Project FY22-IM-015: Integrated Management of FHB and DON in Soft Winter Wheat and Winter Barley in MI

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

1) Evaluate the integrated effects of fungicide treatment and genetic resistance on FHB and DON in all major grain classes, with emphasis on new combination fungicides, Prosaro Pro and Sphaerex.
2) Compare the efficacy of 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.)*

What were the major activities?

Wheat and barley head scab trials were implemented for the 2023 season, including fungicide applications, head scab ratings, harvest, sample preparation for DON analysis, communication of data with Dr. Pierce Paul for further analysis and use in refining FHB risk prediction models. The project findings were summarized and used in extension meetings and field meetings to improve head scab management. The 2024 crop was planted in the fall of 2023, including two wheat and two barley varieties for trials to address the four objectives listed above.

Table: Treatment effect on harvest moisture, DON (ppm), foliar disease on May 22 and Jun21st, FHB disease incidence and disease severity, and FHB index, for white winter wheat cultivar 'Ambassador'. Yield and other parameters were not statistically significant.

	HMoisture		DON		DS_22May	DS_21June		FHB_DI		FHB_DS	FHB_DIX	
Non-inoc nontreated	52.24	bc	3.22	abc	0.80	1.60	ab	9.00	ab	17.80	1.60	ab
non treated	52.20	bc	4.42	a	0.20	2.60	a	10.40	ab	29.05	3.02	a
Prosaro 6.5 fl oz @10.5.1	51.90	c	3.18	abc	1.60	0.60	b	10.20	ab	22.00	2.24	ab
Caramba 13.5 fl oz @ 10.5.1	53.32	abc	2.98	abc	0.40	1.00	b	7.20	ab	21.70	1.56	ab
Miravis Ace 13.7 fl oz @10.5.1	53.60	abc	2.14	cde	0.20	0.20	b	6.20	ab	17.13	1.06	ab
Prosaro Pro 10.3 fl oz @10.5.1	53.40	abc	2.24	cde	0.60	1.00	b	8.60	ab	18.07	1.55	ab
Sphaerex 7.3 fl oz @ 10.5.1	52.38	abc	3.02	abc	0.20	1.00	b	9.20	ab	26.33	2.42	ab
Miravis Ace 13.7 fl oz @10.5.1 fb Prosaro Pro 10.3 fl oz 4-6 days	53.78	abc	1.36	de	0.60	0.20	b	3.60	b	26.97	0.97	b
Miravis Ace 13.7 fl oz @10.5.1 fb Sphaerex 7.3 fl oz 4-6 days	54.32	a	0.84	e	0.20	0.80	b	3.80	b	5.87	0.22	b
Miravis Ace 13.7 fl oz @10.5.1 fb Tebuconazole 4 fl oz 4-6 days	54.04	ab	2.20	cde	0.20	0.70	b	6.00	ab	10.57	0.63	ab
Prosaro 8.2 fl oz @10.5.1	53.22	abc	2.64	bcd	0.40	1.00	b	8.40	ab	18.15	1.52	ab
Sphaerex 7.3 fl oz + Prosaro 6.5 fl oz @10.5.1	53.42	abc	2.76	bcd	0.20	0.60	b	9.40	ab	24.44	2.30	ab
Nexicore 5 fl oz @9 fb Sphaerex 7.3 fl oz @10.5.1	52.90	abc	3.14	abc	0.60	0.60	b	13.60	a	19.64	2.67	ab
Miravis Ace 13.7 fl oz @10.3	52.64	abc	3.84	ab	0.40	1.00	b	12.00	a	26.19	3.14	ab
P-value	0.000888		2.95E-09		0.0575	0.000119		0.000681		0.39	0.00363	

What were the significant results?

Despite relatively low levels of head scab due to dry conditions across the state, we were able to "push disease" by inoculating with grain spawn and supplemental moisture with a lateral irrigation system resulting in treatment differences. The table above and figure below demonstrate data from one of the trials documenting DON suppression of "new and old" fungicide products, and two pass fungicide programs. The data demonstrates that newer products such as Sphaerex and Prosaro Pro are working as well as the older products such as Caramba. The lowest DON was found in the two pass program. This data from Michigan will has been highly valuable in discussing disease management locally and nationally. Additionally, this data will be amalgamated with multistate data to provide a robust assessment of these fungicide products and timing strategies.

