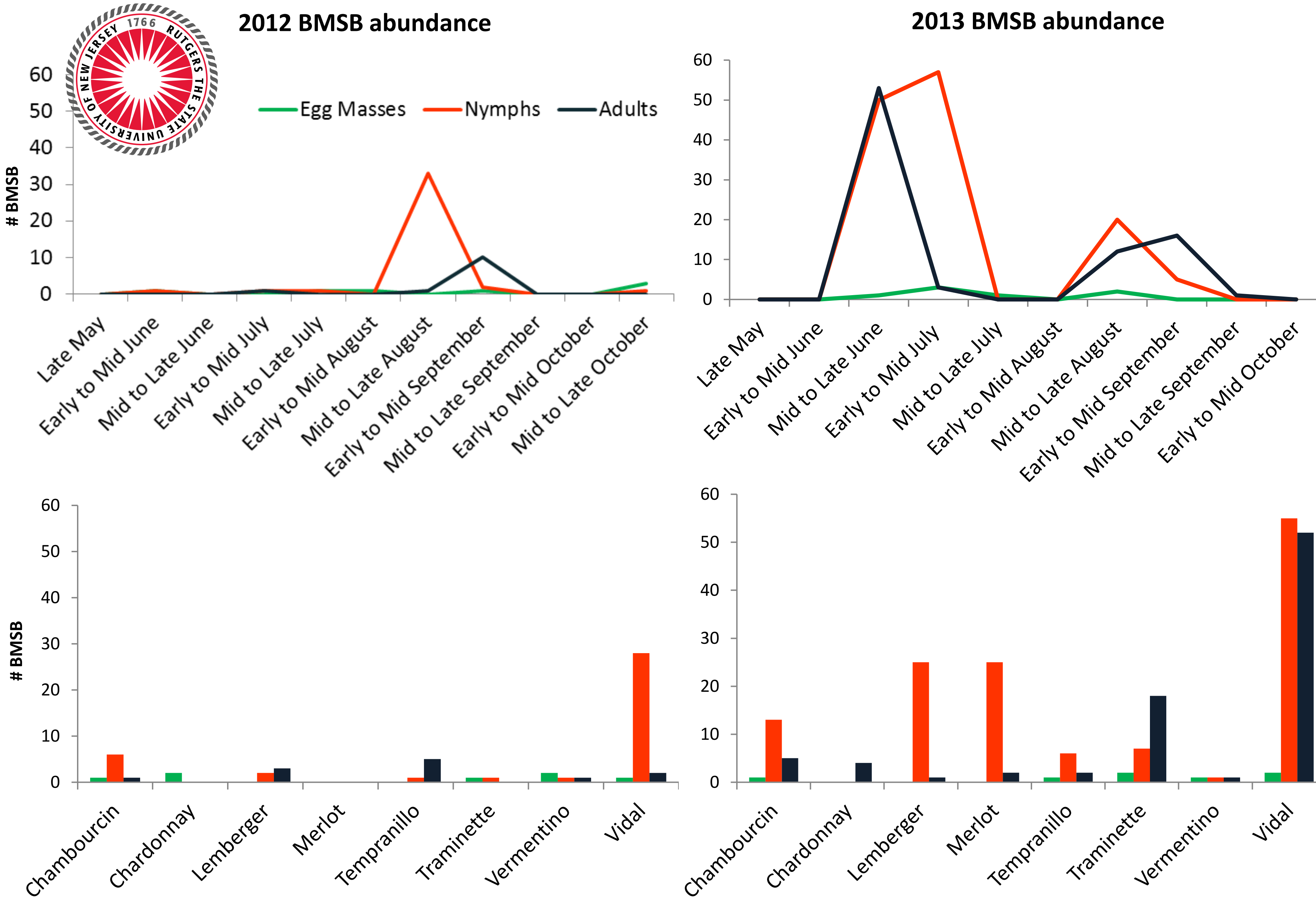
Injury to Asian Pear

Early Season Injury in Peach

Not BMSB Injury!

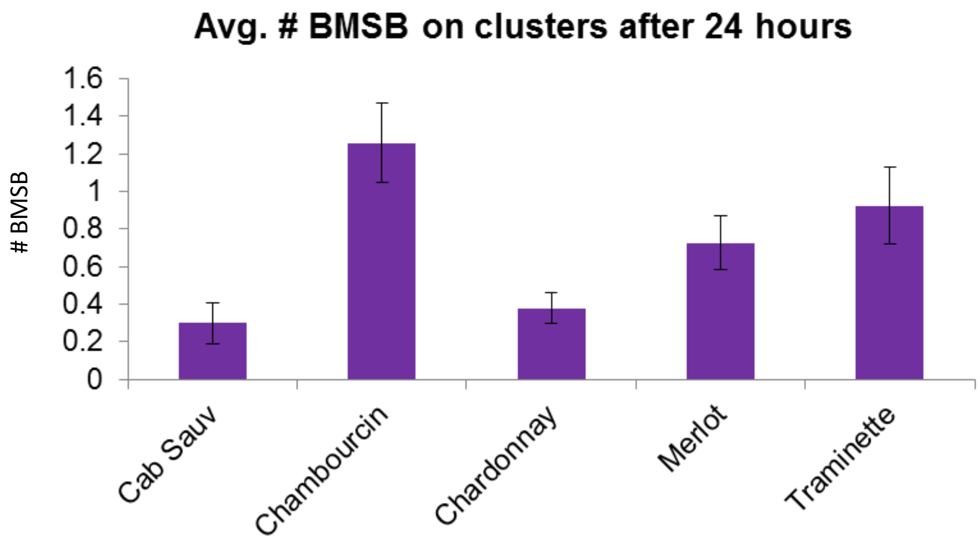
BMSB Threat To Grapes

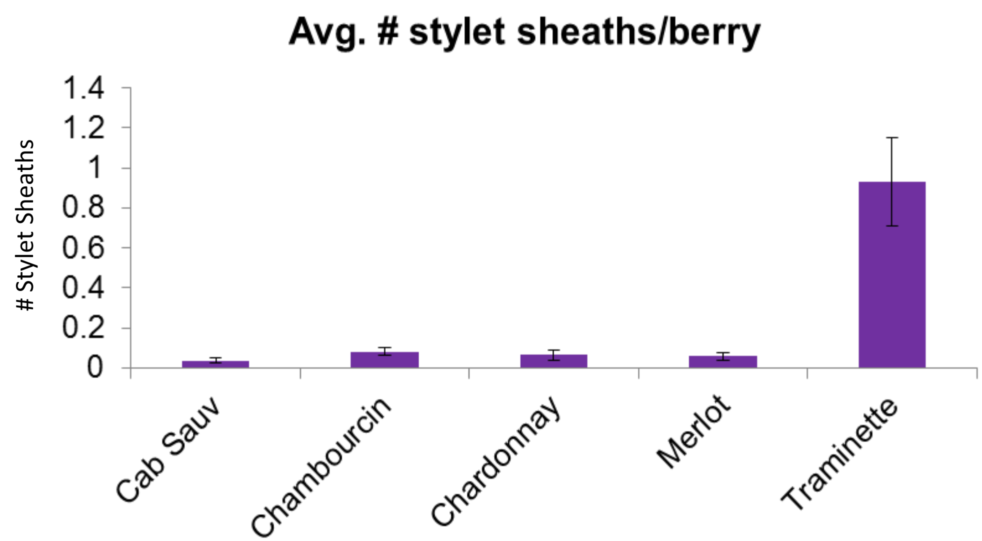




Most abundant in white grapes, from mid-June to mid-July and from mid-August to mid-September

