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Environmental Sciences  
UNIVERSITY OF GEORGIA

# Potential Hybrid Grapes for Florida: Good News and Bad News

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# Pierce's Disease of Grapevines

**Host:** Major disease of *Vitis vinifera* and many hybrids

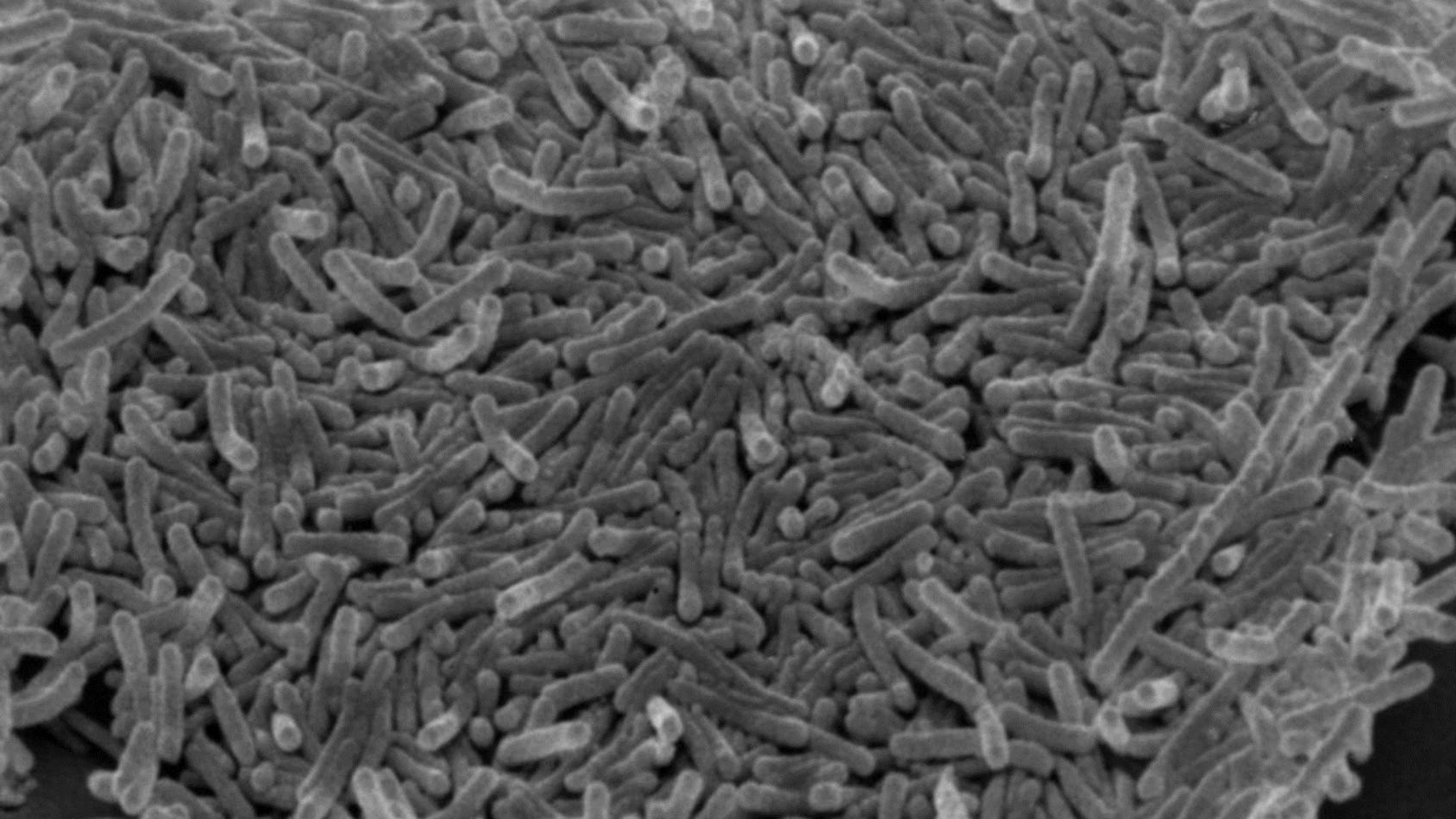
**Causal Agent:** *Xylella fastidiosa* subsp. *fastidiosa*

**Vectors:** Leafhoppers  
(*Cicadellidae* spp.)

Spittlebugs (*Cercopidae* spp.)













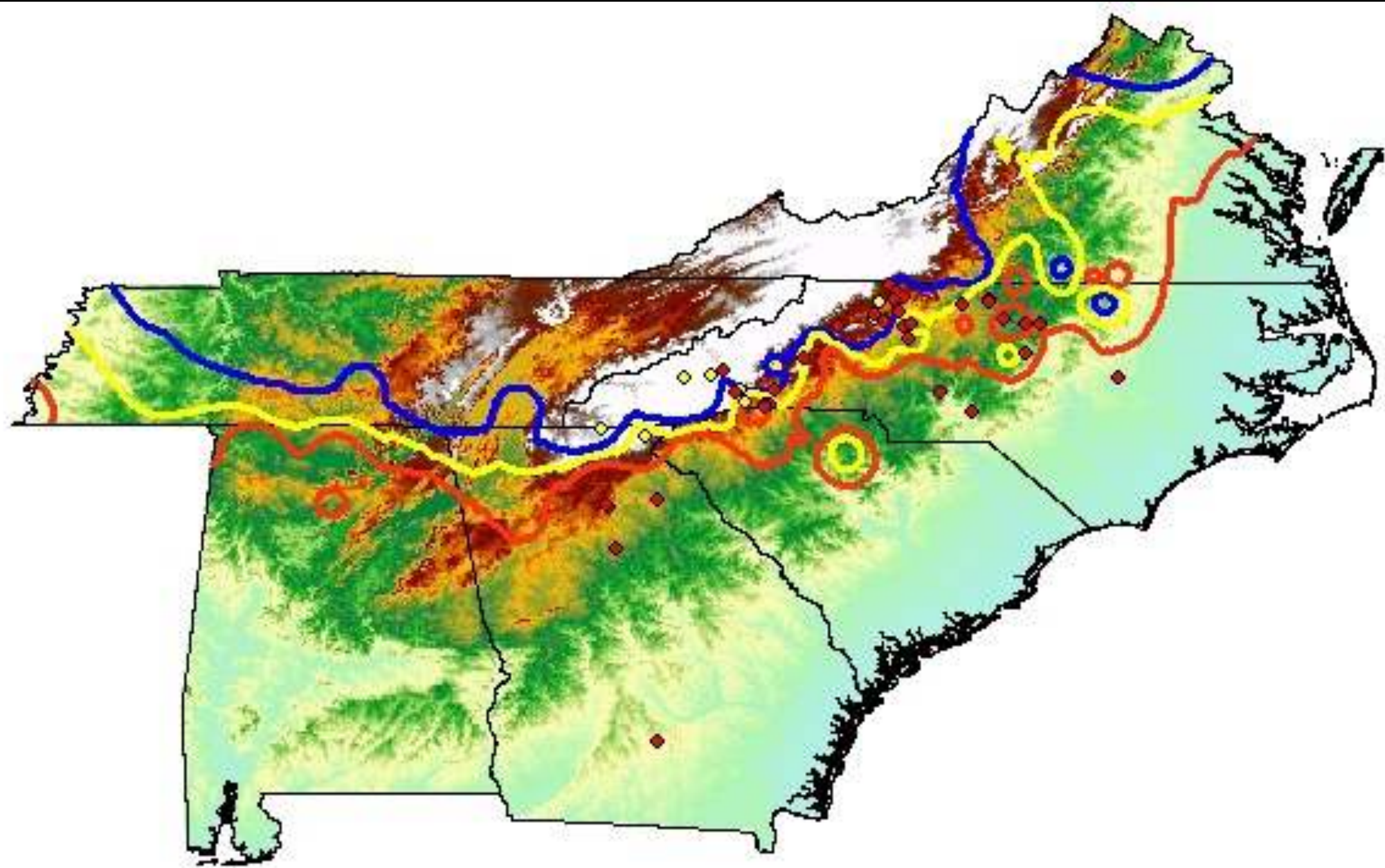
# Pierce's Disease in Native Grapes

- Not a major problem in muscadines
- Infected vines have minimal symptoms or issues
- 'Pride' cultivar is highly susceptible; can be killed



Leaf scorch on susceptible 'Carlos' cultivar







# Current management practices



- Roguing vines
- Imidicloprid insecticides through irrigation
- Foliar application of insecticides (less effective)
- Use of resistant/tolerant species or hybrids





# Pierce's Disease Resistant Grapes

- Norton (Cynthiana)
- Black Spanish (Lenoir)
- Blanc du Bois



California has been testing  
97% vinifera varieties for  
PD resistance and wine  
quality.

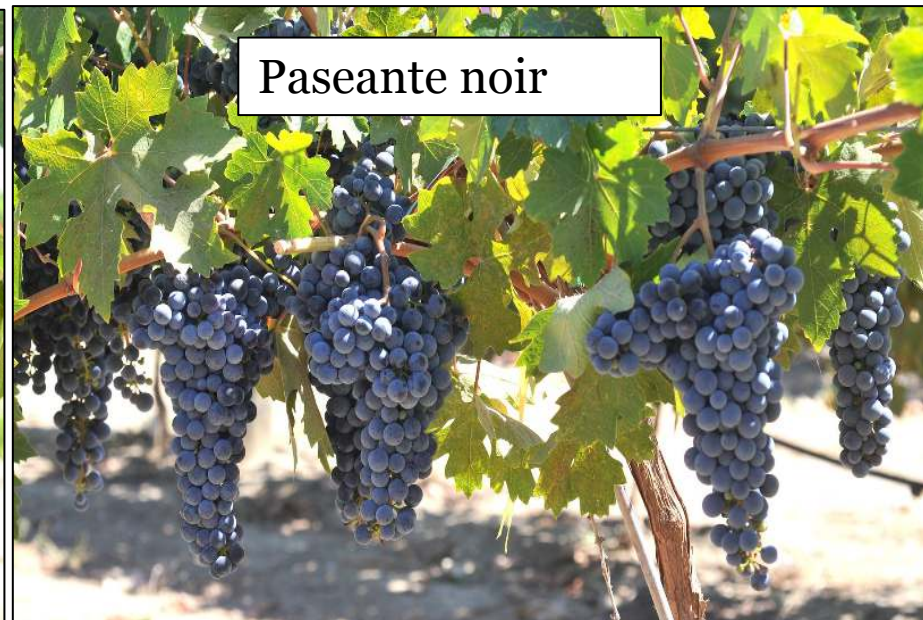




Errante noir



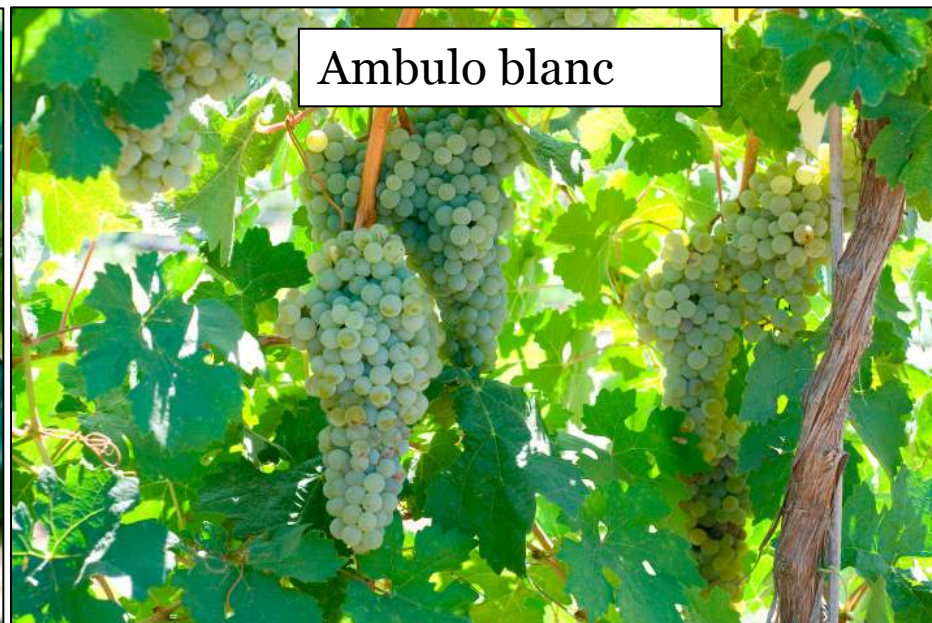
Camminare noir



Paseante noir



Caminante blanc



Ambulo blanc



# Camminare noir



- Red wine grape
- *V. vinifera*,  
*V. arizonica*,  
and *V. rupestris*





# UC Davis selection 07370-84



- White wine grape
- *V. vinifera* and unreported native grapes





# Lomanto



- Red wine grape
- *V. vinifera*, *V. mustangensis*, *V. rupestris*, *V. labrusca*





