Report for FY22-IM-022: Fungicide Combinations and Genetic Resistance for FHB and DON Management

Note: Report must cover the *entire* duration of the project period of performance, May 1, 2022-July 30, 2026.

1. What are the major goals and objectives of the research project?

The goal of this proposal is the continuance of integrated management (IM) and uniform fungicide (UFT) trials that would allow us to evaluate new combinations of AIs either as pre- or tank-mixtures or as sequentially applied treatments. For the wheat IM trial, we conducted inoculated experiments consisting of four cultivars with different levels of resistance to FHB subjected to at least five fungicide treatments, all applied at Feekes 10.5.1, plus two untreated checks.

The Objectives of this FHB Management Coordinated Project (MGMT_CP) are to:

1) Evaluate the integrated effects of fungicide treatment and genetic resistance on FHB and DON in locally produced major grain classes, with emphasis on new combination fungicides, Miravis ERA, Prosaro Pro and Sphaerex
2) Compare the efficacy of Miravis ERA, Prosaro Pro and Sphaerex to that of Prosaro, Caramba, and Miravis Ace.
3) Generate data to further quantify the economic benefit of FHB and DON management programs.
4) Generate data to validate and advance the development of FHB risk prediction models.

2. What was accomplished under these goals or objectives? *(For each major goal/objective, address these three items below.)*

We evaluated the integrated effects of fungicide treatment and genetic resistance on FHB and DON in wheat and barley, with emphasis on new combination fungicides, Prosaro Pro and Sphaerex for the IM trials.

A. Integrated Management Trials:

What were the major activities?

Following standard protocol developed for the MGMT CP, the IM trials were planted (5-2-25) the wheat and barley trials and applied fungicides according to six different treatments to evaluate the efficacy of integrated effects of fungicide treatment and genetic resistance on FHB and DON in wheat and barley, with emphasis on new fungicides (Miravis Ace and Miravis ERA) and new combination fungicides, Prosaro Pro and Sphaerex. Fungicides were applied in hard red and white spring wheat of various resistance classes (susceptible, moderately susceptible and moderately resistant). Fungicides were applied at early anthesis with one treatment having an additional application 4-6 days after the first. There were two checks, one untreated and not inoculated and the other untreated and inoculated. Rating of disease occurred 21-24 days after inoculation, plots were harvested at maturity, and FDK and DON was determined from harvested grain samples.

Table 1. The following fungicide treatments were randomly assigned to experimental units in **Wheat:** WB6211CLP (S), IDO2202CLP (MS, low DON), UI Gold (MS, high DON), and Rollag (R, low DON).

Trt No.	Type	Treatment Name	Form Type	Rate	Rate Unit	Other Rate	Other Rate Unit	Appl Code	Appl Description
1	CHK	Untreated Check (inoculated)							
2	CHK	Untreated, non-inoculated							
3	FUNG	Prosaro	EC	475	ml/ha	6.5	fl oz/a	A	Early Anthesis Feekes 10.5.1
	ADJ	Induce 90 SL	SL	0.125	% v/v			A	Early Anthesis Feekes 10.5.1
4	FUNG	Miravis Ace	SC	1000	ml/ha	13.7	fl oz/a	A	Early Anthesis Feekes 10.5.1
	ADJ	Induce 90 SL	SL	0.125	% v/v			A	Early Anthesis Feekes 10.5.1
5	FUNG	Prosaro Pro	SC	752	ml/ha	10.3	fl oz/a	A	Early Anthesis Feekes 10.5.1
	ADJ	Induce 90 SL	SL	0.125	% v/v			A	Early Anthesis Feekes 10.5.1
6	FUNG	Sphaerex		533	ml/ha	7.3	fl oz/a	A	Early Anthesis Feekes 10.5.1
	ADJ	Induce 90 SL	SL	0.125	% v/v			A	Early Anthesis Feekes 10.5.1

Table 2. The following fungicide treatments were randomly assigned to experimental units in **Barley:** (LGBU17-1320A (susceptible), ABI Voyager (MS), Moravian 179 (MS) and CDC Copeland (MR)