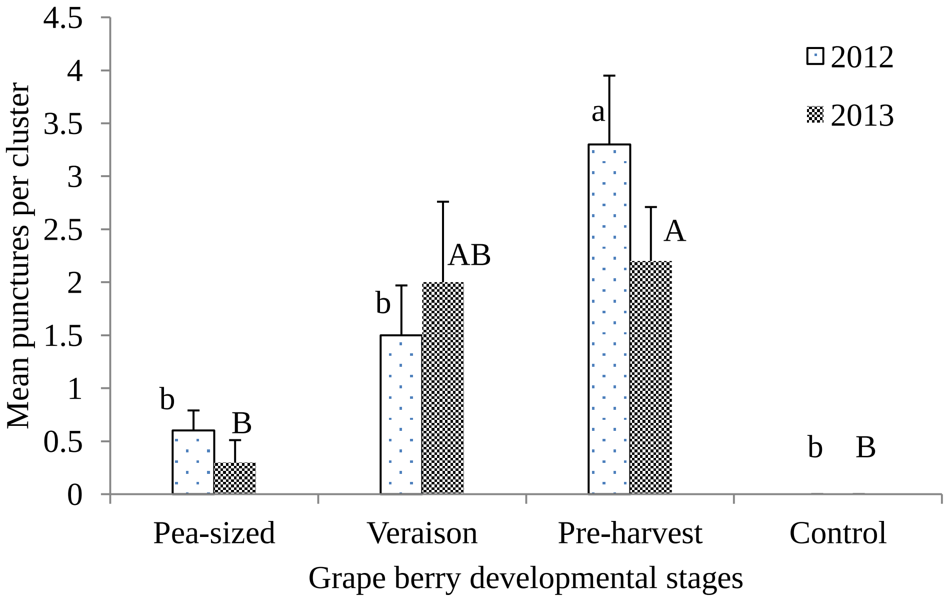
BMSB Field Surveys & Choice Tests



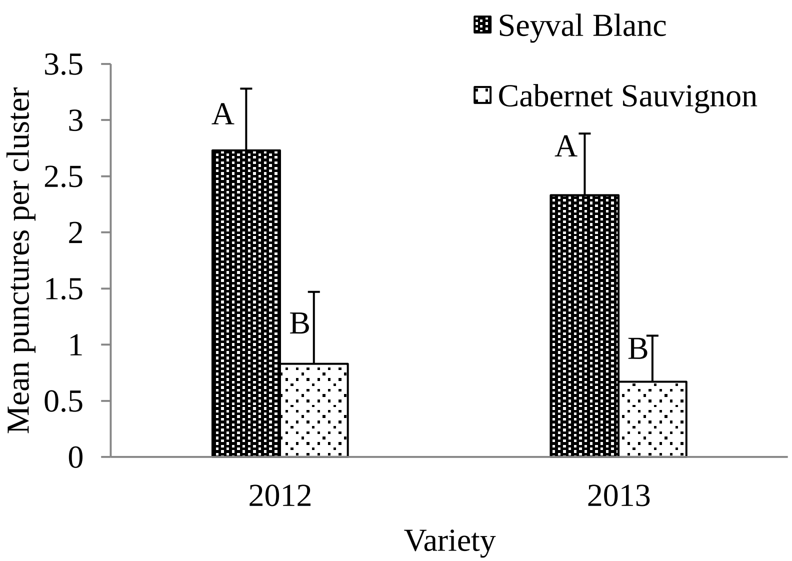


- Significantly more BMSB seen on Chambourcin, Merlot, and Traminette
- Significant difference in stylet sheaths by variety
- Presence doesn’t indicate feeding

Growth Stage And Varietal Susceptibility

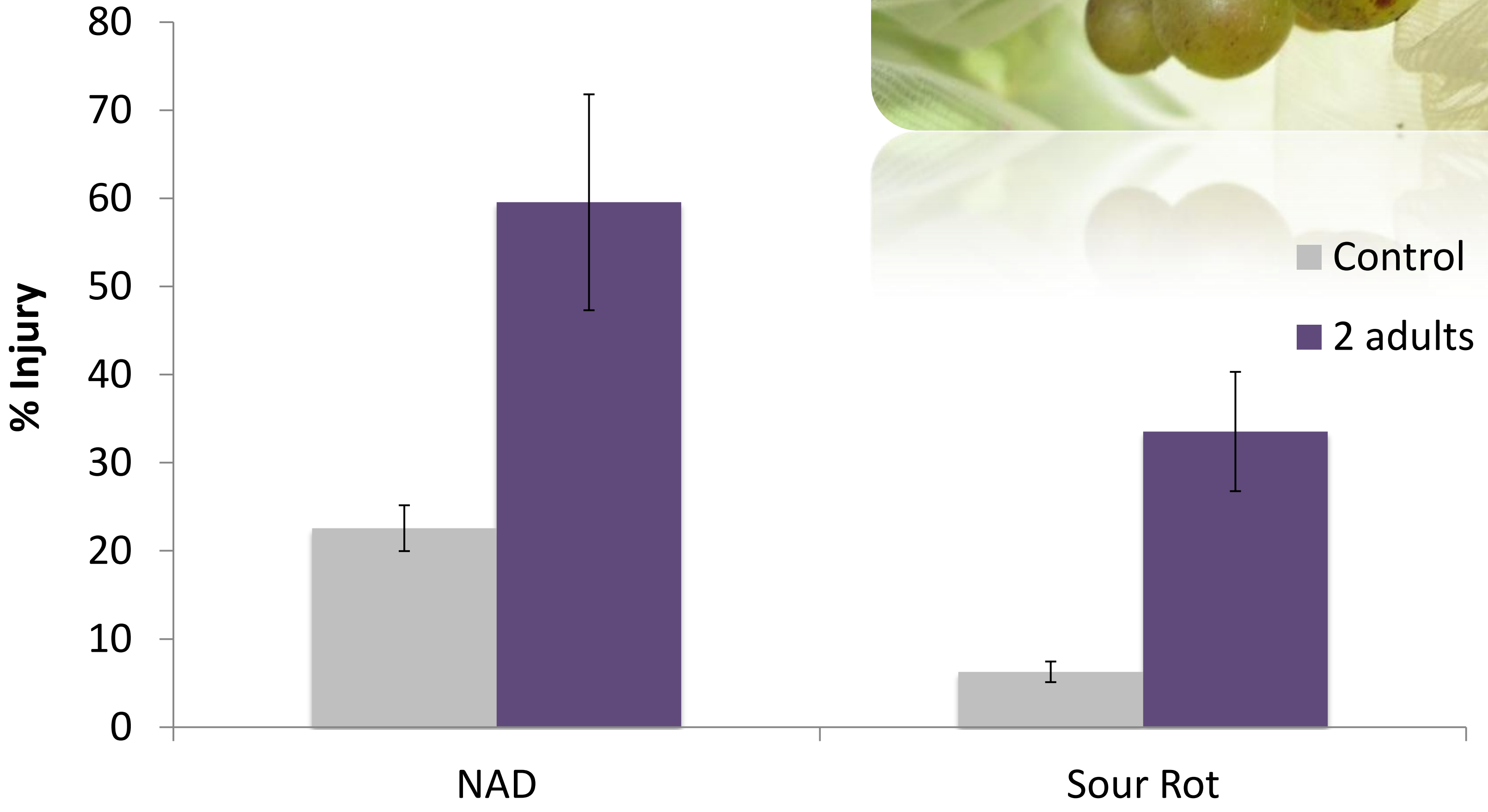


Mean (± ER) number of punctures in different developmental stages of grape in 2012 and 2013. Means with the different letter are significantly different (Tukey-Kramer test; *P* < 0.05).



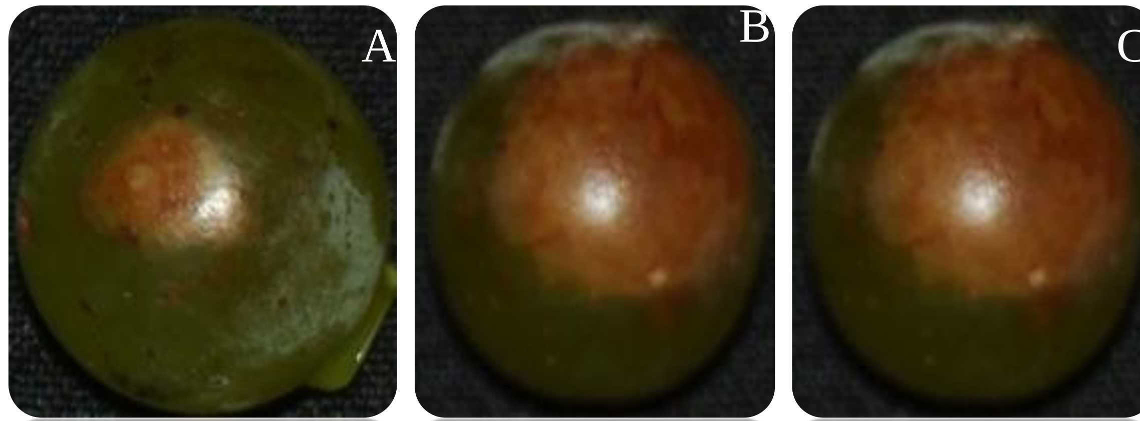
Mean (± ER) number of punctures in Seyval Blanc and Cabernet Sauvignon in 2012 and 2013. Means with the same letter are not significantly different (Student's; *P* < 0.05).

Traminette at Mid-Veraison



Injury Progression

Catfacing injury to pea-sized ‘Chardonnay’ by *Halyomorpha halys*



Progression of injury in veraison stage in 'Vidal Blanc’ grape berries at caused by *Halyomorpha halys*; (A) a small necrotic spot around the site feeding, (B) the necrotic spot gradually increased (B), (C) the berry gets deformed.