# Blanc du Bois



- White wine grape
- *V. vinifera*, *V. smalliana*, *V. simpsonii*, and *V. labrusca*





# Crimson Cabernet



- Red wine grape
- *V. vinifera* and *V. aestivalis*







# Research Objectives

1. Determine diseases that occur on these hybrids in a hot humid environment
2. Determine whether we can develop lower input fungicide programs for these hybrids due to native grape species in their background





## Powdery mildew



## Downy mildew

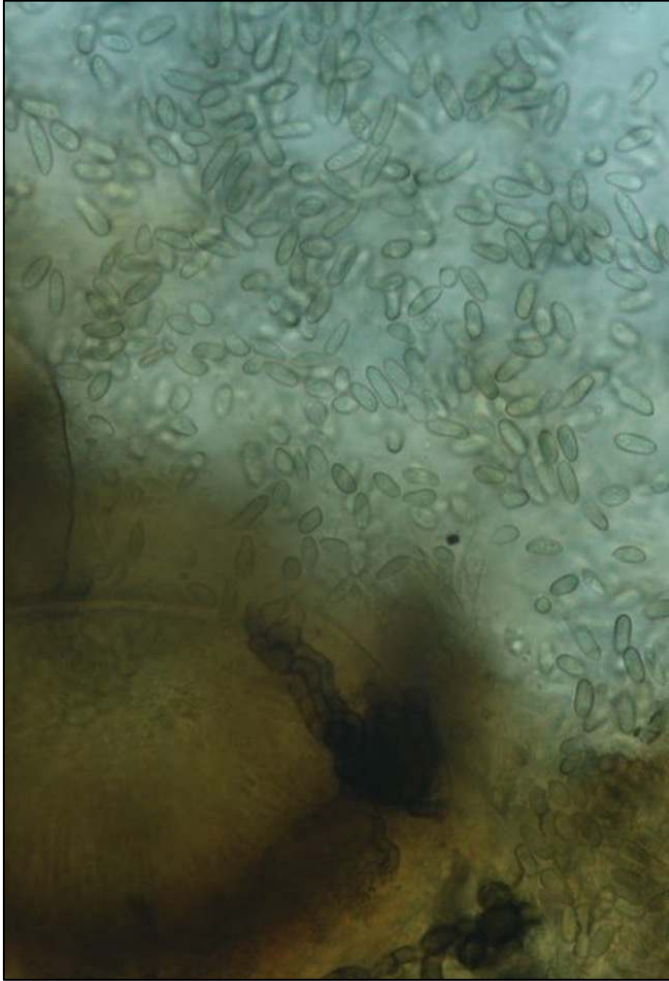


## Rots

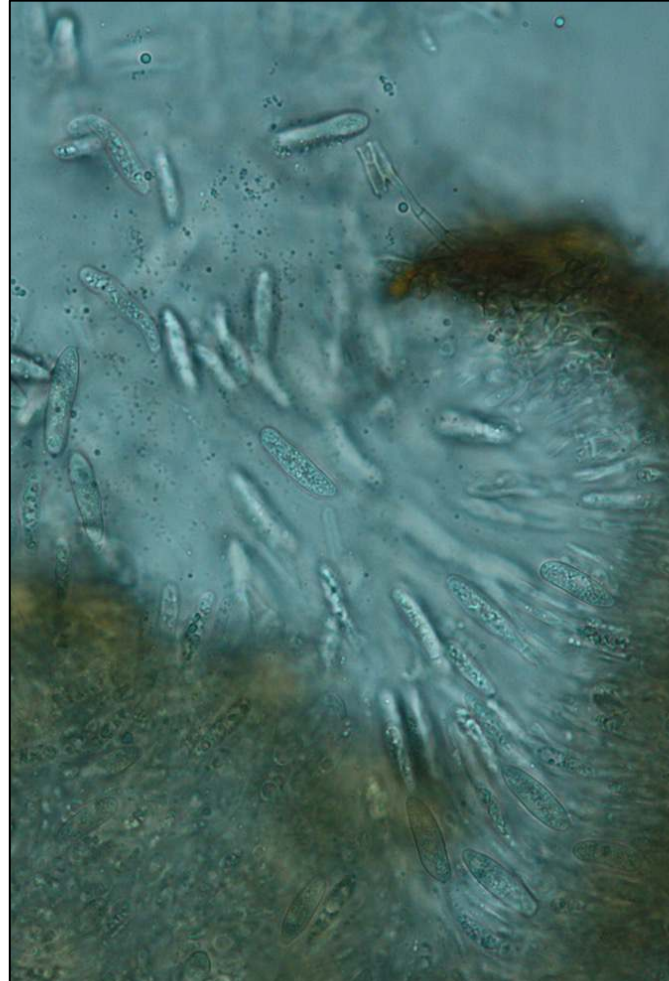




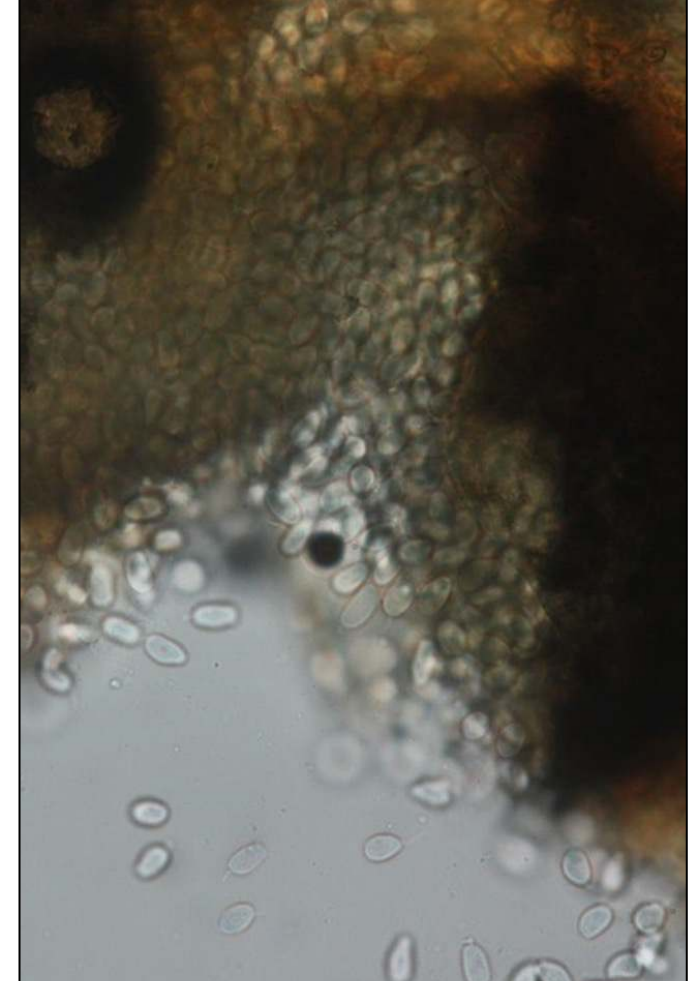
## Bitter rot



## Macrophoma rot



## Black rot





# Hybrid Susceptibility to Pathogens

	Powdery Mildew	Downy Mildew	Fruit Rots
Lomanto	++++	++	+++
Blanc du bois	-	++	++
Crimson cabernet	++	++	++++
Camminare noir	+?	+++++	++++
UC Davis selection 07370-84	+?	+++++	++++





# Fungicide Input Regimens

Treatment and amount/A	High	Moderate	Low	Untreated check
Untreated	---	---	---	ABCDEFGH
Abound @ 10 fl.oz	ADEFH	---	---	---
Captan 4L @ 1.5 qts	DEFGH	DEFGH	DEFGH	---
Elevate @ 1 lb	G	G	G	---
Endura @ 8 oz	BE	B	B	---
Malathion	H	H	H	---
Manzate Prostick @ 3 lb	ABC	ABC	ABC	---
Mustang Max	G	G	G	---
Oxidate	GH	GH	GH	---
Prophyt @ 4 pt	ACEFG	ACEFG	---	---
Rally @ 3 oz	CDG	---	---	---
Ridomil Gold MZ @ 2.5 lb	D	D	---	---
Rovral 2 pt	H	H	H	---
Switch @ 14 oz	F	F	F	---
Vangard @ 10 oz	C	C	C	---
Zampro @ 14 oz	B	B	---	---

\*Treatment dates: A = 27 Apr (prebloom) B = 8 May (bloom 1) C = 21 May (bloom 2), D = 17 Jun (cover), E = 6 Jul (cover), F = 15 Jul (veraison), G = 30 Jul (veraison), H = 13 Aug (pre-harvest).



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# Hybrid Grape Trials



## Experimental Design

- Randomized complete block design
- 3 fungicide program regimens and an untreated check
- Five replications of each treatment
- Each plot consisted of 4 vines:
  - 2 treated center vines and one untreated vine on each side
- Cultural practices were kept standard for the Southeast





# Incidence and Severity Defined

## Leaves

- Disease incidence (% infected leaves) and severity (% of leaf covered by diseased tissue)

## Fruit

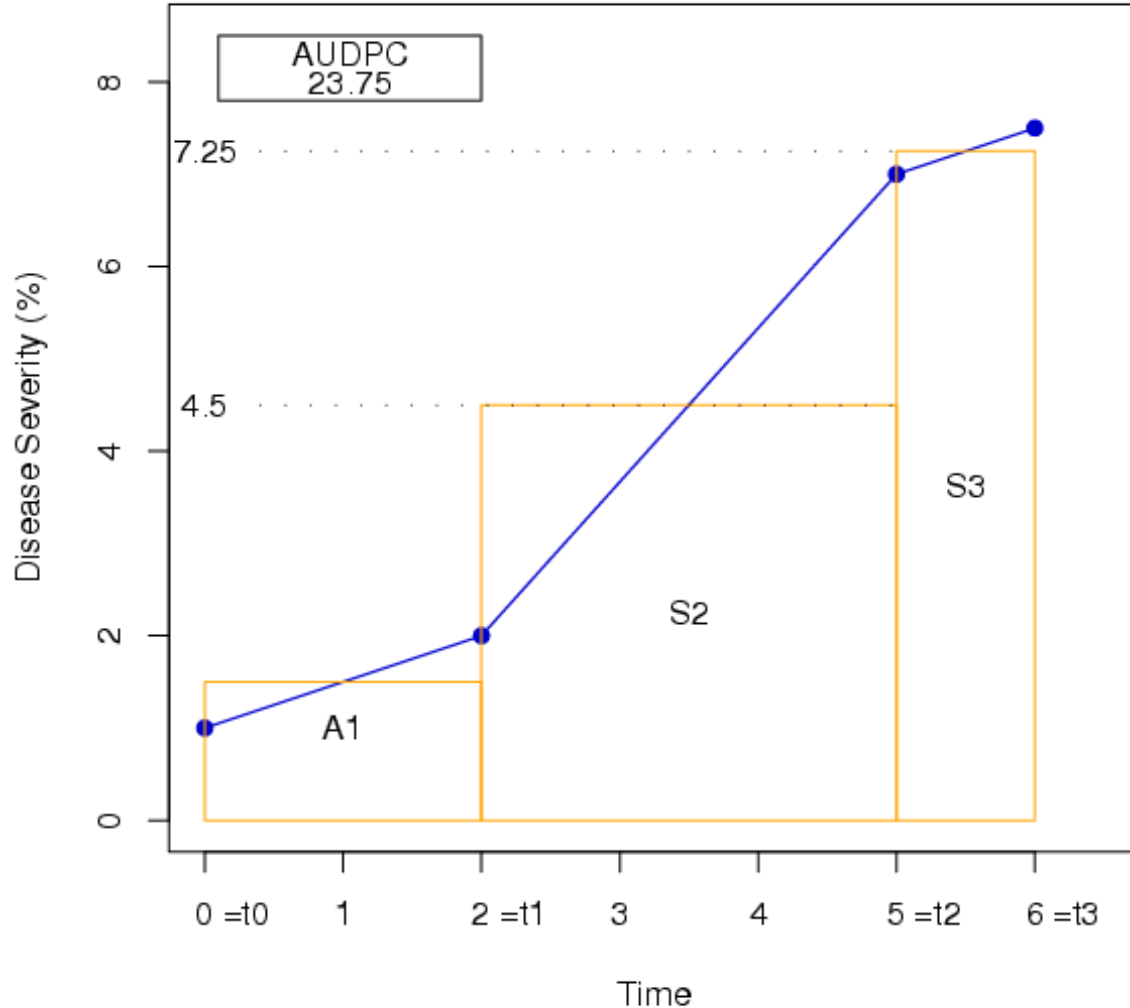
- Disease incidence (% infected clusters) and severity (% of cluster covered by diseased tissue)





