

A diagnostic assay to detect the Phomopsis stem canker pathogens



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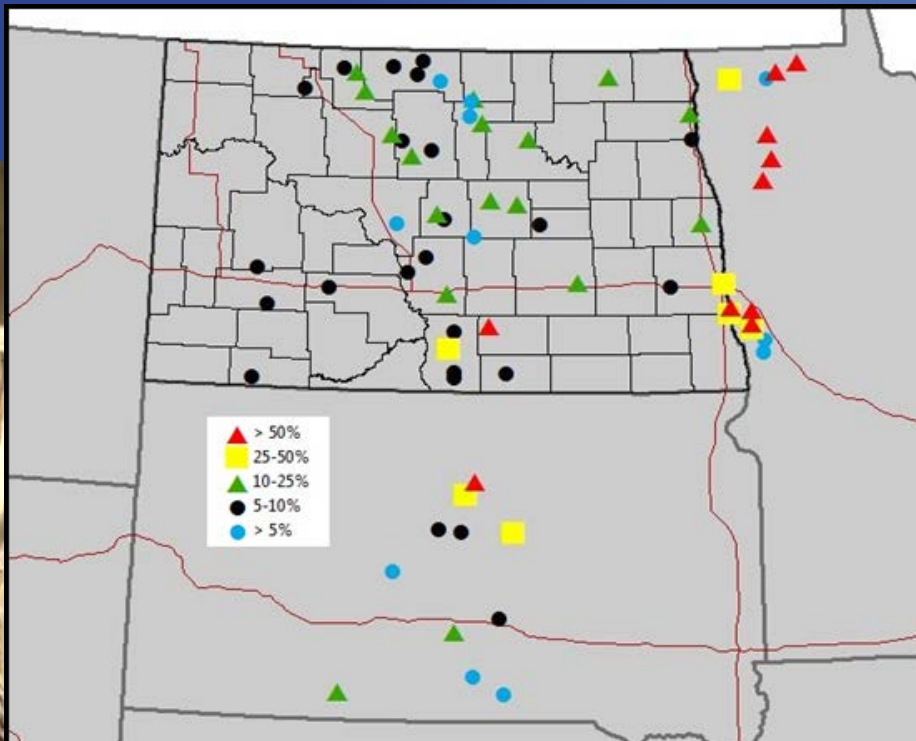


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Impact of Phomopsis stem canker

- In 2010, Phomopsis stem canker epidemic occurred in the Northern Great Plains.
 - Isolated fields had disease incidence of $>50\%$ and yield losses up to 40% (Mathew et al. 2015).

