

Resistance to *Phomopsis* Stem Canker in Cultivated Sunflower – 2011 Field Trials

Tom Gulya, Sue Thompson
and Mal Ryley
USDA-ARS, Fargo ND
DEEDI, Toowoomba, AU



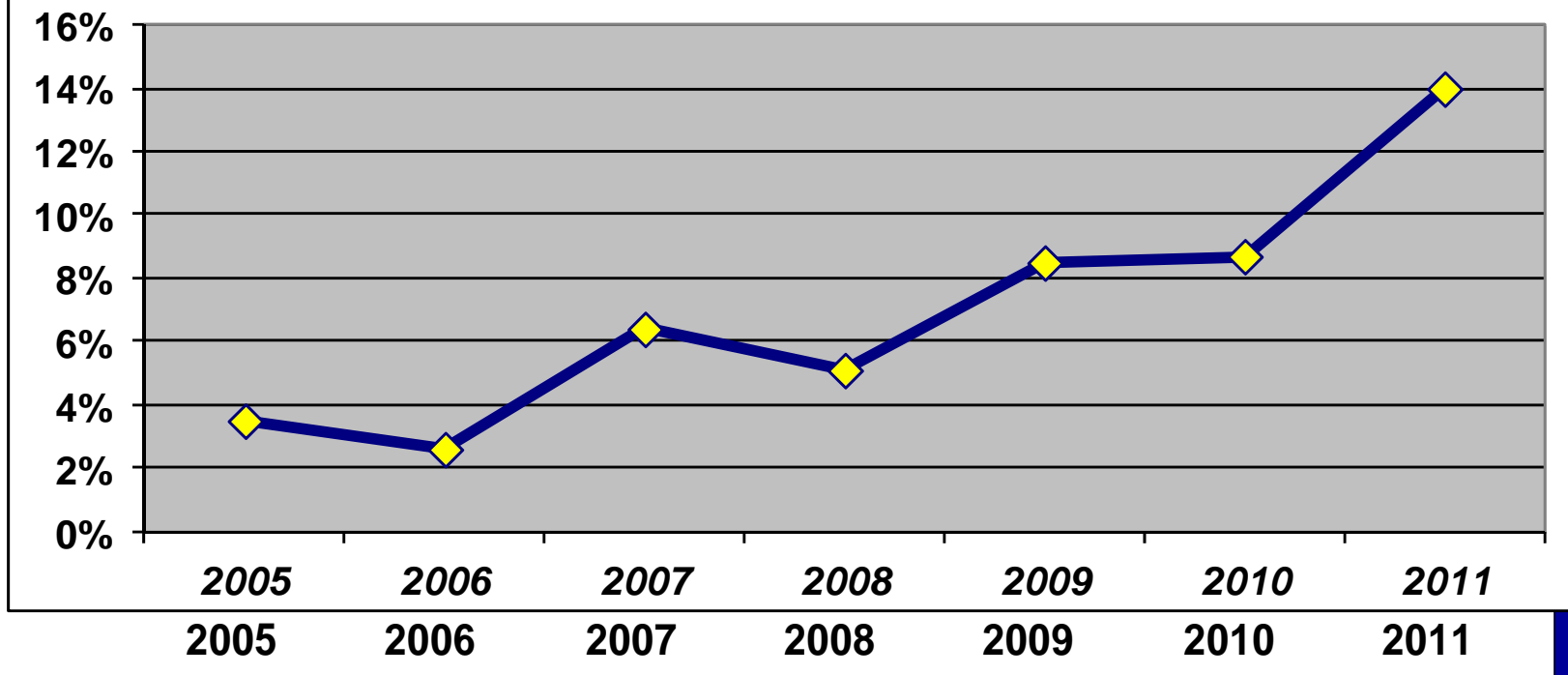
Acknowledgements -

- NSA – funding
- Seed companies (CHS, Croplan, Mycogen and Seeds2000) for plot land and maintenance
- Seed companies – participating in hybrid evaluations
- USDA technicians

Phomopsis Increasing in U.S.

