Summary Report: 2024 High Management Testing of Wheat Varieties

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Project Overview

The 2024 High Management Wheat Project, led by Michigan State University, aims to identify wheat varieties that respond optimally to intensive management practices. The project is funded with a $44,000 budget and $61,875 in matching funds from the MSU Wheat Performance Testing Program. The goal is to align variety trial practices with commercial production standards to improve yield and profitability for Michigan wheat growers.

Experimental Design

1. Two experiments were conducted:
   High-Management Variety Trials: Conducted at seven locations (Allegan, Isabella, Ingham, Huron, Monroe, Sanilac, Tuscola) using a randomized complete block design with three replicates per entry. Practices included high seeding rate (1.5M seeds/ac), multiple nitrogen applications, fungicides, sulfur, and herbicides.
2. Enhanced Management with Seeding Rate Comparison: Conducted at Ingham and Tuscola with 10 varieties × 2 seeding rates (0.5M and 1.0M seeds/ac), four replicates. Practices included micronutrients, growth regulators, and additional nitrogen applications to test European-style low seeding/high yield strategies.

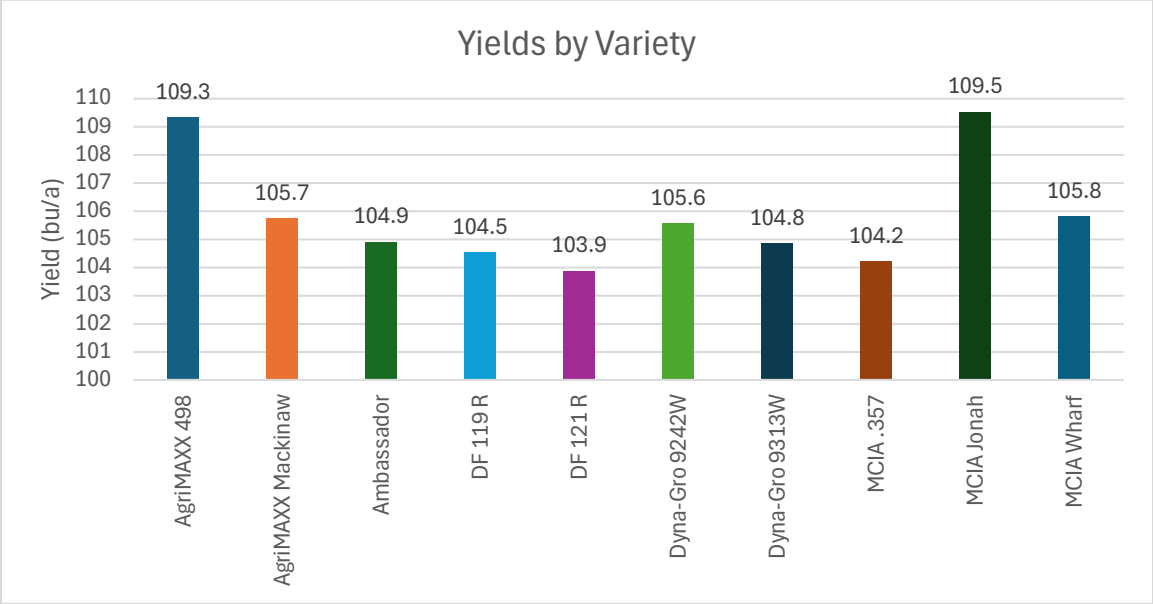
Data Analysis Summary

This is a multi-year project. Data is preliminary and caution should be taken before drawing conclusions. More site years/climates are needed to fully sort out differences in these variables.

Variety Response

There was a significant response to variety, as expected. Yield ranged from 103 to 109 bushels per acre over all locations and replications (Fig. 1).

