ISOLATION AND PATHOGENICITY OF *PHOMOPSIS* FROM SYMPTOMLESS SUNFLOWER

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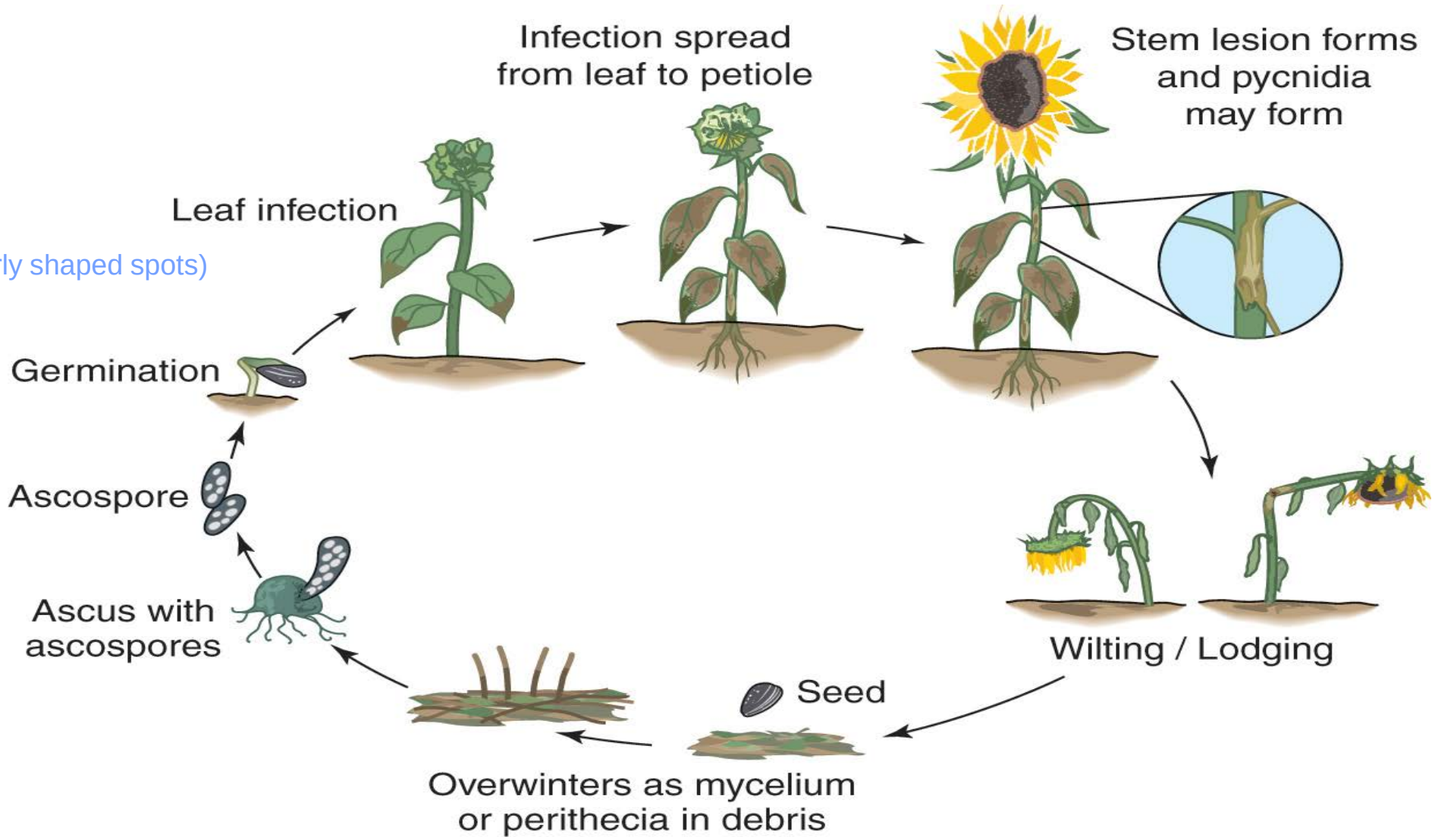
BACKGROUND

- **Phomopsis stem canker**
- Causal pathogens described in the U.S.:
  - *Diaporthe helianthi* (syn. *Phomopsis helianthi)*
  - *D. gulyae*
  - *D. stewartii*

Source: Mathew et al. 2018

DISEASE CYCLE

(brown irregularly shaped spots)



Source: Mathew et al. 2018

PREVIOUS RESEARCH

- Fungus enters through leaves, progresses towards the petioles and finally enters the stem.

- Stem lesions originate from internal fungal development.

Source: Vukojević et al. 2001

JUSTIFICATION

- Studies related to management options (e.g. fungicides) showed inconsistent results

- One of the hypothesis is species of *Diaporthe* may be “latent” as described in other crops, such as soybean (Kmetz et al. 1979).

