

Management Tools for White Mold Disease of Sunflower

S. Halley, R. Henson, K. Rashid, and T. Gulya



Introduction

White mold disease on sunflower is caused by the pathogen *Sclerotinia sclerotiorum* (Lib.) de Bary. The pathogen has been widely studied on many crops as it infects over 400 species of crops worldwide (1). Sunflower is highly susceptible (2) to this pathogen when environmental conditions are conducive for disease development. In addition, the pathogen infects (3) through the root system (wilt), in mid season through the stalk (basal stem rot) and during head development (head rot). The means of infection of each type is very different and each mode of infection needs to be addressed with a different management strategy. In some cases multiple management strategies may be needed to control the disease.

Materials and Methods

- Sites were planted in mid to late May to sunflower lines and a confection type sunflower (Interstate '8048' in 2005) and (Seeds 2000 'Bigfoot') to evaluate for resistance to head rot and for the fungicide evaluation for efficacy against head rot. After cultivation for seedbed preparation the seeds were sown with an Almaco double disk drill (30-inch row spacing). After emergence the stand was thinned to one plant per 12 inches.
- The site, soil type Svea-Barnes complex, was located on the North Dakota State University Langdon Research Extension Center, Langdon North Dakota. The study was arranged in a randomized complete block design with four replicates. Planted plot area was two rows 10 feet long. A micro sprinkler type irrigation system was placed in the center of each alley. Water was applied and timed to deliver a mist for 30 to 60 seconds, twice per hour, to selectively extend the normal nightly wet period both morning and evening to enhance development of disease.
- Ascospores were applied at 7.4 ml/head with a mist type spray bottle at 10% flower growth stage and a week later (5,000 and 10,000 spores per ml) in 2005 and (2000 spores per ml) in 2006. Fungicide treatments were applied with backpack sprayer at 9.2 GPA @ 40 psi with XR8001 nozzles oriented downward. Each treatment was applied twice at half rate traveling both directions to maximize coverage of the sunflower heads. North Dakota State University Extension recommended sunflower production practices for Northeast North Dakota were followed. Each head in the plot was assessed for incidence (number of heads infected) and severity (scale of 0-5, 0=no infection, 1=0-12.4%, 2=12.5-25%, 3=25-50%, 4=50-99%, 5=100%).
- Fungicide treated plots were harvested as soon as heads were dry enough to thresh by hand clipping and threshing with a Hege plot combine. Data were analyzed with the general linear model (GLM) in SAS. Least significant differences (LSD) were used to compare means at the 5% probability level.



S. Halley and R. Henson (deceased) North Dakota State University, K. Rashid Agriculture and Agri-food Canada and T. Gulya USDA-ARS.



Table 1. White mold incidence and severity in 2005 and 2006 by cultivar.

2005		White Mold Disease		2006		White Mold Disease	
Line	Company	Incidence	Severity	Line	Company	Incidence	Severity
05Exp08	CHS	26.7	41.3	AP431NS	Advanta	4.6	14.1
05Exp09	CHS	39.1	49.2	AP461NS	Advanta		
RH318	CHS	52.3	78.1	AP543NS/CL	Advanta	8.6	16.4
CL135	Croplan	40.6	50.2	AP422	Advanta		
Hysun450	Interstate	2.5	12.5	RH316	CHS	4.3	21.9
4540NS	Interstate	27.3	51.2	305	Croplan	1.6	12.5
8048	Interstate	59.1	82.9	343	Croplan		
PEX2424	Kaysar	19.6	29.3	93N05	DynaGro		
LSF126N	Legend	21.2	30.7	93H26	DynaGro	4.9	3.1
EXP35-10	Monsanto	16.7	42.0	93C05	DynaGro		
8N352	Mycogen	30.8	44.9	46904S	Garst		
8N510	Mycogen	29.8	48.5	MTH2	Heaton	4.1	13.3
9405	Proseed	16.0	19.3	PAN9404	Pannar		
C9011	Proseed	39.4	75.3	Pex2453	Pannar		
X978	Seeds2000	7.4	12.0	Bigfoot	Seeds2000	3.1	2.4
X936	Seeds2000	24.3	49.4	Barracuda	Seeds2000		
X4794	Seeds2000	18.4	57.4	X3293	Seeds2000		
USDA	277	19.7	21.4	TRX2354CLS	Triumph	6.7	25.0
Resistant	441x440	24.3	32.4	777C	Triumph	2.5	9.4
Susceptible	270	58.4	68.4	270	Susceptible	11.3	30.1
				270	Susceptible	8.8	39.1
				270	Susceptible	13.8	43.8
				441x439	Resistant	3.7	17.2
				441x439	Resistant		
				441x439	Resistant	2.1	4.7
LSD (0.05)		23.2	33.9			6.6	23.3
%C.V.		57	54			147	164

