

## Cereal Rye Variety Trial 2021

### In a Nutshell:

- Nine cereal rye varieties were screened at four Iowa State University research farms.

### Key Findings:

- Across sites and varieties, average cereal rye yield was 65.3 bu/ac.
- Hybrid varieties, Bono, Brasetto and Serafino, were the top-yielding varieties at each site. Hazlet and Danko were the top yielding open-pollinated varieties at each site.
- Across all sites and open-pollinated varieties, average germination was 91%.

### Cooperators

ISU Northern Research Farm

(Matt Schnabel) – Kanawha

ISU Northeast Research Farm

(Ken Pecinovsky) – Nashua

ISU Ag Engineering and Agronomy Farm

(Matt Schnabel) – Boone

ISU Southwest Research Farm

(Matt Schnabel) – Greenfield

### Funding

Walton Family Foundation

Albert Lea Seed House

### BACKGROUND

Cereal rye, otherwise known as winter rye, is the hardiest of the small grains, germinating at temperatures as low as 35 °F in the fall before going into winter dormancy and resuming growth in the early spring. Because of its hardiness, cereal rye has become a staple winter cover crop in corn-soybeans production systems. Subsequently, demand for cereal rye cover crop seed is increasing, although cereal rye can also be marketed for milling and animal feed. Harvesting cereal rye for grain occurs in mid- to late July, spreading labor and leaving farmers with the opportunity to establish a summer cover crop or apply mid-season manure. Currently most cereal rye planted as cover crop in Iowa is VNS (“Variety Not Stated”). However, farmers looking to plant cereal rye for grain, straw, forage or to roller-crimp their cover crop should consider planting named varieties as they can deliver higher performance and uniformity.

This was the third year that Practical Farmers of Iowa coordinated cereal rye variety trials. In 2021, all trials were moved to Iowa State University research farms. In 2019, the average cereal rye



Plots at the cereal rye variety trial at Boone on July 2, 2021.

yield across three sites in northern Iowa was 43 bu/ac.<sup>[1]</sup> In 2020, the average cereal rye yield across the same northern Iowa sites was 39 bu/ac.<sup>[2]</sup> Cereal rye variety trials conducted by the University of Minnesota reported an average yield of 85.8 in 2020.<sup>[3]</sup>

### METHODS

Variety trials were conducted at four locations in 2021: ISU Northern Research

Farm in Kanawha; ISU Northeast Research Farm in Nashua; ISU Ag Engineering and Agronomy Farm in Boone; ISU Southwest Research Farm in Greenfield. Production characteristics and some breeding history about each of the trialed varieties can be found in **Table 1**. Information on winter hardiness, days to heading, plant height and ergot susceptibility was sourced from the University of Minnesota.<sup>[3]</sup>

TABLE 1. Origin, characteristics and seeding rate of cereal rye varieties trialed in 2021

VARIETY	ORIGIN <sup>a</sup>	YEAR RELEASED	PVP <sup>b</sup>	TYPE <sup>d</sup>	WINTER HARDINESS <sup>e</sup>	PLANT HEIGHT <sup>f</sup>	STRAW STRENGTH <sup>g</sup>	ERGOT RESISTANCE <sup>h</sup>	MATURITY	SEEDING RATE (lb/ac) <sup>i</sup>
Bono	KWS	2013	N/A <sup>c</sup>	Hybrid	2	1	1	1	Late	80
Brasetto	KWS	2007	N/A <sup>c</sup>	Hybrid	3	2	1	1	Late	94
Danko	Danko Hodowla Roślin	1976	None	OPV	1	5	1	3	Medium	95
Elbon	OK	1956	None	OPV	6	8	9	9	Early	55
Hazlet	SeCan	2006	None	OPV	2	7	6	1	Medium	86
ND Dylan	ND	2016	Pending	OPV	2	8	8	2	Medium	69
ND Gardner	ND	2019	Pending	OPV	3	9	9	3	Early	38
Serafino	KWS	2017	N/A <sup>c</sup>	Hybrid	2	2	1	1	Late	69
Spooner	WI	1992	None	OPV	5	9	6	4	Early	66

<sup>a</sup> Origin: OK – Oklahoma State University; ND – North Dakota State University; WI – University of Wisconsin

<sup>b</sup> 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.

<sup>c</sup> Hybrids from KWS are protected from propagation by license agreements entered into with KWS upon seed purchase.

<sup>d</sup> OPV = Open Pollinated Variety.

<sup>e</sup> 1 = shortest; 9 = tallest. Ratings are 2018-2020 averages from the University of Minnesota.

<sup>f</sup> 1 = most hardy; 9 = least hardy. Ratings are 2018-2020 averages from the University of Minnesota.