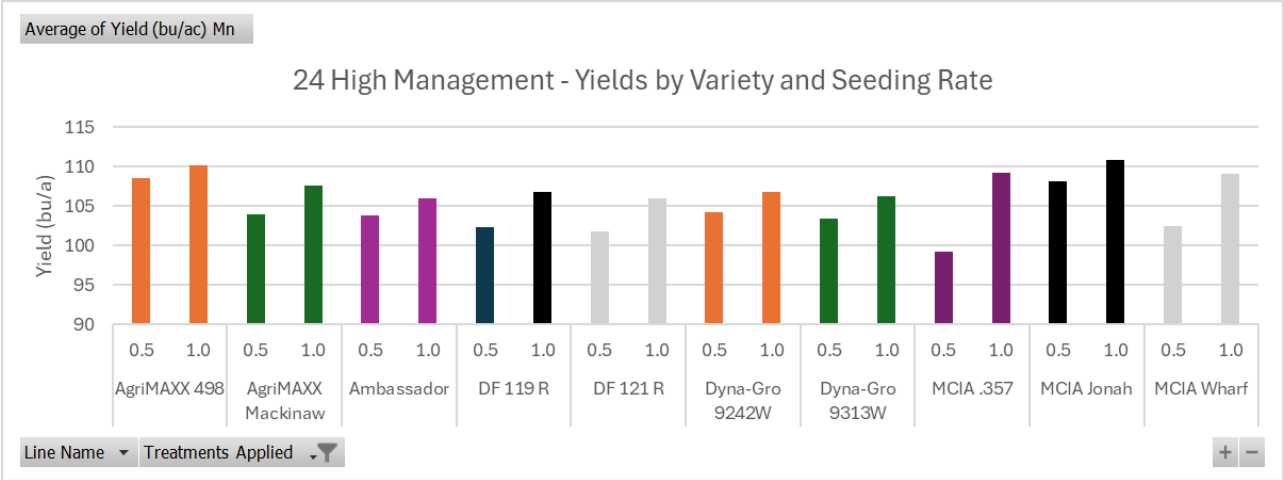
Figure 1. Grain yield in bu/a for 10 varieties entered in the High Management Trial.



Seeding Rate

Two seeding rates were tested for each variety: 0.5 and 1.0 million seeds per acre. In all cases, the 1.0 rate produced higher yield compared to the 0.5 rate. However, some varieties had a bigger response compared to others, indicating a seeding rate by variety relationship (Fig. 2).

Figure 2. Variety response to two seeding rates.



Canopy Type: Tukey HSD Test Results

Statistical analyses were conducted to evaluate the impact of canopy type and seed rate on various agronomic traits. Tukey's HSD tests were used to determine significant differences between Droopy and Erect canopy types.

Table 1. Tukey HSD results for canopy type effect on wheat yield components.

Variable	p-value	Interpretation	Canopy Type
Harvest Index	0.0432	Significant	Erect
Thousand Kernel Weight (TKW)	0.0803	Not Significant	Erect
Spikes per Head	0.5091	Not Significant	Droopy
Seeds per Spikelet	0.1628	Not Significant	Droopy
Grains/m²	0.0400	Significant	Droopy
Heads/m²	0.7149	Not Significant	Droopy
Seeds per Head	0.1628	Not Significant	Droopy

In this first year, erect canopy types produced higher harvest index. Harvest index is a ratio of the total grain weight to the total above ground biomass weight including grain and straw. A higher harvest index indicates that more grain can be produced from the same size plant. Grains/m2 was significantly higher for varieties with the droopy canopy type. This is an important metric because grain yield is a function of the number of kernels per unit area times the weight of each kernel (TKW). In these preliminary results, the p-value for TKW was 0.0803, close to the alpha level of 0.05. The erect canopy varieties tended to produce higher TKW. These results are showing mixed results for the two primary yield components with one favoring erect and one favoring droopy canopy types.

North Central Research Station

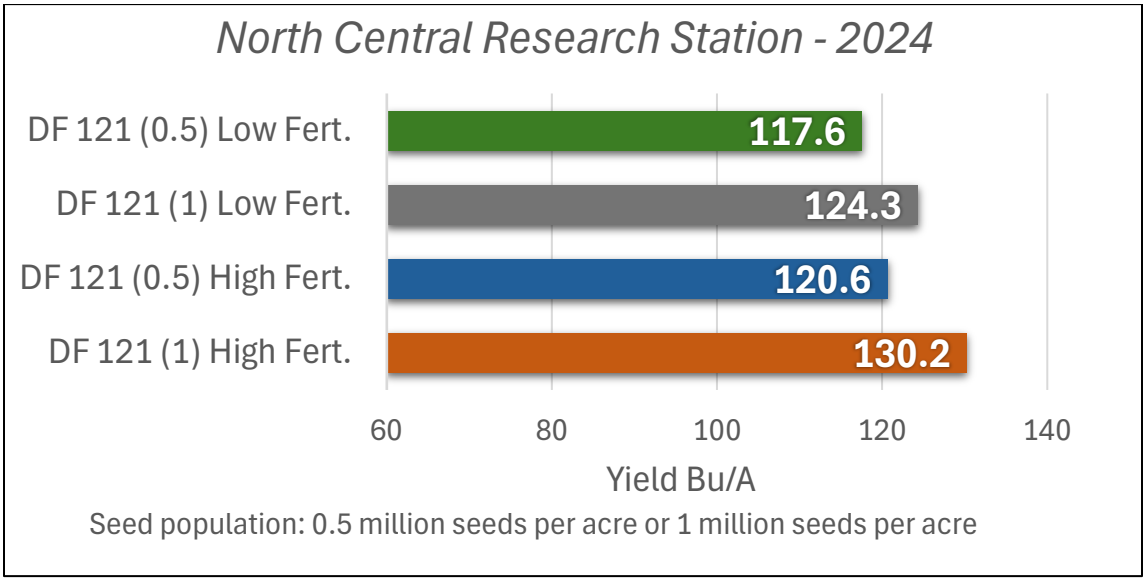
The North Central Research Station, a partner of Agroliquid, ran a version of the high management study on larger, field scale plots. The goal was to find out if larger plots behave the same way small plots do and that the results we find in the small plots translate to larger field scale conditions.

