

## Managing White Mold Disease in Sunflower with Fungicide, Langdon 2008

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### Objective

A study was conducted at the Langdon Research Extension Center in 2008 to evaluate fungicides as a management tool to control Sclerotinia head rot in sunflower. Sclerotinia head rot, also known as white mold disease, is caused by the pathogen *Sclerotinia sclerotiorum*.

### Materials and Methods

The trial site had soil type Svea-Barnes complex. The study was arranged in a randomized complete block design with four replicates. The trial was planted on 15 May to Jaguar confection type sunflower line provided by Seeds 2000 with an Almaco double-disc drill in rows spaced 30 inches apart. Planted plot area was two rows 15 feet long planted in east/west direction. Additional seeds were planted and after emergence the stand was thinned to one plant per 10 inches. Five - foot wide alleys were cut. A micro sprinkler type irrigation system was placed in the center of each alley (15 ft center to center of each sprinkler head – micro sprinkler type orifices rated to deliver 2.7 GPM @ 30 psi). Fungicides, fungicide rates, timings and spray volumes included in the study are listed in Table 1. Induce (Helena Chemical Co.) is a non-ionic surfactant. The fungicides were applied with a CO<sub>2</sub> pressurized backpack sprayer equipped with Spraying Systems XR8001 (9.2 GPA) or XR8002 (18.4 GPA) nozzles spaced 20 inches apart and operated at 40 psi. The nozzles were oriented forward and 30° downward from horizontal. The fungicides were applied when the majority of heads in the plots reached early flowering growth stage. The initial fungicide application was made on 16 Aug beginning at 8:30 a.m. Air temperature was 78° F and the wind was WNW at 5 MPH. Sequential applications were made on 24 Aug. Air temperature was 60° F and there was no wind. Drift to adjacent plots was minimal. Water was applied and timed to deliver a mist for 30 seconds, twice per hour, to keep the heads moist and operated for three consecutive days after ascospores were applied. Ascospores were applied by hand misting to the face of the head when the majority of heads were at or beyond 10-30% bloom growth stage on 8 Aug and again on 13 Aug. The mist bottle delivered 3.7 ml in each of two lever compressions, total 7.4 ml, on each date delivering 30,000 spores per sunflower head. Because the mist system was operated to apply supplemental water on two additional studies, the system was also operated for three days after the ascospores were applied to these studies on the 22 Aug. North Dakota State University Extension recommended sunflower production practices for Northeast North Dakota were followed. To reduce the depredation from blackbirds

Flock Buster was applied by air three times. A propane boomer was installed in the trial and additional noise was provided with a shotgun when birds were present. Proaxis (gamma-cyhalothrin) insecticide was applied twice, at heading and a week later by airplane, to reduce damage from banded sunflower moth, *Cochylis hospes* Walsingham. White mold disease was assessed on 15 Oct after temperatures had cooled but before a killing freeze had been received. Each head in the plot was assessed for incidence (number of heads infected) and severity (scale of 0-5, 0 = no infection, 1=0-24%, 2=25-49%, 3=50-74%, 4=75-99%, 5=100%). The disease Phomopsis stem canker (caused by *Phomopsis helianthi* Munt. Cvet. = *Diaporthe helianthi* Munt. Cvet.) developed in the trials at Langdon and was also scored for control by the fungicide treatments. The scoring was 0 = no disease, 1 = small lesions on stem (<2 inches), 2 = large lesions on stem (>2 inches) 3 = stem turning brown from infection and 4 = stem breakage from Phomopsis stem canker and is reported in Table 1. Fungicide treated plots were harvested 20 Oct 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 using Fischer's protected LSD.

## Results and Discussion

A white mold disease severity index was calculated ((sum of the number of heads in each category \* category number)/total number of heads scored) for white mold. Compared to the untreated, five treatments had smaller white mold disease index values (three treatments that included Endura in the initial timing, the Confidential 3, and the Confidential 1, Table 1). White mold incidence ranged from 15 to 45% but was not statistically different among treatments at the 5% level. Severities ranged from 40% with a Prosaro treatment to over 90% on the untreated but were not statistically different. Heads scoring counts of one, two, or three were measured sporadically and % C.V. was high. Head counts scoring four were not significantly different among treatments. Head counts scoring five were significantly different. Small numbers in this category indicate a suppression of the development of white mold disease. Treatments that included Endura were most effective in this category. Compound Confidential 1 was also more effective than some of the other treatments. Least effective treatments included a) Proline and b) Prosaro treatment applied at 18.4 GPA, the c) Proline and Confidential 2 treatment, and the d) Proline with Induce followed by a sequential Endura application treatment and e) Metconazole. Yield and test weight were not statistically different. The yield and test weight results were complicated by bird damage and from insect damage caused by the sunflower bud moth, *Suleima helianthana* (Riley). No satisfactory insecticides are available to control this insect. Phomopsis stem canker disease index, incidence and severity is reported in Table 1. No significant differences were determined. Fungicide treatment should affect Phomopsis stem canker. In this study no inoculum was provided and although present in all plots the incidence and severity levels were not high enough to measure treatment effects.

Table 1. White Mold Incidence and Severity, Scoring Count and Phomopsis Incidence and Severity by Fungicide Treatment on Sunflower, Langdon 2008.

