Carrington Research Extension Center

NDSU NORTH DAKOTA AGRICULTURAL EXPERIMENT STATION

A Report of Agricultural Research and Extension in Central North Dakota

Volume 58
December 2017

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The Carrington Research Extension Center conducts research and educational programs to enhance the productivity, competitiveness, and diversity of agriculture in central North Dakota. Research effort focuses on dryland and irrigated crop production practices, crop germplasm evaluation and improvement, crop fertility and crop nutrition, soil health and resource improvement, plant disease control and management, evaluation of new agricultural technologies, cropping systems and crop rotation research, precision agricultural practices, crop-livestock nutrient management, integration of crop and livestock production, beef cattle feeding, feedlot management, intensive cow/calf production, growing and finishing traits, carcass data and meat quality, sustainable agriculture practices, foundation seedstocks production, horticulture and forestry evaluations, and fruit and berry production. The central location of the Carrington Center is significant in that research programs address research needs representing a significant part of agriculture in North Dakota. This report highlights a portion of the department's contributions to research and extension. Following are a few examples of highlights from our past season and significant impacts and contributions to the region's agriculture.

Concluded phase one of researching the use of winter rye in a soybean cropping system. This work consists of four years of studies focused on developing recommendations for planting soybeans into winter rye to achieve benefits that include weed suppression, reduced erosion and improved production potential on saline soils. Practices evaluated included rye and soybean planting dates and the timing and method of rye termination. Viable soybean production was seen as a potential in this system, however phase two will look more in-depth into the soil moisture management.

Continued a new precision agriculture research concept of testing different crop input combinations across a landscape with variable soil characteristics to improve quality and yield of barley on a whole field scale. This trial has been gaining support from industry and producers, presenting an opportunity to study precision ag concepts on a research site (a hill) with inherent variability. The initiation and novelty of this type of trial presents opportunity to use this research design for other crops to develop precision agriculture strategies and recommendations for producers managing crops on land with variable soils and topography.

Initial phases for construction and equipping the new foundation seed conditioning plant were completed in 2017. Included in this phase was construction of a plant shell and installation of the air screen, indent mill, gravity table and primary interior grain legs, conveyors and spouting. This project was made possible by an appropriation of $750,000 from the 2015 North Dakota Legislature. A fund raising project is currently underway to raise the remaining funds necessary to complete this facility. The main electrical wiring and controls, dust control systems and purchase and installation of an optical sorter are the main components remaining before the facility will be operational.

Completed a second year of study to determine the effectiveness of soybean PRE herbicides when the products do not experience the proper conditions for incorporation. The study has found that metribuzin does not hold up if water incorporation does not happen, nor is mechanical incorporation effective at activating the herbicide. Both Spartan and Fierce were able to maintain effectiveness even with a two-week delay in incorporation. Spartan activity was increased by rotary hoeing seven days after application, when no rain fell.

Significant advances occurred this past year among research projects that are working to identify situations where the use of unmanned aerial systems (UAS) can contribute toward meaningful precision agriculture practices. Much of this progress is due to the CREC's ability to access useful imagery and associated imagery values from UAV flights much more quickly. Typically, researchers have access to field imagery and geo-referenced NDVI, NDRE and other values within a day of the flight.

Completed a two-year study with a total of six site-years (four locations) to evaluate the safety of spring wheat herbicides to subsequent cover crops. Many popular species used as cover crops are sensitive to herbicides frequently used for weed control in wheat. Crop sensitivity differences and viable herbicide options were identified. This work has led to development of a user-friendly table for cover crop injury risk that will be included in the 2018 North Dakota Weed Control Guide.

The 2017 growing season was another hectic year for the CREC foundation seedstocks staff as they managed all phases of production of foundation grade seed for 36 different varieties representing 11 different crops. Among these varieties were 23 lines representing pure seed of varieties that have been commercially available to seedsman and producers for more than two seasons. Six varieties were grown that were just initially released to registered growers in 2017 or will be in 2018. Seven lines represent experimental material that may be released in the future or discarded if the latest research indicates no advantage over current varieties.

Studied the effects of dicamba and glyphosate drift on soybean, field peas and lentils. Through these studies we've been able to identify the doses of each product needed to cause injury to the listed crops. As part of this study we were able to identify specific leaf tissue concentrations of dicamba and glyphosate that will cause injury (for field pea, potato, and dry beans). Soybean tissue and seeds are being analyzed to determine what leaf and seed concentration of these products cause injury. The above research is ongoing.

Two annual crop field schools were conducted at the CREC during the summer of 2017 that provided agronomy training to over 50 participants at each event. The Crop Management Field School was conducted on June 15 for crop advisers and farmers to provide training on weed identification, herbicide site-of-action, herbicide-tolerant soybean, soil testing salt-affected soils, wheat disease management and UAS field applications. Among the six sessions, 94% of responses were rated as good or excellent for usefulness. A summer lab for Bismarck State College and ND State College of Science agronomy students was conducted on July 20 to provide training on weed identification, alternative crops, crop growth staging and management, and cropping systems.

Improved management of Fusarium and Aphanomyces root rots of field peas. Initial field studies were conducted that demonstrated that planting date, but not residue cover, may be a significant

determinant of the severity of Fusarium and Aphanomyces root rots, with an early planting date critical for strong field pea agronomic performance in fields with root rot pressure.

A new livestock project was initiated this fall that is evaluating the effects of different feed additives on the performance and shedding of Salmonella and *Escherichia coli* strain O157:H7 of newly received feedlot calves. This study is important because calves entering feedlots are exposed to several stress factors such as shipping and commingling with calves from other sources resulting in exposure to different strains of pathogens which can negatively impact feed intake and performance.

Optimized fungicide application methods for improved Sclerotinia control in soybeans. Comprehensive, multi-location field studies were conducted to optimize fungicide deposition to the lower soybean canopy for improved control of white mold in soybeans and to quantify the impact of water volume and adjuvants on fungicide performance against white mold. Results from 2017 demonstrated that significant gains in disease control can be achieved with appropriate nozzle selection for standard fungicides applications with boom-mounted nozzles and with the use of drop nozzles.

A study was conducted in Carrington, Hettinger, and Minot to assess the impact of early, normal, or late seeding, on early- and late-maturity soybean varieties. Three soybean rates were used. Early seeding (first week in May) significantly improved yields over normal planting (close to mid-May), and compared to late planting (June). Among these trials, yields for 175,000 live seeds were better than 200,000 and 150,000 seeds/ac. Yields from Group 0.8 (later maturity) soybeans were often better than group 0.2 (early variety).

Fungicide development as a tool for managing Sclerotinia head rot of sunflowers. Comprehensive, multi-location field studies were conducted to optimize fungicide deposition to sunflower heads, identify fungicides with efficacy against head rot, optimize fungicide application timing for the control of head rot, and quantify the time period after fungicide application that disease control can be achieved with fungicides.

The CREC weed arboretum (living weed exhibit) was used in 2017 for training during five educational events including the North Dakota Weed Control Association Sprayer Clinic, Crop Management Field School, Bismarck State College and ND State College of Science ag student summer lab, Pioneer staff field training and National Sunflower Association field survey workshop. One hundred-eighty people received information on weed identification and management using the exhibit of about 60 weed species. The written evaluation from the Crop Management Field School indicated that weed identification was a common subject that participants would use when working with their clients for crop management.

An Update of Dicamba Drift Injury Thresholds for Dry Beans and Field Peas

Mike Ostlie, Greg Endres, Harlene Hatterman-Valenti, Richard Zollinger, Andrew Robinson, and Brian Jenks

Dicamba injury to soybeans was a hot topic in 2017. Prior to this year, research was conducted in 2015 and 2016 to evaluate the injury to several specialty crops including dry beans and field peas. Soybeans are the most dicamba-sensitive crop grown in North Dakota. However, the above crops are sensitive to dicamba and yield loss can occur with fewer symptoms than soybeans. Because of this, the following studies were conducted to determine how well visual injury after a drift event corresponds to yield loss and whether a tissue test can be used predict yield damage.

Simulated drift was studied with the application of 2.5-25% of Clarity (0.6-6% of the new dicamba formulations) and 0.45-4.5% of RoundUp Powermax (or equivalent) alone and together. This would be the same product ratio that is used for Extend soybeans. The applications were made just prior to flowering for each crop. Injury was rated 10 and 20 days after the drift event and tissue samples were taken at the same time. Plots were harvested and grain was sent for residue analysis and tested for germination.

Field Peas. Field peas received as much as 26% injury 10 days after treatment (DAT), but finished with 17% (Table 1). This only occurred with the highest rate of the combination of the two products. Dicamba caused more injury than glyphosate at the rates used. Glyphosate applied alone did not cause significant injury in the trials.

Table 1. Field pea injury, leaf residue levels, and yield following dicamba and glyphosate applications

		Phytotoxicity		Residue Level 10 DAT		Residue Level 20 DAT			
Treatment	Rate	10 DAT	20 DAT	Dicamba	Glyphosate	Dicamba	Glyphosate	Yield	Protein
	fl oz/ac	%	%	ppb	ppb	ppb	ppb	%	%
Check		0	0	0	0	0	0	0.90	29.74
Dicamba	0.05	1	0.3	3.1	0	2.4	5.9	0.89	29.62
Dicamba	0.25	5.5	3.4	8.7	0	8.9	0	0.88	29.81
Dicamba	0.5	12	6.9	11.4	0	17.9	0	0.86	29.84
Glyphosate	0.1	0.6	0.6	0.4	0	0	0	0.89	29.89
Glyphosate	0.5	0.8	1.3	0.3	3.3	0	0	0.91	30.13
Glyphosate	1	3.4	2.8	0.8	0	0	5.2	0.88	29.92
Glyphosate + dicamba	0.1 + 0.05	1.4	0.9	2.7	4.7	3.1	0	0.92	29.85
Glyphosate + dicamba	0.5 + 0.25	13	8.1	10.5	0	11.7	0	0.82	29.81
Glyphosate + dicamba	1 + 0.5	26.6	17.1	18.4	14.7	17.0	4.5	0.73	29.90
LSD (0.05)		5.2	3.0	5.2	NS	6.3	NS	0.06	NS

Leaf tissue analysis revealed that glyphosate was detected in some treatments but that none of the treatments differed statistically from the check. Dicamba was detected at more meaningful levels both 10 and 20 days after treatment. When combined across site-years, the 10 and 20 DAT data do not differ much. Dicamba was present in tissue at the intermediate and high rates that were used.

Yield was affected by the combination of glyphosate and dicamba at the two highest rates. Yield reductions of 8 and 17% were observed with the intermediate and high rates of the combined products. No yield reduction was realized with either product alone. Protein was not affected by any treatment. In grain samples, seed germination was not affected by any treatment combination, nor was any significant herbicide residue detected.

Dry Beans. Dry beans were affected heavily by the rates used in this study. Dry bean injury ranged from 5-40% when combined across site-years (Table 2). Both glyphosate and dicamba were damaging to dry beans. Only the lowest rates used did not significantly injure plants.

Table 2. Dry bean injury, leaf residue levels, and yield following dicamba and glyphosate applications

		Phytotoxicity		Residue Level 10 DAT		Residue Level 20 DAT		
Treatment	Rate	10 DAT	20 DAT	Dicamba	Glyphosate	Dicamba	Glyphosate	Yield
	fl oz/ac	%	%	ppb	ppb	ppb	ppb	%
Check		0	0	0	0	0	0	0.91
Dicamba	0.05	4.6	5.5	7	0	62	0	0.83
Dicamba	0.25	19.5	21	22	6	1204	1	0.72
Dicamba	0.5	22.8	26.4	259	253	625	30	0.33
Glyphosate	0.1	6.2	5.4	15	11	305	5	0.74
Glyphosate	0.5	20.6	16.1	65	1037	414	143	0.54
Glyphosate	1	24.6	25.3	121	510	145	75	0.40
Glyphosate + dicamba	0.1 + 0.05	11.4	11.4	8	258	49	108	0.78
Glyphosate + dicamba	0.5 + 0.25	29.3	23.8	85	541	628	38	0.48
Glyphosate + dicamba	1 + 0.5	33.4	39.3	262	676	509	185	0.14
LSD (0.05)		9.1	11.6	192	930	586	100	0.26

Dicamba and glyphosate leaf residue data was very difficult to interpret due to the variability. Glyphosate concentrations received from the lab were sometimes several times higher than would be anticipated. At times, the check plots would read residue levels at several thousand ppm even though no visible injury occurred. Dicamba was less erratic but suffered a similar result. With either product, there was no consistent meaningful correlation between visual injury and residue levels.

Visual injury was more related to final yield data. Yield reductions of up to 80% occurred with the highest rates of both products. Even each product individually caused unacceptably high levels of injury at the highest rates. Only the lowest rates of each product alone and together produced yields similar to the check.

Germination was reduced in the highest rate of dicamba alone and dicamba plus glyphosate. Unfortunately, dicamba was also detected in the grain of the highest rate of dicamba plus glyphosate. However, the yield of that treatment was reduced to the point that it is unlikely a farmer would harvest the crop (86% yield loss).

Summary. The levels of herbicide concentration with this study should be sufficient to measure causality, however, the highest detected concentrations many times did not correspond to the highest application rates. Once again, the relationships between residue levels and yield are only moderate at best across herbicide dose and species. Overall, dicamba was more predictive of response than glyphosate, but only when averaged across sites. Sometimes there was little or no correlation between dicamba leaf concentration and yield at an individual site. When averaged across sites and species, glyphosate did not accumulate to a consistent concentration in leaf tissues. However, dicamba concentration in the leaves tended to be higher when applied with glyphosate than alone. Overall, without the visual injury and yield information, the herbicide residue data would not mean much in this study, representing a challenging situation to producers who may have been affected by drift. Instead of relying on tissue testing, it will be necessary to use that data as supporting evidence only in determining if a drift situation has occurred.

With the information generated from this study, we were able to identify visual injury and leaf concentration values that indicate when yield loss begins as a result of dicamba drift. Due to the variability in dry bean data, there is a wide range of possible responses (Table 3). Both dry beans and field pea could begin to see yield losses at similar leaf concentrations of dicamba. However, with dry beans, a significant yield response did not occur until 25% yield loss, whereas the same concentration caused a 6% yield loss in field peas. This indicates that dry beans are more sensitive to dicamba drift than field peas. More Information about residue sampling procedures will be found on page 111 of the 2018 North Dakota Weed Control Guide.

Table 3. Dicamba leaf concentration and visual injury that caused a yield loss in field peas and dry beans

	Ppb	ppm	Visual injury	Yield Reduction	Crop
Dicamba	30-130	0.03-0.13	21-33%	≥25%	Dry Bean
Dicamba	20-30	0.02-0.03	10-22%	≥6%	Field Peas

Partial funding for this project was provided by the North Dakota Department of Agriculture USDA Specialty Crop Block Grant. Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the view of the U.S. Department of Agriculture or the North Dakota Department of Agriculture.

Post Anthesis Nitrogen Application on Wheat to Enhance Protein

Szilvia Yuja and Jasper Teboh

High protein premiums are often offered for spring wheat when an above average winter wheat yield is expected. To try to capitalize on the projected premiums, farmers may try to enhance the protein content of their spring wheat kernels with a late-season application of nitrogen.

Overview of past research at the CREC

Research into using foliar application of nitrogen post-anthesis has been ongoing intermittently for nearly 30 years at the CREC. Various rates, timings, application volumes and even the use of adjuvants were explored. Many of the trial years also replicated the treatments on several varieties which were chosen as representatives of certain yield and protein content characteristics. The one universal aspect of these trials was the foliar application of 28% UAN immediately or shortly after anthesis with the goal of enhancing protein content.

Between 1988 and 1991, Blaine Schatz and Greg Endres assessed the nitrogen rate to use to give the most optimal protein boost. Their work was summarized by Dr. Dave Franzen in an Extension publication titled "Post-anthesis N application studies North Dakota, region and elsewhere," https://**www.ndsu.edu**/fileadmin/**soils**/pdfs/**postanthesis**compilation.pdf. In their research Schatz and Endres used 0, 15, 30, 45 and 60 lbs N/ac foliar treatments right after anthesis. The application volume was 20 gal/ac for each treatment which means that the 60 lb N was pure 28% UAN, the 45 lb N treatment was at 3:1 UAN to water ratio, the 30 lb treatment was 1 to 1 and the 15 lb treatment was 1 to 3. The 30 lb treatment proved to be the most beneficial in this scenario. Protein increased 1.25% with the 30 lb treatment on average between the 6 site-years of the study. Protein increase above that nitrogen rate was not consistent. The same publication by Dr. Franzen also describes the results of a survey done in 1993 by Blaine Schatz and Greg Endres involving 27 farmers that used post-anthesis nitrogen application that year. Amongst the responders the average yield difference from their application was +0.2 bu/ac and the average protein difference was +0.7%. A more detailed description of both the survey respondents' application rates and methods, and the summarized data and methodology of the trials conducted by Schatz and Endres, can be found in the aforementioned Extension bulletin.

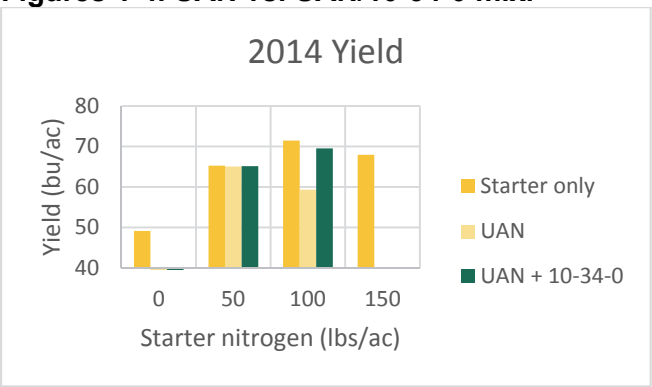
In 2012 Blaine Schatz conducted a trial to assess whether a late post-anthesis treatment would still be beneficial. The report on that trial can be found in the 2012 Annual Report of the Carrington Research Extension Center under the title “Influence of a “late” post-anthesis nitrogen on spring wheat performance.” In that trial, 28% UAN was applied at the early- to medium-dough stage, past the immediate post-anthesis stage that is normally recommended for such application. Four different varieties were used in this study and it was found that despite the delay, the treatment still increased protein content for all of them. The average increase across varieties was 1.1%. The application mix was roughly a 4:3 UAN:water ratio.

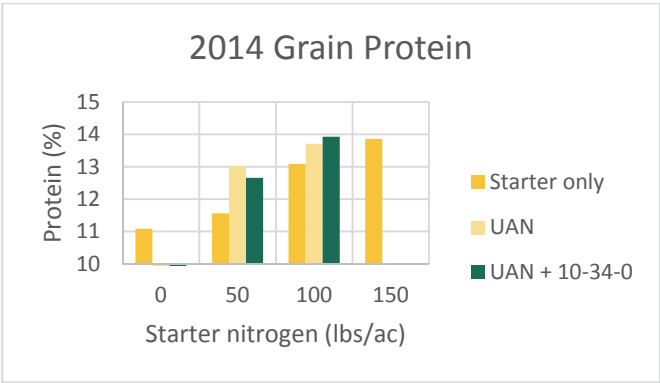
In 2016 there was an article published in the American Journal of Plant Sciences by Joel Ransom, Senay Simsek, Blaine Schatz, Eric Eriksmoen, Grant Mehring and Itai Mutukwa with the title “Effect of a post-anthesis foliar application of nitrogen on grain protein and milling and baking quality of spring wheat”(http://dx.doi.org/10.4236/ajps.2016.717218). This research article was the product of collaboration between the Carrington and Minot RECs as well as the Department of Plant Sciences at NDSU in Fargo. The aim of this study was to compare the post-anthesis foliar application to the same amount of extra nitrogen added as a starter. The other objective was to assess whether baking quality would be affected by the post-anthesis treatment. This study used sites from Carrington, Minot and Prosper between 2011 and 2013. Treatments were 75% optimal N-rate, 75% optimal N-rate plus 30 lbs N per acre at planting, 75% optimal N-rate plus 30 lbs N per acre applied post anthesis with a foliar application of 1:1 28% UAN and water mix. Four varieties were used, but there was no variety interaction with the fertility treatments for yield or protein. This means that even though the varieties differed from each other in yield and protein content, there were no statistical differences between the nitrogen treatments. Protein content was consistently higher for the post-anthesis treatment compared to when the same additional rate was applied at planting. The milling and baking quality results showed that the increase in protein achieved by post-anthesis treatment yields similar grain quality as a wheat crop of the same protein content fertilized only at planting. This article however cautions farmers that the practice is likely to be profitable only under certain circumstances and market conditions.

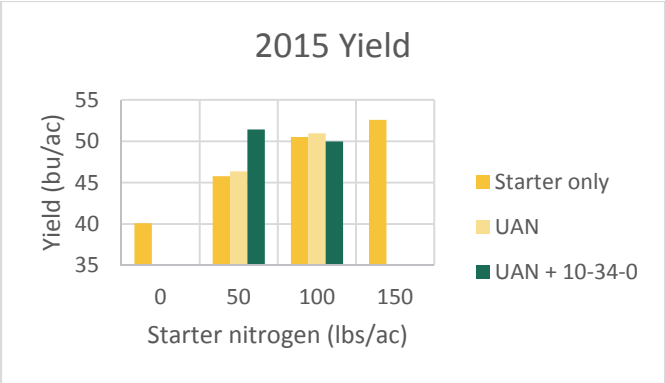
Recent Research

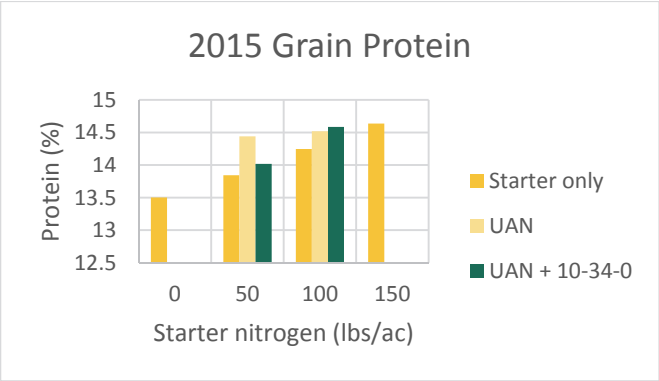
The CREC has continued with the post-anthesis nitrogen application trials. Following are results from the 2014, 2015 and 2017 trial years.

Figures 1-4. UAN vs. UAN/10-34-0 mix.









In 2014 and 2015 we compared foliar application of a mix of UAN and 10-34-0 with the intention of assessing whether including phosphorus in the post-anthesis treatment would provide any added benefits.

A single rate of 30 lbs N/ac was applied at the milk stage to plots treated with different rates of starter nitrogen in the form of urea. Liquid fertilizers were diluted to a 1:3 fertilizer to water ratio. The variety Briggs was used and the trial was under irrigation.

The treatments consisted of two rates of starter N in the form of urea, 50 and 100 lbs N/ac which either did or did not receive a post-anthesis treatment. The post-anthesis treatment was applied either in the form of 28% UAN or as a 1:1 nitrogen ratio of UAN and ammonium polyphosphate (APP) (10-34-0). There was also a check with no nitrogen applied and a set of plots that received 150 lbs N/ac at planting but no foliar treatment. This was done to observe where treatments would fall within that year's nitrogen response curve.

The UAN-APP mix did not have protein and yield results consistently different from UAN applied by itself, suggesting that there is neither any benefit nor any damage caused by applying this mixture versus using only UAN.

Protein increased with the foliar treatments for both years and for both the 50 and the 100 lb N rates. Averaged for the two years, protein increased by 1% for the 50 lb starter N rate when foliar was applied and 0.45% for the 100 lb N rate. Yield increased with starter nitrogen rates up to the 100 lb N rate in 2014 and up to the 150 lb N rate in 2015.

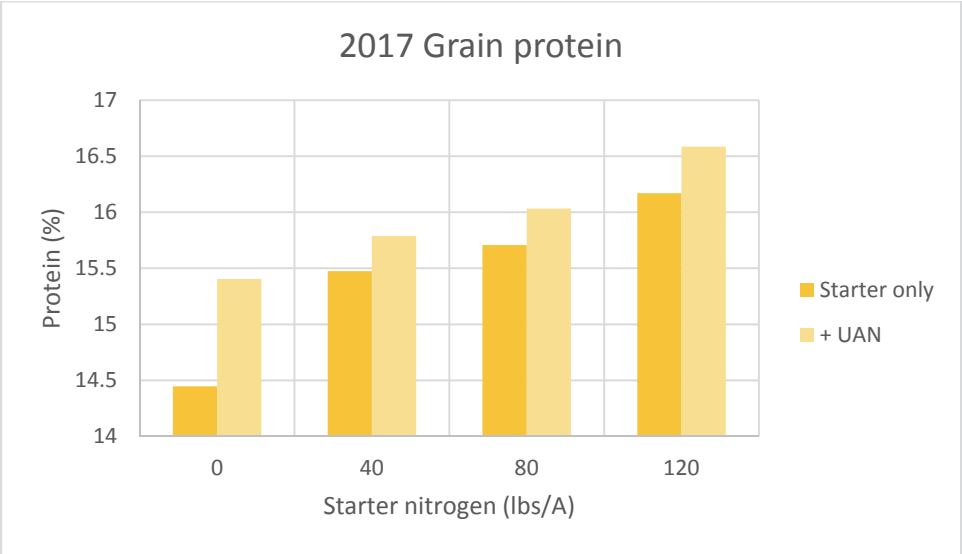


Figure 5. Protein boost despite no yield response to nitrogen.

In 2017, 30 lbs nitrogen was foliar applied to plots treated with 0, 40, 80 or 120 lbs nitrogen at planting. Results were compared to plots that only received the starter rates. Nitrogen application did not have an effect on yield this year, possibly due to a large rate of mineralization early in the season when moist soil conditions coupled with unusually warm temperatures. By the time of advanced tillering it was apparent that based on NDVI readings, which are an indicator of plant vigor, that there would be no yield response. Despite that, protein increased with starter nitrogen rates both with and without post-anthesis treatment, and the post-anthesis application of nitrogen consistently yielded higher amounts of protein than plots receiving the same rate of starter but no foliar nitrogen. Foliar application produced 1% more protein when no starter nitrogen was applied, 0.3% at 40 lbs N, 0.3% at 80 lbs N and 0.4% at the 120 lb starter N rate.

Future research

Looking at the last two decades of research at the CREC, we can confidently say that foliar applying 30 lbs of nitrogen per acre to spring wheat shortly after anthesis is a reliable way of increasing grain protein. The question is whether the expected gain in protein would translate to an increase in profit. Economics would depend on market conditions and also on the crop's potential for protein production in a given year. For this reason, staff at the CREC are looking into integrating the use of an unmanned aerial system for predicting yield and protein response to post-anthesis nitrogen application.

Optimizing Row Spacing and Seeding Rate for Maximum Soybean Agronomic Performance under White Mold Pressure

Michael Wunsch, Billy Kraft, Michael Schaefer, Suanne Kallis, Kelly Cooper, Leonard Besemann, Heidi Eslinger, Venkata Chapara, Amanda Arens, Tyler Tjelde, Audrey Kalil and Justin Jacobs

In fields where Sclerotinia (white mold) is a concern, soybeans are often seeded to wide rows (generally 30 inches) to minimize disease development. However, previous research suggests that even under significant white mold disease pressure, soybean yields may often be maximized by seeding soybeans to narrower rows. The goal of this study is to identify how row spacing impacts soybean yield and market grade under different levels of white mold disease pressure.

Field studies were established at the NDSU Carrington, Langdon, and Williston Research Extension Centers and at the NDSU Robert Titus Research Farm in Oakes. Soybean varieties representing a mix of upright and bushy types were evaluated in four row spacings (7, 14, 21, and 28 inches or 7.5, 15, 22.5, and 30 inches) at each of three seeding rates (132,000; 165,000; and 198,000 pure live seeds/ac). To create conditions favorable for white mold, supplemental overhead irrigation was applied. Presented are results from 2016 and 2015, combined with preliminary studies conducted in Carrington in 2013 and 2014. Seed yield and quality data from the 2017 field season are still being collected.

Wide row spacing minimized Sclerotinia incidence (Figure 1) but often did not optimize soybean yield. When Sclerotinia incidence was less than 50% in soybeans seeded to intermediate (21 or 22.5-inch) row spacing, yields were maximized with the intermediate row spacing (Figure 2). When Sclerotinia incidence in soybeans seeded to 21- or 22.5-inch row spacing was below 40%, the increased contamination of the grain with sclerotia (resting structures of the Sclerotinia fungus) associated with the narrower row spacing was never sufficient to result in a reduction in soybean market grade (Figure 3). Parallel results were observed for soybeans seeded to 14- and 15-inch rows. Increasing the seeding rate from 132,000 to 198,000 pure live seeds/ac contributed to a modest increase in Sclerotinia disease pressure but also a modest increase in soybean yield.