<sup>g</sup> 1 = strongest; 9 = weakest. Ratings are 2018-2020 averages from the University of Minnesota.

<sup>h</sup> 1 = most resistant; 9 = least resistant. Ratings are 2018-2020 averages from the University of Minnesota.

<sup>i</sup> Calculated from seed lot weights from each seed source to achieve target population of 23 seeds/ft<sup>2</sup>.

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 roughly five weeks after harvest. 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 reported yields are corrected for 14% moisture. A “percentage of test average” calculation for 2021 is included to aid in comparing among entries at each location. The yield average is provided for varieties that were also trialed in 2019 and 2020 at Nashua and Kanawha. Rainfall and temperature data were accessed from the nearest weather station.<sup>[4]</sup> Rainfall was lower than average for the 2020-2021 growing season, especially at the Nashua and Boone research farms.

Across all sites and varieties, the average yield was 65.3, higher than both the 2019 and 2020 averages. Bono, Brasetto and Serafino, all hybrid varieties developed by KWS, were the top yield performers at each location, having yields of roughly 10-30 bu/ac higher than the open-pollinated varieties. The hybrids were also shorter in stature than the open-pollinated varieties (sometimes by as much as 8-10 in.). Of the six open-pollinated varieties trialed, Danko and Hazlet were the top yielding varieties across all four sites.

Varieties at the Greenfield farm had the highest percent lodging (**Table 5**), however they were also harvested the latest, two weeks after the varieties were harvested at Nashua, which had the highest yields of all sites (**Table 3**).

Seed germination ranged from 62 to 98% (**Table 6**). Samples with low germination were reported to have fungal abnormalities present. Boone and Kanawha had, on average, higher germination across varieties than Greenfield and Nashua.

## ISU NORTHERN RESEARCH FARM, KANAWHA

Previous crop: Soybeans  
 Replications: 3  
 Harvested plot size: 5 ft x 60 ft  
 Fertilizer applied: 28 lb N/ac and 147 lb P/ac on November 3, 2020  
 36 lb N/ac and 192 lb Gypsum/ac on April 6, 2021  
 Planting date: October 7, 2020  
 Row spacing: 7.5 in.  
 Seeding rate: 23 seeds/ft<sup>2</sup> – see **Table 1** for pounds per acre of each variety to reach target population  
 Seeding depth: 1.25 in.  
 Harvest date: July 19, 2021

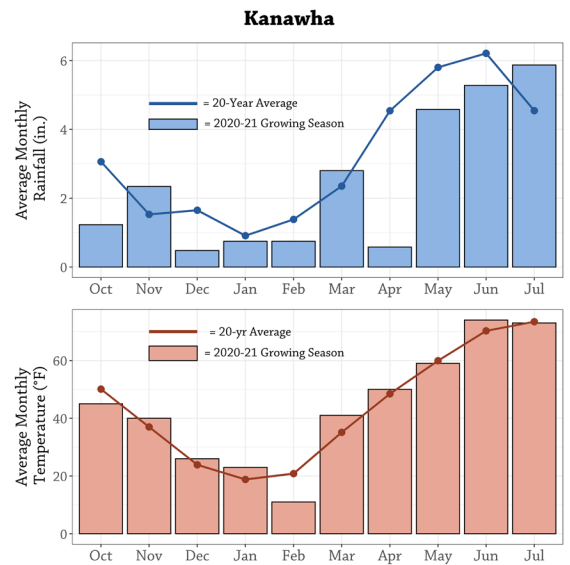


TABLE 2. Results for the 2021 Cereal Rye Variety Trial at Kanawha in north-central Iowa.

VARIETY	YIELD (bu/ac)				YIELD (% of site avg.) 2021	TEST WEIGHT (lb/bu) 2021	PLANT HEIGHT AT HARVEST (in.) 2021	LODGING (%) 2021
	2021	2020	2019	3-yr				
Bono	74	67	77	73	135	55	44	5
Brasetto	76	65	70	70	139	53	45	5
Danko	51	--	--	--	93	53	49	5
Elbon	33	32	25	30	59	53	53	15
Hazlet	62	47	45	51	112	52	50	8
ND Dylan	41	39	40	40	74	52	55	18
ND Gardner	40	--	--	--	74	52	56	15
Serafino	73	64	--	69	133	54	46	5
Spooner	44	38	--	41	80	53	55	10
LSD (90%)	16	--	--	--	--	2	4	5
MEAN	55	--	--	--	--	53	50	10

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.

