

# Screening Sunflower Hybrids for Sclerotinia Head Rot Resistance in the Northern Great Plains

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## ABSTRACT

Sclerotinia head rot (*Sclerotinia sclerotiorum*) was not a major limiting factor for sunflower (*Helianthus annuus* L.) yield in 2007. However, extended precipitation and foggy conditions caused some level of sclerotinia pressure during the late season (2007 Crop Survey). In 2007, the initial screening of 80 entries was conducted at Carrington, ND; Crookston, MN; and Morden, Canada, and 20 of the best entries for both head rot and stalk rot in the 2006 initial screening were evaluated at Carrington, ND; Langdon, ND; Morden, Canada; and Oakes, ND. Entries consisted of production hybrids and experimental lines submitted by private breeding programs. Individual heads were inoculated with ascospores and plots were misted to provide favorable conditions for disease development. After several weeks of misting, inoculated heads were evaluated for incidence and severity of head rot. Tests were verified using a susceptible check and a resistant check. Incidence of the resistant check was 2.5% and 92.5% and incidence of the susceptible check was 30% and 100% for Carrington and Oakes, respectively. Langdon and Morden had limited disease pressure for both the repeat test and the initial screening. The range of incidence levels for the repeat evaluation was 0 - 39% and 72 - 100% for Carrington and Oakes, respectively. There was no correlation between locations due to the very high incidence in Oakes. However, the repeat test showed that a repeated evaluation is necessary to confirm previous observations. For the initial screening, good disease pressure was achieved at Carrington (0 - 45.9%) and Crookston (21 - 98%) and highly significant correlation existed between entry rankings at the two sites ( $r = 0.66, P < 0.001$ ). Further testing is needed to confirm these observations at various locations in 2008.

## INTRODUCTION

Sclerotinia head rot is a devastating disease of sunflower and no resistant commercial hybrids are available. A long-term germplasm screening nursery was established in 2000 at the North Dakota State University Carrington Research Extension Center.

## MATERIALS and METHODS

- The initial and repeat screening trials were planted during late May through early June in 30-inch rows.
- The initial screening trials tested 75 hybrids from 14 companies at Carrington, ND; Crookston, MN; and Morden, Canada.
- The repeat screening trial tested the 20 best hybrids from 2006 with eight companies represented at Carrington, Langdon and Oakes, ND.
- Fifteen uniform heads per row were selected and inoculated with an ascospores suspension to ensure that the disease-causing organism was present in sufficient numbers to cause the disease in susceptible hybrids.
- After inoculation, mist irrigation systems were put in place to provide favorable conditions for sclerotinia head rot infection and disease progression.
- All inoculated plants were scored late September through early October to determine incidence and severity of the disease.
- The severity rating scale was one through five: with 1 being up to 12.5% of the head infected, 2 up to 25% infected, 3 up to 50% infected, 4 up to 75% infected, and 5 up to 100% infected (Picture 1).

Picture 1. The severity rating scale for sunflower sclerotinia head rot.



## Acknowledgment

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Fig. 1. The correlation of sunflower head rot incidence between 2006 initial screening and 2007 repeat evaluation.

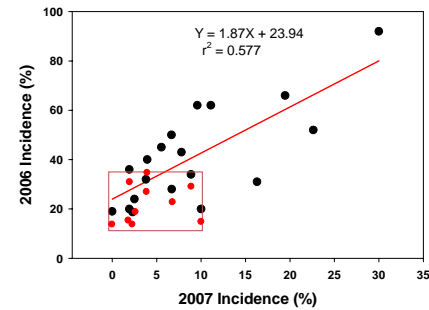


Fig. 3. Sunflower head rot incidence in the 2007 initial screening at Carrington.

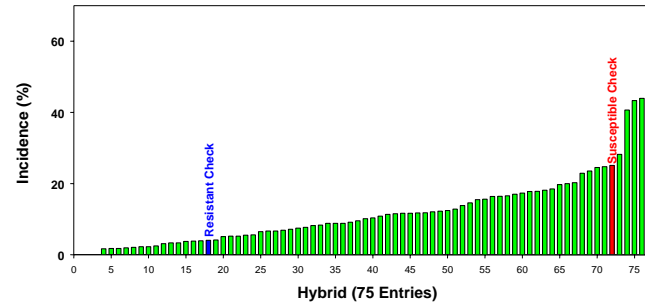


Fig. 4. Sunflower head rot severity in the 2007 initial screening at Carrington.

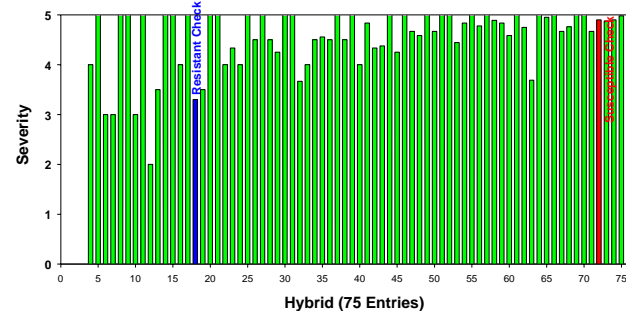


Fig. 2. Sunflower head rot and stalk rot incidence in the 2007 repeat evaluation, Carrington.

