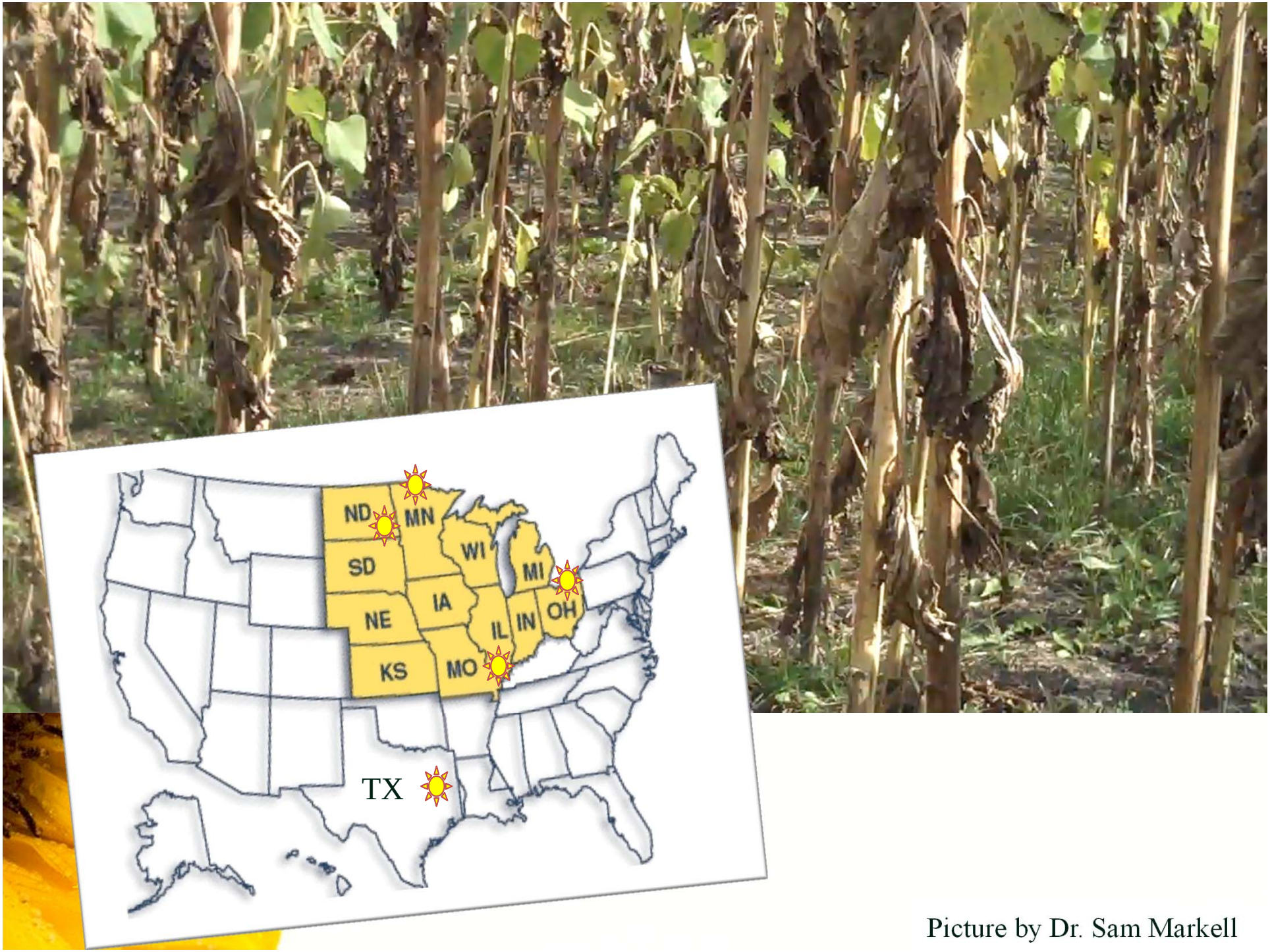
Assessing the Impact of Phomopsis Stem Canker on Sunflower Yield

Febina Mathew[1], Kathy Grady[1], Emmanuel Byamukama[1], Brent Hulke[2], and Sam Markell[3]

