2013 ADOPT Project Report

The Effect of Fungicide Application Timing on Leaf Disease and Fusarium Head Blight Infection in Spring Wheat

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1. **Project Title:** The effect of fungicide application timing on leaf disease and fusarium head blight infection on spring wheat

2. **Project Number:** 20120406

3. **Producer Group Sponsoring the Project:** Conservation Learning Centre Inc

4. **Project Location:** Conservation Learning Centre, Prince Albert, Sask.
Located on the SW 20-46-26 W2, RM 461

5. **Project Start Date and End Date:** May 1, 2013 to February 1, 2014

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7. **Project Objectives:** To demonstrate the effect of fungicide timing on leaf spot diseases and fusarium head blight (FHB) on spring wheat.
To demonstrate the benefit of planting varieties with improved disease resistance.

8. **Project Rationale:** The incidence of leaf diseases and head blight have increased in NE Saskatchewan, which has resulted in increased fungicide use. The optimum timing of fungicide application for control of leaf spotting diseases is the flag leaf stage, while the optimum timing for suppression of FHB is at early flowering. Although the timing for application are different for these spring wheat diseases, producers are interested in the effects of a single application of fungicide to control both diseases. Environmental conditions can also affect the optimum timing so it is of interest to see what effect application outside the optimum timing has on disease control.
Hard red spring wheat varieties vary greatly in their resistance to fungal pathogens and different varieties respond differently to fungicides. The project will demonstrate the effects of fungicide timing on two different varieties. Shaw has poor resistance to both leaf spotting diseases and FHB. Unity has fair resistance to leaf spotting and FHB.

9. **Methodology:** The demonstration will be set up as a four replicate factorial randomized complete block design with 14 treatments. Fungicide will be applied on two spring wheat varieties, Shaw and Unity, at six different timings plus an untreated check.
Twinline (130 g/L pyraclostrobin plus 80 g/L metconazole) will be applied to T1 at a rate of 0.500 L/ac., followed by Prosaro 250 Ec (125 g/L prothioconazole plus 125 g/L tebuconazole) at T2 and T3 at 0.324 L/ac.
Treatments were:
    1. Unity VB--untreated
    2. Unity VB--fungicide at flag leaf (T1)
    3. Unity VB--fungicide at 75% head emergence (T2)
    4. Unity VB--fungicide at 50% flower (T3)
    5. Unity VB--fungicide at flag + fungicide at 75% head emergence (T1 + T2)
    6. Unity VB--fungicide at flag + fungicide at 50% flower (T1 + T3)
    7. Unity VB--all three fungicide applications (T1 + T2 + T3)
    8. Shaw VB--untreated
    9. Shaw VB--fungicide at flag leaf (T1)
    10. Shaw VB--fungicide at 75% head emergence (T2)
    11. Shaw VB--fungicide at 50% flower (T3)
    12. Shaw VB--fungicide at flag + fungicide at 75% head emergence (T1 + T2)
    13. Shaw VB--fungicide at flag + fungicide at 50% flower (T1 + T3)
    14. Shaw VB--all three fungicide applications (T1 + T2 + T3)

Data to be collected includes the severity of leaf disease, severity of FHB infection, crop maturity, yield and thousand kernel weight. Leaf spot disease will be measured using the Horstall-Barrett scale at the flag leaf, 50% flower and soft dough stages. FHB infection will be measured close to plant maturity.

The project was planted on pea stubble. The plot had a pre-seed burn off of Maverick 11 at a rate of 1'5 L/ac on May 17, 2013. The day was cool and a soil temperature of 12C. The crop was seeded on May 23, 2013 at a rate of 100 lbs/ac. and a depth of 3/4". The seed treatment used was Raxial. The top soil was dry with an air temperature of 20C and a soil temperature of 12C. The fertilizer applied with the seed was 50 lbs/ac N, 20 lbs/ac P and 20 lbs/ac S.

The crop emerged on May 28, 2013. It was sprayed with 2, 4D Amine 600 at 0.50 L/ac on June 24, 2013. The temperature at spraying time was 14C. The Unity started to head July 14, 2013 and the Shaw on July 17, 2013.

The fungicide treatments were applied as follows:

Unity VB--T1--July 12, 2013--Twinline at 0.50 L/ac. Temperature 24C.
Unity VB--T2--July 19, 2013--Prosaro at 0.324 L/ac. Temperature 18C
Unity VB--T3--July 26, 2013--Prosaro at 0.324 L/ac. Temperature 20C
Shaw VB--T1--July 14, 2013--Twinline at 0.50 L/ac. Temperature 21C
Shaw VB--T2--July 23, 2013--Prosaro at 0.324 L/ac. Temperature 24C
Shaw VB--T3--July 30, 2013--Prosaro at 0.324 L/ac. Temperature 18C

The pre harvest burn off of 1.5 L/ac of Maverick 111 was applied on September 3, 2013. The treatments had samples harvested on September 14, 2013.