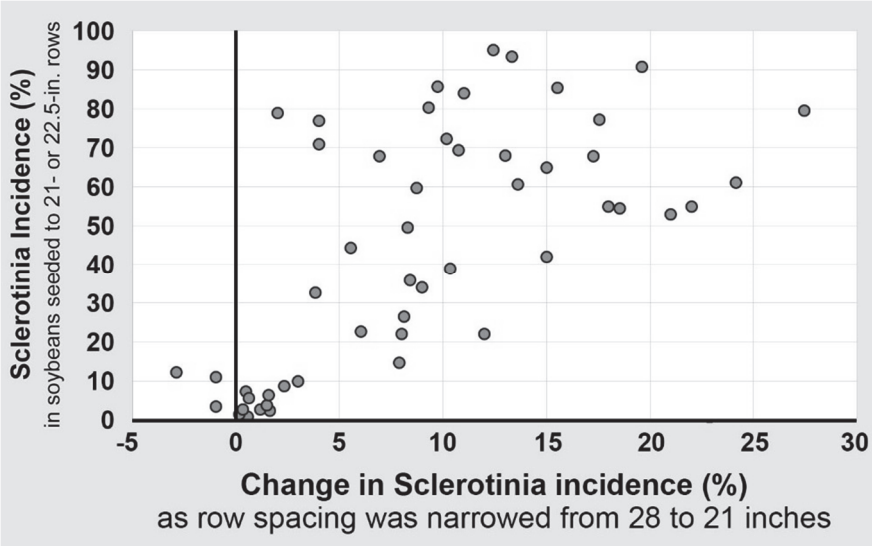


Figure 1. Impact of row spacing on white mold (Sclerotinia) incidence in soybeans grown under Sclerotinia disease pressure. *Each dot represents a soybean variety tested at one location in one year.*

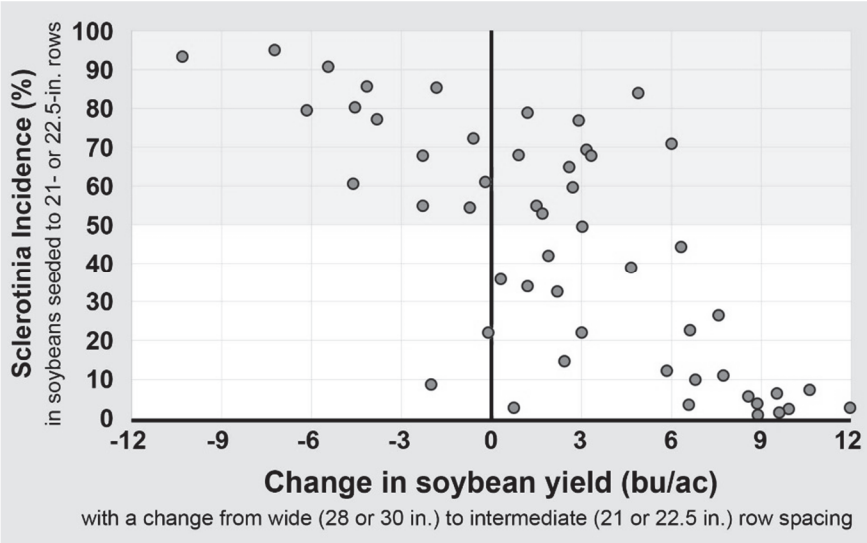


Figure 2. Impact of row spacing on soybean yield in soybeans grown under Sclerotinia disease pressure. *Each dot represents a soybean variety tested at one location in one year.*

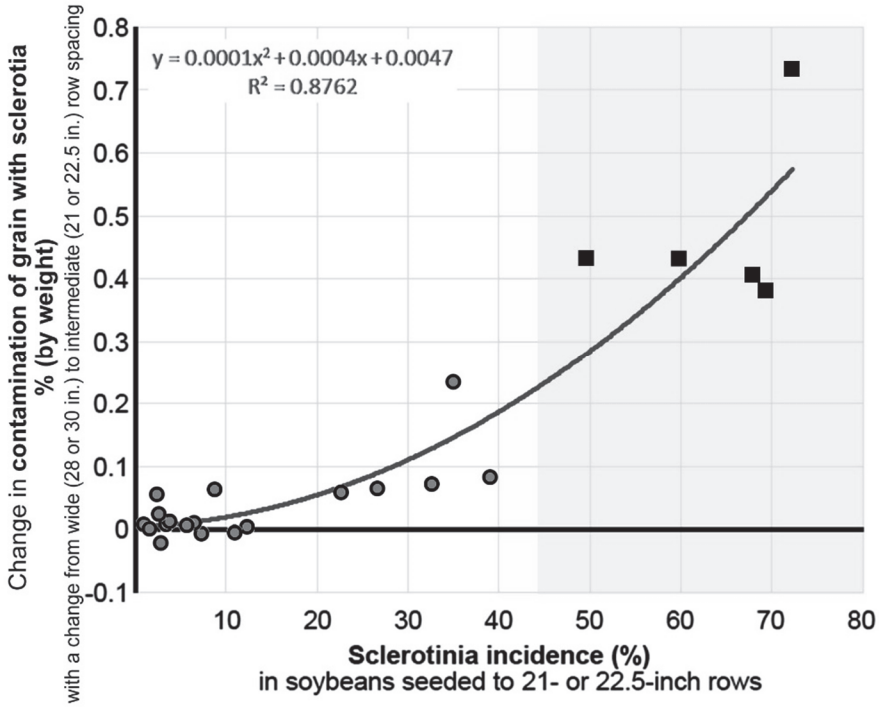


Figure 3. Impact of row spacing on contamination of soybean grain with sclerotia (resting structures of the Sclerotinia fungus) in soybeans grown under Sclerotinia disease pressure. *Each dot represents a soybean variety tested at one location in one year. Square dots denote a reduction in U.S. market grade due to increased contamination of grain with sclerotia.*

The results suggest that if Sclerotinia incidence is not expected to exceed 40 to 50 percent, seeding soybeans to an intermediate row spacing (14 to 22.5 inches) is likely to maximize soybean yield under white mold pressure without reductions in soybean market grade.

Partial funding for this project was provided by the North Dakota Soybean Council.

Changes to Barley Protein and Yield on Variable Terrain

Mike Ostlie, Szilvia Yuja, Paulo Flores, and Jasper Teboh

A study has been conducted at the CREC in 2016 and 2017 to investigate the application of precision agriculture concepts in barley. Specifically, the study was looking to utilize variable rate nitrogen and seeding strategies to optimize barley protein and yield across a hill with variable terrain to improve the number of acres in a field that qualify for malting grade. The goal was to start with traditional production parameters and determine performance in different zones along a hill. A combination of three seeding rates (0.8 m, 1.3 m and 1.8 m PLS) and three soil nitrogen levels (75, 100, and 125 lbs/ac) were used.

To set up this study, a hill was divided into six zones based on elevation. The hills represent an elevation change of only about 5 ft. However, the soil properties vary drastically over that distance. The organic matter varied from 0.8 to 3.7% and the pH changed from 5.7 (bottom) to 8.5 (top). Thus, we not only had an elevation gradient, but also a pH and organic matter gradient. These locations represent a typical eroded hill in North Dakota complete with a substantial lightening of soil color (nearly white) at the top. A UAV (unmanned aerial vehicle) and Greenseeker™ were used to capture in-season differences in plant health through NDVI (a vegetation index) with the hope that it would be a useful tool in predicting crop quality.

Previous research had indicated that increasing plant population is more likely to result in lower protein levels. We were expecting that increasing plant population on the hills would result in lower protein content due to more main stem heads and fewer tillers. This study showed that tiller number did not change much from the bottom to the top of the hill, regardless of plant population. The number of stems per acre did decrease toward the top of the hill, but treatments did not influence stem number. Results showed that protein decreased on the hill tops naturally, regardless of nitrogen treatment (Figure 1). Protein content ranged from 10-15.5% but protein levels typically did not change until near the top of the hill in zone 5 and 6. The best predictor of grain protein was soil pH. Elevation and organic matter had a correlation to protein content but not nearly as strong of a relationship as pH. The UAV was able to moderately predict crop quality, but soil pH was a better indicator.

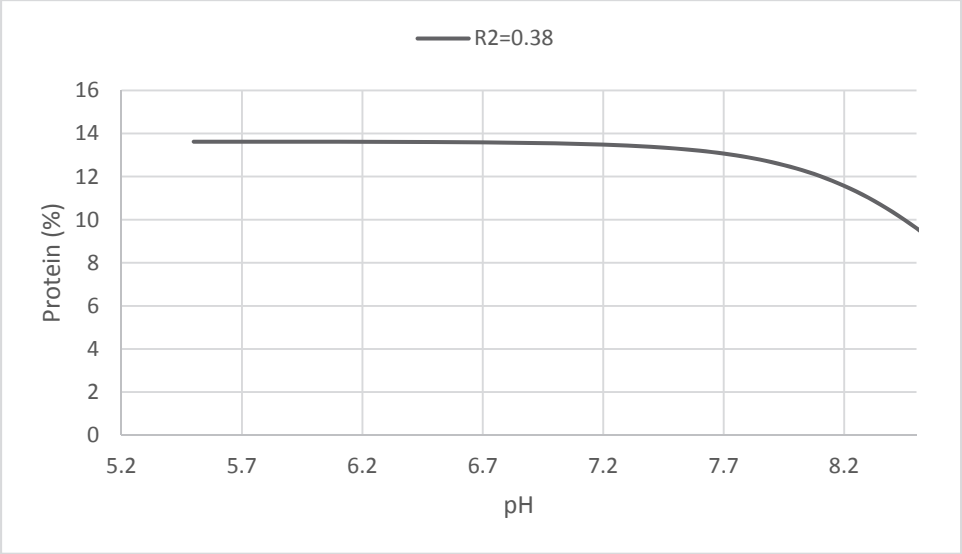


Figure 1. Barley protein content across a pH gradient. The pH increased going up the hill.

Crop yields were monitored in the same fashion as the protein. Not surprisingly there were drastic differences in crop yield. Crop yields ranged from 68-150 bu/ac in 2017 and 27-58 bu/ac in 2016. In this case, the above-soil characteristics did a poor job of predicting yield. Instead, remote sensing with the Greenseeker™ or UAV was the best tool for yield estimation when NDVI was captured 40 days after planting (Figure 2).

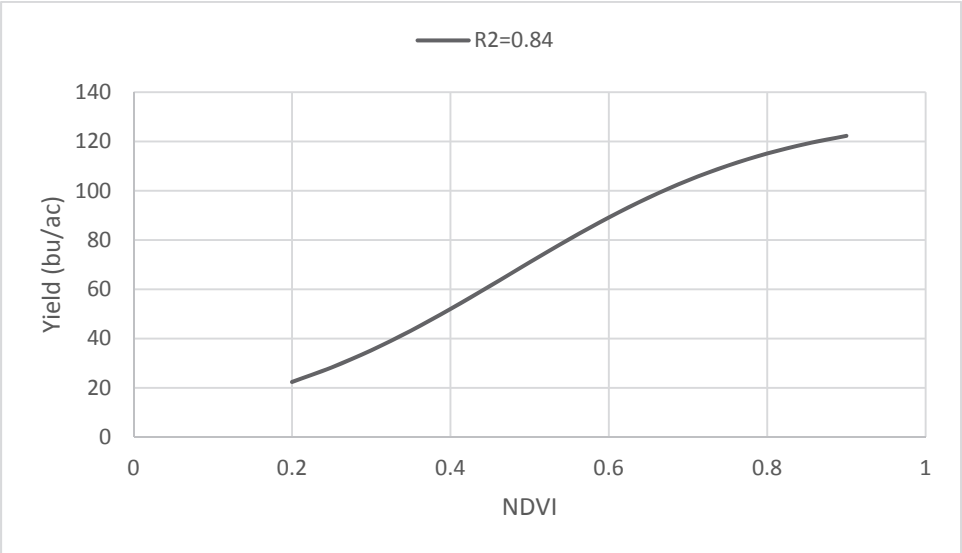


Figure 2. Barley yield changes with NDVI captured with an unmanned aerial vehicle in mid-season.

While this study will be ongoing through 2019, there are some meaningful outcomes thus far. The above data indicates that expected protein differences can be predicted through changes in soil pH on a hill, and yield potential can be captured with mid-season remote sensing. Combining the two methods could provide useful insight into production potential prior to harvest, which could lead to partitioning a field into areas that are most likely to make malting grade, particularly when it is believed that the protein levels may be high in a particular year.

As for precision agriculture applications, as of now, it does not appear that using variable rate seeding will affect crop quality. Variable rate nitrogen is still a possibility. Applying nitrogen to the top of our hills seemed unnecessary. At our locations, which weren't using variable N rates previously, the soil residual N content at the top of the hill typically far exceeded the residual N at the bottom of the hill. The hill tops had inherently higher N content but protein levels largely fell within desired values, plus they had lower yield potential; so reducing N application to hill tops seems like a sound strategy. 2016 and 2017 were years with high mineralization potential. Thus, the higher organic matter content in the lower elevations likely meant that nitrogen would not be a limiting factor at the bottom of the hills, which has led to no nitrogen response.

Partial funding for this project was provided by the North Dakota Soybean Council, the State Board of Agricultural Research and Education and the Agriculture Experiment Station Precision Agriculture grant.

Black Bean Seed Yield with Row Spacing and Plant Population

Greg Endres, Hans Kandel, and Mike Ostlie

A field study is being conducted to examine the response of black and navy bean to row spacing and plant population. 'Eclipse' black and 'Avalanche' navy bean were planted in 14-, 21- and 28-inch rows at 100,000, 125,000 and 150,000 pure live seeds (PLS)/acre at Carrington in 2014 and 2016-17. In addition, the two dry bean market classes were planted at the three planting rates at Park River in 2014, and Prosper in 2014 and 2016-17. This preliminary report provides current seed yield results on black bean.

Averaged across three years and plant populations at Carrington, 21-inch rows increased black bean yield by 240 lb/acre compared to 28-inch rows (Table 1). Yield with 14-inch rows was statistically similar to 21-inch rows.

Table 1. Black bean seed yield with row spacing[1], Carrington, 2014 and 2016-17.

Row Spacing	Seed Yield (lb/acre)			
Inch	2014	2016	2017	3-year average
14	1945	2356	2078	2126ab
21	1860	3162	1988	2337a
28	1595	2618	2074	2096b
LSD (0.10)				210

[1]Variety = 'Eclipse'. Averaged across three plant populations.

a, b Numbers followed by different letters are statistically different at $P<0.1$.

Averaged across seven site-years and three rows spacings, black bean planted at the low, medium and high rates produced 99,950, 118,530 and 140,480 plants/acre, respectively. Yield increased with the high- versus low-plant population, while the intermediate plant population was statistically similar to the high plant population (Table 2). Based on these data, return-on-investment would indicate that the intermediate planting rate would be appropriate.

Table 2. Black bean response to plant population, North Dakota, 2014, 2016-17 (7 site-years)[1].

Planting Rate	Plant Population	Seed Yield
PLS/acre (x1000)	number/acre	lb/acre
100	99,950	2430b
125	118,530	2470ab
150	140,480	2510a
LSD (0.10)	x	75

[1]Variety = 'Eclipse'. Trial locations: Carrington and Prosper (2014, 2016-17); Park River (2014). Averaged across three row spacings at Carrington.
a, b Numbers followed by different letters are statistically different at $P<0.1$.

These preliminary data would suggest black bean planted in narrow rows and with a planting rate to achieve 115,000 to 125,000 plants/acre would optimize yield potential. The study will be continued in 2018 at Carrington to expand the database before plant establishment recommendations by NDSU are likely revised for black bean.

Partial funding for this research was provided by Northarvest Bean Growers Association.

Effect of Nitrogen and Sulfur Interaction on Yield of Corn

Jasper M. Teboh, Kelly Cooper, Szilvia Yuja, Blaine G. Schatz, and Heidi Eslinger

Sulfur and N fertilizer management can be improved to optimize corn yields. This is imperative because the market price of corn grain is currently very low, N requirement by corn is high, this fertilizer input is costly, and yield response to S is infrequent due to the influence of climatic factors, soil texture, and soil organic matter content. Furthermore, N as nitrate (NO_3) and S as sulfate (SO_4) are the two major plant nutrients susceptible to leaching. S fertilization enhancement of corn N use efficiency needs further verification, and therefore research needs to be conducted to assess the effect of their interactions on corn.

Objectives

(1) Determine S fertilizer recommendation on loam soil for optimum corn production
(2) Investigate the impact of S on N use efficiency of corn

Rationale

Farmers need a clear message to better decide whether regular application of S is needed, or if a more conservative approach may serve them better. At current grain prices, input cost management decisions are key for farmers to curb expenses.

Methods

This field trial was conducted on a strip-tilled loam soil at Forman (southeast North Dakota), and on a conventional-till loam at the Carrington Research Extension Center (CREC). A 93-day corn variety was

planted at Forman, and an 83-day variety at Carrington. At Forman, N rates were 0 (control), 60, 120, 180, and 240 lbs N, and the S rates were 0, 10, and 20 lbs S/ac. At Carrington, N rates were 0, 55, 110, and 140 lbs N (corresponding to 0, 50, 100, and 125% respectively, of N recommendation for the site) and S rates the same as at Forman. Nitrogen adjustment was made to account for the N supplied with the S from ammonium sulfate (AMS). Urea was the source of N. Soil N before planting was 44 lbs. Experimental design was a randomized complete block. Fertilizer treatments were broadcasted on the surface without incorporation. Five replicates were used at Forman, and four at Carrington. Best management practices were employed.

Results

Effects of N and S treatments were statistically significant for grain yields and quality at Forman. At Carrington, neither N nor S resulted in any significant yield or grain quality response, but oil content did respond. Therefore, only the results from Forman are discussed. Interaction effects of N and S were not significant (Table 1). Sulfur resulted in yield increase at each N rate (Figure 1). Application of 10 or 20 lbs of S resulted in a similar yield increase of 12 bushels from the check. In a similar study conducted last year (Teboh et al., 2016 CREC Annual Report) average yield produced at 160 lbs N/ac was 200 bushels without S, which was significantly less compared to 243 bushels at 10 lbs S, and 246 bushels at 20 lbs S. Test weight increased with the application of S. The TWT at 20 lbs S was significantly greater than without S application. At 10 lbs S, TWT mean differences were not significant from the 0 or 20 lb rates. Ear leaf S concentration was significantly increased with 20 lbs addition of S. Application of N up to 120 lbs resulted in significant yield increases. Yields increased by 27 bushels from the control treatment at 60 lbs N, and by 17 bushels from 60 to 120 lbs N/ac. Grain protein and ear leaf N showed linear increase with N rates; meanwhile increasing N rates resulted in a linear decline in starch content of the grain. Leaf N and S increased with application of both N and S respectively. Improved N use efficiency at 10 and 20 lbs S was not clearly evident as we saw in 2016. Nitrogen on the other hand, had significant effect on ear leaf S content, showing a significant difference between 0 lbs and 240 lbs N.

Corn Yield Response to N and S at Forman, 2017.

N Rates	Yield	TWT	Protein	Starch	Oil
0	168c	55.0	7.48	72.64	3.61
60	195b	55.5	7.69	72.40	3.64
120	212a	55.8	7.79	72.35	3.62
180	212a	55.4	8.21	72.08	3.61
240	222a	55.4	8.39	71.91	3.61
S Rates					
0	196b	55.1	8.05	72.17	3.60
10	208a	55.5	7.86	72.30	3.63
20	208a	55.6	7.84	72.35	3.62

Effect			Pr > F		
N Rate (N)	<.0001	0.1121	0.0063	0.0136	0.9623
S Rate (S)	0.0031	0.0501	0.5484	0.5438	0.6323
NxS Rate	0.309	0.9045	0.2836	0.0799	0.2121

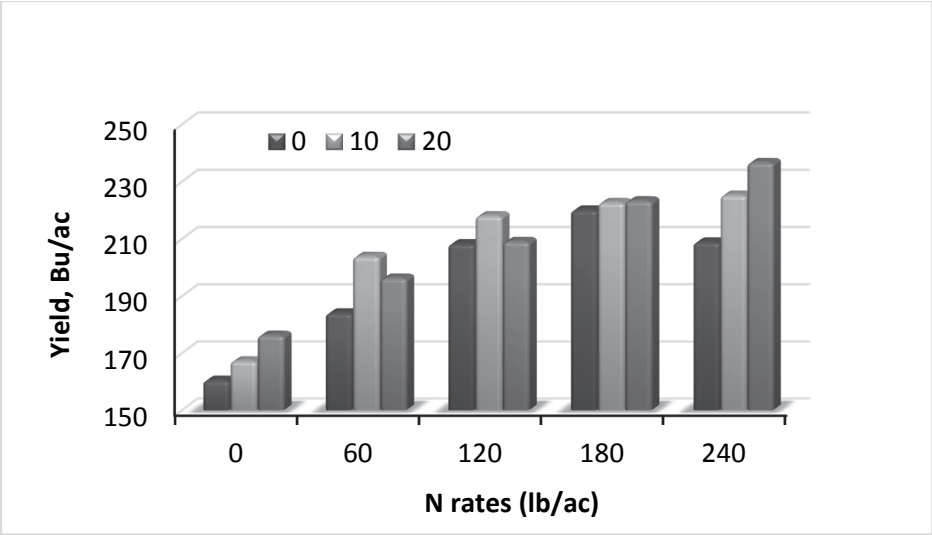


Figure 1. Corn yield response to N at three levels of S at Forman, ND.

Conclusion

Corn requires sulfur to optimize yields. It was evident from this study that application of S at 10 lbs should be enough to cause significant increase in corn yields in this loam soil. Similar to 2016, our results this year showed that yield differences were not significant between 10 and 20 lbs S. However, in years of heavy rainfall, or on sandy loams (or lighter soils with low organic matter) application of up to 15 or 20 lbs S would provide insurance to minimize S deficiency where corn yields are traditionally high, and when applied in the sulfate form. Application of 120 lbs N and 10 lbs S was enough to optimize yields at Forman.

Partial funding for this project was provided by the North Dakota Corn Utilization Council.

Soybean Dicamba Tolerance Varies by Variety

Mike Ostlie

This past summer, PGR (plant growth regulator) symptoms showed up in many soybean fields. A lot of confusion ensued regarding the cause of the symptoms and whether there would be yield loss as a result. In many cases, dicamba drift was the likely cause of the PGR symptoms being expressed. Even though the new dicamba formulations were designed to have less volatility, it is clear that there were issues with vapor (volatility) drift, more so than particle drift. Dicamba is one of the older chemistries used, so why was there so much more drift than in the past? The application rate of dicamba to dicamba-tolerant soybeans is four times the rate applied to cereals in the past. Soybeans are also the leading crop by acres in North Dakota and the most sensitive to dicamba. Soybeans are about 10 times more sensitive to dicamba than grapes are to 2,4-D. The increased acreage, and increased rates, coupled with an extremely sensitive crop, have led us to the current point of widespread PGR symptom expression.

While some instances of drift injury were clear, with severe stunting, delayed maturity, and reduced yields, many instances were less severe, with leaf cupping and alligator skin, but no growing-point damage. The difficult task this winter will be for many people to determine if there was any yield damage due to the less severe symptoms. Several factors have made this challenging, including whole fields with symptom expression, possible multiple dicamba exposures, and differences in variety tolerance to dicamba. This latter factor was surprising to learn and may not be noticed outside of variety trials. At the CREC there was a great opportunity to observe varietal differences in PGR symptoms. In 2017 there were irrigated and dryland versions of conventional, Liberty Link, and Roundup Ready®

(plus dicamba tolerant) trials. Each plot in these trials was given a rating of 0-9 based on the severity of PGR symptoms observed in mid-August. A 0 indicated a perfectly healthy plant, while a 9 indicated severe growing-point damage. In these trials, damage was relatively light in most cases, with only a handful of varieties reaching a score of up to 5. At a 5, there was severe leaf cupping, along with some leaf necrosis along the edges, but no growing-point damage.

None of the irrigated trials displayed more than very minor leaf cupping. There was not any correlation between symptoms and yield in those trials. The dryland trials had more symptoms. In each trial, there were several plot and varieties with no symptoms. The highest percent of PGR-affected plots was in the Liberty Link trial, where 83% of plots displayed symptoms, compared to the low of 66% of plots in the conventional trial. Roughly half of all plots which had symptoms were categorized as having only minor leaf cupping (a score of 1).

It is difficult to estimate the effects of symptoms on soybean yields by only looking at a single year. In Figure 1 it appears that yield is gradually increasing as the severity of symptoms increases. This initially indicates that the expression of symptoms has caused a yield increase. However, a more accurate method to test the effects of symptoms would be to compare 2017 to historical data. There were several varieties tested in 2016 and 2017. For each year we compared a variety's mean performance with the trial average (to get a % yield). We then determined if the performance increased or decreased compared to the trial mean. This was plotted against symptom severity in 2017 (Figure 2). With this comparison, there was no relationship between symptom severity and change in yield. If anything, there are more varieties with lower relative performance than increased performance. But statistically, this indicates that varieties that had more symptoms did not perform different than varieties without symptoms. In Figure 1, yields seemed to increase with symptom severity, but this could be linked to inherent production potential. Varieties that were more affected by PGR symptoms may have been varieties that were growing more vigorously at the time of symptom expression, thus more prone to any factor causing a PGR response. Essentially, dicamba exposure was not increasing yields but rather varieties with higher yield potential were more susceptible to the effects of dicamba and the level of injury was not enough to decrease yield.

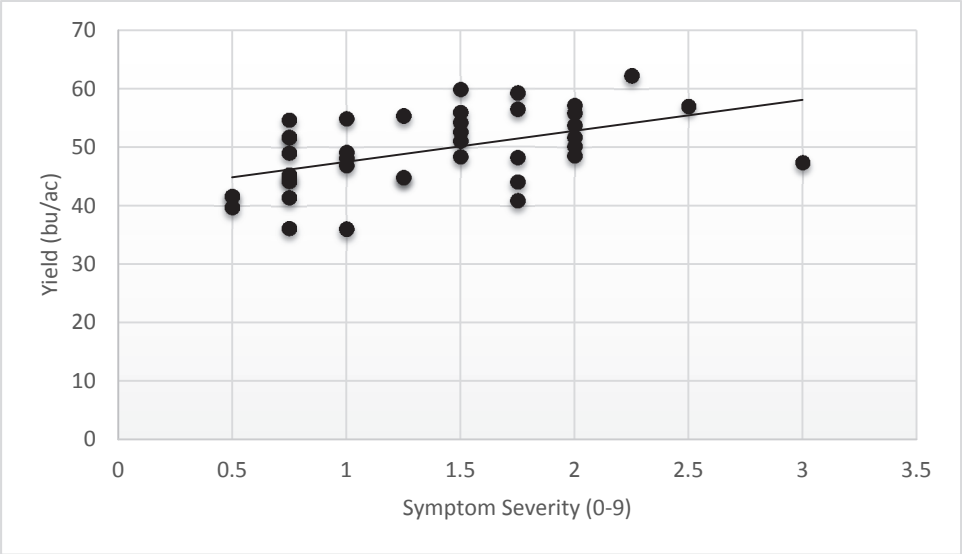


Figure 1. Soybean variety performance compared to plant growth regulator (PGR) symptom severity.

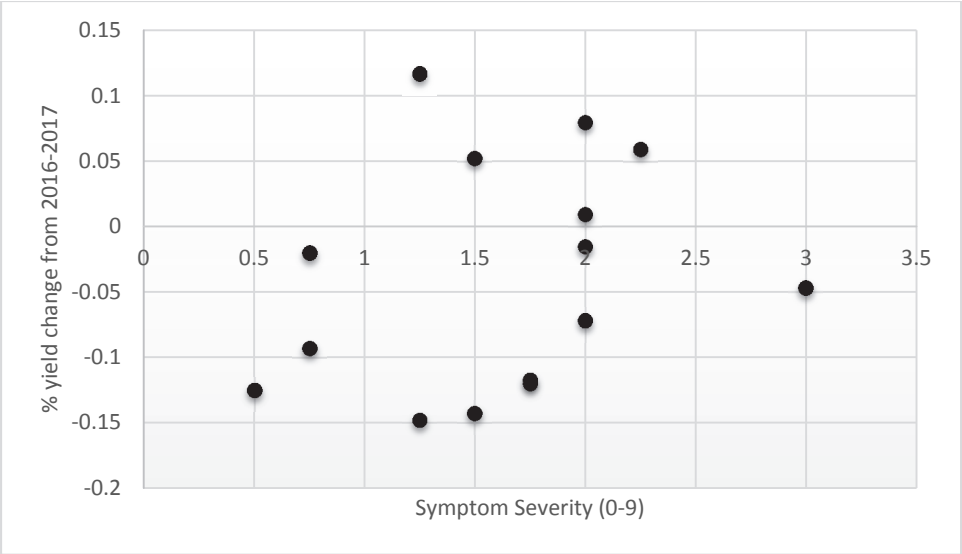


Figure 2. Year to year change in variety performance based on PGR symptom expression.