# Area Under the Disease Progress Curve (AUDPC)

Illustration of AUDPC Calculation

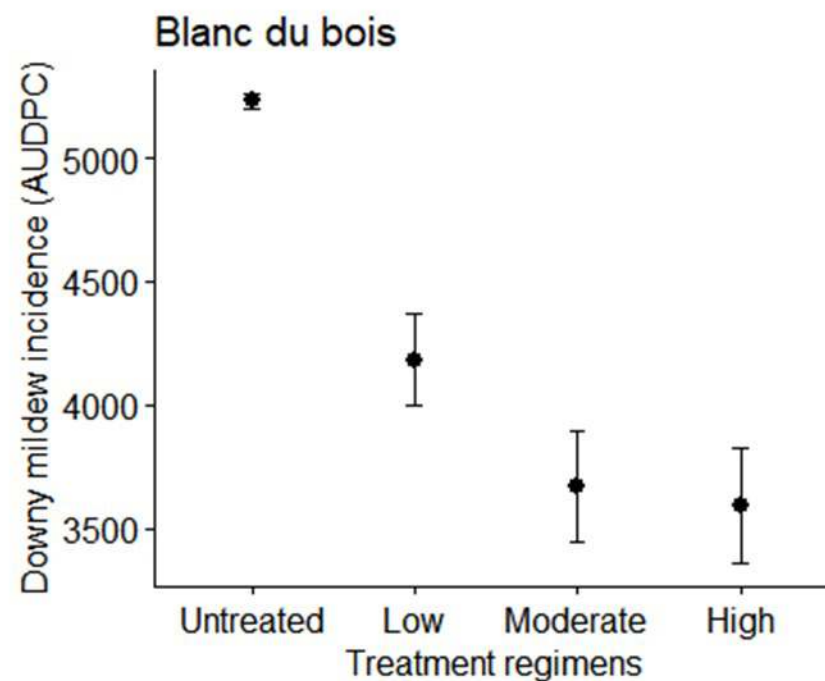
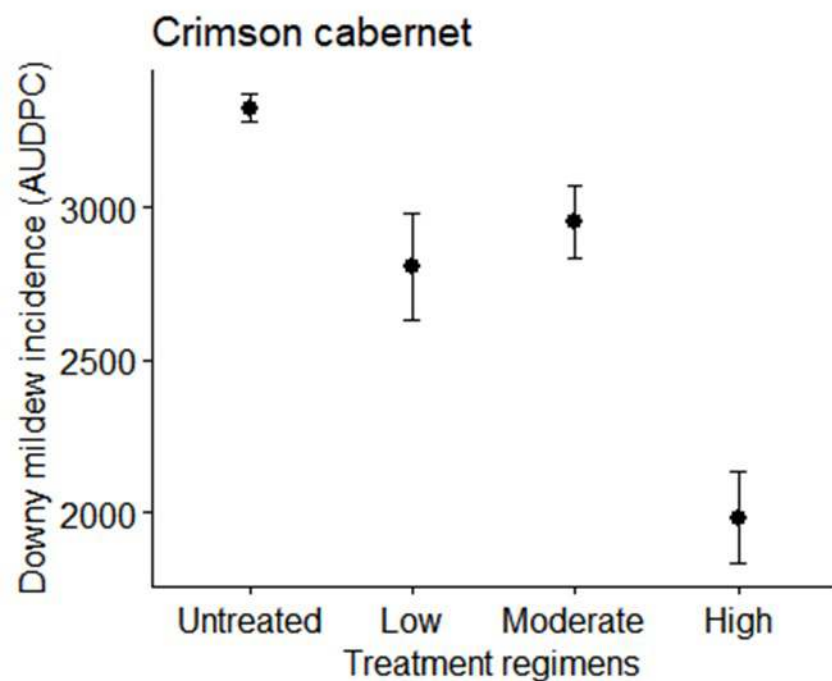
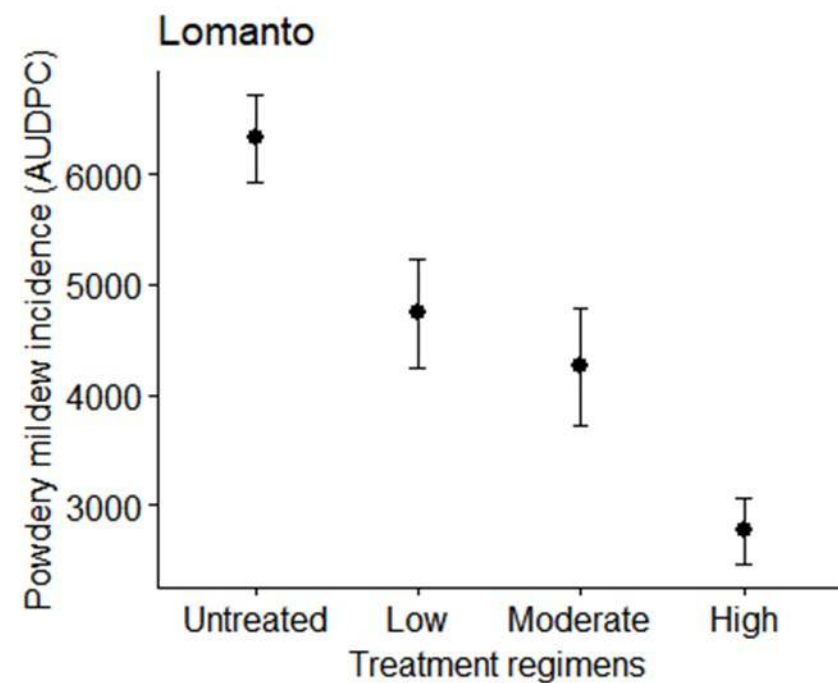
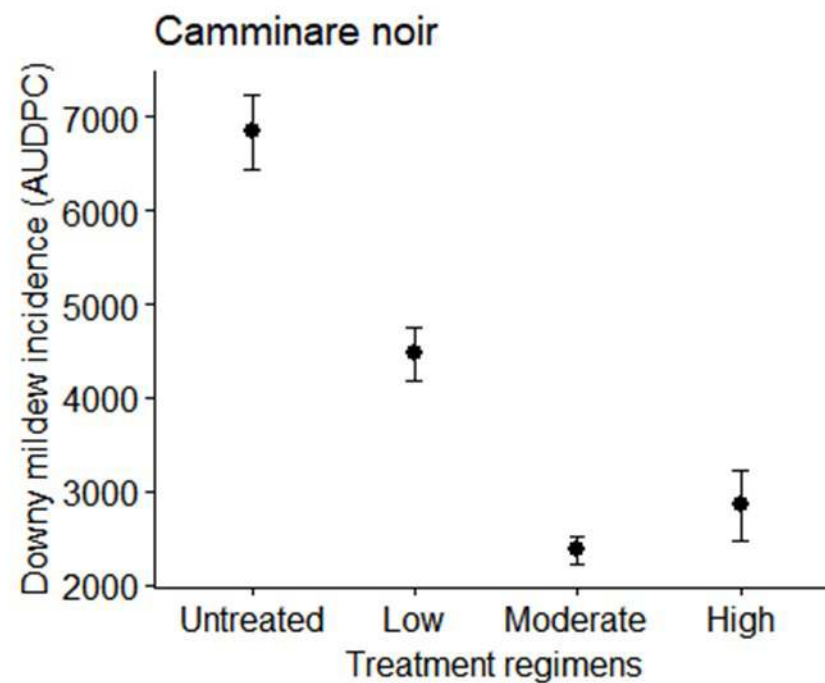
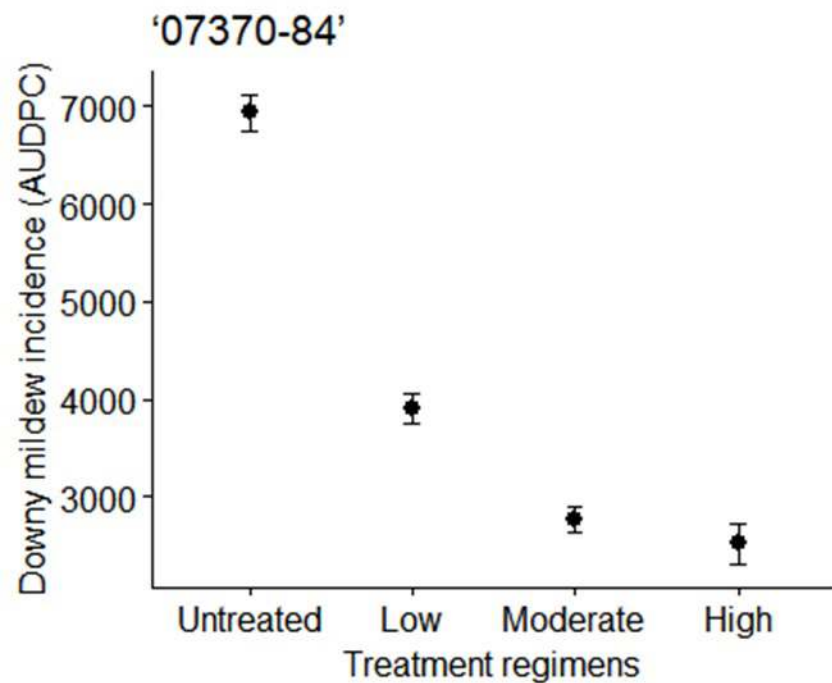