10. **Results:** Weather conditions during the growing season greatly impacts the level of disease in spring wheat. May at the CLC was warmer and drier than normal; June was normal for temperature but wetter than normal; July was cooler than normal and substantially wetter than normal; August was warmer than normal but drier than normal. Some of the plots were flooded out and others saw reduced yields due to the excess moisture in June (181 mm). There were no visible signs of leaf spot or FHB on any of the treatments on July 31, 2013. All treatments were green and showing no discoloration. On August 8, 2013 the visual assessment of the treatments found no evidence of leaf spot or FHB. A disease assessment on August 20, 2013 found no visual evidence of leaf spot or FHB in any of the treatments.

    Yield samples were taken. The data analysis was completed by Chris Holzapfel of IHARF and he concluded as follows; "grain yield was affected by fungicide (not statistically significant) but not variety and the thousand seed weight and test weight was not affected by either variable. Unity VB tended to yield higher than Shaw VB however this was not statistically significant at the desired probability level. Composite samples for each treatment were submitted for determination of fusarium damaged kernels and percent blackpoint and, while no fusarium was detected, the results suggested that blackpoint was lower for Unity VB than for Shaw VB and infection levels appeared to be highest when no fungicide was applied".

11. **Conclusions and Recommendations:** Weather conditions at the CLC in 2013 were less conducive to the development of fusarium head blight and blackpoint than those encountered in previous growing seasons. Overall spring wheat yields in the trial were limited by excess moisture and there was no benefit to foliar fungicide applications detected under these circumstances either.

    This demonstration was also carried out at Indian Head, Swift Current, Melfort and Scott. In the composite report completed by Chris Holzapfel, IHARF he concluded that," at these locations in 2013, the final fungicide application at early flowering provided the greatest and most consistent response at all three of these locations and there were no cases where a dual fungicide application resulted in higher yields than a single application applied at the optimal stage of growth, which in 2013 was the early flowering stage. In cases where leaf disease symptoms develop early on and have potential to do damage to the flag leaf prior to head emergence, the earlier fungicide application may be warranted, however this was not the case at any of the

locations in 2013. Growers who have experienced yield losses or grade reductions in the past, should select varieties with good resistance to leaf disease but should plan on applying a fungicide to control FHB sometime between the 75% head emergence and early flowering, especially when warm and humid conditions are encountered at this time. For growers who have not had trouble with FHB in the past or are facing dry conditions, fungicides are much less likely to be beneficial and simply choosing a variety with good genetic disease resistance may provide adequate protection".

12. **Acknowledgements: The** Conservation Learning Centre would like to acknowledge the funding for this project from the ADOPT Program of the Ministry of Agriculture and the leadership from Chris Holzapfel of NARF in designing and doing the combined report on the demonstration.

The CLC would like to acknowledge the staff who were instrumental in seeing the project successfully completed, Manager Curtis Braaten, Field Technician Russell Wall and the summer students.

13. **Appendices:** APPENDIX A: Treatment Data

14. **Abstract/Summary: (as adapted from the combined report for the demonstration prepared by Chris Holzapfel of NARF)**

Due to the wet weather in recent years, the incidence and severity of leaf disease and fusarium head blight (FHB) in spring wheat have risen in many parts of Saskatchewan and fusarium damaged kernels were a major cause for yield and grade reductions throughout the province in 2012. In 2013, field demonstrations were conducted near Indian Head, Melfort, Scott, Swift Current and Prince Albert to evaluate fungicide application timing on two spring wheat varieties with contrasting disease resistance packages. Significant yield increases with fungicide application were detected at Indian Head, Melfort and Scott but not at Swift Current or Prince Albert. The most consistent yield increases were obtained with fungicide applied at early flower while the flag-leaf application provided the least consistent benefits. There were no cases where dual fungicide applications resulted in higher yields than a single, well timed application; therefore, dual fungicide applications are unlikely to be economically viable except potentially under severe circumstances. Even at the responsive locations, fusarium head blight infection levels were generally quite low and the only location where fungicide applications resulted in statistically significant differences in fusarium damaged kernels was Melfort where levels tended to be lowest when fungicides targeting this specific disease were applied. At the two locations where fungicides failed to increase grain yields, overall disease levels were very low and, in the case of Prince Albert, yields were likely limited by factors other than disease. The CLC and combined results will be presented at winter meetings and in written reports over the coming months and will appear on the Conservation Learning Centre website.

