Foliar Fungicides for Oat Production

RFR-A1709

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Introduction

Oats are a major spring-sown, small grain crop in Iowa. It can be used for grain and straw production, as a companion crop to establish hay and pastures, or for early-season forage such as hay or haylage. Because oats mature in late July to early August, it allows for cropping options for the remainder of the season including establishment of a perennial forage or cover crop and a timely window for a mid-season animal manure application.

Careful management and proper choice of variety can make oats a profitable crop due to their low input requirements and favorable effects on succeeding crops in a rotation. Planting oats before April 15 is recommended for optimal yields in Iowa. This helps avoid exposure to warmer weather during grain fill.

Test weight is the most commonly used indicator of grain quality. High test-weight varieties should be chosen by growers who intend to market oat grain.

Oat growth is regularly affected by rust and barley yellow dwarf virus. Variety resistance to these diseases should be considered. Another option is the use of a foliar fungicide applied at Feekes 9 growth stage, defined as flag leaf emerged with ligule visible. This research evaluates the effects of foliar fungicide application on oat production.

Materials and Methods

Four oat varieties were planted in 2017. The soils at the site consist of 83B Kenyon loam and 198B Floyd loam. The site was in soybeans the previous year and has been in a corn-soybean crop rotation for over 20 years. In fall 2016, the site was fertilized with 11 lb N/acre, 58 lb P_2O_5/acre, and 135 lb K_2O/acre. On March 22, the site was fertilized with 7 lb N/acre as urea and 73 lb K_2O/acre.

On March 23, the site was field cultivated, and then again April 6 in the opposite direction to spread soybean residue. The oats were planted April 7 at four bushels/acre. The planter was a John Deere BD1108 drill with 7.5-in. row spacing, followed by a pass with a cultipacker. Each plot of a variety occupied 731 sq. ft and there were four replications. The trial was sufficiently weed-free to not require the use of herbicides or hand weeding. Priaxor fungicide was applied at four oz/acre on all varieties June 12 when Shelby oats reached Feekes 9 growth stage.

The trial was harvested July 31 with a JD4420 combine with Weigh-Tronix load cells on weigh bin. Straw yields were determined from 8.125-ft wide by 20-ft long windrows from the center of each plot. Subsamples were collected and dried for percent dry matter determination.

The 2017 season weather had near normal growing degree days and precipitation from April through June, although it was hot and dry from late May through early June. July was much wetter than normal (Table 1).

Results and Discussion

Variety trial results for 2017 are presented in Table 3. Yields reported are on a 32 lb/bushel basis. Test weight is the most important indicator of grain milling quality. Minimum test weights are 36 lb/bushel for U.S. No. 1 oats, and 33 lb/bushel for U.S. No. 2 oats.

Yield results from a single year are not reliable predictors of next year's yield. Environment and disease conditions can fluctuate greatly from year to year, so it is important to consider yields averaged over multiple years. Tables 4 and 5 provide results of similar trials conducted on this farm in 2015 and 2014.

Overall, a foliar fungicide application provided an average 5.6 bushels/acre increase for varieties over the three years of trials, but this was not statistically significant or economically profitable. However, each season had one variety with a 9 to 11 bushel/acre yield response to a fungicide application.

Acknowledgements

Thanks to General Mills, Albert Lee Seed House, Melanie Caffe of South Dakota State University, Practical Farmers of Iowa, Grain Millers, Inc., and the Sustainable Food Lab.

Table 1. Rainfall and oat growing degree days (GDD) for 2017 and the long-term normal.

	Rainfall, in.		GDD, base 32ºF	
Month	2017	Normal	2017	Normal
April	4.31	3.88	564	498
May	4.79	4.44	790	823
June	5.15	5.40	1,167	1,098
July	8.35	4.75	1,227	1,250
Total	22.60	18.47	3,748	3,669

Table 2. State of origin, PVP[a], and disease ratings[b] for oat varieties in the 2017 foliar fungicide trial at the ISU Northeast Research and Demonstration Farm, Nashua.

	State of			Foliar	Disease ratings[c] on June 30		
Variety	origin[a]	PVP[b]	Maturity	fungicide	Crown rust	BYDV[d]	Septoria
Deon	MN	PVP	Late	No	0	3.75	0.5
				Yes	0	4.0	1.5
Hayden	SD	PVP	Early	No	0.25	2.75	2.0
				Yes	0.25	2.75	1.25
Horsepower	SD	PVP	Early-mid	No	1.0	5.5	1.75
				Yes	0.5	6.26	2.25
Shelby 427	SD	PVP	Mid	No	0	2.75	1.5
				Yes	0	2.0	1.5
LSD[e] 0.05					0.7	1.6	1.2

[a]Origin: MN = University of Minnesota; SD = South Dakota State University.
[b]PVP = Plant Variety Protection. The PVP Act provides a certificate to the developer of a variety granting exclusive rights for reproducing and marketing the seed.
[c]Disease ratings on a 1-9 scale: 1 = no disease; 9 = heavy disease presence.
[d]Disease: BYDV = Barley Yellow Dwarf Virus.
[e]LSD = least significant difference. Entries that differ by one LSD or more are considered to be in different classes with 95 percent certainty.

