

Integrated Approach to Manage Yellow Dwarf Viruses in Perennial Grass Seed Crops

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Yellow Dwarf Symptoms and Disease Cycle



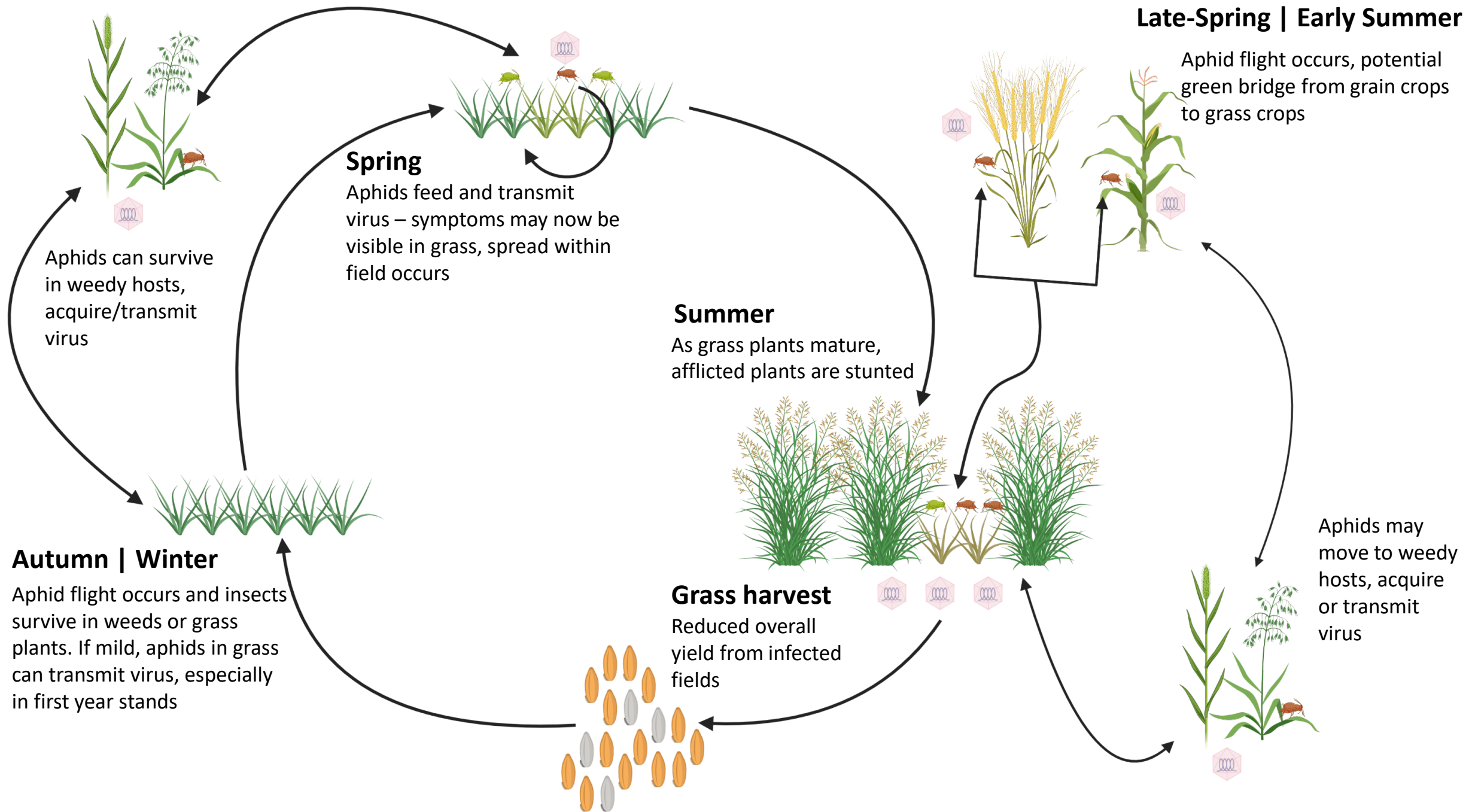
Tall Fescue



Perennial Ryegrass

Grass Seed Symptoms

- May see yellowing and reddening
- Reduced or increased foliage growth
 - Seed yield reduction
 - Poorly developed roots
- Large scale dieback after extreme weather



YDV – Challenges

- Subtle Symptoms
- Multiple Hosts
 - Over 150 species of cereals and grasses
 - Weedy grass hosts
- Multiple Virus Species
 - 3 virus genera – Barley yellow dwarf viruses (BYDV; Luteovirus, Sobemovirus) and Cereal yellow dwarf viruses (CYDV; Polerovirus)
 - 9+ virus species of economic importance detectable with PCR
- Multiple Aphid Species
 - Up to 20 species can transmit
 - Bird cherry oat aphid, Corn leaf aphid, English grain aphid, Rose grain aphid, Green bug
 - 2 major flights per season
- Limited control measures



Research Questions

- What aphid and YDV species are prominent in Oregon grass seed fields and what environmental/management factors contribute to these populations?