Damage to Wine Grapes

Characterizing Damage and Impacts of Brown Marmorated Stink Bug in Small Fruit Crops

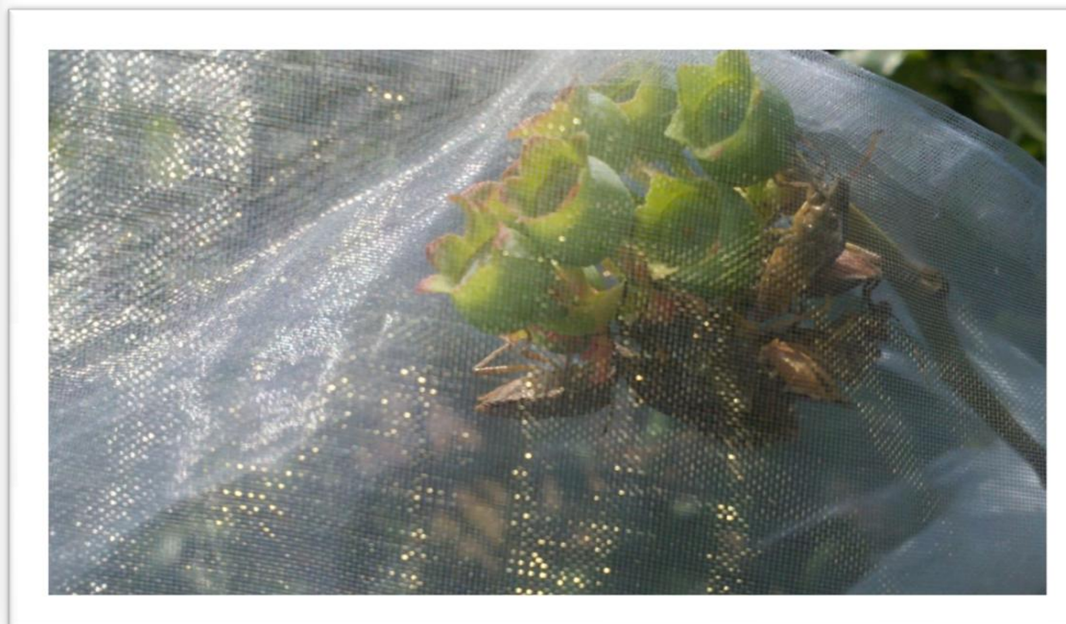
Nik Wiman, Vaughn Walton,
Joyce Parker, Cesar Rodriguez-Saona

Department of Horticulture, Oregon State University
Philip E. Marucci Center for Blueberry and Cranberry Research and Extension Center, Rutgers University

Methods

Duke		Aurora
Early maturing variety (Late June - Early July) High commercial value	VS.	Late maturing variety (Early Aug - Early Sept) High commercial value

- 10/clusters per bush bagged with organza after fruit-set
  - Clusters thinned to 10 berries if needed
  - Exclude other insect damage
- 10 bushes/treatment (reps)
- Treatments: 0, 2, 5, 10/bugs per cluster
  - Field-collected bugs
- After one week of feeding, bugs moved to a new cluster
  - Dead BMSB replaced

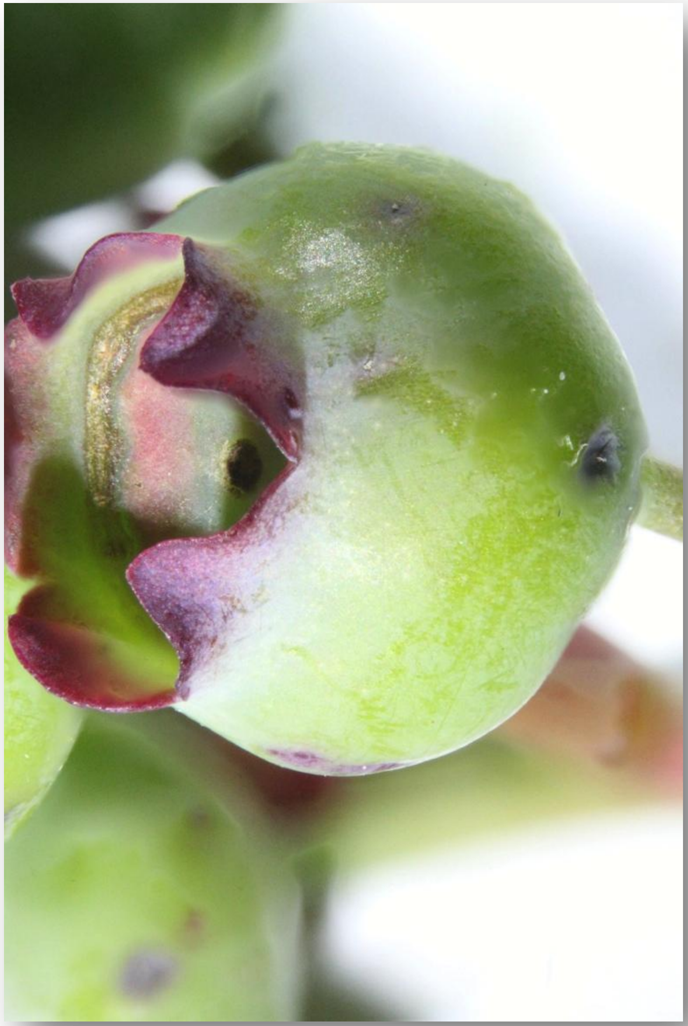


Postharvest analysis

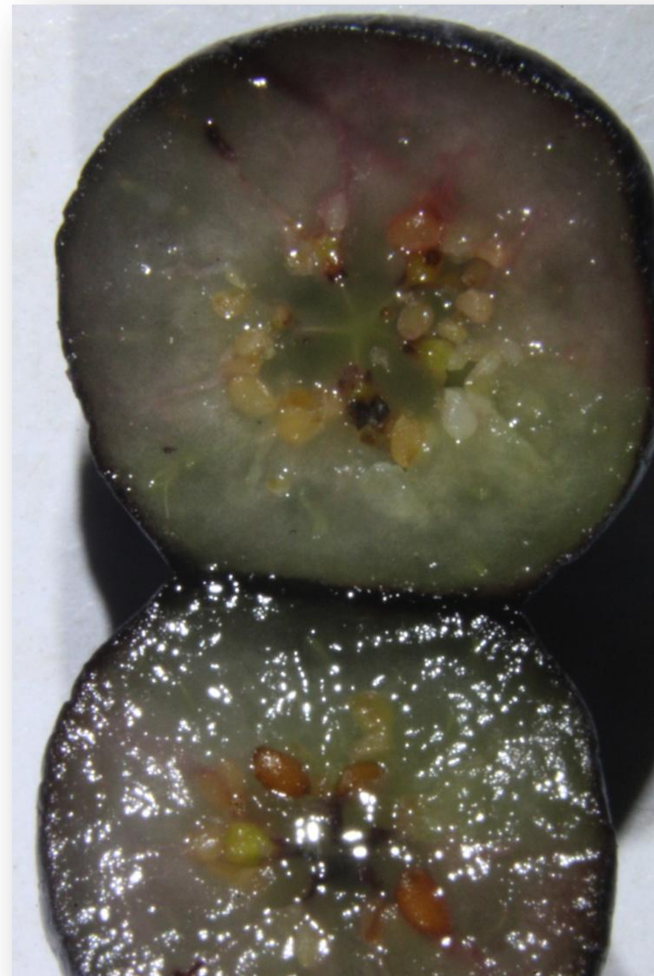
- Acid fuchsin-dyed stylet sheaths
  - Protein positive stain
- Each berry weighed and examined
  - Necrosis
  - Discoloration
  - Number stylet sheaths


