Wide-Row Wheat Management Practices to Maximize Profits

Laura Lindsey[1], Pierce Paul[2], and Edwin Lentz[3]

[1]Horticulture & Crop Science, The Ohio State University; [2]Plant Pathology, The Ohio State University; [3]Extension, The Ohio State University

Introduction

In Ohio, wheat acreage has decreased since the 1970s. However, soft red winter wheat is an integral component of Ohio's economy and baking industry. Acreage is decreasing partly due to an increase in corn and soybean prices as well as a reduction in equipment inventory. Wide-row wheat may increase overall farm profitability by allowing for modified intercropping of soybean as well as reduced input costs (reducing seed and/or nitrogen application rates).

Objectives

The objectives of two experiments were to:

1. Evaluate the effect of row width and wheat variety on grain yield (Experiment #1).
2. Evaluate the effect of row width and nitrogen application rate on grain yield (Experiment #2).

Methods

- Field studies were established fall 2012 at the Northwest Agricultural Research Station (NWARS) in Custar, OH and Wooster Campus in Wooster, OH. Studies will be continued during the 2013-2014 growing season.
- Experiments were a split-plot randomized complete block design with four replications of treatments.

Experiment #1:

- Main plot factor of row width
  - 7.5-inch and 15-inch
- Subplot factor of wheat variety
  - Rupp 935, Rupp 972, Syngenta W1104, and Syngenta SY483

Experiment #2:

- Main plot factor of row width
  - 7.5-inch and 15-inch
- Subplot factor of N application rate
  - 0, 30, 60, 90, and 120 lb N/ac
- In both experiments, wheat was seeded at 25 seeds/ft row regardless of row spacing.
- Initial stand counts were collected at emergence. Tillering was recorded at green-up.
- At harvest, lodging, test weight, grain moisture, and yield was evaluated.
- Data was analyzed using the mixed procedure in SAS. Factors were considered statistically significant at $\alpha = 0.10$. If factors were found significant, paired t-tests were used to separate treatment means.
- Economic return of wheat grown in 7.5-inch row spacing was compared to 15-inch row spacing by:

Return = gross return – (N cost + seed cost)

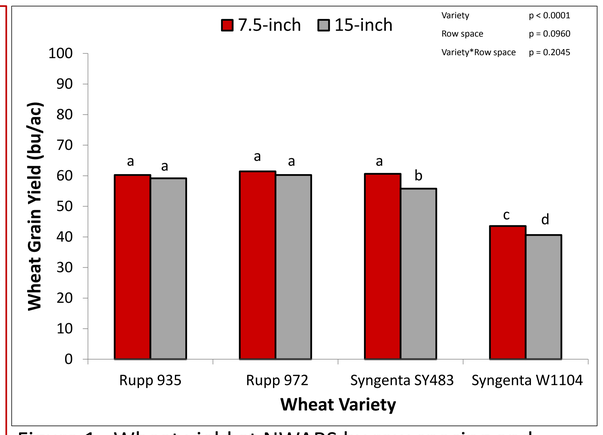

Figure 1. Wheat yield at NWARS by row spacing and variety, 2013.

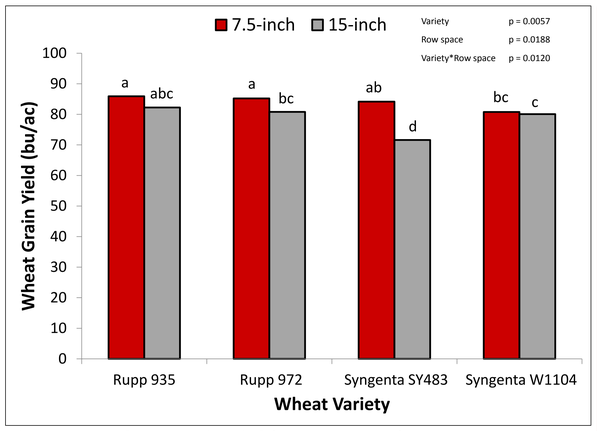

Figure 2. Wheat grain yield at Wooster by row spacing and variety, 2013.