If dicamba symptoms were more severe, such as plants with growing-point injury and/or stunted growth, yields would surely decline. Even though varieties in our trials differed in the expression of PGR symptoms, with only leaf cupping and blistering, there did not appear to be any consistent positive or negative yield response based on variety.

Two Liberty Link soybean varieties. The variety on the left was more susceptible to dicamba than the one on the right.

Effect of N Fertilization and Tillage on Nitrous Oxide (N_2O) Loss from Soil under Wheat Production

Sheel Bansal, Ezra Aberle, Jasper M. Teboh, Szilvia Yuja, Mark Liebig, Jacob Meier, and Alec Boyd

Nitrous oxide (N_2O-N) is one of the most important gases in the atmosphere because it is 300 times more powerful than carbon dioxide in its ability to trap heat, and is a key chemical agent of ozone depletion. The amount of N_2O-N emitted from agricultural fields can be quite high, depending on the complex interplay between N fertility and residue management, plant N uptake, microbial processes, environmental conditions, and wet-up and dry-down events. High N fertilizer rates generally increase yields, but may disproportionately increase N_2O-N losses due to prolonged residence time in soil when not used by the crop, and incomplete decomposition of excess N-compounds by microbes. Tillage could also affect N_2O-N losses through changes in soil moisture content. Though nitrogen monoxide (NO) is one form of N lost from the soil, especially under conventional tillage, this study objective was to quantify N_2O loss in wheat fields from applied urea on soil under no-till (NT) versus incorporated urea under conventional till (CT).

Materials and Methods

This was a collaborative study between NDSU Carrington REC (Aberle, Teboh, Yuja), the U.S. Geological Survey, Northern Prairie Wildlife Research Center (NPWRC) in Jamestown, ND (Bansal, Meier, Boyd) and the USDA-ARS in Mandan, ND (Liebig). In the study, soil N_2O gas flux was measured from wheat plots during the 2017 growing season within a long-term study examining the effects of N fertilizer rates (as sub-sub-plots), tillage (sub-plots) and crop rotations (main plots) on crop production and soil chemical properties. The plots evaluated for N_2O gas flux had urea applied at four levels (0, 50, 100 and 150 lbs per acre) within CT and NT plots. The urea was incorporated for the CT plots. Gas flux was measured every two weeks from April (prior to planting) to August (post-harvest) 2017. On each sampling date, gas was collected from chambers placed in the middle of each urea N rate treatment over a 30-min time period to provide a flux rate (g N_2O-N/area/time). There were a total of 432 gas flux measurements over the season. Total N lost to the atmosphere as N_2O-N was calculated for each subplot and then summarized by fertilizer or tillage treatment.

Results and Discussion

N_2O-N flux rates generally mirrored soil moisture content, with wetter periods having higher rates of N_2O-N emission (Fig. 1, data available at https://www.sciencebase.gov/catalog/item/5a15c101e4b09fc93dd170ab). The exceptions were at the beginning of the season when temperatures were low and at the end of the season after soil N was likely depleted. N_2O-N emissions were highly variable among N fertilizer rates (8 to 588 g/acre/season) with an average of 233 g N_2O-N/acre/season, which is similar to other studies in the region. Total N_2O-N loss to the atmosphere was nearly twice as high in the highest N rate (150 lbs/acre) compared to the control (0 lbs/acre) treatment (Fig. 2a), which was likely due to excess available N for microbes to reduce. Yields also increased with increasing N fertilizer rate with 36 bu/acre at 0 lbs, 50 bu/acre at 50 lbs, 51 bu/acre at 100 lbs, and 57 bu/acre at 150 lbs N/acre. Therefore, N_2O-N emissions per bushel did not differ significantly across fertilization treatments (about 5 g N_2O-N/bushel). Notably, the control treatment with no fertilizer application lost about 160 g N_2O-N/acre, indicating that N levels in soils would diminish even without supplemental N as fertilizer. Yield was significantly higher at 54 bu/acre for NT vs. 46 bu/ac for CT. However, there were no overall differences in N_2O-N loss between CT and NT, although there was slightly greater emission at the end of the season in the NT treatment (Fig. 2b). Even though soil moisture was higher for NT (20%) vs. the CT (15%) plots throughout the season, which probably explained higher yields in the NT plots for a year plagued by periods of drought, N_2O flux was essentially similar throughout most of the growing season. The separation of fluxes between the NT and CT during the last month was mainly attributable to differences in N_2O flux on a single date (July 19), which had the lowest soil moisture content of the season (about 5%). Overall, the total amount of N loss as N_2O was relatively low, even at the highest fertilization rate. However, due to the extremely strong heat-trapping capacity of N_2O and the extensive coverage of farmland in the region,

best N management practices would be expected to minimize aggregate contribution from even small losses of N_2O per acre, which can potentially affect climate and increase frequency of drought in the region.

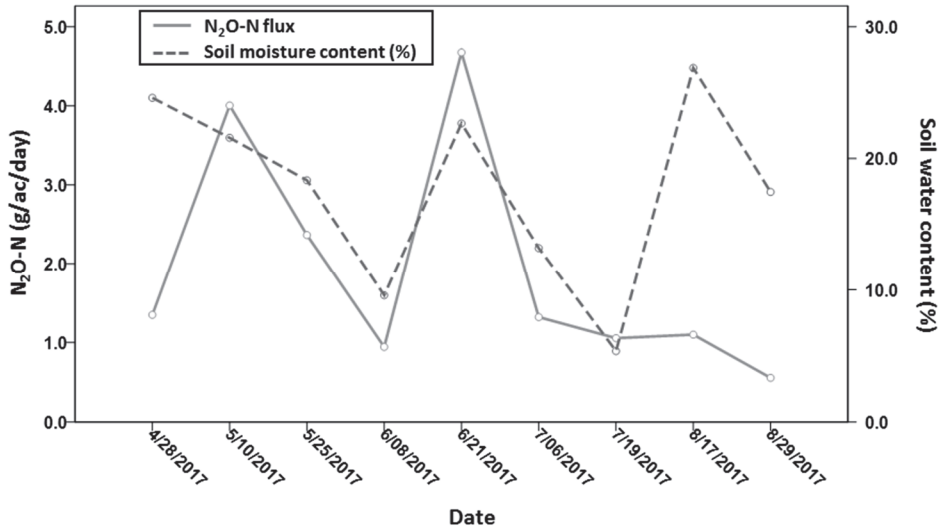


Figure 1. Seasonal N_2O-N flux rates (g/acre/day; solid line) and soil water content (%;dashed line) during the 2017 growing season on wheat plots at the NDSU Carrington Research Extension Center.

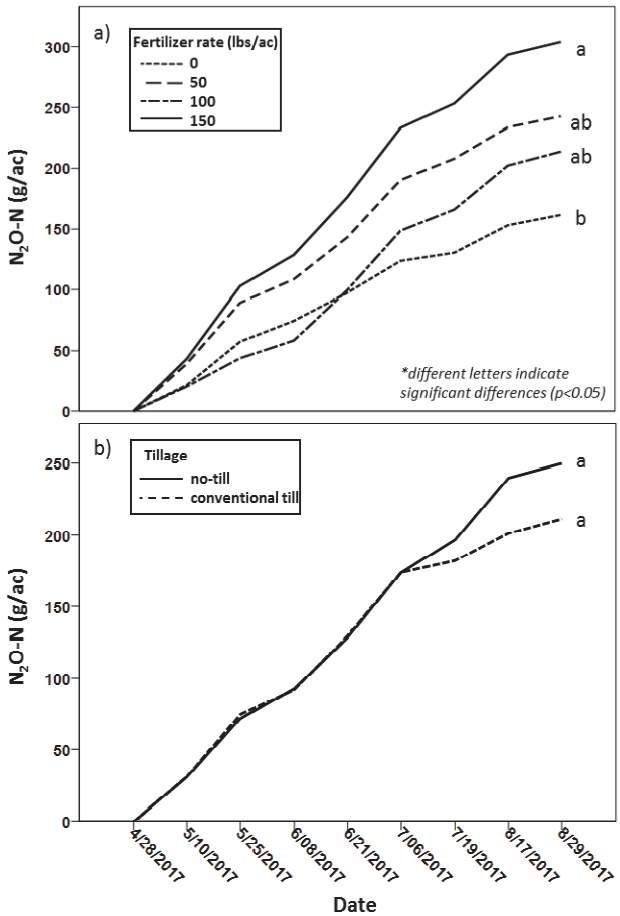


Figure 2. Cumulative loss of nitrogen as nitrous oxide gas (N_20-N) over the 2017 growing season in wheat plots under a) four fertilization rates and b) two tillage treatments.

Soybean Response to Paired-row Spacing and Canopy Type

Greg Endres and Mike Ostlie

Potential soybean seed yield increases with decreasing row width. A relatively new configuration is use of paired rows. For example, pairs with 7.5 inches between rows and centered at 30 inches. The Carrington REC conducted trials during four site-years to measure soybean performance with paired rows compared to intermediate and wide row spacing. In addition, the trials included the comparison of intermediate (medium) and bush (full) canopy plant types.

Table 1 lists soybean yield with row spacing (7-inch pairs, 14-inch and 28-inch) for individual trials and multi-year averages. Within years and the 4-year average indicate no yield advantage with paired rows compared to intermediate (14-inch) rows. A primary reason for the lack of yield response with paired rows is the delay in canopy closure (10-18 days) compared to intermediate rows. Also, note the 3-year average yield trend for paired and intermediate rows compared to wide rows.

Table 1. Soybean seed yield with paired 7-inch vs. 14- and 28-inch row spacing, Carrington, 2007, 2015-17.

Row Spacing	Seed Yield (bu/acre)					
Inches	2007	2015	2016	2017	2015-17 (3-year) average	4-year average
paired 7	54.2	20.7	50.7	54.3	41.9	45.0
14	62.6	18.7	52.5	56.0	42.4	47.5
28	x	19.6	44.6	49.1	37.8	x
LSD (0.05)	4.2	NS	NS	NS	x	x

A factor considered when selecting soybean varieties is canopy type, with most varieties having either intermediate or bush types. Canopy type selection with row spacing may have an impact on rate of canopy closure and possibly yield. The previously mentioned soybean row spacing study also included comparison of varieties of either intermediate- or bush-type canopies having similar maturity, plant height, other agronomic properties, and yield potential. Averaged across three years (2015-17) and the three row spacings, days from soybean planting to canopy closure were similar between the intermediate and bush types (Table 2). While yield differed between variety pairs (data not shown), this was likely due to plant genetics and not influenced by canopy type.

Table 2. Soybean canopy closure time between canopy types[1], Carrington, 2015-17.

	Canopy Closure	
	Intermediate	Bush
	% (August 15)	
2015	85	86
	Jday	
2016	204	206
2017	214	213

[1]Varieties (Peterson Farms Seed) used in study: 2015-16 = 12R05 RR2Y (intermediate) and 15R05N (bush); 2017 = L01-14N (intermediate) and L03-12N (bush).

Intermediate row spacing (middle) vs. paired rows on the right.

Partial funding for this project was provided by the North Dakota Soybean Council.

Effect of Planting Date and Population of Two Soybean Varieties under Dryland and Irrigation

Jasper M. Teboh, Szilvia Yuja, and Kelly Bjerke

Research Objectives

To improve farmers and stakeholder understanding of:

(1) Effects of planting dates on soybean performance under dryland and irrigated conditions
(2) Impact of three practicable seeding rates on yields
(3) Interaction of variety and planting date on soybean seed performance

Methods

This trial was conducted at the Carrington REC to assess the effects that early, normal or late planting, and plant population (seeding rates) would have on two soybean varieties – an early and a late relative maturity group (MG). Both varieties were Roundup Ready from the same company. The early MG (0.2) and late MG (0.8) soybeans were planted at rates to attain three target populations: 150,000 (150K), 175,000 (175K), and 200,000 (200K) plants/acre. The three planting dates were approximately two weeks apart, from early planting on May 11, normal planting date on May 24, and late planting on June 9. The trial was conducted on separate fields, one on dryland, and the other under irrigation. Previous crop was corn on both fields. Soybeans were planted at 14-inch row spacing.

Results

Under both dryland and irrigated conditions, plant population had no interaction with planting date or MG. Result means are therefore presented only for interactions between planting dates and MGs, and for each main effect (dates, population, MGs), where significant interaction effects were observed between MG and planting date for yields, test weight (TWT), protein, and oil on dryland (Table 1), and for oil under irrigation (Table 2).

Table 1. Dryland. Effect of planting data, maturity group, and seeding rates on soybean yield and seed quality

Sources of Variation	Yield	TWT	Protein	Oil	KWT (250 seeds)
	bu/ac	lb/bu	-------%-------		g
Planting date (PD)					
Early (May-11)	52.2	57.6	36.3	18.5	38.2a
Normal (May-24)	48.5	57.6	35.7	18.2	35.6b
Late (June-9)	45.0	57.6	35.9	17.2	31.9c
Maturity Group (MG)					
0.2	47.4	57.5	36.1	18.2	35.7a
0.8	49.7	57.7	35.9	17.8	34.8b
Population					
150000	46.6b	57.6	35.9	18.0	35.3
175000	49.9a	57.5	35.9	18.0	35.2
200000	49.2ab	57.6	36.1	18.0	35.2
MG x PD					
Early-0.2	48.3b	57.3b	36.3ab	19.2a	38.9
Early-0.8	56.2a	58.0a	35.6c	17.9b	37.5
Normal-0.2	49.1b	57.6ab	35.7bc	18.3b	35.9
Normal-0.8	47.9b	57.7ab	35.8abc	18.2b	35.3
Late-0.2	45.0b	57.6ab	36.3a	17.2c	32.3
Late-0.8	45.0b	57.5ab	36.3ab	17.2c	31.5
Analysis of variance	----------*Pr>F*----------				
Date	0.0053	0.841	0.0265	<.0001	<.0001
MG	0.0439	0.032	0.0413	<.0001	0.0092
Date x MG	0.0024	0.007	0.0164	<.0001	0.5626
Pop	0.0446	0.779	0.1315	0.944	0.9907
Date x Pop	0.1432	0.368	0.9565	0.726	0.7738
MG x Pop	0.406	0.423	0.1157	0.154	0.5911
Date x M x Pop	0.9066	0.562	0.157	0.155	0.9008

Highlighted values indicate significant effect

Means with identical letters within each column are not statistically different

Table 2. Irrigated. Effect of planting data, maturity group, and seeding rates on soybean yield and seed quality

Sources of Variation	Yield	TWT	Protein	Oil	KWT (250 seeds)
	bu/ac	lb/bu	-------%-------		g
Planting date (PD)					
Early (May-11)	59.2a	57.9a	37.1	17.4	36.8a
Normal (May-24)	57.7a	57.4b	37.2	17.0	35.6ab
Late (June-9)	50.0b	58.1a	36.9	16.5	34.4c
Maturity Group (MG)					
0.2	55.6	57.7b	37.0	17.1	35.7
0.8	55.6	57.9a	37.1	16.8	35.6
Population					
150000	53.0b	57.9	36.9	17.0	35.5
175000	55.9ab	57.8	37.1	16.9	35.6
200000	58.0a	57.8	37.1	16.9	35.8
MG x PD					
Early-0.2	58.4	57.7	36.9	17.8a	36.9
Early-0.8	60.0	58.2	37.3	17.0b	36.7
Normal-0.2	58.2	57.4	37.2	17.0b	35.8
Normal-0.8	57.2	57.4	37.2	17.0b	35.5
Late-0.2	50.2	58.0	36.9	16.5bc	34.4
Late-0.8	49.8	58.2	36.8	16.4c	34.4
Analysis of variance	----------*Pr>F*----------				
Date	0.0023	<.0001	0.1660	<.0001	0.0261
MG	0.9952	0.0339	0.3216	0.001	0.7374
Date x MG	0.6662	0.1317	0.0677	0.003	0.9474
Pop	0.0047	0.8261	0.2290	0.6450	0.7949
Date x Pop	0.9402	0.5229	0.4543	0.9833	0.7492
MG x Pop	0.7652	0.2072	0.8382	0.5691	0.5897
Date x M x Pop	0.1457	0.2251	0.1699	0.4560	0.6394

Highlighted values indicate significant effect

Means with identical letters within each column are not statistically different

Dryland soybeans

Significant yield interactions between planting date and maturity group indicated that, despite decreasing yield trends from early to late planting, significant differences in yields were only between MG 0.8 planted early compared to normal and late planting. Yields from early planting of MG 0.8 were also significantly different from yields of MG 0.2 across planting dates. There was a yield advantage of about 8 bushels when MG 0.8 was planted early compared to the normal planting date, and 10 bushels more compared to late planting under dryland. Results from 2015 and 2016 at Carrington showed that MG 0.8 or 0.6 produced greater yields, than MG 0.2. Yield differences in plant population were significant. Mean yield at 175K (50 bushels) was significantly greater than yield at 150K (47 bushels). Yield at 200K (49 bushels) was not different from either plant population. This may have been due to

plant competition for moisture given that between mid-May to late July there were some prolonged periods of moisture stress from shortage of rainfall.

It was evident that greater protein accumulation happened with delayed planting of MG 0.8 soybeans. This was not evident with MG 0.2. Protein content of MG 0.2 was significantly greater than MG 0.8 for early planting date, but not later. This may be a result of protein dilution by the relatively higher yield of MG 0.8 compared to MG 0.2 for early planting. Meanwhile, seed oil was greatest for MG 0.2 especially with early planting. Oil produced by MG 0.8 was not different between early and normal planting, but decreased significantly at late planting.

Seeding date and maturity group each had significant effects on seed weight. Seed weight decreased significantly, and linear from early to late planting. Seed weight of MG 0.2 soybean was significantly greater than for MG 0.8.

Irrigated soybeans

Yields were significantly greater for early (59 bu/ac) and normal (58 bu/ac) planting dates compared to those of the late (50 bu/ac) planting dates. Similar to dryland, higher seeding rates enhanced yields from 53 bushels at 150K to 56 bushels at 175K and 58 bushels at 200K. Yields were significantly different only between 150K and 200K. Under irrigation, where moisture was adequate, yields at 200K were likely unaffected by moisture stress, which probably explained higher yields (56 bu/ac) under irrigation compared to dryland (49 bu/ac).

Conclusion

Our results support previous studies showing that planting soybeans at the Carrington area early, or before mid-May, will likely produce better yields than planting later. Delaying beyond May increases the risk of yield loss, except in years where moisture is adequate year-round and growing season is long. Under conditions where drought can be an impediment to crop yields, early planting in May enabled soybeans to use early spring soil moisture for growth. Meanwhile the longer growing season due to late rainfall in August, allowed the earlier planted crop to grow and accumulate dry matter for a longer period. Planting at 175,000 seeds/ac presented the best seeding rate for yield production. Maturity Group 0.8 produced higher yields than 0.2 at this site. Further studies need to examine other varieties since we could not determine whether differences are due to other inherent traits associate with yield potential, or mainly due to relative maturity.

Evaluation of Organic HRS Wheat Seeding Rates

Steve Zwinger, Steve Schaubert, Lynne Brakke, Les Miller, Dan Avery, and Jonathon Moser

North Dakota has a history of organic production and is a leader in the nation with USDA certified organic acres ranking fifth overall in 2016. The majority of the organic acres are field crops with spring wheat being the main crop grown in the state.

With the absence of synthetic inputs such as herbicides for weed control organic farming relies on cultural methods to control pests like weeds. Organic agriculture tends to use increased seeding rates as a production practice. An organic field trial was established at the CREC to evaluate seeding rates with spring wheat. The trial was in collaboration with the Northern Plains Sustainable Agriculture Society's (NPSAS) Farm Breeding Club (FBC). The FBC is a non-profit member group that works with farmers to evaluate and develop crop varieties adapted to organic agriculture. The seed source used in the trial was a variety of hard red spring wheat released by the FBC in 2008. Objectives of this trial were twofold: evaluate the effect of seeding rates on agronomic performance and determine the effect seeding rate has on milling and baking qualities of the wheat.

The trial evaluated six seeding rates ranging from 500,000 to 3 million PLS/ac spaced in increments of 0.5 million PLS between each treatment. Seeding rates ranged from 36 to 218 pounds per acre. FBC Dylan wheat was sown on May 3 on ground that was a radish cover crop the previous year. The seed lot used had a germination of 98% and a seed count of 14,012 seeds per pound. The trial was blind harrowed (crop not emerged) with a tine weeder on May 7 for weed control. Stand counts were taken on May 17 to determine the number of plants established with each seeding rate. Stand counts are presented both in plants/ac and plants per square foot. Stand establishment based on percent of plants emerged relative to seeding rate was highest at the lowest seed rate, 85%, while only 60% establishment was achieved at the highest seeding rate (data not presented). Data gathered illustrates a trend often observed where successful plant establishment in relationship to seed rate decreases as seeding rates increase.

Gathered agronomic data demonstrate the effect plant density has on maturity. Lower seeding rates took longer to reach heading as compared to higher rates. Days to 50% heading ranged from 56 days for the 0.5 million rate to 52 days for the 3 million rate. Plant height was also influenced by seeding rates. As rates are increased, plant heights tend to slightly decrease. Spike counts taken at harvest demonstrate the wheat plant's ability to compensate by producing more spikes per plant with lower plant densities. Counts from the lowest rates show that the plants produced 1.9 spikes per plant as compared to 1.1 spikes for the highest rates.

The trial was direct combined on August 18. Grain quality was significantly influenced by seeding rate in this trial. Seed weights or 1000 KWT were higher for the lower rates and decreased as the seeding rate was increased. Test weights were the opposite, as seeding rates increased there was a trend of increased test weight. Grain protein was highest for the 0.5 million seeding rate and decreased as the seeding rate increased. Protein contents significantly decreased approximately 1% from the lowest to the highest rate.

Grain yields were significantly influenced by seeding rates with this trial. As rates were increased there was a trend for increase grain yield. Yields increased from 30 to 39.8 bushels per acre as seeding rates were increased. Data gathered from this trial suggest that a seeding rate of 1.5 million PLS/ac or greater is required for organic management of a spring wheat crop.

Samples from each of the seeding rate treatments will be sent to a miller/baker where they will be stone ground and artesian baked as 100% whole wheat to determine if plant density has an influence on the milling and baking qualities of this wheat variety.

Organic Hard Red Spring Wheat Seeding Rate Trial

Seeding Rate	Pounds Sown	Seedling Stand	Seedling Stand	Days to Heading	Plant Height	Spikes	Spikes	1000 KWT	Test Weight	Grain Protein	Grain Yield
PLS/ac	lb/ac	plants/acre	sq ft		inch	spikes/acre	sq ft	gram	lb/bu	%	bu/ac
0.5 million	36.4	427,107	9.8	56.0	30.2	802,961	18.4	34.6	59.5	10.5	30.0
1 million	72.8	625,000	14.3	54.8	30.0	1,084,852	24.9	33.9	60.7	10.2	34.4
1.5 million	109.2	895,501	20.5	54.0	29.2	1,181,663	27.1	32.3	60.7	9.9	37.1
2 million	145.6	1,272,779	29.2	52.3	28.9	1,355,353	31.1	31.4	60.5	9.4	36.4
2.5 million	182	1,463,554	33.6	52.0	28.8	1,711,276	39.3	31.0	60.6	9.6	39.8
3 million	218.5	1,816,629	41.7	52.0	27.8	1,950,456	44.7	30.1	60.3	9.6	38.0
Mean		1,083,428	24.9	53.5	29.2	1,347,760	30.9	32.2	60.3	9.9	36.0
C.V. (%)		10.6	10.6	1.3	3.1	10.0	10.0	3.4	0.7	5.6	5.5
LSD 0.05		173,097	4.0	1.0	1.4	203,254	4.7	1.6	0.7	0.8	3.0

The Effect of Energy Beets in a Crop Rotation

Mike Ostlie, Jasper Teboh, Szilvia Yuja, and Ezra Aberle

Energy beets are a potential new crop for central North Dakota. Energy beets are a type of sugar beet that have been bred for use in ethanol production. Past data has indicated that dryland energy beet yields in central North Dakota can be significant. Theory suggests that energy beets would be a good fit in rotations due to its deep taproot which can mine subsurface water and nutrients, and it is a crop that is more salt tolerant than most current North Dakota crops. There are no energy beet processing facilities in North Dakota as of this writing.

A crop rotation study was established in 2014 to evaluate how energy beets would affect cropping systems in central North Dakota. The study was conducted through 2017 and consisted of four crop rotations as follows:

1) Wheat ➡ Energy Beet ➡ Corn ➡ Soybeans
2) Wheat ➡ Soybean ➡ Corn ➡ Soybeans
3) Wheat ➡ Energy Beet ➡ Corn
4) Continuous Energy Beets

Each crop in the rotation was present each year (12 treatments), and replicated four times. Each plot was divided into a conventional till and no-till portion. The effect of previous crop was analyzed for the 2015-2017 growing seasons. Tables were assembled for each crop in the study to view the effect of the crop sequence from each crop's perspective.

Energy beets

Energy beets were not affected by crop rotation from a yield or quality perspective (Table 1). Energy beets were preceded by either wheat or energy beets (no rotation). It was expected that energy beet production would drop without rotating to a different crop. Due to the lack of energy beet production proximate to Carrington, few leaf and root diseases were observed during the course of the study. Cercospora leaf spot was detected with very low incidence in plots with continuous beets. The lack of pathogen pressure is likely a key reason that there was no drop in energy beet performance in the absence of rotation. Continuous beets would not be a recommended practice for long-term sustainability.

Table 1. The effect of crop rotation on the yield and quality of energy beets.

Rotation[b]	Previous Crop	Beet Weight	Yield	Sugar[a]	Crude Protein	Phosphorous	Potassium	Dry Matter	Nitrogen[a]
		lb/beet	ton/ac	%	%	%	%	%	%
1	Wheat	1.46	19.83	15.75	3.75	0.093	0.69	28.67	0.323
2	Wheat	1.45	20.57	16.71	4.07	0.092	0.67	30.45	0.383
3	Beet	1.48	20.62	17.28	4.11	0.081	0.63	29.88	0.381
Mean		1.46	20.34	16.58	3.98	0.089	0.663	29.667	0.362
LSD (0.05)		NS	NS	NS	NS	NS	NS	NS	NS
C.V. (%)		35.3	32.1	24.6	30.3	42.8	30.3	29.4	25.5

[a]calculated on current moisture, all other nutrients calculated on a dry matter basis

[b]rotations consist of 1) wheat->beet->corn->soybean, 2) wheat->beet->corn, and 3) beet->beet->beet

Energy beet performance was affected by tillage practice. Conventionally-tilled plots performed better than no-till plots for the duration of the study (Table 2). A big reason for this was due to established stand. There were generally less plants/ac in the no-till plots compared to the tilled. This is likely due to a poor seed bed from harvest activity disturbance and harder soils associated with the first years of no-till production. As a result of fewer plants/ac, the average size of the beet was larger in the no-till plots. The conventionally-tilled plots had higher protein (and nitrogen) content, while the no-till plots had greater phosphorus concentration.

Table 2. The effect of tillage practice on the yield and quality of energy beets.

Treatment	Tillage	Beet Weight	Yield	Sugar[a]	Crude Protein	Phosphorous	Potassium	Dry Matter	Nitrogen[a]
		lb/beet	ton/ac	%	%	%	%	%	%
1	No-till	1.74	16.97	15.47	2.74	0.108	0.70	33.04	0.278
2	Conv. Till	1.19	23.71	16.95	4.72	0.082	0.58	28.54	0.457
	Mean	1.47	20.34	16.21	3.73	0.10	0.64	30.79	0.37
	LSD (0.05)	0.3	3.1	NS	0.81	0.026	NS	NS	0.062
	C.V. (%)	35.3	32.1	24.6	30.3	42.8	30.3	29.4	25.5

Corn

Corn quality was affected by crop rotation. Corn harvest moisture was higher in rotations that contained energy beets as the previous crop (Table 3). Corn protein was also higher in rotations that contained energy beets. It should be noted that when energy beets preceded corn, there were severe phosphorous deficiency symptoms on the corn leaves in 2015 and 2016. This was indicated by moderate to high levels of purple leaves prior to the V5 growth stage. These deficiency symptoms did not carry over to affect yields. It is known that sugar beets do not host mycorrhizae, which assist with phosphorous uptake. Fewer mycorrhizae in the soil is a likely reason there would be early-season phosphorous deficiency symptoms in the corn.

Table 3. The effect of crop rotation on the yield and quality of corn.