Stylet sheaths on apple

Fresh damage- Stylet sheaths and discoloration

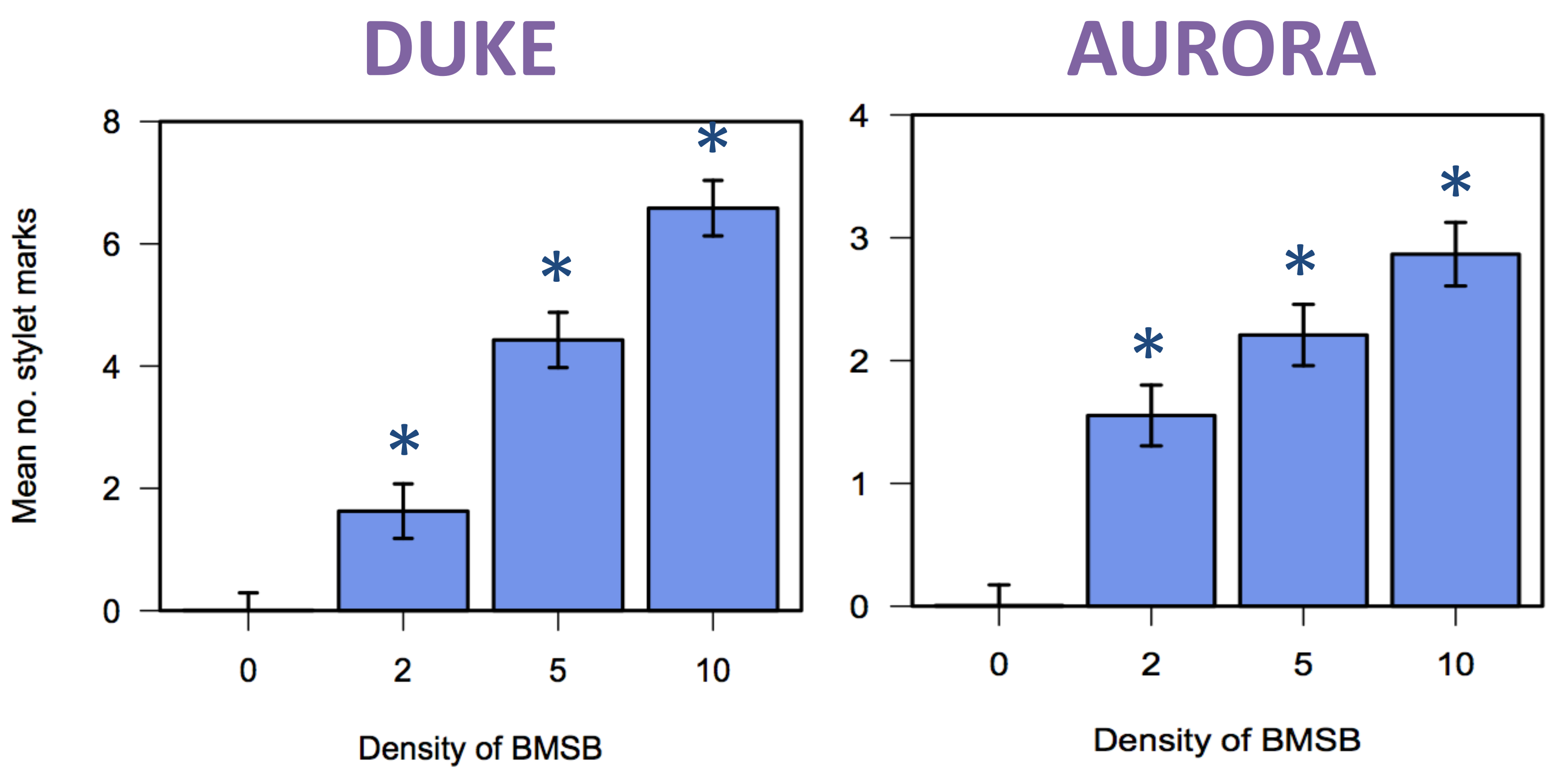


Fresh damage – mature berries



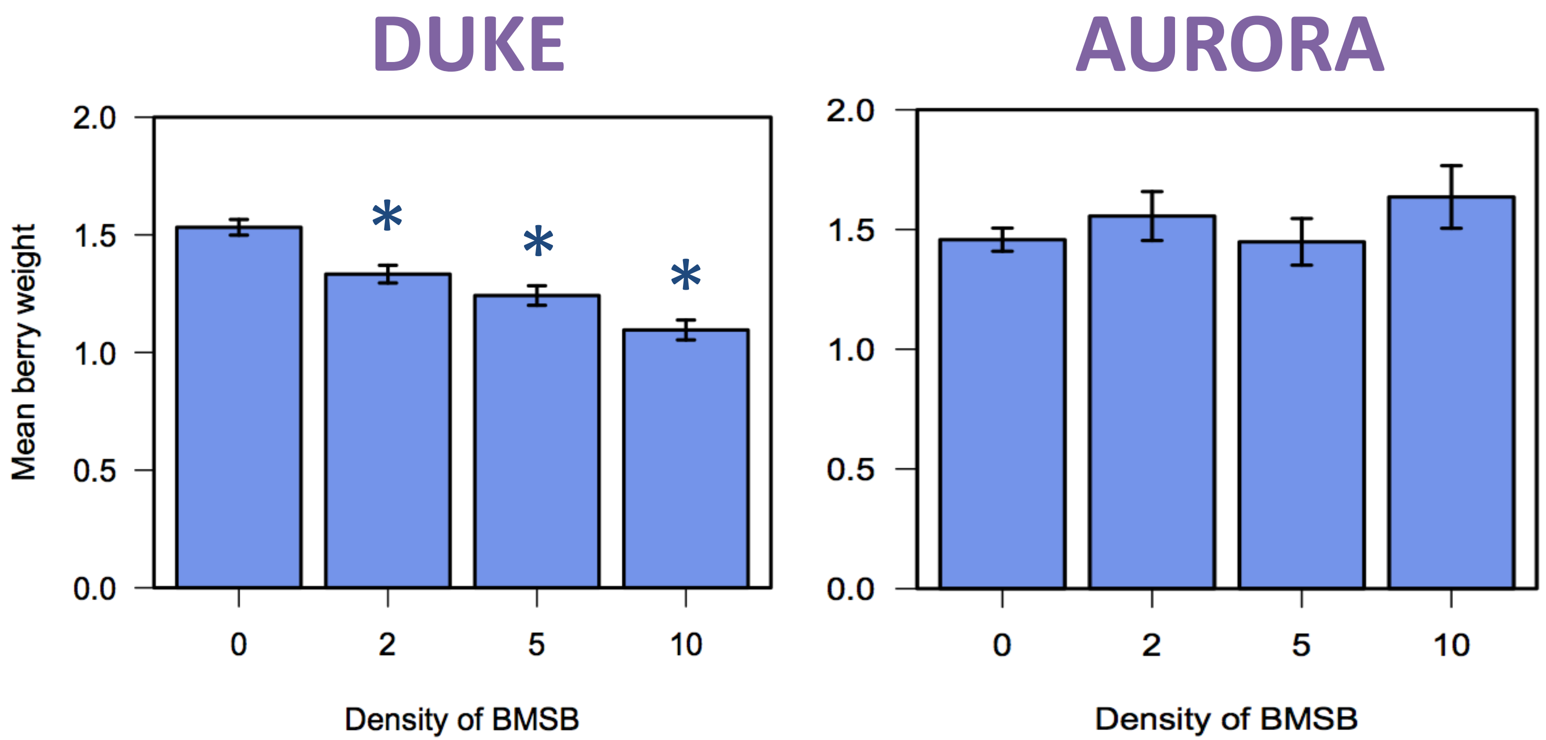
Mature damage - shrivel and necrosis

Damage effects – Stylet sheaths



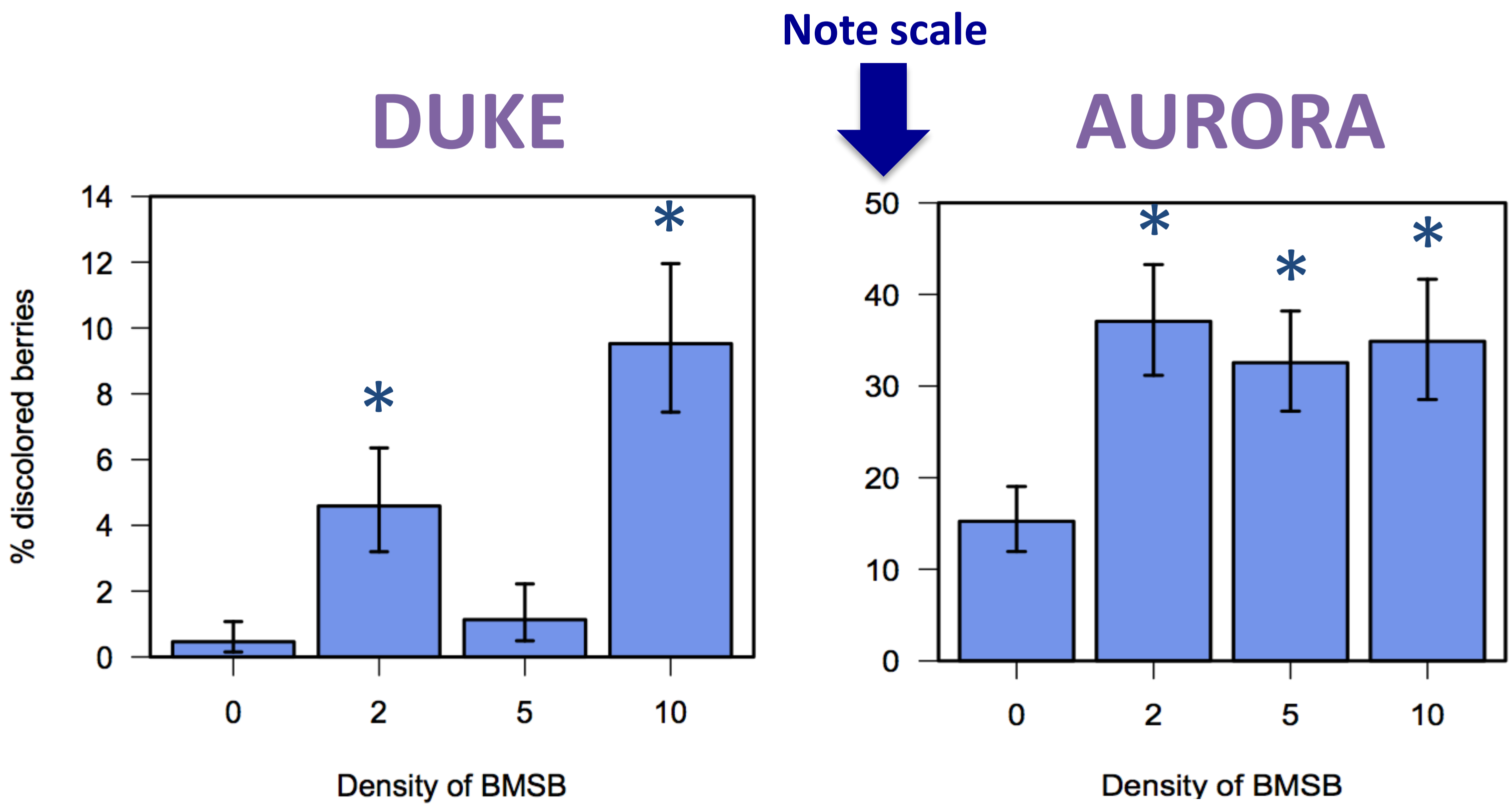
Increasing the number of BMSB per cluster increases feeding pressure. Less feeding on AURORA.