South Dakota State University®

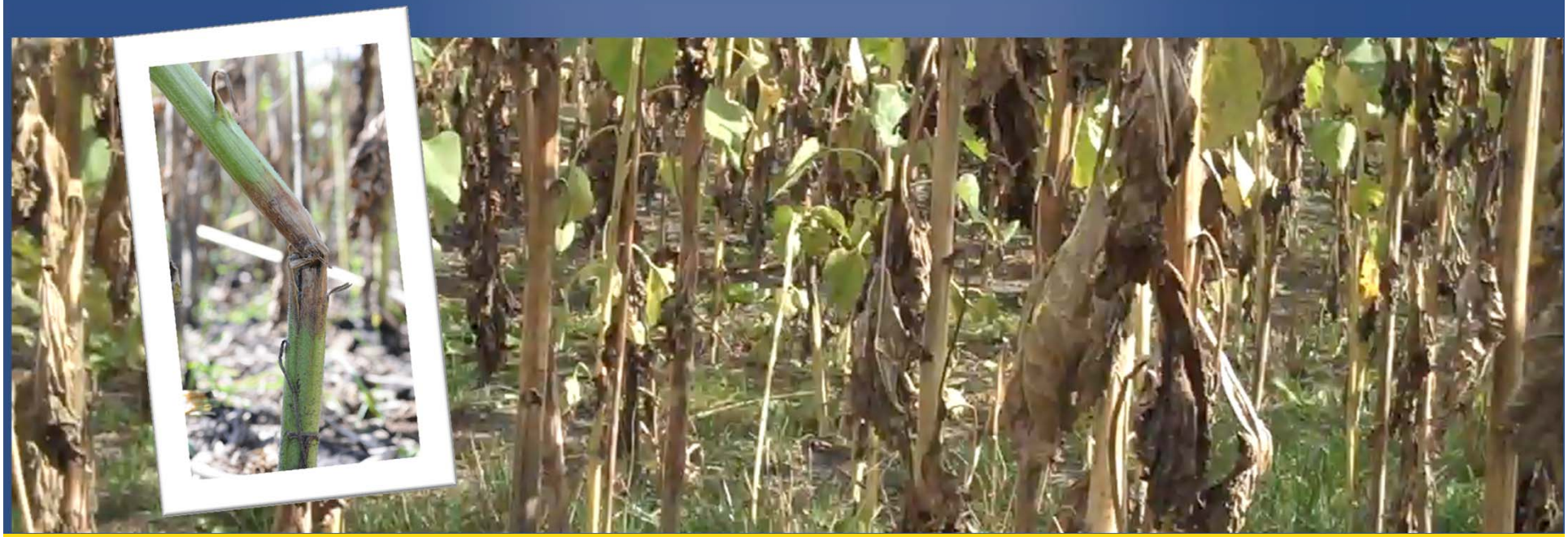
[1]South Dakota State University, Brookings, SD;
[2]USDA-ARS, Northern Crop Science Laboratory, Fargo, ND;
[3]North Dakota State University, Fargo, ND



