

“Determining production and economic benefits of fungicide application on oats and barley to control foliar and head diseases”

**MSU Extension Project GREEN Report
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Project justification:

Oats and barley continue to be important feed, rotation and cash crops in Michigan, with 30,000 acres of oats and 8,000 acres of barley harvested state-wide in 2011. Strong commodity prices are encouraging farmers to consider producing more small grains as cash crops. Oats and barley are of special interest in the northern areas of Michigan, outside the traditional winter wheat production areas. Project GREEN agronomy research priorities established for 2011 by the Growing U.P. Agricultural Association include “evaluate cost-effective methods to maintain or increase the economic viability of crop production in the UP.” Improving oat and barley yield and quality falls within this priority.

Over recent years, MSU plant pathologists and extension staff have shown that fungicides applied to winter wheat at the appropriate growth stage give good protection against serious disease threats. Similar diseases pose serious threats to oats and barley under favorable disease conditions. However, these crops have not received similar attention due to their relatively small acreages. By coordinating with on-going wheat disease management work, oat and barley fungicide trials will determine the agronomic and economic benefit, if any, of protecting oat and barley crops with fungicides under northern Michigan growing conditions. Preliminary work at the U.P. Research Center in Chatham was conducted in 2011 with no outside funding. Fungicides were applied to small, replicated oat and barley plots at heading time. No statistically significant yield differences resulted. However, hot dry conditions in July and August created conditions unfavorable for disease development. This project provides a second year of data.



Figure 1: Oat (right) and barley (left) fungicide trial plots, MSU U.P. Research Center, Chatham, MI, July 6, 2012. Plots were designed to allow sprayer tracks through “sacrifice plots”.

Objectives:

1. Determine effectiveness of a single application of available, labeled fungicides on oat and barley varieties commonly grown by northern Michigan farmers as indicated by disease severity and yield differences on small, replicated plots and on larger, replicated on-farm strip plots
2. Model potential economic impacts of fungicide use on oats and barley

Results:

Oat and barley yield and test weight data from two locations (MSU U.P. Research Center, Chatham, MI and Mike Iho farm, Trenary, MI), visual disease ratings at both locations, and barley quality data for malting and barley were collected and tabulated as follows:

Fungicide Treatment	MSU Research Center, Chatham, MI		Mike Iho Farm, Trenary, MI	
	Oat yield, bu/a 13.5% moisture	Oat test weight	Oat yield, bu/a 13.5% moisture	Oat test weight
Control (no fungicide)	100	33.8	68.8	34.2
Twinline	114*	34.6*	<i>Not included</i>	<i>Not included</i>
Caramba	108*	33.6	<i>Not included</i>	<i>Not included</i>
Stratego	<i>Not included</i>	<i>Not included</i>	77.9*	35.0*
AVERAGE	107	34.0	73.3	
Coefficient of variation	7%	1.3%	4.3%	0.9%
Least Significant Difference	7	0.8	7.5	0.8
Level of significance	20%	5%	10%	10%

* = significantly better than control

Figure 2: Oat yield and test weight results



Figure 3: Harvesting oat plots and cleaning barley samples , August 14, 2012, at the MSU Research Center, Chatham, MI

Fungicide Treatment	Barley yield, bu/a, 13.5% moisture	Barley test weight	Grain quality for malting		
			DON, ppm	% Protein	% Germination
Control (no fungicide)	79	47.7	1.6	11.95	96
Stratego YLD	74	48.5*	2.2	12.35	92
Quilt Xcel	83	48.7*	2.7	12.60	95
Absolute	72	48.3	2.6	12.38	95
Caramba	75	47.5	1.4	12.20	94
Prosaro	67	47.9	1.6	12.07	94
Twinline	64	47.9	2.3	11.73	95
AVERAGE	73	48.1	2.0	12.18	94
Coefficient of variation	25.0%	1.5%	50.7%	4.6%	2.0%
Least Significant Difference	17	0.7	1.0	0.53	2
Level of Significance	20%	20%	20%	20%	20%

* = significantly better than control

Cargill Malt quality standards: DON-1.0 ppm max, protein-13.5% max, germination-96% min
 Figure 4: Barley yield, test weight and malting quality results

