

Quantification of Yield Loss from Rhizopus Head Rot in Sunflower

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Rhizopus Head Rot

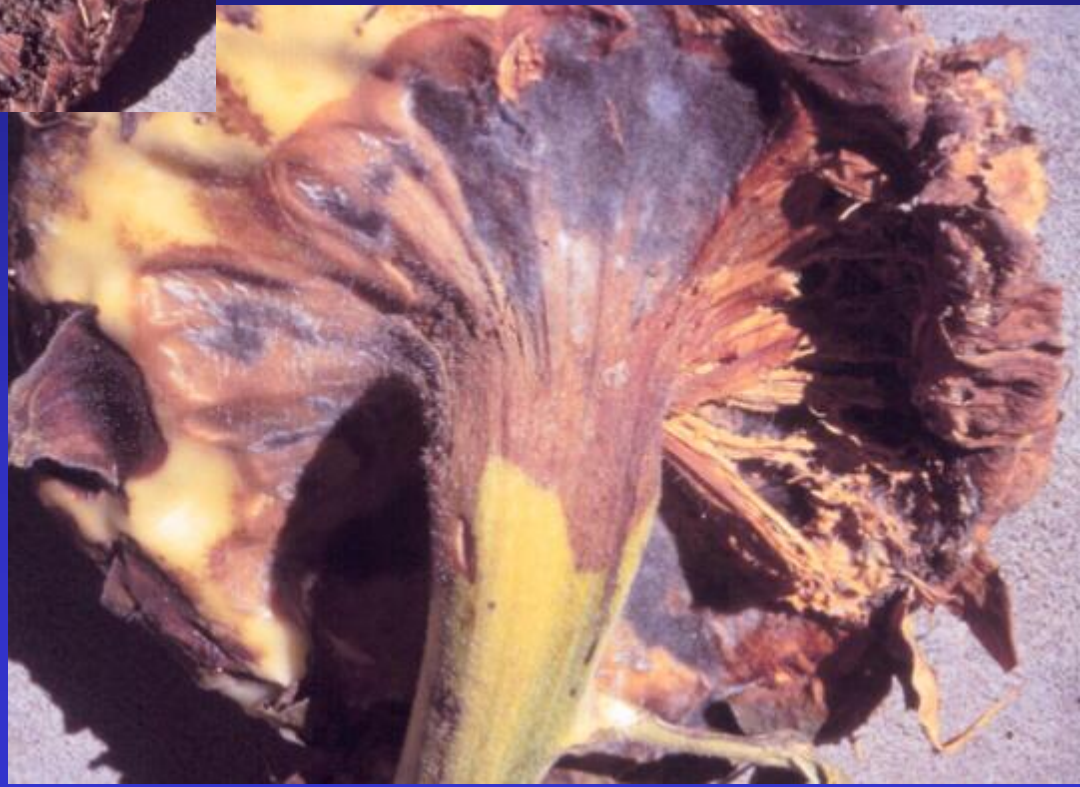
- Historically been considered a disease of minor importance
- Identified as a major constraint for Central High Plains (Kansas, Colorado, and Nebraska)
- Recently, problematic in Northern Plains (North Dakota, South Dakota, and Minnesota)
- Recent NSA surveys have been identified from 40% of fields in Northern Plains

Rhizopus Head Rot

- Pathogen
 - *Rhizopus arrhizus*, *R. stolonifer*, and *R. microsporus*
- Life Cycle and Infection
 - Overwinters in soils as sporangia and opportunistically infects through wounds under conditions of high humidity
- Capable of causing serious yield losses

Symptoms











Seed Drop – Hail and Disease



Objectives

- Evaluate different techniques to facilitate infection.
- Quantify damage/yield loss to Rhizopus
- Multiple geographically and environmentally different locations within sunflower production areas of the Great Plains.

Methodology

- Plots established in North Dakota, South Dakota, and Nebraska
- Plots: 4 30 inch rows, 25+ ft in length
- Sprinkler irrigated (Nebraska only)
- Inoculated 10 plants/plot
 - Early to mid-August at R5 stage
- Disease ratings approximately R7

Inoculations

- Two isolates of *R. oryzae*
- Treatments
 - Control
 - Wound with ball-peen hammer
 - Wound with hammer + inoculum
 - Wound with a cork borer
 - Wound with cork borer + inoculum





Agar plug + Vaseline



Hammer (1 week)