## ISU NORTHEAST RESEARCH FARM, NASHUA

Previous crop: Soybeans  
 Replications: 3  
 Harvested plot size: 8 ft x 50 ft  
 Fertilizer applied: 60 lb P/ac and 267 lb K/ac on October 21, 2020  
 30 lb N/ac on March 3, 2021  
 Planting date: October 9, 2020 with no-till drill followed by cultipacker  
 Row spacing: 7.5 in.  
 Seeding rate: 23 seeds/ft<sup>2</sup> – see **Table 1** for pounds per acre of each variety to reach target population  
 Seeding depth: 1.25 in.  
 Harvest date: July 13, 2021

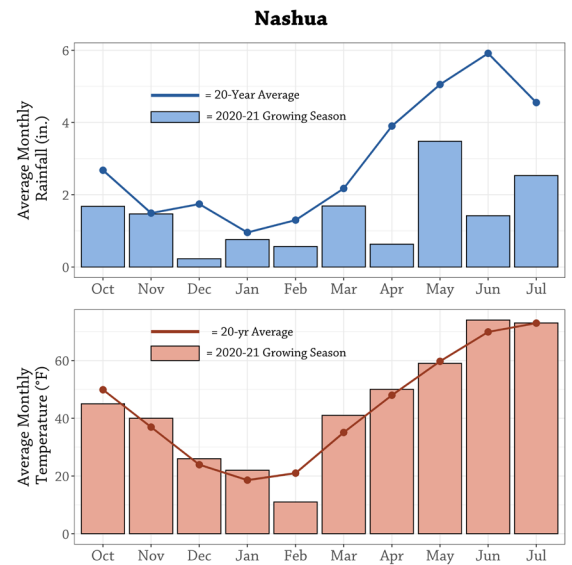


TABLE 3. Results for the 2021 Cereal Rye Variety Trial at Nashua in northeast Iowa.

VARIETY	YIELD (bu/ac)				YIELD (% of site avg.) 2021	TEST WEIGHT (lb/bu) 2021	STRAW YIELD (ton/ac) 2021	PLANT HEIGHT AT HARVEST (in.) 2021
	2021	2020	2019	3-yr				
Bono	111	60	62	78	133	54	2.3	43
Brasetto	115	54	57	75	138	53	2.6	45
Danko	86	--	--	--	103	54	1.9	48
Elbon	60	32	32	41	71	54	2.3	50
Hazlet	79	46	43	56	95	54	2.6	50
ND Dylan	58	44	43	48	70	53	2.8	51
ND Gardner	68	--	--	--	82	53	2.7	51
Serafino	117	59	--	88	140	54	3.0	45
Spooner	56	41	--	49	67	53	2.5	52
LSD (90%)	36	--	--	--	--	1	0.2	6
MEAN	83	--	--	--	--	54	2.5	48

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.

## ISU AG ENGINEERING AND AGRONOMY FARM, BOONE

Previous crop: Soybeans  
 Replications: 3  
 Harvested plot size: 5 ft x 60 ft  
 Fertilizer applied: 30 lb N/ac, 100 lb P/ac, 25 lb S/ac on April 3, 2021  
 Planting date: October 7, 2020  
 Row spacing: 7.5 in.  
 Seeding rate: 23 seeds/ft<sup>2</sup> – see **Table 1** for pounds per acre of each variety to reach target population  
 Seeding depth: 1.25 in.  
 Harvest date: July 22, 2021

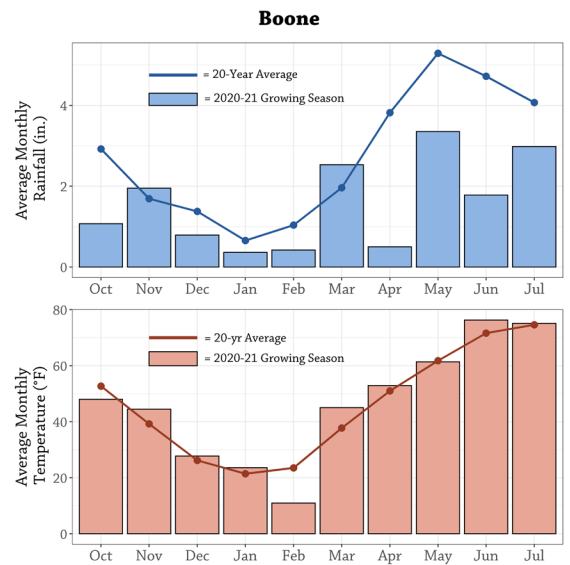


TABLE 4. Results for the 2021 Cereal Rye Variety Trial at Boone in central Iowa.

