

Cereal Rye Variety Trial 2020

In a Nutshell:

- Nine cereal rye varieties were screened at two Iowa State University research farms and one commercial farm.

Key Findings:

- Across sites and varieties, average cereal rye yield was 39 bu/ac.
- Hybrid varieties, Bono, Brasetto and Serafino, were the top-yielding varieties at each site.
- Hazlet and ND Dylan, more-recently-released open-pollinated varieties, were intermediate yield performers across sites.

BACKGROUND

Cereal rye has recently gained attention as a winter cover crop in corn-soybean production systems. Seeded in the fall, cereal rye will grow before going into winter dormancy and resume growth early the following spring. When managed as a cash crop, cereal rye is harvested for grain in mid- to late July and field management options for the remainder of the season are numerous. These include establishment of a perennial forage or summer cover crop,

as well as an opportunity for mid-season manure application. As farmers begin to plant cereal rye for various purposes – cover crop seed, grain, straw, forage, hay or haylage production – they might seek to plant cereal rye varieties with distinct production characteristics.

This was the second year that Practical Farmers of Iowa coordinated cereal rye variety trials on university and commercial farms. In 2019, the average cereal rye yield across three sites in northern Iowa was 43 bu/ac.^[1] Recent

cereal rye variety trials conducted by the University of Minnesota, however, reported an average yield of 77 bu/ac in 2018^[2] and 68 bu/ac in 2019.^[3]

METHODS

Variety trials were conducted at three locations in 2020: ISU Northern Research Farm in Kanawha; ISU Northeast Research Farm in Nashua; Wendy Johnson's farm in Charles City. Production characteristics and some breeding history about each of the trialed varieties can be found in **Table 1**. Information on winter hardiness,

Cooperators

ISU Northern Research Farm
 (Matt Schnabel) – Kanawha
 ISU Northeast Research Farm
 (Ken Pecinovsky) – Nashua
 Wendy Johnson – Charles City

Funding

Walton Family Foundation
 Albert Lea Seed House

TABLE 1. Characteristics of cereal rye varieties trialed in 2020.

VARIETY	ORIGIN ^a	YEAR OF RELEASE	PVP ^b	TYPE ^c	WINTER HARDINESS ^d	TIME TO HEADING ^e	PLANT HEIGHT ^f	ERGOT RESISTANCE ^g
Aroostook	USDA-NRCS	1981	None	OPV	1	1	6	4
Bono	KWS	2013	N/A	Hybrid ^h	2	9	7	2
Brasetto	KWS	2007	N/A	Hybrid ^h	3	8	1	2
Elbon	OK	1956	None	OPV	6	1	8	9
Hazlet	SeCan	2006	None	OPV	2	5	6	2
ND Dylan	ND	2016	Pending	OPV	2	4	8	2
Serafino	KWS	2017	N/A	Hybrid ^h	2	9	1	2
Spooner (2019)	WI	1992	None	OPV	5	1	8	4
Wheeler (2018)	MI	1972	None	OPV	1	9	9	9

^a Origin: OK – Oklahoma State University; ND – North Dakota State University; WI – University of Wisconsin; MI – Michigan State University.

^b PVP = Plant Variety Protection. The PVP Act provides a certificate to the developer of a variety granting exclusive rights for reproducing and marketing the seed.

^c OPV = Open Pollinated Variety.

^d 1 = most hardy; 9 = least hardy. Ratings are average of 2016–2018 or 2017–2019 trials at University of Minnesota.

^e 1 = earliest; 9 = latest. Ratings are average of 2016–2018 or 2017–2019 trials at University of Minnesota.

^f 1 = shortest; 9 = tallest. Ratings are average of 2016–2018 or 2017–2019 trials at University of Minnesota.

^g 1 = most resistant; 9 = least resistant. Ratings are average of 2016–2018 or 2017–2019 trials at University of Minnesota.

^h Hybrids from KWS are protected from propagation by license agreements entered into with KWS upon seed purchase.

days to heading, plant height and ergot susceptibility was sourced from the University of Minnesota.^[2,3]

Rye management information is provided with the results from each location. No herbicide, insecticide or fungicide were applied at any location. Data were analyzed using JMP Pro 15 (SAS Institute Inc., Cary, NC). Statistical significance is determined at $P \leq 0.10$ level and means separations are reported using Tukey's least significant difference (LSD).