Treatment	Treatment Rate	Spray	White Mold			Scoring Count					
		Volume GPA	Index 1-5	Inc. %	Sev. %	One	Two	Three	Four	Five	UnInf.
Untreated		Na	1.9	43	86.6	0.0	0.3	0.0	3.0	3.8	10.3
Endura 70 WDG	6 oz/a	9.2	0.9	29	58.7	0.5	1.0	0.5	1.8	0.8	12.3
Endura 70 WDG	6 oz/a	18.4	0.9	18	70.3	0.0	0.0	0.3	1.3	1.5	11.8
Proline SC + Induce	5.7 fl oz + 0.125%v/v	9.2	1.9	45	85.0	0.3	0.3	0.3	1.8	4.5	10.3
Proline SC + Induce	5.7 fl oz + 0.125%v/v	18.4	1.7	35	75.6	0.0	0.0	0.0	3.0	2.5	10.0
Prosaro 421 SC + Induce	8.2 fl oz/a + 0.125%v/v	9.2	1.8	42	78.4	0.0	0.0	1.3	2.5	3.5	9.0
Prosaro 421 SC + Induce	8.2 fl oz/a + 0.125%v/v	18.4	1.9	42	88.1	0.0	0.0	1.0	1.8	4.3	10.0
Topsin M 70% WP	2 lb/a	9.2	1.4	30	75.2	0.3	0.0	0.3	1.5	3.3	11.5
Topsin M 70% WP	2 lb/a	18.4	2.1	45	89.8	0.0	0.0	0.0	3.3	3.8	8.5
Confidential 4		18.4	1.5	36	75.4	0.0	0.0	0.3	2.0	2.5	10.5
Confidential 5		18.4	1.9	40	86.6	0.0	0.0	0.3	1.5	4.3	9.8
Proline SC + Induce and Endura	5.7 fl oz + 0.125%v/v and 6 oz/ a (1 wk later)	18.4	1.3	25	63.5	0.3	0.3	0.0	1.3	2.8	11.5
Prosaro 421 SC	8.2 fl oz/a	18.4	1.7	41	84.3	0.5	0.0	0.3	2.8	4.0	11.3
Prosaro 421 SC + Induce + Endura	8.2 fl oz /a + 0.125% v/v + 6 oz / a	18.4	0.6	15	40.0	0.0	0.0	0.3	1.5	0.8	14.5
Topsin M and Proline SC + Induce	2 lb and 5.7 fl oz + 0.125% v/v (1 wk later)	18.4	1.4	31	65.4	0.0	0.0	0.5	1.5	3.0	11.5
Topsin M WDG	1.6 lb/a	18.4	1.3	26	66.2	0.0	0.0	0.0	2.5	2.0	11.0
Metconazole	17 fl oz/a	18.4	1.8	39	88.5	0.0	0.3	0.0	1.3	5.0	11.5
Confidential 2		18.4	1.4	33	68.2	0.0	0.3	0.0	3.5	2.5	11.8
Confidential 3		18.4	1.1	23	80.0	0.0	0.0	0.0	2.3	1.8	12.8
Confidential 1		18.4	1.1	23	69.3	0.0	0.0	0.0	2.3	1.8	12.3
LSD ( $P>0.5$ )			0.8	NS	NS	NS	NS	NS	NS	2.3	NS
% .C.V			37.9	47	32.8	261.1	276.2	237.0	72.5	57.2	22.5

Table 1. ....continued.

Treatment	Treatment Rate	Spray	Yield	Test Wt.	Phomopsis		
		Volume			Index	Inc.	Sev.
		GPA	Bu/A	Lb/Bu	1-4	%	%
Untreated		NA	1024.9	23.6	1.2	66	1.3
Endura 70 WDG	6 oz/a	9.2	1334.5	24.1	1.3	72	1.4
Endura 70 WDG	6 oz/a	18.4	1042.3	22.9	1.6	74	1.7
Proline SC + Induce	5.7 fl oz/a + 0.125%v/v	9.2	1064.1	23.1	1.4	73	1.6
Proline SC + Induce	5.7 fl oz/a + 0.125%v/v	18.4	1011.8	22.8	1.2	63	1.4
Prosaro 421 SC + Induce	8.2 fl oz/a + 0.125%v/v	9.2	1107.8	22.7	1.6	80	1.8
Prosaro 421 SC + Induce	8.2 fl oz/a + 0.125%v/v	18.4	998.7	23.0	1.0	57	1.2
Topsin M 70% WP	2 lb/a	9.2	1072.9	23.2	1.3	72	1.4
Topsin M 70% WP	2 lb/a	18.4	894.1	22.8	1.4	72	1.6
Confidential 4		18.4	915.9	22.6	1.1	61	1.4
Confidential 5		18.4	850.4	23.5	1.3	72	1.5
Proline SC + Induce and Endura	5.7 fl oz/a + 0.125%v/v and 6 oz/a (1 wk later)	18.4	1116.5	24.5	1.3	72	1.5
Prosaro 421 SC	8.2 fl oz/a	18.4	1295.3	23.5	1.1	58	1.2
Prosaro + Induce + Endura	8.2 fl oz /a + 0.125% v/v + 6 oz / a	18.4	950.7	22.6	1.6	73	1.8
Topsin M and Proline SC + Induce	2 lb and 5.7 fl oz/a + 0.125% v/v (1 wk later)	18.4	1007.4	23.4	1.3	61	1.6
Topsin M WDG	1.6 lb/a	18.4	976.9	22.8	1.2	55	1.3
Metconazole	17 fl oz/acre	18.4	1077.2	23.9	1.2	67	1.4
Confidential 2		18.4	1260.4	23.7	1.0	52	1.2
Confidential 3		18.4	1138.3	24.0	1.2	67	1.5
Confidential 1		18.4	1195.0	23.5	1.4	65	1.6
LSD ( $P>0.5$ )			NS	NS	NS	NS	NS
% .C.V			25.9	4.6	31.4	19.7	29.0

Phomopsis scoring; 0=no disease, 1=small lesions on stem (<2 inches), 2=large lesions on stem (>2 inches) 3=stem turning brown from infection, 4= stem breakage from phomopsis