RESEARCH OBJECTIVES

- Examine the possibility of latent infection by species of *Diaporthe* on sunflower

- Determine if “latent” species of *Diaporthe* are pathogenic on sunflower

MATERIALS AND METHODS

- **Field study:**
  - Location: ND, NE and SD (One site each)
  - Large plots (50 ft long by 10 ft wide)
  - 4 replicate blocks
  - Sunflower: Rh 400 CL
  - Plant samples taken biweekly basis, cut into parts (stems, leaves, roots) and air-dried.
  - Heads sampled during maturity

MATERIALS AND METHODS

- Fungal isolation and identify confirmation
  - 6 pieces of stem tissue randomly selected
  - Surface-sterilized and placed on PDA
  - Incubated
  - Fungi isolated and purified
  - Identified by morphology and qPCR (Elverson et al. 2019)

RESULTS – SOUTH DAKOTA

- **Symptom observed in field:**

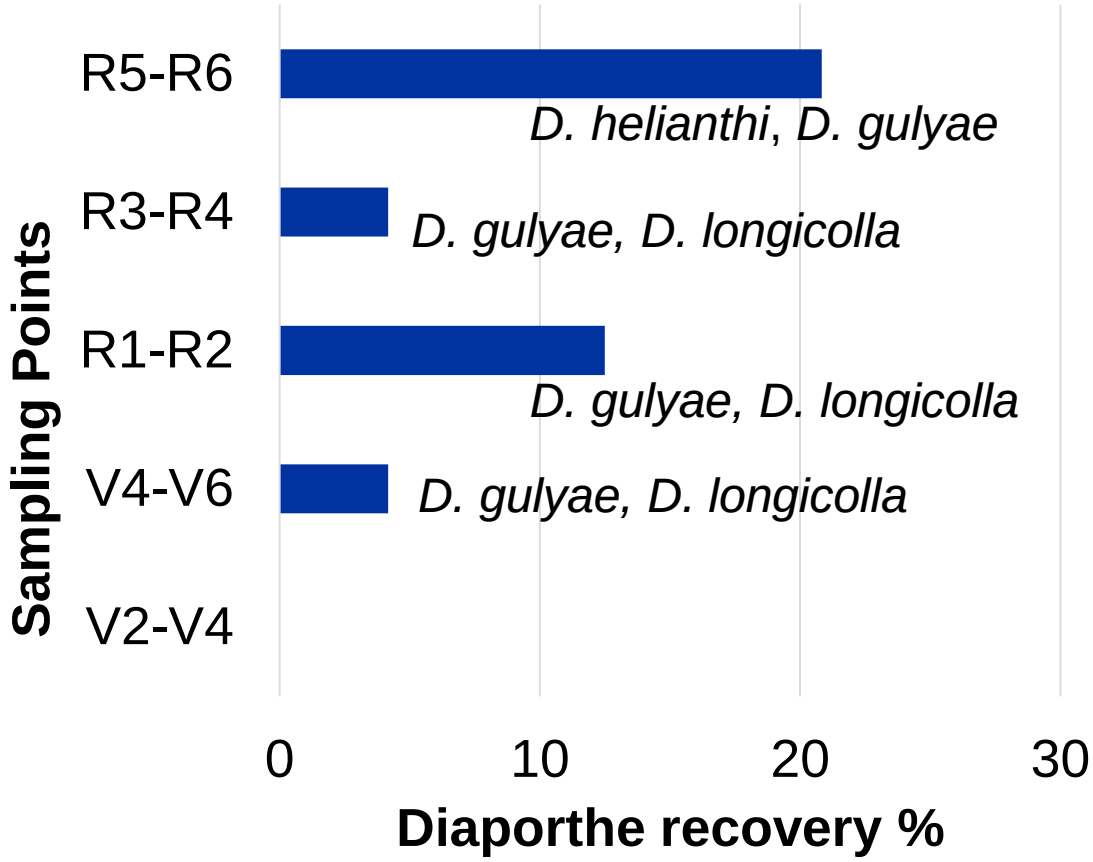
1st SP (V2-V4): No disease

2nd SP (V4-V6): No disease

3rd SP (R1-R2): Few lower leaves had symptoms

4th SP (R3-R4): Few petioles had symptoms

5th SP (R5-R6): Symptom in lower leaves, petioles and stems



MATERIALS AND METHODS

Greenhouse experiment:

- Design: CRD, 6 pots per treatment (2 plants in each pot)
- Treatments: 7 isolates and a non-inoculated control

Treatments	Species	Sampling point
N-58	*D. gulyae*	3rd
N-31	*D. longicolla*	4th
N-4	*D. gulyae*	5th
N-1, N-3, N-5, N-6	*D. helianthi*	5th
Non-inoculated control	Sterilized PDA plug	