Rotation[a]	Previous Crop	Moisture	Test Weight	Yield	Starch	Protein
		%	lb/bu	bu/ac	%	%
1	Beet	16.45	56.07	156.2	71.43	8.84
2	Soybean	15.54	56.33	159.2	71.57	8.58
3	Beet	16.05	56.28	165.7	71.50	8.91
Mean		16.01	56.23	160.4	71.50	8.78
LSD (0.05)		0.43	NS	NS	NS	0.28
C.V. (%)		4.7	1.3	15.1	0.9	5.5

[a]rotations consist of 1) wheat->beet->corn->soybean, 2) wheat->soybean->corn->soybean, and 3) wheat->beet->corn

Corn following energy beets (left) and corn following soybean (right).

Tillage practice affected corn yield and moisture (Table 4). Harvest moisture was higher in the conventional-till plots, but this could be related to the higher yields in those plots as well. Corn quality was not affected by tillage. With a longer duration of study (5 or more years), it would be expected that the no-till plots will perform more similarly to conventional-till plots.

Table 4. The effect of tillage practice on the yield and quality of corn.

Treatment	Tillage	Moisture	Test Weight	Yield	Starch	Protein
		%	lb/bu	bu/ac	%	%
1	No-till	15.77	56.29	152.1	71.57	8.68
2	Conv. Till	16.26	56.15	168.6	71.43	8.87
	Mean	16.02	56.22	160.4	71.50	8.78
	LSD (0.05)	0.35	NS	11.4	NS	NS
	C.V. (%)	4.7	1.3	15.1	0.9	5.5

Soybean

Soybean yield was affected by crop rotation. Soybeans benefited from energy beets in the rotation (Table 5). The four-year crop rotation with energy beets yielded better than the four-year rotation where a second soybean year substituted energy beets. Soybean production in the three-year rotation with energy beets trended higher than the no-beet rotation, but was statistically similar.

Table 5. The effect of crop rotation on the yield and quality of soybeans.

Rotation[a]	Previous crop	Moisture	Test Weight	Yield	Protein	Oil
		%	lb/bu	bu/ac	%	%
1	Corn	12.67	59.19	66.1	35.21	16.74
2	Corn	12.68	58.94	57.9	35.07	16.65
3	Wheat	12.69	59.04	62.0	34.92	16.82
Mean		12.68	59.06	62.0	35.07	16.74
LSD (0.05)		NS	NS	5.2	NS	NS
C.V. (%)		10.3	2.6	14.5	1.7	2.2

[a]rotations consist of 1) wheat->beet->corn->soybean, 2) wheat->soybean->corn->soybean, and 3) wheat->beet->corn

Soybeans were affected by tillage practice (Table 6). No-till soybeans had higher harvest moisture, and lower yields. No-till soybeans also had higher grain protein content but lower oil content. Similar to corn, it is expected that a longer study duration would result in fewer differences between the tillage systems.

Table 6. The effect of tillage practice on the yield and quality of soybeans.

Treatment	Tillage	Moisture	Test Weight	Yield	Protein	Oil
		%	lb/bu	c	%	%
1	No-till	13.08	59.12	59.0	35.24	16.56
2	Conv. Till	12.29	59.00	65.1	34.89	16.91
	Mean	12.69	59.06	62.0	35.07	16.74
	LSD (0.05)	0.62	NS	4.2	0.34	0.22
	C.V. (%)	10.3	2.6	14.5	1.7	2.2

Wheat

Wheat was not affected by tillage practice, but was affected by crop rotation. Wheat performed better following soybeans than following corn (Table 7). Wheat would not typically be recommended following corn, but it is a better agronomic sequence to prepare for energy beets in a three-year rotation. Wheat moisture was higher and test weight was lower following corn. Grain protein, surprisingly, was not affected by previous crop. Having beets in the rotation did not influence wheat production (comparing treatments 1 and 2).

Table 7. The effect of crop rotation on the yield and quality of wheat.

Rotation[a]	Previous Crop	Moisture	Test Weight	Yield	Protein
		%	lb/bu	bu/ac	%
1	Soybean	16.15	58.74	59.5	14.26
2	Soybean	15.08	59.52	60.3	14.51
3	Corn	17.42	57.14	54.4	14.69
Mean		16.22	58.47	58.1	14.49
LSD (0.05)		1.36	1.18	3.9	NS
C.V. (%)		14.6	3.5	11.8	6.7

[a]rotations consist of 1) wheat->beet->corn->soybean, 2) wheat->soybean->corn->soybean, and 3) wheat->beet->corn

Summary

Energy beets were not affected by the different rotations used in this study. Meanwhile, soybean yields were higher in a four-year rotation with energy beets, and corn and wheat yields were unaffected by a rotation with energy beets. Further data are being collected and analyzed to quantify water use differences by the different rotations as well as model development for energy beet growth and development in central North Dakota.

Partial funding for this project was provided by the USDA National Institute of Food and Agriculture. Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the view of the U.S. Department of Agriculture.

Sunflower Stand Counts from Imagery Collected with a Small Off-The-Shelf UAS

Paulo Flores, Blaine Schatz, and Ezra Aberle

Establishing a uniform stand when planting sunflower has been one of the more challenging factors when managing the crop to optimize performance. Achieving evenly spaced sunflower plants can be difficult due to the inherent size, shape and weight of the seeds. Evenly spaced plants or singulation is the goal when planting, however sunflower stands often include gaps (skips) and doubles (plants too close together). A stand establishment trial was conducted in 2017 to evaluate different factors that may impact the ability to enhance sunflower seed spacing at planting. This trial was utilized to develop a methodology to perform sunflower stand counts early in the growing season using UAV imagery and GIS (Geographic Information System) software.

Material and Methods

Sunflower plots (50 ft long by 30 ft wide) were planted on May 25, 2017 with a 30-in. row spacing. Stand counts in the field were conducted on June 7, 8, 9 and 12, 2017, by counting the number of plants on four pre-selected 30 ft long rows in each plot. On those same dates, plus June 16, a small UAS (unmanned aerial system) (Phantom 4 Pro) was flown to collect imagery from the experimental area. The Phantom 4 Pro is an off-the-shelf, ready-to-fly quadcopter, fitted with a 20.1 megapixel camera. Missions were flown at 45 ft above the ground level. The images collected were processed with Pix4Dmapper Pro by Pix4D. The resulting orthomosaic had a ground resolution of around 0.1 in/pixel. That resolution allowed for clear observation of individual sunflower plants, with few exceptions.

For this study, the field stand count data and UAS imagery collected on June 12 was used, plus UAS imagery collected on June 16. Using tools in ArcGIS 10.5 software and the UAS imagery, we were able to develop a computer workflow to perform stand counts on the same rows evaluated on the ground. To evaluate the accuracy of our computer model approach, we compared the ground stand count with the stand count obtained by our methodology. The ground stand count for June 12 was obtained by visually counting the plants in the field, while for June 16 it was obtained by manually counting the plants on the UAS imagery. The UAS imagery from both dates was used to count and locate "doubles" by either visual observation (overlapping plants, 2+ plants) or distance (less than 4 inches between plants). The location and number of doubles play a crucial role in the accuracy of our method.

Results and Discussion

Figure 1 shows the location and distribution of doubles (by visual observation [VO] and distance) across the experimental area. As one can observe, there are rows with no doubles while others have a considerable number of them. As shown in Figures 2 and 3, the occurrence of doubles has a big impact on the accuracy of the computer model. On June 12, the number of doubles by distance was higher and the number of doubles by VO was lower than on June 16. That is because on the earlier date the plants are still small and do not overlap each other, so the software can segment the plants individually. However, four days later, the closest plants were overlapping each other and were counted as doubles by VO, decreasing the occurrence of doubles by distance (Figure 1).

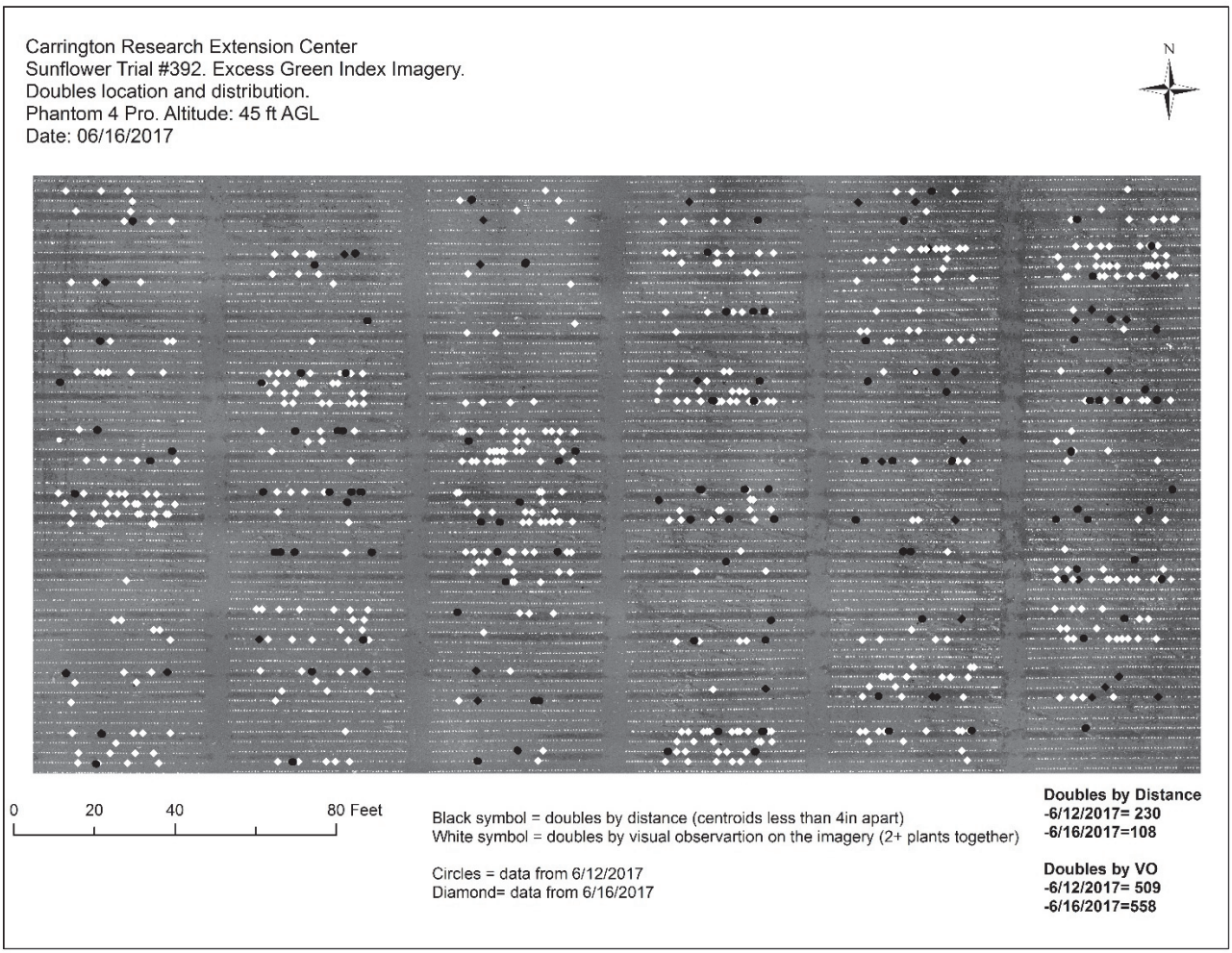


Figure 1. Doubles location and distribution on a sunflower trial at the Carrington REC. Imagery collected on June 16, 2017 at 45 ft above the ground.

Figures 2 and 3 show the correlation between the plant stand either from the field (Figure 2) or by direct stand count on the UAS imagery (Figure 3) and the plant stand obtained from the UAS imagery using ArcGIS software. In both cases, one can see that the correlations between the data from visual counting and the computer stand counting is greatly improved when the rows with doubles were removed from the dataset, in which case both methods yielded very similar stand counts for both dates. We made an attempt to take into consideration the occurrence of doubles, but due to the non uniform size of the plants and the occurrence of doubles with 3-4 plants, that approach did not work well. The same approach seems to work well when there were few doubles per row and they were made up of only two plants.

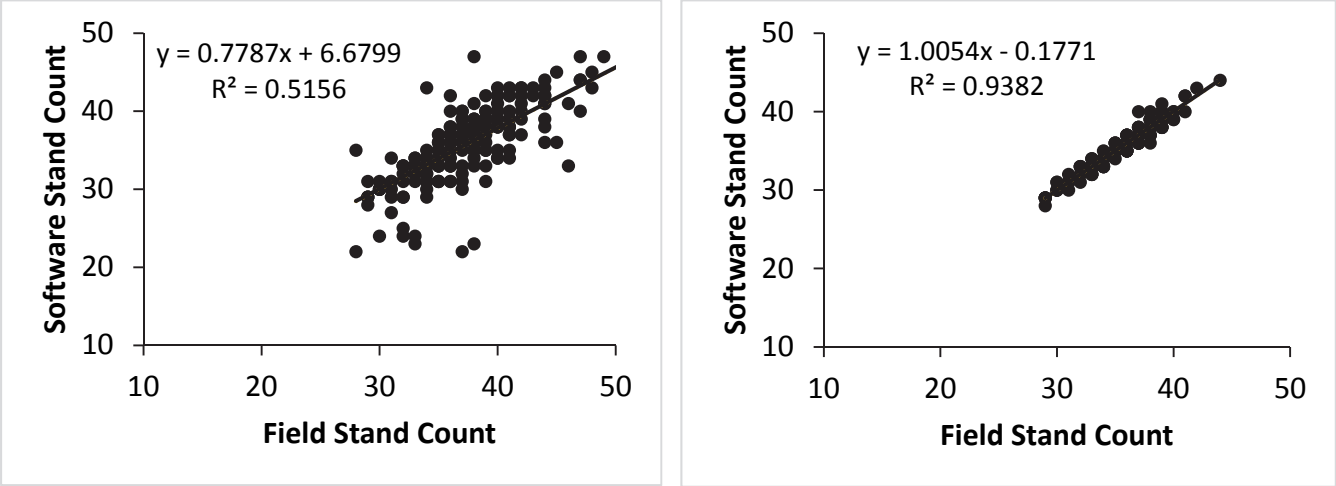


Figure 2. Correlation between sunflower stand count in the field and count made using UAV imagery and ArcGIS, before (left) and after (right) adjusting for doubles (128 sunflower rows).

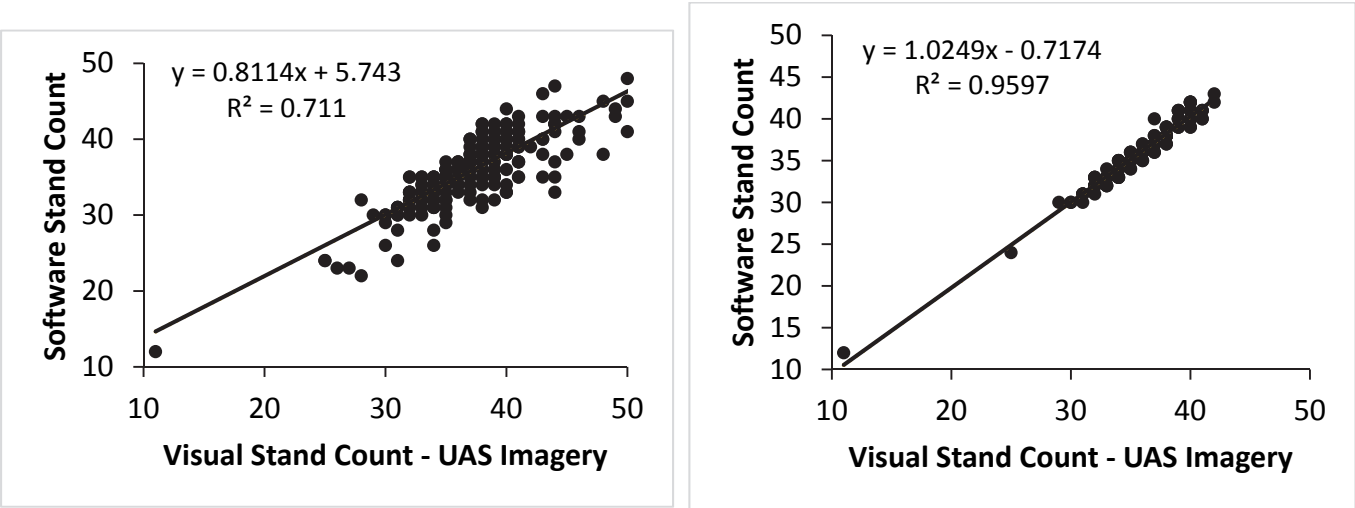


Figure 3. Correlation between sunflower stand count done by visual observation on UAV imagery and by using ArcGIS, before (left) and after (right) adjusting for doubles (135 sunflower rows).

Based on the results found in this study, given that the UAS imagery has adequate spatial resolution, we are confident that our methodology can accurately perform stand counts on sunflower fields established with adequate singulation. One factor that needs to be improved is the approach for determination of the rows, which will allow us to easily apply our methodology to large commercial fields. In addition, a similar approach can be used to perform stand counts on other crops, such as corn.

Winter Rye in Soybeans: What You Need to Know

Mike Ostlie, Steve Zwinger, Jasper M. Teboh, Greg Endres, and Ezra Aberle

Research has been conducted at the CREC since 2014 involving the rye and soybean cropping system. The concept for the system is that winter rye would be planted the fall prior to soybeans. The rye would then be terminated so that soybean production is maximized. This system provides some key benefits to soybeans. The top three reasons, in order of benefit, are 1) reducing soil erosion, 2) weed suppression, including glyphosate-resistant weeds, and 3) soil water management in saline soils. Improving soil health would be a component of several of the goals, but could also encompass increasing diversity and assisting with reducing tillage. If you are a livestock producer, extending grazing periods would fit on that list as well. Before growing rye, you need to understand many of the same concepts as you would with a cash crop. Below is a set of guidelines that will get you off to a good start.

Variety selection: With rye, like any other crop, variety matters. The success or failure of this system may come down to variety alone. Many times an available rye variety may not be known. A VNS (variety not stated) variety can still provide some of the key benefits to your system, particularly in regards to preventing erosion. Rye variety matters most for weed management or grazing. Weed suppression is tied very strongly to biomass production. The more biomass produced, the better the weed control (which is also good for grazing). At the CREC, the varieties Hancock and ND Dylan have provided high levels of kochia suppression (up to 70% under heavy kochia pressure). Variety maturity may be another consideration if the goal is to harvest the rye (i.e. hay) prior to planting. Make sure the selected variety is hardy for northern climates. If soil erosion is the primary goal, winter wheat or winter triticale may be alternative options if they are easier to acquire.

Weed suppression: Rye provides selective weed suppression, much like herbicides. The full spectrum of suppressed weeds is not yet known. At the CREC, we've seen high levels of suppression of kochia, green and yellow foxtail, and common lambsquarters. Other areas of the country have reported moderate suppression of common ragweed and pigweed species and high levels of suppression of horseweed. Rye has little or no effect on several legume or mint species. This is why soybeans do well with rye. Soybeans, dry beans, field peas, black medic, and lanceleaf sage have been observed growing with rye with no apparent adverse effects. As discussed above, some varieties are better than others at providing weed suppression. Typically, rye does not prevent weed emergence. There may be less weeds present, but the biggest effect is that rye stunts weeds. Kochia has been observed remaining less than 2" tall up until rye reaches anthesis. Once rye reaches anthesis, the weed suppression disappears and the weeds will begin to grow as normal.

Planting date: Rye has a wide range of possible planting dates. Optimum time of planting for biomass production is going to be mid-to late September, but can be extended into the fall until near soil freeze-up. This provides the opportunity to seed rye after corn harvest in some years. The disadvantage of planting late is that there will be less biomass and the rye will be less vigorous and mature later. Higher seeding rates would be recommended for late plantings.

Seeding rate: Seeding rate will vary greatly depending on your goals. If weed suppression is a high priority then higher seeding rates and stand uniformity are needed. When there are gaps in rye stand, there will be more weeds. Because of this, aerial seeding is not the best seeding method for weed management. We typically use 60 lb (~1 bu/ac) seeding rate for weed control. If reducing erosion is the highest priority, the seeding rate is much more flexible. Lower rates can be used and aerial seeding could be considered. Some have used as low as 30 lb/ac with reasonable success for the latter goals. Aerial seeding typically requires higher seeding rates as there is lower establishment. Once again, when rye is planted earlier in the year, lower seeding rates could be used as there will be more tillers and more vigorous spring growth.

Termination method: Rye can be terminated several ways. Glyphosate is one of the more reliable options for termination. Use a minimum of 1 lb ae/ac of glyphosate to prevent escapes. Other effective options in soybeans would be Select/Assure II (or generics) as long as rye has not reached the boot stage. After the boot stage, Group 1 herbicides will not be effective on rye. Raptor can be effective on rye until rye heading, but there is a higher chance for escapes than glyphosate due to high inherent genetic variability to Raptor efficacy. Using a crimper roller can be as effective as many of the herbicides, but timing is very critical. Rye rolled prior to anthesis **will** recover. A land roller alone will not terminate rye. If using a land roller, pair with an herbicide application. Mowing or haying could also be considered but again, removal prior to anthesis will result in poor termination. Tillage can be used to terminate rye, but it would be the most risky method. Escapes are likely with tillage and it removes most of the benefits that rye would provide. In 2017 there were also incidents of heavy seed corn maggot pressure due to rye residue being buried.

Termination timing: This question is the most difficult to answer as it varies by year. Some years, we've seen rye and soybeans co-exist together up until rye anthesis, when the soybeans are likely planted and emerged. In other years, that same treatment has resulted in complete soybean failure in test plots. The driving factor in that difference in response is soil moisture. In years of good spring moisture, the two crops can grow as well as if there was only a single crop. In 2016 and 2017 (very dry springs), terminating rye at or after soybean planting resulted in lower soybean yields. The problem is that if rye is terminated too early, you will lose many of the benefits of rye. Weed suppression disappears within 1 week without rye growth or stubble. On the other hand, rye plus a single glyphosate application at anthesis can provide season-long weed control some years due to a living mulch effect. Keep in mind that the more advanced the growth stage of rye, the more moisture is used. Early maturing varieties tend to accumulate biomass earlier in the season. Terminating rye two weeks prior to soybean planting is generally a safe practice, even more so when paired with early soybean planting dates.

Partial funding for this project was provided by the North Dakota Soybean Council

Cover Crop Safety following Wheat Herbicide Application

Mike Ostlie, Caleb Dalley, Kirk Howatt, and Brian Jenks

In 2016 and 2017 a herbicide residual study was conducted across four locations covering much of the diversity of environments in North Dakota: Carrington, Fargo, Hettinger, and Minot. The goal of the study was to determine which cover crops were safe to plant following wheat. Wheat herbicides were chosen that are known to have residual activity that may be injurious to cover crops that are planted in the same season. Nine herbicides were applied and eight cover crops were planted into each herbicide strip. Treatments were replicated three times at each location. Wheat herbicides were applied in late May or early June, and cover crops were planted within two weeks after wheat harvest, which was mid-August in 2016 and late August or early September in 2017. Treatments were rated for phytotoxicity and reduced stand. Data were compiled across locations. The highest injury rating across all locations was added to a table. For ease, the data were categorized by the level of injury. If a treatment combination caused less than 20% injury at every location, it was categorized as low risk. If a treatment combination caused between 21 and 50% injury at even a single location, it was categorized as medium risk. If there was more than 50% injury at any location it was labeled high risk.

Herbicide safety varied by location, as expected. Carrington had the most incidences of increased injury. In some environments all treatment combinations were safe. Oats, barley, and field peas were the most tolerant cover crops to the herbicides that were studied (Table 1). The brassica species (radish, turnip, and dwarf essex rape) were the most sensitive group of plants. Three combinations received high risk ratings 1) field pea and Widematch, 2) lentil and Widematch, and 3) turnip and Clarity

(dicamba). Combinations 2 and 3 were rated as high risk on more than one occasion. Those two combinations would not be recommended.

Table 1. Risk of cover crop injury based on highest damage recorded between five ND locations in 2016 and 2017.

Herbicide	Radish	Turnip	Beet	Field Pea	Lentil	Flax	Oats	Barley	Dwarf Essex Rape
Widematch	MR	MR	.	HR	HR	LR	LR	LR	MR
Huskie	LR	LR	0	LR	MR	MR	LR	LR	MR
Everest 2.0	MR	MR	0	LR	MR	LR	LR	LR	MR
Supremacy	LR	LR	.	LR	LR	LR	LR	LR	LR
Quelex	MR	MR	.	LR	LR	LR	LR	LR	LR
Powerflex	LR	LR	0	LR	MR	MR	LR	LR	MR
Goldsky	MR	MR	.	LR	LR	MR	LR	LR	LR
Varro	MR	LR	3	LR	LR	LR	LR	MR	LR
Clarity	MR	HR	0	LR	MR	MR	LR	MR	MR
2,4-D	MR	LR	.	LR	LR	LR	LR	LR	MR

LR = 0-20% injury; MR = 21-50% injury; HR = 51-100% injury

Due to environmental variability from year to year and field to field, some combinations may be higher or lower risk in a particular location and season. Factors that reduce injury risk include high soil organic matter content, high rainfall, tillage, low pH, and others. Table 1 is meant to be a guide. When planting following conditions favorable to herbicide breakdown, cover crop injury risk is reduced. In most instances, combinations listed as medium risk had low levels of injury in all but one environment.

Evaluation of an Avian Repellent in Reducing Blackbird Damage when Applied to Sunflower Using Drop Nozzle-equipped Ground Rigs

Page E. Klug[1], Michael H. Ostlie[2], Scott J. Werner[3]
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Introduction

In North Dakota large flocks of blackbirds feed on ripening crops after breeding and prior to migration with annual damage estimates averaging $3.5 million for sunflower (Cummings et al. 1989; Klosterman et al. 2013). Sunflower producers implement various techniques to disperse blackbirds, including firearms, propane cannons, pyrotechnics, and thinning of cattail marshes (Linz et al 2011). As a last resort, sunflower producers have also been known to remove sunflower from their crop rotation due to high levels of blackbird damage (Kleingartner 1992). Chemical repellents applied to sunflower may be a method to protect fields if the product can be effectively applied (Linz et al. 2011). One candidate bird repellent is anthraquinone (AQ). Arkion™ Life Sciences, LLC has been granted a national registration (EPA FIFRA Section 3) to use AQ at the seeding stage and is working on foliar application near harvest. Although AQ has shown repellency in the lab (Werner et al. 2009), field studies in foliar sunflower have been inconclusive (Kandel et al. 2009; Werner et al. 2011, 2014; Niner et al. 2015). Since the repellent needs to be ingested to be effective, one obstacle to using AQ in ripening sunflower is applying sufficient repellent directly on the face of the sunflower. Thus, using a ground rig equipped with drop nozzles to apply repellent directly to the sunflower face may increase field efficacy. We tested efficacy of an anthraquinone-based repellent (AV-5055) when applied via drop-nozzle to sunflower and using enclosed blackbirds in a semi-natural field setting.

Methods

We established 10 replicates with no repellent and 10 replicates where repellent was applied (Fig. 1). Each replicate (11.5 x 12.5 ft) included five rows of oilseed sunflower spaced 30 inches apart (0.0033 acres). On 31 August 2017, we used a ground rig equipped with 360 Yield Center, 360 Undercover® drop nozzle sprayers to apply repellent (AV-5055; 13% AQ by weight) when at least 50% of the sunflowers were at the R6 growth stage (Fig. 1). The drop nozzles were equipped with flat fan nozzles on the side ports (XR11001VS) and a hollow cone nozzle in the center (TX-VK3). We applied 20 gal/ac of solution to sunflower plots with a product application rate of 1.0 gal/ac, achieved with the combination of 60 PSI while driving 2.4 MPH. During application, we applied 35 spray cards (2.25 x 3.5 in) to sunflower heads to assess coverage. We collected disk flowers and achenes for residue analyses after application and prior to harvest.

We installed a bird enclosure (12 x 13 x 6 to 10 ft) over each replicate to stock 10 captive birds for 23 days (7-29 September 2017; Fig. 1). We provided 300 g of alternative diet (i.e., red milo) for the birds in all untreated and treated enclosures and provided water ad libitum. We measured consumption of alternative diet every other day throughout the study. We manually harvested sunflower heads and collected stand count and damage estimates within untreated and treated enclosures on 7 October 2017. We recorded the area of developed by measuring the diameter and undeveloped center of each sunflower head within the enclosure and area damaged for each sunflower head using a 5-cm^2 template grid. The estimate of percent damage was calculated by dividing the area of missing achenes by total area of developed achenes and multiplying by 100. We estimated blackbird consumption of sunflower by dividing the developed area that had sunflower achenes remaining by yield at harvest (corrected for moisture content) to estimate mass of achenes per square inch. We then multiplied mass per square inch by area damaged for an estimate of mass damaged for each enclosure. The mass damaged included the entire achene (i.e., seed and hull).