Date	Oats, MSU-UPRC, Chatham, % diseased leaf tissue			Oats, Iho Farm, Trenary % diseased leaf tissue		Barley, MSU-UPRC, Chatham						
	Control	Caramba	Twinline	Control	Stratego	Control	Stratego YLD	Quilt Xcel	Absolute	Caramba	Prosaro	Twinline
July 6, 2012	1	<1	<1	3	<1	1	<1	<1	<1	1	<1	1
July 17, 2012	4	2	2	-	-	<1	<1	<1	<1	<1	<1	<1
July 20, 2012	4	2	2	-	-	-	-	-	-	-	-	-

Figure 5: Visual disease ratings on oats and barley

Discussion:

1. Average yields of both barley and oats at the MSU Upper Peninsula Research Center were excellent, 73 bushels/acre and 107 bushels per acre respectively. Oat yield at the Mike Iho farm was more modest, with an average of 73 bushels/acre.
2. Oat and barley test weights were improved based on fungicide treatment at each location, although the level of significance used to analyze test weight data was adjusted for each location. The oat and barley test weight data at the MSU Upper Peninsula Research Center produced significant differences at 5% and 10% level of significance, respectively. The oat test weight data at the Iho farm produced significant difference at 10% level of significance. The barley test weight data produced a significant difference at 20% level of significance.
3. No significant differences in barley grain quality for the malting barley market were shown based on different fungicide treatments. DON and germination levels were not acceptable under any of the fungicide treatments. Germination was acceptable under all treatments.
4. Disease pressure as determined by visual rating was low on oats and very low on barley. The primary foliar disease on oats was visually identified as septoria leaf blotch. No crown rust was noted.
5. Economic comparison: Because of the unreliability of barley data, only oats are included.

Assumptions:

- Estimated price received by farmer for 2012 oats: \$3.25
- Estimated per-acre cost of fungicide application:
 - \$10.97 Stratego fungicide/acre (7 oz/acre at \$200.60/gallon)
 - \$19.91 Caramba fungicide/acre (14 oz/acre at \$182.00/gallon)
 - \$18.19 Twinline fungicide/acre (9 oz/acre at \$258.65/gallon)
 - \$6.50 Machinery cost

Fungicide treatment	Oats, UPRC, Chatham, MI				Oats, M. Iho Farm, Trenary, MI			
	Avg. yld Bu/acre	Value of yld above control	Cost of fungicide treatment Per acre	Income per acre above control	Avg. yld Bu/acre	Value of yld above control	Cost of fungicide treatment Per acre	Income per acre above control
Control (non-treated)	100	\$0	\$0	\$0	69	\$0	\$0	\$0
Caramba-treated	108	\$26.00	\$26.41	-\$0.41	-	-	-	-
Twinline-treated	114	\$45.50	\$25.41	\$20.09	-	-	-	-
Stratego-treated	-	-	-	-	78	\$29.95	\$17.47	\$11.78

Figure 6

: Economic comparison of non-treated vs fungicide treated oats, Chatham and Trenary, MI

Conclusions:

1. We saw yield advantages in oats based on single application of Twinline and Stratego fungicides at the MSU Upper Peninsula Research Center and the Mike Iho farm, respectively. No yield advantage was observed from Caramba application on oats at the single location tested.
2. Oat test weight was improved by single application of Twinline and Stratego fungicides at the MSU Upper Peninsula Research Center and the Mike Iho farm, respectively. Caramba application did not improve test weight at the single location tested.
3. Yield data from the barley fungicide trial did not show differences based on fungicide treatment. Plots were badly damaged by birds.
4. Barley test weight was improved by single application of Stratego YLD and Quilt Excel fungicides at the single location tested. The other fungicides included in the trial did not improve test weight significantly.
5. Barley grain failed to meet standards for malting regardless of fungicide treatments applied. No differences in barley grain quality for malting were seen based on fungicide treatments.
6. We saw an economic advantage of \$20.09 per acre when applying Twinline fungicide and \$11.78 per acre when applying Stratego fungicide to oats at 1 location each. It was not economically beneficial to apply Caramba at the single location tested.