Spray vol: 20 GAL/AC

Trt No.	Type	Treatment Name	Form Type	Rate	Rate Unit	Other Rate	Other Rate Unit	Appl Code	Appl Description
1	CHK	Untreated Check (inoculated)							
2	FUNG	Prosaro	EC	475	ml/ha	6.5	fl oz/a	A	Heading
	ADJ	Induce 90 SL	SL	0.125	% v/v			A	Heading
3	FUNG	Miravis Ace	SC	1000	ml/ha	13.7	fl oz/a	A	Heading
	ADJ	Induce 90 SL	SL	0.125	% v/v			A	Heading
4	FUNG	Prosaro Pro	SC	752	ml/ha	10.3	fl oz/a	A	Heading
	ADJ	Induce 90 SL	SL	0.125	% v/v			A	Heading
5	FUNG	Sphaerex		533	ml/ha	7.3	fl oz/a	A	Heading
	ADJ	Induce 90 SL	SL	0.125	% v/v			A	Heading
6	FUNG	Sphaerex		533	ml/ha	7.3	fl oz/a	B	4-6 days after heading
	ADJ	Induce 90 SL	SL	0.125	% v/v			B	4-6 days after heading

What were the significant results?

Within the IM trials, there were significant differences between wheat varieties for disease severity, index, test weight, and DON (Table 3). Across the experiments from 2022 through 2025, the susceptible varieties had lower test weight and higher DON. While yields of susceptible uninoculated varieties often had lower yields, when disease was light to moderate, those differences were not statistically different. Moderately resistant lines such as Holmes

performed similar to the resistant check, Rollag. All fungicide treatments significantly reduced FHB incidence, severity and Index (Table 4) compared to the two checks (untreated inoculated and untreated non-inoculated check) and when compared across varieties (Table 5). Yield and test weight were higher with all fungicide treatments in general, and DON was reduced with all fungicide treatments. In 2025, there were no significant effects of fungicide on test weight at Pr>0.05 for fungicide applications. In some years (2025) the effects of fungicides on yield were significant at Pr>0.10. There were significant variety by fungicide differences for incidence (P value 0.06), yield, and test weight (Table 5).

Table 3. Spring wheat variety performance for disease measures (incidence, severity, and index), yield, test weight, FDK and DON (ppm).

Variety	DISEASE			Yield	Test Wt	FDK	DON
	Incidence (%)	Severity (%)	Index (%)	(bu/A)	(lb/bu)	(%)	(ppm)
A IDO1904S	24.7 a	38.8 ab	10.8 a	103 ab	55.3 c	0.69 a	0.50 a
B Holmes	13.6 ab	28.4 b	4.0 b	106 ab	58.5 ab	0.42 ab	0.08 bc
C UI Gold	16.4 ab	48.7 a	8.3 ab	120 a	57.9 b	0.63 b	0.28 ab
D Rollag	12.0 b	28.4 b	3.3 b	91 b	58.9 a	0.70 a	0.01 c
P-value (Alpha=0.05)	0.1796	0.03	0.0407	0.1794	<0.0001	0.0803	0.0058

Table 4. Fungicide performance for disease measures (incidence, severity, and index), yield, test weight, FDK and DON (ppm). UC = untreated check.

Fungicide Treatment	DISEASE			Yield	Test Wt	FDK	DON
	Incidence (%)	Severity (%)	Index (%)	bu/A	(lb/bu)	(%)	(ppm)
1 UC, inoculated	23.4 a	48.1 a	12.1 a	104 a	57.1 b	0.68 a	0.40 a
2 UC	21.1 a	44.9 ab	9.6 a	102 a	57.8 ab	0.70 a	0.29 ab
3 Prosaro	14.7 bc	32.6 cd	5.3 b	104 a	57.7 ab	0.51 a	0.23 bc
4 Miravis Ace	17.9 ab	25.9 d	4.9 b	108 a	57.7 ab	0.59 a	0.13 bc
5 Prosaro Pro	13.3 bc	36.8 bc	5.0 b	108 a	57.8 ab	0.66 a	0.20 bc
6 Sphaerex	9.7 c	28.2 cd	2.6 b	104 a	58.0 a	0.53 a	0.07 c
P-value (Alpha=0.05)	<0.0001	<0.0001	<0.0001	<0.0001	0.2073	0.3628	0.0035

Table 5a. Disease, yield, test weight, FDK and DON results for four spring wheat varieties with two untreated controls (one inoculated, one not inoculated) and four different fungicide treatments.