In this study, there two varieties (DF121 and Jonah), two seeding rates (0.5 and 1.0), two fertility regimes (see Table 2) and four replications. All plots received 220 lbs/a of MAP and 150 lbs/a of potash in the fall broadcast and incorporated prior to planting. The first chart (Fig. 3) shows the seeding rate response for DF 121 for the low fert and high fert treatments. In the low fert treatments, 1.0 seed rate produced 6.7 bu/a higher yield. In the high fert treatments, that number jumped to 9.6 bu/a.

Table 2. The low fertilizer treatment consisted of 80 lbs nitrogen per acre total. The high fertilizer treatment included a T1 fungicide, 180 lbs nitrogen per acre applied in three splits. Both treatments received T3 fungicide.

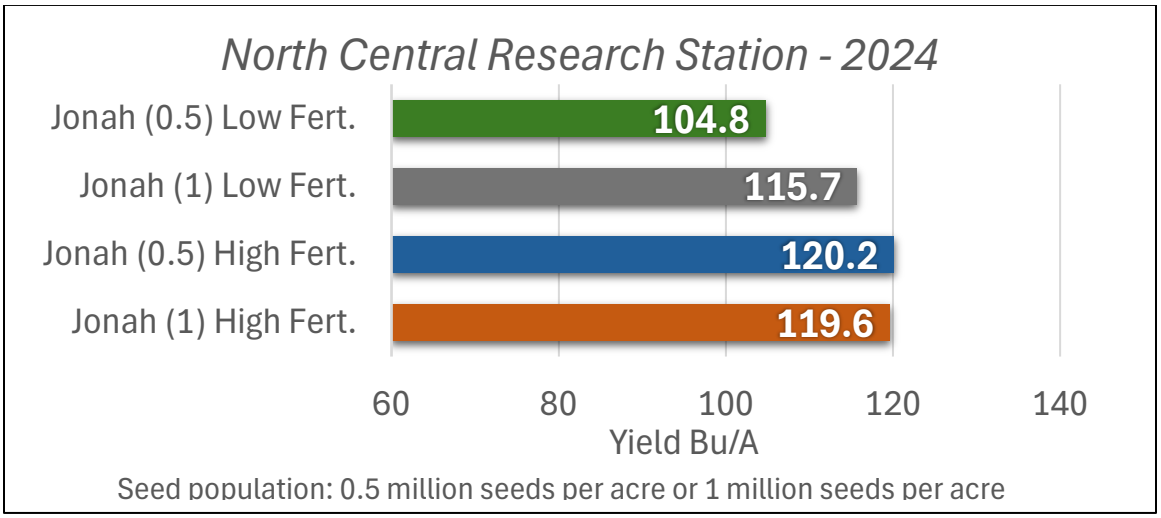
Treatment	Product	Timing	Rate
Low Fert	28% UAN	Greenup	20 gal/a
Low Fert	eNhance	Greenup	5 gal/a
Low Fert	Miravis Ace	Feekes 10.5.1	13 oz/a
High Fert	28% UAN	Greenup	20 gal/a
High Fert	eNhance	Greenup	5 gal/a
High Fert	Stratego Yield	Feekes 6	4 oz/a
High Fert	Palisade	Feekes 6	13 oz/a
High Fert	28% UAN	Feekes 6.5	20 gal/a
High Fert	Urea	Feekes 9	87 lb/a
High Fert	Miravis Ace	Feekes 10.5.1	13 oz/a

Figure 3. Results for DF 121 at the low and high fert rates and 0.5 and 1.0 million seeds per acre seeding rate.



For Jonah (Fig. 4), the same trend was true for seed rate at low fert, but there was no difference between seed rates at the high fert.

Figure 4. Results for Jonah at the low and high fert rates and 0.5 and 1.0 million seeds per acre seeding rate.



More research is needed. Quantifying the yield response to these management variables and comparing the response of yield components will help determine how to manage the wheat crop to obtain the best crop canopy and management practices that maximize yields.