$$AUDPC = \sum_{i=1}^{n-1} \frac{y_i + y_{i+1}}{2} \times (t_{i+1} - t_i)$$

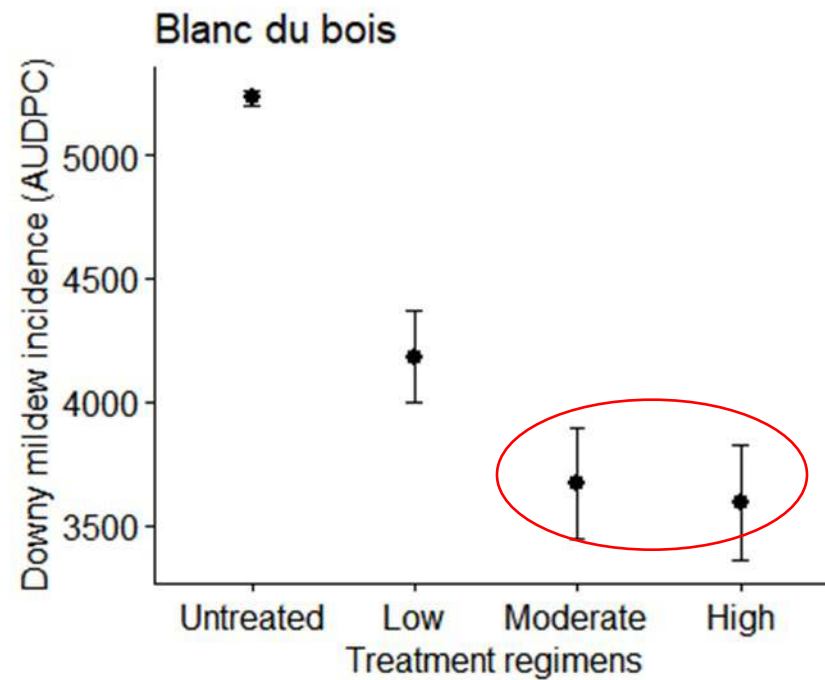
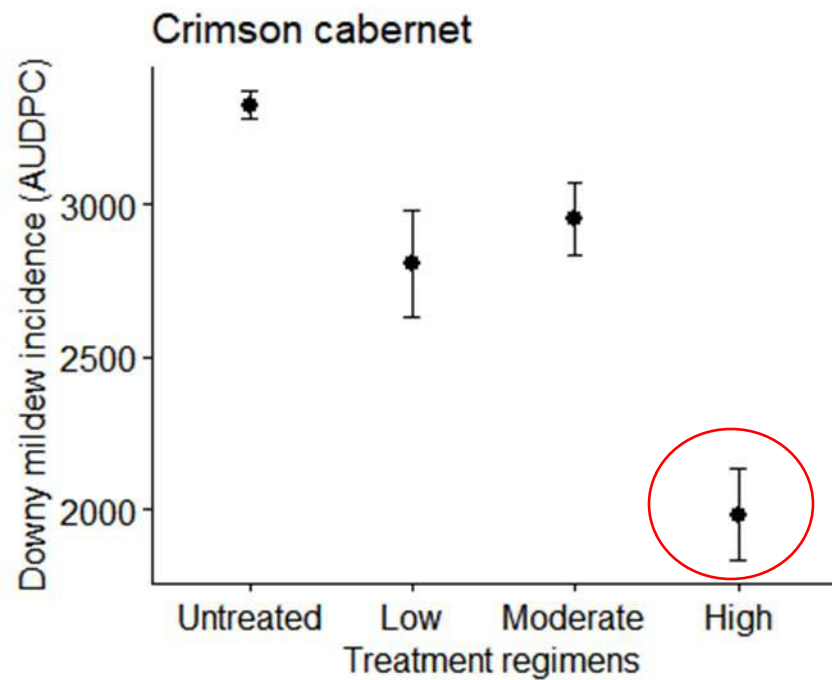
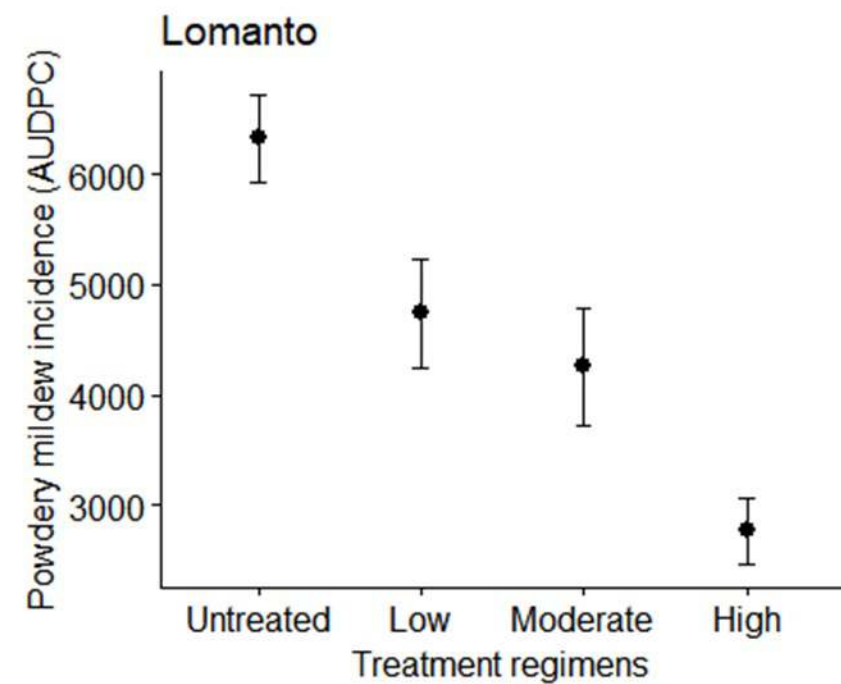
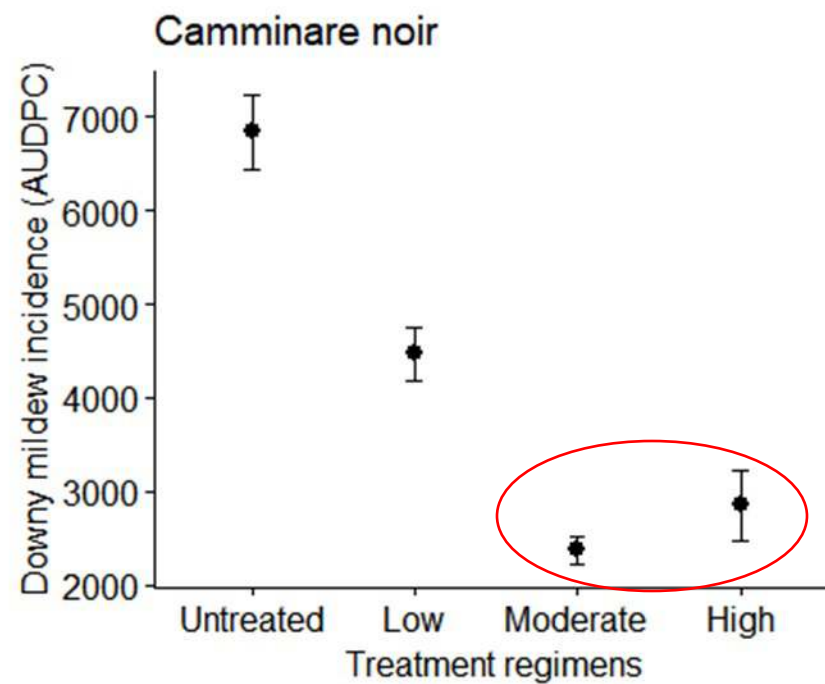
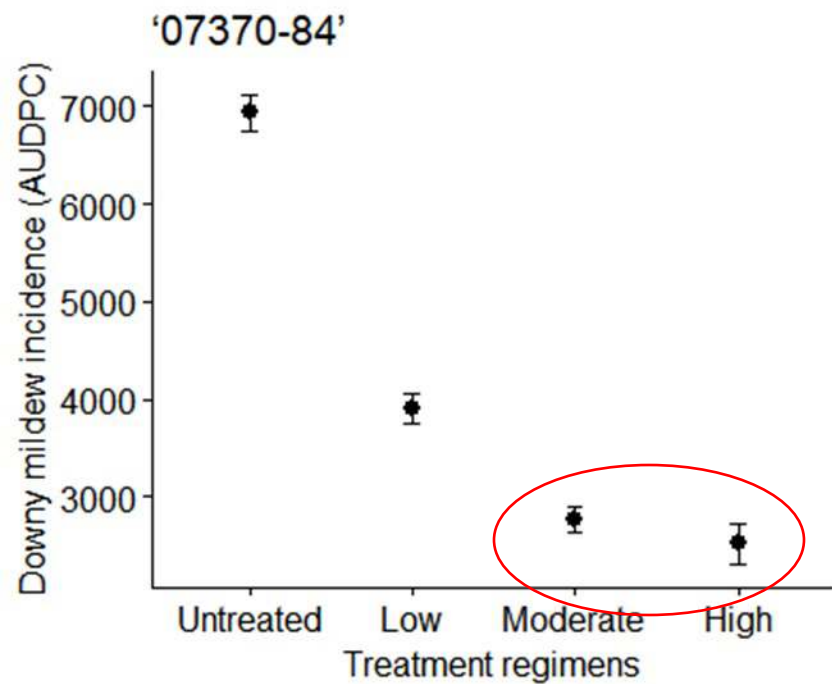
American Phytopathological Society; Calculating the area under the disease progress curve to quantify disease progress



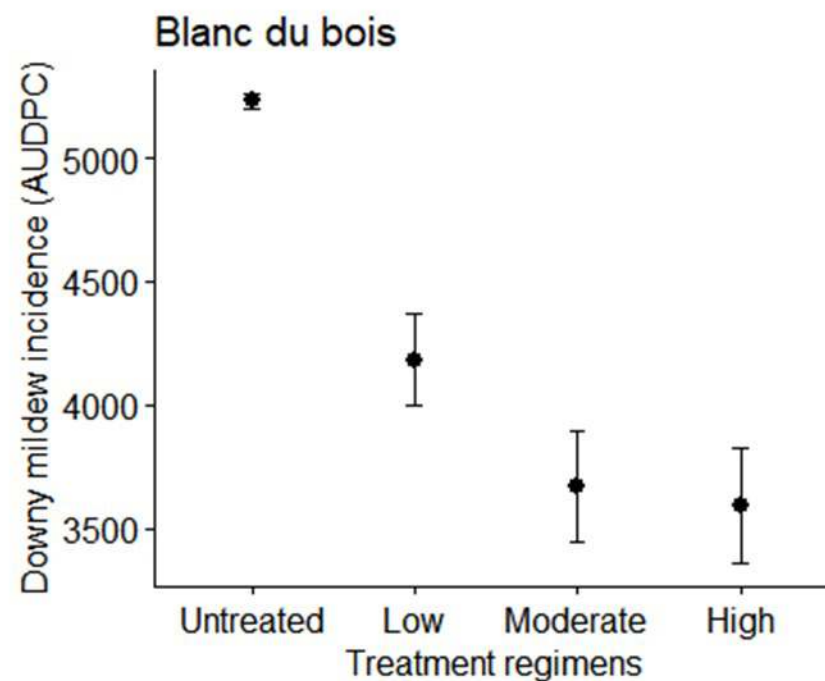
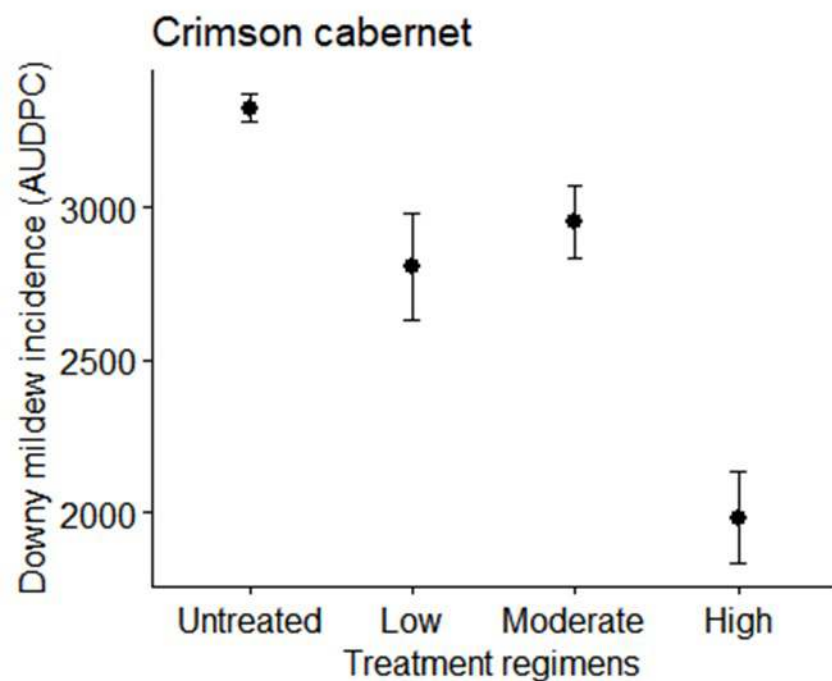
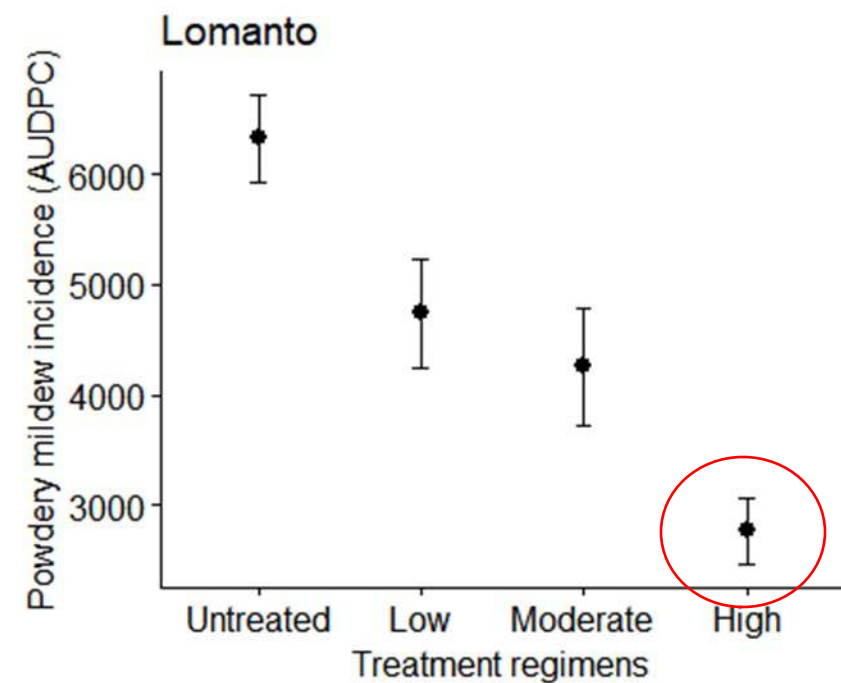
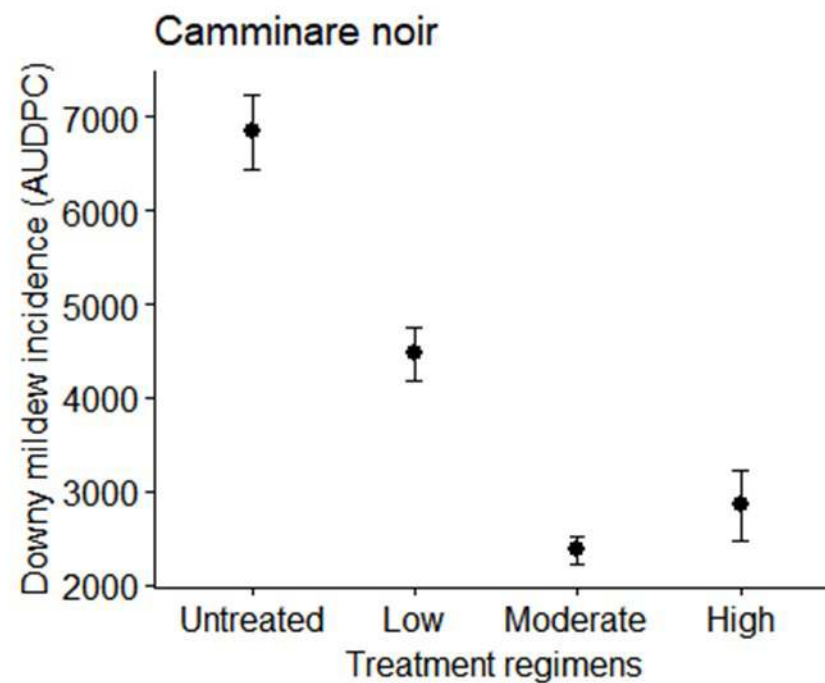
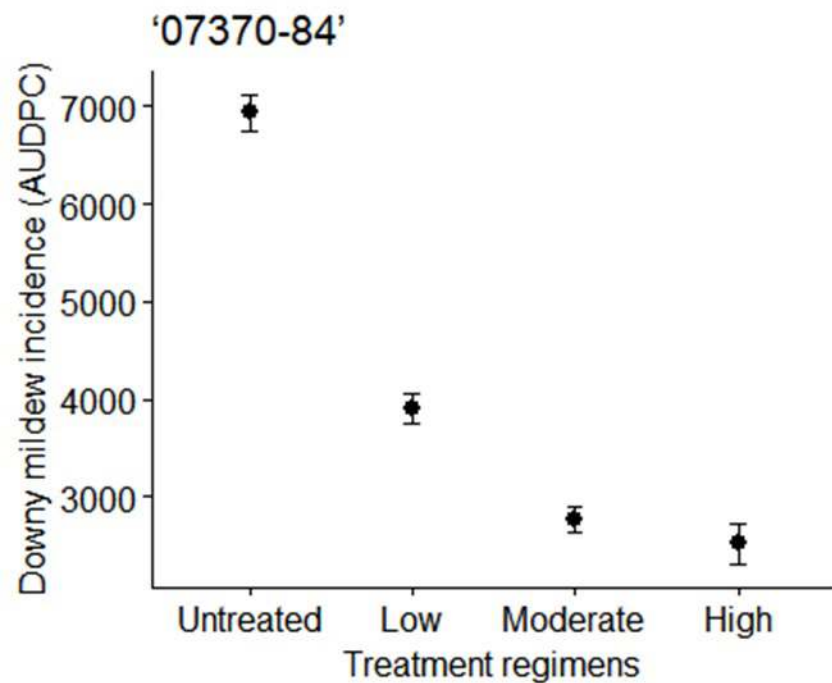