FACTOR		DISEASE		
Variety	Fungicide	Incidence (%)	Severity (%)	Index (%)
IDO1904S	1 Untreated check	33.8 ab	51.3 abc	17.0 abc
IDO1904S	2 Untreated, non-inoculated	41.0 a	44.0 abcde	19.0 a
IDO1904S	3 Prosaro	17.3 cde	37.1 cdefgh	8.5 de
IDO1904S	4 Miravis Ace	24.5 bcd	27.9 defgh	6.8 de
IDO1904S	5 Prosaro Pro	19.5 cde	35.8 cdefgh	8.8 de
IDO1904S	6 Sphaerex	12.0 cde	36.8 cdefgh	4.8 de

Holmes	1	Untreated check	20.5	bcde	35.9	cdefgh	9.0	cde
Holmes	2	Untreated, non-inoculated	13.0	cde	41.7	bcdef	4.8	de
Holmes	3	Prosaro	11.0	de	26.6	defgh	2.8	de
Holmes	4	Miravis Ace	14.0	cde	15.8	h	2.0	e
Holmes	5	Prosaro Pro	12.3	cde	31.2	cdefgh	3.3	de
Holmes	6	Sphaerex	10.8	de	19.5	gh	2.0	e
UI Gold	1	Untreated check	27.3	abc	65.1	a	17.5	ab
UI Gold	2	Untreated, non-inoculated	17.0	cde	61.2	ab	10.5	bcd
UI Gold	3	Prosaro	15.0	cde	44.4	abcd	7.0	de
UI Gold	4	Miravis Ace	20.0	bcde	41.1	bcdefg	8.0	de
UI Gold	5	Prosaro Pro	11.0	de	44.2	abcd	4.5	de
UI Gold	6	Sphaerex	8.0	e	36.3	cdefgh	2.3	e
Rollag	1	Untreated check	12.0	cde	40.1	bcdefg	5.0	de
Rollag	2	Untreated, non-inoculated	13.5	cde	32.7	cdefgh	4.0	de
Rollag	3	Prosaro	15.5	cde	22.2	efgh	3.0	de
Rollag	4	Miravis Ace	13.0	cde	18.9	h	3.0	de
Rollag	5	Prosaro Pro	10.3	de	36.3	cdefgh	3.5	de
Rollag	6	Sphaerex	8.0	e	20.2	fgh	1.5	e
P-value (Alpha = 0.05)			0.0639		0.9707		0.3826	

Table 5b. Disease, yield, test weight, FDK and DON results for each variety and fungicide treatments.

FACTOR			Yield		Test Wt		FDK		DON	
Variety	Fungicide		bu/A		(lb/bu)		(%)		(ppm)	
IDO1904S	1	Untreated check	98	defgh	53.8	i	0.78	ab	0.78	a
IDO1904S	2	Untreated, non-inoculated	93	gh	54.5	hi	0.74	ab	0.72	ab
IDO1904S	3	Prosaro	103	cdefgh	55.5	gh	0.60	abc	0.39	bcdef
IDO1904S	4	Miravis Ace	106	bcdefg	55.6	gh	0.78	abc	0.29	bcdef
IDO1904S	5	Prosaro Pro	109	abcdefg	55.9	fgh	0.74	abc	0.59	abc
IDO1904S	6	Sphaerex	110	abcdefg	56.7	efg	0.50	abc	0.23	defg
Holmes	1	Untreated check	105	bcdefg	57.9	bcde	0.72	ab	0.32	cdefg
Holmes	2	Untreated, non-inoculated	106	bcdefg	59.2	ab	0.54	abc	0.08	efg
Holmes	3	Prosaro	114	abcdef	59.4	a	0.36	bc	0.02	g
Holmes	4	Miravis Ace	104	cdefg	58.6	abcd	0.28	c	0.01	g
Holmes	5	Prosaro Pro	111	abcdefg	57.5	cde	0.36	bc	0.03	fg
Holmes	6	Sphaerex	96	efgh	58.5	abcd	0.28	c	0.00	g

