

Climatic & genetic determinants of grapevine overwinter recovery from Pierce's disease



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Grapevine overwinter recovery (“cold curing”)

Yr 1 localized infection



PD symptoms



Yr 2 early stunting



chronic disease



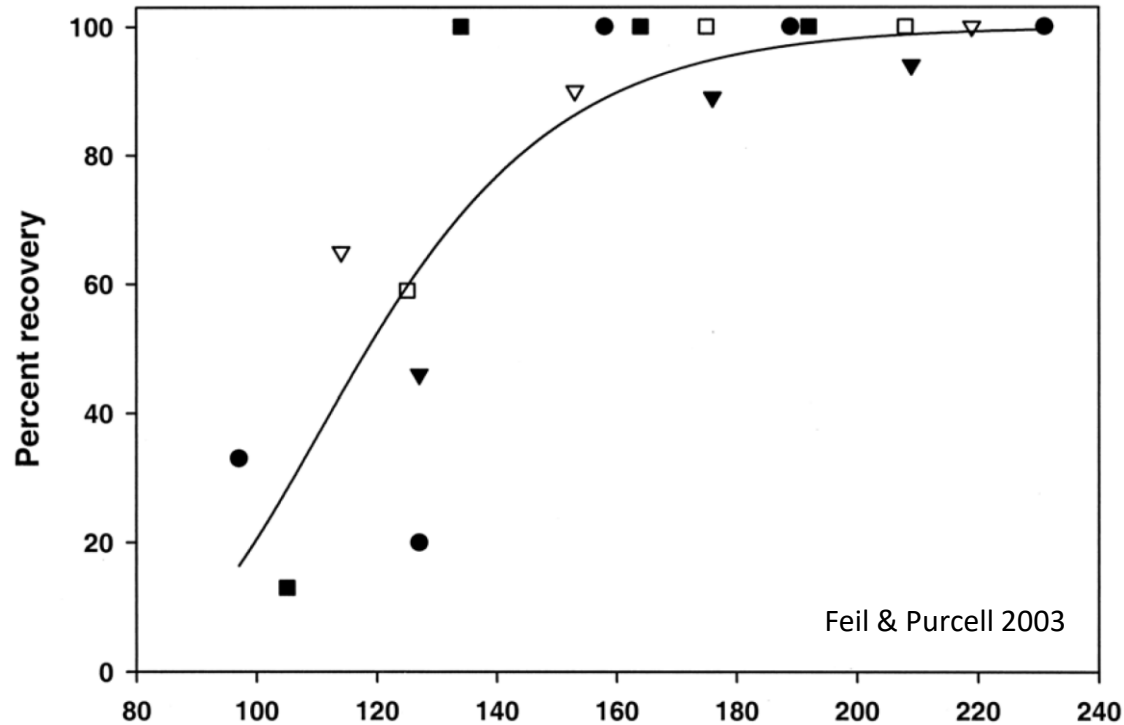
overwinter
recovery



healthy vine