Picture by Dr. Sam Markell

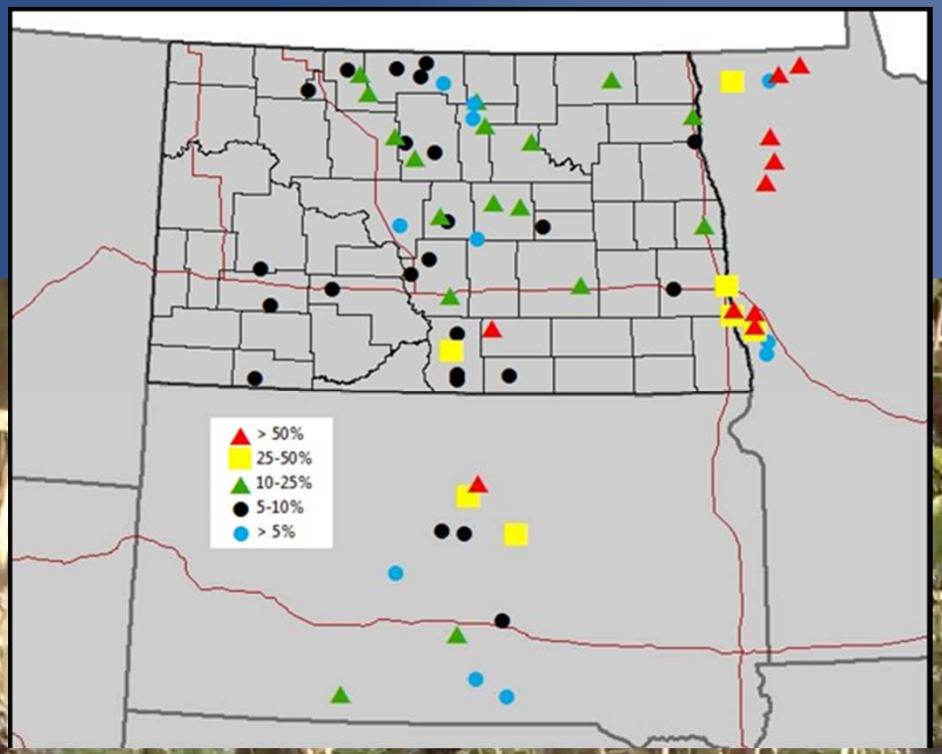
Background

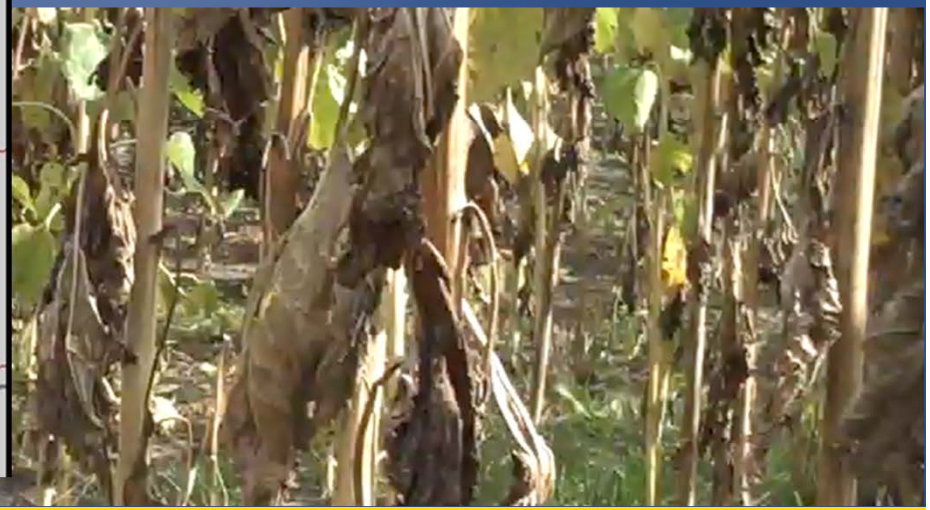
- In Europe, the disease has been one of the primary limiting factors for sunflower production
  - Yield losses up to 50% and losses in oil content >10% have occurred on sunflowers (Masirevic and Gulya 1992, Laville 1986).
- In the U.S., yield losses have been minimal, if occurring at all.



Background

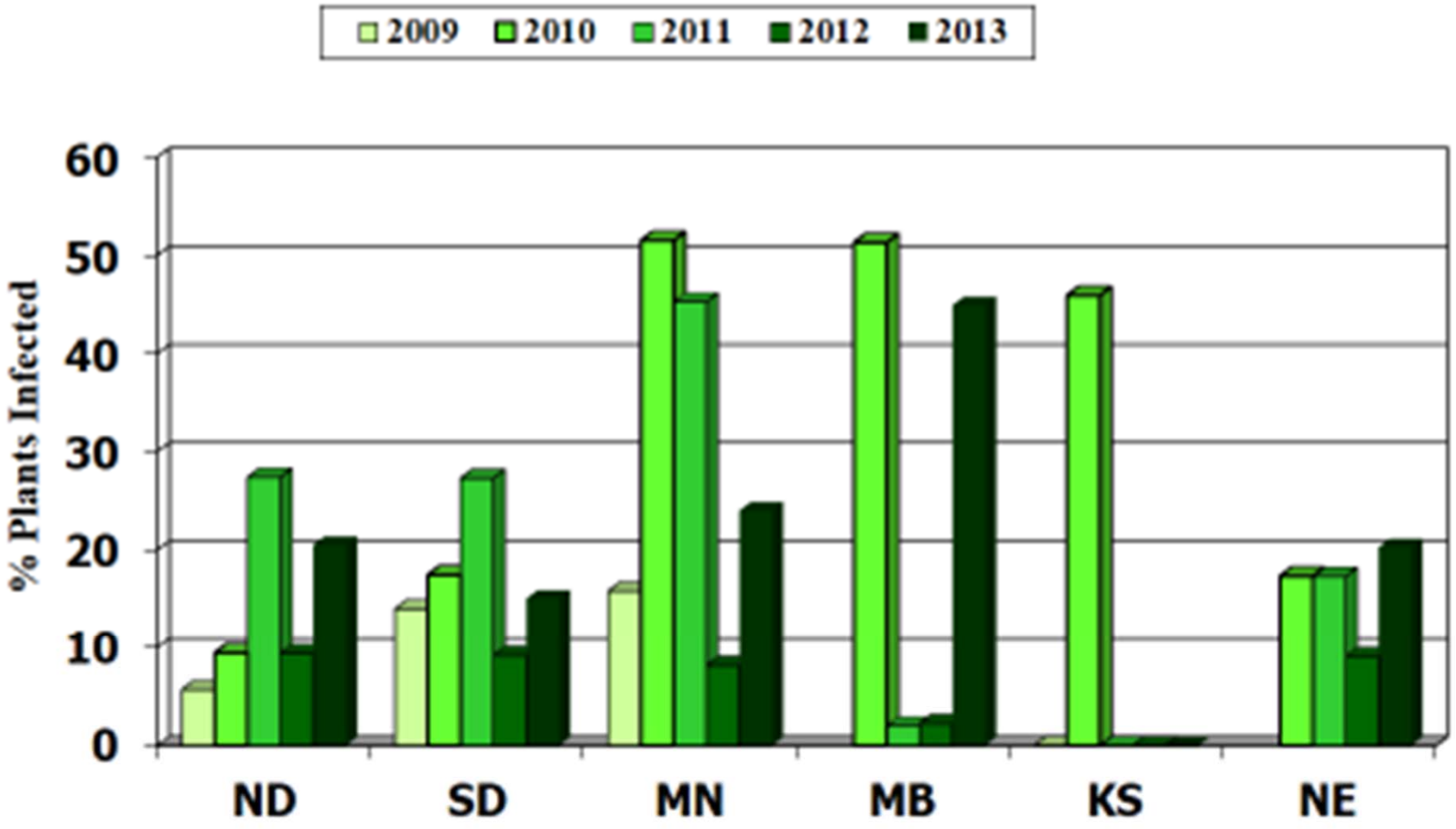
- In 2010, Phomopsis stem canker epidemic occurred in the Northern Great Plains.
  - Isolated fields had disease incidence of >50% and yield losses up to 40%.