UI Gold	1	Untreated check	117	abcd	57.6	cde	0.54	abc	0.43	abdce
UI Gold	2	Untreated, non-inoculated	116	abcde	58.0	abcde	0.68	abc	0.35	cdefg
UI Gold	3	Prosaro	115	abcde	57.2	def	0.68	abc	0.50	abcd
UI Gold	4	Miravis Ace	128	a	57.9	bcde	0.68	abc	0.22	defg
UI Gold	5	Prosaro Pro	120	abc	58.7	abc	0.60	abc	0.16	efg
UI Gold	6	Sphaerex	126	ab	58.4	abcd	0.58	abc	0.05	fg
Rollag	1	Untreated check	97	defgh	59.3	ab	0.68	abc	0.06	fg
Rollag	2	Untreated, non-inoculated	94	fgh	59.3	ab	0.84	a	0.00	g
Rollag	3	Prosaro	84	h	58.7	abc	0.40	bc	0.00	g
Rollag	4	Miravis Ace	96	fgh	58.9	abc	0.62	abc	0.00	g
Rollag	5	Prosaro Pro	92	gh	59.1	ab	0.94	a	0.00	g
Rollag	6	Sphaerex	84	h	58.4	abcd	0.74	ab	0.00	g
P-value (Alpha = 0.05)			0.064		0.0075		0.6945		0.3923	

When results were split into fungicide effects, there were statistically significant differences between treatments (Pr>F=0.01) for incidence, disease severity, index, and DON. All fungicide treatments resulted in lower disease and DON compared to the two checks. DON content was lowest on plots treated with Sphaerex. There were significant differences for varieties for disease severity, index and DON (Alpha = 0.05), as well as yield and test weight. Varieties with higher levels of resistance had significantly less DON and disease than more susceptible varieties and breeding lines without fungicide applications.

Table 6. Spring barley variety performance for disease measures (incidence, severity, and index), yield, test weight, FDK and DON (ppm) averaged over fungicide treatment. Ratings of varieties: LGBU17-1320A (MS), ABI Voyager (MS), Moravian 179 (MS), CDC Copeland (MR).

Variety		DISEASE						Yield	Test Wt	DON
		Incidence	(%)	Severity	(%)	Index	(%)	(bu/A)	(lb/bu)	(ppm)
1	LGBU17-1320A	24.2	ab	11.7	ab	3.2	ab	145 a	44.8 a	0.1 ab
2	ABI Voyager	33.8	ab	12.0	ab	4.4	a	138 ab	45.0 a	0.2 a
3	Moravian 179	22.1	ab	13.0	a	3.0	ab	115 c	46.9 a	0.0 b
4	CDC Copeland	12.8	b	9.3	b	1.5	b	120 bc	46.3 a	0.1 b
P-value (Alpha = 0.05)		**0.1247**		**0.1377**		**0.1497**		**0.0216**	**0.4424**	**0.0518**

Table 7. Fungicide performance for disease measures (incidence, severity, and index), yield, test weight, FDK and DON (ppm) averaged over barley variety. UC = untreated check. DAH = days after heading.

Fungicide Treatments		DISEASE			Yield	Test Wt	DON
		Incidence (%)	Severity (%)	Index (%)	bu/A	(lb/bu)	(ppm)
1	UC (Inoculated)	20.9 bc	12.8 a	3.2 ab	135 ab	45.8 a	0.2 a
2	Prosaro	28.1 ab	12.8 a	3.7 ab	126 ab	45.9 a	0.1 ab
3	Miravis Ace	30.8 a	13.5 a	4.4 a	123 b	45.6 a	0.1 ab
4	Prosaro Pro	18.9 c	8.8 b	1.9 b	138 a	46.0 a	0.1 ab
5	Sphaerex	20.4 bc	10.2 ab	2.4 b	129 ab	45.6 a	0.1 ab
6	Sphaerex (4-6DAH)	20.3 bc	10.9 ab	2.4 b	126 ab	45.5 a	0.0 b
P-value (Alpha =0.05)		**0.0361**	**0.1467**	**0.0862**	**0.2736**	**0.816**	**0.1969**

Table 8a. Disease results for four spring barley varieties with an untreated control (inoculated) and five different fungicide treatments. DAH is days after heading. Ratings of varieties: LGBU17-1320A (MS), ABI Voyager (MS), Moravian 179 (MS), CDC Copeland (MR). UC is untreated check.