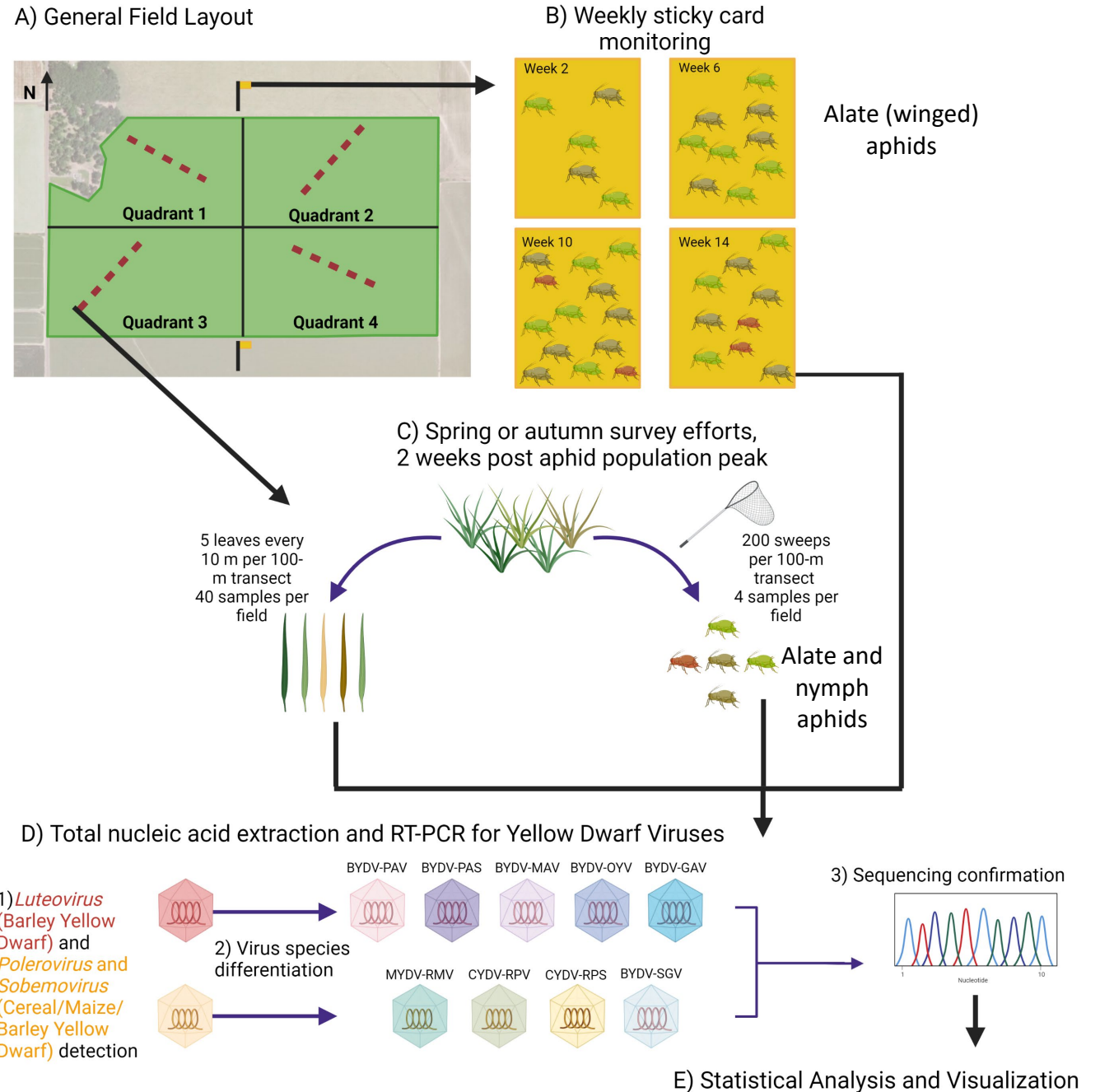
Methods

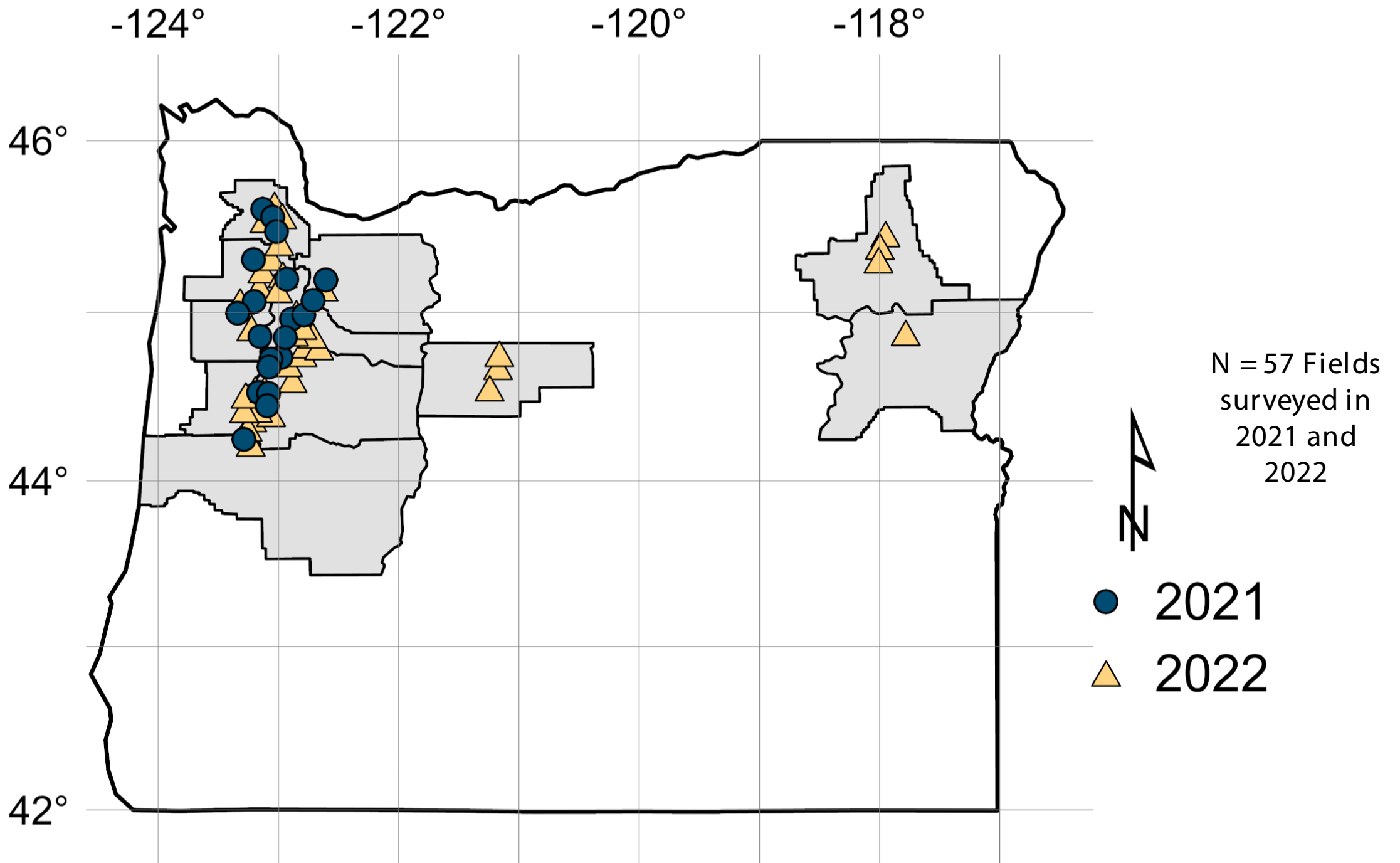
Field survey of both aphids and plants to identify aphid and virus species

- Aphid counting – 15 weeks in spring and autumn
- Plant sampling – once in spring and autumn
- Record environmental factors for risk modeling

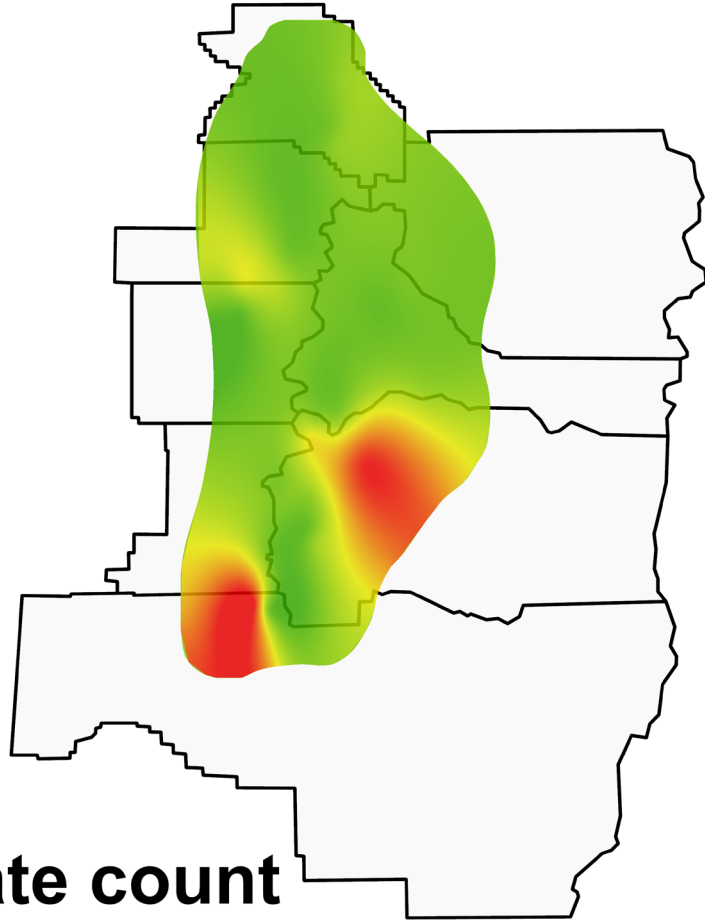
Molecular analysis of both aphids and plants