2010 NSA survey, Courtesy : Dr. Tom Gulya and Dr. John Nowatzki

Phomopsis Incidence in sunflower fields (2009-2013)



Source: Dr. Hans Kandel, Extension Agronomist Broadleaf Crops, NDSU

Diseases Affect Sunflower Crop

Posted: Oct 22, 2013 10:01 AM CDT

Updated: Nov 05, 2013 10:01 AM CST

“Sunflowers bring a garden to life, b
Phoma Black Stem and Phomopsis s
down”- (www.kfyrtv.com)

Dakota FARMER

Phomopsis Stem Canker Rears Head In Sunflower

Ruth Beck, SDSU Extension Specialist, 2014

Phomopsis stem canker in sunflower is back, says Ruth Beck, SDSU Extension agronomy field specialist.

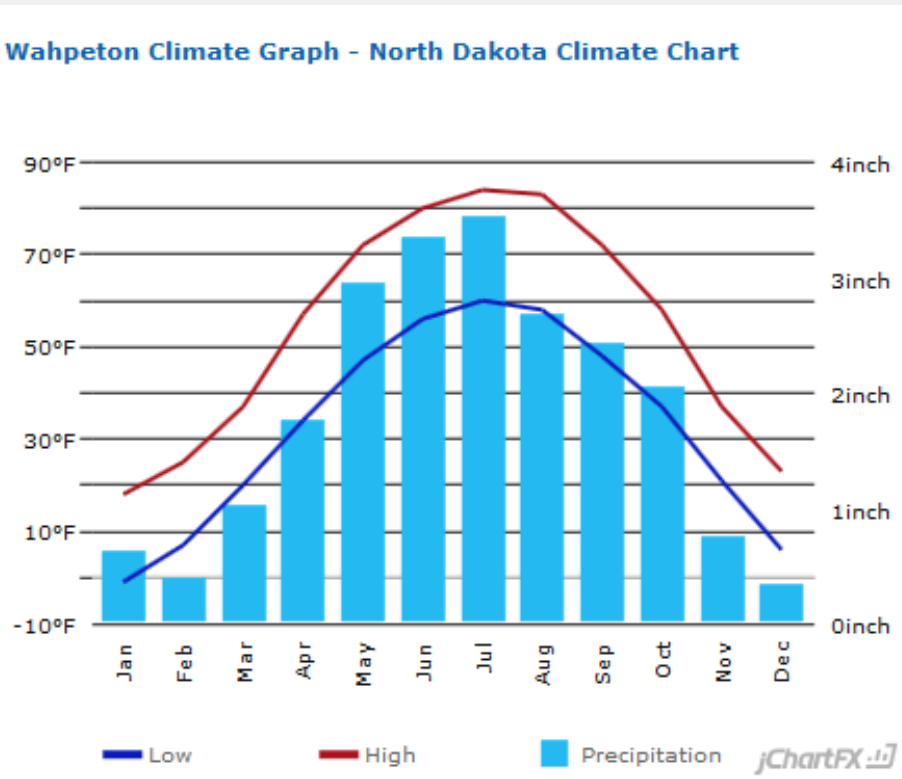
Disease cycle

Summer

Relative humidity =90%
Temperatures = 21 to 26°C
Rainfall from budding (in early June) to flowering (July)