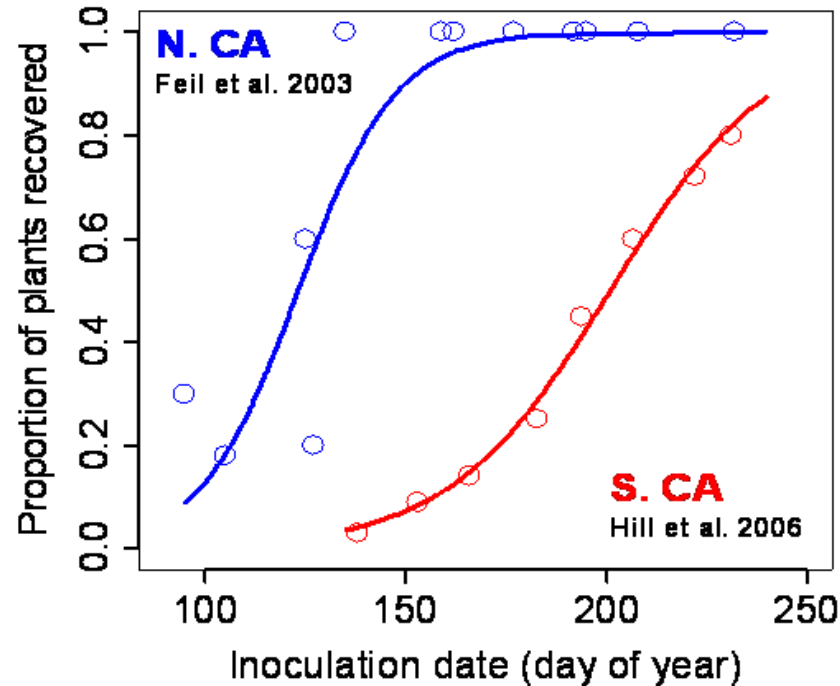


Timing of initial infection



- early season infections are less likely to recover over the winter

Winter temperatures



- cold winter temperatures are associated with greater overwinter recovery

1. What severity/duration of cold exposure is necessary for recovery?



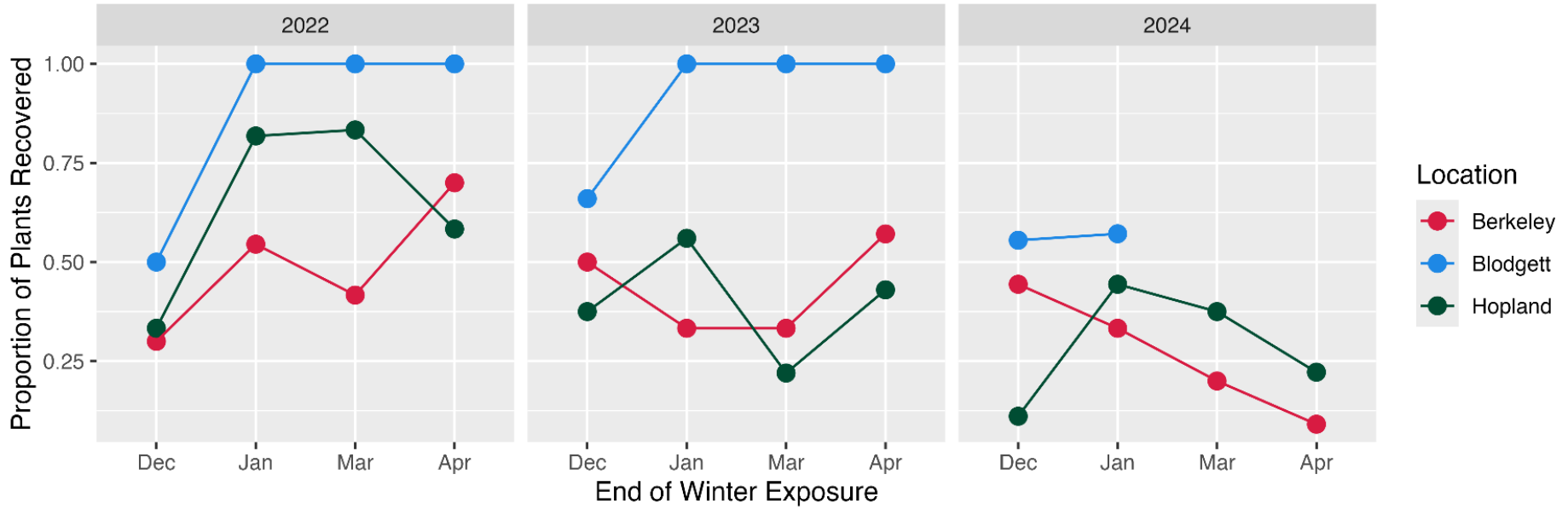