Phomopsis Incidence in U.S. Sunflower Fields

Phomopsis Severity in U.S. Sunflower Crop



Objectives

- Search for resistance in cross-section of USDA Plant Introduction collection
- Data to be used in association mapping project
- Evaluate U.S. commercial hybrids & compare with *Phomopsis* resistant hybrids from Novi Sad program (Serbia)

Methodology

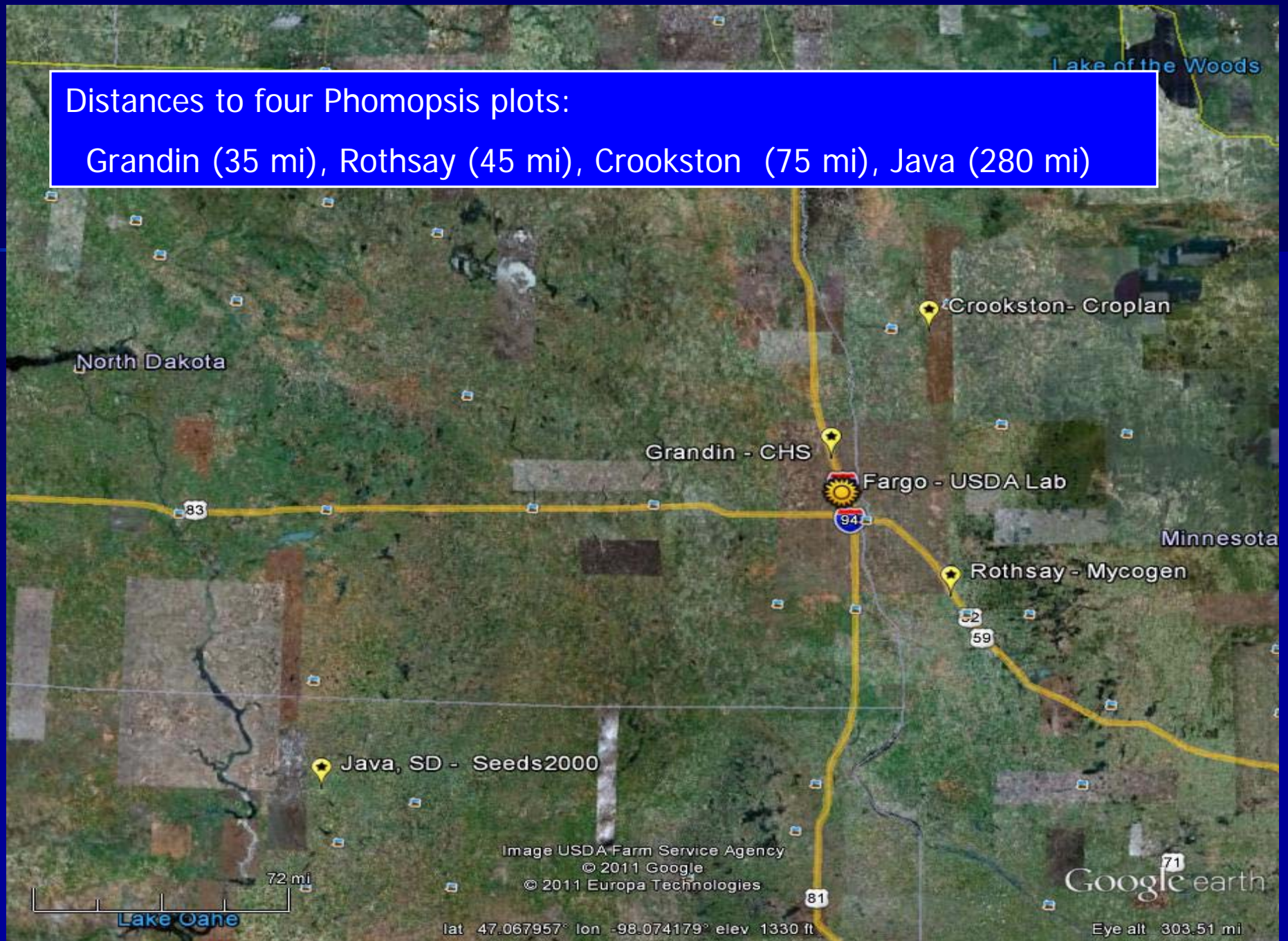
- Test sites located in Red River Valley (Crookston, Grandin, Rothsay) and one in north-central SD.
- All four locations relying on natural infection and dryland conditions
- In total – 8 single rows replications of PIs. Hybrids planted at 3 locations, 4 reps each.