Damage effects - Weight



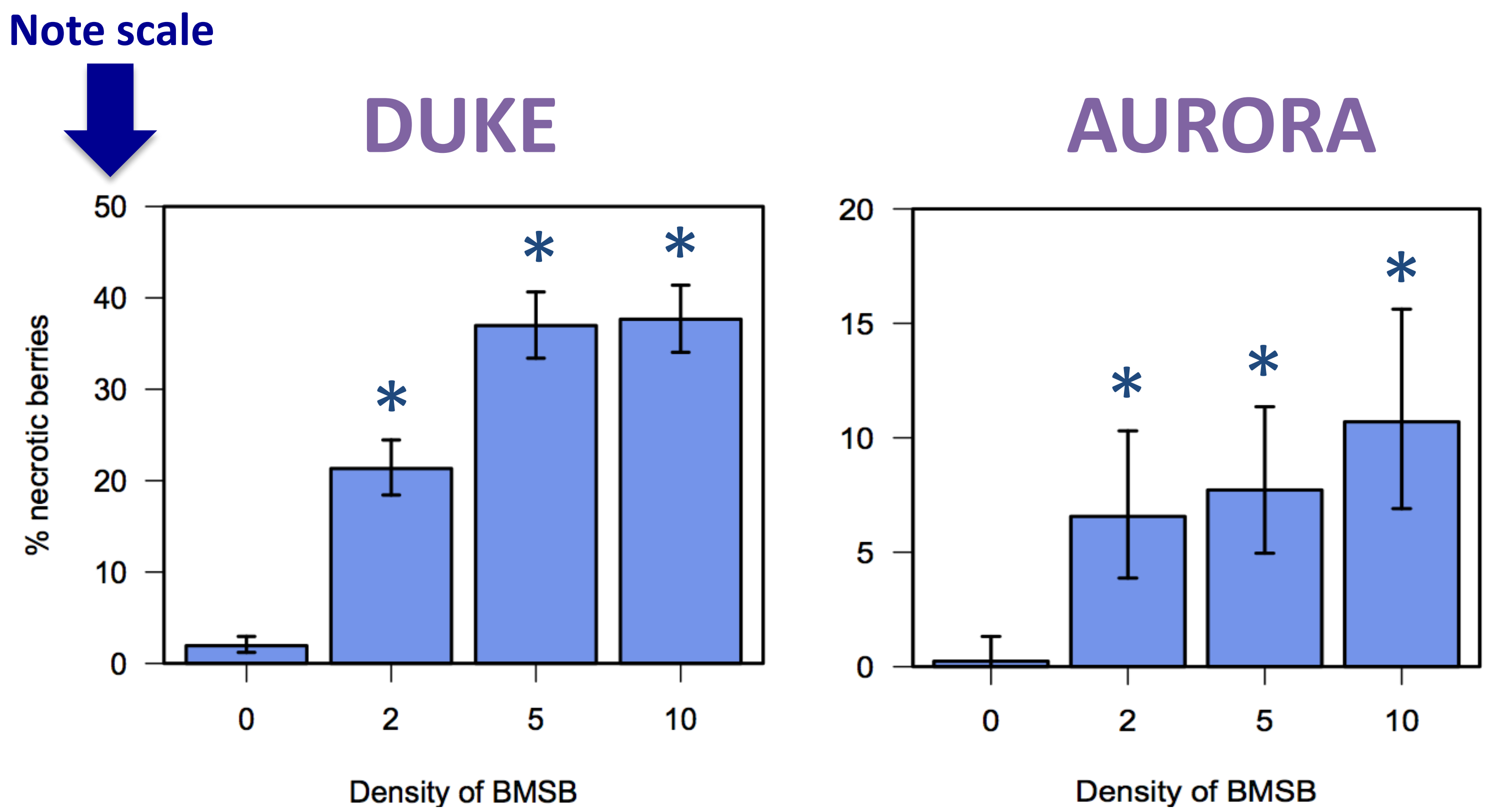
Increasing the number of BMSB per cluster decreased berry weight at harvest (DUKE only)

Damage effects - Discoloration



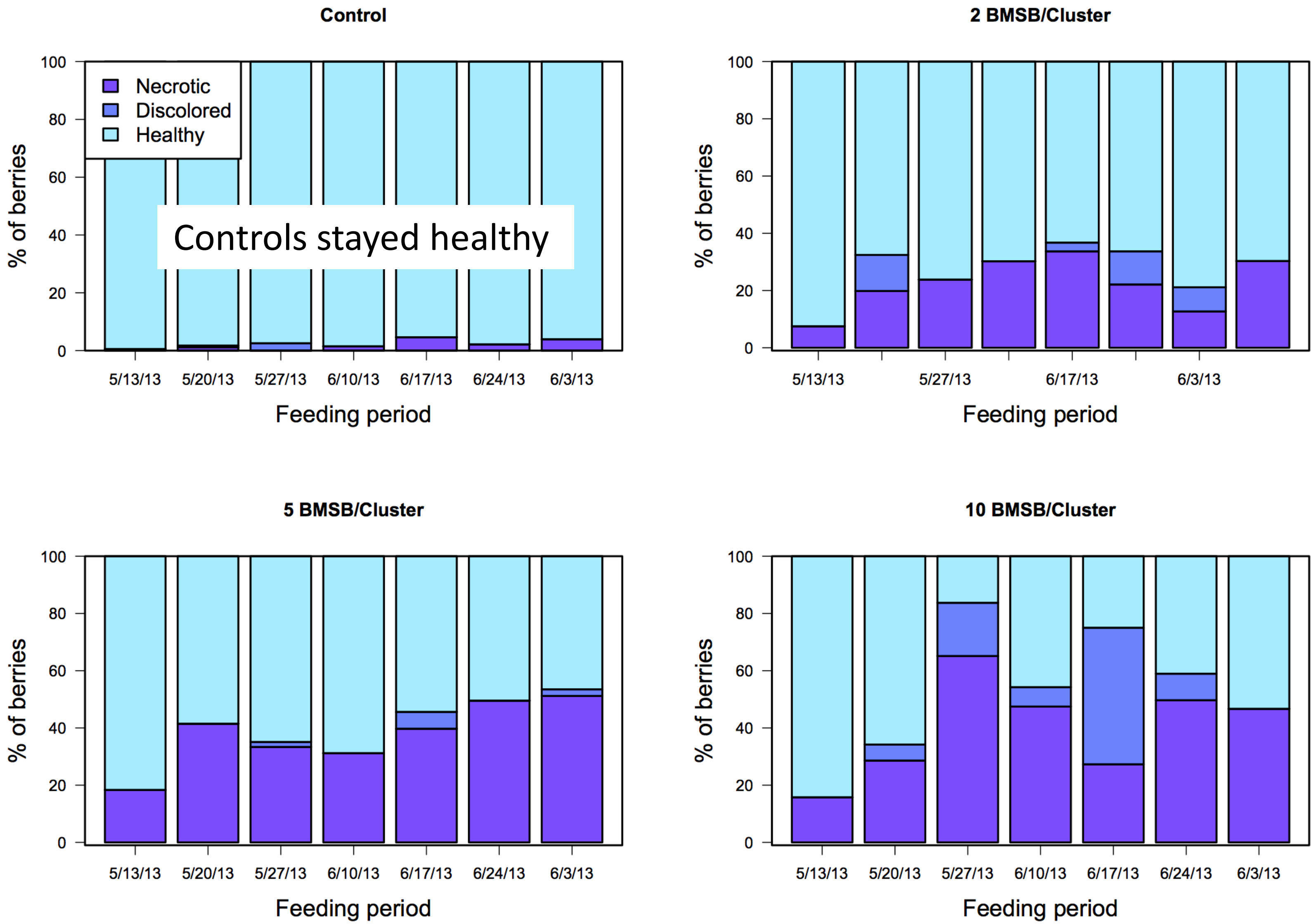
Discoloration was an inconsistent symptom for DUKE, but BMSB caused high levels of discoloration on AURORA

