Evaluation of Wild *Helianthus* Species for Resistance to Sclerotinia Stalk Rot

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INTRODUCTION

Sclerotinia stalk rot continues to be among the most serious disease problems affecting U.S. sunflower production (Fig. 1). The objective of this research is to identify new sources of *Sclerotinia* wilt (stalk and root rot) resistance in wild *Helianthus* germplasm. There are also some perennials of interest such as *H. resinosus.*

In 2008, all available accessions of the following species were evaluated: *Helianthus argophyllus*, *H. debilis*, *H. exilis, H. neglectus*, and *H. praecox*. Germplasm with promising resistance was found in all species except for *H. exilis*. Five percent (45) of the ~900 accession *H. annuus* collection was tested, with five promising accessions identified.

This suggests that additional resistant germplasm can be readily identified that could contribute toward improved Sclerotinia resistance in cultivated sunflower.

Figure 1. Mature sunflower stem colonized by *Sclerotinia sclerotiorum*.

OBJECTIVES

1. Develop a reliable greenhouse screening method - completed.
2. Evaluate a wide array of wild sunflower germplasm in the greenhouse and test the best-performing material in field trials.

GREENHOUSE SCREENING METHOD

The process starts with dormancy-breaking seed treatments. Seeds are soaked overnight in water containing 25 ppm ethephon (Ethrel), followed by bleaching, and then cold-stratified for two weeks at 4C on blotters in Petri plates.

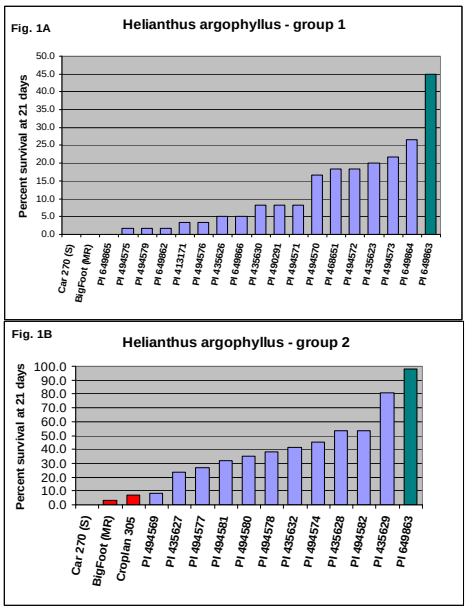
GREENHOUSE SCREENING METHOD

Germinated seeds are transplanted to 32-cell greenhouse flats (11x21 cm) and grown under 14-hr light until they reach the 6-8 leaf stage. The plants are then transplanted into new cells containing a bottom layer of 2.5g of *Sclerotinia*-infested millet. Greenhouse temperatures are maintained to keep soil temperatures in the range of 20-22C. Three cultivars with known resistant/susceptible reactions are used as checks. Plants are observed on a daily basis, and time in days to first wilt and to permanent wilt are recorded for each plant. After 21 days, the remaining live plants are recorded.

2008 GREENHOUSE RESULTS

In 2008, 255 accessions were evaluated in replicated trials including all available accessions of *H. argophyllus*, *H. debilis*, *H. exilis*, *H. neglectus*, and *H. praecox* plus 45 accessions of *H. annuus.* Accessions with superior Sclerotinia wilt resistance were identified from all species except for *H. exilis*. Figures Figs. 1A and 1B show results for 29 accessions of *H. argophyllus.* PI 649863 was identified in 2007 as highly resistant and was included in both sets as a resistant check. As a species, *H. argophyllus* shows good resistance.

Fig. 1(A,B). Two sets of *H. argophyllus* results from 2008. PI 649863 was clearly the most resistant accession in both groups. The first group (1A) had extreme disease pressure (note 0 to 50% scale) which killed the resistant check early.



GREENHOUSE EVALUATIONS

Figures 2 & 3 show results for *H. debilis* and *H. praecox*, respectively and demonstrate that resistance exceeding that of the resistant check hybrids is common.

Fig. 2. Relative performance of *Helianthus debilis* accessions in 2008 greenhouse tests.

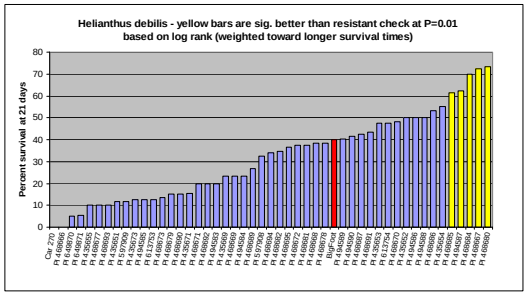
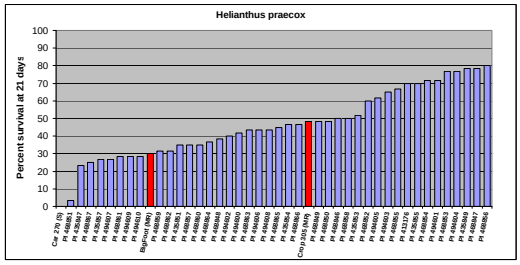


Fig. 3. Relative performance of *Helianthus praecox* accessions in 2008 greenhouse tests.



2008 FIELD EVALUATIONS

Twenty accessions were selected for a summer ND field trial. These included nine *H. debilis* accessions, three *H. argophyllus*, six *H. annuus* and two *H. resinosus* accessions. Flooding killed the *H. debilis* plantings and no data was obtained from them. Survival data for the other entries is shown in Table 1 below.

Table 1. Sclerotinia-inoculated field trial in summer 2008. Susc. checks are highlighted.

Species	Entry	% survival
H. argophyllus	PI 649863 (Res)	94
H. argophyllus	PI 649864 (M. Res)	75
H. argophyllus	PI 649865 (Susc)	42
H. annuus	PI 435417 (Res)	85
H. annuus	PI 435434 (Res)	86
H. annuus	PI 468517 (Res)	83
H. annuus	PI 586854 (Res)	80
H. annuus	PI 653604 (Res)	87
H. annuus	PI 435414 (Susc)	62
H. resinosus	PI 650079 (Res)	100
H. resinosus	PI 650082 (Res)	100
Croplan 305	Res. check	88
Car 270	Susc. check	59

ACKNOWLEDGMENTS

- Funding from USDA-ARS National Sclerotinia Initiative.
- Technical assistance: Bill Van Roekel, Lisa Shepherd.