- RT-PCR Distinguish up to 9 YDV species
- NextSeq 500 sequencing

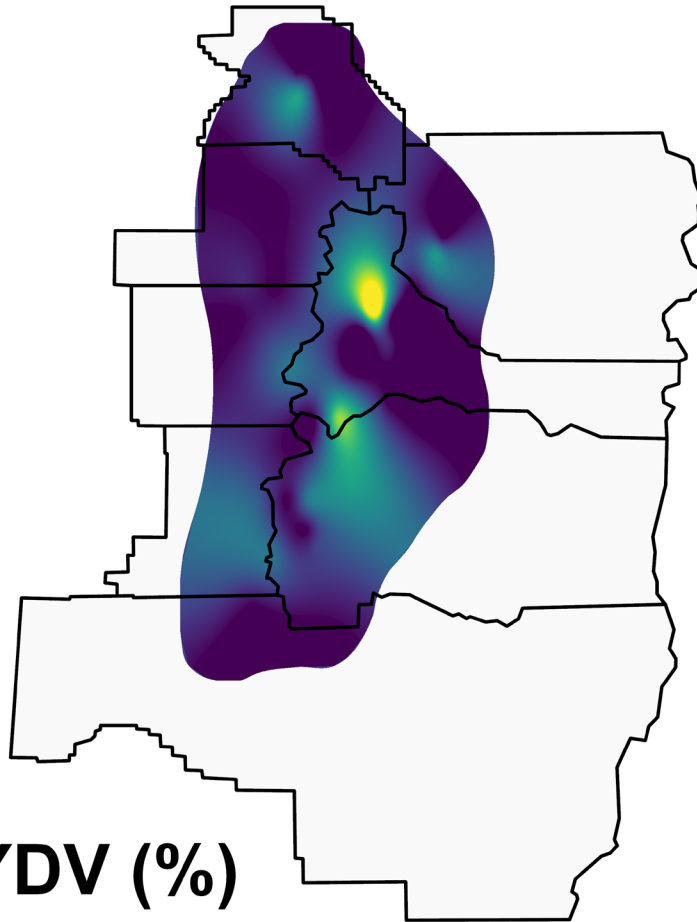
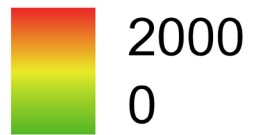




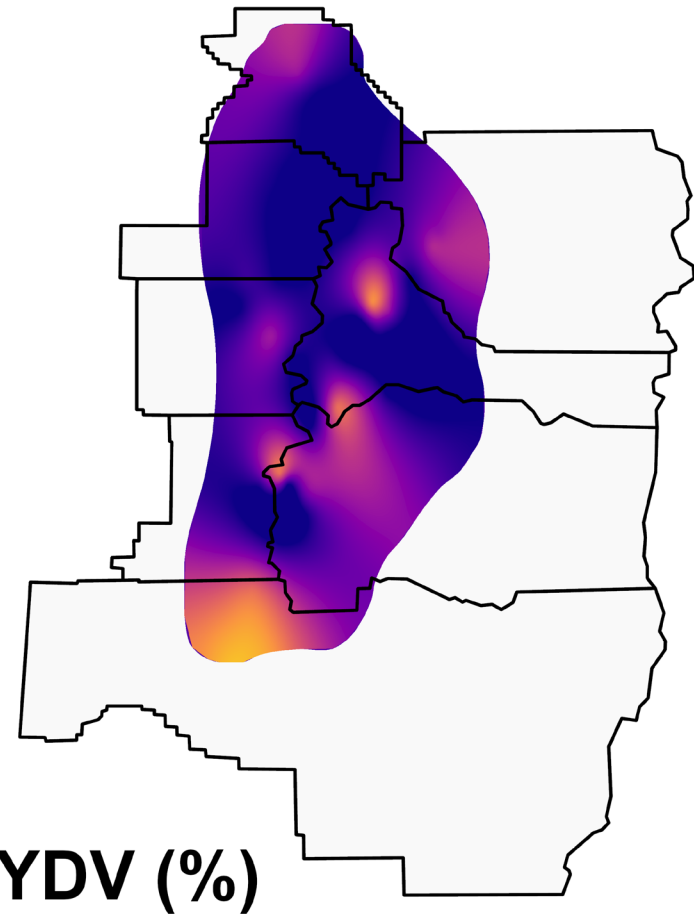
Aphid Collections – Willamette Valley



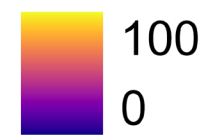
Alate count



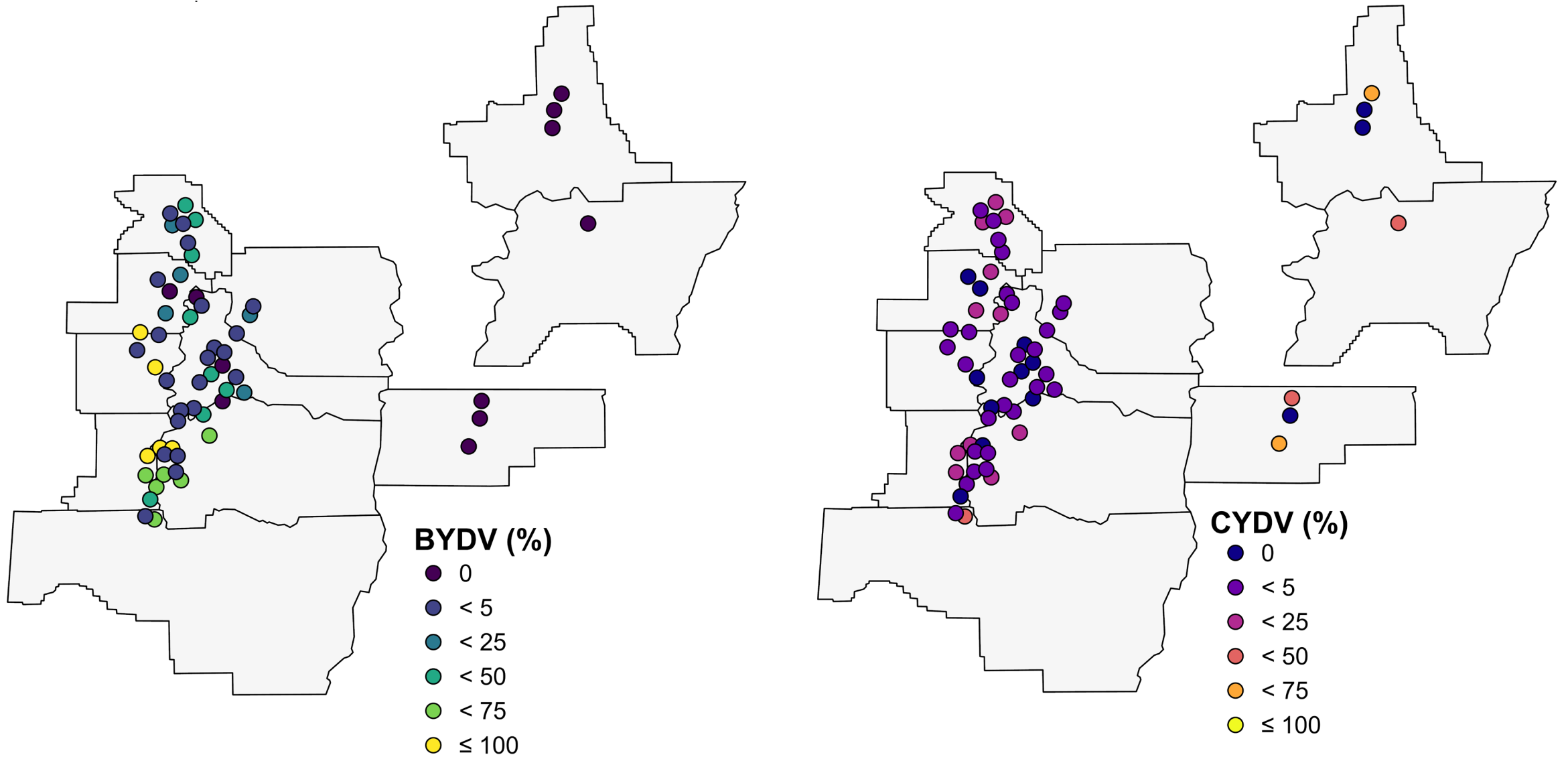
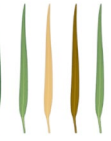
BYDV (%)