Damage effects - Necrosis

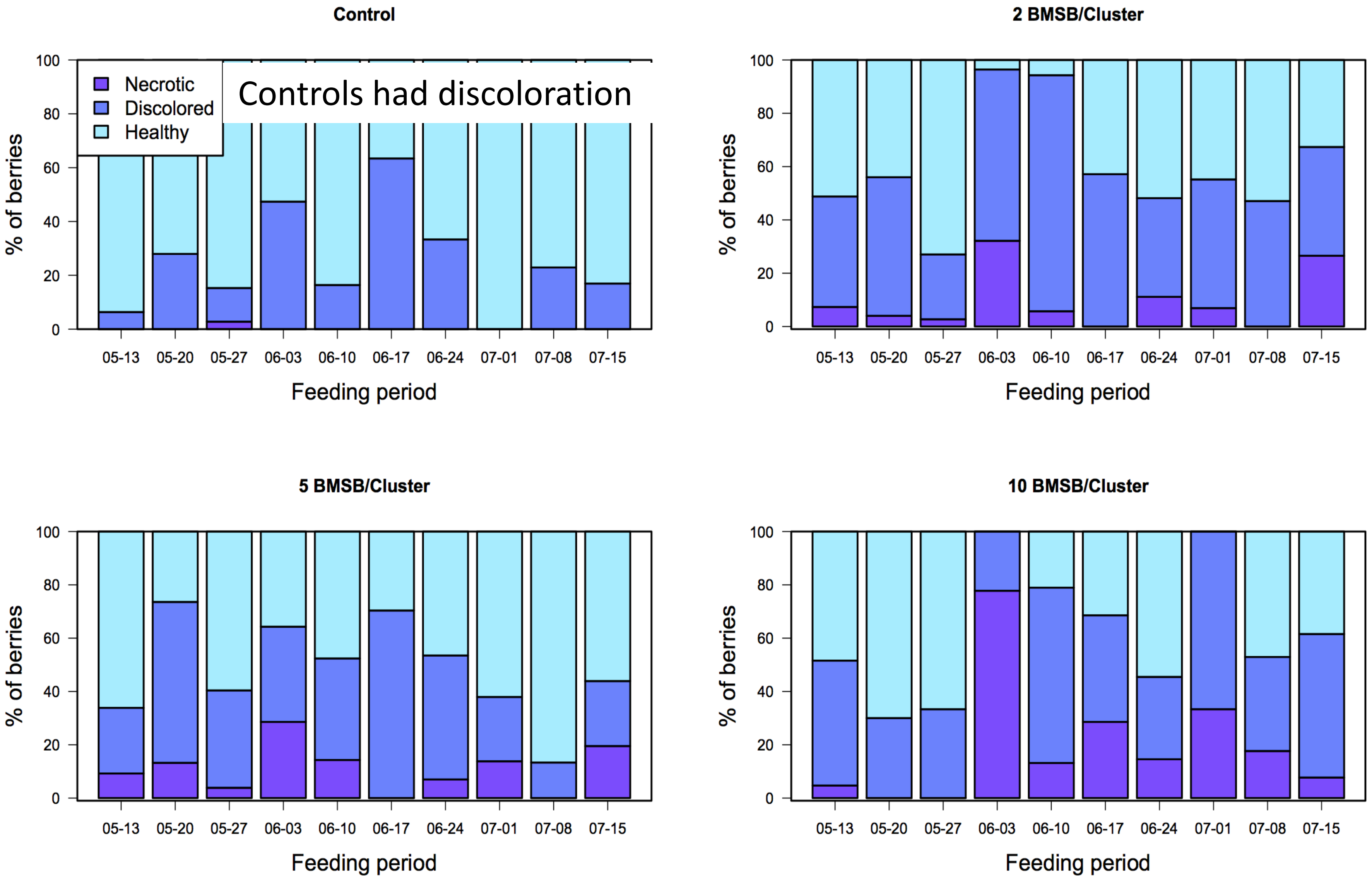


No question that berry necrosis was a key feeding symptom.
Necrosis was worse on DUKE.