FACTOR			DISEASE		
Variety		Fungicide	Incidence (%)	Severity (%)	Index (%)
LGBU17-1320A	1	UC (Inoculated)	23.5 bcdef	14.3 a	4.0 abc
LGBU17-1320A	2	Prosaro	31.0 abc	11.8 ab	3.9 abc
LGBU17-1320A	3	Miravis Ace	36.5 ab	14.3 a	5.2 ab
LGBU17-1320A	4	Prosaro Pro	17.5 cdef	10.9 ab	2.1 bc
LGBU17-1320A	5	Sphaerex	15.5 cdef	8.3 ab	1.3 c
LGBU17-1320A	6	Sphaerex (4-6 DAH)	21.0 bcdef	10.5 ab	2.5 bc
ABI Voyager	1	UC (Inoculated)	29.5 bcd	13.5 ab	4.2 abc
ABI Voyager	2	Prosaro	35.0 abc	11.7 ab	4.1 abc
ABI Voyager	3	Miravis Ace	47.5 a	14.4 a	7.6 a
ABI Voyager	4	Prosaro Pro	26.0 bcdef	9.1 ab	2.7 bc
ABI Voyager	5	Sphaerex	33.0 abc	12.0 ab	4.0 abc
ABI Voyager	6	Sphaerex (4-6 DAH)	31.5 abc	11.2 ab	3.5 bc
Moravian 179	1	UC (Inoculated)	19.5 bcdef	11.4 ab	2.7 bc
Moravian 179	2	Prosaro	27.0 bcde	16.0 a	4.0 abc
Moravian 179	3	Miravis Ace	18.0 bcdef	15.9 a	2.8 bc
Moravian 179	4	Prosaro Pro	25.0 bcdef	8.8 ab	2.2 bc
Moravian 179	5	Sphaerex	24.0 bcdef	12.2 ab	3.4 bc
Moravian 179	6	Sphaerex (4-6 DAH)	19.0 bvdef	13.5 ab	2.6 bc
CDC Copeland	1	UC (Inoculated)	11.0 def	11.8 ab	1.78 bc
CDC Copeland	2	Prosaro	19.5 bcdef	11.5 ab	2.89 bc
CDC Copeland	3	Miravis Ace	21.0 bcdef	9.3 ab	2.11 bc
CDC Copeland	4	Prosaro Pro	7.0 f	6.3 b	0.71 c
CDC Copeland	5	Sphaerex	9.0 ef	8.3 ab	0.85 c
CDC Copeland	6	Sphaerex (4-6 DAH)	9.5 ef	8.5 ab	0.93 c
P-value (Alpha = 0.05)			**0.7306**	**0.9779**	**0.8995**

Table 8b. Yield, test weight, and DON results for four spring barley varieties with an untreated control (inoculated) and five different fungicide treatments. DAH is days after heading. Ratings of varieties: LGBU17-1320A (MS), ABI Voyager (MS), Moravian 179 (MS), CDC Copeland (MR). UC is untreated check.

FACTOR			Yield	Test Wt	DON
Variety		Fungicide	bu/A	(lb/bu)	(ppm)
LGBU17-1320A	1	UC (Inoculated)	151 a	45.2 a	0.3 abc
LGBU17-1320A	2	Prosaro	140 abcd	44.3 a	0.1 bcd
LGBU17-1320A	3	Miravis Ace	141 abcd	44.5 a	0.1 cd
LGBU17-1320A	4	Prosaro Pro	145 abc	45.1 a	0.0 d
LGBU17-1320A	5	Sphaerex	151 a	45.5 a	0.0 d
LGBU17-1320A	6	Sphaerex (4-6 DAH)	145 abc	44.7 a	0.0 d
ABI Voyager	1	UC (Inoculated)	138 abcd	45.1 a	0.4 ab
ABI Voyager	2	Prosaro	128 abcde	45.6 a	0.1 cd
ABI Voyager	3	Miravis Ace	130 abcde	44.9 a	0.1 bcd
ABI Voyager	4	Prosaro Pro	148 ab	45.0 a	0.1 bcd
ABI Voyager	5	Sphaerex	147 ab	44.7 a	0.4 a
ABI Voyager	6	Sphaerex (4-6 DAH)	136 abcd	44.6 a	0.1 cd
Moravian 179	1	UC (Inoculated)	130 abcde	46.7 a	0.0 d
Moravian 179	2	Prosaro	112 de	47.1 a	0.1 cd
Moravian 179	3	Miravis Ace	112 de	46.9 a	0.0 d
Moravian 179	4	Prosaro Pro	119 bcde	47.3 a	0.1 cd
Moravian 179	5	Sphaerex	103 e	47.0 a	0.0 d
Moravian 179	6	Sphaerex (4-6 DAH)	111 de	46.6 a	0.0 d
CDC Copeland	1	UC (Inoculated)	120 bcde	46.2 a	0.05 cd
CDC Copeland	2	Prosaro	125 abcde	46.9 a	0.00 d
CDC Copeland	3	Miravis Ace	110 de	46.1 a	0.17 abcd
CDC Copeland	4	Prosaro Pro	139 abcd	46.9 a	0.08 cd
CDC Copeland	5	Sphaerex	115 cde	45.5 a	0.04 cd
CDC Copeland	6	Sphaerex (4-6 DAH)	111 de	46.1 a	0.00 d
P-value (Alpha = 0.05)			**0.8603**	**0.977**	**0.3928**