Results and Discussion

Although yield can be influenced by variation in agronomic factors, we did not see significant differences between untreated and treated enclosures. The stand count ranged from 85–120 plants (mean = 102 ± 3) for untreated and 85-122 plants (mean = 97 ± 4) for treated. The area of developed ranged from 2,329-3,295 in^2 (mean = 2,829 ± 98 in^2) for untreated and 2,143-3,285 in^2 (mean = 2,850 ± 99 in^2) for treated. Thus, the amount of sunflower available to be damaged was similar between treated and untreated. When foraging on sunflower, birds respond to moisture and oil content when selecting which seeds and the amount of seeds to consume in an effort to meet nutritional needs. The percent moisture ranged from 2.2-2.8% (mean = 2.5 ± 0.1%) for untreated and 2.2-2.5% (mean = 2.3 ± 0.04%) for treated. The percent oil ranged from 41.9-45.7% (mean = 44.3 ± 0.4%) for untreated and 42.5-45.9% (mean = 44.4 ± 0.3%) for treated. Sunflower test weight ranged from 28.1-31.4 lbs/bu (mean = 29.8 ± 0.3 lbs/bu) for untreated and 28.7-30.9 lbs/bu (mean = 29.4 ± 0.2 lbs/bu) for treated. Birds were not exposed to different sunflower quality, therefore seed consumption was not likely to vary due to agronomic factors.

If the repellent was effective in decreasing avian consumption of sunflower, the consumption of alternative feed would increase to maintain daily energy demands of the red-winged blackbird. The consumption of alternative diet ranged from 0.035–1.268 lbs (mean = 0.582 ± 0.096 lbs) for untreated and 0.159–0.833 lbs (mean = 0.433 ± 0.076 lbs) for treated replicates. Thus, the avian repellent did not cause the birds to consume more alternative diet. The red-winged blackbirds in this study were using sunflower to maintain their daily energy needs as evidenced from the estimated mass of sunflower damaged. Sunflower damage ranged from 891–1,572 lbs/ac (mean = 1,238 ± 60 lbs/ac) for untreated and 874–1,554 lbs/ac (mean = 1,243 ± 76 lbs/ac) for treated replicates. For individual blackbirds average mass of achenes consumed per day ranged from 0.0128-0.0225 lbs (mean = 0.0178 ± 0.001 lbs) for untreated and 0.0125-0.0223 lbs (mean = 0.0178 ± 0.001 lbs) for treated replicates, which is in line with bioenergetic models as discussed by Peer et al. (2003), where male red-winged blackbirds were estimated to consume 0.0110-0.0198 lbs of achenes per day. Thus, sunflower yield did not differ between treated and untreated enclosures as a result of blackbird damage. Sunflower yield corrected

for moisture ranged from 846–2,167 lbs/ac (mean = 1,397 ± 136 lbs/ac) for untreated and 959–1,668 lbs/ac (mean = 1355 ± 84 lbs/ac) for treated replicates. As applied, the avian repellent was not effective at reducing blackbird damage in sunflower.

Spray cards indicate presence of repellent on the sunflower face after application, but the amount of residue needed on disk flowers to effectively decrease blackbird consumption is unknown. Repellent residues appeared to be insufficient to decrease blackbird consumption of sunflower treated with AV-5055. Our results indicate that field application of repellent to achenes within downward facing sunflower heads is problematic. Repellent coverage on the spray cards ranged from 0–61% (mean = 14 ± 3%). The variation in the amount of repellent reaching the face of the sunflower is a limitation when applying a repellent to reduce bird damage in sunflower. This could be overcome by increasing the application rate. Sprayer technology and economic limitations related to repellent costs currently make increasing application rate impractical for broad-scale agriculture. Thus, future repellent studies should be aimed at optimizing the repellent formulation (e.g., %AQ) for specific pests and crops. For example, studies aimed at optimizing the efficacy of repellents in sunflower should take into consideration growth form and application abilities in the field in combination with blackbird feeding physiology and behavior.

Acknowledgements
Our research was supported by Arkion Life Sciences, LLC, National Sunflower Association, USDA-APHIS-WS National Wildlife Research Center, and NDSU Carrington Research Extension Center. We thank C. Quiring, M. Kropp, W. Kennerley, C. Egan, B. Kaiser, J. Preuss, K. Boteler, S. Deliberto, H. McClean, and J. Ellis for field assistance. We thank S. Peng of Biotechnical Resources for conducting chemical residue analyses. Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government. All research was performed according to protocols approved by the USDA-APHIS-WS NWRC Institutional Animal Care and Use Committee and adhering to regulations under the National Environmental Policy Act and Endangered Species Act (QA-2728).

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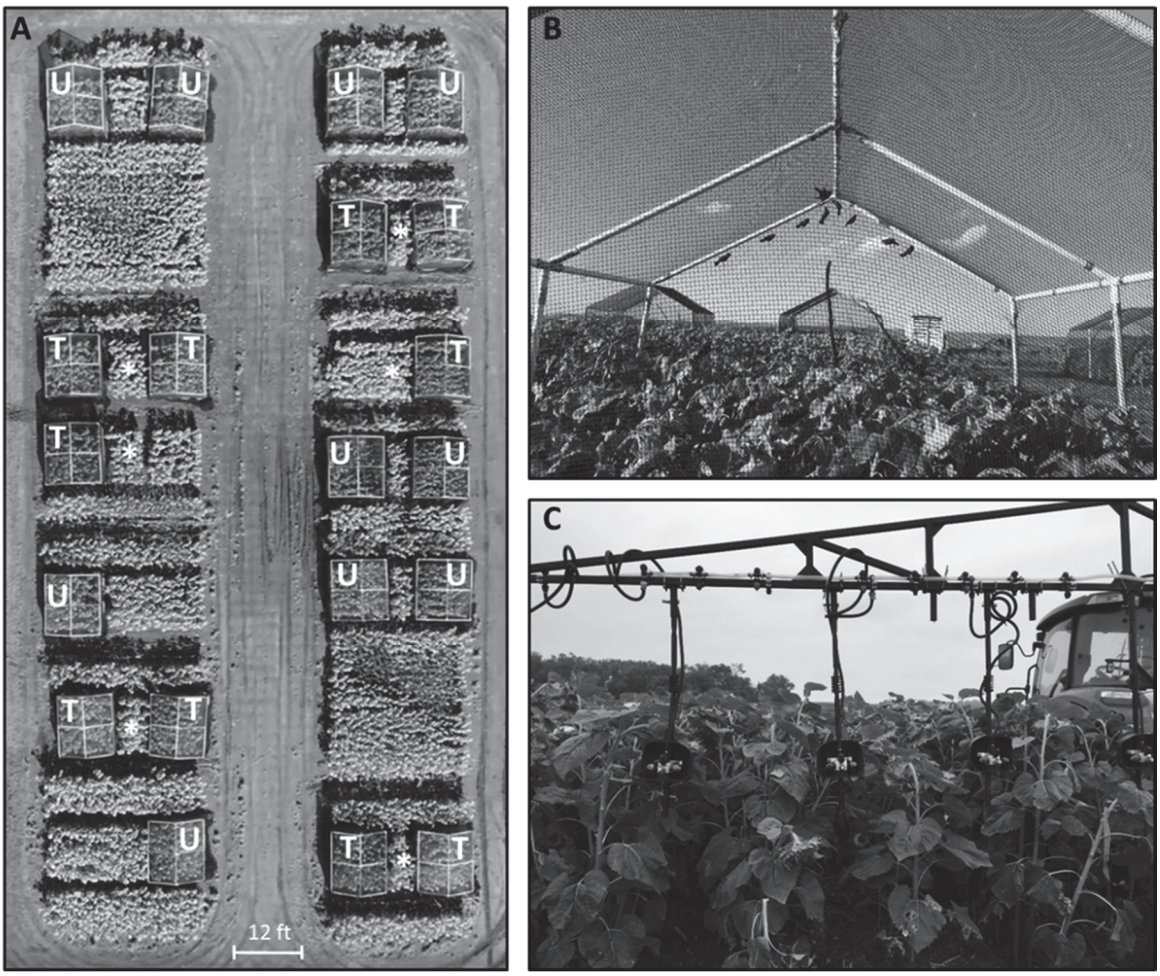

Fig. 1: A) Sunflower plots at NDSU Carrington REC with installation of 20 bird enclosures (U = untreated replicates; T = treated replicates; * = spray cards). B) The 12 x 13 x 6-10 ft bird enclosure stocked with 10 male red-winged blackbirds (*Agelaius phoeniceus*). C) Small plot, ground rig equipped with 360 Yield Center, 360 Undercover® drop nozzles.

2017 Summary of Extension Field Surveys in South-Central North Dakota

Greg Endres and Brittney Aasand

Integrated pest management (IPM) Survey

During the 2017 crop season, an integrated pest management (IPM) small grain, soybean and sunflower field survey was conducted by the NDSU Extension Service, in cooperation with the North Dakota Department of Agriculture, to identify crop pest presence and agronomic factors. Use of the survey data includes farmer, crop adviser and ag industry education; support for exporting North Dakota crops; and reference for educational and research projects.

State IPM survey coordinators are Janet Knodel, extension entomologist; Patrick Beauzay, State IPM coordinator and entomology research specialist; and Sam Markell and Andrew Friskop, extension plant pathologists. Brittney Aasand, crop scout based at the Carrington Research Extension Center (CREC), surveyed 381 fields in 11 south-central counties: Burleigh, Dickey, Eddy, Emmons, Foster, Kidder, LaMoure, Logan, McIntosh, Stutsman, and Wells.

The small grain survey was conducted in 240 **spring and winter wheat,** and 24 **barley** fields during late May to early August, primarily for leaf and head diseases, and insects. Primary diseases in the

survey were bacterial leaf blight, barley yellow dwarf virus, rust (leaf, stem and stripe), Fusarium head blight (scab), Septoria, loose smut, net and spot blotch (barley), tan spot (wheat), and wheat streak mosaic virus (wheat). Insects surveyed were grasshoppers, aphids, cereal leaf beetle, wheat stem maggot and sawfly, and barley thrips.

The **soybean** survey was conducted in 81 fields from the last week of June through the first third of August to detect grasshoppers, soybean aphid, bean leaf beetle, spider mites and Western corn rootworm. Soybean aphids were first detected on July 10 but levels did not reach economic thresholds during the scouting period. Percent of soybean fields grown on previous crop ground: wheat = 35%, corn = 35%, and soybean = 29%. Sixty-one percent of fields were grown in 15-inch rows; 34 percent in 30-inch rows; and 5 percent were solid-seeded.

The survey included 36 **sunflower** fields inspected during the last week of June through the first third of August for grasshoppers, downy mildew, rust and verticillium wilt. Grasshoppers were found at low densities (range of 1-29/yd^2). Downy mildew was found in three fields and rust in only one field. Wheat was the most common crop that preceded sunflower (59% of total fields) followed by corn (38%).

Maps displaying summaries of the state survey results by crop and pest are available at the following website: www.ag.ndsu.edu/ndipm

Also, insect traps were placed in two **wheat** fields (CREC and Wishek area) to sample for two exotic insects (ND Dept. of Ag), and in a CREC **corn** field to sample for four exotic insects (NDSU Dept. of Entomology). Sunflower moth, banded sunflower moth and *Cochylis arthuri* pheromone traps were located at the CREC during mid-June through July to monitor the presence of these **sunflower** insects. All three moths were present in traps during the last half of July, with banded sunflower moth the most common. In addition, a Swede midge trap was placed in a CREC **carinata** trial (NDSU Dept. of Entomology). Also, soil samples for nematodes were collected from 11 **wheat** fields (one per county) for the ND Dept. of Ag.

Crop Scout Brittany Aasand places sunflower traps, June, 2017.

Sunflower Survey

A fall **sunflower** field survey was conducted by the National Sunflower Association in cooperation with the NDSU Extension Service. Data recorded included plant population, row spacing, tillage system, seed yield, and presence of or damage by weeds, insects, disease and birds. In south-central ND, eight oilseed fields were surveyed during September 14-28 in Eddy, Foster, Kidder, Logan, McIntosh, Sheridan and Wells counties by Greg Endres and the following extension agents: Tim Becker, Sheldon Gerhardt, Joel Lemer, Lindsay Maddock, Penny Nester, Crystal Shaunaman and Nicole Wardner.

Lindsay Maddock and Tim Becker conduct a sunflower survey.

Across these fields, average seed yield was estimated at 1800 lb/acre (range of 1250 to 2630 lb/acre). Harvestable sunflower stands averaged 16,950 plants/acre, with a range of 15,300 to 19,300 plants/acre. The majority of fields followed small grain (57%) or corn (29%); were reduced- or no-till (71%); and all planted in 30-inch rows. Diseases present in at least 50% of the fields included phoma (100%), leaf rust (75%; severity ranging from trace to 1%), and rhizopus (75%). Also, sclerotinia (wilt, mid-stalk rot and head rot) was found in half of the surveyed fields with incidence ranging from 1 to 13%. Bird feeding damage was noted in half the fields. Also, long-horned beetle larvae and associated stalk damage were found in Kidder and McIntosh county fields.

Details from the field surveys may be obtained by contacting the CREC.

Northern-Hardy Fruit Evaluation Project: 2017 Production

Kathy Wiederholt

In 2017, the Northern Hardy Fruit Evaluation Project brought information to over 1,000 people through tours, meetings, video conference programs and personal phone calls. Since the project started in 2006, 10,740 constituents have interacted with the fruit project. Five new North Dakota business contacts were made and two received fruit samples. Eight new contacts requested information about starting orchards in the state. In addition to constituents in North Dakota, calls came from Minnesota, Montana, Illinois, Nebraska, Oregon, Wisconsin, and South Dakota. We also corresponded with a researcher from Kazakhstan.

Fall 2016 was extended and dry with 2.4 inches of rain in September and October. November averaged 52.2˚F, which was 14.4˚F above average. During this extended warm period, chilling requirements were met and some Russian honeyberries bloomed. Winter low temperatures (Dec-Feb) were 4.0°F warmer than average. Snowfall was 56.2 inches from November 28, 2016 to April 1, 2017, with 77% occurring in December. Three blizzards filled the orchard with snow, ruining much of the grape trellis and both the east and west ends of the orchard fence. Thawing began in mid-March with near average temperatures through May 30.

Drought conditions developed across North Dakota in spring 2017. Carrington was lucky, with 4.56 inches of rainfall in May and June, and a remaining 4.58 inches through August. Rain events were several weeks apart but were in amounts that allowed the moisture to soak into the soil. Wide swaths of hail passed near CREC, but missed the orchard this year. The orchard yielded good crops except for aronia. After a large aronia crop in 2016, we expected a decrease in 2017; however, the crop was even smaller than anticipated. Immature fruit began to fall in mid-August and was hardly worth harvesting in September. The fruit, though sweet, was small and quite tannic and was discarded. Some growers in our five-state area had similar experiences, even with irrigated crops, though others reported a fine harvest.

Spotted Winged Drosophila fruit fly continues to cause problems for fruit growers across the country and in North Dakota. At CREC, cherries were ruined for a sixth year despite good spray coverage. This very attractive crop becomes a potent source of inoculum for late haskaps, Juneberries and currants. The cherry plants will be removed in 2018/19 after NDSU graduate student research is completed.

Notable Events in the Fruit Orchard:

- A large number of bumblebees were observed due to warm soil conditions all winter 2016-17. Haskap production was much greater than in any other year.
- Twenty-one new Japanese haskaps were planted in fall 2017 in continuation of our efforts to find haskaps that are more suited to North Dakota's conditions.
- The first male SWD fruit fly was captured on a sticky card + lure July 9. Spraying began July 4, based on strawberry infestation in the city of Carrington.

Northern Hardy Fruit Project - Yearly Production Records

		No. of plants	2014		2015		2016		2017	
			Date	pounds	Date	pounds	Date	pounds	Date	pounds
Aronia	Nero	4	11-Sep	16.8	31-Aug	25.7	9/3-6	54.5	9/12-13	12.6
	Raintree Seedling	4	11-Sep	29.6	28-Aug	17.8	2-Sep	52.1	*did not pick*	x
	Raintree Select	4	11-Sep	28.9	1-Sep	21.4	6-Sep	60.0	9/13-19	7.4
	Viking	4	11-Sep	19.1	1-Sep	19.7	9/2-7	63.2	12-Sep	4.5
	McKenzie	4	11-Sep	22.5	2-Sep	0.9	7-Sep	42.0	11-Sep	5.1
	Galicjanka	4					6-Sep	3.6	5-Sep	1.0
				116.9		**85.5**		**275.4**		**30.6**
					Freeze, hail, wind - All				*Tiny, tannic fruit*	
Hardy Cherries	SK Carmine Jewel	12	28-Jul	1.3	x	x	13-Jul	93.1	19-Jul	306.4
	SK Crimson Passion	12	28-Jul	2.4	x	x	13-Jul	32.2	20-Jul	45.2
				3.7		**0.0**		**125.3**		**351.6**
	2014 *- CJ crop apx. 7lb per shrub prior to Field Day tasting, high wind, bird hail, SWD 70% loss*									
	Evans / Bali	2	x	**0.0**	x	**0.0**	19-Jul	**17.3**	8/1-2	loss
					Freeze, hail, wind - All		*hail, SWD 70% loss*		*SWD in all*	
Black Currant	*Ben Sarek*	12	x	x	x	x	x	x	x	x
Variety Trial	*Black Down*	16	11-Aug	74.2	x	x	7/22-28	36.7	x	x
	Hilltop Baldwin	16	8-Aug	15.9	x	x	25-Jul	17.5	*Removed*	x
	Swedish Black	11	29-Jul	41.0	x	x	15-Jul	x	*Removed*	x
	Titania	15	7-Aug	107.9	x	x	25-Jul	20.1	x	x
	Whistler	12	29-Jul	59.9	x	x	7/27-28	53.0	x	x
				298.9		**0.0**		**127.3**		**0.0**
	Whistler replaced Ben Sarek 2011				*Freeze, hail, wind - All*		*hail, SWD ≥ 50% loss*		*Pruned out bearing ca*	
Black Currant	*Blackcomb*	15					1-Aug	6.3	31-Jul	67.2
New	*Cheakamus*	15					28-Jul	6.7	28-Jul	79.7
Variety Trial	*Stikine*	15					1-Aug	0.1	26-Jul	115.4
	Tahsis	15					28-Jul	2.8	26-Jul	77.6
	Tiben	15					1-Aug	3.8	8-Aug	88.0
	Tofino	14					10-Aug	3.0	8/1-4	45.9
	Nechako -2 ft space	7					15-Aug	2.5	11-Aug	21.5
	Nechako -3 ft space	7					15-Aug	3.5	11-Aug	26.6
								28.7		**521.9**
							hail, SWD ≥ 50% loss		*some SWD*	
Black Currant	Ben Lomand	4	1-Aug	11.9	x	x	26-Jul	8.3	x	x
	Blackcomb	4	4-Aug	13.3	x	x	26-Jul	21.4	x	x
	Champion	4	11-Aug	5.6	x	x	26-Jul	6.7	x	x
	Minaj Smyriou	4	7/31-8/1	34.7	x	x	26-Jul	3.2	x	x
				65.5		**0.0**		**39.6**		**0.0**
							hail, SWD ≥ 50% loss		*Pruned out bearing ca*	
Red Currant	Jhonkheer Van Tets	4	30-Jul	29.8	x	x	21-Jul	42.9	21-Jul	46.1
	Red Lake	4	1-Aug	x	x	x	x	x	21-Jul	18.4
	Redstart	4	8-Aug	19.0	x	x	x	x	*Removed*	x
	Rosetta	4	8/4-11	38.7	x	x	26-Jul	20.9	3-Aug	70.5
	Rovada	4	12-Aug	34.8	x	x	27-Jul	52.3	31-Jul	83.6
				122.4		**0.0**		**116.1**		**218.6**
							SWD loss			

Northern Hardy Fruit Project - Yearly Production Records *(cont'd)*

		No. of plants	2014		2015		2016		2017	
			Date	pounds	Date	pounds	Date	pounds	Date	pounds
White Currant	Blanka	4	31-Jul	30.8	x	x	22-Jul	15.0	*Removed*	x
	Swedish White	4	7/25-28	53.0	x	x	21-Jul	20.5	*Removed*	x
				83.8		**0.0**		**35.5**		**0.0**
							SWD loss		*Removed plants*	
Japanese	22-37	3/ 2 2016	17-Jul	3.6	7-Jul	1.8	1-Jul	5.8	*did not pick*	x
Haskap	41-100	3/ 1 2016	17-Jul	8.8	7-Jul	1.8	30-Jun	3.0	*did not pick*	x
	43-87	3/ 2 2016	14-Jul	1.8	1-Jul	2.0	30-Jun	1.2	*did not pick*	x
	43-97	3/ 2 2016	17-Jul	4.2	9-Jul	2.3	5-Jul	3.6	*did not pick*	x
	45-57	3/ 1 2016	17-Jul	2.2	9-Jul	1.6	5-Jul	1.2	*did not pick*	x
	85-26	3/ 2 2016	14-Jul	9.0	7-Jul	8.3	5-Jul	8.8	*did not pick*	x
New trial	20-04	3					30-Jun	3.8	7-Jul	12.8
Planted 2012	21-20	3					6-Jul	1.9	12-Jul	4.3
	22-14	3					6-Jul	2.8	7-Jul	8.2
	22-26	3					6-Jul	3.4	7-Jul	12.0.
	41-75	3					6-Jul	3.7	7/4-6	15.7
	44-19	3					6-Jul	2.2	12-Jul	9.4
	57-49	3					6-Jul	4.6	11-Jul	13.0
	88-92	3					30-Jun	2.0	4-Jul	6.3
	88-102	2					30-Jun	0.9	4-Jul	5.8
	108-23	3					30-Jun	4.8	7/6-7	17.0
	131-08	3					6-Jul	2.8	12-Jul	10.8
	142-30	3					6-Jul	1.9	10-Jul	6.8
				29.5		**17.8**		**58.4**		**110.1**
			Wind loss all		*Freeze, hail, wind - All*				*Good pollination*	
Russian	Berry Blue	4	6/27-7/1	26.0	30-Jun	7.5	21-Jun	12.4	28-Jun	23.6
Honeyberry	Blue Belle	4	6/18-26	23.5	6/22-25	12.4	13-Jun	10.1	19-Jun	21.8
	Blue Moon	4/ **2** 2016	25-Jul	10.6	x	x	x	x	*did not pick*	x
	Blue Velvet	4/ **2** 2016	x	x	x	x	1-Jul	1.8	*did not pick*	x
	Kamchatka	4	6/20-26	17.1	25-Jun	7.4	15-Jun	9.2	*did not pick*	x
	Cinderella	4	x	x	22-Jun	1.3	14-Jun	6.0	*did not pick*	x
				77.2		**28.6**		**39.5**		**45.4**
			Wind loss B Blue						*Good pollination*	
Canadian	Borealis	4/ **2** 2016	9-Jul	4.6	7-Jul	0.8	30-Jun	0.7	26-Jun	9.6
Haskaps	Tundra	5/ **3** 2016	3-Jul	6.0	1-Jul	2.8	27-Jun	2.8	27-Jun	17.7
	Indigo Gem (9-15)	5	2-Jul	12.3	1-Jul	6.1	22-Jun	12.4	27-Jun	20.9
	Indigo Treat (9-91)	5/ **2** 2016	3-Jul	1.2	7-Jul	0.2	27-Jun	0.5	29-Jun	6.9
				24.2		**9.9**		**16.4**		**55.1**
			Wind loss Tundra, Treat						*Good pollination*	
Juneberry	*Honeywood*	20	16-Jul	53.3	7/16-20	19.5	7/9-12	144.6	7/10-11	166.2
Variety Trial	*JB30*	20	to	28.3	7/9-10	25.4	7/6-7	174.3	7/5-7	133.4
	Martin	20	17-Jul	36.6	7/9-10	32.5	7/5-7	131.4	7/5-6	101.0
	Smoky	20		19.8	7/16-19	71.8	7/8-12	147.3	7/13-14	154.1
	Thiessen	20		32.5	7/9-13	35.4	7/5-8	164.9	7/5-6	142.2
				170.4		**184.6**		**762.5**		**696.9**
			Pruned spring 2014		*Freeze, hail, wind - All*		*Some SWD after 7/8*		*No SWD*	

The Project was planted in 2007, except Juneberries 2006.

Retained Ownership of Calves – A Year to Remember

Karl Hoppe and Dakota Feeder Calf Show Livestock Committee, Turtle Lake, ND

The Dakota Feeder Calf Show feedout project assists cattle producers in identifying cattle with superior growth and carcass characteristics. The spread in average profitability between consignments from the top five herds and the bottom five herds was $224.84 per head for the 2016-2017 feeding period. Overall feeding profitability was $632.74 per head.

Summary
The Dakota Feeder Calf Show feedout project was developed to discover the actual value of spring born beef steer calves, provide comparisons among herds, and benchmark feeding and carcass performance. Cattle consigned to the feedout project were delivered to the Carrington Research Extension Center Livestock Unit on Oct. 15, 2016. After a 213-day feeding period with 2.93 percent death loss, cattle averaged 1,334.9 pounds (shrunk harvest weight). Feed required per pound of gain was 6.77 (dry-matter basis). Overall pen average daily gain was 3.14 pounds. Feed cost per pound of gain was $0.494 and total cost per pound of gain was $0.743. Profit ranged from $790.79 per head for pen-of-three cattle with superior growth and carcass traits to $456.82 per head (no death loss). Substantial variability in the feeding and carcass value of spring-born calves continues to be discovered through participation in the feedout project.

Introduction
Determining calf value is a learning experience for cow-calf producers. To remain competitive with other livestock and poultry in the meat industry, cow-calf producers need to identify superior genetics and management. Marketplace premiums are provided for calves that have exceptional feedlot performance and produce a high-quality carcass.

In addition, cost-effective feeding performance is needed to justify the expense of feeding cattle past weaning. Because North Dakota has low-cost feeds and a favorable climate, low cost per pound of gain can be accomplished.

Combining the low cost of gains with the identification of superior cattle, this ongoing feedlot project provides cattle producers with an understanding of cattle feeding and cattle selection in North Dakota.

Experimental Procedures
The Dakota Feeder Calf Show was developed for cattle producers willing to consign steer calves to a show and feedout project. The calves were received in groups of three or four on October15, 2016, at the Turtle Lake Weighing Station, Turtle Lake, N.D., for weighing, tagging, veterinary processing and showing. The calves were evaluated for conformation and uniformity, with the judges providing a discussion to the owners at the beginning of the feedout. The number of cattle consigned was 205, of which 179 competed in the pen-of-three contest.

The calves were then shipped to the Carrington Research Extension Center, Carrington, N.D., for feeding. Prior to shipment, calves were vaccinated, implanted, dewormed and injected with a prophylactic long-acting antibiotic. Cattle were implanted with Synovex S upon arrival.

Calves then were sorted and placed on corn-based receiving diets. After an eight-week backgrounding period, the calves were transitioned to a 0.62 megacalorie of net energy for gain (Mcal NEg) per pound finishing diet. Cattle were weighed every 28 days, and updated performance reports were provided to the owners. Cattle were reimplanted with Revlor S.

An open house was held on February 7, 2017, at the Carrington Research Extension Center Livestock Unit, where the owners reviewed the calves and discussed marketing conditions.

The cattle were harvested on May 17, 2017 (199 head). The cattle were sold to Tyson Fresh Meats, Dakota City, Nebraska, on a grid basis, with premiums and discounts based on carcass quality. Carcass data were collected after harvest. Ranking in the pen-of-three competition was based on the best overall score. The overall score was determined by adding the index values for feedlot average daily gain (25 percent of score), marbling score (25 percent of score) and profit (25 percent of score) and subtracting index value for calculated yield grade (25 percent of score). The Dakota Feeder Calf Show provided awards and recognition for the top-ranking pen of steers.

Results and Discussion

Cattle consigned to the Dakota Feeder Calf Show feedout project averaged 623.8 pounds upon delivery to the Carrington Research Extension Center Livestock Unit on October 15, 2016. After an average 213-day feeding period, cattle averaged 1,334.9 pounds (at plant, shrunk weight). Death loss was 2.93 percent (six head) during the feeding period.

Average daily feed intake per head was 32.4 pounds on an as-fed basis and 21.4 pounds on a dry-matter basis. Pounds of feed required per pound of gain were 10.25 on an as-fed basis and 6.77 pounds on a dry-matter basis.

The overall feed cost per pound of gain was $0.494. The overall yardage cost per pound of gain was $0.100. The combined cost per pound of gain, including feed, yardage, veterinary, trucking and other expenses except interest, was $0.743.

Calves were priced by weight upon delivery to the feedlot. The pricing equation ($ per 100 pounds = (-0.035172919* initial calf weight, pounds) + 145.5825919) was determined by regression analysis on local livestock auction prices reported for the weeks before and after delivery.