Rye seed samples from each location were sent to the Iowa State Seed Testing Laboratory for germination testing. Samples were pooled across replicates at each site and this precluded us from

analyzing these germination data statistically. As such, please keep in mind: We present germination percentages in this report as a rough comparison among varieties and locations.

RESULTS AND DISCUSSION

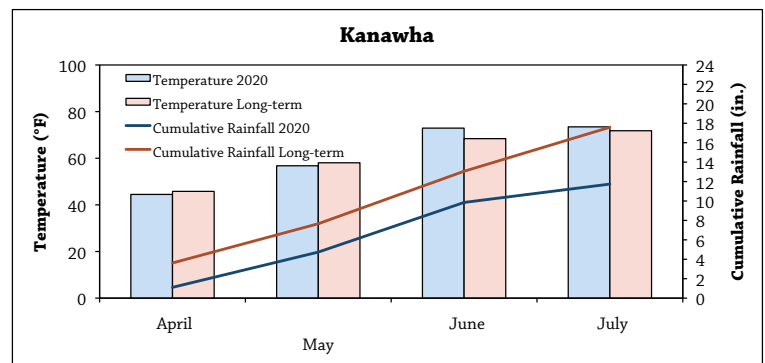
Data were analyzed by location and varieties are listed in order of 2020 yield performance. Reported yields are corrected for 14% moisture. A "percentage of test average" calculation for 2020 is included to aid in comparing among entries at each location. The two-year yield average is provided for varieties that were also trialed in 2019. Rainfall and temperature data were accessed from the nearest weather station.^[4] All three

sites saw rainfall amounts less than the historical averages for April and May – particularly the ISU Northern Research Farm at Kanawha which also experienced low rainfall through June and July.

Bono, Brasetto and Serafino, all hybrid varieties developed by KWS, were the top yield performers at each location. The hybrids were also significantly shorter in stature than the open-pollinated varieties (sometimes by as much as 10 in.). The newer open-pollinated varieties, Hazlet and ND Dylan, were intermediate in terms of yield at each location. Most varieties had germination rates above 90% across sites (**Table 5**).

ISU NORTHERN RESEARCH FARM, KANAWHA

Previous crop: Soybeans
 Replications: 3
 Plot size: 5 ft x 57 ft
 Fertilizer applied: 720 lb K/ac as potash on Nov. 22, 2019
 102 lb N/ac and 480 lb P/ac as MAP on Nov. 25, 2019
Note: P and K were applied based on an estimated 4-year crop removal rate.
 Planting date: Oct. 19, 2019 with no-till drill
 Row spacing: 7.5 in.
 Seeding rate: 23 seeds/ft²
 Rate on weight basis to achieve target population:
 Aroostook (56 lb/ac)
 Bono (85 lb/ac)
 Brasetto (54 lb/ac)
 Elbon (76 lb/ac)
 Hazlet (76 lb/ac)
 ND Dylan (69 lb/ac)
 Serafino (107 lb/ac)
 Spooner (90 lb/ac)
 Wheeler (84 lb/ac)
 Seeding depth: 1.25 in.
 Harvest date: July 22, 2020



VARIETY	YIELD (bu/ac)			YIELD (% OF SITE AVG.) 2020	TEST WEIGHT (LB/BU) 2020	PLANT HEIGHT AT HARVEST (IN.) 2020	% LODGING AT HARVEST ^b 2020
	2020	2019	2-YR				
Bono	67	77	72	153	56	37	2
Brasetto	65	70	68	147	55	36	2
Serafino	64	--	64	147	55	37	0
Hazlet	47	45	46	108	56	44	7
ND Dylan	39	40	40	88	55	45	3
Spooner	38	--	38	88	55	45	5
Elbon	32	25	29	74	56	44	3
Aroostook	24	23	24	54	55	47	0
Wheeler	18	--	18	52	52	53	5
MEAN	44	48	--	--	55	43	3
LSD(0.10)^a	7	17	--	--	1	4	--

^a By response variable, if the difference between any two entries is greater than the least significant difference (LSD) the entries are considered statistically different with 90% confidence.
^b Lodging data are visual estimates and were not statistically analyzed.