Damage timing - Duke



Damage timing - Aurora

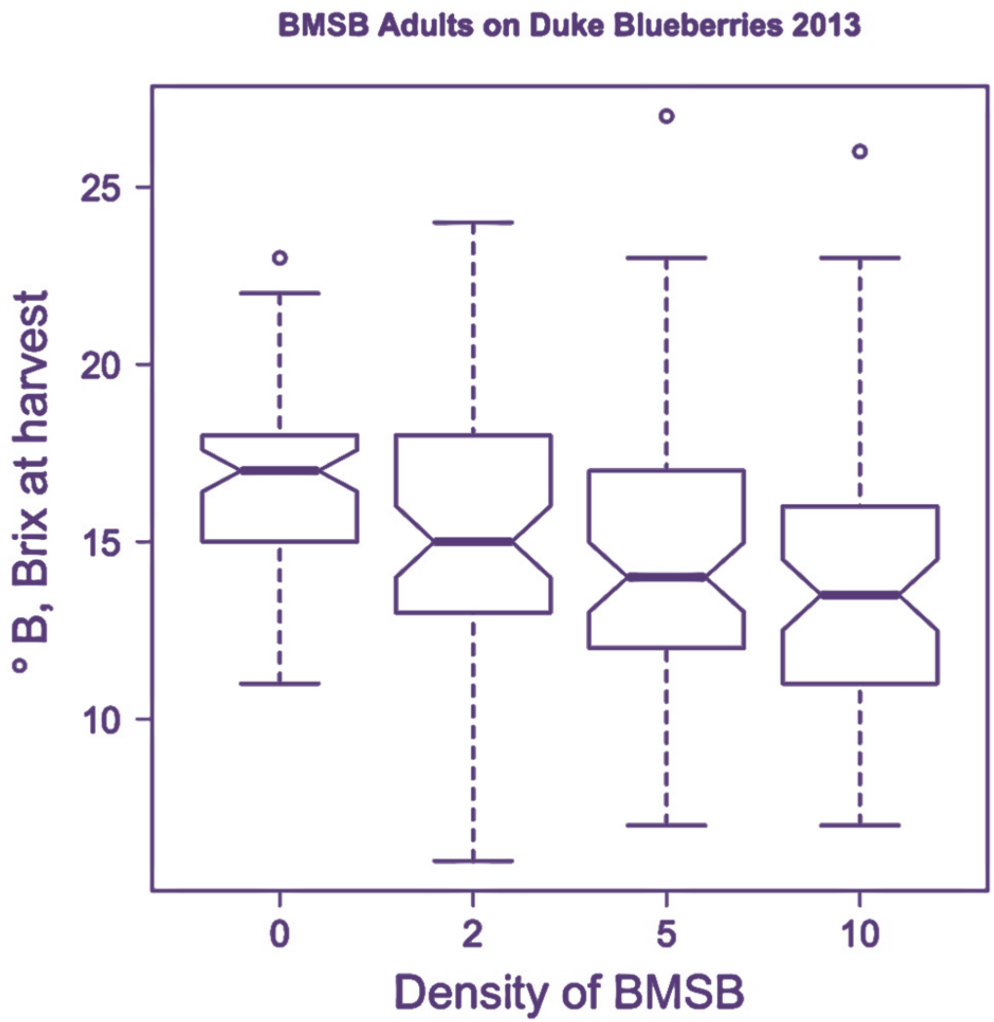


Premature ripening

Unbagged clusters

Bagged clusters

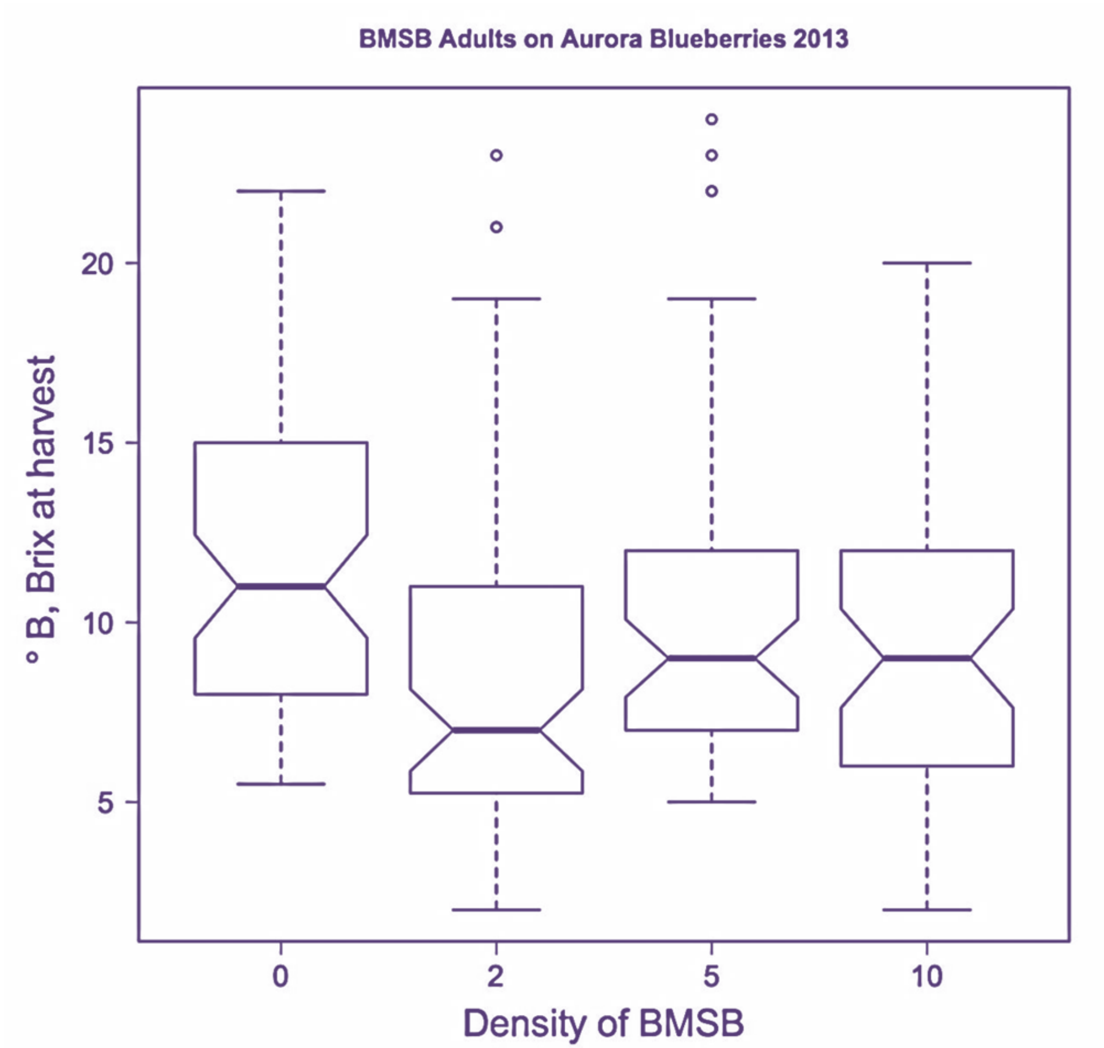
Quality effects on blueberry: brix



DUKE

- **<u>All</u> increasing densities of BMSB resulted in significantly lower brix @ harvest**
- 10.78 on 3 and 249 d.f., *p*-value: 1.101e-06

Quality effects on blueberry: brix



AURORA

- **Similar to Duke, but not a strong density effect (all densities had equal effect)**
- **Lower Brix for control**
- 10.78 on 3 and 249 d.f., *p*-value: 1.101e-06

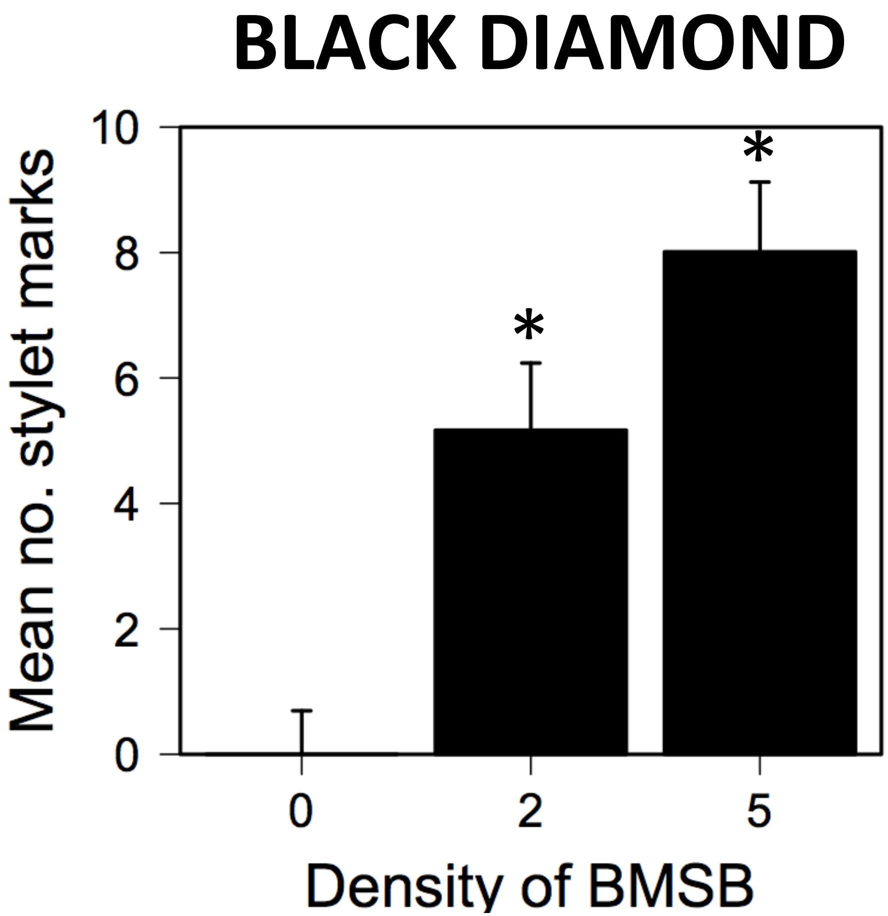
Conclusions – Blueberries

- BMSB feeding pressure had **consistent** effects on:
  - Necrosis: major increases
  - Brix: lower sugar
- Less consistent effects on:
  - Berry weight
  - Discoloration
- Some evidence of timing effects
  - Some recovery from early damage
- Other effects:
  - Dropped berries
  - Ripening effects

Controlled Damage-Blackberry

- Black Diamond was selected
- Preliminary- not as much data as blueberry study
- Raspberries in 2014
- Very similar protocol

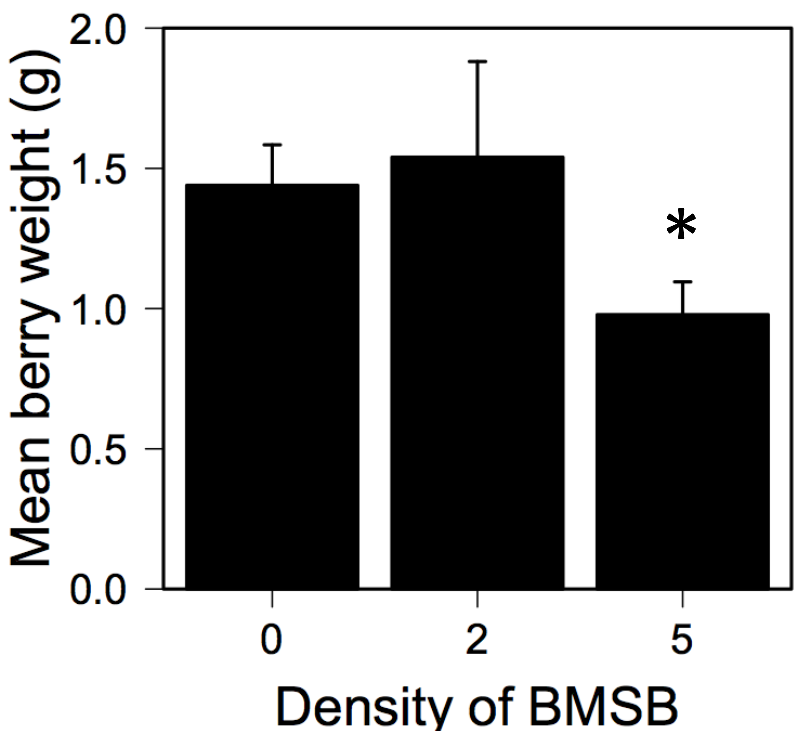
Damage effects – Stylet sheaths



Increasing the number of BMSB per cluster increased feeding pressure.