MATERIALS AND METHODS

Greenhouse experiment……

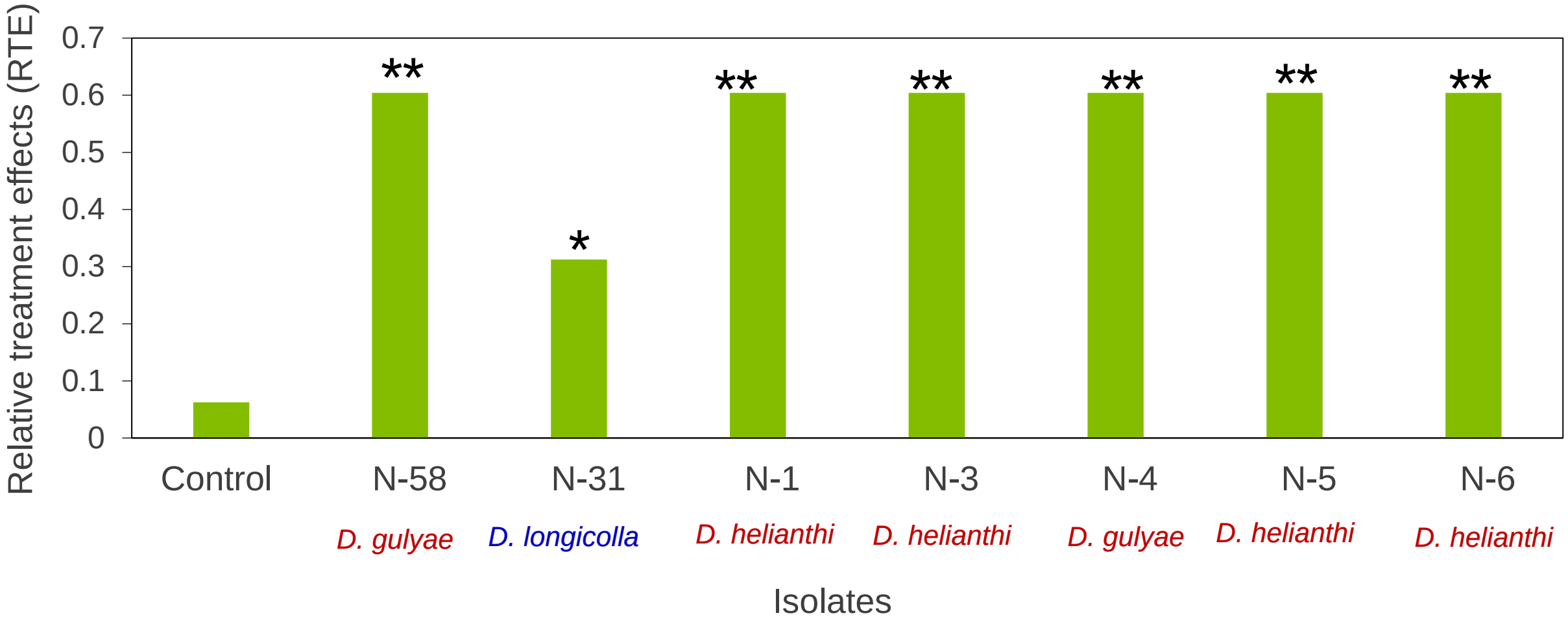
- Inoculation at R1 stage (The terminal bud forms a miniature floral head rather than a cluster of leaves)
- Stem wound method (Mathew et al. 2015)
- Inserted a mycelial plug (4 mm)
- Covered with petroleum jelly
- Misting for 3 days

MATERIALS AND METHODS

Greenhouse experiment….

- At 15 days after inoculation, Disease severity scored using a **0 to 5** scale (Mathew et al. 2015)
- Data analyses using non-parametric statistics in R.

RESULTS


Relative treatment effects (RTE)
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
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Control
N-58
N-31
N-1
N-3
N-4
N-5
N-6
D. gulyae
D. longicolla
D. helianthi
D. helianthi
D. gulyae
D. helianthi
D. helianthi
Isolates

RESULTS

D. longicolla

D. gulyae

D. gulyae

D. helianthi

SUMMARY

- Species of *Diaporthe* cause latent infection of sunflower at early vegetative stages
  - *D. gulyae* and *D. longicolla*
  - First report of *D. longicolla* causing disease

- These pathogens cause disease at R1 and favorable environment

FUTURE WORK

- Isolates of *Diaporthe* recovered from stem (ND, NE) and roots (ND, NE and SD)
- Identity of the fungus and pathogenicity study in progress

- Repeat the etiology study in 2020 in ND, NE and SD.

THANK YOU

NDSU

University of Nebraska Lincoln

CHS

USDA

South Dakota State University
College of Agriculture, Food and Environmental Sciences

South Dakota Oilseeds Council

National Sunflower Association