Spring

Winter

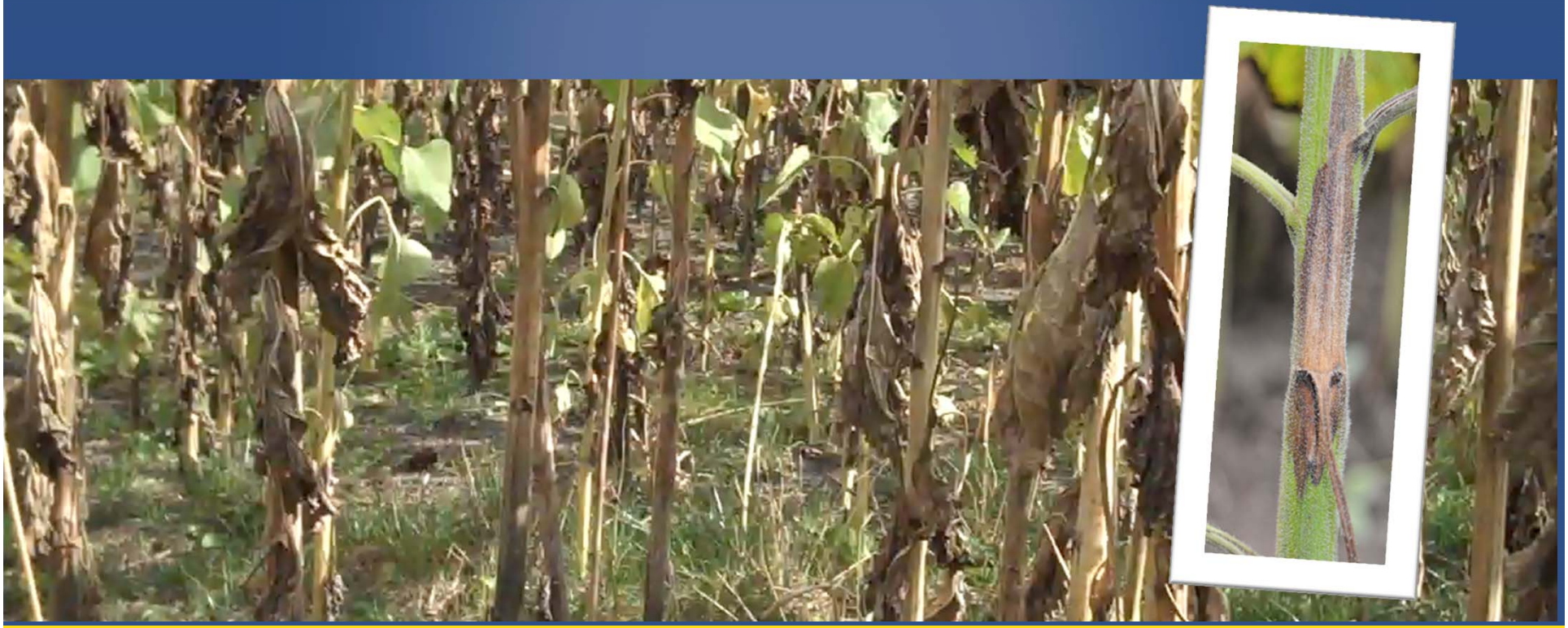


Pictures by Dr. Sam Markell, Dr. Tom Gulya and Sue Thompson (Agri-Science Queensland, Australia)

Objectives

I. Evaluate Phomopsis stem canker resistance in commercial hybrids

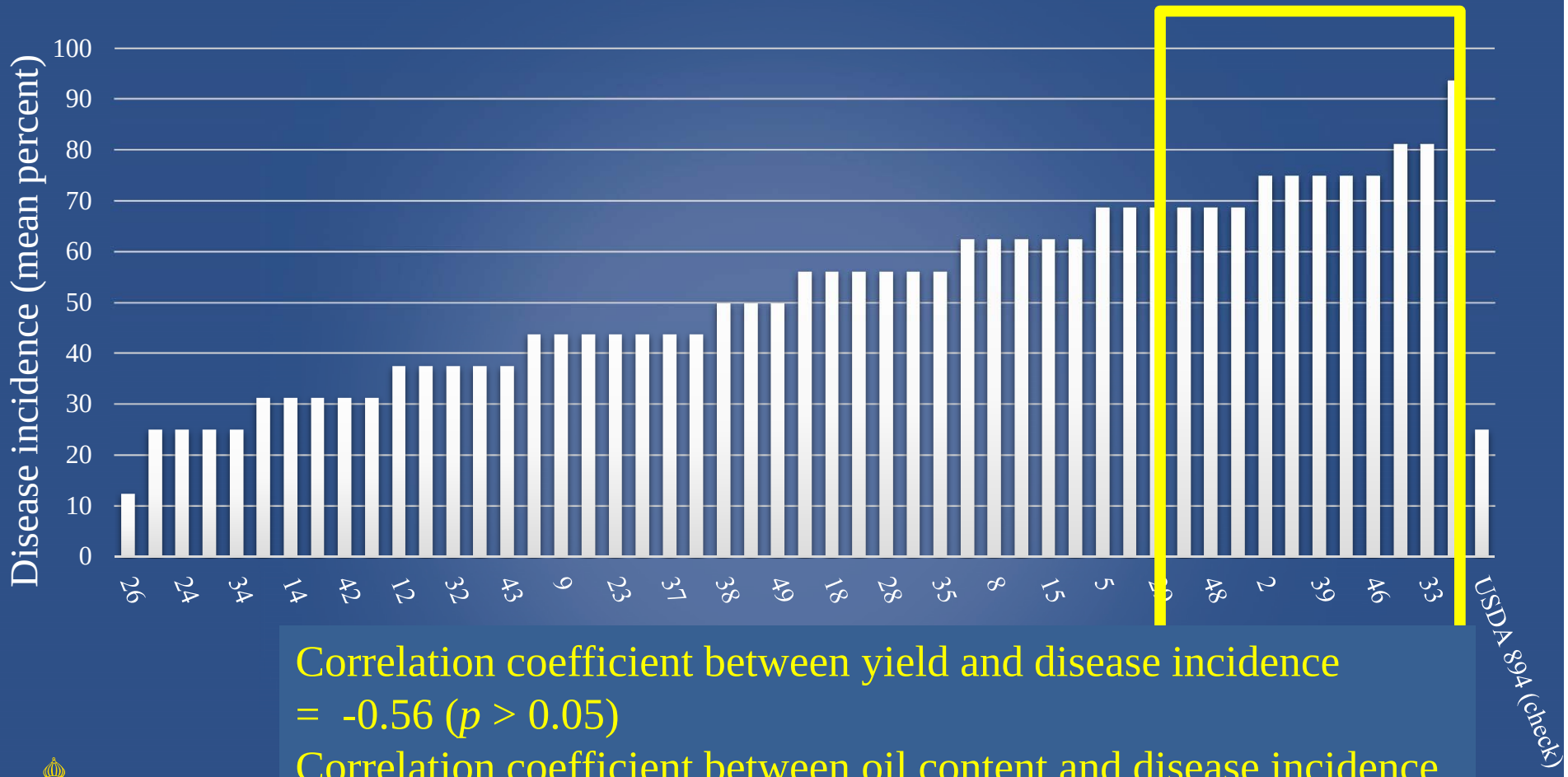
II. Correlate Phomopsis stem canker disease incidence and yield loss.