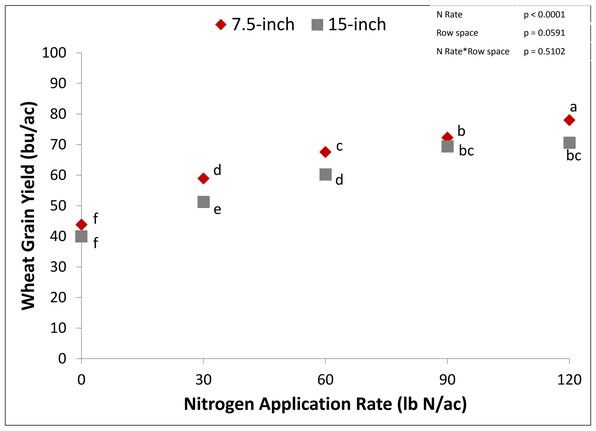

Figure 3. Wheat grain yield at NWARS by row spacing and nitrogen application rate, 2013.

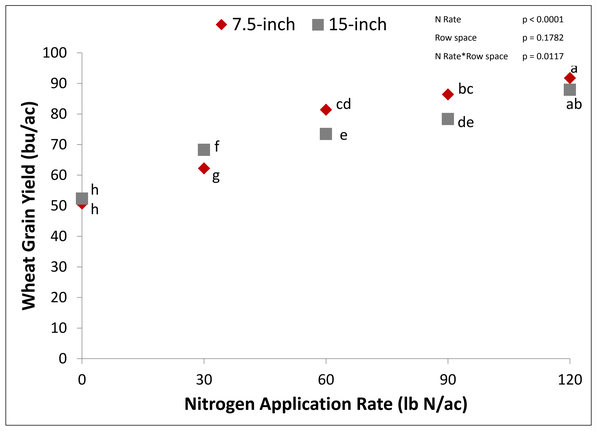

Figure 4. Wheat grain yield at Wooster by row spacing and nitrogen application rate, 2013.

Table 1. Economic return of wheat for row spacing/variety trial at NWARS, 2013.

Row Space	Variety	Yield	Gross Return[a]	Seed Cost	Economic Return
in		bu/ac	$/ac		
7.5	Rupp 935	60.3	409.70	60.00	349.70
7.5	Rupp 972	61.4	417.69	60.00	357.69
7.5	Syngenta SY483	60.6	412.25	60.00	352.25
7.5	Syngenta W1104	43.6	296.14	60.00	236.14
15	Rupp 935	59.2	402.22	30.00	372.22
15	Rupp 972	60.3	409.70	30.00	379.70
15	Syngenta SY483	55.8	379.27	30.00	349.27
15	Syngenta W1104	40.6	276.25	30.00	246.25

[a]Based on wheat price of $6.80/bushel.

Table 2. Economic return of wheat for row spacing/variety trial at Wooster, 2013.

Row Space	Variety	Yield	Gross Return[a]	Seed Cost	Economic Return
in		bu/ac	$/ac		
7.5	Rupp 935	85.9	584.26	60.00	524.26
7.5	Rupp 972	85.2	579.36	60.00	519.36
7.5	Syngenta SY483	84.2	572.22	60.00	512.22
7.5	Syngenta W1104	80.8	549.24	60.00	489.24
15	Rupp 935	82.3	559.30	30.00	499.30
15	Rupp 972	80.8	549.44	30.00	489.44
15	Syngenta SY483	71.6	486.88	30.00	426.88
15	Syngenta W1104	80.1	544.34	30.00	484.34

[a]Based on wheat price of $6.80/bushel.

Table 3. Economic return of wheat for row spacing/N rate trial at NWARS, 2013.

