

Field evaluation of fungicides for management of Sclerotinia head rot on sunflowers

Oakes, ND (2013)

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KEY FINDINGS:

Endura, a fungicide with excellent activity against Sclerotinia diseases on many other crops, showed no efficacy against Sclerotinia head rot of sunflowers irrespective of the frequency with which it was applied. The poor disease control observed in this trial was likely due to the difficulty of achieving satisfactory fungicide coverage to desired target (the front of the sunflower head) when applying fungicides over the top of the sunflower canopy.

Active ingredient of the fungicide tested in this trial:
Endura contains 700 grams boscalid per kilogram.

Fungicides were applied in 55 gallons of water per acre with a tractor-mounted spray boom equipped with 8004 flat-fan nozzles and operated at 30 psi.

IMPORTANT NOTICE:

Fungicide performance can differ in response to which diseases are present, levels of disease when products are applied, environmental conditions, plant architecture and the susceptibility to disease of the variety planted, crop growth stage at the time of fungicide application, and other factors.

This report summarizes fungicide performance as tested at the NDSU Carrington Research Extension Center under the conditions partially summarized in this report. Fungicide efficacy may differ under other conditions; when choosing fungicides, always evaluate results from multiple trials.

This report is shared for educational purposes and is not an endorsement of any specific products.

Treatment (application timing) ^z	Scl. head rot - R8 growth stage				Scl. head rot - R9 growth stage				Seed size			
	Sample size ^x	Incidence: % ^w	Severity: % ^v	Index: % ^u	Sample size ^x	Incidence: % ^w	Severity: % ^v	Index: % ^u	Yield	Test weight	percent	percent
1 Non-treated check (water, A)	197	44 a *	3.5 a *	1.7 a *	197	58 a *	4.0 a *	2.4 a *	2109 a *	22.1 a *	12 a *	28.4 a *
2 Endura 70WG 9 oz/ac (A)	177	36 a	3.9 a	1.5 a	174	51 a	4.2 a	2.2 a	2166 a	22.1 a	10 a	29.7 a
3 Endura 70WG 9 oz/ac (A,B)	176	29 a	2.8 a	0.9 a	176	41 a	3.7 a	1.6 a	2740 a	22.2 a	8 a	20.5 b
4 Endura 70WG 9 oz/ac (A,B,C)	171	39 a	3.4 a	1.4 a	171	54 a	4.2 a	2.3 a	2293 a	22.2 a	9 a	24.8 ab
	F:	0.68	2.74	0.84		1.16	1.25	1.01	0.82	0.02	2.20	7.16
	F > P:	0.5888	0.1130	0.5079		0.3831	0.3546	0.4385	0.5199	0.9955	0.1655	0.0118
	CV:	42.2	15.8	55.7		26.6	11.6	36.7	27.2	3.1	26.4	12.0
Fungicide application timing:												
Application A: August 7 at 1:15 to 1:30 pm; sunflowers at R4 to R5.4 (inflorescence beginning to open to 40% of the disk flowers blooming or already completed bloom), no Sclerotinia head rot present; wind = 3 mph, relative humidity = 46%, temperature = 73°F												
Application B: August 19 at 9:10 to 9:20 am; sunflowers at R5.9 to R6.0 (90 to 100% of the disk flowers blooming or already bloomed), no Sclerotinia head rot present; wind = 3 mph, relative humidity = 71°F												
Application C: August 29 at 9:30 to 9:40 am; sunflowers at R8 growth stage, with ray petals completely dry or gone, to early R7 growth stage (slight yellowing on backs of heads); wind = 6 mph, relative humidity = 78%, temperature = 80°F												
Inoculation: Inoculations were conducted by applying 15,000 laboratory produced ascospores of <i>Sclerotinia sclerotiorum</i> to the front of each sunflower head at mid-bloom (R5.3 to R5.6) and again at late bloom												
Sample size: The number of plants evaluated for Sclerotinia head rot and stalk rot.												
Sclerotinia head rot incidence: The percent of plants exhibiting Sclerotinia head rot. All plants in each plot were evaluated.												
Sclerotinia head rot severity: Average Sclerotinia head rot severity across those plants exhibiting disease. Disease assessments were conducted on a 1 to 5 scale: 1 = 1 to 25% of head exhibiting symptoms of Sclerotinia head rot, 2 = 26 to 50% of head exhibiting symptoms of Sclerotinia head rot, 3 = 51 to 75% of head exhibiting symptoms of Sclerotinia head rot, 4 = 76 to 99% of head exhibiting symptoms of Sclerotinia head rot, and 5 = 100% of head exhibiting Sclerotinia head rot. All plants in each plot were evaluated.												
Sclerotinia head rot index: Average Sclerotinia head rot severity across all plants, including those not exhibiting disease. Disease assessments were conducted on a 0 to 5 scale: 0 = no Sclerotinia head rot, 1 = 1 to 25% of head exhibiting symptoms of Sclerotinia head rot, 2 = 26 to 50% of head exhibiting symptoms of Sclerotinia head rot, 3 = 51 to 75% of head exhibiting symptoms of Sclerotinia head rot, 4 = 76 to 99% of head exhibiting symptoms of Sclerotinia head rot, and 5 = 100% of head exhibiting Sclerotinia head rot. All plants in each plot were evaluated.												
Sclerotinia stalk rot incidence: The percent of plants exhibiting Sclerotinia stalk rot. All plants in each plot were evaluated.												
^s On September 11, sunflowers were at the R8 growth stage (back of the heads yellow but bracts remain green); on September 19, sunflowers were at the R9 growth stage (physiological maturity).												
* Within-column means followed by different letters are significantly different (P < 0.05; Tukey multiple comparison procedure).												