Materials and Method

- Oilseed and confection hybrid performance trials were conducted in Onida, SD and Galchutt, ND in 2014.
- Trial was arranged in a randomized complete block design with four replications.
- Natural epidemics of Phomopsis stem canker occurred.
- Disease incidence was evaluated at growth stage R4-R5 (beginning of flowering) as the mean percent of plants infected
- Yield, test weight and oil content (for oilseeds) were evaluated.

53 oilseed hybrids, Onida, SD



Correlation coefficient between yield and disease incidence = -0.56 ($p > 0.05$)

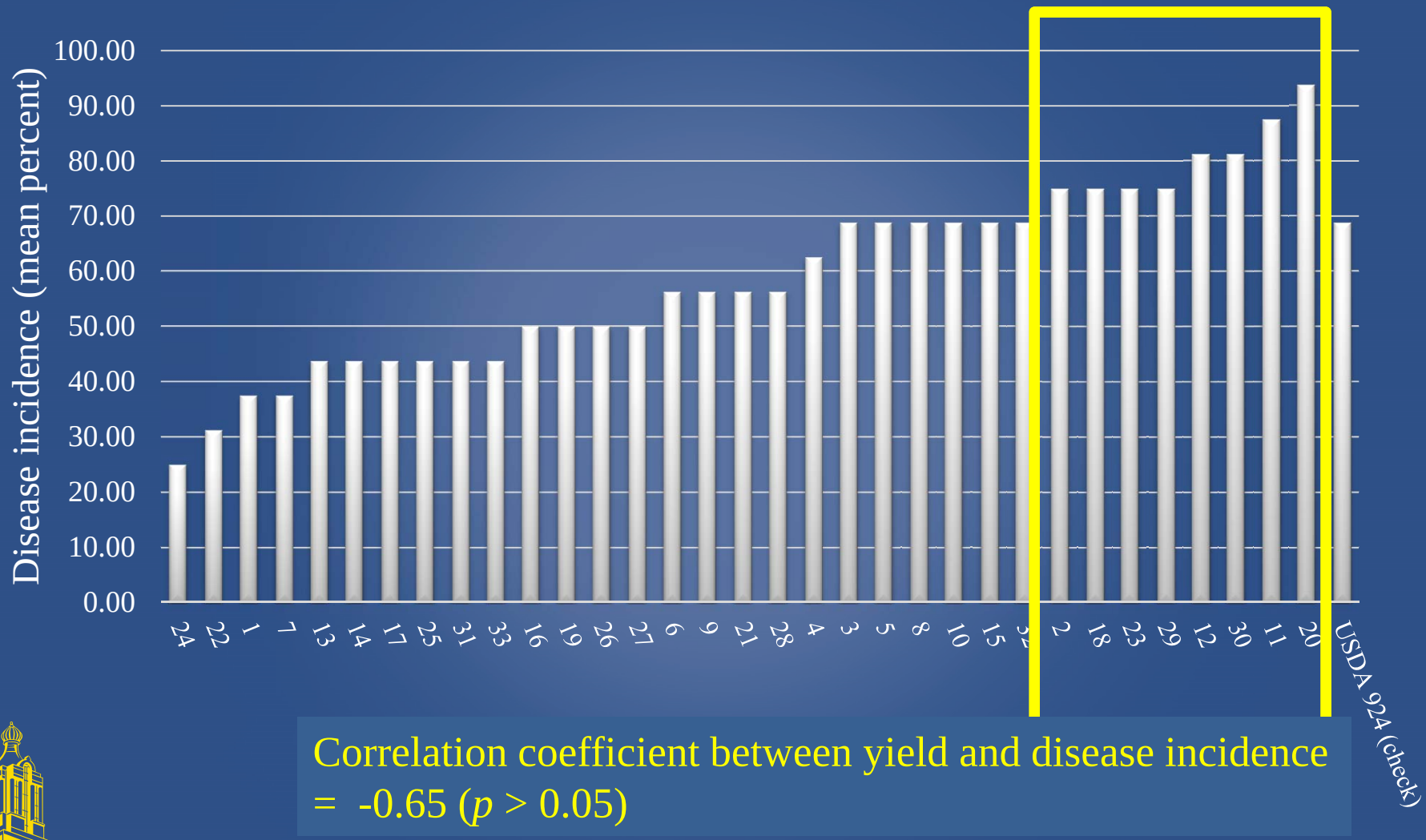
Correlation coefficient between oil content and disease incidence = -0.69 ($p = 0.05$)