CYDV (%)

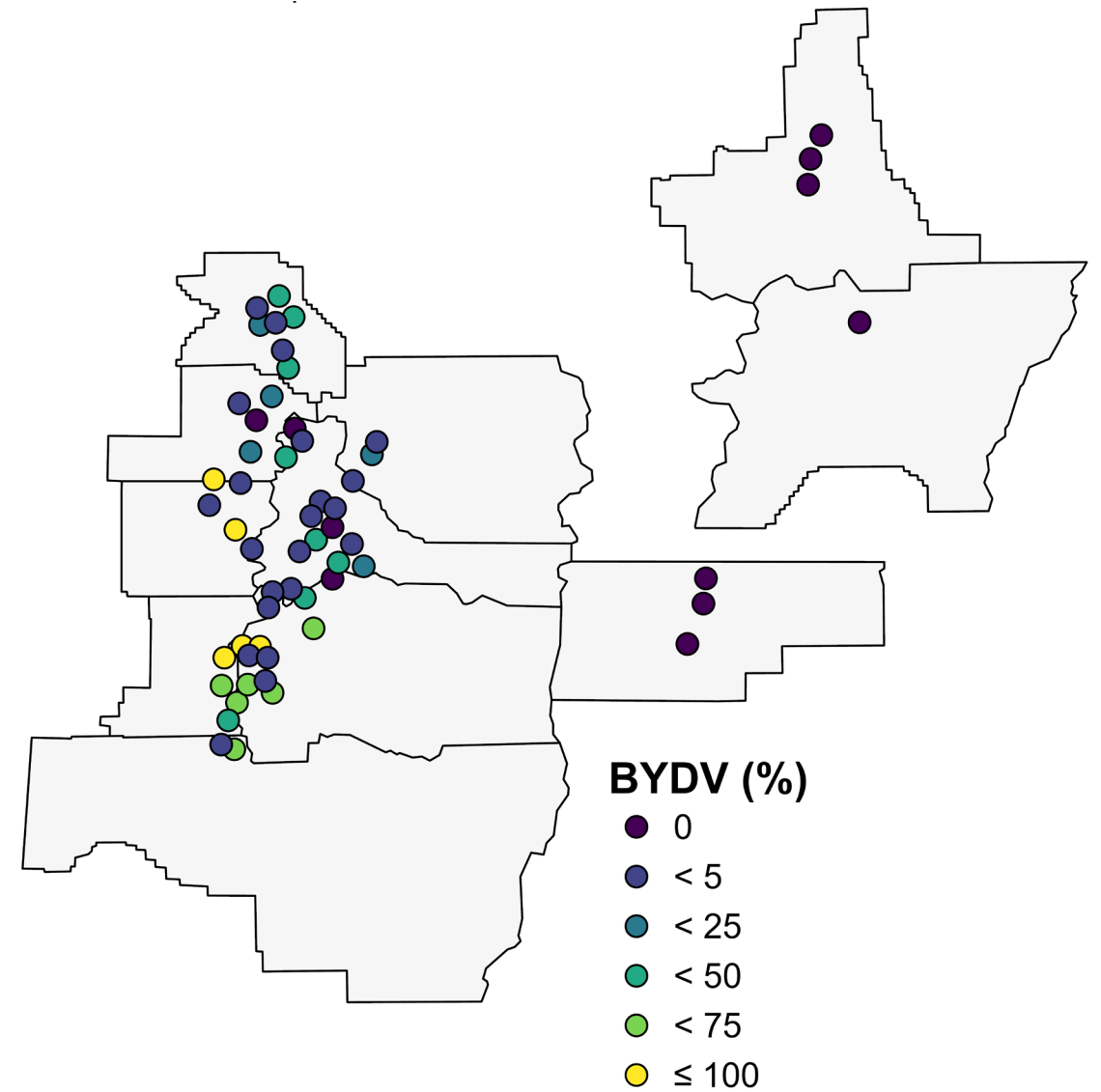


Plant Collections – All Locations



YDV Field Survey Takeaways

- YDVs are widely distributed in OR grass seed production.
- Efforts to sequence YDV species are ongoing
 - Confirmation of 8 species
- Efforts to develop predictive decision aids based on YDV and environmental data underway



Research Questions

- What aphid and YDV species are prominent in Oregon grass seed production and what environmental/management factors contribute to these populations?
- What integrated management strategies can be used to improve YDV control in perennial ryegrass?