Hammer + Inoculum



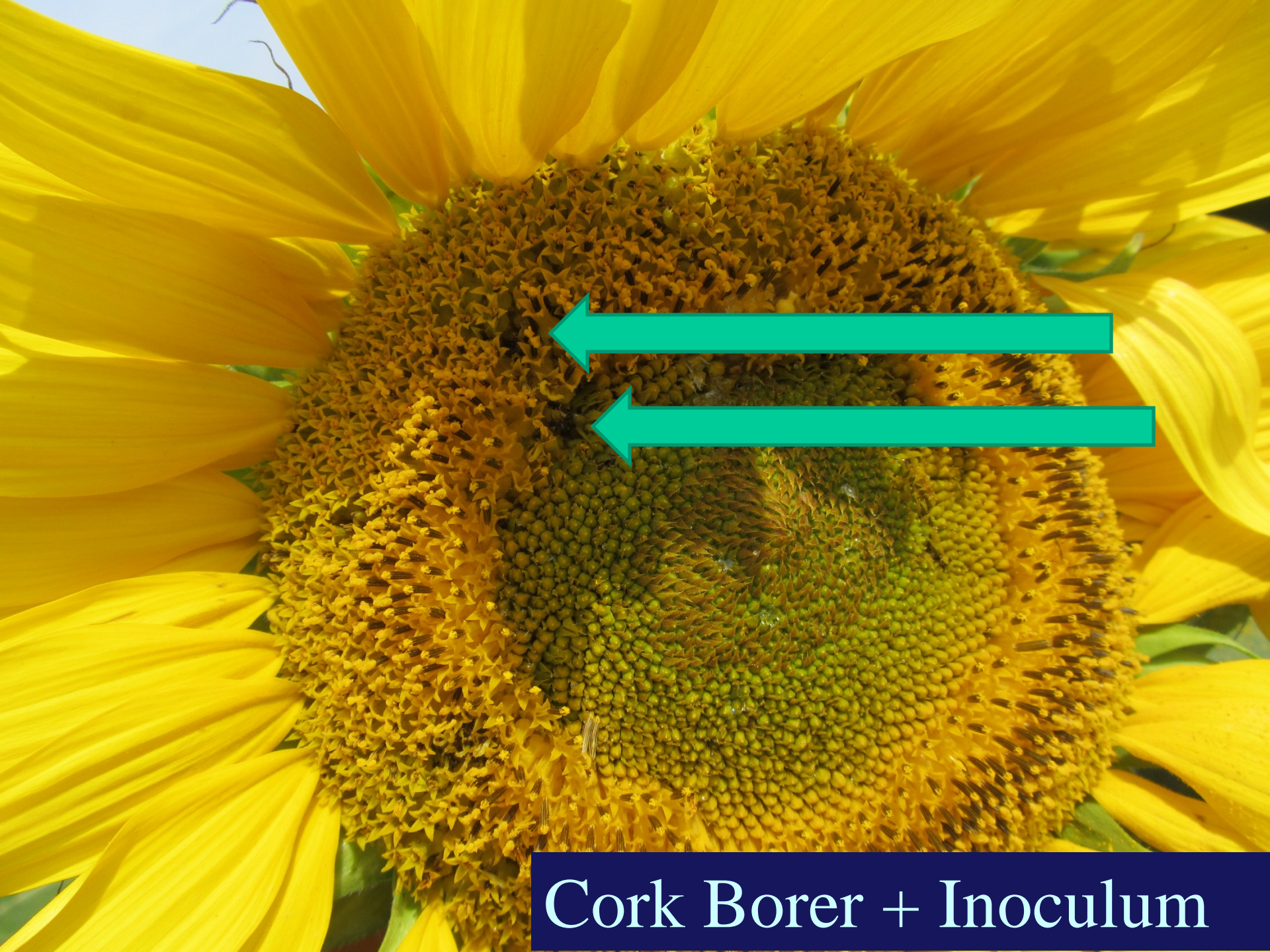




Hammer + Inoculum (1 week)



Cork Borer (1 week)



Cork Borer + Inoculum



Cork Borer + Inoculum



Cork Borer + Inoculum (1 week)

Disease Ratings

0 to 4 ratings on sunflower heads

- 0 = no signs or symptoms of disease
- 1 = 1-25% of head affected
- 2 = 26-50% of head affected
- 3 = 51-75% of head affected
- 4 – 76-100% of head affected

Disease Index Procedure

$$(\# \text{ rated } 0 \times 0) + (\# \text{ rated } 1 \times 1) + (\# \text{ rated } 2 \times 2) +$$
$$(\# \text{ rated } 3 \times 3) + (\# \text{ rated } 4 \times 4)$$

$$(\text{Total number of heads} \times 4) \times 100$$

Rating of 1(left) and 2 (right)



Rating of 3 (left) and 4 (right)



Rating of 4



Nebraska Results – Field 1

	Disease	Yield (lbs)
Control	33.0c	9.3a
Hammer	78.5a	5.5b
Hammer + Inoc	75.5ab	6.2b
Cork borer	63.5b	6.4b
Cork borer + Inoc	84.0a	5.5b

Nebraska Results – Field 2

	Disease	Yield (lbs)
Control	19.0b	7.3a
Hammer	65.9a	6.7ab
Hammer + Inoc	59.5a	4.4c
Cork borer	51.5a	4.9bc
Cork borer + Inoc	59.7a	5.3bc

SDSU Results

Treatment	Disease 2 - weeks	Disease 3 - weeks	Yield (grams)
Non-inoculated check	18.75 b	35.71 a	904.82 a
Ballpeen Hammer	15.18 b	26.78 a	925.57 a
Ballpeen Hammer+Inoculum	35.71 a	40.18 a	820.95 a
Cork Borer	17.85 b	27.67 a	949.45 a
Cork Borer+inoculum	13.39 b	33.03 a	648.45 a
LSD @ 0.10	10.37	24.82	309.42
LSD @ 0.05	12.61	30.17	376.21
P-value	0.013	0.865	0.456

NDSU Results

**2017 FCS
CHAMPIONS**



Conclusions

- Wounding techniques helped facilitate disease
- Few differences among treatments, but all significantly different from controls (NE)
- Inoculum could exacerbate disease
- Yield reduction of 40% compared with controls, in both Nebraska fields

Thank you for your support – Questions?

National Sunflower Association

Teams at U Neb, SDSU and NDSU

Company support (NDSU-BASF)

Farmer cooperators