WENDY JOHNSON'S FARM, CHARLES CITY

Previous crop: Soybeans
 Replications: 3
 Plot size: 5 ft × 58 ft
 Fertilizer applied: 30 lb N/ac, 34 lb P/ac, 71 lb K/ac on Oct. 14, 2019
 Planting date: Oct. 18, 2019 with no-till drill
 Row spacing: 7.5 in.
 Seeding rate: 23 seeds/ft²

Rate on weight basis to achieve target population:

Aroostook (56 lb/ac)
 Bono (85 lb/ac)
 Brasetto (54 lb/ac)
 Elbon (76 lb/ac)
 Hazlet (76 lb/ac)
 ND Dylan (70 lb/ac)
 Serafino (107 lb/ac)
 Spooner (90 lb/ac)
 Wheeler (84 lb/ac)

Seeding depth: 1.25 in.
 Harvest date: July 23, 2020



Harvesting cereal rye variety trial plots at Wendy Johnson's farm near Charles City on July 23, 2020.

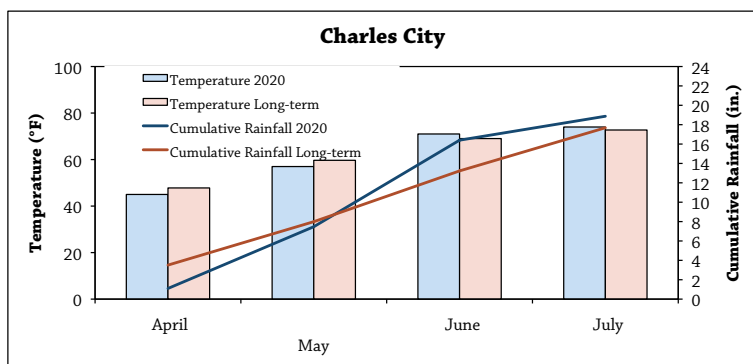


TABLE 3. Results for the 2020 Cereal Rye Variety Trial at Charles City in northeast Iowa.

VARIETY	YIELD (bu/ac)			YIELD (% OF SITE AVG.) 2020	TEST WEIGHT (LB/BU) 2020	PLANT HEIGHT AT HARVEST (IN.) 2020	% LODGING AT HARVEST ^b 2020
	2020	2019	2-YR				
Bono	48	63	55	153	54	34	2
Serafino	46	--	46	147	55	34	2
Brasetto	41	55	48	132	54	34	2
Hazlet	34	31	33	110	54	44	17
ND Dylan	28	28	28	91	53	47	32
Spooner	28	--	28	90	55	43	12
Elbon	25	13	19	81	55	47	22
Aroostook	18	18	18	58	53	46	60
Wheeler	12	--	12	38	52	53	3
MEAN	31	35	--	--	54	42	2
LSD(0.10)^a	13	10	--	--	3	3	--

^a By response variable, if the difference between any two entries is greater than the least significant difference (LSD) the entries are considered statistically different with 90% confidence.

^b Lodging data are visual estimates and were not statistically analyzed.

ISU NORTHEAST RESEARCH FARM, NASHUA

Previous crop: Soybeans
 Replications: 3
 Plot size: 8 ft × 50 ft
 Fertilizer applied: 60 lb P/ac and 267 lb K/ac on Nov. 13, 2019
 Planting date: Oct. 17, 2019 with no-till drill followed by culipacker
 Row spacing: 7.5 in.
 Seeding rate: 23 seeds/ft²

Rate on weight basis to achieve target population:

Aroostook (56 lb/ac)
 Bono (85 lb/ac)
 Brasetto (54 lb/ac)
 Elbon (76 lb/ac)
 Hazlet (76 lb/ac)
 ND Dylan (70 lb/ac)
 Serafino (107 lb/ac)
 Spooner (90 lb/ac)
 Wheeler (84 lb/ac)