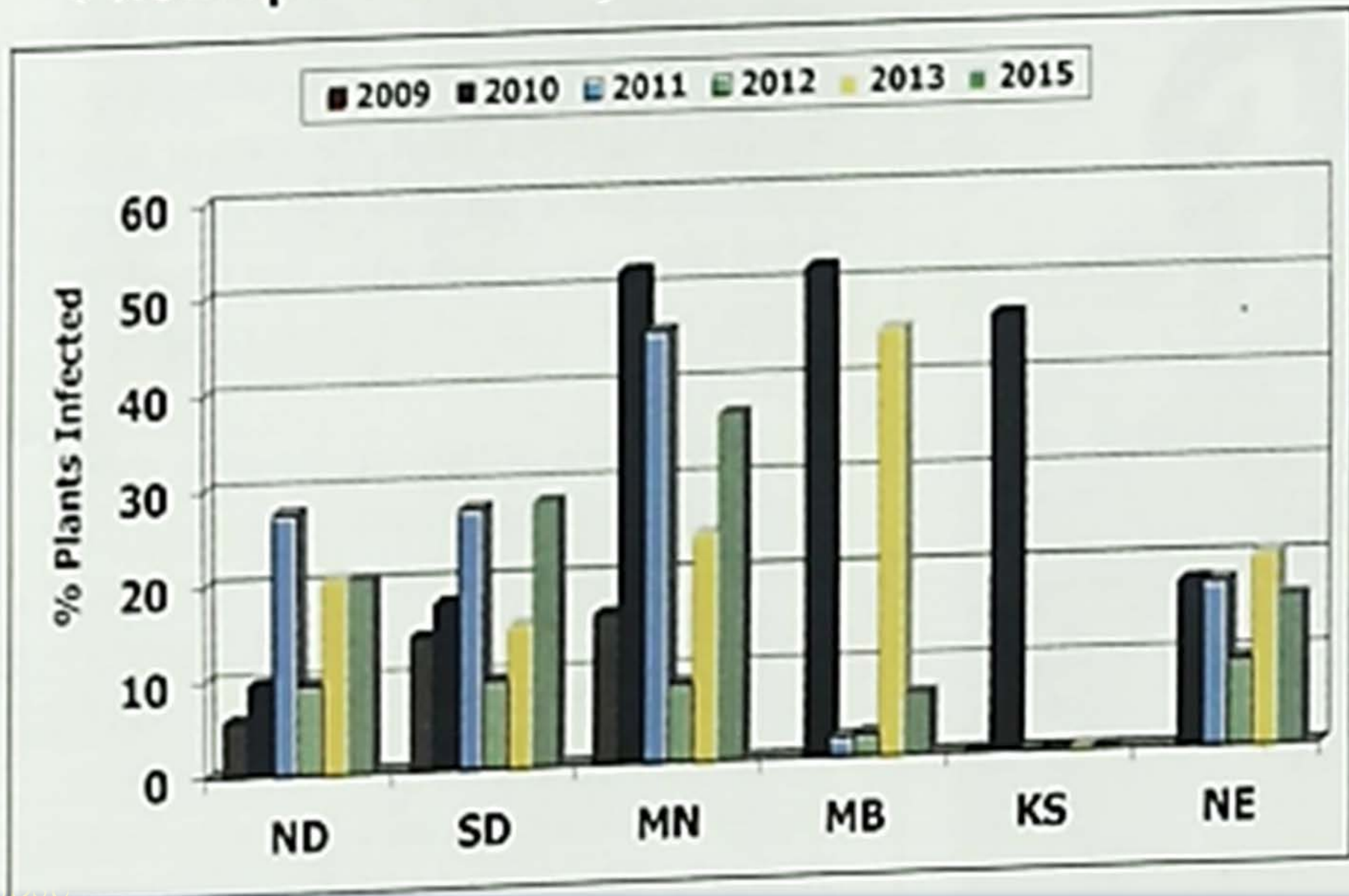


Phomopsis stem canker in 2015

- Phomopsis stem canker was among the top three diseases in 2015.
 - Found in 61% of surveyed fields
 - Incidence ranged from 40% in Texas to 100% in MN and Manitoba (Canada)



Phomopsis Severity in Sunflower, 2009-2015



Symptoms - Phomopsis stem canker



Light
brown/tan
lesion



Pith degradation



Lodging



Wilting



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Research objectives

- Develop and validate a diagnostic assay to detect Phomopsis stem canker pathogens.
- Screen germplasm for resistance to *D. helianthi* and *D. gulyae* using diagnostic assay



Diagnostic Assay

- Quantitative Polymerase Chain Reaction (qPCR)
- Identifies causal agent of Phomopsis stem canker
- Similar to DNA profiling



Screening for resistance

- 288 Plant Introduction lines screened in a preliminary field trial (Feng et al. 2015).
- 54 lines chosen for greenhouse screening.
- *Diaporthe helianthi* and *Diaporthe gulyae* isolates from SD were used.
- A completely randomized design was adopted
 - Six replications est. for each accession.
 - Stem wound method (Mathew et al. 2015)
 - Disease assessed after 14 days
 - Experiment replicated three times