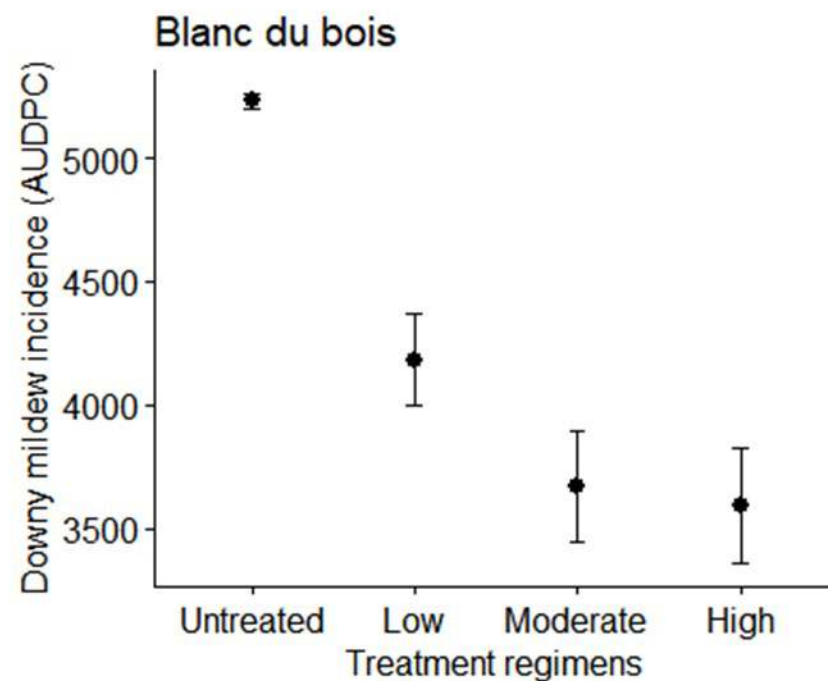
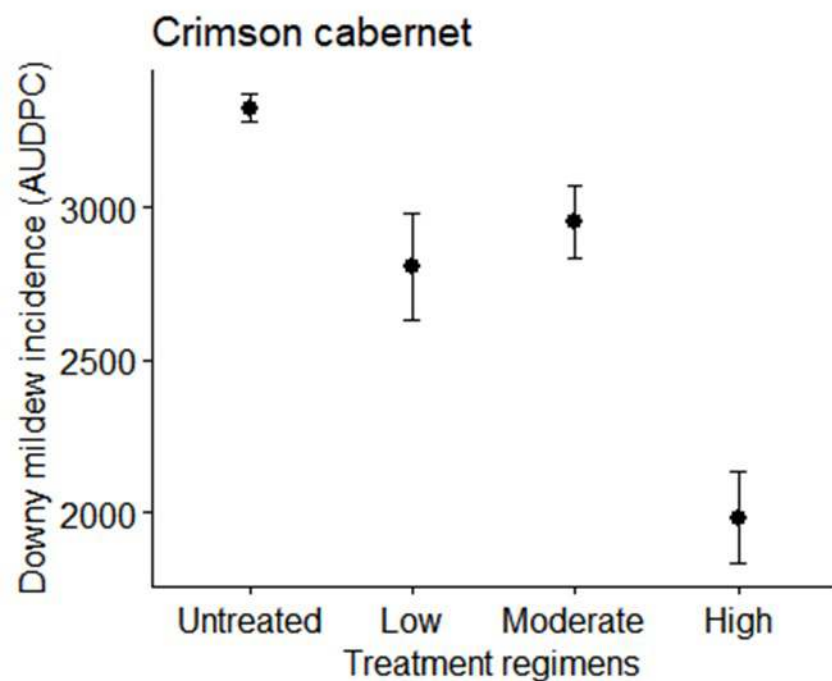
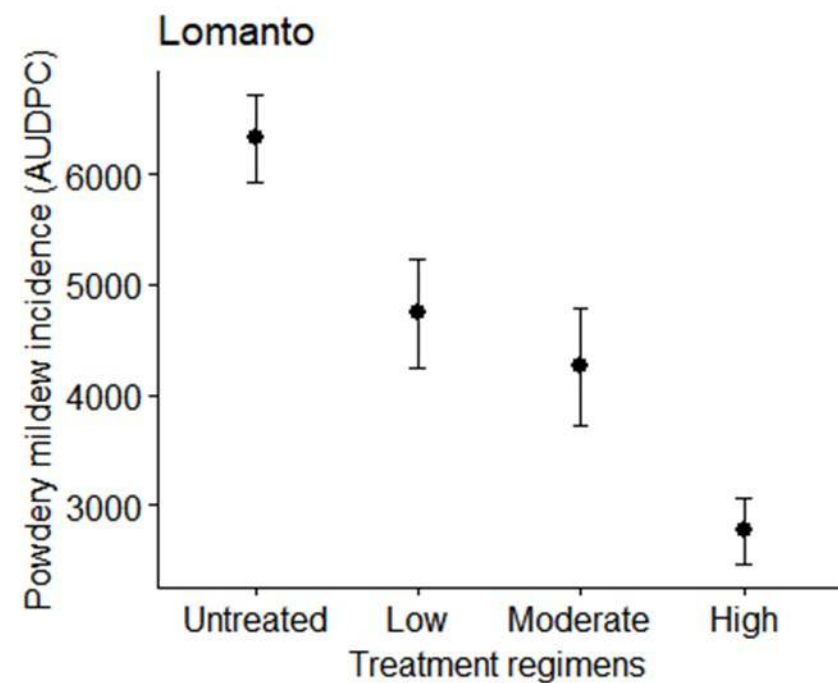
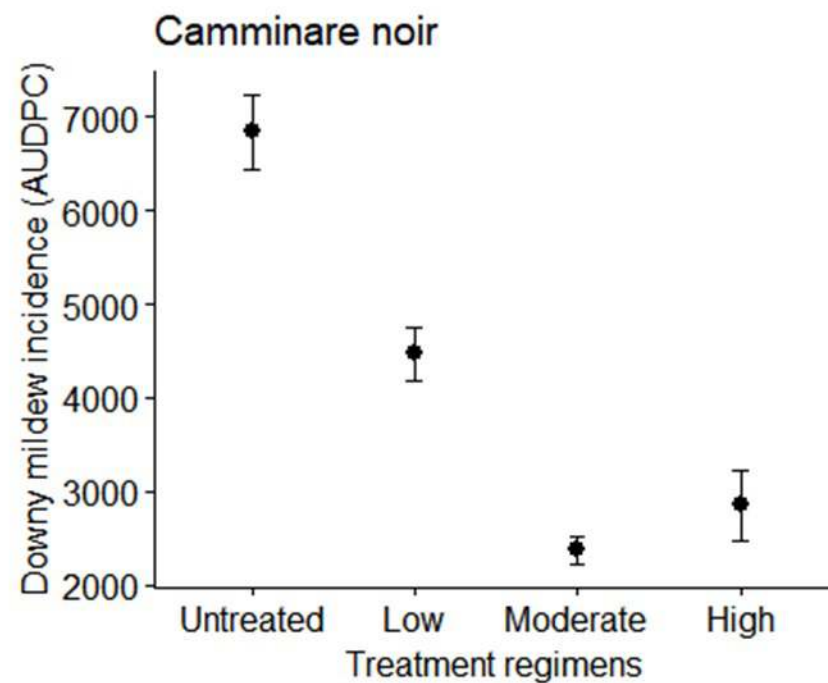
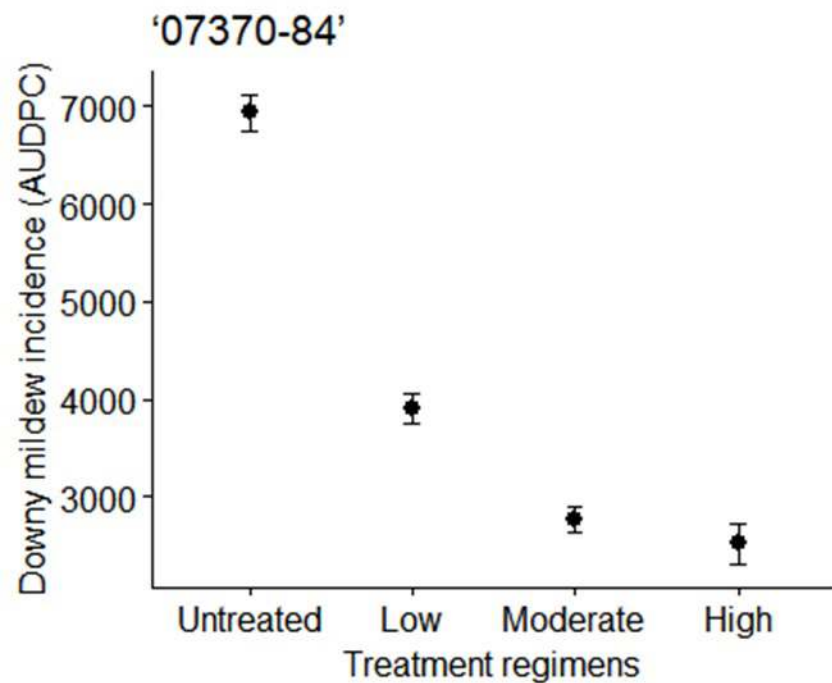




