

Identification of common accessions resistant to *Diaporthe gulyae* at the vegetative and adult growth stages of sunflower

Renan Guidini, Nathan Braun and Febina Mathew

Department of Agronomy, Horticulture and Plant Science, South Dakota State University, Brookings, SD



INTRODUCTION

Phomopsis stem canker is a major disease of sunflower (*Helianthus annuus*) that can cause yield losses up to 40% in the U.S. states of Minnesota, North Dakota, and South Dakota. Among the causal pathogens, *Diaporthe gulyae* was reported causing Phomopsis stem canker in 2010 (Mathew et al. 2015). At this time, options to manage Phomopsis stem canker are limited and it is critical that sunflower accessions be screened for resistance in order to identify parental material that can be used by breeders to develop commercial hybrids with resistance to *D. gulyae*.

OBJECTIVE

The objective of this study was to compare the cultivated sunflower accessions (Mandel et al. 2013) for resistance to *D. gulyae* at the vegetative and adult growth stages of the sunflower development.

MATERIALS AND METHODS

- At two growth stages [vegetative = V4 – V6 (four to six true leaves) and reproductive = R4 – R6 (flowering)], 142 accessions were screened for resistance to *D. gulyae* in the greenhouse.
- The confection inbred ‘HA 288’ (PI552934) was used as the susceptible check.
- The experiment was designed as a completely randomized design and performed twice at each growth stage.
- Sunflower plants were inoculated using the mycelial-contact method (Thompson et al. 2011; Fig. 3a).
- After inoculation, plants were misted for 2 min every 2 h for 3 days.
- At 14 days after inoculation, the disease severity was evaluated on a 0 to 5 rating scale from Mathew et al. (2015) and Thompson et al. (2011).
- The disease severity data was analyzed separately each growth stage using non-parametric statistics and expressed as relative treatment effects (RTE).

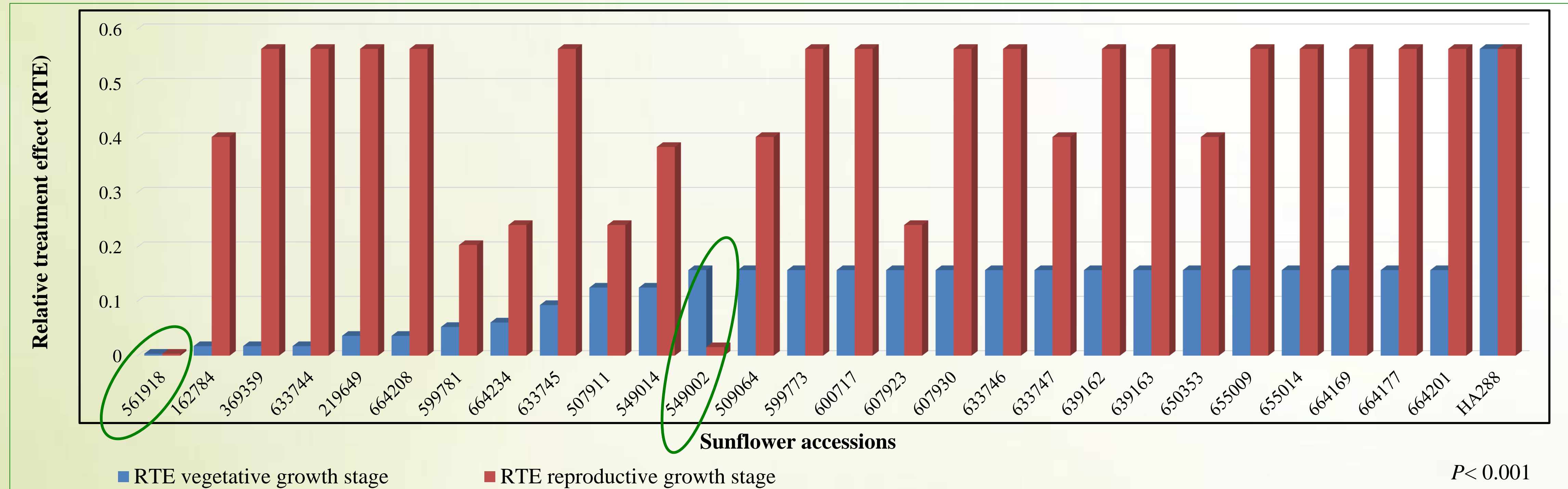


Fig. 1. Disease severity caused by *D. gulyae* on selected cultivated accessions at the vegetative and reproductive growth stages of sunflower in the greenhouse.



Fig. 2. PI 561918, 14 days after inoculation.



Fig. 3 (a) Mycelial plug covered with petroleum jelly. (b) HA288, 14 days after inoculation.

ACKNOWLEDGEMENTS

SUMMARY

- At the vegetative growth stage, 27 accessions were significantly less susceptible ($P=0.05$) compared to HA 288 (Fig.1).
- At the reproductive growth stage, three accessions were significantly less susceptible ($P=0.05$) compared to HA 288 (Fig. 1).
- Between the two growth stages, only two accessions (PI561918 (Fig. 2) and PI549002) were significantly less susceptible ($P=0.05$) than HA 288 (Fig. 3b).
- This study suggests adult plants may be more susceptible to *D. gulyae* than younger plants. This may be because of the changes in the defense mechanisms as the plant ages, which can impair its capacity to prevent disease development.
- Correlation between RTE in the vegetative and adult plant stages of sunflower accessions were significant and low ($r=0.25$; $P=0.0033$).
- Future research will focus on identification of quantitative trait loci (QTL) and candidate genes associated with resistance to *D. gulyae*.

LITERATURE CITED

- Mandel, J. R., et al. 2013. PLoS Genet 9(3): e1003378.
- Mathew, F. M., et al. 2015. Phytopathology 105: 990- 997.
- Thompson, S., et al. 2011. Persoonia 27: 80–89.