Discussion

Disease evaluation under two very different environments, indicated some large differences among genetic resistance to infections cause by *S. sclerotiorum* (Table 1). The best resistance is available in the oil type sunflower. A screening of fungicides in the same contrasting environments has not been able to show differences in yield or white mold disease either among fungicides or compared to the untreated (Figure 1). Large growth stage differences are present in small plots. Further study will be necessary to determine the most effective time to apply fungicide relative to the initial infection time. The orientation of the face of the sunflower makes the application of fungicide to the face very difficult with standard spray equipment. Studies are needed to determine if application to the face will curb disease development or if application to other areas of the head are necessary.

References

- Boland, G.J., and Hall, R. 1994. Index of plant hosts of *Sclerotinia sclerotiorum*. Can J. Plant Pathol. 16:93-1082.
- Gulya, T.J., Vick, B.A. and Nelson, B.D. 1989. *Sclerotinia* head rot of sunflower in North Dakota: 1986 incidence, effect on yield and oil components, and sources of resistance. Plant Dis. 73:504-507.
- Rashid, K.Y. 2003. Diseases of sunflower. Pages 169-176. in: Diseases of Field Crops in Canada. K.L. Bailey, B.D. Gossen, R.K. Gugel, and R.A.A. Morrall eds. Can. Phytopathological Soc.

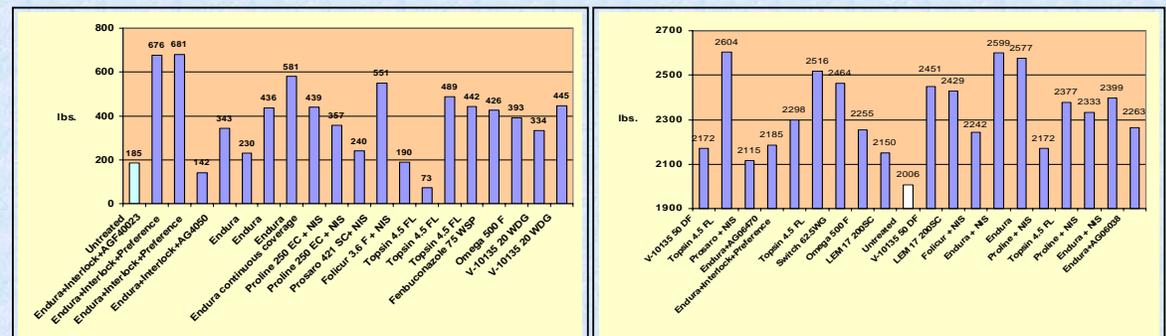


Figure 1. Yield in 2005 and 2006 by fungicide treatment.

The study group wishes to acknowledge funding support of the USDA-ARS *Sclerotinia* Initiative. "This material is based upon work supported by the U.S. Department of Agriculture, under Agreement Nos. 58-5442-4-279. This is a cooperative project with the USDA-ARS *Sclerotinia* Initiative. "Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the authors and do not necessarily reflect the view of the U.S. Department of Agriculture."