Methods

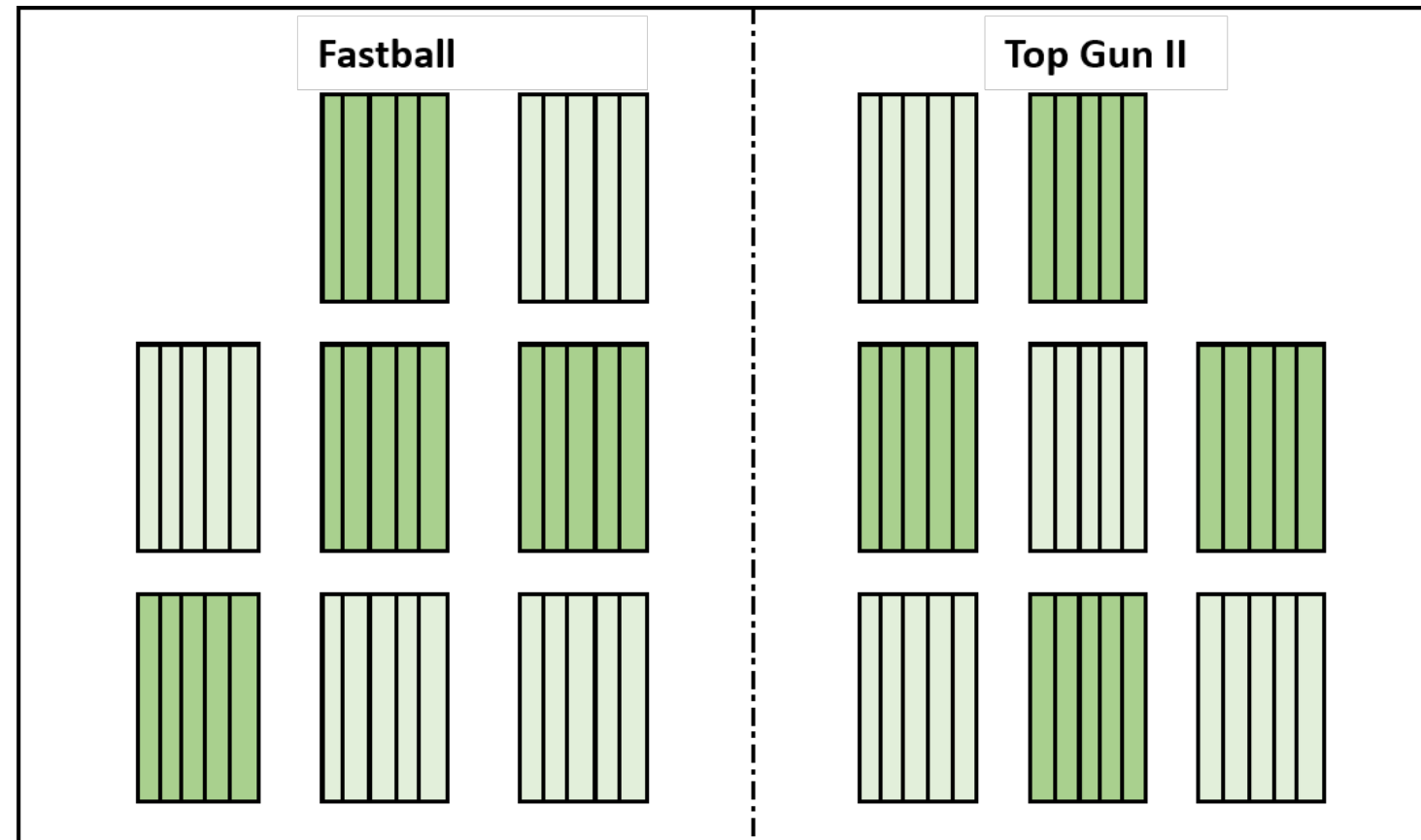
- Field Trial – OSU Research Farm
 - Variety selection, nitrogen rate, insecticide (flupyradifurone) timing
 - Aphid trapping and counting
 - Plant sampling – spring, summer, autumn, winter
- PCR analysis of both aphids and plants
- Maintain for at least 3 years
- Compare treatments to disease incidence, aphid abundance, seed yield, economic return