South Dakota State University®

SDSU

Analyzed on SAS v 9.3

34 confection hybrids, Onida, SD



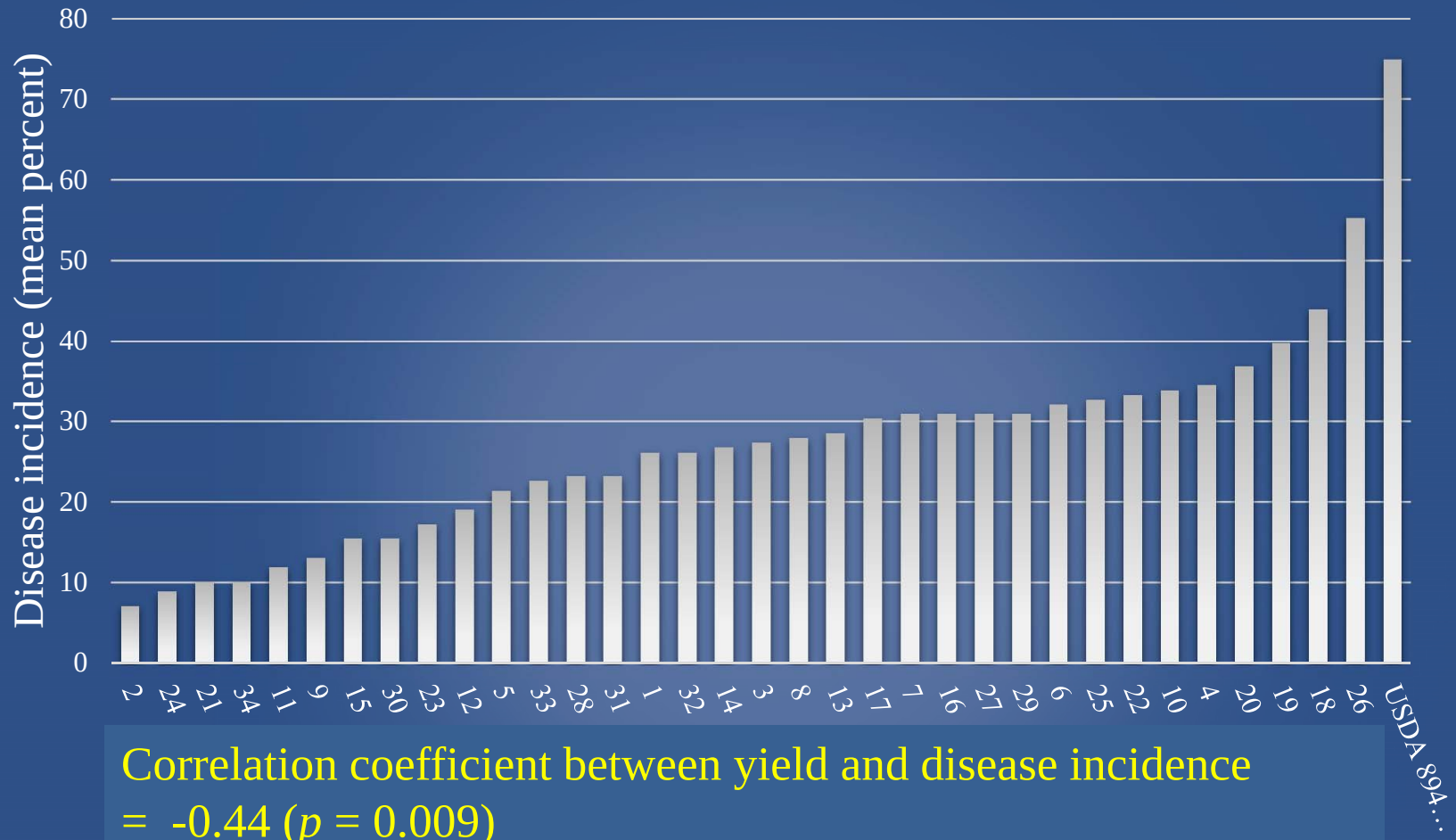
Correlation coefficient between yield and disease incidence = -0.65 ($p > 0.05$)

South Dakota State University

SDSU

Analyzed on SAS v 9.3

35 oilseed hybrids, Galchutt, ND



Correlation coefficient between yield and disease incidence = -0.44 (p = 0.009)