mechanical inoculation in
greenhouse



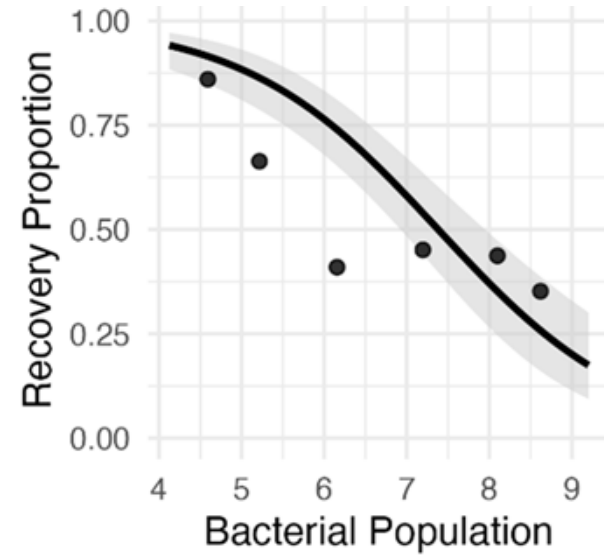
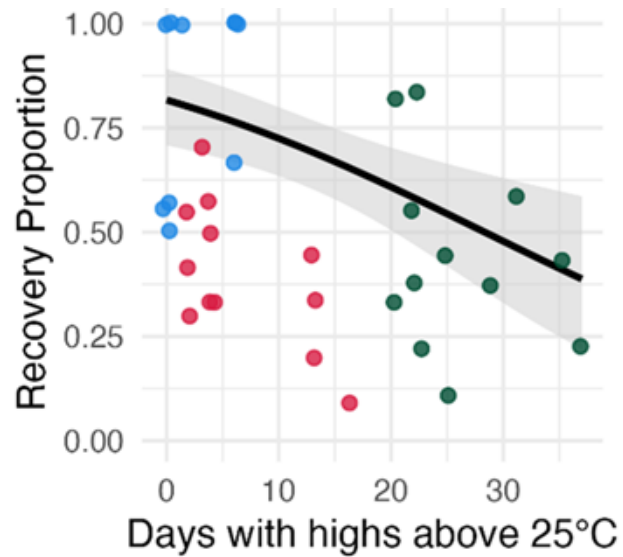
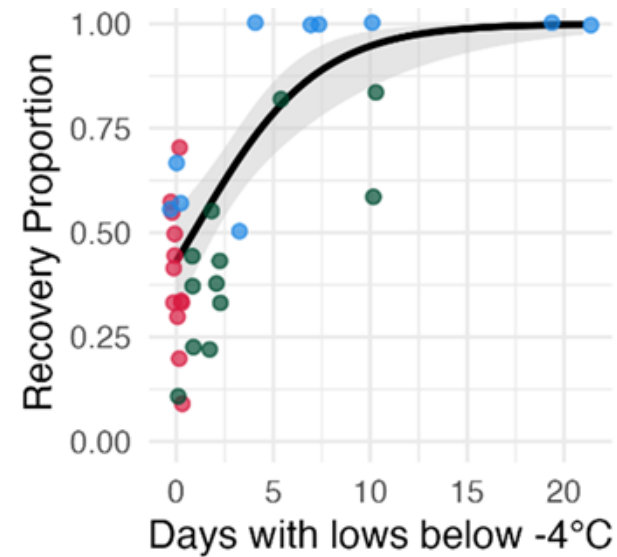
Fall and Winter in the field,
for different durations



back to greenhouse



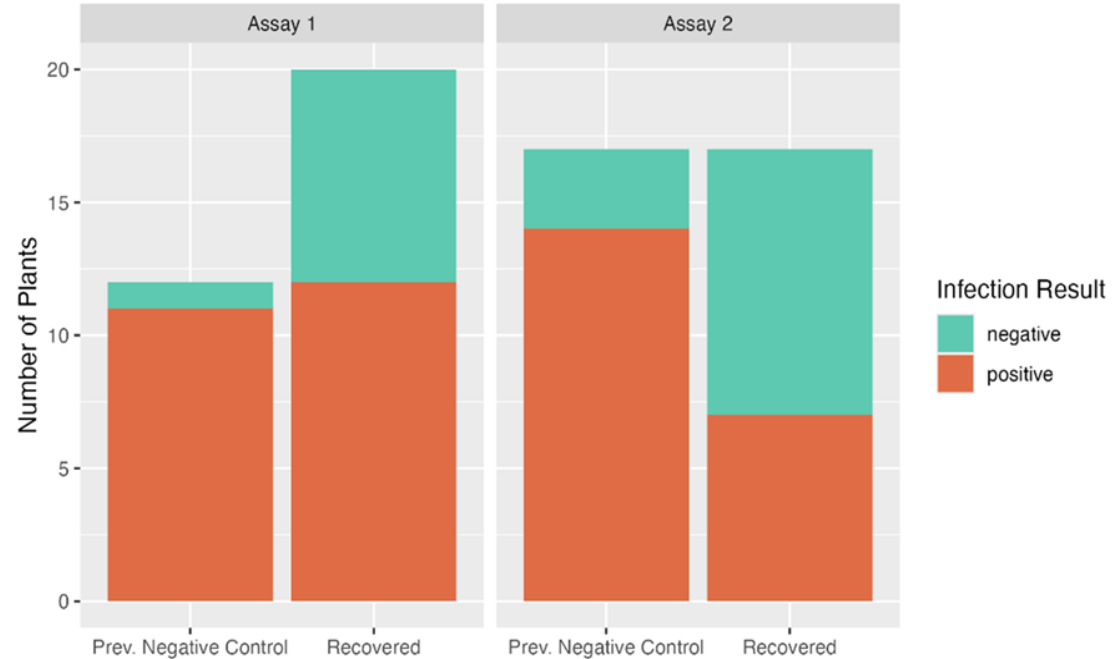
- recovery did not increase predictably with overwinter exposure time