Nitrogen Rates

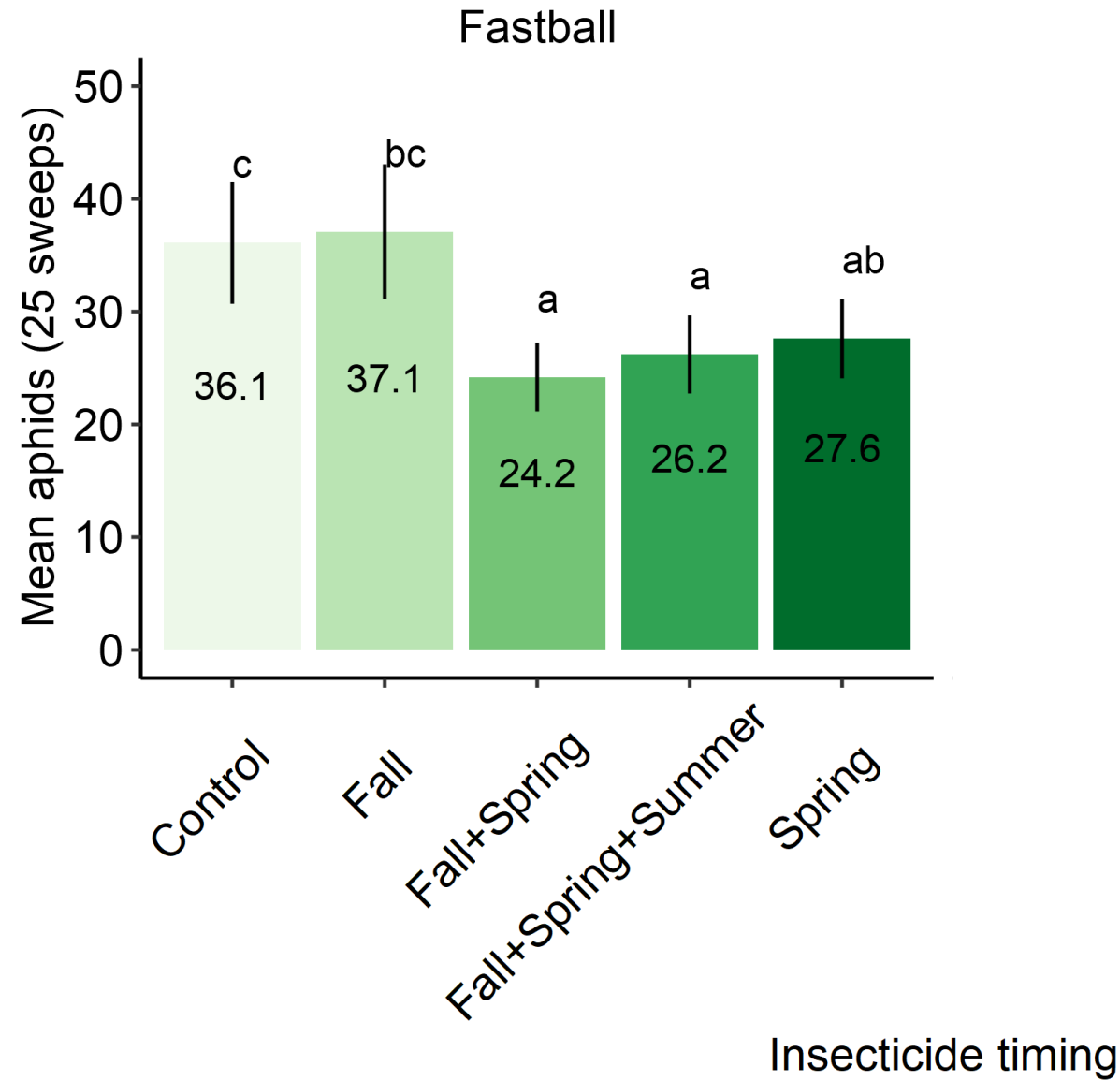
- 120 lb N/ac
- 200 lb N/ac

Split-plot Treatments

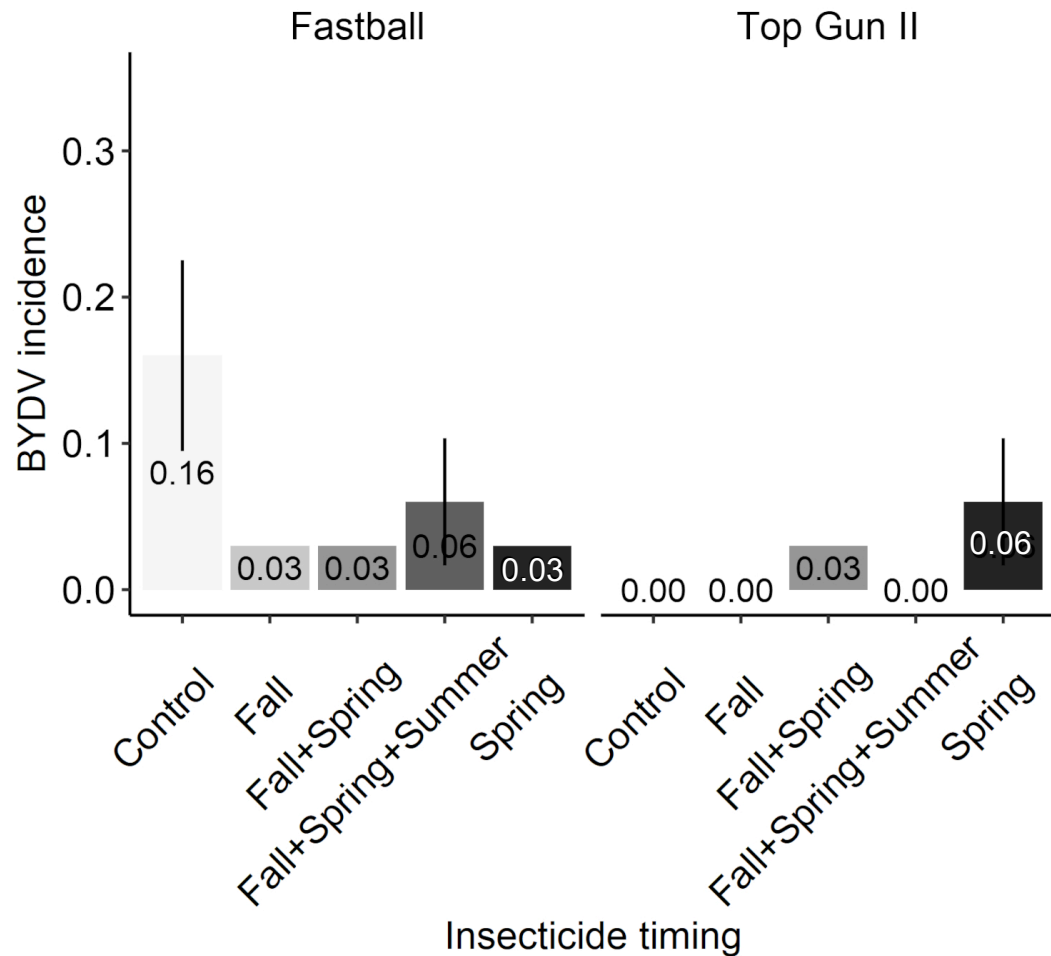
1. Control
2. Fall
3. Spring
4. Fall + Spring
5. Fall + Spring + Summer