Overall, the carcasses contained U.S. Department of Agriculture Quality Grades at 3.5 percent Prime, 73.4 percent Choice or better (including 11.5 percent Certified Angus Beef), 22.1 percent Select, 0.5 percent Standard and 0.5 percent other, and USDA Yield Grades at 9 percent YG1, 45.2 percent YG2, 40.2 percent YG3, 5 percent YG4 and 0.50 percent YG5. One carcass (0.50 percent) was greater than 1,050 pounds.

Carcass value per 100 pounds (cwt) was calculated using the actual base carcass price plus premiums and discounts for each carcass. The grid price received for May 17, 2017, was $224.84 Choice YG3 base with premiums: Prime $20, CAB $6, YG1 $6.50 and YG2 $2, and discounts: Select minus $15, Standard (no roll) minus $15, YG4 minus $8, YG5 minus $20 and carcasses greater than 1,050 pounds minus $20.

Results from the calves selected for the pen-of-three competition are listed in Table 1.

Overall, the pen-of-three calves averaged 410 days of age and 1,403.9 pounds per head at harvest. The overall pen-of-three feedlot average daily gain was 3.36 pounds, while weight gain per day of age was -3.27 pounds. The overall pen-of three marbling score was 461.2 (low choice, small marbling).

The top-profit pen-of-three calves with superior genetics returned $790.79 per head, while the bottom pen-of-three calves returned $456.82 per head. The average per head profit of the five top-scoring pens of steers averaged $739.62 per head, while the average per head profit of the bottom five scoring pens of steers averaged $514.77 per head. For the pen-of-three competition, average profit was $632.83 per head. The spread in profitability between the top and bottom five herds was $224.84 per head.

Implications

Calf value is improved with superior carcass and feedlot performance. Exceptional average daily gains, weight per day of age, harvest weight and marbling score can be found in North Dakota beef herds.

Feedout projects provide a source of information for cattle producers to learn about feedlot performance and individual animal differences, and discover cattle value.

Steers consigned to the Dakota Feeder Calf Show Feedout study, February, 2017.

Table 1. Feeding performance - 2016-2017 Dakota Feeder Calf Show Feedout

Pen of three	Best Three Score Total	Average Birth Date	Average Weight per Day of Age, lbs	Average Harvest Weight, lbs.	Average Daily Gain, lbs.	Average Marbling Score[1]	Ave Calculated Yield Grade	Ave Feeding Profit or Loss / Head
1	1.834	30-Mar-16	3.605	1558.3	4.037	546.3	3.538	$ 747.56
2	1.794	9-Mar-16	3.156	1433.3	3.364	482.7	2.643	$ 745.63
3	1.782	24-Mar-16	3.277	1435.0	3.426	494.3	2.762	$ 732.49
4	1.758	21-Feb-16	3.160	1493.3	3.522	571.7	3.752	$ 790.79
5	1.752	8-Apr-16	3.529	1493.3	3.717	459.0	2.670	$ 681.63
Average Top 5 Herds	1.784	19-Mar-16	3.345	1482.667	3.613	510.800	3.073	$ 739.62
6	1.750	17-Apr-16	3.533	1460.0	3.724	434.3	2.471	$ 671.68
7	1.749	12-Apr-16	3.327	1391.7	3.490	520.3	2.909	$ 687.42
8	1.738	18-Apr-16	3.456	1423.3	3.686	544.7	3.504	$ 729.39
9	1.715	2-Mar-16	3.328	1536.7	3.645	425.3	3.026	$ 782.68
10	1.679	30-Mar-16	3.355	1451.7	3.391	503.0	3.256	$ 741.30
11	1.666	3-Apr-16	2.934	1255.0	3.201	542.7	2.763	$ 612.72
12	1.660	5-Mar-16	3.263	1496.7	3.342	479.3	2.948	$ 703.99
13	1.640	5-Apr-16	3.086	1313.3	3.438	422.3	2.466	$ 649.04
14	1.637	11-Apr-16	3.680	1543.3	3.636	585.7	4.102	$ 720.77
15	1.634	18-Apr-16	3.476	1431.7	3.793	459.7	3.048	$ 644.67
16	1.624	9-Apr-16	3.212	1355.0	3.397	501.7	2.775	$ 598.76
17	1.600	19-Mar-16	3.230	1433.3	3.170	441.0	2.816	$ 711.66
18	1.592	24-Mar-16	3.261	1430.0	3.170	509.3	3.122	$ 675.30
19	1.589	22-Mar-16	3.361	1481.7	3.431	485.3	3.290	$ 689.95
20	1.586	18-Mar-16	3.260	1453.3	3.399	543.7	3.192	$ 594.94
21	1.583	20-Apr-16	3.465	1420.0	3.858	449.0	3.306	$ 657.15
22	1.559	28-Mar-16	3.248	1411.7	3.237	516.7	3.336	$ 668.16
23	1.541	25-Mar-16	3.189	1391.7	3.000	490.3	2.871	$ 639.59
24	1.532	16-Apr-16	3.411	1415.0	3.727	443.0	3.087	$ 602.86
25	1.521	13-Apr-16	3.357	1401.7	3.340	469.0	3.014	$ 616.63
26	1.505	19-Apr-16	3.408	1401.7	3.558	444.0	3.337	$ 661.78
27	1.501	25-Feb-16	3.111	1455.0	3.219	542.3	3.751	$ 673.08
28	1.484	3-Apr-16	3.006	1286.7	3.358	385.0	2.323	$ 555.32
29	1.441	16-Mar-16	2.944	1315.0	2.978	394.0	2.121	$ 537.71
30	1.421	20-Apr-16	3.119	1278.3	3.204	441.0	2.868	$ 566.81
31	1.413	28-Apr-16	3.546	1423.3	3.514	370.7	2.641	$ 550.74
32	1.399	12-Apr-16	3.444	1443.3	3.588	410.0	3.302	$ 606.40
33	1.391	12-Mar-16	3.171	1431.7	3.287	419.3	2.540	$ 488.83
34	1.384	10-Mar-16	2.909	1316.7	2.791	407.7	2.116	$ 506.20
35	1.384	24-Apr-16	3.331	1351.7	3.336	359.3	2.383	$ 523.26
36	1.355	23-Mar-16	3.340	1468.3	3.068	401.3	3.288	$ 676.64
37	1.348	15-Apr-16	3.469	1438.3	3.285	458.3	3.769	$ 650.69
38	1.339	19-Mar-16	2.920	1295.0	3.045	421.3	2.793	$ 539.61
39	1.316	21-Mar-16	3.151	1391.7	3.101	427.7	3.362	$ 617.31
40	1.313	30-Mar-16	3.197	1381.7	3.181	369.7	2.505	$ 503.80
41	1.277	2-May-16	2.881	1146.7	2.704	407.3	2.229	$ 456.82
42	1.178	12-Apr-16	3.084	1293.3	2.983	395.3	3.077	$ 510.28
43	1.171	28-Apr-16	3.374	1355.0	3.343	409.0	3.406	$ 485.66
Average Bottom 5 Herds	1.251	12-Apr-16	3.137	1313.7	3.062	401.8	2.916	$ 514.77
Overall average pens of three	1.538	1-Apr-16	3.269	1404.3	3.365	460.1	2.988	632.74
Standard deviation		17.7	0.2	83.0	0.3	58.4	0.5	86.6
number		43	43	43	43	43	43	43

[1] Marbling score 300-399 = select, 400-499 = low choice, 500-599 = average choice, 600-699 = high choice, 700-799 = low prime

Are You Giving Credit Where Credit is Due? Thoughts on Nutrient Management Planning

Mary Berg

In between trying to get corn off the field and hoping the snow waits just a little longer, you are also supposed to be thinking about a field plan for next year. What will you plant, what herbicides will you need and what fertilizers will you use? Did you spread manure on your fields? If you did, does that manure have a fertilizer value and are you considering that when you make your fertility plans?

The total nitrogen (N) in solid beef manure is 50% available to plants during the first growing season. That means if the manure you used has 13 pounds of total N/ton of manure (ND beef manure average), 6.5 pounds of that is available for plant growth. Given you spread 25 tons of manure/acre you have 325 pounds of total N with 162.5 pounds of that available during the first growing season. What happens to the other 162.5 pounds? In year 2, 20 percent of the total N, or in this example, 65 pounds of N would be available during the second growing season. Are you taking that credit into consideration as you map out your nutrient management plan for the next growing season?

Let's say you plan to plant corn grain in eastern North Dakota in medium-textured soils with historic yields greater than 160 bu/ac. You have a previous crop (soybean) credit and you have 20 pounds N/ac in your soil. (You know all of this because you tested your soils and you used the ND Corn Nitrogen Calculator.) The N recommendation for your yield goals would be 162 pounds/ac.

According to this example, in year 1, you wouldn't need to add any other nitrogen fertilizer to reach your yield goals. Looking at phosphorus (P), if you have 6 pounds of P/ton of manure (ND beef manure average) and you're spreading at 20 ton/ac you have 120 pounds of total P. Eighty percent of the total P in solid beef manure is available for plant growth during the first growing season, so 96 pounds of P/ac would be available. If your soils are in the medium range (8-11 ppm) according to the Olsen test, you would need 52 pounds of P/ac. So your N and P requirements are already met.

Let's move on to year 2. You're going to plant soybean in the field described above following the corn crop. You have no previous crop credit. Your soil test says you have 15 pounds of N and you know from above that you have 65 pounds of N from manure. So you have 80 pounds of N fertilizer right away. According to the North Dakota Fertilizer Recommendation Tables and Equations, you will need zero pounds of N fertilizer for a 60 bu/ac yield potential. Ten percent of the total P in manure is available in year two for plant use. The P credit from the manure would be 12 pounds/ac. Because of the excess P that was applied during year 1, your soil test P will very likely be in the high to very high range, neither of which require additional P fertilizer.

Often times in the Midwest, producers aren't instructed to give manure fertilizer credit value but we have to remember that along with the added organic matter and beneficial organisms, we are also adding useful nutrients when manure is spread on a field. Let's give credit where credit is due.

Additional resources:

- Find a North Dakota custom manure hauler: https://www.ag.ndsu.edu/lem
- Regional Manure and Soil Health Blog: http://soilhealthnexus.org/blog/
- e-Xtension Animal Manure Management: http://articles.extension.org/pages/8647/manure-nutrient-management

Weather Summary

Monthly Temperatures (°F) and Normals

	Max Temp				Min Temp				Monthly Avg. Temp			
Month	2017	Norm*	2016	2015	2017	Norm*	2016	2015	2017	Norm*	2016	2015
Apr	54	55	51	58	31	31	31	29	43	37	41	43
May	69	68	70	64	41	43	43	40	55	54	56	52
June	77	76	76	76	52	53	53	54	65	63	65	65
July	83	82	81	80	58	58	57	58	71	65	69	69
Aug	77	81	80	80	52	55	54	53	64	65	67	66
Sept	70	71	70	75	46	45	47	48	58	58	58	62
Avgs:	72	72	71	72	47	47	48	47	59	57	59	60

*Normals = 1981-2010 averages

Monthly Precipitation (in) and Normals

	2017 Monthly Precipitation*				
Month	NDAWN	NOAA	Normal[1]	2016	2015
Apr	1.43	1.37	1.17	2.73	0.44
May	0.94	1.44	2.76	1.14	4.53
June	3.62	3.98	3.77	1.76	2.10
July	1.13	1.47	3.39	4.52	4.43
Aug	3.45	3.74	2.31	3.66	1.69
Sept	2.68	2.89	1.91	1.78	0.81
Totals:	13.26	14.89	15.31	15.60	13.99

[1] Normals = 1981-2010 averages * NDAWN and NOAA are two different weather stations at the CREC.

Monthly Growing Degree Days and Normals

	Wheat GDD				Sunflower GDD				Corn GDD		
Month	2017	Norm*	2016	2015	2017	Norm*	2016	2015	2017	Norm*	2016
Apr	341	357	318	382	---	---	---	---	---	---	---
May	718	717	761	596	395	386	438	333	290	282	314
June	976	925	982	908	619	609	625	607	447	448	458
July	1198	1082	966	1044	826	786	774	750	625	624	579
Aug	1004	1000	1269	940	632	721	717	672	456	561	534
Sept	785	717	789	797	442	417	456	537	314	320	319
Totals	5022	5155	5085	5106	2914	3006	3010	2994	2132	2235	2204

*Normals = 1981-2010 averages

Growing season GDD Totals, Normals, and Killing Frost Dates

Year	Frost Date	Corn Temp (°F)	Total GDD	Frost Date	Sunflower Temp (°F)	Total GDD
2015	*Sept 29	30	2194	**Oct 16	24	2994
2016	*Oct 19	29	2306	**Oct 24	22	2963
2017	*Sept 29	31	2121	**Oct 9	27	2740

*Normal Corn GDD for date = 2231 **Normal Sunflower GDD for date = 2960

Total corn GDD = May 1 to frost date Total sunflower GDD = May 20 to frost date

Normals=1981-2010 averages Source: NDAWN

Agronomic Research Trials

The following information is a listing of agronomic research conducted at the Carrington Research Extension Center. CREC and other NDSU research staff provide this list to illustrate specific research issues that are being addressed. The listing briefly describes the trial and indicates project collaborators who are working in cooperation with CREC agronomy team leaders. Results of this work may be made available at a later date by contacting the CREC.

Cover Crop Research

Barley: Cover crop timing of establishment
Misc: Interseeding demo
Soybean: Soybean planting date into winter rye; *North Dakota Soybean Council*
Soybean: Winter rye interseeding
Wheat: Cover crop establishment following residual wheat herbicides; *Howatt (Plant Sciences)/Dalley(Hettinger REC)/Jenks (North Central REC)*
Wheat: Interseeding wheat and clover species
Dry Bean: Dry bean with rye; *Northarvest Bean Growers Assoc.*

Crop Fertility Research

Carinata: Dryland carinata nitrogen and sulfur fertilizer response
Carinata: Irrigated carinata nitrogen and sulfur fertilizer response
Corn: Starter fertilizer
Corn: Phosphorus fertilization of corn by wet distillers grain and condensed distillers solubles (syrup); *North Dakota Corn Utilization Council*
Corn: Corn nitrogen x sulfur response – Carrington and Forman; *North Dakota Corn Utilization Council*
Corn: Sensor based nitrogen application for corn
Dry Bean: Pinto bean starter fertilizer; *Northarvest Bean Growers Assoc.*
Soybean: P rates by planting date – Wishek
Soybean: Seed inoculation techniques
Soybean: Response to selected plant nutrition inputs - Wishek; *Tri-county agents*
Wheat: Wheat sulfur x nitrogen
Wheat: Midseason sulfur wheat
Wheat: Wheat variety x sulfur
Wheat: Yara wheat S by N
Wheat: Wheat distillers grain P trial
Wheat: Wheat sensor based N application from Greenseeker
Wheat: Wheat P x variety (low P)
Wheat: Wheat P x variety (high P)
Wheat: Wheat sulfur x nitrogen; Ada; *Minnesota Wheat Research and Promotion Council*
Wheat: Wheat sulfur x nitrogen; Gentilly
Wheat: Wheat sulfur x nitrogen; Forman
Wheat: Wheat P variety - low yielding site
Wheat: Effects of N fertilizer rate and tillage system on HRSW yield and greenhouse gas exchange; *Bansal (U.S. Geological Survey)*

Crop Management and Production Research

Barley: Optimizing barley quality across a pH and organic matter gradient; *State Board of Agricultural Research and Education/North Dakota Barley Council*
Buckwheat: Evaluating buckwheat as a P amendment to the soil; *State Board of Agricultural Research and Education*
Carinata: Rotation effect
Corn: Rye management in corn - a large plot research project; *North Dakota Corn Utilization Council/Cooper (Oakes Irrigation Research Site)*
Corn: Corn plant population X hybrid maturity

Corn: Evaluating P influence of previous crop (buckwheat)
Corn: Impact of CO2 in the form of gas and carbonated water on corn yield and soil CO2 flux; *Knorr Farms/North American Coal/Great River Energy*
Dry Bean: Effect of insect pollinators on dry bean yield
Dry Bean: Black and navy planting rates and rows; *Northarvest Bean Growers Assoc.*
Dry Bean: Pinto bean with rye cover/companion; *Northarvest Bean Growers Assoc.*
Flax: Impact of harvest management on flax performance; *Ameriflax*
Oats: Organic Jerry seed source trial; *General Mills*
Oats: Organic seeding rate trial; *General Mills*
Oats: Organic planting date trial; *General Mills*
Oats: Organic harrowing trial; *General Mills*
Rye: Rye seeding rate/grain
Rye: Winter rye planting date; *North Dakota Soybean Council*
Soybean: Soybean performance based on rye planting method
Soybean: Row spacing by canopy type; *North Dakota Soybean Council*
Soybean: Weed management trait by herbicide demonstration
Soybean: Dryland soybean P rates by planting date
Soybean: Irrigated soybean P rates by planting date
Soybean: P rates by planting date – Oakes
Soybean: Dryland soybean planting date x maturity
Soybean: Irrigated soybean planting date x maturity
Sugarbeet: Stand count demonstration
Wheat: Influence of seed source on wheat variety performance, standard depth
Wheat: Influence of seed source on wheat variety performance, deep-seeded evaluation
Wheat: Organic wheat seeding rate; *Northern Plains Sustainable Agriculture Society Farmer Breeder Club*

Crop Rotation Research
Barley: Cropping systems experiment - rotation, tillage, and fertility
Corn: Cropping systems experiment - rotation, tillage, and fertility
Corn: NIFA crop rotation study; *National Institute of Food and Agriculture*
Field Pea: Cropping systems experiment - rotation, tillage, and fertility
Soybean: Cropping systems experiment - rotation, tillage, and fertility
Soybean: NIFA crop rotation study; *National Institute of Food and Agriculture*
Sugarbeet: NIFA crop rotation study; *National Institute of Food and Agriculture*
Sunflower: Cropping systems experiment - rotation, tillage, and fertility
Winter Wheat: Cropping systems experiment - rotation, tillage, and fertility
Wheat: Cropping systems experiment - rotation, tillage, and fertility
Wheat: NIFA crop rotation study; *National Institute of Food and Agriculture*

Entomology Research
Canola: Flea beetle management in canola 11807; *Monsanto*
Canola: Flea beetle management in canola 11808; *Monsanto*
Canola: Flea beetle management in canola 11810; *Monsanto*
Canola: Flea beetle management in canola 11811a; *Monsanto*
Lentil: Field pea aphid management in lentils; *Knodel (Plant Pathology)*

Forage Production Research
Forages: Cereal/pea forage trial; *Pulse USA*
Forages: Forage/cover crop pea variety trial; *Pulse USA*
Forages: Organic cereal oat forage trial; *McMullen (Plant Sciences)*
Forages: Cool-season cereal forage trial; *Pulse USA/McMullen (Plant Sciences)*
Forages: Warm season forage trial; *Husker Genetics*
Forages: Winter rye forage variety trial

Forages: Winter rye seeding rate/forage
Forages: Winter triticale variety trial; *Husker Genetics*
Forages: Winter triticale variety trial; *Northern Seed*

Greenhouse Research
Sorghum: Sorghum improvement, propagation and crossing
Wheat and corn: Crop response to CO2 enriched water; *Knorr Farms/North American Coal/Great River Energy*
Wheat: Wheat response to phosphorus from WDG and CDS in a controlled environment
Wheat: Wheat tillering and yield response to different rates of P in a controlled environment

Product Evaluation Research
Corn: In-furrow biostimulants for corn production; *Ag Concepts*
Corn: Safener evaluation for POST herbicide applications in corn; *Italpollina USA*
Corn: In-furrow safeners for phosphorous application in corn; *Italpollina USA*
Corn: In-furrow fungicide effect x corn planting date; *BASF*
Dry Bean: Fungicide and biostimulant seed treatment blends for dry beans; *Albaugh*
Dry Bean: Dry bean anthracnose evaluations (2); *Arysta*
Field Pea: Granular Soygreen applicatoin to field peas; *West Central*
Soybean: Green and Grow soybean seed treatment evaluation; *Green and Grow*
Soybean: Safener evaluation for POST herbicides in soybean; *Italpollina USA*
Soybean: Bacterial biostimulant seed treatments for soybeans; *Albaugh*
Soybean: Micronutrient seed treatments for soybeans; *West Central*
Soybean: Using EnVigor on soybeans at bloom; *Ag Concepts*
Sunflower: Efficacy of bird repellant on sunflowers; *Klug (USDA-APHIS-Wildlife Services National Wildlife Research Center)*
Sunflower: Evaluation of seed coating on stand establishment in sunflower; *Germains*
Sunflower: Evaluation of seed coating on stand establishment and yield in sunflower; *Germains*
Winter Wheat: Green and Grow winter wheat seed treatment; *Eriksmoen (North Central REC)/Green and Grow*
Wheat: Evaluation of seed treatments in wheat; *Elemental Enzymes*
Wheat: Wheat seed treatment evaluation; *Green and Grow*

Plant Pathology Research
Barley: Fungicide applications for disease control in barley
Barley: Uniform scab fungicide evaluation; *Friskop (Plant Pathology)*
Barley: Evaluation of fungicides for disease control in barley; *Gowan*
Canola: Evaluation of foliar fungicides for Sclerotinia; *DuPont*
Canola: Evaluation of foliar fungicides for Sclerotinia; *Gowan*
Canola: Evaluation of foliar fungicides for Sclerotinia; *Syngenta*
Chickpea: Seed treatment for Rhizoctonia; *Syngenta*
Chickpea: Evaluation of foliar fungicides for Ascochyta, (2); *Arysta*
Chickpea: Evaluation of foliar fungicides for Ascochyta; *BASF*
Chickpea: Evaluation of foliar fungicides for Ascochyta; *Syngenta*
Chickpea: Susceptibility of varieties to Ascochyta blight; *Pasche (Plant Pathology)*
Dry Bean: Sclerotinia infection timing in pinto bean; *North Dakota Dept. of Agriculture/USDA Specialty Crop Block Grant*
Dry Bean: Field evaluation of fungicide timing for management of Sclerotinia in navy bean; *North Dakota Dept. of Agriculture/USDA Specialty Crop Block Grant*
Dry Bean: Field evaluation of fungicide timing for management of Sclerotinia in black bean; *North Dakota Dept. of Agriculture/USDA Specialty Crop Block Grant*
Dry Bean: Evaluation of foliar fungicides for Sclerotinia (2); *Arysta*
Dry Bean: Evaluation of foliar fungicides for Sclerotinia; *BASF*

Dry Bean: Evaluation of experimental foliar fungicides for Sclerotinia on pinto beans; *Bayer CropScience*
Dry Bean: Fungicide application technology for Sclerotinia on pinto beans
Dry Bean: Fungicide application technology for Sclerotinia on kidney beans
Dry Bean: Evaluation of in-furrow fungicides for management of Fusarium root rot of dry edible bean; *North Dakota Crop Protection Product Harmonization Board/Pasche (Plant Pathology)*
Dry Bean: Evaluation of in-furrow fungicides for management of Rhizoctonia root rot of dry edible beans; *North Dakota Crop Protection Product Harmonization Board/Pasche (Plant Pathology)*
Dry Bean: Evaluation of registered foliar fungicides for Sclerotinia on pinto beans; *Bayer CropScience*
Dry Bean: Evaluation of foliar fungicides for Anthracnose (2); *Arysta*
Dry Bean: White mold resistance screening nursery; *USDA National Sclerotinia Initiative*
Dry Bean: Evaluation of experimental foliar fungicides for Sclerotinia in kidney beans; *Bayer CropScience*
Dry Bean: Impact of irrigation management and fungicide timing for Sclerotinia – Oakes and Williston; *North Dakota Dept. of Agriculture/USDA Specialty Crop Block Grant*
Durum: Durum leaf and head disease fungicide evaluation; *Bayer CropScience*
Durum: Fusarium head blight fungicide x variety assessment; *USDA Wheat and Barley Scab Initiative*
Faba Bean: Fungicide efficacy; *North Dakota Dept. of Agriculture/USDA Specialty Crop Block Grant/Jenks (North Central REC)*
Faba Bean: Fungicide timing; *North Dakota Dept. of Agriculture/USDA Specialty Crop Block Grant/Jenks (North Central REC)*
Faba Bean: Seed treatment evaluation; *State Board of Agricultural Research and Education*
Faba Bean: Impact of seed-borne Botrytis and fungicide seed treatment on faba bean agronomic performance – Langdon; *State Board of Agricultural Research and Education*
Field Pea: Management of bacterial blight in field peas; *Northern Pulse Growers Assoc.*
Field Pea: Field evaluation of seed treatments for management of Aphanomyces in field peas; *Valent USA*
Field Pea: Field evaluation of crop residue levels for management of Aphanomyces in field peas; *North Dakota Crop Protection Product Harmonization Board*
Field Pea: Field evaluation of the impact of herbicides on Aphanomyces root rot in field peas
Field Pea: Impact of timing of saturated soils and seed treatment on Aphanomyces in field peas; *North Dakota Crop Protection Product Harmonization Board*
Field Pea: Field evaluation of the impact of herbicides on Fusarium root rot in field peas
Field Pea: Field evaluation of the impact of planting date for management of Fusarium root rot in field peas; *North Dakota Crop Protection Product Harmonization Board*
Field Pea: Field evaluation of crop residue levels for management of Fusarium root rot in field peas; *North Dakota Crop Protection Product Harmonization Board*
Field Pea: Field evaluation of in-furrow fungicides for management of Fusarium root rot in field peas; *North Dakota Crop Protection Product Harmonization Board/Pasche (Plant Pathology)*
Field Pea: Field evaluation of seed treatments for management of Fusarium root rot in field peas; *Valent USA*
Field Pea: Field evaluation of seed treatments for management of Fusarium root rot in field peas; *Bayer CropScience*
Field Pea: Field evaluation of seed treatments for management of Aphanomyces in field peas; *Syngenta*
Field Pea: Field evaluation of seed treatments for management of Fusarium in field peas; *BASF*
Field Pea: Field evaluation of fungicide seed treatments for management of Rhizoctonia root rot of field peas; *Valent USA*
Field Pea: Field evaluation of fungicide seed treatments for management of Rhizoctonia root rot of field peas; *Syngenta*
Field Pea: Susceptibility of field pea varieties to Aphanomyces root rot; *Legume Logic*
Field Pea: Evaluation of foliar fungicides for powdery mildew (2); *Arysta*
Field Pea: Evaluation of foliar fungicides for Ascochyta; *BASF*
Field Pea: Susceptibility of field pea varieties to Fusarium root rot; *Legume Logic*

Field Pea: Management of bacterial blight in field peas – Oakes; *North Dakota Crop Protection Product Harmonization Board*
Field Pea: Management of Fusarium root rot of field peas with in-furrow fungicides – Oakes; *Northern Pulse Growers Assoc./Pasche (Plant Pathology)*
Field Pea: Management of root diseases of peas with crop rotation; *Northern Pulse Growers Assoc.*
Flax: Evaluation of pasmo fungicide efficacy; *BASF*
Lentil: Fungicide efficacy for Sclerotinia; *Northern Pulse Growers Assoc.*
Lentil: Impact of nozzle spray pattern, droplet size, and application pressure for Sclerotinia fungicide; *Northern Pulse Growers Assoc.*
Lentil: Impact of water volume for Sclerotinia fungicide; *Northern Pulse Growers Assoc.*
Lentil: Evaluation of seed treatments for management of Fusarium root rot; *BASF*
Lentil: Evaluation of seed treatments for management of Fusarium root rot; *Valent USA*
Lentil: Evaluation of seed treatments for management of Rhizoctonia root rot; *BASF*
Lentil: Evaluation of seed treatments for management of Rhizoctonia root rot; *Syngenta*
Lentil: Evaluation of seed treatments for management of Rhizoctonia root rot; *Valent USA*
Lentil: Susceptibility of 'ND Eagle' lentil to Anthracnose; *Pasche (Plant Pathology)*
Lentil: Susceptibility of 'ND Eagle' lentil to white mold; *Pasche (Plant Pathology)*
Oats: Organic rust sentinel evaluation; *General Mills*
Safflower: Field evaluation of foliar fungicides for management of alternaria blight; *BASF*
Soybean: Impact of row spacing and seeding rate on Sclerotinia – Langdon and Williston; *North Dakota Soybean Council*
Soybean: Impact of spreader-sticker and drift-control adjuvants for Sclerotinia fungicide; *North Dakota Soybean Council*
Soybean: Impact of water volume on fungicide for Sclerotinia; *North Dakota Soybean Council*
Soybean: Impact of nozzle type and nozzle placement of fungicide for Sclerotinia; *North Dakota Soybean Council*
Soybean: Impact of nozzle spray pattern, droplet size, and application pressure of fungicide for Sclerotinia; *North Dakota Soybean Council*
Soybean: Impact of row spacing and seeding rate on Sclerotinia; *North Dakota Soybean Council*
Soybean: Infection timing on Sclerotinia; *North Dakota Soybean Council*
Soybean: Fungicide application timing for Sclerotinia
Soybean: Impact of boom height of fungicide for Sclerotinia; *North Dakota Soybean Council*
Soybean: Field evaluation of fungicide seed treatments for management of Phytophthora root rot of soybeans (2); *DuPont*
Soybean: Impact of rye cover crop on soybean Sclerotinia
Soybean: Evaluation of foliar fungicides on Sclerotinia; *DuPont*
Soybean: Evaluation of foliar fungicides on Sclerotinia; *AMVAC*
Soybean: Evaluation of foliar fungicides on Sclerotinia; *BASF*
Soybean: Evaluation of foliar fungicides on Sclerotinia; *Plant Health Care*
Soybean: Seed treatment evaluation; *BASF*
Soybean: Impact of nozzle type and nozzle placement of fungicide for Sclerotinia – Oakes; *North Dakota Soybean Council*
Soybean: Impact of spreader-sticker and drift-control adjuvants for Sclerotinia fungicide – Oakes; *North Dakota Soybean Council*
Soybean: Impact of water volume on fungicide for Sclerotinia – Oakes; *North Dakota Soybean Council*
Soybean: Impact of row spacing and seeding rate on Sclerotinia – Oakes; *North Dakota Soybean Council*
Sunflower: Fungicide application technology – fungicide efficacy and impact of adjuvants
Sunflower: Fungicide application technology – nozzle type and nozzle placement
Sunflower: USDA stalk rot germplasm evaluation; *Misar (USDA)*
Sunflower: Phomopsis fungicide evaluation (2); *Markell (Plant Pathology)*
Sunflower: Rust fungicide evaluation (3); *Markell (Plant Pathology)*
Sunflower: Phomopsis and rust fungicide evaluation; *Markell (Plant Pathology)*
Sunflower: Field evaluation of fungicide seed treatments for management of downy mildew; *DuPont*