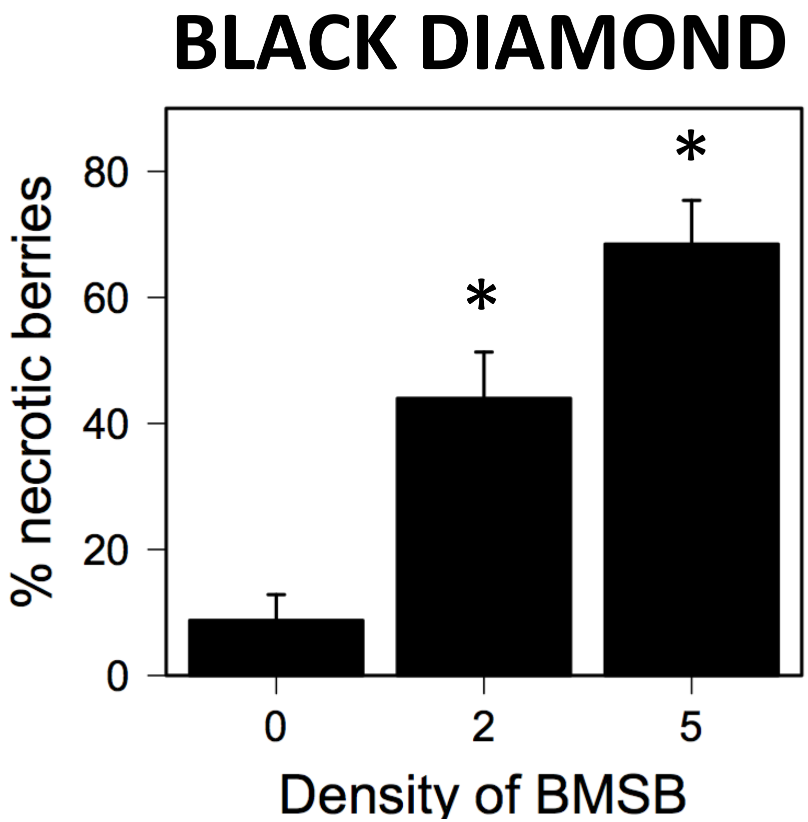
Damage effects - Weight

BLACK DIAMOND



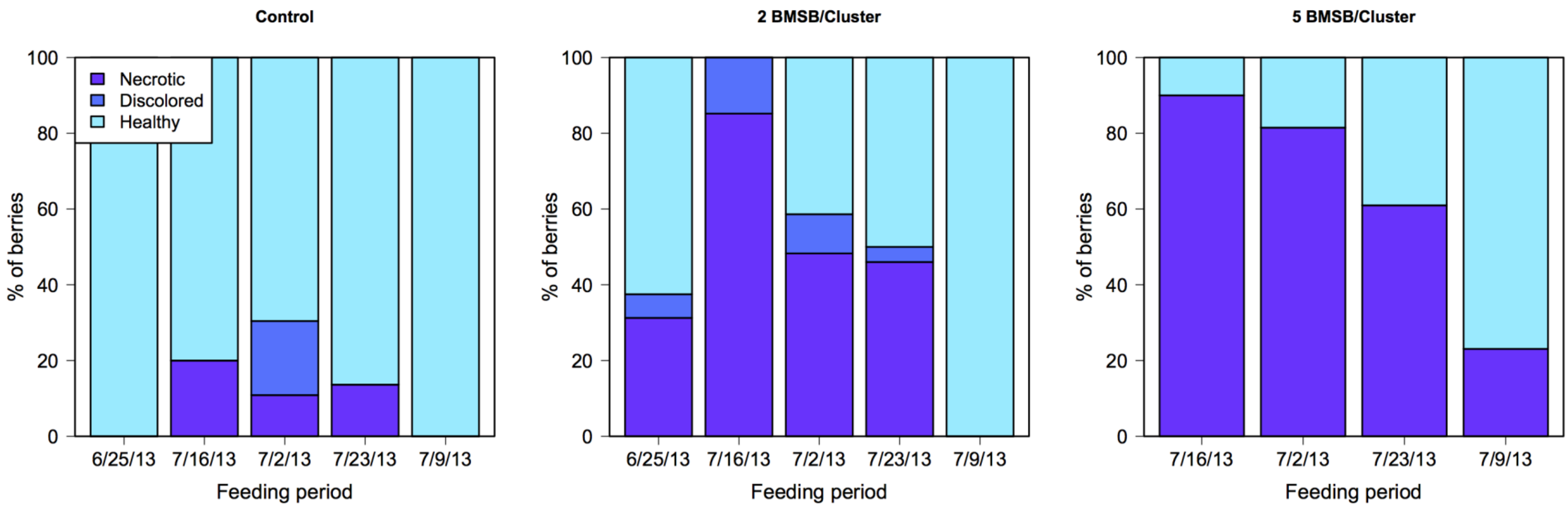
High feeding pressure affected berry weight.

Damage effects - Necrosis



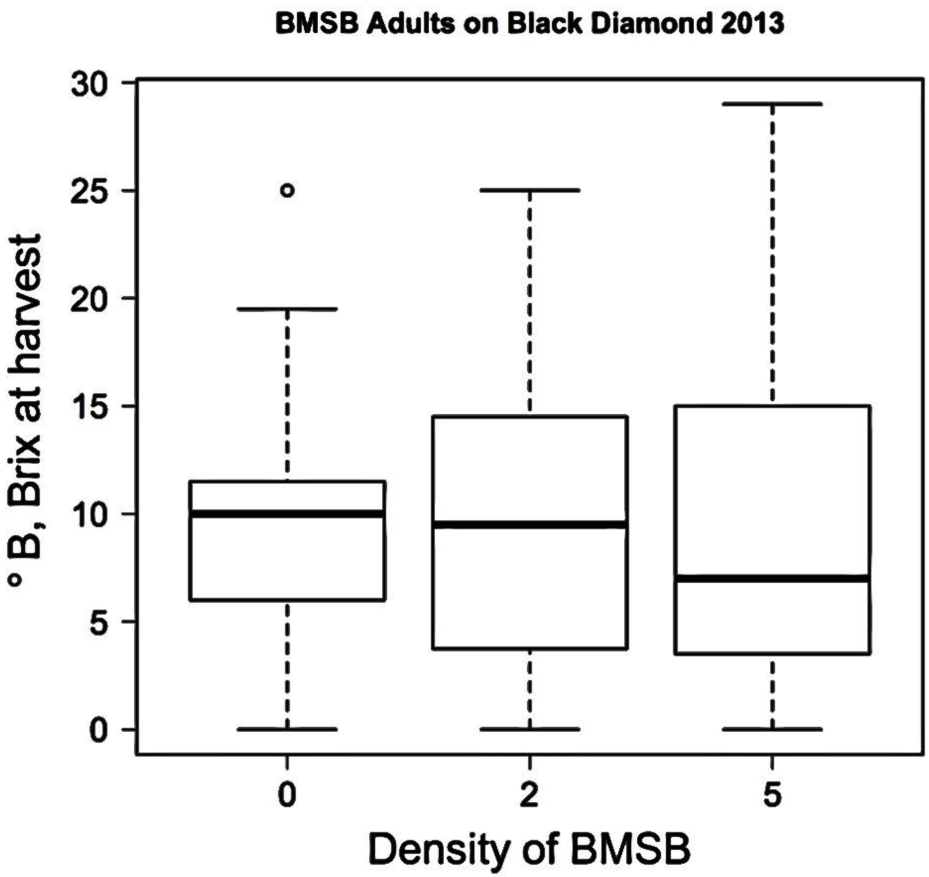
Extreme levels of necrosis from BMSB feeding.

Damage timing – BLACK DIAMOND



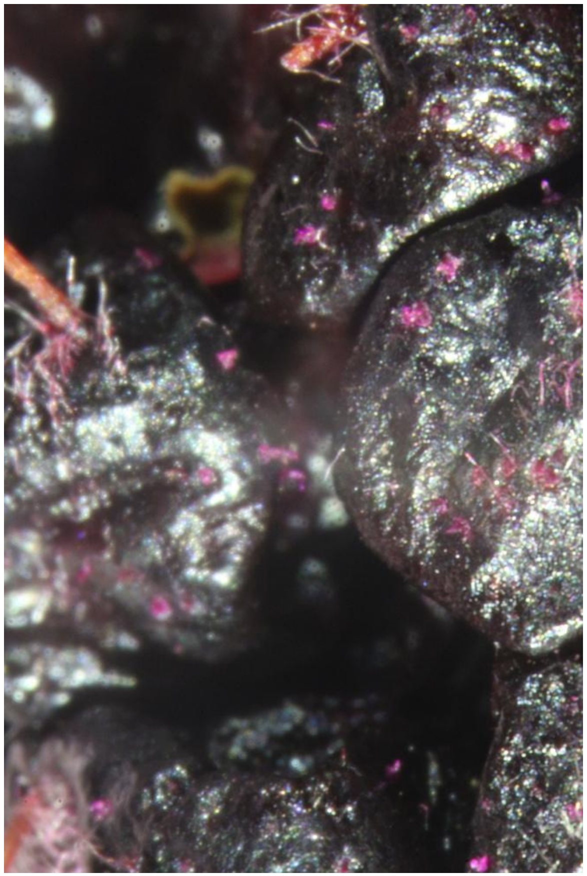
It takes some time for necrosis to develop.

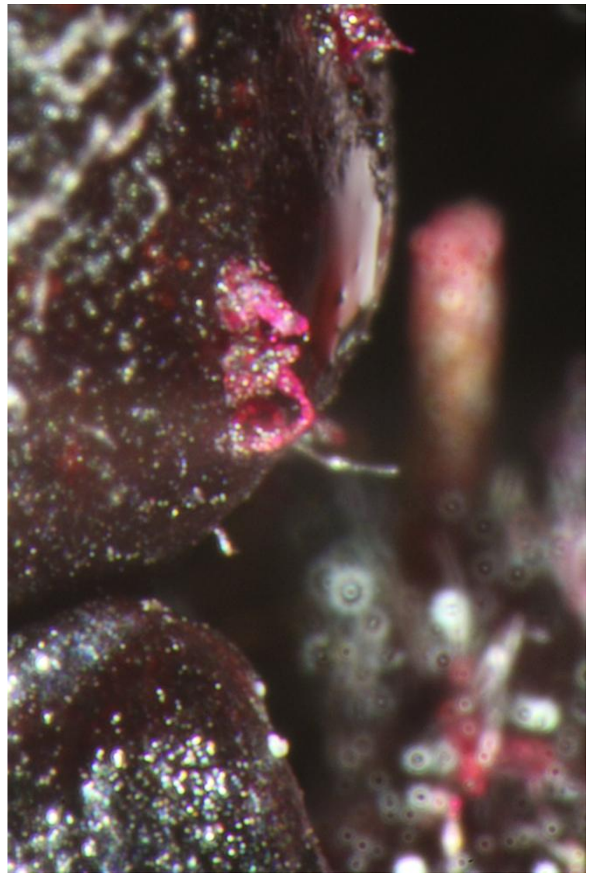
Quality effects on blackberry: brix



No evidence that BMSB feeding affected brix.

Blackberry Damage





Conclusions – Blackberries

- Like blueberries, levels of necrosis were very high and were correlated with BMSB pressure
- Unlike blueberries, Brix may not be affected on blackberry
- Berry weight was affected only by intense feeding
- More research needed: replicate the study on blackberries and add raspberries