Table 3. Performance of foliar fungicide on oat varieties in 2017 at the ISU Northeast Research and Demonstration Farm.

Variety	Grain yield[a] July 31 bu/ac	Grain moisture %	Test weight lb/bu	Heading June 15 %	Plant height July 31 in.	Lodging July 31 %	Straw yield August 1 ton/ac
No fungicide:							
Deon	116.6	13.4	33.7	1	32	0	1.38
Hayden	124.7	13.4	35.6	6	32	1	1.55
Horsepower	114.6	13.3	35.0	30	26	0	0.93
Shelby 427	100.0	14.9	34.6	28	31	0	1.20
Average without	112.7	13.8	34.7	- -	30	0	1.27
Fungicide:							
Deon	121.0	14.4	33.8	1	33	0	1.53
Hayden	126.4	13.8	35.8	6	33	0	1.52
Horsepower	113.0	15.9	34.0	28	26	0	1.05
Shelby 427	111.1	15.3	35.3	33	32	0	1.92
Average with	117.9	14.9	34.7	- -	31	0	1.51
Overall average	115.3	14.4	34.7	- -	31	0	1.39
LSD[b] 0.05	15.4	1.5	1.0	- -	4	1	0.33

[a]Grain yields are based on 32 lb/bu test weight.
[b]LSD = least significant difference. Entries that differ by one LSD or more are considered to be in different classes with 95 percent certainty.

Table 4. Performance of foliar fungicide on oat varieties in 2015 at the ISU Northeast Research and Demonstration Farm.

Variety	Grain yield[a] July 23 bu/ac	Grain moisture %	Test weight lb/bu	Heading June 12 %	Plant height July 23 in.	Lodging July 23 %	Straw yield July 25 tons/ac
No fungicide:							
Badger	121	13.9	33	100	31	33	0.9
GM423	117	14.9	31	1	38	0	1.4
Goliath	111	18.4	34	1	41	0	1.4
Rockford	101	15.4	34	1	34	0	1.4
Average without	113	15.7	33	- -	- 36	- -	1.3
Fungicide:							
Badger	119	13.6	34	100	32	30	0.9
GM423	128	16.6	31	1	34	0	1.7
Goliath	121	19.5	34	1	43	0	1.8
Rockford	108	17.1	35	1	36	0	1.6
Average with	119	16.7	34	- -	- 36	- -	1.5
Overall average	116	16.2	34	- -	- 36	- -	1.4
LSD[b] 0.05	14	1.8	1	- -	- 6	- -	0.7

[a]Grain yields are based on 32 lb/bushel test weight.
[b]LSD = least significant difference. Entries that differ by one LSD or more are considered to be in different classes with 95 percent certainty.

Table 5. Performance of foliar fungicide on oat varieties in 2014 at the ISU Northeast Research and Demonstration Farm.

Variety	Grain yield[a] August 4 bu/ac	Grain moisture %	Test weight lb/bu	Heading June 20 %	Plant height August 3 inches	Lodging August 3 %	Straw yield August 8 tons/ac
No fungicide:							
Badger	93.6	14.2	27.3	90	29.6	18.6	1.42
Jerry	79.7	14.0	29.3	50	36.5	11.6	1.70
Shelby 427	82.7	14.7	30.3	50	34.3	0	1.34
Average without	85.3	14.3	29.0	- -	33.5	10.1	1.49
Fungicide:							
Badger	102.9	17.1	28.4	90	30.8	6.5	1.70
Jerry	85.7	15.4	30.1	50	36.9	3.3	1.91
Shelby 427	84.3	16.1	30.4	50	34.1	2.0	1.60
Average with	91.0	16.2	29.6	- -	33.9	3.9	1.74
Overall average	88.2	15.3	29.3	- -	33.7	7.0	1.62
LSD[b] 0.05	9.1	2.2	1.2	- -	2.4	7.8	0.30

[a]Grain yields are based on 32 lb/bushel test weight.
[b]LSD = least significant difference. Entries that differ by one LSD or more are considered to be in different classes with 95 percent certainty.