When results were split into barley variety and fungicide effects, there were statistically significant differences between treatments (Pr>F=0.05) for disease incidence for fungicide effects, and yield and DON for varieties. Fungicide treatments were not significant for severity, index, yield, test weight or DON compared to the check. DON content was lowest on plots treated with Sphaerex applied 4-6 days after heading. The untreated check produced DON level higher than fungicide treated (Tables 7-8).

List key outcomes or other achievements.
Fungicide treatments improved yield and grain quality while effectively controlling FHB when disease was significant, thus supporting their role in FHB management strategies for spring wheat and spring barley. One of the main takeaways from the research in Idaho has been the understanding that the balance between disease and control more heavily favors control with the least aggressive strategies. As part of the IM team, data was included in analysis of all participant's data and presented at the USWBSI forum.

B. Uniform Fungicide Trials:

What were the major activities? For the UFT, 8-15 treatments were evaluated over several years, including the inoculated check, for FHB development, yield, test weight, grain moisture, DON and FDK. The UFT trial at the University of Idaho research farm in Aberdeen, Bingham County ID, used soft white spring wheat 'WB6211CLP' (highly FHB-susceptible) to evaluate fungicide efficacy against Fusarium Head Blight (FHB). In order to get the optimum disease development, experimental plots were set up in a randomized complete block design with four replications, planted on May 2, 2025, and irrigated as needed to replace evapotranspiration. An additional sprinkler system was installed across the experimental plot to create conducive environment for disease infection and development. Different fungicide combinations were used as treatments (See Table 1, Treatments). A *Fusarium graminearum* spore suspension (100,000 spores/ml) was used for inoculation on July 8, the same day as the anthesis fungicide treatments were carried out. The second fungicide application was applied 15 July for treatments 8 and 9. The FHB index was calculated as (incidence × severity) / 100. FHB ratings, including incidence and severity, were recorded 23 days after anthesis. There was no evidence of phytotoxicity after fungicide treatments. Plots were harvested on 6 Sept with a small plot combine. Yield and test weight was determined with the HarvestMaster system on the combine. Analysis used PROC GLIMMIX in SAS 9.4 with LSD ($\alpha = 0.05$) for mean comparisons.

Table 1. The following fungicide treatments were the base treatments for the Uniform Fungicide Trial for 2025. Additional treatments were included at the request of Syngenta.

Trt[a]	Product	Rate/A (fl oz)	Timing[b]
1	Untreated check	…	…
2	Prosaro	6.5	Feekes 10.5.1 (early anthesis)
3	Miravis ERA	10.2	Feekes 10.5.1 (early anthesis)
4	Miravis Ace	13.7	Feekes 10.5.1 (early anthesis)
5	Prosaro Pro	10.3	Feekes 10.5.1 (early anthesis)
6	Sphaerex	7.3	Feekes 10.5.1 (early anthesis)
7	Miravis Ace fb Prosaro Pro	13.7/10.3	Early anthesis/4-6 DAA
8	Miravis Ace fb Sphaerex	13.7/7.3	Early anthesis/4-6 DAA
9	Miravis Ace fb Tebuconazole	13.7/4	Early anthesis/4-6 DAA

What were the significant results?

Table 2. Fungicide effects on disease incidence, severity, index, DON and FDK and agronomic compared to the inoculated untreated control.