Sunflower: Optimizing fungicide application methods for head rot; *North Dakota Dept. of Agriculture/USDA Specialty Crop Block Grant*
Sunflower: Impact of adjuvants on fungicide performance for head rot; *North Dakota Dept. of Agriculture/USDA Specialty Crop Block Grant*
Sunflower: Fungicide efficacy, residual, application timing for head rot; *North Dakota Dept. of Agriculture/USDA Specialty Crop Block Grant*
Sunflower: Head rot resistance screening nursery; *Underwood (USDA)*
Sunflower: Head rot resistance screening nursery; *Industry*
Sunflower: Field evaluation of seed treatments for management of downy mildew; *NuSeed*
Sunflower: Impact of bee vectoring of biological control agents on head rot; *BVT Corp.*
Sunflower: Rust fungicide efficacy evaluation; *BASF*
Sunflower: Fungicide efficacy evaluation for head rot; *Syngenta*
Sunflower: Fungicide efficacy and impact of adjuvants on fungicide performance for head rot – Oakes; *North Dakota Dept. of Agriculture/USDA Specialty Crop Block Grant*
Sunflower: Optimizing fungicide application methods for head rot– Oakes; *North Dakota Dept. of Agriculture/USDA Specialty Crop Block Grant*
Sunflower: Seed treatment of Clearfield sunflower for downy mildew; *DuPont*
Wheat: Stripe rust nusery; *Green (Plant Sciences)*
Wheat: Leaf rust nursery; *Green (Plant Sciences)*
Wheat: Uniform scab fungicide evaluation; *Friskop (Plant Pathology)*
Wheat: Evaluation of fungicide combinations applied at different growth stages in spring wheat; *Arysta*
Wheat: Evaluation of herbicide and fungicide tank mix on crop response in spring wheat; *BASF*
Wheat: Management of FHB and leaf diseases in wheat; *Bayer CropScience*
Wheat: Evaluation of fungicide seed treatments for management of common root rot and Fusarium root rot; *Bayer CropScience*
Wheat: Evaluation of fungicide seed treatments for management of common root rot; *BASF*

Specialty Seed Increase
Buckwheat: Plant introduction accession bulk population; *Murphy (Washington State Univ.)*
Greenhouse: Lupin seed increase
Oats: Organic seed increases; *General Mills*
Rye: Winter rye early experimental increases
Rye: Winter rye early anthesis selections
Sorghum: Organic sorghum white open pollinated selections; *North Central Regional SARE/Northern Plains Sustainable Agriculture Society Farm Breeder Club/Johnson (Plant Sciences)*

Germplasm Evaluation/Cultivar Development
Alfalfa: Dryland conventional variety trial; *Industry/Eriksmoen (North Central REC)*
Alfalfa: Dryland Roundup Ready variety trial; *Industry/Eriksmoen (North Central REC)*
Barley: Drill strip demonstration plots
Barley: Dryland variety trial
Barley: Irrigated variety trial
Barley: Recrop/direct seed variety trial
Barley: Barnes County (Dazey) variety trial
Barley: Tri-County (Wishek) variety trial
Barley: Barley breeder nurseries (3); *Horsley (Plant Sciences)*
Barley: Organic variety trial
Buckwheat: Organic pollination by variety rial; *General Mills*
Canola: Roundup Ready performance test; *Industry*
Canola: Clearfield and Sulfonylurea performance tests; *Industry*
Canola: Canola breeder's project nurseries (convential material); *Rahman (Plant Sciences)*
Canola: Mycogen cultivar evaluation - mega plots; *Dow AgroSciences*
Canola: Hybrid yield evaluation I; *Cibus*
Canola: Hybrid yield evaluation II; *Cibus*

Canola: Hybrid yield evaluation III; *Cibus*
Canola: Hybrid yield evaluation IV; *Cibus*
Canola: Hybrid yield evaluation V; *Cibus*
Canola: Hybrid yield evaluation VI; *Cibus*
Canola: Hybrid yield evaluation VII; *Cibus*
Canola: Hybrid yield evaluation VIII; *Cibus*
Carinata: Carinata advanced yield trial; *Agrisoma*
Carinata: PYTA cultivar evaluation; *Agrisoma*
Carinata: PYTC cultivar evaluation; *Agrisoma*
Carinata: Carinata hybrid evaluation; *Agrisoma*
Chickpea: Breeders nursery 1781; advanced chickpea yield trial; *Stefaniak (North Central REC)*
Corn: Dryland hybrid performance test - conventional lines; *Industry*
Corn: Dryland hybrid performance test; *Industry*
Corn: Irrigated hybrid performance test; *Industry*
Corn: Fingal ybrid performance test; *Industry*
Corn: Oakes dryland hybrid performance test; *Industry*
Corn: Oakes irrigated hybrid performance test; *Industry*
Dry Bean: Dryland variety trial; *Industry*
Dry Bean: Irrigated variety trial; *Industry*
Dry Bean: Breeder's nursery block (10 nurseries); *Osorno (Plant Sciences)*
Durum: Drill strip demonstration plots
Durum: Dryland variety trial
Durum: Recrop/direct seed variety trial
Durum: Uniform Regional Durum Nursery – dryland; *Elias (Plant Sciences)*
Durum: Uniform Regional Durum Nursery – irrigated; *Elias (Plant Sciences)*
Durum: Organic variety trial
Einkorn: CERES accession evaluation for desirable traits including salt tolerance, protein, starch, minerals, and carotenoids; *Jaradat (USDA)/Santra (Univ. of Nebraska)/CERES/Northern Plains Sustainable Agriculture Society Farm Breeder Club/*
Faba Bean: Dryland variety trial; *Industry*
Faba Bean: Irrigated variety trial; *Industry*
Faba Bean: Organic variety trial; *Industry*
Field Pea: Variety trial - primary evaluation 1771; *Stefaniak (North Central REC)*
Field Pea: Breeder nursery 1701; advanced pea yield trial; *Stefaniak (North Central REC)*
Field Pea: Breeding program nursery - primary; *Legume Logic*
Field Pea: Organic variety trial/nursery; *Pulse USA/Stefaniak (North Central REC)*
Flax: Breeder nursery; *Rahman (Plant Sciences)*
Flax: Variety trial; *Ameriflax/Eriksmoen (North Central REC)*
Flax: Organic flax variety trial; *Ameriflax/Eriksmoen (North Central REC)*
Lentil: Breeders nursery 1752; advanced green lentil yield trial; *Stefaniak (North Central REC)*
Lupin: White lupin drill strips
Lupin: Blue-yellow lupin germplasm evaluation
Oats: Drill strip demonstration plots
Oats: Dryland variety trial
Oats: Recrop/direct seed variety trial
Oats: Midseason Oat Nursery; *McMullen (Plant Sciences)*
Oats: Organic variety trial
Oats: Organic hexaploid yield trial; *General Mills*
Oats: Organic breeders nursery; *Mitchell Fetch (Agriculture and Agri-Food Canada)*
Rye: Winter rye variety trial
Rye: Organic winter rye variety trial (2)
Rye: Tri-County (Wishek) rye grain variety trial
Safflower: Variety trial; *E. Link (Williston REC)*
Soybean: Dryland conventional variety performance test; *Industry*

Soybean: Dryland Roundup Ready variety performance test; *Industry*
Soybean: Dryland Liberty Link variety performance test; *Industry*
Soybean: Irrigatedconventional variety performance test; *Industry*
Soybean: Irrigated Roundup Ready variety performance test; *Industry*
Soybean: Barnes County (Dazey) Roundup Ready variety performance test; *Industry*
Soybean: Barnes County (Dazey) Liberty Link variety performance test; *Industry*
Soybean: Tri-County (Wishek) Roundup Ready variety performance test; *Industry*
Soybean: LaMoure Roundup Ready variety performance test; *Helms (Plant Sciences)/Industry*
Soybean: Oakes conventional variety performance test; *Industry*
Soybean: Oakes irrigated Roundup Ready variety performance test; *Industry*
Soybean: Oakes Liberty Link variety performance test; *Industry*
Soybean: Breeders Nursery Expt. 17C19 Advanced Conventional; *Helms (Plant Sciences)*
Soybean: Breeders Nursery Expt. 17C17 Tofu Conventional; *Helms (Plant Sciences)*
Soybean: Breeders Nursery Expt. 17C18 Natto Conventional; *Helms (Plant Sciences)*
Soybean: Breeders Nursery Expt. 17C20 Advanced Glyphosate - Dryland; *Helms (Plant Sciences)*
Soybean: Breeders Nursery Expt. 17I20 Advanced Glyphosate - Irrigated; *Helms (Plant Sciences)*
Soybean: Breeders Nursery Expt. 17D17 Glyphosate Tolerant - Dazey; *Helms (Plant Sciences)*
Soybean: Breeders Nursery Expt. 17C14 Glyphosate Tolerant; *Helms (Plant Sciences)*
Soybean: Breeders Nursery Expt. 17C15 Glyphosate Tolerant; *Helms (Plant Sciences)*
Soybean: Breeders Nursery Expt. 17C16 Glyphosate Tolerant; *Helms (Plant Sciences)*
Soybean: Soybean agronomic performance trial - Carrington; *Bayer US Agronomics*
Soybean: Soybean agronomic performance trial - Dazey; *Bayer US Agronomics*
Soybean: Soybean agronomic performance trial - Wishek; *Bayer US Agronomics*
Soybean: Soybean agronomic performance trial - Fingal; *Bayer US Agronomics*
Soybean: Soybean agronomic performance trial - Oakes; *Bayer US Agronomics*
Soybean: Organic soybean variety trial
Soybean: Barnes County (Dazey) conventional variety performance test; *Industry*
Soybean: Tri-County (Wishek) conventional variety performance test; *Industry*
Soybean: Tri-County (Wishek) Liberty Link variety performance test; *Industry*
Soybean: LaMoure conventional variety performance test; *Helms (Plant Sciences)/Industry*
Sunflower: Oil sunflower hybrid performance test; *Industry*
Sunflower: Non-oil sunflower hybrid performance test; *Industry*
Sunflower: Sunflower hybrid nursery - confection type; *SunOpta*
Sunflower: Sunflower hybrid nursery - oil type; *SunOpta*
Winter Triticale: Triticale grain variety trial
Winter Triticale: Tri-County (Wishek) triticale grain variety trial
Winter Wheat: Winter wheat variety trial
Winter Wheat: Tri-County (Wishek) winter wheat variety trial
Winter Wheat: Winter wheat elite breeder's nursery; *Marais (Plant Sciences)*
Winter Wheat: Irrigated winter wheat elite breeder's nursery; *Marais (Plant Sciences)*
Wheat: Drill strip demonstration plots
Wheat: Dryland variety trial
Wheat: Irrigated variety trial
Wheat: Recrop/direct seed variety trial
Wheat: Barnes County (Dazey) variety trial
Wheat: Tri-County (Wishek) variety trial
Wheat: Uniform Regional Spring Wheat Nursery; *Garvin (Univ. of Minnesota)*
Wheat: Spring wheat breeder elite nurseries; *Green (Plant Sciences)*
Wheat: Organic variety trial

Weed Science Research
Barley: Grass weed management in barley; *North Dakota Barley Council*
Carinata: Carinata desiccation options; *Agrisoma*
Carinata: Herbicide tolerance screening; *Agrisoma*

Corn: Herbicide options for lentil interseeding in corn
Corn: Corn herbicide PRE evaluations; *Syngenta*
Corn: Corn herbicide evaluations; *Bayer CropScience*
Corn: Armezon Pro systems for corn; *BASF*
Corn: Two-pass Armezon Pro herbicide; *BASF*
Dry Bean: Pinto bean response to herbicide drift; *North Dakota Dept. of Agriculture/USDA Specialty Crop Block Grant*
Faba Bean: Herbicide tolerance evaluation; *Jenks (North Central REC)/ North Dakota Dept. of Agriculture/USDA Specialty Crop Block Grant*
Faba Bean: Desiccation options; *Jenks (North Central REC)/ North Dakota Dept. of Agriculture/USDA Specialty Crop Block Grant*
Field Pea: Simulated drift injury effects on field peas; *North Dakota Dept. of Agriculture/USDA Specialty Crop Block Grant*
Flax: Flax weed management; *Ameriflax*
Greenhouse: Herbicide screening of clover species
Lentil: Simulated drift injury effects on lentils; *North Dakota Dept. of Agriculture/USDA Specialty Crop Block Grant*
Misc: Acuron carryover effect on sunflower and dry bean; *Syngenta*
Misc: Preplant burndown evaluation with Vida in the spring; *Gowan*
Misc: Herbicide site-of-action demonstration
Soybean: Soybean herbicide incorporation strategies; *North Dakota Soybean Council*
Soybean: Drift injury simulation on edamame; *North Dakota Dept. of Agriculture/USDA Specialty Crop Block Grant*
Soybean: Comparison between Engenia and Extendimax systems; *BASF*
Soybean: BASF systems for glyphosate-resistant kochia management; *BASF*
Soybean: Dicamba-tolerant soybean evaluations for weed control; *BASF*
Soybean: Weed management with Zidua systems in soybeans; *BASF*
Soybean: Adjuvant performance with a high rate of Liberty; *Winfield Solutions*
Soybean: Adjuvant performance with a low rate of Liberty; *Winfield Solutions*
Sugarbeet: Sugarbeet trait demonstration; *Betaseed*
Wheat: Wheat herbicide programs; *Bayer CropScience*
Wheat: Weed control with Varro; *Bayer CropScience*
Wheat: Evaluating Opensky in spring wheat; *Dow AgroSciences*
Wheat: Green foxtail management with Syngenta systems; *Syngenta*
Wheat: Yellow and green foxtail management in wheat; *Arysta*
Wheat: Grass control in wheat; *Arysta*
Wheat: Kochia management with various adjuvant combinations; *Winfield Solutions*
Wheat: Evaluating glyphosate drift injury to spring wheat; *Howatt (Plant Sciences)/ North Dakota Dept. of Agriculture/USDA Specialty Crop Block Grant*

Variety	Days to Head	Plant Lodge	Plant Height	---- Grain Protein ---- 2017	3-yr. Avg.	1000 KWT	Test Weight	---------- Grain Yield ---------- 2017	2-yr. Avg.	3-yr. Avg.
		0-9	inch	---------- % ----------		gram	lb/bu	---------- bu/ac ----------		
SY Soren	65.0	0.0	31.2	15.7	15.5	27.1	59.3	60.0	47.6	48.5
SY Ingmar	66.3	0.3	32.1	15.5	15.4	27.2	59.6	57.0	47.5	50.9
Elgin-ND	66.0	2.0	34.5	14.8	15.1	26.7	57.9	57.7	46.8	51.1
Barlow	62.0	2.3	31.9	14.7	15.4	27.5	59.7	57.1	45.9	49.5
Glenn	60.5	1.5	32.5	14.4	15.2	27.7	61.2	56.5	43.9	48.6
Faller	67.5	3.0	31.6	13.6	14.3	29.7	58.0	58.6	44.3	48.3
Prosper	67.8	2.5	33.1	13.6	14.5	29.7	58.4	63.1	46.0	49.3
Linkert	63.0	0.3	28.7	16.0	16.3	30.7	58.9	57.0	45.0	49.5
WB-Mayville	63.0	0.8	29.8	14.9	15.7	30.1	58.9	54.9	44.8	47.7
Rollag	61.8	2.0	32.4	15.8	16.0	28.7	59.1	58.6	47.5	50.6
Bolles	66.5	1.0	29.8	16.1	16.9	32.7	58.7	60.0	44.2	46.2
Boost	67.3	2.0	32.4	15.1	15.4	30.4	58.7	58.4	48.8	49.6
Ambush	61.3	2.0	30.8	14.6	--	30.1	60.0	59.7	--	--
Caliber	66.8	0.0	28.6	15.6	--	30.7	59.1	54.7	--	--
HRS 3100	66.0	0.5	28.9	14.7	--	28.6	57.4	59.3	--	--
HRS 3419	68.8	2.0	32.9	14.4	14.1	23.3	55.6	58.7	47.0	48.6
HRS 3504	65.8	1.3	28.4	15.0	--	27.3	56.2	61.2	49.9	--
HRS 3530	67.3	2.3	31.8	14.7	15.2	27.9	57.4	57.9	40.8	48.2
HRS 3616	65.0	1.3	32.6	15.6	--	30.3	57.7	61.1	49.2	--
Lang-MN	66.5	0.0	30.5	15.6	15.6	26.3	59.2	58.8	45.8	50.6
LCS Anchor	65.3	0.5	28.5	15.7	--	28.5	59.2	51.5	44.7	--
LCS Breakaway	62.8	0.0	28.8	16.7	16.4	31.6	59.7	50.4	43.1	47.2
LCS Nitro	67.3	0.8	30.5	13.4	14.3	26.9	56.7	57.2	45.5	47.2
LCS Prime	62.3	1.0	33.0	13.3	--	30.3	60.0	60.8	46.1	--
LCS Rebel	61.8	2.5	32.5	14.9	--	29.6	59.7	57.1	--	--
LCS Trigger	70.8	1.5	31.6	13.3	--	25.7	57.7	63.6	--	--
MS Camaro	65.0	0.0	29.5	15.6	--	29.8	59.5	53.0	--	--
MS Chevelle	62.0	2.3	29.4	14.5	14.5	27.6	58.6	60.5	49.4	50.6
Mott	68.3	1.0	36.5	15.5	15.3	25.6	57.8	58.6	46.1	50.8
ND VitPro	63.0	1.3	31.4	15.3	15.7	28.8	60.0	56.4	44.4	48.9
Prevail	62.3	1.3	28.9	14.0	14.7	28.7	58.9	62.4	47.3	52.5
Shelly	67.5	1.0	30.0	14.5	14.9	28.7	58.4	66.3	48.3	51.5
Surpass	58.8	1.0	30.7	15.1	14.9	26.7	58.0	60.6	48.1	51.4
SY Rowyn	63.8	1.5	29.3	14.1	14.7	26.4	58.2	55.7	42.9	50.6
SY Valda	64.8	1.8	29.6	14.7	14.9	29.0	58.6	66.9	50.3	52.4
TCG-Climax	70.5	0.0	32.3	16.3	--	27.0	61.0	63.0	--	--
TCG-Cornerstone	66.5	0.5	32.2	14.9	--	30.4	58.4	55.2	43.7	--
TCG-Spitfire	67.8	0.5	32.6	14.3	--	29.4	58.4	66.3	51.9	--
WB9479	62.0	0.3	27.5	15.8	--	29.6	58.5	57.5	--	--
MEAN	64.6	1.3	31.4	14.9	---	28.6	58.7	58.5	---	---
C.V. (%)	1.7	38.4	7.2	4.8	---	5.3	1.2	7.2	---	---
LSD 0.10	1.3	0.6	2.6	0.8	---	1.7	0.8	4.9	---	---
LSD 0.05	1.5	0.7	3.1	1.0	---	2.1	1.0	5.8	---	---

Planting Date = April 17 ; Harvest Date = August 18 ; Previous Crop = Field Pea

Variety	Days to Head	Plant Lodge	Plant Height	Grain Protein	3-yr. Avg.	1000 KWT	Test Weight	Grain Yield 2017	Grain Yield 2-yr. Avg.	Grain Yield 3-yr. Avg.
		0-9	inch	%		gram	lb/bu	bu/ac	bu/ac	bu/ac
WB9590	62.3	1.0	28.8	15.0	--	29.0	57.7	63.4	--	--
WB9653	64.3	1.3	29.4	14.3	14.9	27.1	56.3	64.9	50.8	56.6
WB9719	64.0	1.3	28.1	14.5	--	28.3	60.7	58.6	--	--
AKF-Astro	65.3	1.8	31.8	13.8	--	30.1	55.5	55.6	--	--
Prestige	61.5	2.3	34.4	14.7	15.0	27.7	58.1	59.7	48.4	50.8
Redstone	70.3	2.0	32.8	14.0	14.1	24.0	57.4	63.5	48.8	50.8
Prosper/ND VitPro[1]	65.0	2.0	32.0	14.8	--	29.4	58.6	59.9	--	--
Shelly/Bolles[1]	67.8	1.3	34.1	15.2	--	28.8	58.5	64.7	--	--
WB-Mayville[2] {1.8}	62.5	0.3	29.5	15.4	--	33.1	59.5	58.8	45.5	--
Faller[2] {1.8}	66.8	2.5	31.3	13.7	--	29.7	58.0	57.9	--	--
MEAN	64.6	1.3	31.4	14.9	---	28.6	58.7	58.5	---	---
C.V. (%)	1.7	38.4	7.2	4.8	---	5.3	1.2	7.2	---	---
LSD 0.10	1.3	0.6	2.6	0.8	---	1.7	0.8	4.9	---	---
LSD 0.05	1.5	0.7	3.1	1.0	---	2.1	1.0	5.8	---	---

Planting Date = April 17 ; Harvest Date = August 18 ; Previous Crop = Field Pea

** Spring wheat seeding rate used in this trial was 1,400,000 pure live seeds acre^{-1}.

[1] Treatments represent an equal mixture of PLS seed (700K:700K) from each variety.

[2] Treatments # 57 and #58 were planted at a seeding rate of 1,800,000 pure live seeds acre^{-1}.

Foundation-grade ND VitPro hard red spring wheat.

Hard Red Spring Wheat - Direct Seeded Dryland Recrop Elite* **Carrington**

Variety	Days to Head	Plant Lodge	Plant Height	-- Grain Protein -- 2017	3-yr. Avg.	1000 KWT	Test Weight	--------- Grain Yield --------- 2017	2-yr. Avg.	3-yr. Avg.
		0 to 9	inch	--------- % ---------		gram	lb/bu	---------- bu/ac ----------		
SY Soren	58.8	0.0	28.9	14.1	13.9	28.9	59.7	61.1	53.0	47.9
SY Ingmar	62.0	0.0	30.5	13.9	--	29.3	60.3	59.0	--	--
Elgin-ND	59.8	0.0	33.2	13.4	13.2	30.5	59.3	53.6	47.8	46.1
Barlow	58.8	0.3	31.9	13.6	13.5	31.0	60.2	53.7	46.3	42.3
Glenn	57.3	0.3	32.3	14.1	13.7	31.5	62.4	49.6	40.2	36.6
Faller	60.3	0.0	30.3	13.0	12.9	33.1	58.1	51.5	48.2	44.4
Prosper	60.0	0.5	31.6	12.4	12.6	34.4	58.9	55.0	49.5	46.7
Linkert	60.3	0.0	28.3	14.7	14.2	34.2	59.1	53.5	47.9	46.8
WB-Mayville	58.0	0.0	30.1	13.7	13.6	33.0	58.7	51.8	47.1	41.4
Rollag	59.3	0.0	29.0	14.5	14.0	32.1	59.6	45.3	42.1	39.8
Bolles	61.3	0.0	30.3	14.7	14.4	33.0	58.6	53.3	42.8	41.0
Boost	63.3	0.0	31.7	13.9	--	33.2	59.2	52.0	46.5	--
HRS 3419	61.3	0.0	31.8	12.0	--	27.4	57.8	64.5	55.3	--
HRS 3530	60.8	0.0	34.4	12.7	--	32.4	59.3	58.7	51.8	--
HRS 3616	59.0	0.0	31.0	14.0	--	35.1	59.3	60.0	--	--
Lang-MN	59.5	0.0	33.4	13.5	--	30.5	60.8	60.7	47.7	--
LCS Anchor	58.3	0.0	28.1	14.0	--	30.8	59.8	54.1	--	--
LCS Breakaway	58.5	0.5	27.4	13.8	--	32.5	60.6	49.7	46.4	--
LCS Rebel	60.0	0.8	33.9	12.9	--	34.3	61.2	59.5	--	--
LCS Trigger	65.3	0.0	32.9	11.7	--	29.6	59.4	63.3	--	--
ND VitPro	59.0	0.3	31.0	14.0	--	32.4	61.5	55.5	45.3	--
Prevail	58.5	0.3	32.3	13.5	13.2	32.0	59.3	52.7	46.8	43.3
Shelly	62.0	0.0	26.8	12.9	--	31.7	59.1	51.8	45.6	--
Surpass	56.5	0.8	31.5	13.1	--	28.9	58.4	52.0	46.7	--
SY Valda	59.3	0.0	28.8	12.7	12.6	31.9	59.7	55.1	51.4	44.9
TCG-Climax	65.3	0.0	30.9	14.9	--	28.8	62.0	57.3	--	--
WB9479	58.3	0.0	28.0	13.5	--	33.1	59.4	57.5	--	--
WB9590	58.3	0.0	26.9	13.4	--	33.9	58.8	56.1	--	--
WB9719	59.3	0.0	28.4	12.6	--	31.6	62.0	66.8	--	--
Prosper/ND VitPro[1]	60.3	0.0	30.9	13.0	--	33.5	59.7	53.5	--	--
MEAN	59.8	0.1	30.7	13.5	---	31.8	59.8	55.2	---	---
C.V. (%)	1.9	278.0	6.6	3.4	---	2.9	0.6	9.1	---	---
LSD 0.10	1.3	0.4	2.4	0.5	---	1.1	0.4	5.9	---	---
LSD 0.05	1.6	0.5	2.9	0.6	---	1.3	0.5	7.1	---	---

Planting Date = May 1 ; Harvest Date = August 30 ; Previous Crop = Spring Wheat

* This trial was directly planted into an undisturbed wheat stubble.

[1] This treatment represents an equal mixture of PLS seed (700K:700K) from each variety at planting.