+ cold days, - warm days, - higher pathogen infection levels

2. Are recovered vines less susceptible to reinfection by Xf

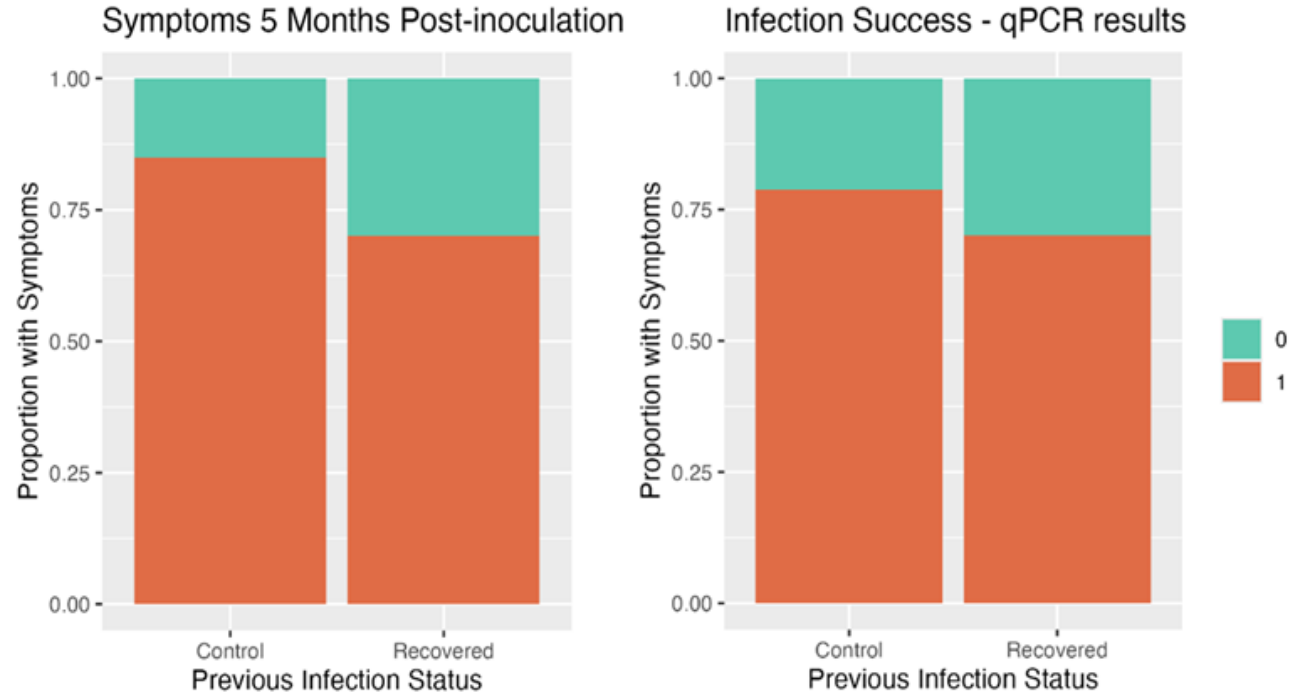
reinoculated vines in greenhouse



- recovered vines were less likely to be reinfected

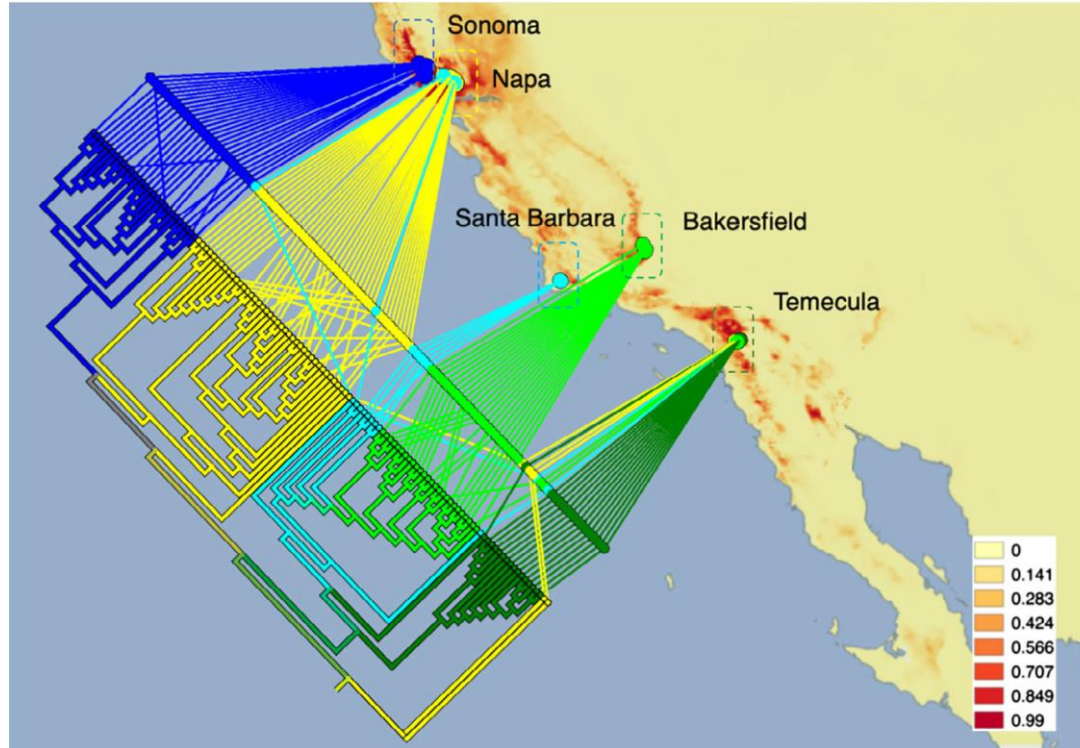


reinoculated vines in the field