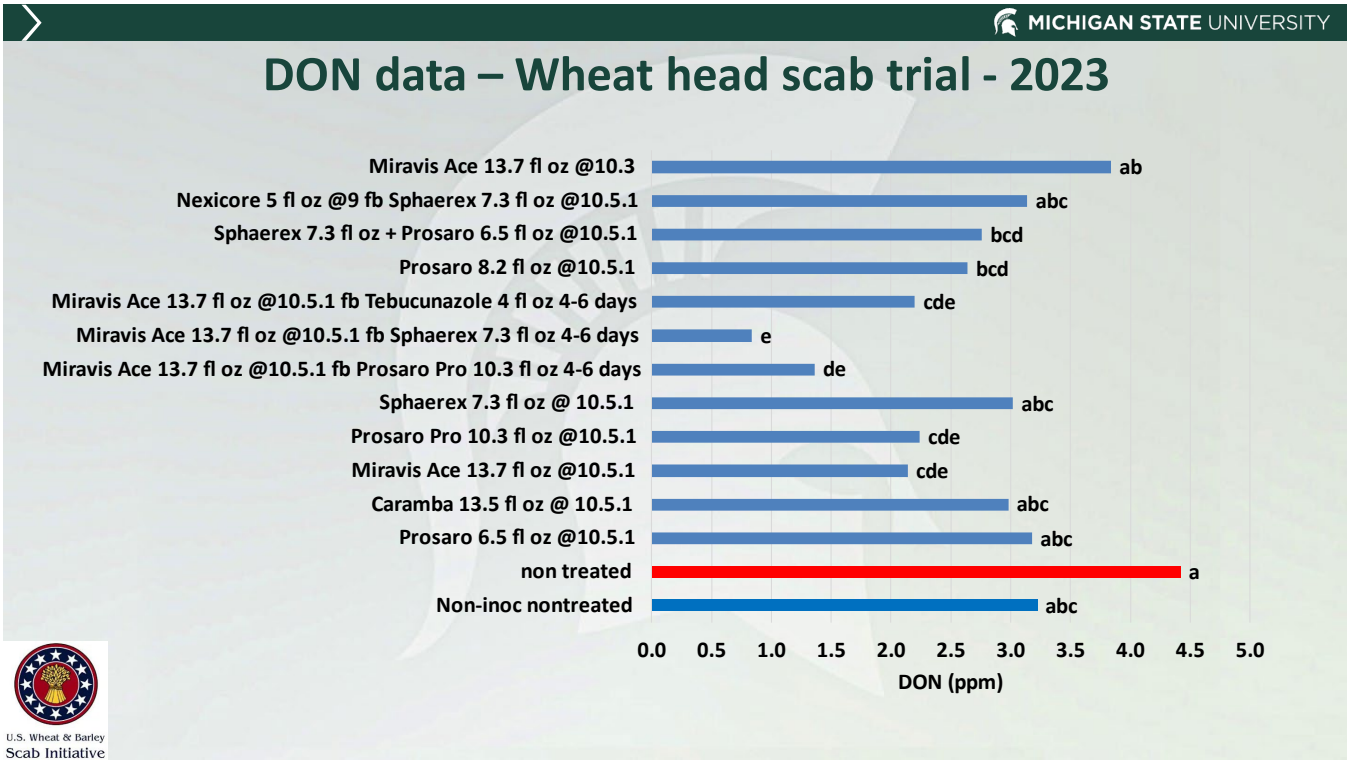

Figure: 2023 field trial data demonstrating suppression of DON from evaluated fungicide treatments.

List key outcomes or other achievements.

This data and data from the USWBSI collective were invaluable in discussions with farmers and agribusiness personnel around head scab management.

Expected Outcome: Regional product performance for the effects of fungicide treatment and genetic resistance on FHB and DON, with emphasis on new combination fungicides, Prosaro Pro and Sphaerex.

Actual Outcome: Data on new combination fungicides was generated and shared at winter meetings.

Expected Outcome: Regional performance on efficacy of Prosaro Pro and Sphaerex to that of Prosaro, Caramba, and Miravis Ace.

Actual Outcome: Data on Products were assessed in a moderate disease environment and observations were added to national dataset.

Expected Outcome: Contribute data to further quantify the economic benefit of FHB and DON management programs.

Actual Outcome: Data was contributed to a pooled data set for continued economic analysis.

Expected Outcome: Contribute data to validate and advance the development of FHB risk prediction models.

Actual Outcome: Data was contributed which will be used to help improve model development.

3. What opportunities for training and professional development has the project provided?

The entire lab participates in head scab trial rating. This provides an opportunity for undergraduate, graduate students and postdocs to become familiar with the project. We discuss treatments and why the trial is conducted, and what we can learn from the trials.

4. How have the results been disseminated to communities of interest?

As detailed below in the list of extension outputs the research results from the trials conducted at Michigan State University and from the USWBSI collective are presented at field days and winter extension meetings to improve farmer and agribusiness understanding of head scab management, including the importance integrated disease management of variety resistance and judicious fungicide use, as well as product performance and best practices and use of the head scab risk prediction model.

Wheat fungicide efficacy information is updated annually through a national fungicide efficacy chart and discussions with members of the NCERA-184 group and published through the Crop Protection Network. I regularly share this guide with farmers and industry: https://cropprotectionnetwork.org/publications/fungicide-efficacy-for-control-of-wheat-diseases

5. What do you plan to do during the next reporting period to accomplish the goals and objectives?

We plan to repeat the trial to strengthen the data set, with the possibility of revisions to the field protocols, depending on availability of new products.