Methodology

- Plant stands counted once, at maturity
- Phomopsis infected plants rated once, in late September (any # of lesions)
- Disease severity expressed as % infected plants.
- Three pathologists rated all three trials.

Distances to four Phomopsis plots:

Grandin (35 mi), Rothsay (45 mi), Crookston (75 mi), Java (280 mi)



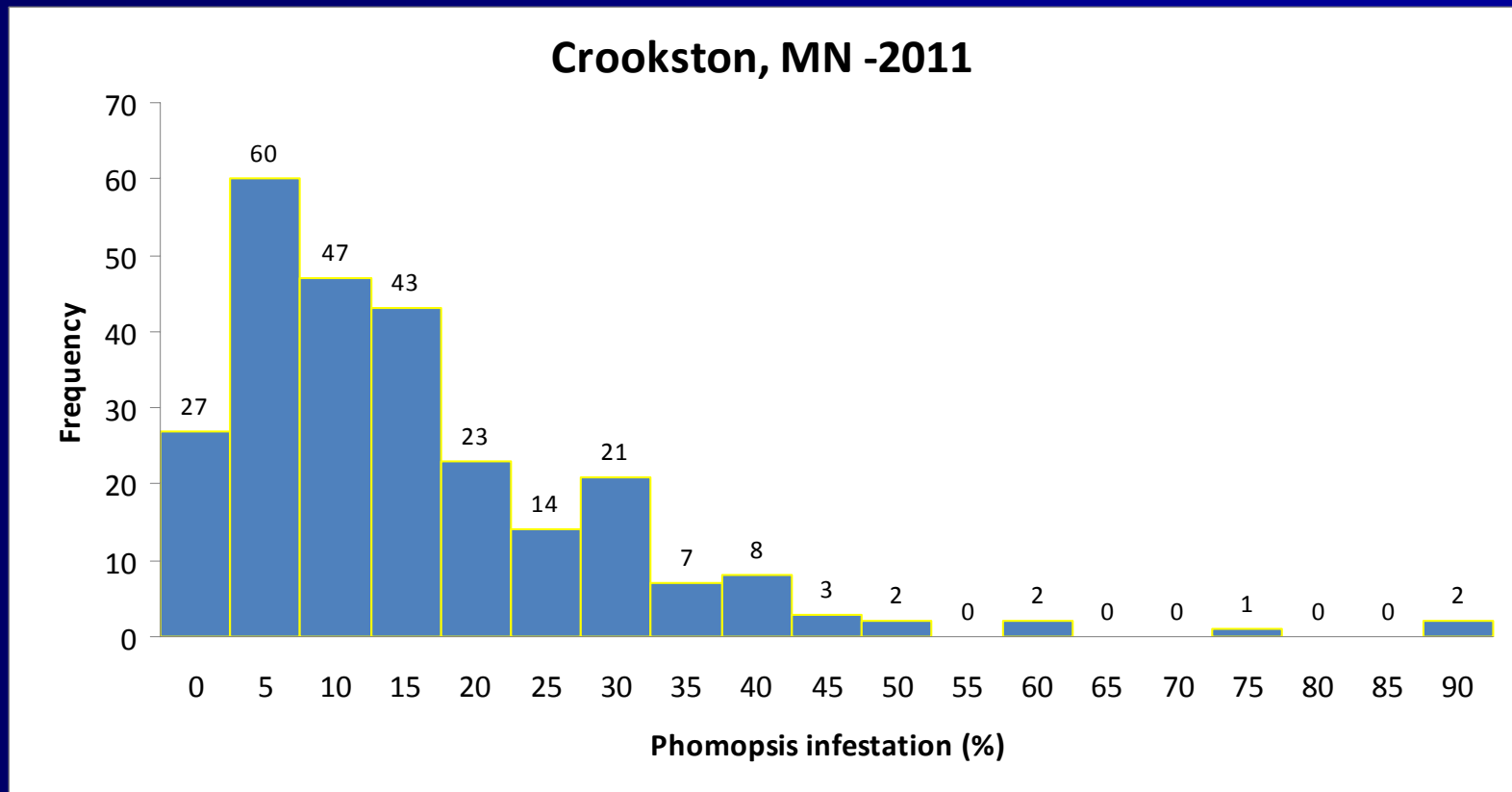


Phomopsis Stem Lesions – 2011 - August

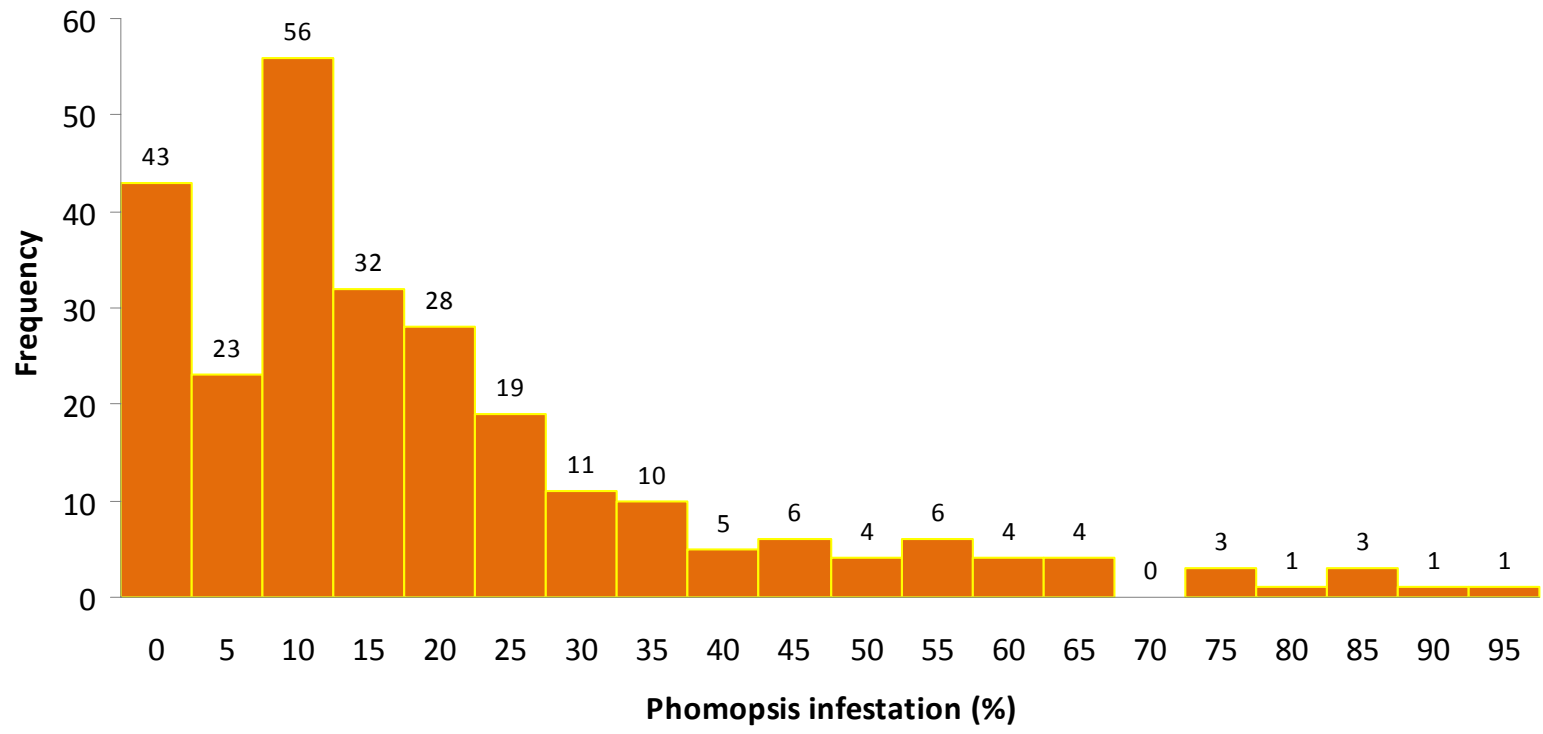


Note how when lesion enlarges (2 stems on right) the stems collapse and lodge (as the pith is destroyed and the stem becomes hollow).