- recovered vines were less likely to show symptoms or be reinfected

3. Does pathogen genotype affect overwinter recovery?

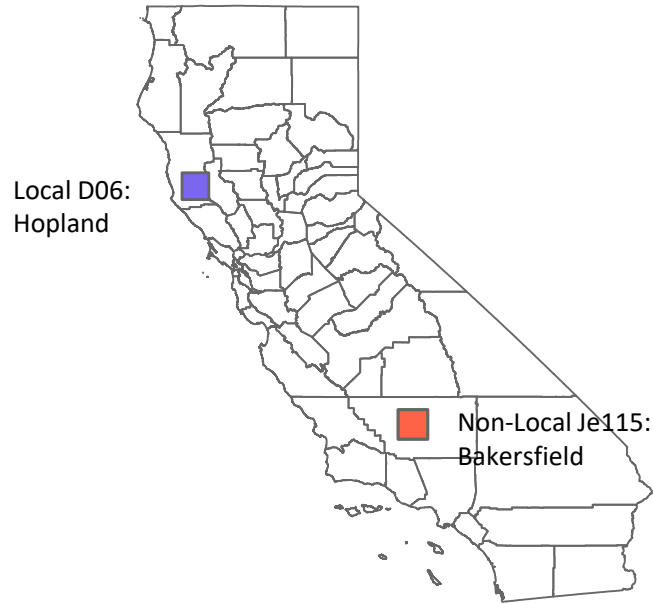


Van hove et al. 2020



- *Xylella fastidiosa* genetics shows substantial geographic structure

3. Does pathogen genotype affect overwinter recovery?



Strain origin



Common garden (Hopland)