Tr No	Treatment Name	Appl Rate	Appl Code	Incidence 21 daa C	Severity 21 daa C	Index 21 daa C	Yield (bu/A)	TstWt (lb/bu)	DON (ppm)	FDK (%)
1	UC (Inoc.)	---		31 a	37 a	12 a	110 abc	54.5 d	0.81 a	0.70 ab
2	Prosaro	6.5 fl.oz/A	C	18 ab	15 bcd	3 b	103 abc	55.7 abc	0.35 bc	0.85 ab
3	Miravis ERA	10.2 fl. oz./A	C	14 b	18 bcd	2 b	118 a	56.6 a	0.20 bcd	0.45 ab
4	Miravis Ace	13.7 fl. oz./A	C	25 ab	21 bcd	5 b	111 abc	55.8 abc	0.39 b	0.60 ab
5	Prosaro Pro	10.3 fl. oz./A	C	22 ab	18 bcd	4 b	115 abc	56.1 ab	0.12 bcd	0.75 ab
6	Sphaerex	7.3 fl. oz./A	C	20 ab	18 bcd	3 b	109 abc	54.9 cd	0.29 bcd	1.15 a
7	Miravis Ace Prosaro Pro	13.7 fl. oz./A 10.3 fl. oz./A	C D	19 ab	24 bcd	5 b	108 abc	55.7 abcd	0.35 bc	1.15 a
8	Miravis Ace Sphaerex	13.7 fl. oz./A 7.3 fl. oz./A	C D	24 ab	17 bcd	4 b	107 abc	55.4 bcd	0.25 bcd	0.65 ab
9	Miravis Ace Tebuconazole	13.7 fl. oz./A 4 fl. oz./A	C D	22 ab	27 ab	5 b	96 c	55.8 abc	0.29 bcd	0.45 ab
10	A23751 [C]	8.59 fl. oz./A	C	18 ab	14 cd	2 b	97 bc	55.9 abc	0.18 bcd	1.10 a
11	A25317 [B]	10.3 fl. oz./A	C	14 b	11 d	2 b	93 c	56.3 ab	0.03 d	0.30 b
12	A24814 [B] A17414 [A]	10.3 fl. oz./A 2.38 fl. oz./A	C C	18 ab	12 cd	2 b	117 a	55.5 abcd	0.07 cd	0.65 ab
13	A24814 [B] A17414 [A]	9.57 fl.oz./A 2.38 fl. oz./A	C C	20 ab	13 cd	3 b	120 a	56.3 ab	0.30 bcd	0.60 ab
14	A24180 [A]	fl. oz./A	C	16 b	15 bcd	2 b	118 a	56.1 ab	0.09 cd	0.50 b
15	A24188	fl. oz./A	C	20 ab	24 abc	5 b	121 a	55.9 abc	0.18 bcd	0.25 b
			Mean	**19.9**	**18.9**	**4.0**	**109.6**	**55.8**	0.26	0.68
			Treatment Prob (F)	0.590	**0.015**	**0.024**	**0.059**	0.102	**0.0011**	0.257

Application Codes: C =Early Flowering (Feekes 10.5.1), D=4-6 Days after Anthesis. Days after fungicide application = daa.

Note: Treatments with the same letter in a column are not significantly different (P<0.05)

When results were split into variety and fungicide effects, there were no statistically significant differences between treatments except for test weight. All fungicide treatments resulted in lower disease and DON compared to the two checks. DON content was lowest (0.07 ppm) on plots treated with Sphaerex.

None of the fungicides had significant effect on yield or FDK, but improved test weight compared to the untreated check for all treatments except Sphearex. Disease incidence and disease index was reduced for all fungicide treatments. DON averaged approximately 50% less for all treatments.

List key outcomes or other achievements.

New fungicides have been added to the list of effective fungicides to reduce the impact of FHB and accumulation of DON. Sphaerex was as effective as the other fungicides in reducing disease incidence, severity and index. The most effective control of FHB occurred with the combination of resistant varieties and application of fungicides applied at anthesis. As part of the IM team, data was included in analysis of all participant's data and presented at the USWBSI forum.

3. **What opportunities for training and professional development has the project provided?**
   New staff have joined the Cereals breeding program and have been trained in assessment of FHB disease.

4. **How have the results been disseminated to communities of interest?**
   The results of all the trials are published in our Annual Small Grains Report, disseminated to collaborating breeders, presented at various grower seminar and field events, and reported annually at the Scab Forum and in the biennial Scabinar.

5. **What do you plan to do during the next reporting period to accomplish the goals and objectives?**
   Not applicable, this is the final report for the agreement.