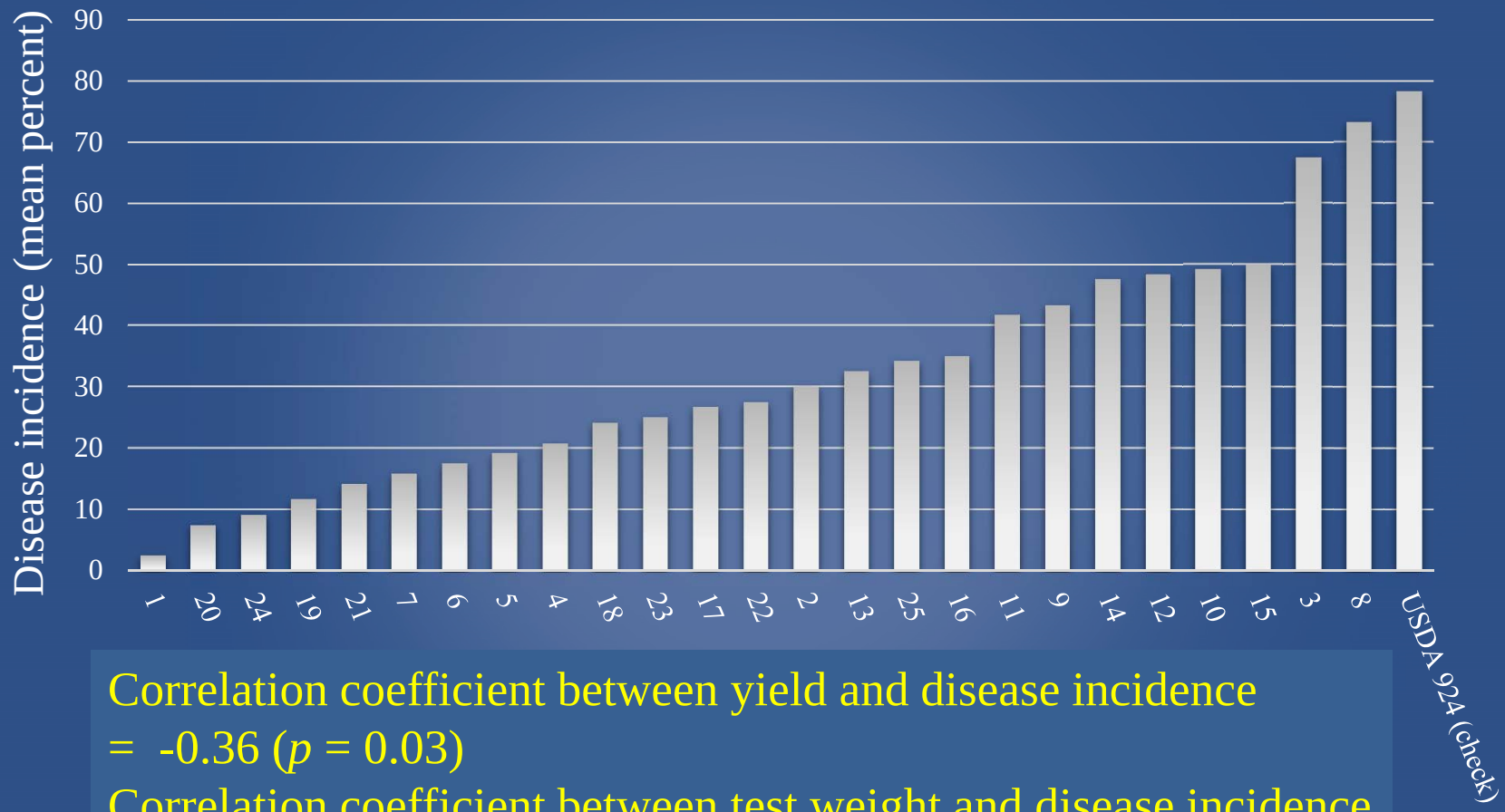
Correlation coefficient between test weight and disease incidence = -0.27 (p > 0.05)

South Dakota State University®

SDSU

Analyzed on SAS v 9.3

37 confection hybrids, Galchutt, ND



Correlation coefficient between yield and disease incidence = -0.36 (p = 0.03)

Correlation coefficient between test weight and disease incidence = -0.20 (p > 0.05)

South Dakota State University®

SDSU

Analyzed on SAS v 9.3

Summary

- Most of the available hybrids are susceptible to Phomopsis stem canker.
  - Disease incidence was > 50% for oilseed and confection hybrids in South Dakota.
  - Yield reduction were similar for both hybrids.
- Disease incidence was negatively correlated with all variables (oil content for oilseed hybrids, yield and test weight for both oilseed and confection hybrids).
- Negative correlation indicates Phomopsis stem canker is a yield limiting disease.

Acknowledgements

- Members of Ms. Grady's, Dr. Mathew's, Dr. Markell's and Dr. Hulke's lab
- Connie Tande (Plant Diagnostic Clinic, SDSU & Dr. Byamukama's lab)
- Bob Fanning and Ruth Beck (SDSU Extension)

South Dakota Oilseeds Council

South Dakota State University