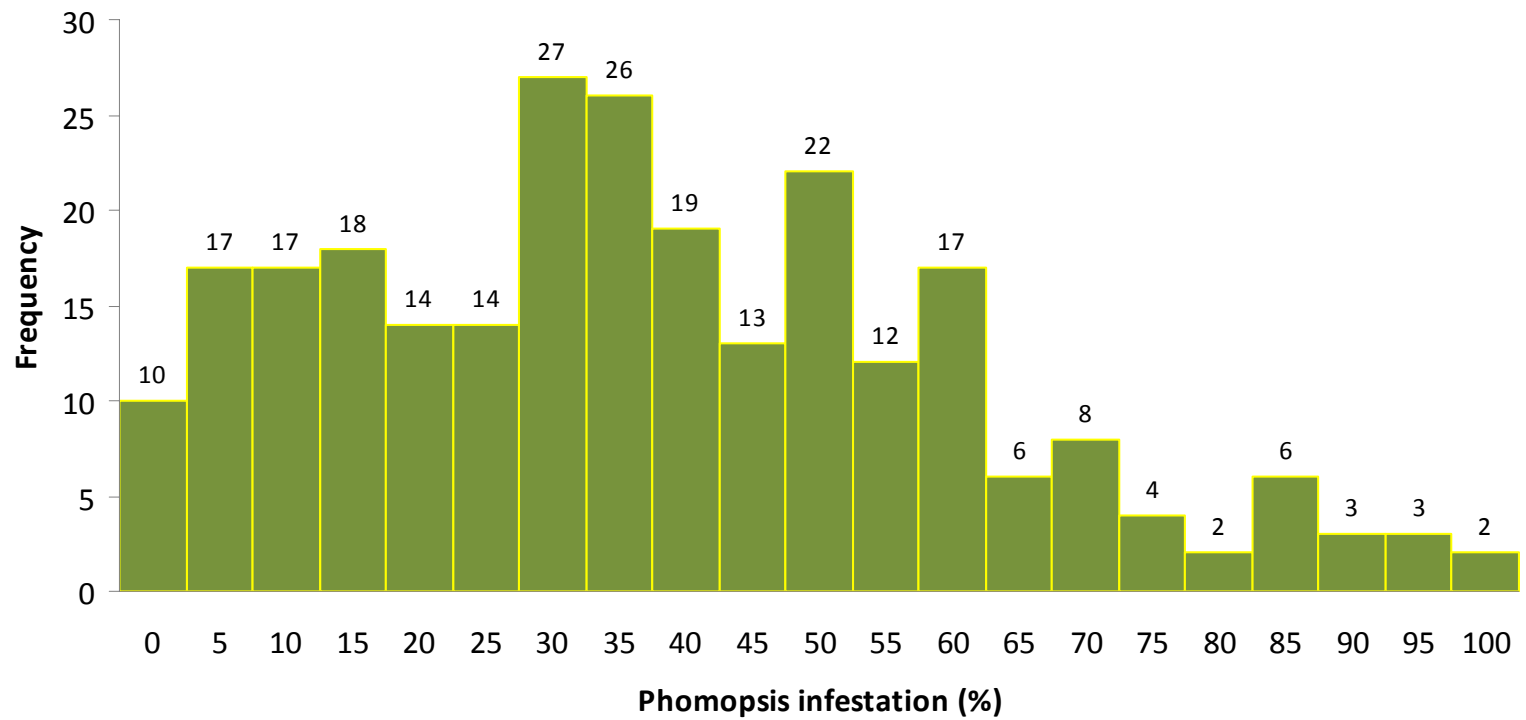
Histograms of PI Ratings at three 2011 test plots