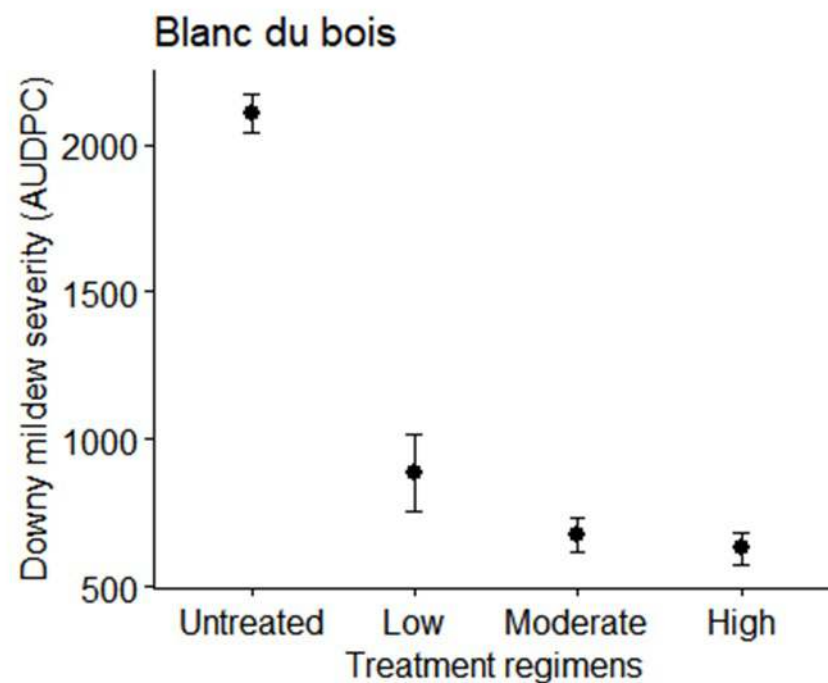
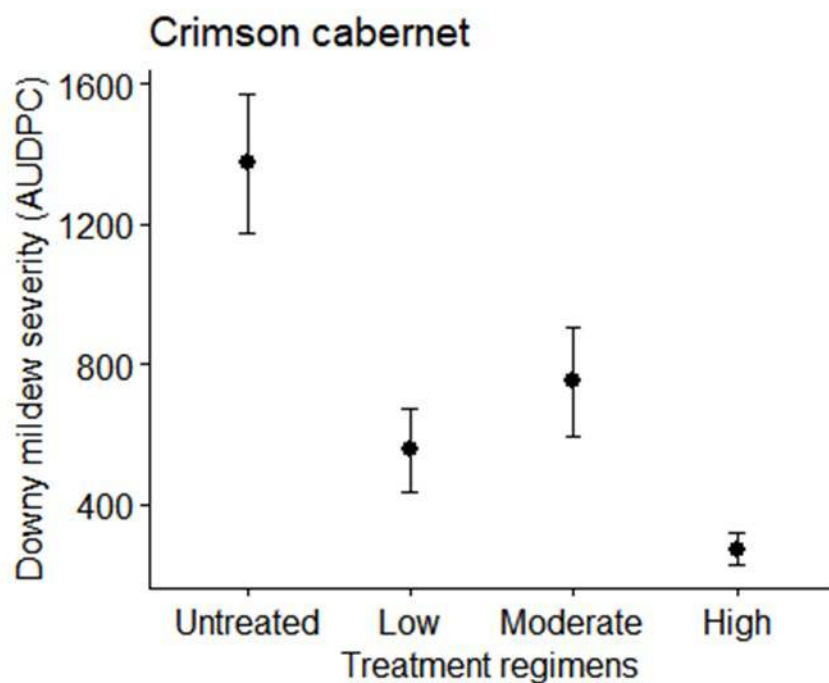
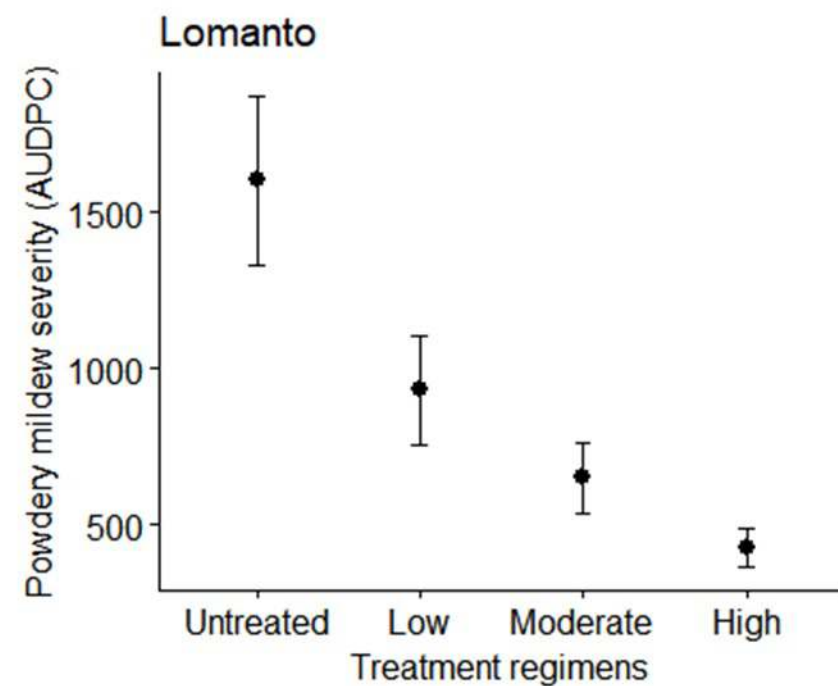
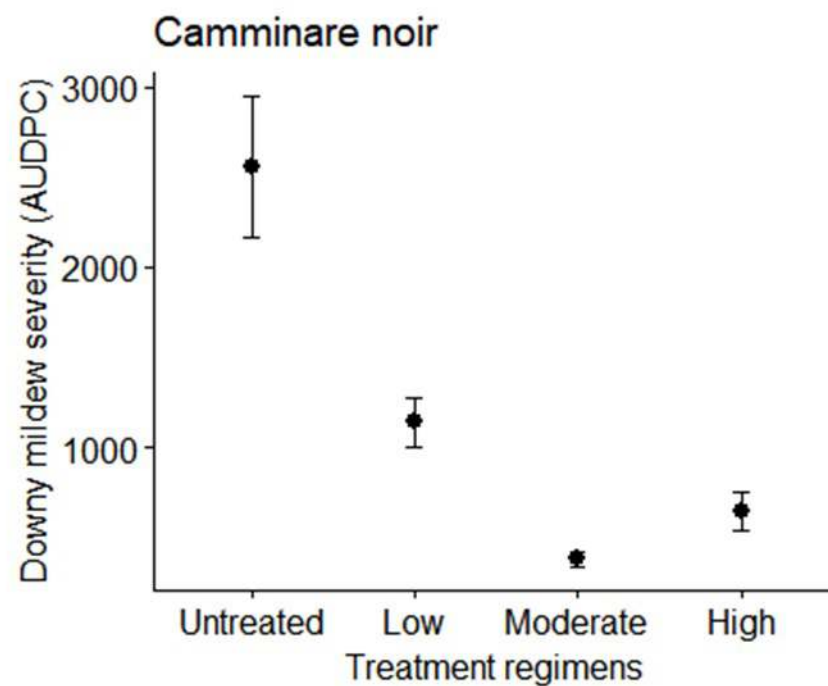
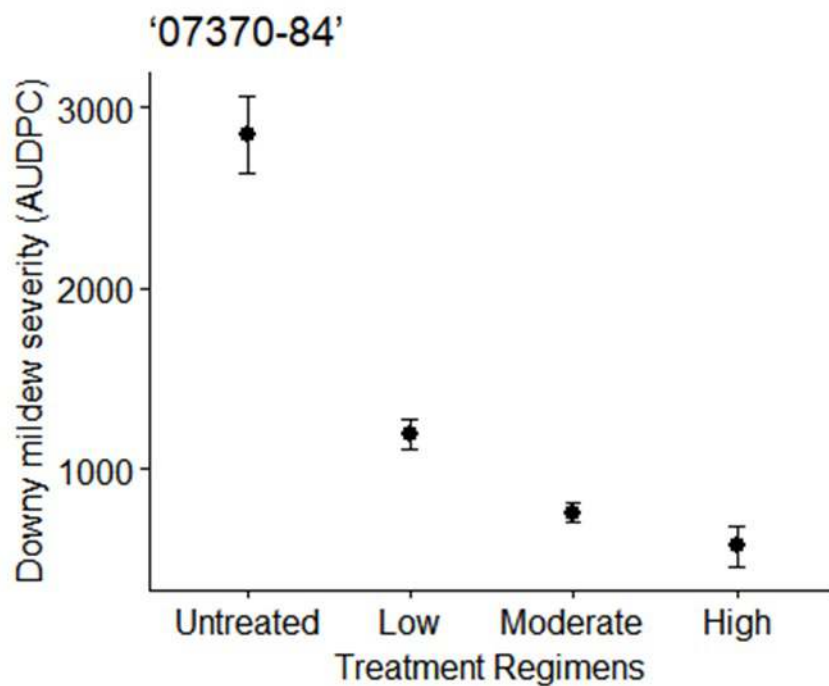


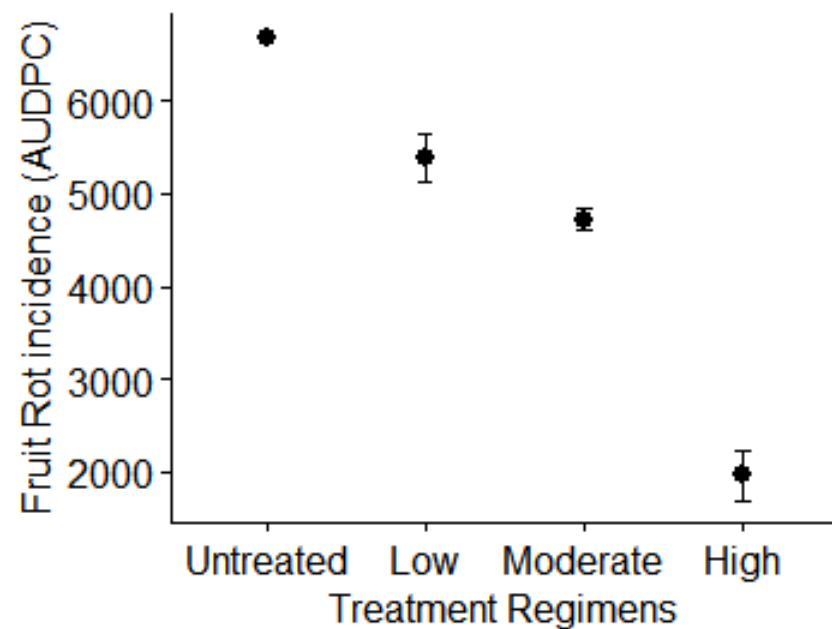
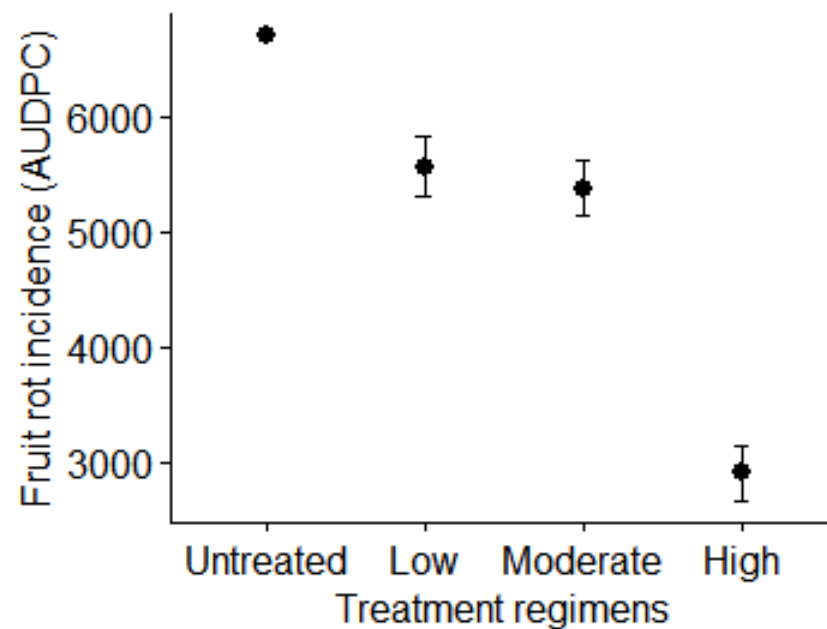
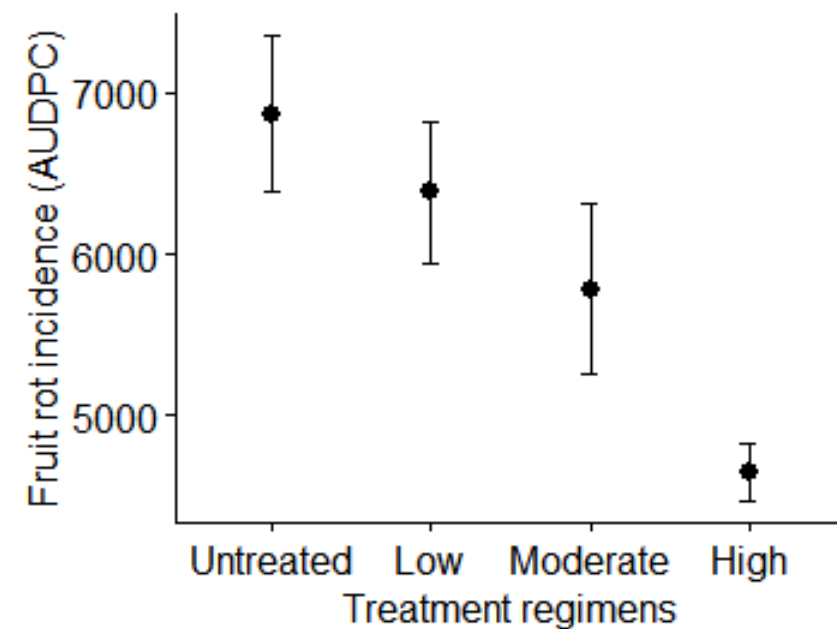
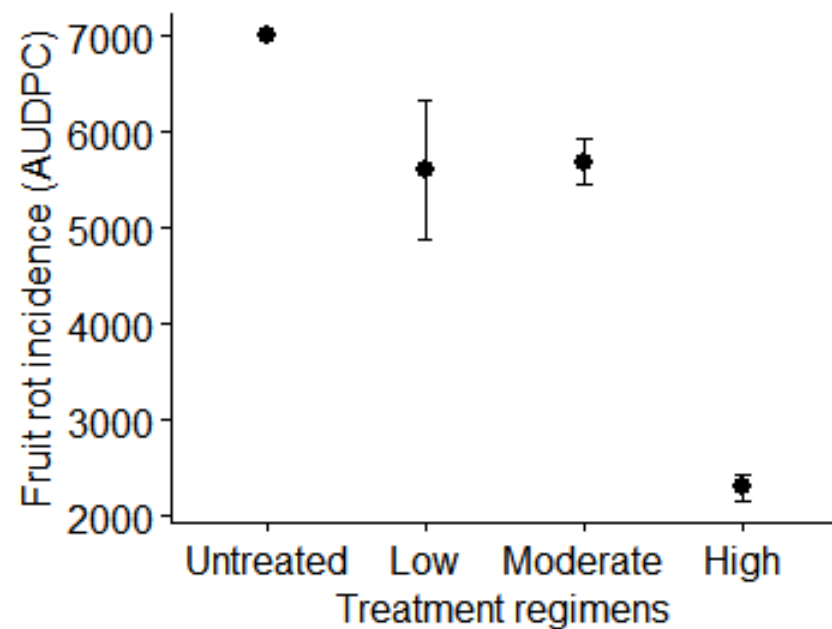
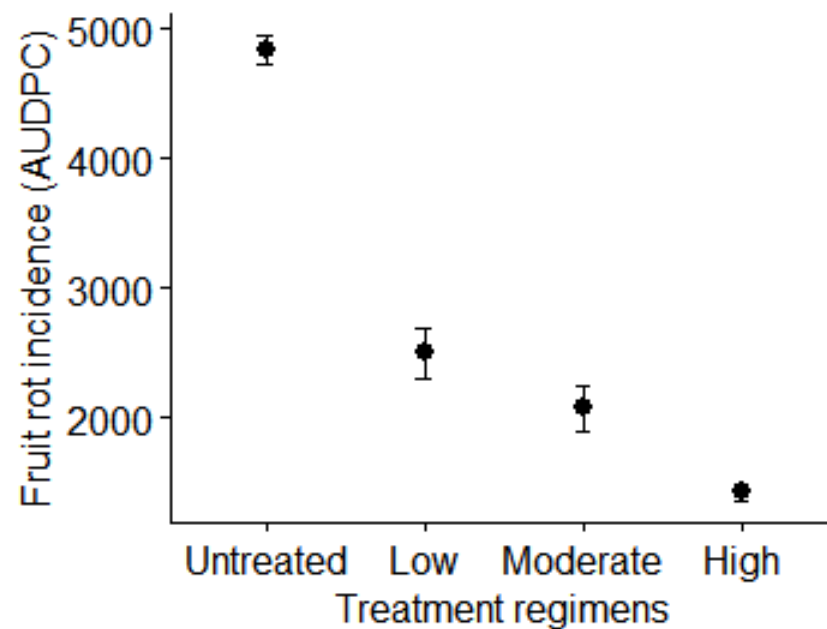