Disease Rating



0: No discoloration



1: low level discoloration



3: necrotic lesions 2–5 mm, leaf wilting and twisting



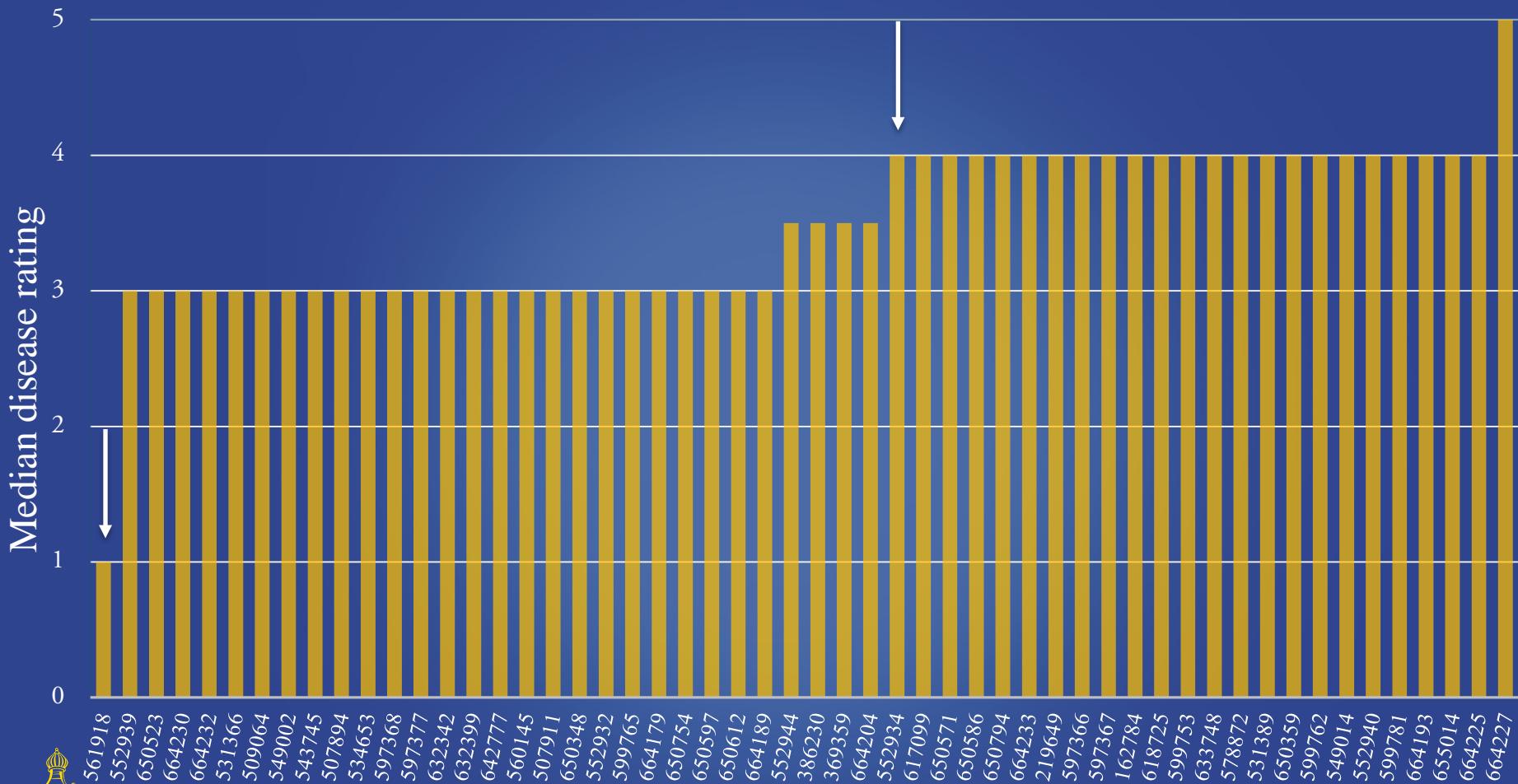
5: very severe necrosis and lesions, or plant death



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(Scale from Mathew et al. 2015 and Thompson et al. 2011)

Phomopsis stem canker ratings of sunflower PI lines





HA 378

Summary

- HA 378 (PI 561918) showed resistance to *Diaporthe gulyae* and *Diaporthe helianthi*.
- Resistance will be confirmed using diagnostic assay



Future work

- Diagnostic assay will be used to
 - Identify the causal pathogen from the sunflower field samples
 - evaluate fungicide efficacy



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