Seeding depth: 1.25 in.
 Harvest date: July 20, 2020

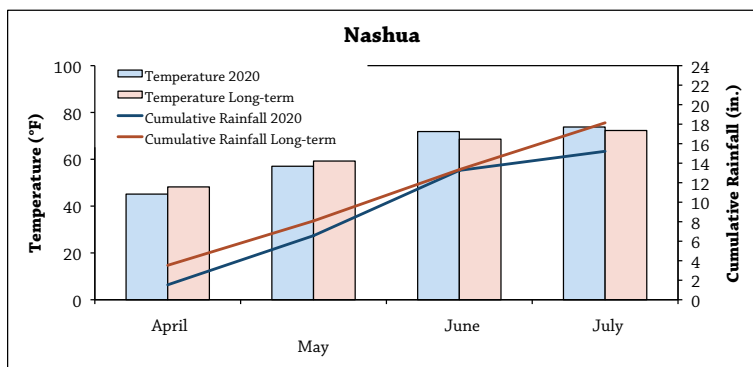


TABLE 4. Results for the 2020 Cereal Rye Variety Trial at Nashua in northeast Iowa.

VARIETY	YIELD (bu/ac)			YIELD (% OF SITE AVG.) 2020	TEST WEIGHT (LB/BU) 2020	STRAW YIELD (TON/AC) 2020	PLANT HEIGHT AT HARVEST (IN.) 2020	% LODGING AT HARVEST ^b 2020
	2020	2019	2-YR					
Bono	60	62	61	138	54	1.3	34	2
Serafino	59	--	59	136	54	1.3	35	2
Brasetto	54	57	55	124	53	1.3	35	2
Hazlet	46	43	44	106	54	1.5	43	2
ND Dylan	44	43	44	102	54	1.5	44	2
Spooner	41	--	41	95	54	1.3	43	2
Elbon	32	32	32	74	54	1.2	45	2
Aroostook	32	35	33	74	53	1.3	42	3
Wheeler	23	--	23	52	51	1.4	51	2
MEAN	43	45	--	--	54	1.3	42	2
LSD(0.10)^a	7	5	--	--	3	0.2	3	--

^a By response variable, if the difference between any two entries is greater than the least significant difference (LSD) the entries are considered statistically different with 90% confidence.

^b Lodging data are visual estimates and were not statistically analyzed.

TABLE 5. Seed germination (%) for cereal rye varieties harvested at each location.

VARIETY	KANAWHA	CHARLES CITY	NASHUA	MEAN (variety) ^c
Aroostook	97	96	91	95
Bono ^a	--	--	--	--
Brasetto ^a	--	--	--	--
Elbon	95	96	87 ^b	93
Hazlet	96	90 ^b	88 ^b	91
ND Dylan	96	94	88	92
Serafino ^a	--	--	--	--
Spooner	94	93	91 ^b	93
Wheeler	91	96	89 ^b	92
MEAN (site) ^c	95	94	89	

^a Hybrids did not receive germination testing

^b Fungal abnormalities present in the sample

^c Due to germination samples being pooled across replicates within a site we cannot test for statistically significant differences between varieties or site.

CONCLUSIONS AND NEXT STEPS

Desired cereal rye characteristics vary depending on intended purpose of the crop. For instance, if harvesting grain for livestock feed was the main priority in planting cereal rye, high-yielding hybrid varieties such as Bono, Brasetto or Serafino might be optimal choices. If the intended purpose is haylage, the varieties Wheeler or Aroostook, with their tall plant height, might be preferable to the shorter hybrids. In contrast, if someone were growing cereal rye as a seed crop (e.g., for cover crop seed) to be used on their own farm, they would avoid hybrid varieties and seek high yield with little lodging coupled with high seed germination. Farmers intending to sell cereal rye seed for cover crops to be sold off their farm need to be familiar with intellectual property considerations and the licensing process for those varieties with plant variety protection.

With the compiled information on plant protection status, winter hardiness, days to heading, plant height, and ergot susceptibility, alongside the researched characteristics of yield, test weight, plant height, and percent lodging, a farmer in Iowa can determine which cereal rye variety will best meet their production goals.

REFERENCES

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