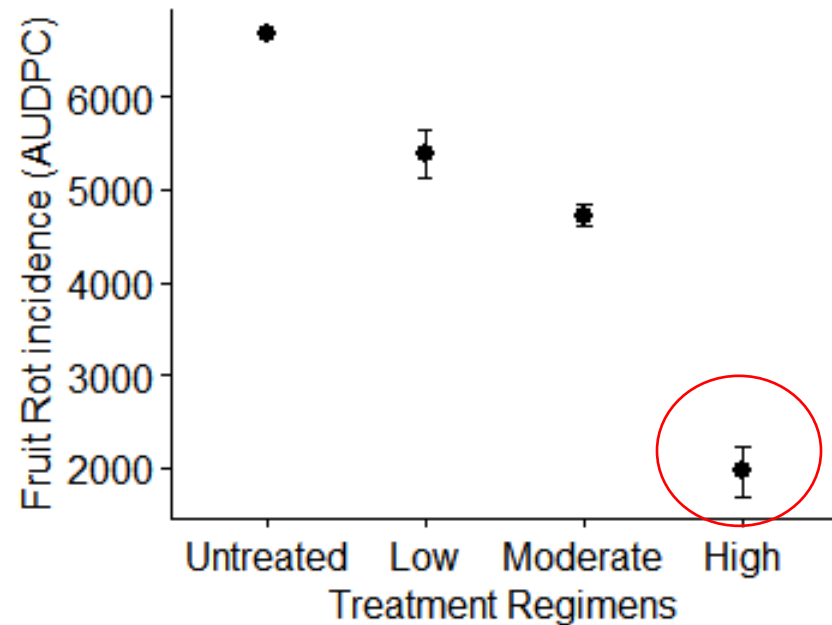




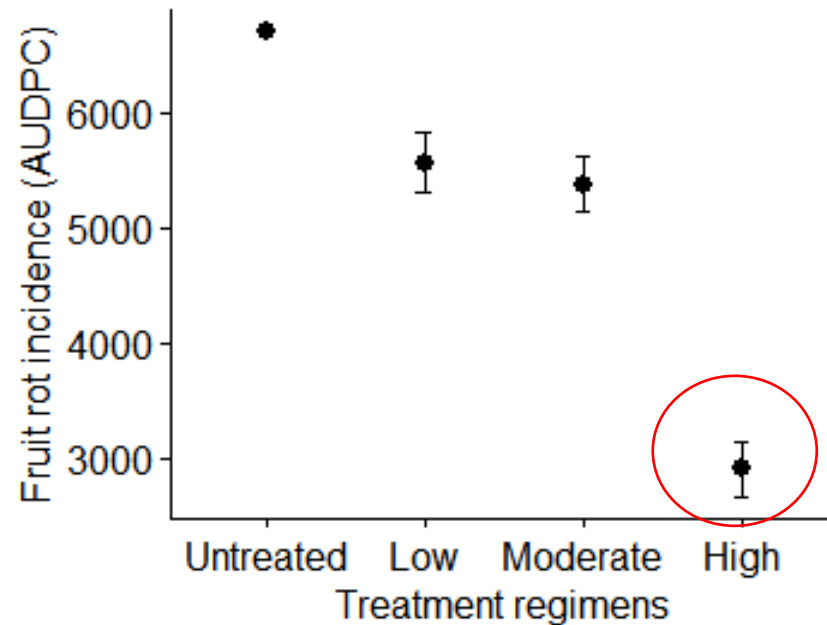
**'07370-84'****Camminare noir****Lomanto****Crimson cabernet****Blanc du bois**



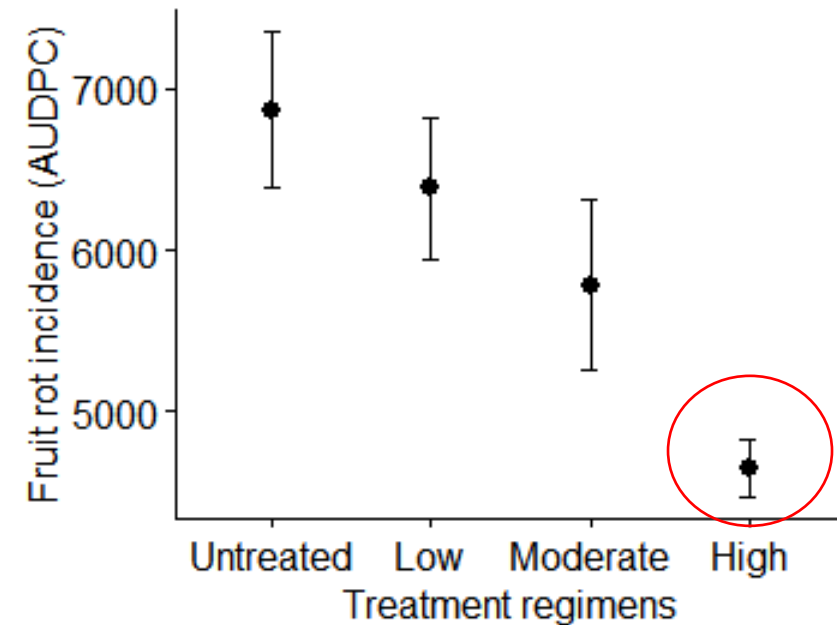
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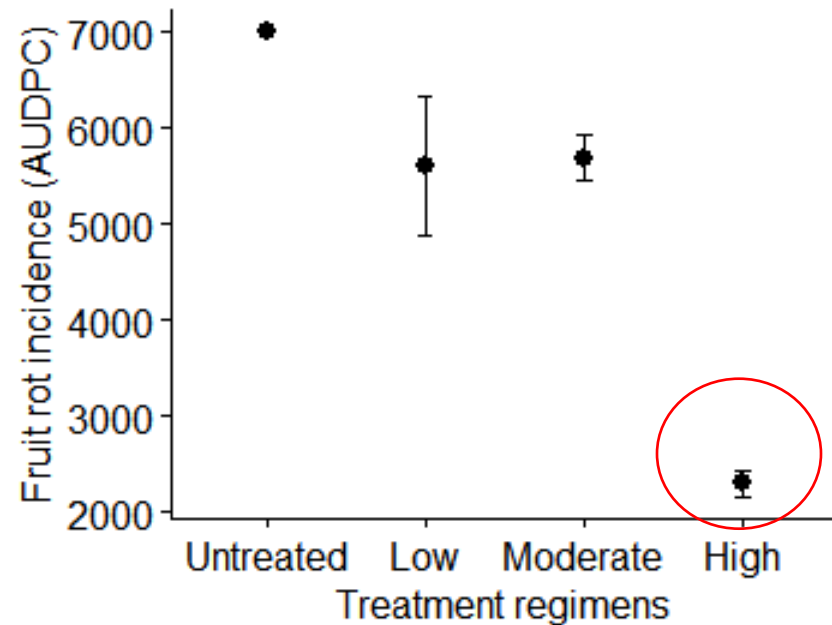
Camminare noir