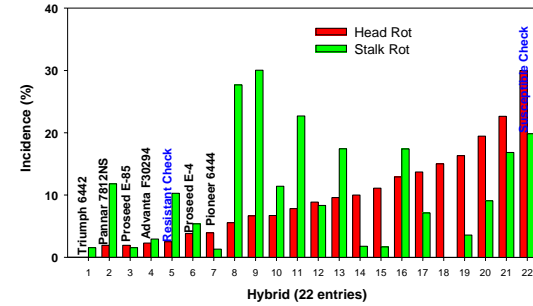


Fig. 5. The correlation between sunflower head rot and stalk rot incidence in the 2007 initial screening.

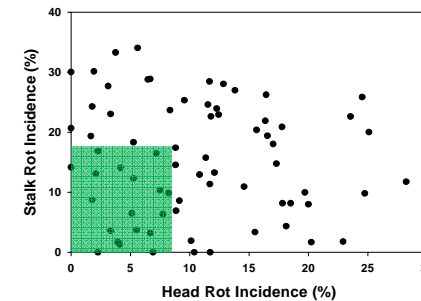


Table 1. Sunflower head rot incidence of top 20 hybrids selected from the 2007 initial screening at Carrington and Crookston.

Company	Variety	Incidence (%)	
		Carrington	Crookston
Mycogen	E89450	0.0	74.7
Seeds 2000	X3293	0.0	45.0
Triumph	859 HOCL	0.0	62.3
Dahlgren	9583	1.7	59.7
Proseed	6481	1.8	20.7
Triumph	7434 HOCL	1.8	89.0
Dahlgren	9519	1.9	55.3
Tom Heaton	H7016	2.1	58.7
Proseed	6004	2.3	65.0
Seeds 2000	X5493	2.3	38.7
Croplan	H7027	2.5	87.7
Pannar	7824 NS	3.1	76.7
Proseed	EE-2	3.3	80.0
Seeds 2000	X4744	3.3	59.0
Tom Heaton	H7018	3.8	88.0
Advanta	F41258	3.8	80.3
Tom Heaton	H7020	3.9	81.7
Resistant Check	412X409	4.1	50.0
Seeds 2000	X5331	4.2	36.3
Croplan	H7026	5.1	68.3
Resistant Check		4.1	50.0
Susceptible Check		25.1	-

## RESULTS AND DISCUSSION

### Repeat Evaluation

- Good disease pressure was achieved at Carrington (0 to 39%) and Oakes (72 to 100%), allowing a valid comparison of the data; Langdon and Morden had limited disease pressure.
- The correlation of head rot incidences between initial screenings (2006) and repeat screenings (2007) was very high, showing good repeatability between years at Carrington (Fig. 1)
- Many hybrids were highly resistant to both head rot and stalk rot at Carrington (Fig. 2).

### Initial Screening

- Good disease pressure was achieved at Carrington (0 to 45.9%) and Crookston (21 to 98%).
- Very limited disease was observed in Morden, Canada, due to the high temperature during the ascospore-inoculation period.
- At the Carrington site, many hybrids were performing better than the resistant check (Fig. 3).
- Severity ratings for 90% of hybrids were above 4; less than 5% of hybrids had a severity rating under 3 (Fig. 4)
- The correlation between relative ranking of incidence at the two sites (Carrington and Crookston) was high ( $r = 0.66, P < 0.001$ ), allowing valid comparison (Table 1).
- Many hybrids were tolerant to both head rot and stalk rot (Fig. 5 and Table 2).

Table 2. Sunflower hybrids selected for head rot and stalk rot from 2007 initial screening.

Company	Hybrid	Head Rot (%)	Stalk Rot (%)
Mycogen	E89450	0.0	14.2
Proseed	6481	1.8	8.7
Tom Heaton	H7016	2.1	13.1
Proseed	6004	2.3	0.0
Seeds 2000	X5493	2.3	16.9
Proseed	EE-2	3.3	3.6
Tom Heaton	H7020	3.9	1.7
Seeds 2000	X5331	4.2	14.1
Croplan	H7026	5.1	6.5
Seeds 2000	X9478	5.3	12.3
Triumph	7441	5.5	3.7
CHS	07EXP02	6.7	3.2
Mycogen	BH419 DIM	6.9	0.0
Mycogen	E89550	7.2	16.0
Red River Com.	2216	7.5	10.3
Croplan	H7025	7.7	6.4
Tom Heaton	H7017	8.2	9.9
Interstate	MH 6643	8.8	14.6
Interstate	MH 6641	8.8	6.9
CHS	07EXP05	9.1	8.6
Resistant Check		4.1	1.3
Susceptible Check		25.1	20.0



Sunflower head rot misting system in action.

## SUMMARY

- Importance of the misting systems to project
- "2007 Repeat Screening" confirmed "2006 Initial Screening"
- Results from "Initial Screening" trial suggest many good hybrid candidates for continued evaluation.
- Sunflower seed companies in cooperation with USDA geneticists are making positive advances in developing hybrids with improved resistance.