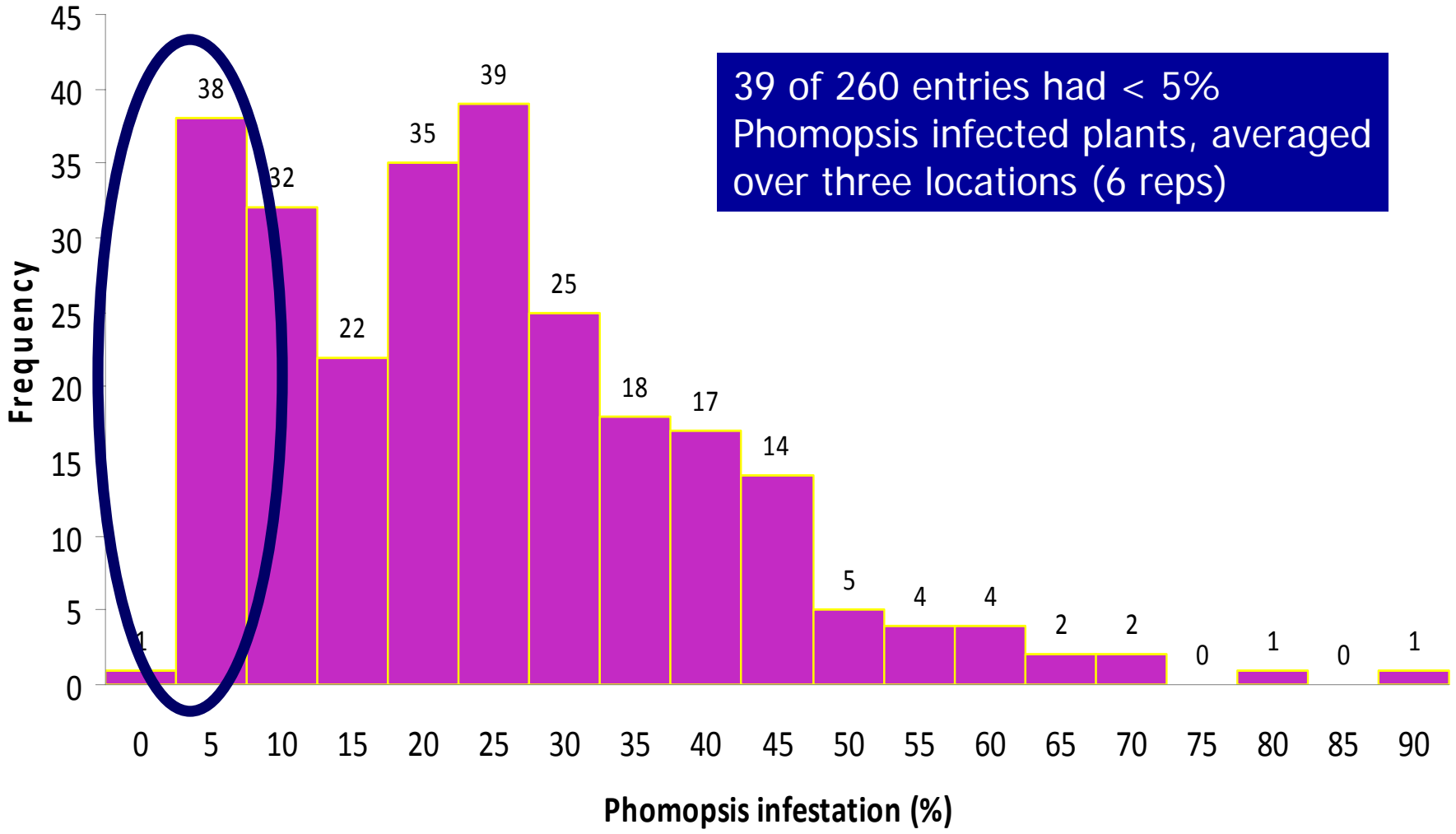
Rothsay, MN -2011



Java, SD - 2011



Three locations mean



Most Resistant Cultivated Plant Introductions -



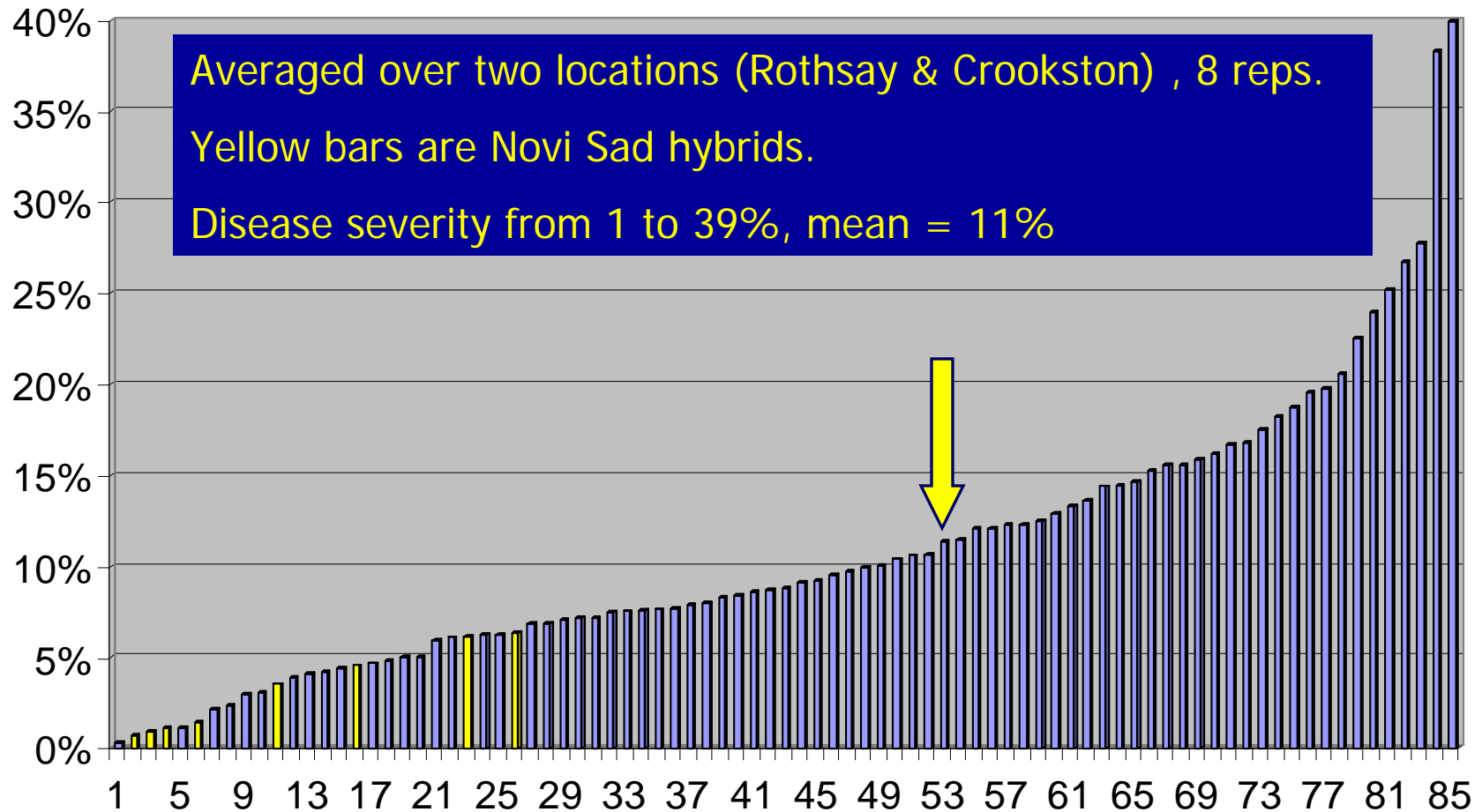
Examples of stem lesions observed



Commercial hybrids

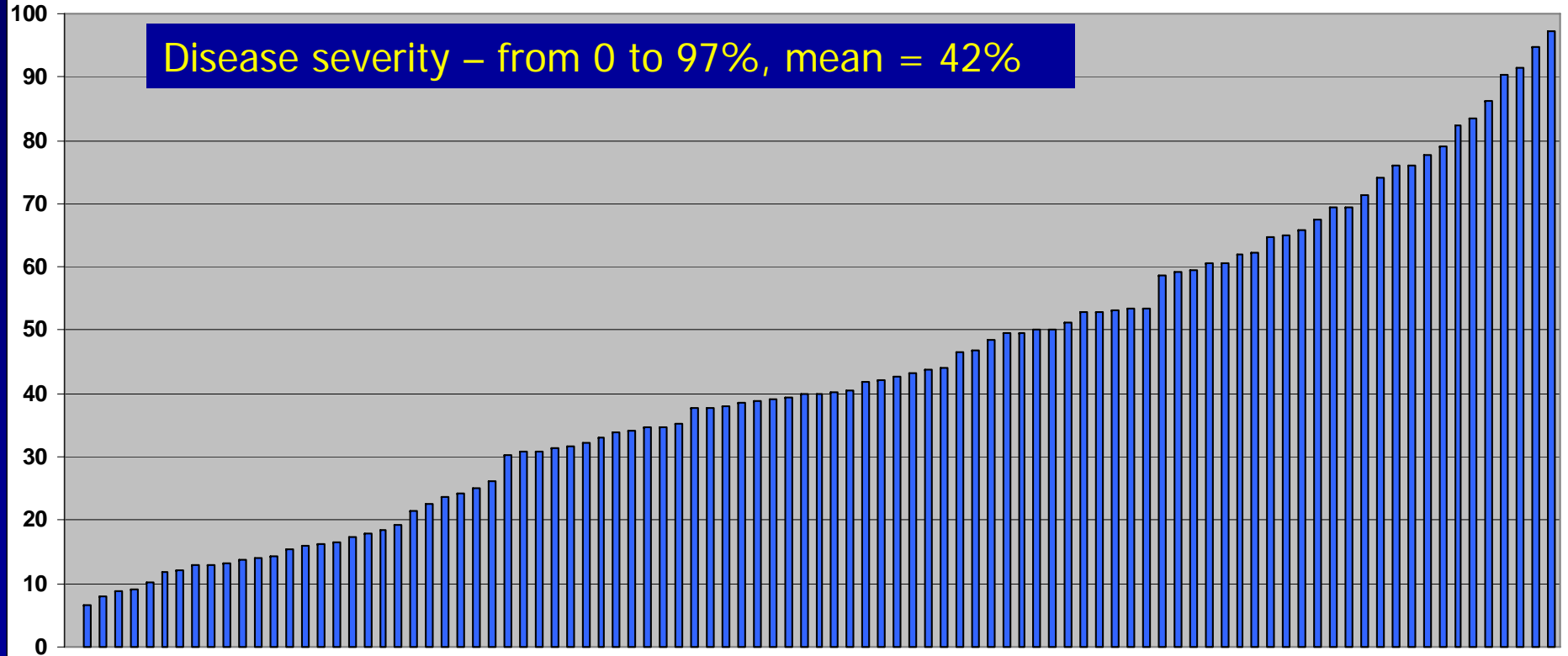
- Seven companies submit entries, for a total of 72 entries + 10 hybrids from Novi Sad, Serbia.
- Each company requested to have 2 released hybrids, along with experimentals.
- Oilseed and confection hybrids included.

Commercial Hybrids – Phomopsis ratings - 2011



Commercial Hybrids – Phomopsis ratings – *2010*

2010 Ada MN Phomopsis Severity on 100 Sunflower Hybrids



Hybrids most resistant to Phomopsis stem canker -

- Five NS-hybrids in top ten.
- Entries from Seeds2000, CHS, Mycogen, Triumph and Croplan with < 5% infection.

Phomopsis species present -

- Based on morphological and DNA sequence analysis, all three locations predominantly had *Phomopsis helianthi*.
- Ms. Febina Mathew, NDSU PhD student funded by NSA, is continuing her analysis of *Phomopsis* isolates from across the U.S. production area to determine which other *Phomopsis* species may be present in the U.S.

Conclusions

- In 2011, we succeeded in having natural infection at 3 of 4 locations, all of which had the same *Phomopsis* species.
- Disease severity was less than observed in 2010, primarily due to drier weather.
- Entries with high levels of resistance were observed both within USDA public germplasm and commercial hybrids.

Conclusions – 2

- An effective *Phomopsis* field screening program would benefit from artificial inoculation.
- Association mapping & SNPS on the 260 USDA entries will lead to marker-assisted selection for *Phomopsis* resistance.
- *Phomopsis helianthi* was present at all three 2011 locations. We do not know whether these 'resistant' entries would also be resistant to the other *Phomopsis* species recently identified in Australia as sunflower stem pathogens (see Thompson poster).