APPENDIX A

Unity VB Spring Wheat

Plot #	Treatment	Grain Moisture %	1000 Weight gms	Weight/bus g/500ml	Yield Bus/ac
109	untreated	12.5	19.0	409	44.32
214	untreated	Flooded out			
306	untreated	11.8	19.3	408	38.72
411	untreated	10.3	17.6	353	26.77
Ave		11.5	18.6	390	36.60

Plot #	Treatment	Grain Moisture %	1000 Weight gms	Weight/bus g/500ml	Yield Bus/ac
108	T1	12.4	17.5	395	49.61
205	T1	12.1	18.7	411	43.71
309	T1	11.6	19.2	400	36.45
406	T1	11.2	19.4	407	46.87
Ave		11.8	18.7	403	44.16

Plot #	Treatment	Grain Moisture %	1000 Weight gms	Weight/bus g/500ml	Yield Bus/ac
105	T2	12.0	19.3	411	43.86
207	T2	12.5	19.6	425	40.99
303	T2	11.2	17.8	407	28.59
412	T2	Flooded out			
Ave		11.9	18.9	414	37.81

Plot #	Treatment	Grain Moisture %	1000 Weight gms	Weight/bus g/500 ml	Yield Bus/ac
114	T3	12.7	17.8	395	25.40
211	T3	13.0	18.3	413	43.56
302	T3	11.8	19.6	413	24.51
413	T3	Flooded out			
Ave		12.5	18.6	407	31.16

Plot #	Treatment	Grain Moisture %	1000 Weight gms	Weight/bus g/500ml	Yield Bus/ac
112	T1 + T2	12.9	18.3	405	41.44
208	T1 + T2	12.4	17.9	403	37.20
310	T1 + T2	11.0	17.4	407	30.86
409	T1 + T2	11.5	19.4	405	38.11
Ave		11.9	18.3	405	36.90

Plot #	Treatment	Grain Moisture %	1000 Weight gms	Weight/bus g/500ml	Yield Bus/ac
101	T1 + T3	11.4	15.6	379	23.44
213	T1 + T3	11.7	17.7	413	36.45
313	T1 + T3	12.5	19.3	405	39.33
405	T1 + T3	12.7	20.2	401	23.75
Ave		12.1	18.2	399	30.74

Plot #	Treatment	Grain Moisture %	1000 Weight gms	Weight/bus g/500ml	Yield Bus/ac
104	T1 + T2 + T3	13.1	18.9	423	39.78
210	T1 + T2 + T3	11.8	19.2	417	32.37
301	T1 + T2 + T3	11.8	20.6	385	38.08
402	T1 + T2 + T3	Flooded out			
Ave		12.2	19.6	408	36.74

Shaw VB Spring Wheat

Plot #	Treatment	Grain Moisture %	1000 Weight gms	Weight/bus g/500ml	Yield Bus/ac
103	Untreated	12.7	18.7	395	36.90
203	Untreated	10.4	18.8	417	26.92
314	Untreated	12.7	19.1	393	47.34
404	Untreated	11.0	19.4	401	25.01
Ave		11.7	19.0	402	34.04

Plot #	Treatment	Grain Moisture %	1000 Weight gms	Weight/bus g/500ml	Yield Bus/ac
107	T1	13.1	17.9	389	34.35
202	T1	12.4	18.2	407	38.27
304	T1	11.0	19.6	405	32.52
401	T1	Flooded out			
Ave		12.2	18.6	400	35.05

Plot #	Treatment	Grain Moisture %	1000 Weight gms	Weight/bus g/500ml	Yield Bus/ac
106	T2	12.9	19.3	403	40.69
201	T2	12.7	18.1	391	27.00
305	T2	11.2	20.1	399	33.88
408	T2	11.2	19.4	413	45.22
Ave		12.0	19.2	402	36.70

Plot #	Treatment	Grain Moisture %	1000 Weight gms	Weight/bus g/500ml	Yield Bus/ac
111	T3	12.9	19.7	399	25.11
209	T3	12.5	19.1	395	25.11
307	T3	11.8	20.2	383	25.50
410	T3	12.1	19.4	343	28.25
Ave		12.3	19.6	380	25.99

Plot #	Treatment	Grain Moisture %	1000 Weight gms	Weight/bus g/500ml	Yield Bus/ac
110	T1 + T2	12.9	19.8	393	33.28
212	T1 + T2	11.2	18.4	403	36.30
312	T1 + T2	11.4	18.4	395	37.51
403	T1 + T2	Flooded out			
Ave		11.8	18.9	397	35.69

Plot #	Treatment	Grain Moisture %	1000 Weight gms	Weight/bus g/500ml	Yield Bus/ac
113	T1 + T3	13.1	17.7	399	28.52
204	T1 + T3	12.5	19.8	407	32.97
311	T1 + T3	11.4	19.4	395	24.50
414	T1 + T3	Flooded out			
Ave		12.3	19.0	400	28.66

Plot #	Treatment	Grain Moisture %	1000 Weight gms	Weight/bus g/500ml	Yield Bus/ac
102	T1 + T2 + T3	12.3	18.1	401	32.21
206	T1 + T2 + T3	12.5	17.8	402	28.04
308	T1 + T2 + T3	11.1	16.3	395	34.18
407	T1 + T2 + T3	11.0	19.6	413	41.14
Ave		11.7	17.9	403	33.89