Preliminary Results - Insecticide Timing

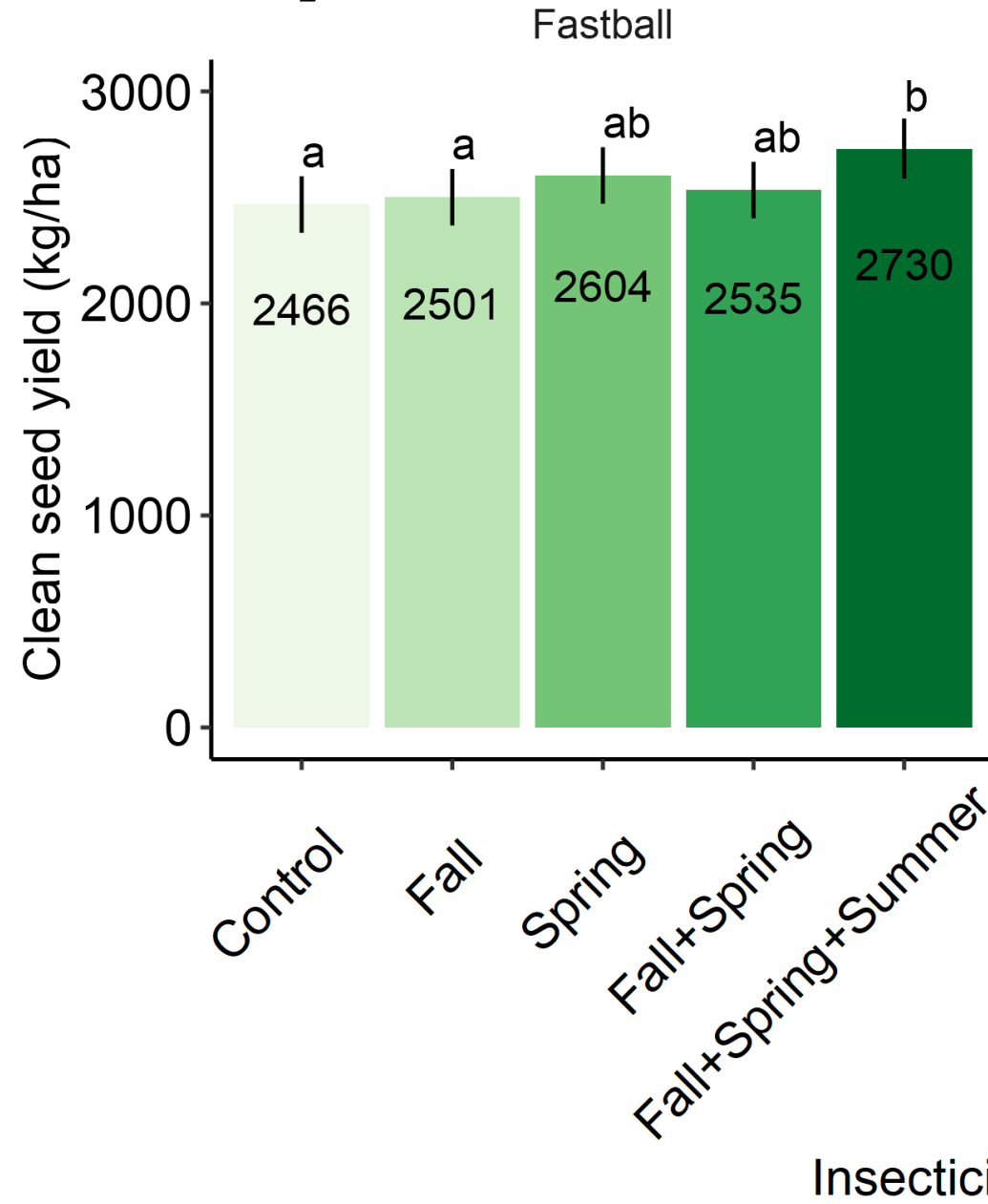


Preliminary Results - Insecticide Timing

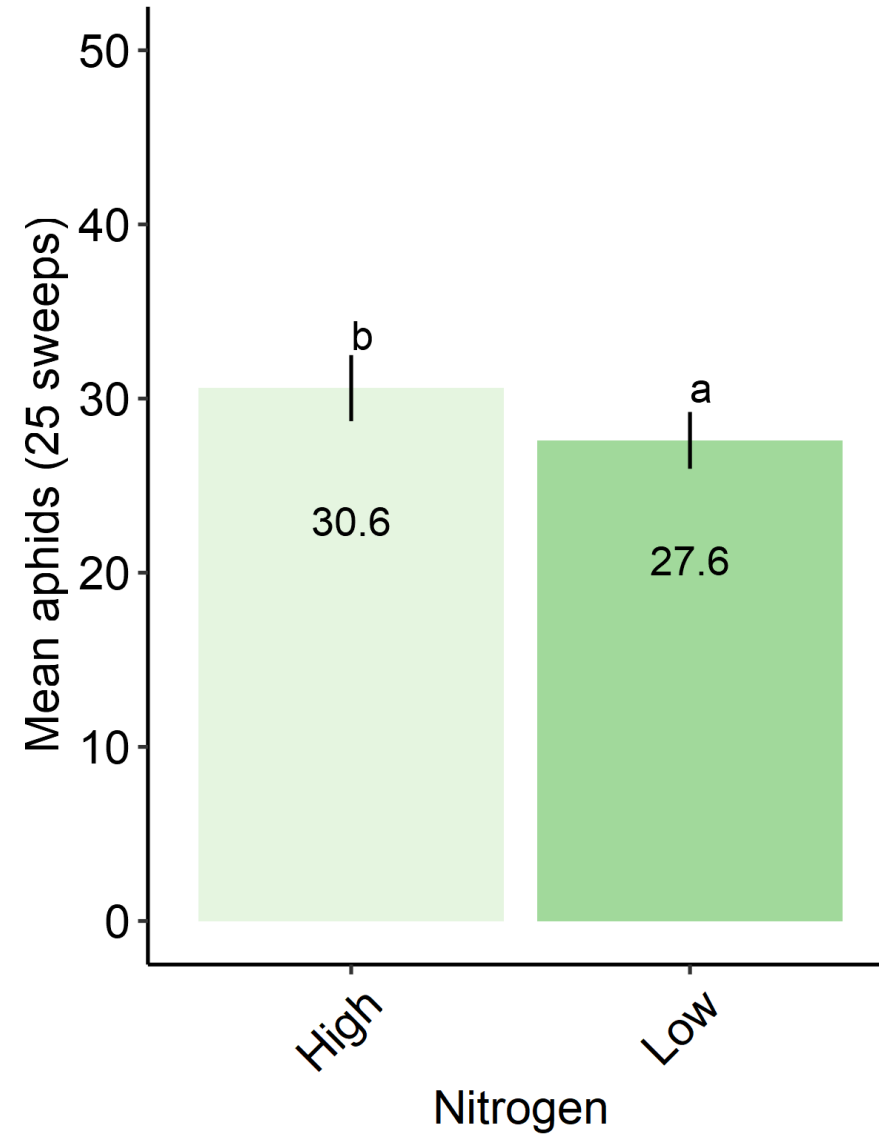


Higher incidence of BYDV in Fastball, and in untreated control
Higher incidence of CYDV in Top Gun II

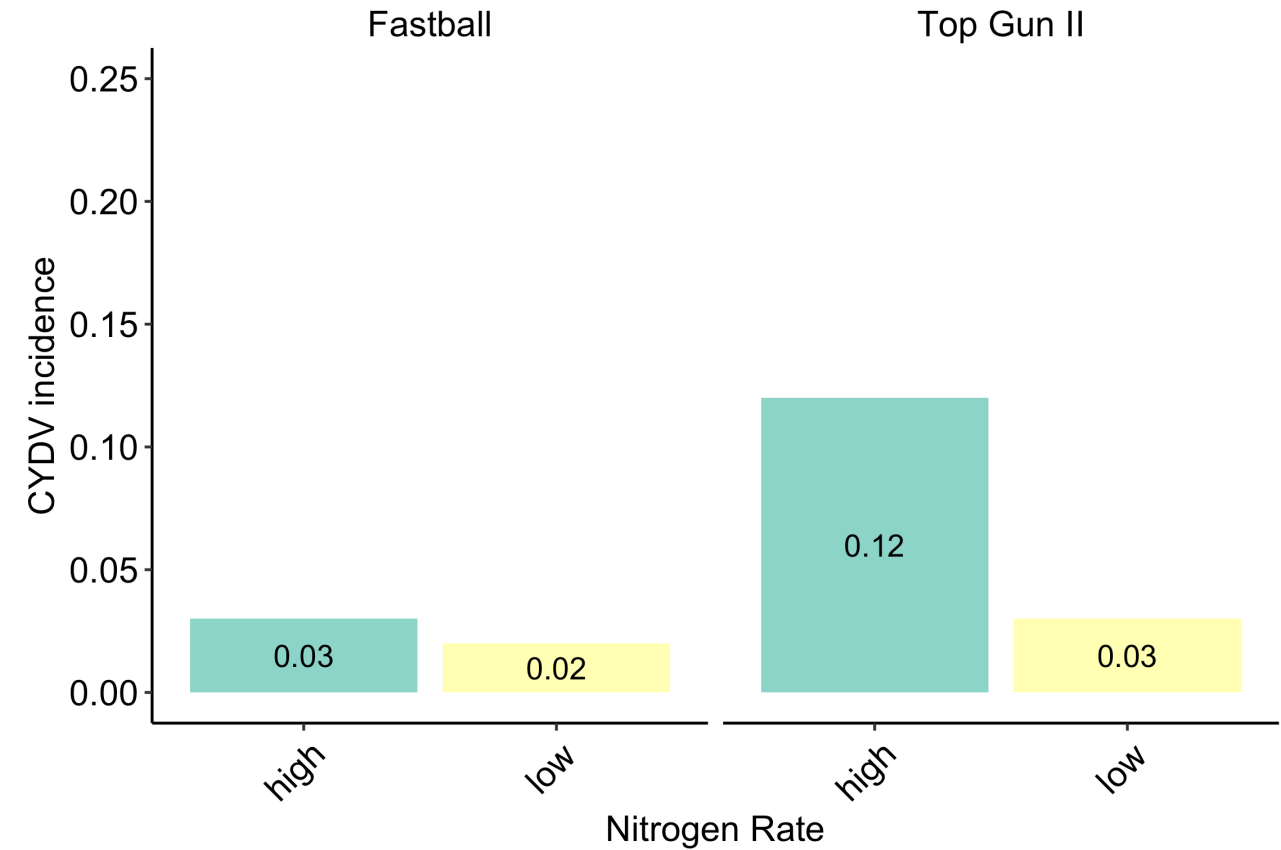
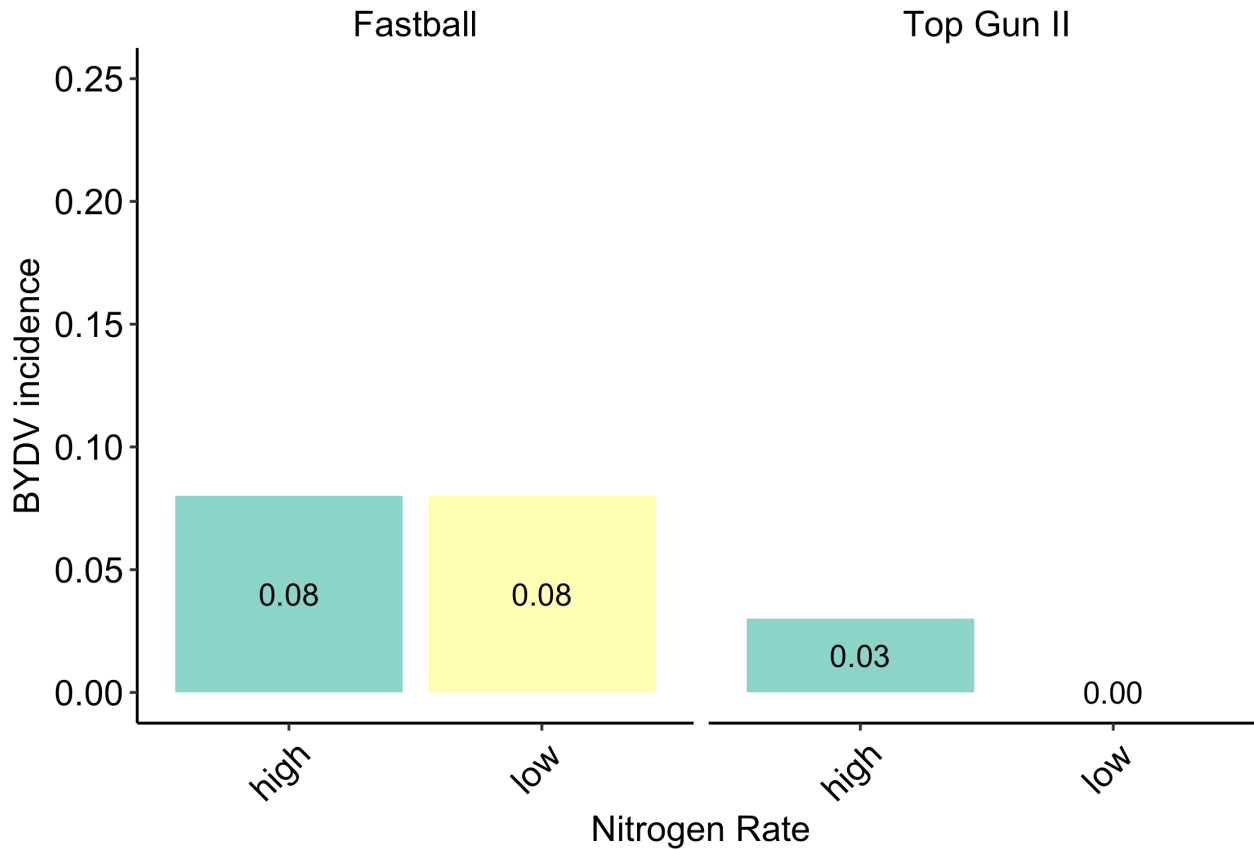
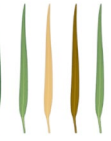
Preliminary Results - Insecticide Timing