Row Space	N Rate	Yield	Gross Return[a]	Seed Cost	N Cost[b]	Economic Return
in	lb N/ac	bu/ac	$/ac			
7.5	0	43.8	297.98	60	0.00	237.98
7.5	30	58.9	400.66	60	13.50	327.16
7.5	60	67.6	459.48	60	27.00	372.48
7.5	90	72.3	491.44	60	40.50	390.94
7.5	120	78.0	530.40	60	54.00	416.40
15	0	40.0	271.80	30	0.00	241.80
15	30	51.3	348.64	30	13.50	305.14
15	60	60.2	409.50	30	27.00	352.50
15	90	69.4	471.72	30	40.50	401.22
15	120	70.6	480.22	30	54.00	396.22

[a]Based on wheat price of $6.80/bushel.
[b]Based on N cost of $0.45/lb N.

Table 4. Economic return of wheat for row spacing/N rate trial at Wooster, 2013.

Row Space	N Rate	Yield	Gross Return[a]	Seed Cost	N Cost[b]	Economic Return
in	lb N/ac	bu/ac	$/ac			
7.5	0	50.7	344.9	60.00	0.00	284.90
7.5	30	62.2	423.1	60.00	13.50	349.60
7.5	60	81.4	553.52	60.00	27.00	466.52
7.5	90	86.4	587.52	60.00	40.50	487.02
7.5	120	91.8	623.9	60.00	54.00	509.90
15	0	52.4	355.98	30.00	0.00	325.98
15	30	68.3	464.58	30.00	13.50	421.08
15	60	73.5	499.94	30.00	27.00	442.94
15	90	78.4	533.26	30.00	40.50	462.76
15	120	87.9	597.86	30.00	54.00	513.86

[a]Based on wheat price of $6.80/bushel.
[b]Based on N cost of $0.45/lb N.

Conclusions

Generally, wheat grain yield was greatest when grown in 7.5-inch row spacing compared to 15-inch row spacing. However, yield was dependent on wheat variety. Optimum N application rate was the same regardless of row spacing.

Economic return was generally greater at NWARS when wheat was grown 15-inch spacing. However, at Wooster, economic return was generally greatest when wheat was grown in 7.5-inch spacing. Overall, yield potential was greater at Wooster compared to NWARS indicating that 7.5-inch spacing is optimum for high-yielding environments.

Results

Experiment 1: Row spacing and variety

- At NWARS, wheat yield was reduced when grown in 15-inch row spacing compared to 7.5-inch row spacing when Syngenta SY483 and W1104 were planted (Fig. 1). There was no yield difference between row spacings when Rupp 935 and 972 were grown.
- At Wooster, wheat yield was reduced when grown in 15-inch row spacing compared to 7.5-inch row spacing when Rupp 972 and Syngenta SY483 were grown (Fig. 2). There was no yield difference between row spacings when Rupp 935 and Syngenta W1104 were grown (Fig. 2).
- Overall, wheat yield tended to be greatest when grown in 7.5-inch compared to 15-inch.

Experiment 2: Row spacing and nitrogen application rate

- Wheat yield was not influenced by the interaction of N rate and row spacing at NWARS (Fig. 3). Overall, wheat yield was greatest when grown in 7.5-inch row spacing at 120 lb N/ac.
- Wheat yield was influenced by the interaction of N rate and row spacing at Wooster (Fig. 4). Wheat yield was greater when grown in 7.5-inch row spacing compared to 15-inch row spacing, but only when 60-120 lb N/ac was applied.
- The agronomic optimum N rate was the same (>120 lb N/ac) regardless of row spacing (data not shown).

Economic Analysis

Treatments with the greatest economic return are highlighted in Tables 1-4 for each experiment and trial location.

Experiment 1: Row spacing and variety

- Economic return at NWARS tended to be greatest for both Rupp varieties grown in 15-inch row spacing and Rupp 972 in 7.5-inch row spacing (Table 1).
- Economic return at Wooster tended to be greatest for both Rupp varieties and Syngenta SY483 grown in 7.5-inch row spacing (Table 2).

Experiment 2: Row spacing and nitrogen application rate

- At NWARS, economic return was greatest at 120 lb N/ac for both row spacings and 90 lb N/ac for 7.5-inch row spacing (Table 3).
- At Wooster, economic return was greatest when wheat was grown at 90 and 120 lb N/ac in 7.5-inch row spacing and at 120 lb N/ac in 15-inch row spacing.

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