<8.7 mm,
>7.9 mm,¹
>7.1 mm,¹

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METHODS:

- **Location of trial:** Oakes Irrigation Research Site of the NDSU Carrington Research Extension Center, Oakes, ND
- **GPS coordinates of trial:** 46.071094,-98.09199
- **Previous crop:** Fallow
- **Soil preparation:** Disk (May 24), Multiweed twice (June 3) to incorporate herbicide & smooth seedbed
- **Fertilization:** N=29 lb; P=127 lbs; K=102 lbs/ac (May 2), N = 30 lb/ac as urea (July 19)
- **Completely randomized block design / Replicates:** 4
- **Hybrid:** Seeds 2000 'Jaguar' (a confection type)
- **Planting date:** June 4
- **Planting equipment:** Cone units on a 6 row Kinze (John Deere)
- **Seeding rate:** 3.83 seeds/linear foot of row = 60,000 seeds/ac
- **Final plant population:** 1 plant every 12 inches of row = 17,400 plants/ac. The final plant population was achieved by manually thinning the sunflowers at the V4 growth stage (four true leaves).
- **Row spacing:** 30 inches / **Rows per plot:** 3
- **Seeded plot size:** 20 feet x 7.5 feet
- **Final plot size after alleys were cut:** 17 feet x 7.5 feet
- **Buffer plots (2 rows wide x 20 feet long) were established between treatment plots.**
- **Fungicide application methods:** Fungicides were applied with a tractor-mounted boom equipped with Spraying Systems TeeJet 8004 flat-fan nozzles at a spray volume of 55 gal water/A operated at 30 psi. Fungicides were applied to all three rows of the treatment plot plus the outermost row of each of the adjacent buffer or guard plots (a total of five rows).
- **Fungicide application A:** August 7 at 1:15 to 1:30 pm; sunflowers at R4 to R5.4 (inflorescence beginning to open to 40% of the disk flowers blooming or already completed bloom), no Sclerotinia head rot present; wind = 3 mph, relative humidity = 46%, temperature = 73°F
- **Fungicide application B:** August 19 at 9:10 to 9:20 am; sunflowers at R5.9 to R6.0 (90 to 100% of the disk flowers blooming or already bloomed), no Sclerotinia head rot present; wind = 3 mph, relative humidity = 89%, temperature = 71°F
- **Fungicide application C:** August 29 at 9:30 to 9:40 am; sunflowers at R6 growth stage, with ray petals completely dry or gone, to early R7 growth stage (slight yellowing on backs of heads); wind = 6 mph, relative humidity = 78%, temperature = 80°F
- **Inoculation methods:** Spore solutions were prepared by adding laboratory-grown ascospores of *Sclerotinia sclerotiorum* to water and adding a few drops of Tween 20. The spore solutions were adjusted such that hand-held spray bottles delivered 5,000 spores per spray, and inoculations were conducted by applying three squirts of the spray bottle (15,000 spores) to the front of each head. Two inoculations were conducted, one at mid-bloom (30 to 60% of the disk flowers in bloom or completed bloom) and one at late bloom (70 to 90% of the disk flowers in bloom or completed bloom).
- **Irrigation:** Microsprinkler misting systems were utilized to promote conditions favorable for disease, with intense misting applied for 3 days after each inoculation and more modest irrigation applied thereafter.
- **Sclerotinia head rot assessments:** Sclerotinia head rot assessments were conducted on Sept. 11 at the R8 (back of the head is yellow but bracts remain green) and on Sept. 19 at the R9 (physiological maturity) growth stages. All plants in all three rows of each plot were evaluated. Plants were evaluated for Sclerotinia head rot on a 0 to 5 scale: 0 = no Sclerotinia head rot, 1 = 1 to 25% of head exhibiting symptoms of Sclerotinia head rot, 2 = 26 to 50% of head exhibiting symptoms of Sclerotinia head rot, 3 = 51 to 75% of head exhibiting symptoms of Sclerotinia head rot, 4 = 76 to 99% of head exhibiting symptoms of Sclerotinia head rot, and 5 = 100% of head exhibiting Sclerotinia head rot.
- **Seed yield and quality:** Plot-level yield was assessed in pounds using the yield monitor in an Almaco plot combine, and, from each plot, subsample of approximately 400 to 600 grams of seed was collected. Seed moisture levels were determined for this sub-sample immediately after harvest. After determining seed moisture, the subsample was placed in a drier until the seed reached approx. 8% seed moisture; the subsample was weighed, cleaned to remove sclerotia and other debris, and weighed again. To account for differential levels of sclerotia and other debris across treatments, the original yield estimates from the combine's yield monitor were adjusted by multiplying by the ratio of the cleaned to uncleaned sub-sample weights. Test weight and seed size were determined using the cleaned sub-sample. Seed yield and test weight were reported at 10% seed moisture.
- **Harvest:** Sunflower heads were hand-harvested Sept. 23 shortly after reaching physiological maturity, placed in a drier for 7 days, and run through a combine on October 2.

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