VARIETY	YIELD (bu/ac)	YIELD (% of site avg.)	TEST WEIGHT (lb/bu)	PLANT HEIGHT AT HARVEST (in.)	LODGING (%)
Bono	82	141	55	41	3
Brasetto	74	128	55	42	3
Danko	63	108	56	48	2
Elbon	32	54	54	53	15
Hazlet	59	102	55	52	3
ND Dylan	42	73	54	54	20
ND Gardner	40	69	54	54	15
Serafino	79	136	56	44	3
Spooner	51	87	55	54	7
LSD(90%)	16	--	1	3	16
MEAN	58	--	55	49	8

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.



Cereal rye at Boone on July 2, 2021.

## ISU SOUTHWEST RESEARCH FARM, GREENFIELD

Previous crop: Soybeans  
 Replications: 3  
 Harvested plot size: 5 ft x 56 ft  
 Fertilizer applied: 14 lb N/ac on April 7, 2021  
 37 lb N/ac, 175 lb P/ac and 164 lb K/ac on April 15, 2021  
 Planting date: October 7, 2020  
 Row spacing: 7.5 in.  
 Seeding rate: 23 seeds/ft<sup>2</sup> – see **Table 1** for pounds per acre of each variety to reach target population  
 Seeding depth: 1.25 in.  
 Harvest date: July 28, 2021

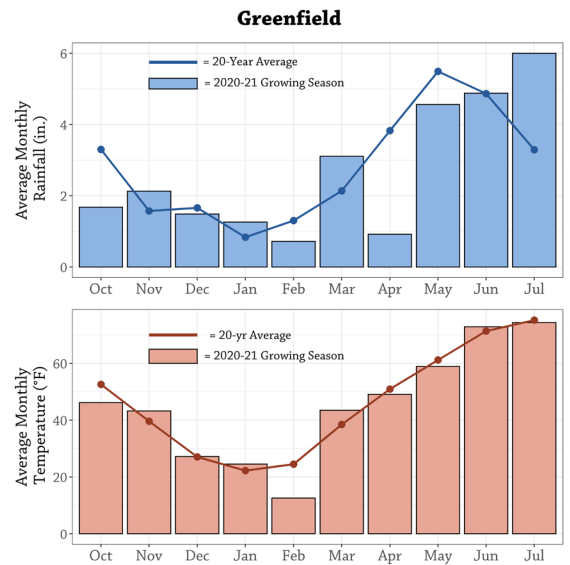


TABLE 5. Results for the 2021 Cereal Rye Variety Trial at Greenfield in southwest Iowa.

VARIETY	YIELD (bu/ac)	YIELD (% of site avg.)	TEST WEIGHT (lb/bu)	PLANT HEIGHT AT HARVEST (in.)	LODGING (%)
Bono	90	139	56	46	5
Brasetto	91	139	55	45	5
Danko	73	112	54	49	7
Elbon	45	69	53	54	65
Hazlet	60	92	52	50	25
ND Dylan	49	76	52	56	87
ND Gardner	41	64	53	55	82
Serafino	88	135	55	47	13
Spooner	49	75	53	55	62
LSD(90%)	19	--	1	5	34
MEAN	65	--	54	51	39

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.

TABLE 6. Seed germination (%) for cereal rye varieties harvested at each location

	<b>BOONE</b>	<b>GREENFIELD</b>	<b>KANAWHA</b>	<b>NASHUA</b>	<b>MEAN (variety)</b>
Elbon	95	94	98	90	94
Hazlet	92	62 <sup>a</sup>	92	87 <sup>a</sup>	83
Danko	95	82 <sup>a</sup>	93	89	90
ND Gardner	97	92	97	89	94
ND Dylan	96	89	95	88	92
Spooner	96	90 <sup>a</sup>	95	88	92
MEAN (site)	95	85	95	89	3

<sup>a</sup> Fungal or other abnormalities present in the sample

## CONCLUSIONS AND NEXT STEPS

Desired cereal rye characteristics vary depending on intended purpose of the crop. For instance, hybrid rye is the best option for those using cereal rye for milling or livestock feed, as it has the highest yield. However, hybrid rye cannot be saved for seed, therefore those interested in the cover crop seed market must choose an open-pollinated variety. For those looking to roller crimp, using ND Gardner, an early, tall variety is best. Germination results were high across all sites and varieties, except in cases where seed showed signs of fungal disease, underscoring the importance of proper disease management for cover crop seed. 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

- Gailans, S. 2019. Cereal Rye Variety Trial 2019. Practical Farmers of Iowa Cooperators' Program. <https://practicalfarmers.org/research/cereal-rye-variety-trial-2019/> (accessed September 2021).
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If you are interested in conducting an on-farm trial contact Stefan Gailans @ 515-232-5661 or [stefan@practicalfarmers.org](mailto:stefan@practicalfarmers.org).