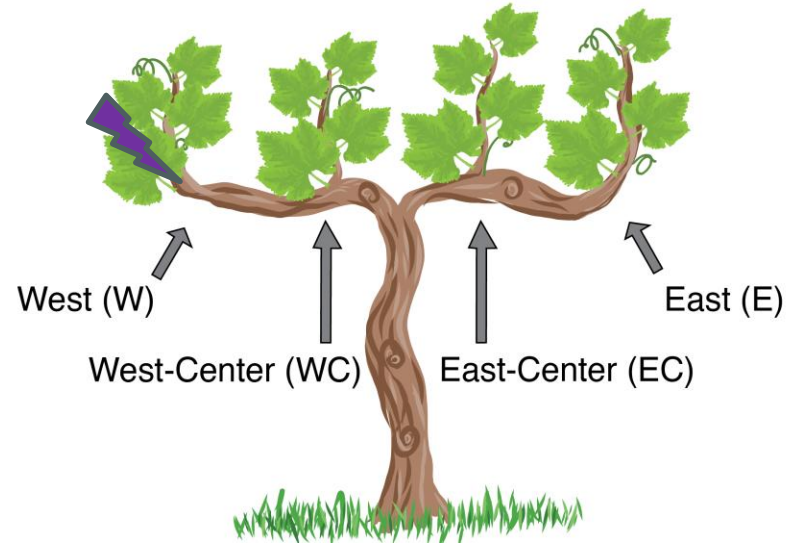


Cultivar

Albariño (34)	Petit Manseng (36)	Missing (33)
Ciliegiolo (38)	Sagrantino (33)	Rootstock 101-14 (26)
Falanghina (40)	Tannat (40)	Wrong Cultivar (13)
Tempranillo (34)	Teroldego (38)	Chardonnay (15)
Greco di Tufo (38)	Tinta Amarella (38)	Negro Amaro (5)
Mencia (35)	Tinta Francisca (38)	Pagadebito (8)
Periquita (39)	Touriga Nacional (9)	<Null> (3)