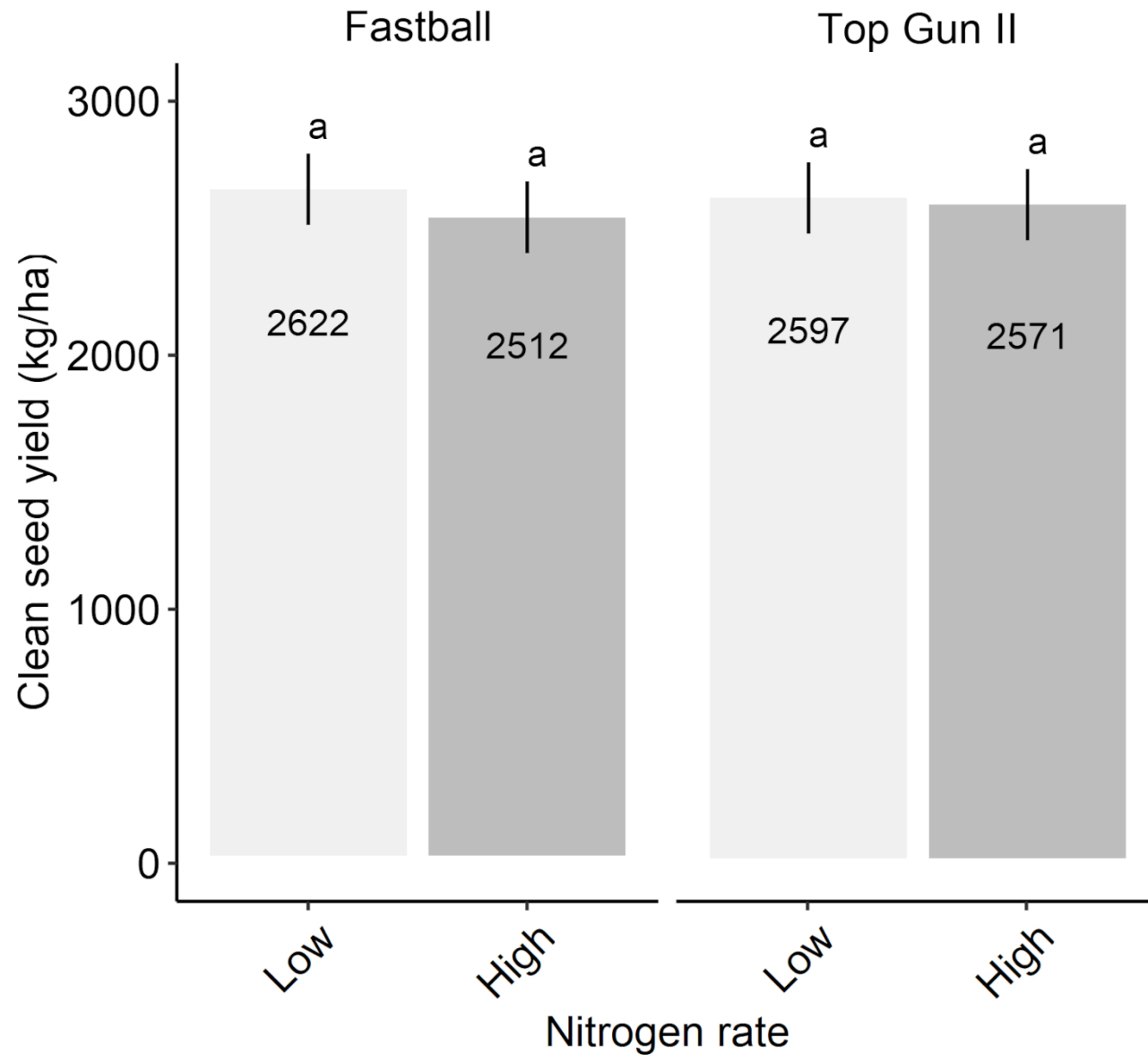
Preliminary Results – Nitrogen Rate



Preliminary Results – Nitrogen Rate



Preliminary Results – Nitrogen Rate



No statistical difference, numerically higher yield at low N rate in first year perennial ryegrass

Takeaways

- Depending on variety, foliar insecticide sprays in fall or spring of first-year perennial ryegrass stands may provide protection from YDV transmission
- Lower nitrogen is associated with lower YDV incidence and no yield loss in first year stands
- Impacts on yield and overall cost of management programs over time still under evaluation



Future Directions

- Continued field trial data collection, analysis
- Evaluation of individual virus species against grass varieties – aphid preferences and host response
- Molecular analysis of virus species to improve detection methods



Acknowledgments

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**AGRICULTURAL
RESEARCH FOUNDATION**

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Thank you! Questions?

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