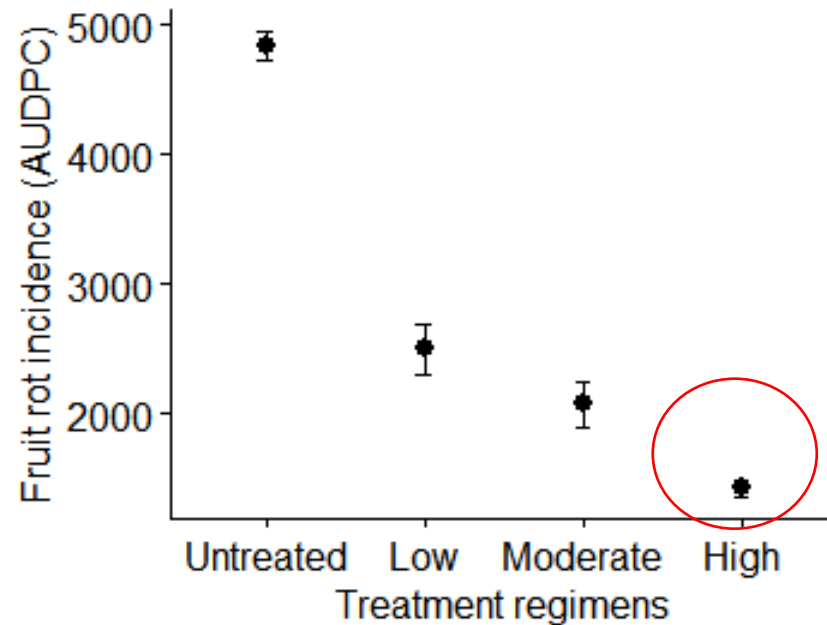
Lomanto



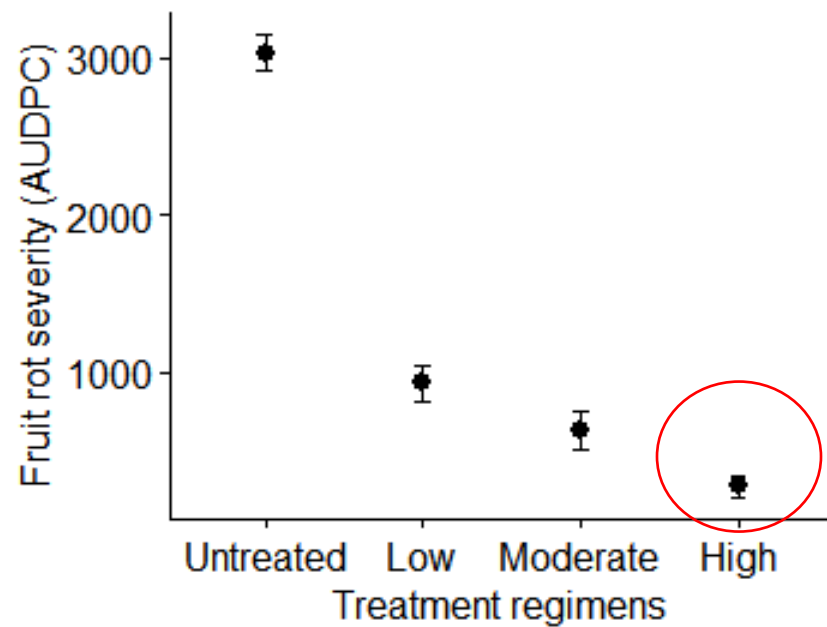
Crimson cabernet



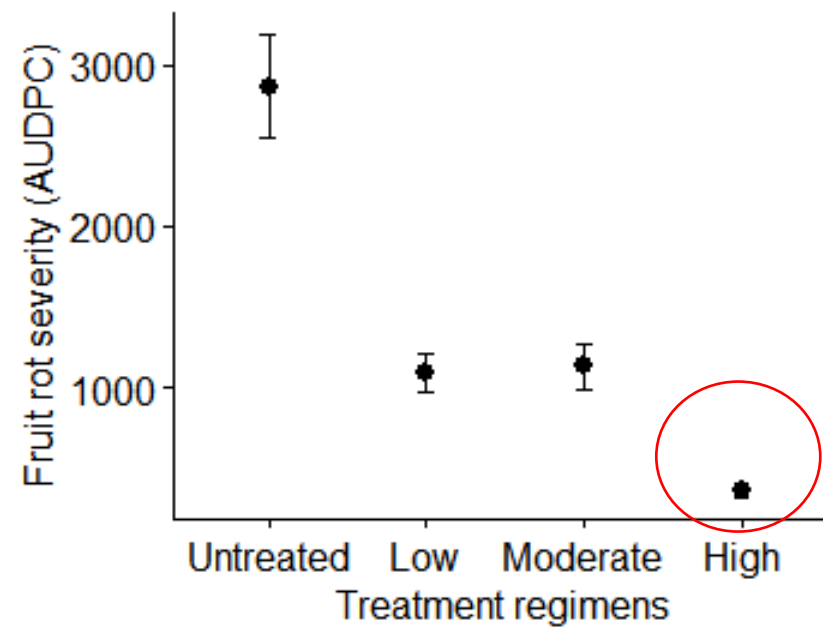
Blanc du bois



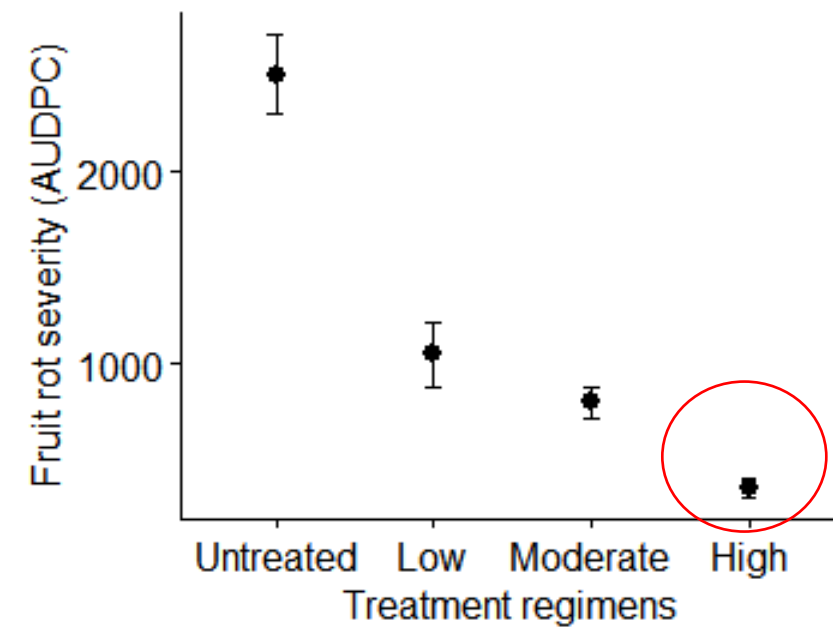
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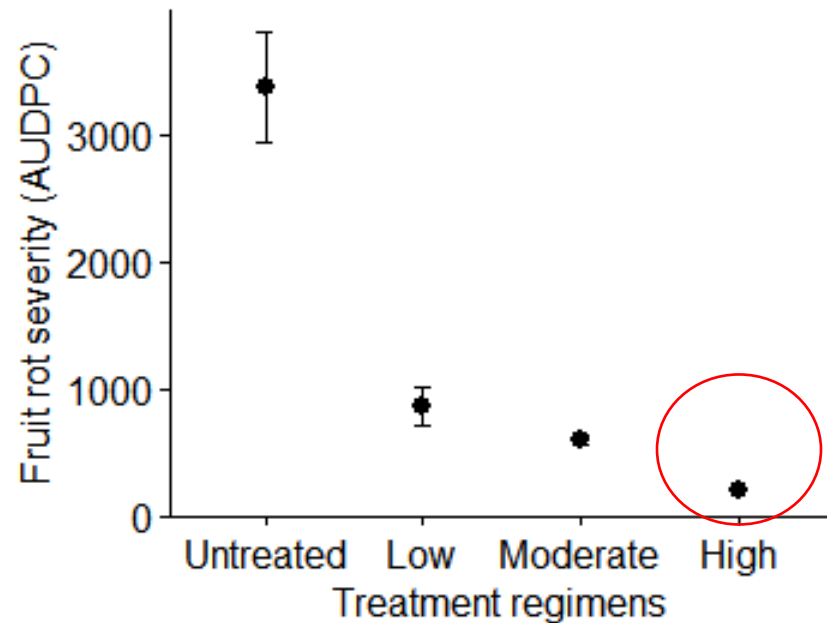
Camminare noir



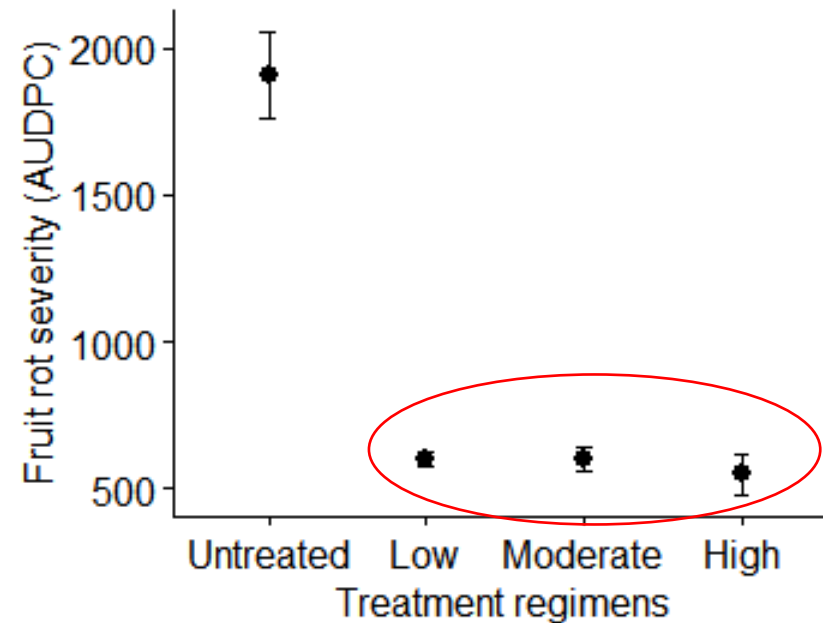
Lomanto



Crimson cabernet



Blanc du bois





# Conclusions

1. All hybrids were susceptible to downy mildew and rots though the degree may vary.
2. Blanc du Bois did not show powdery mildew, whereas the other hybrids did show some degree of powdery mildew susceptibility, and would require additional powdery mildew active materials.
3. Rots observed were Macrophoma rot, bitter rot, and black rot.
4. A full spray program is generally required for hybrids due to rots. Unfortunately, limited cost savings could be realized in a hot, humid environment.

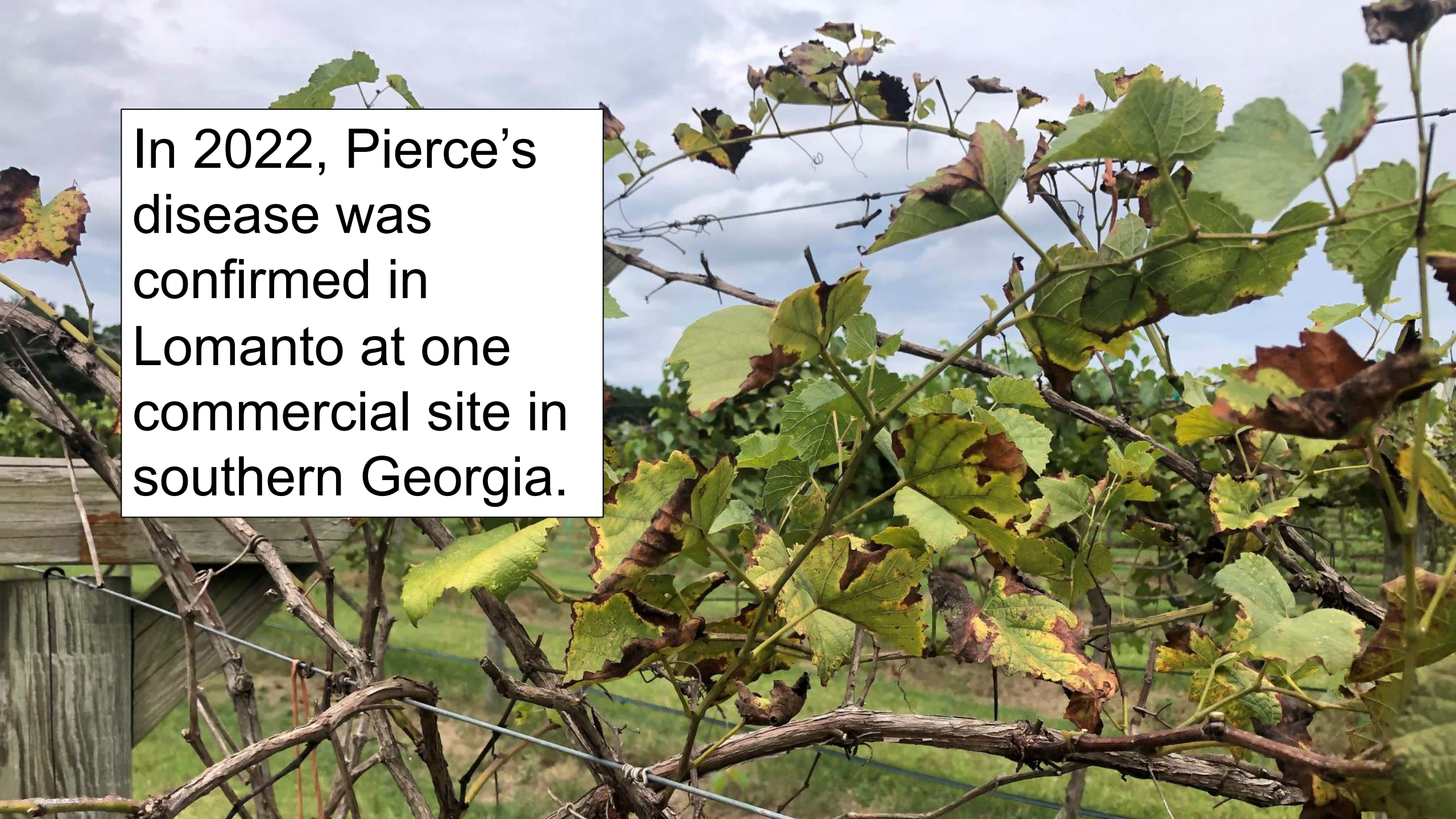


In 2022, Pierce's disease was confirmed in Crimson Cabernet vines in our research site in Watkinsville, GA and in one commercial site.





In 2022, Pierce's disease was confirmed in Lomanto at one commercial site in southern Georgia.









# Critical Takeaways

1. There is a major need for more Pierce's disease (PD) tolerant/resistant hybrids.
2. Likewise, there is likely an equal need for development of PD tolerant/resistant rootstocks.
3. Even “tried and true” PD tolerant/resistant scions such as ‘Blanc du Bois’ may benefit from rootstocks, and many of the current hybrids may not be tolerant of all grape nematodes, Phylloxera and soil types.
4. Do not trust a hybrid that is PD tolerant/resistant in one area to be PD tolerant/resistant in Florida.
5. PD tolerant/resistant scions may still be very difficult to grow due to diseases (e.g. rots) and insects (e.g. grape root borer) in Florida.



# Path Forward

- Classical and marker-assisted breeding of PD tolerant/resistant hybrid scions and rootstocks
- Use of GMO, CRISPR, and other technologies to develop PD tolerant/resistant hybrid scions and rootstocks
- Addition of resistance or tolerance to other diseases and insects
- Testing of all of the above in multiple environments, soils, etc. throughout regions where PD is an issue
- Development of individual spray programs that match each scion







# Questions?



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