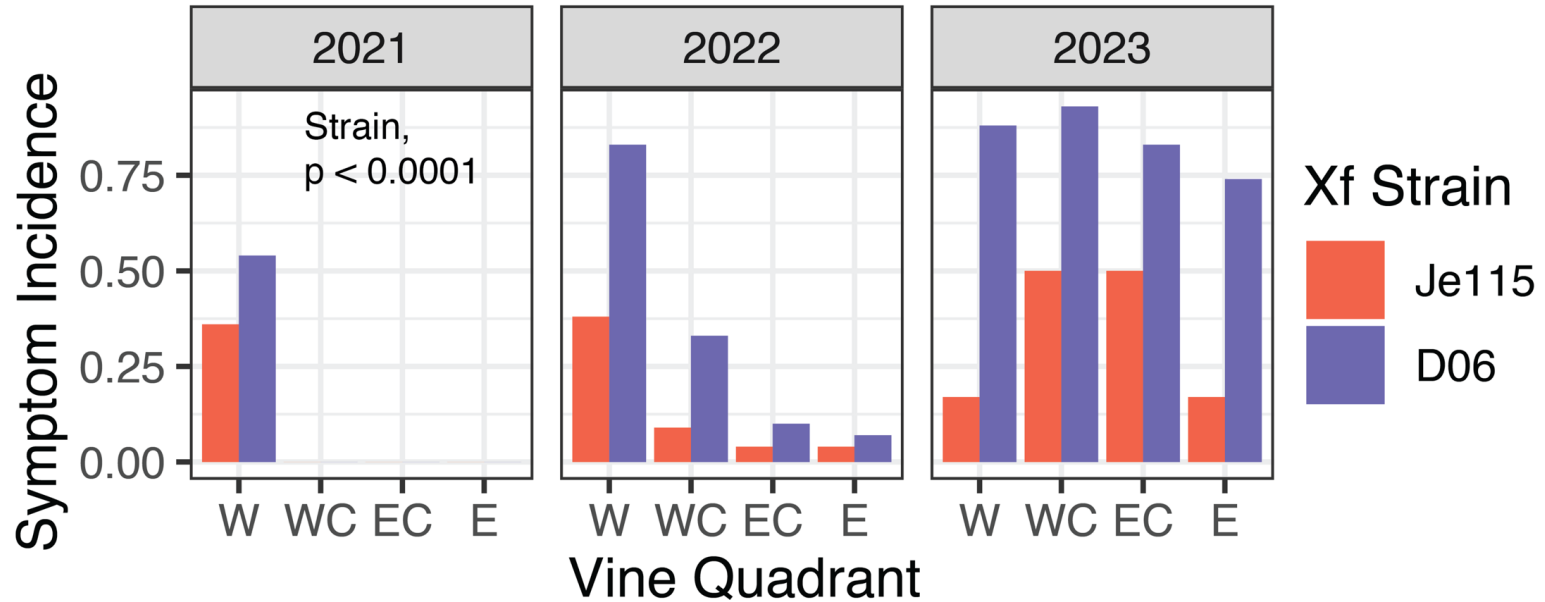
0 10 20 40 Feet





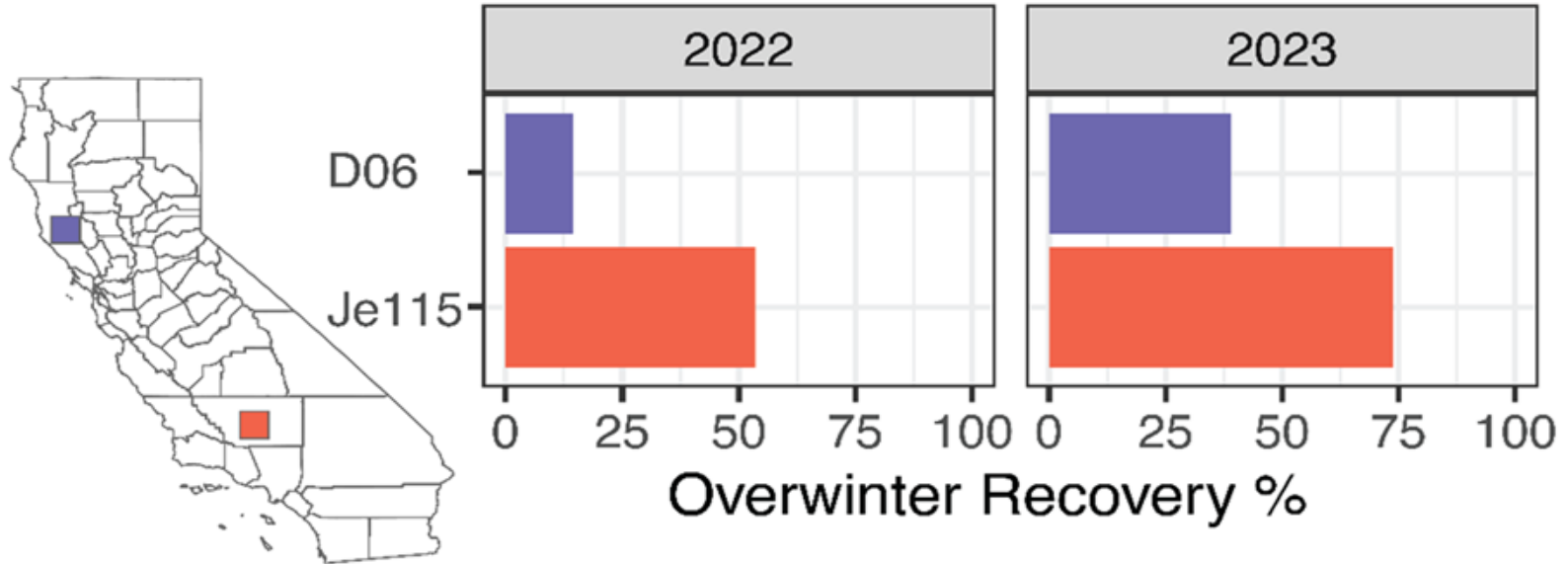
- 1/3rd inoculated with Hopland strain, Bakersfield strain, or uninoculated control
- followed symptoms and infection over next three years

Symptom incidence varied by strain



- local strain spread more quickly, produced more widespread symptoms

Recovery rate differed between strains



- local strain appears more tolerant to colder winter conditions

Conclusions

1. Evidence of *Xf* local adaptation based on climate
 - source of cold tolerance is *Xf* subsp. *multiplex*?
2. Growing season temperatures affect recovery, likely due to late-season infection levels
 - reduce Fall infection levels (ZnSO_4 , NAC, endophytes)
3. Some evidence of induced resistance following recovery
 - identify resistance/stress genes?

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