Variety	Days to Head	Plant Height	Plant Lodge	--- Grain Protein --- 2017	3-yr. Avg.[1]	1000 KWT	Test Weight	---------- Grain Yield ---------- 2017	2-yr. Avg.[1]	3-yr. Avg.[1]
		inch	0 to 9	---------- % ----------		gram	lb/bu	---------- bu/ac ----------		
SY Soren	56.5	34.4	7.0	15.7	14.7	26.9	59.4	64.3	55.7	58.9
SY Ingmar	57.0	36.4	6.3	15.2	14.4	27.5	59.6	68.1	61.3	59.3
Elgin-ND	57.0	41.5	4.5	15.3	14.6	30.9	59.8	70.4	65.0	65.7
Barlow	55.5	39.0	5.0	16.0	15.1	30.9	60.6	68.1	59.5	60.8
Glenn	55.5	39.9	3.0	16.0	14.8	31.6	62.9	75.6	63.7	65.2
Faller	58.8	39.8	5.0	14.3	13.7	34.0	60.1	83.5	66.4	72.7
Prosper	58.8	39.3	5.3	14.7	13.5	33.8	59.3	82.1	64.4	67.7
Linkert	57.0	35.0	2.8	15.4	15.1	32.8	59.9	76.8	70.4	67.7
WB-Mayville	56.0	34.3	5.0	15.4	14.9	33.5	59.7	72.2	58.9	62.0
Rollag	56.5	37.3	4.8	15.6	14.8	30.0	60.1	68.9	64.1	62.6
Bolles	59.0	37.4	4.3	16.3	--	31.3	58.9	70.6	64.1	--
Boost	59.0	39.1	6.0	15.4	--	31.0	59.4	72.1	--	--
Ambush	56.0	37.1	5.5	15.4	--	32.1	61.3	70.8	--	--
Caliber	58.5	34.7	1.0	15.6	--	32.1	60.5	73.5	--	--
HRS 3100	58.3	36.2	4.0	14.5	--	29.8	58.9	78.5	--	--
HRS 3419	63.0	38.1	3.0	13.1	12.7	28.1	58.8	83.0	75.6	76.0
HRS 3504	57.8	35.0	5.8	14.0	--	28.6	57.9	80.0	--	--
HRS 3530	59.0	41.3	4.5	15.2	--	32.9	60.3	90.9	75.3	--
HRS 3616	57.3	37.2	6.5	16.0	--	30.4	58.4	70.7	--	--
Lang-MN	59.8	41.1	4.8	16.0	--	32.8	61.8	83.2	--	--
LCS Anchor	56.5	34.4	7.3	15.6	--	28.6	60.0	71.0	--	--
LCS Breakaway	56.0	36.0	6.0	15.1	14.3	29.9	61.5	77.7	65.5	64.5
LCS Nitro	60.3	37.9	6.8	13.6	12.8	29.3	58.0	76.6	65.6	69.0
LCS Prime	55.3	38.7	5.8	13.9	--	32.4	60.8	81.6	--	--
LCS Rebel	56.0	40.0	6.3	15.9	--	32.8	61.0	75.7	--	--
LCS Trigger	63.5	38.3	6.3	13.2	--	28.3	59.0	77.4	--	--
MS Camaro	56.5	34.4	6.3	15.6	--	29.3	59.8	72.6	--	--
MS Chevelle	55.3	35.2	6.3	14.7	--	26.3	57.9	71.3	--	--
ND VitPro	56.5	38.6	4.0	15.8	14.8	32.6	61.8	74.3	66.9	65.5
Prevail	55.3	39.6	4.3	14.0	13.5	32.1	59.4	84.6	74.8	72.8
Shelly	59.0	36.1	5.3	14.8	--	29.9	59.4	78.9	--	--
Surpass	53.0	36.5	6.0	15.1	--	26.7	58.2	72.9	--	--
SY Rowyn	57.5	36.1	7.5	14.4	13.9	26.6	59.0	71.3	65.6	67.1
SY Valda	57.0	35.2	4.8	14.3	--	31.5	60.4	87.5	71.3	--
TCG-Climax	62.8	37.7	1.0	16.3	--	28.8	62.6	79.3	--	--
TCG-Cornerstone	58.8	36.0	3.5	14.8	--	32.0	60.1	67.9	--	--
TCG-Spitfire	59.5	36.8	6.5	14.5	--	30.4	59.0	68.4	--	--
WB9479	56.5	36.2	4.3	15.9	--	32.8	60.6	80.2	--	--
MEAN	57.3	37.5	4.9	15.2	--	30.7	59.9	74.8	--	--
C.V. (%)	1.2	3.4	23.5	1.9	--	5.5	1.4	8.3	--	--
LSD 0.10	0.8	1.5	1.3	0.3	--	2.0	1.0	7.2	--	--
LSD 0.05	0.9	1.8	1.6	0.4	--	2.3	1.1	8.6	--	--

Planting Date = May 1 ; Harvest Date = August 23 ; Previous Crop = Soybean

Variety	Days to Head	Plant Height	Plant Lodge	--- Grain Protein --- 2017	3-yr. Avg.[1]	1000 KWT	Test Weight	---------- Grain Yield ---------- 2017	2-yr. Avg.[1]	3-yr. Avg.[1]
		inch	0 to 9	---------- % ----------		gram	lb/bu	---------- bu/ac ----------		
WB9590	56.0	33.0	4.0	15.7	--	33.5	59.4	81.6	--	--
WB9653	57.5	34.4	5.3	14.1	--	28.0	57.6	76.3	--	--
WB9719	58.3	35.6	5.5	15.0	--	30.8	62.2	67.5	--	--
AKF-Astro	60.0	38.6	3.0	13.0	--	32.9	56.8	76.3	--	--
Prosper/ND VitPro[2]	57.8	39.5	5.3	15.2	--	31.3	60.1	70.8	--	--
Shelly/Bolles[2]	60.0	38.8	5.5	16.1	--	29.8	58.4	74.0	--	--
WB-Mayville {1.8}	56.0	33.0	5.8	15.2	--	33.5	59.8	73.3	--	--
MEAN	57.3	37.5	4.9	15.2	--	30.7	59.9	74.8	--	--
C.V. (%)	1.2	3.4	23.5	1.9	--	5.5	1.4	8.3	--	--
LSD 0.10	0.8	1.5	1.3	0.3	--	2.0	1.0	7.2	--	--
LSD 0.05	0.9	1.8	1.6	0.4	--	2.3	1.1	8.6	--	--

Planting Date = May 1 ; Harvest Date = August 23 ; Previous Crop = Soybean

[1] Two-year average is for 2015 and 2017 and three-year average is for 2014, 2015, and 2017 as the trial was lost to hail in 2016.
[2] These treatments represent an equal mixture of PLS seed (700K:700K) from each variety at planting.

Uniform regional durum nursery, July, 2017.

Variety	Days to Head	Plant Height	Plant Lodge	-- Grain Protein -- 2017	3-yr. Avg.	1000 KWT	Test Weight	-------- Grain Yield -------- 2017	2-yr. Avg.	3-yr. Avg.
		inch	0 to 9	--------- % ---------		gram	lb/bu	---------- bu/ac ----------		
SY Soren	57.8	71.8	0.0	14.8	14.6	29.9	60.6	87.6	77.2	76.0
SY Ingmar	57.8	71.3	0.0	15.2	--	30.7	60.6	80.9	--	--
Elgin-ND	58.5	89.3	0.8	14.9	14.8	33.4	59.9	90.5	82.1	78.1
Barlow	56.3	82.0	1.0	15.1	14.9	33.6	61.1	84.4	82.0	78.4
Glenn	55.8	85.3	1.5	15.5	15.1	34.0	62.7	83.6	76.3	75.9
Faller	59.1	83.8	1.3	13.5	13.6	37.4	60.7	91.2	88.2	83.1
Prosper	58.3	85.0	1.5	13.6	13.7	38.9	60.7	95.4	88.7	83.0
Linkert	58.0	71.8	0.0	15.3	14.8	35.6	60.6	81.3	79.3	72.8
WB-Mayville	55.5	69.3	0.0	15.3	14.6	36.4	60.6	88.7	84.1	77.4
Rollag	57.5	77.3	0.3	15.3	15.0	34.9	61.4	81.7	79.4	77.6
Bolles	60.1	83.8	0.5	16.9	16.3	35.0	59.7	83.5	74.0	72.2
Boost	58.8	84.0	0.5	14.6	--	34.4	60.2	86.2	80.2	--
HRS 3100	58.0	77.3	0.0	14.1	--	31.8	59.4	91.9	--	--
HRS 3419	59.3	76.8	0.3	13.1	13.0	30.7	59.7	100.8	93.8	90.3
HRS 3504	58.0	74.3	0.0	13.8	13.5	29.2	58.2	88.6	83.8	76.1
HRS 3530	58.0	84.5	1.0	14.7	14.5	36.0	60.4	94.1	91.6	86.3
HRS 3616	56.5	79.3	0.3	15.8	--	35.7	59.9	92.1	76.8	--
Lang-MN	58.3	86.8	0.3	15.5	--	31.9	61.6	86.4	82.7	--
LCS Breakaway	54.5	74.3	0.3	14.9	--	32.1	61.8	84.4	81.9	--
LCS Rebel	56.3	83.5	1.5	14.7	--	34.9	61.7	88.4	--	--
LCS Trigger	60.3	82.8	0.5	12.1	--	34.2	61.3	94.0	--	--
ND VitPro	56.8	76.8	1.8	15.6	--	34.3	62.0	83.4	77.4	--
Prevail	58.1	84.3	0.3	14.5	13.9	33.5	60.1	86.5	82.3	82.3
Shelly	58.4	77.5	0.3	13.6	--	35.4	61.4	96.7	90.4	--
Surpass	56.8	80.0	1.0	14.7	--	30.8	59.4	83.6	82.9	--
SY Valda	56.8	77.0	1.0	13.7	13.7	32.3	60.4	92.2	87.6	80.6
WB9479	56.3	69.8	0.0	15.7	--	35.6	60.8	90.1	--	--
WB9590	56.3	69.3	0.0	15.3	--	36.3	60.6	91.0	--	--
WB9719	58.5	76.3	0.5	14.6	--	35.1	62.7	96.5	--	--
Prosper/ND VitPro[A]	57.8	85.3	1.3	14.6	--	36.5	61.5	89.3	--	--
Shelly/Bolles[A]	59.8	83.3	0.0	15.5	--	34.9	60.5	86.1	--	--
WB-Mayville {1.8}	55.0	72.3	0.0	15.4	--	35.9	60.8	89.5	84.7	--
MEAN	57.5	79.2	0.5	14.8	--	34.1	60.8	88.4	--	--
C.V. (%)	1.7	4.9	102.7	1.3	--	3.0	0.5	4.4	--	--
LSD 0.10	1.1	4.6	0.6	0.2	--	1.2	0.3	4.6	--	--
LSD 0.05	1.4	5.5	0.8	0.3	--	1.4	0.4	5.5	--	--

Planting Date = May 11 ; Harvest Date = August 28 ; Previous Crop = Soybean

** Wheat seeding rate used in this trial was 1,400,000 pure live seeds acre^{-1}, except treatment 34.

[A] These treatments represent an equal mixture of PLS seed (700K:700K) from each variety at planting.

Variety	Days to Head	Plant Height	---- Grain Protein ---- 2017	3-yr. Avg.	1000 KWT	Test Weight	---------- Grain Yield ---------- 2017	2-yr. Avg.	3-yr. Avg.
		inch	---------- % ----------		gram	lb/bu	---------- bu/ac ----------		
SY Soren	53.3	27.4	16.2	15.0	25.2	59.2	42.9	58.7	50.1
SY Ingmar	54.5	28.9	15.9	14.4	23.8	58.8	42.0	59.9	55.6
Elgin-ND	55.3	31.8	15.6	14.5	23.8	57.5	32.8	54.8	53.1
Barlow	51.8	29.1	15.5	14.7	27.2	59.9	36.5	55.4	53.2
Glenn	52.3	29.7	15.8	15.0	25.5	61.1	29.2	47.2	49.1
Faller	55.5	28.0	14.9	13.9	25.6	57.3	30.0	59.2	54.9
Prosper	56.0	30.4	15.0	14.1	26.9	57.2	35.0	60.2	54.0
Linkert	53.0	29.3	16.0	15.1	27.9	57.9	36.6	59.7	60.1
WB-Mayville	52.5	27.2	16.8	15.1	28.2	58.4	37.9	54.4	53.4
Rollag	53.5	30.1	16.2	15.4	25.3	58.8	36.7	56.3	58.4
Bolles	56.8	31.1	17.7	16.8	26.1	57.4	37.1	45.8	49.8
Boost	56.5	29.7	15.9	--	26.9	57.3	35.3	52.9	--
HRS 3100	54.5	30.2	16.0	--	26.5	57.1	40.7	--	--
HRS 3419	57.5	28.3	15.2	14.2	23.4	56.7	37.2	50.3	56.9
HRS 3504	55.3	26.7	15.7	14.0	24.7	57.3	38.3	57.0	53.7
HRS 3530	56.3	31.5	15.5	14.8	28.1	58.6	37.5	57.5	53.7
HRS 3616	53.5	31.0	16.4	--	26.1	57.0	35.7	51.7	--
Lang-MN	54.8	31.9	15.7	--	24.2	58.7	39.3	57.6	--
LCS Breakaway	52.0	26.2	16.2	--	27.3	59.3	30.6	49.2	--
LCS Rebel	53.0	29.3	16.1	--	28.2	59.8	39.2	--	--
LCS Trigger	58.3	28.9	14.1	--	26.4	58.7	41.2	--	--
Mott	54.0	31.3	16.2	14.9	23.3	57.8	37.4	57.4	55.8
ND VitPro	53.0	29.9	16.0	--	26.3	59.9	35.1	56.3	--
Prevail	52.3	29.4	14.5	14.0	25.3	57.4	37.7	50.9	55.9
Shelly	55.0	27.1	14.6	--	26.6	59.2	42.3	57.3	--
Surpass	51.3	27.1	14.6	--	23.4	58.3	34.1	49.0	--
SY Valda	53.3	27.1	15.2	14.1	27.4	60.2	45.6	63.1	58.4
WB9479	52.0	25.8	16.5	--	26.6	58.2	35.8	--	--
WB9590	53.0	25.4	16.3	--	29.5	58.0	36.5	--	--
WB9719	54.0	28.6	15.7	--	28.3	61.9	46.8	--	--
Prosper/ND VitPro [-A]	53.3	29.5	15.8	--	26.8	58.1	36.5	--	--
Shelly/Bolles [-A]	56.5	28.9	16.1	--	26.5	58.5	32.5	--	--
WB-Mayville {1.8M}	52.5	26.9	17.0	--	27.2	58.2	36.6	--	--
MEAN	53.9	29.1	15.8	--	26.2	58.6	37.3	--	--
C.V. (%)	2.2	6.4	3.3	--	5.7	1.3	12.0	--	--
LSD 0.10	1.4	2.2	0.6	--	1.8	0.9	5.3	--	--
LSD 0.05	1.7	2.6	0.7	--	2.1	1.1	6.3	--	--

Planting Date = May 5 ; Harvest Date = August 11 ; Previous Crop = Soybean

** Spring wheat seeding rate used in this trial was 1,400,000 pure live seeds acre^{-1}, except trmt.#36.

** Plant lodging scores were determined, however there was zero lodging to record.

A: These treatments represent an equal mixture of PLS seed (700K:700K) from each variety at planting.

Hard Red Spring Wheat - Organic **Carrington**

Variety	Days to Head	Plant Height	1000 KWT	----- Grain Protein ----- 2017	3-yr. Avg.	Test Weight	------- Grain Yield ------- 2017	3-yr. Avg.
		inch	gram	---------- % ----------		lb/bu	---------- bu/ac ----------	
Glenn	53.3	27.8	29.7	10.5	11.2	62.6	27.5	30.0
Faller	59.0	27.6	36.3	10.2	10.6	60.2	35.8	36.4
Barlow	56.0	27.2	31.5	11.3	11.4	60.7	25.7	33.3
Prosper	57.8	28.3	37.4	10.5	--	60.2	34.2	--
Elgin-ND	58.5	27.2	31.8	10.7	11.0	60.7	26.6	35.0
Rollag	56.8	26.1	32.2	11.4	--	60.3	23.9	--
Linkert	56.3	23.7	34.5	11.4	--	60.3	26.1	--
Bolles	59.3	27.3	33.6	11.6	11.8	60.0	26.4	32.2
Shelly	58.8	24.8	33.9	10.3	--	60.9	30.8	--
Boost	60.8	27.2	36.4	11.6	--	60.4	25.4	--
Surpass	54.5	27.8	28.4	9.4	--	59.0	28.3	--
WB-Mayville	55.8	23.0	35.2	11.1	--	60.3	25.7	--
SY Soren	56.3	24.5	34.8	12.1	--	59.8	25.3	--
SY Ingmar	58.0	26.0	30.7	10.9	--	61.5	25.7	--
Dapps	55.5	29.6	31.0	11.0	11.9	59.9	25.6	30.4
Mida	58.5	32.4	39.8	11.2	--	59.3	22.7	--
Ceres	57.8	33.4	30.2	10.9	--	59.1	22.5	--
FBC Dylan	55.3	28.1	33.4	9.9	10.9	59.7	27.5	31.2
Howard	55.0	26.5	31.8	10.3	11.2	59.9	27.9	35.4
Red Fife	61.5	35.9	36.2	9.6	--	58.4	28.8	--
Mean	57.2	27.7	33.4	10.8	--	60.2	27.1	--
C.V. (%)	1.4	5.5	3.0	5.5	--	0.9	11.0	--
LSD 0.10	0.9	1.8	1.2	0.7	--	0.6	3.5	--
LSD 0.05	1.1	2.2	1.4	0.8		0.8	4.2	

Planting Date = May 2; Harvest Date = August 8; Previous Crop = Grain Sorghum

Hard Red Winter Wheat - Direct Seeded **Carrington (Page 1 of 2)**

Variety	Disease[3] Lower Canopy	Disease[3] Flag Leaf	Heading Date	Plant Height	Lodge	Grain Protein 2017	Grain Protein 3-yr. Avg.[5]	KWT	Test Weight	Grain Yield No Fungicide	Grain Yield 2017 Fungicide	Grain Yield 2-yr. Avg.[4]	Grain Yield 3-yr. Avg.[5]
	%	%		in.		%	%	g/1000	lb/bu	bu/ac	bu/ac	bu/ac	bu/ac
Jerry	74.2	20.3	6/9	24.7	1.2	14.83	13.6	34.44	60.1	43.5	45.8	55.2	61.9
Decade	68.3	23.0	6/9	22.7	1.2	15.74	14.5	29.96	60.2	26.6	31.5	47.8	56.4
Lyman	76.7	41.7	6/8	23.9	2.0	17.69	15.1	31.69	57.6	9.9	34.9	45.7	52.9
Ideal	65.0	18.3	6/10	22.5	0.7	14.67	13.0	29.57	59.7	38.2	31.0	47.5	58.0
Overland	58.3	19.0	6/8	25.7	1.3	15.91	14.0	29.99	59.1	31.4	39.6	47.8	56.5
SY Wolf	74.2	6.3	6/9	24.4	1.0	14.84	13.5	32.82	61.2	44.2	50.1	53.5	59.8
WB Matlock	73.3	43.7	6/8	24.3	1.7	14.38	13.2	31.06	59.9	60.3	50.7	56.6	61.9
Peregrine	75.0	7.0	6/9	27.1	1.3	13.44	12.2	31.71	62.4	47.9	42.9	54.6	62.2
Accipiter	70.0	20.3	6/8	23.6	1.8	13.00	12.2	29.70	62.4	48.2	54.6	56.7	62.8
Moats	45.8	7.7	6/9	26.3	1.8	13.34	12.7	30.95	62.3	45.5	49.2	55.8	59.4
Flourish	58.3	20.3	6/8	25.1	1.0	14.84	13.5	33.71	61.2	33.1	42.3	49.9	54.9
AC Broadview	65.0	25.7	6/9	23.0	1.3	13.85	12.5	31.81	60.6	41.6	38.4	53.0	61.0
AC Emerson	66.7	19.7	6/8	26.2	0.5	15.49	14.0	26.53	61.1	34.4	38.0	49.4	57.4
AC Gateway	50.0	11.0	6/8	23.8	0.3	14.38	13.6	32.03	61.8	45.9	40.9	48.4	53.9
CDC Chase	60.0	15.0	6/8	27.6	0.8	13.35	--	31.19	62.7	42.7	53.7	55.6	--
Redfield	50.8	24.3	6/8	24.1	1.7	14.00	--	33.83	61.6	42.5	55.1	57.2	--
Ruth	40.8	31.0	6/8	23.6	1.3	15.85	--	29.45	58.9	35.1	35.1	--	--
Mean	58.7	21.8	6/9	24.5	1.2	14.74	--	31.52	60.6	40.0	42.5	--	--
C.V. (%)	33.9	49.6	0.7	11.9	48.1	7.1	--	5.6	2.1	18.7	18.7	--	--
LSD (0.05)[1]							--			2.4		--	--
LSD (0.05)[2]	22.8	17.6	1.0	3.3	0.7	1.19	--	2.04	1.4	8.9	8.9	--	--
LSD (0.10)[2]	19.1	14.7	1.0	2.8	0.6	1.00		1.68	1.2	7.3	7.3		

Planting Date = September 17, 2016; Harvest Date = July 25; Previous Crop = Flax; Fungicide = Proline applied at heading

Hard Red Winter Wheat - Direct Seeded **Carrington (Page 2 of 2)**

Variety	Disease[3] Lower Canopy	Disease[3] Flag Leaf	Heading Date	Plant Height	Lodge	Grain Protein 2017	Grain Protein 3-yr. Avg.[5]	KWT	Test Weight	Grain Yield No Fungicide	Grain Yield 2017 Fungicide	Grain Yield 2-yr. Avg.[4]	Grain Yield 3-yr. Avg.[5]
	%	%		in.		%	%	g/1000	lb/bu	bu/ac	bu/ac	bu/ac	bu/ac
WB4614	52.5	15.7	6/9	23.8	0.3	15.51	--	31.03	61.3	33.8	38.7	53.5	--
SY Monument	66.7	19.0	6/8	24.8	0.8	13.83	--	32.88	59.7	43.9	30.8	--	--
SY Sunrise	41.7	28.3	6/11	22.0	0.5	16.16	--	30.53	58.9	37.7	37.7	--	--
Northern	27.5	24.3	6/11	23.0	1.7	14.27	--	35.37	61.5	44.1	47.3	--	--
Loma	40.0	60.0	6/11	22.4	2.0	15.19	--	29.56	58.9	35.0	36.9	--	--
Oahe	55.0	12.3	6/8	25.7	0.8	15.01	--	31.21	60.0	39.8	35.3	--	--
Keldin	52.5	9.0	6/9	27.0	1.2	12.75	--	41.13	62.3	55.8	60.4	--	--
Mean	58.7	21.8	6/9	24.5	1.2	14.74	--	31.52	60.6	40.0	42.5	--	--
C.V. (%)	33.9	49.6	0.7	11.9	48.1	7.1	--	5.6	2.1	18.7	18.7	--	--
LSD (0.05)[1]							--			2.4		--	--
LSD (0.05)[2]	22.8	17.6	1.0	3.3	0.7	1.19	--	2.04	1.4	8.9	8.9	--	--
LSD (0.10)[2]	19.1	14.7	1.0	2.8	0.6	1.00		1.68	1.2	7.3	7.3		

Planting Date = September 17, 2016; Harvest Date = July 25; Previous Crop = Flax; Fungicide = Proline applied at heading

[1]This represents the LSD value between columns

[2]This represents the LSD value within columns

[3]Leaf Disease Assessment:

** Values expressed as percent of leaf area affected by leaf spot diseases, primarily tan spot and with some septoria.

** Lower Canopy: Assessment of leaf spot diseases present on lower canopy leaves (2 and 3 leaves below flag), rated at initial heading.

** Flag Leaf: Assessment of leaf spot diseases present on flag leaves, rated at early to medium dough stage.

[4] Two-year average is for 2015 and 2017 as 2016 trial experienced significant hail; average is for fungicide application.

[5] Three-year average is for 2014, 2015 and 2017 as 2016 trial experienced significant hail; average is for fungicide application.

Variety	Heading Date	Plant Height	Lodge	--- Grain Protein --- 2017	3-yr. Avg.	Test Weight	KWT	--------- Grain Yield --------- 2017	2-yr. Avg.	3-yr. Avg.
		in.	0-9	--------- %	---------	lb/bu	g/1000	bu/ac		
Jerry	6/4	24.4	0.0	13.02	13.1	57.8	29.83	20.1	21.8	36.1
Decade	6/2	23.6	0.0	13.17	13.6	59.1	28.03	26.3	25.4	38.3
Lyman	6/2	24.6	0.8	12.98	13.4	58.6	32.49	26.2	28.0	37.5
Ideal	6/3	24.3	0.3	12.22	12.4	58.6	26.22	27.2	28.2	40.1
Overland	6/3	24.8	0.3	11.96	12.7	59.4	29.92	31.2	29.3	38.1
SY Wolf	6/2	25.7	0.0	11.23	12.3	60.4	32.26	39.7	38.4	44.5
WB Matlock	6/4	23.3	0.0	12.70	12.9	59.0	29.20	26.1	28.8	40.0
Peregrine	6/5	24.8	0.0	11.31	12.0	60.1	27.41	30.1	28.4	41.0
Accipiter	6/5	22.1	0.0	11.77	12.5	59.2	25.14	24.8	24.9	36.2
Moats	6/4	23.4	0.0	12.84	12.8	58.5	25.12	28.3	26.6	38.6
Flourish	6/4	24.1	0.0	12.58	13.1	59.1	31.44	26.6	26.7	36.9
AC Broadview	6/4	21.9	0.0	12.49	12.5	57.9	26.25	24.7	27.3	40.8
AC Emerson	6/5	23.0	0.0	13.37	13.7	58.8	23.82	24.7	26.2	37.7
AC Gateway	6/3	22.8	0.3	13.80	13.8	59.5	27.59	26.5	29.7	38.4
CDC Chase	6/3	27.9	0.3	12.42	12.7	60.0	27.05	31.9	29.2	38.7
Redfield	6/3	23.9	0.0	13.16	13.2	58.9	30.10	34.4	30.7	40.2
Ruth	6/2	24.8	0.0	13.20	--	60.1	29.90	36.6	--	--
WB4614	6/3	24.4	0.0	13.47	13.1	58.9	26.34	38.6	34.6	45.8
SY Monument	6/2	28.1	0.0	11.41	--	59.7	31.75	46.2	39.5	--
SY Sunrise	6/2	23.1	0.0	12.50	--	59.8	32.49	34.2	33.9	--
Northern	6/6	23.4	0.0	14.50	13.6	58.9	30.78	31.8	35.7	43.5
Loma	6/5	21.2	0.0	15.64	--	56.5	25.86	26.8	30.9	--
Oahe	6/2	27.3	0.3	12.95	--	60.0	33.56	42.7	--	--
Keldin	6/5	26.8	0.0	13.43	--	59.3	33.68	44.6	--	--
Mean	6/3	24.4	0.1	12.91	--	59.1	29.08	31.1	--	--
C.V. (%)	0.6	9.0	279	6.8	--	1.0	6.1	19.7	--	--
LSD (0.05)	1	3.1	0.4	1.24	--	0.9	2.48	8.6	--	--
LSD (0.10)	1	2.6	0.3	1.04	--	0.7	2.08	7.2	--	--

Planting Date = September 21, 2016; Harvest Date = July 26; Previous Crop = Spring Wheat

Variety	Days to Head	Plant Lodge	Plant Height	--- Grain Protein --- 2017	3-yr. Avg.[2]	1000 KWT	Test Weight	---------- Grain Yield ---------- 2017	2-yr. Avg.[1]	3-yr. Avg.[2]
		0-9	inch	---------- % ----------		gram	lb/bu	---------- bu/ac ----------		
Rugby	61.8	0.8	36.9	16.4	14.2	37.5	59.0	48.3	44.6	52.1
Divide	61.8	0.3	36.6	15.7	13.8	37.1	59.7	56.9	52.8	56.8
Carpio	62.0	0.8	35.0	16.1	13.7	38.5	59.3	48.6	50.5	56.3
Alkabo	62.0	0.0	30.6	15.5	13.5	38.5	59.7	47.4	44.5	53.9
Joppa	62.0	0.5	34.4	15.1	13.3	38.7	59.6	56.8	51.5	58.0
Tioga	61.3	1.0	38.7	16.2	14.2	38.4	58.9	60.4	53.0	59.2
Lebsock	61.5	0.3	34.6	16.0	13.8	37.1	59.9	59.8	53.5	59.6
Mountrail	62.0	0.0	34.1	15.9	13.3	36.0	59.3	51.5	51.0	57.7
Grenora	62.3	0.0	33.6	15.8	13.9	41.4	58.8	57.2	54.1	60.0
VT Peak	61.0	0.0	33.6	15.9	14.0	40.2	60.7	57.4	53.1	57.2
Pierce	61.3	0.3	34.5	15.1	13.3	36.2	60.3	55.1	51.0	55.6
Maier	61.0	0.0	37.0	14.8	13.1	38.3	60.1	61.4	50.5	57.3
Ben	60.3	0.8	35.4	16.2	14.2	39.2	59.4	52.8	49.5	54.0
Alzada	60.8	0.0	28.5	15.9	14.5	36.8	59.4	46.9	44.4	51.5
Strongfield	61.8	0.5	34.8	16.9	14.8	39.2	59.3	50.5	48.5	50.8
AC Commander	61.3	1.3	31.8	16.0	14.1	37.1	58.8	52.3	48.3	53.3
AC Navigator	61.0	0.3	34.5	15.9	14.2	36.2	59.6	45.4	44.5	50.7
CDC Verona	62.0	0.0	34.4	15.6	14.1	38.6	59.9	52.9	51.9	56.4
ND Grano	61.3	0.3	35.3	15.7	13.9	38.1	60.4	62.5	56.7	62.3
ND Riveland	61.0	0.0	35.1	16.7	14.4	41.8	59.2	51.9	49.7	55.7
MEAN	61.7	0.3	35.9	15.8	--	39.0	59.9	56.2	--	--
C.V. (%)	1.4	145	7.9	4.1	--	4.3	0.8	13.3	--	--
LSD 0.10	1.0	0.5	3.3	0.8	--	2.0	0.6	8.7	--	--
LSD 0.05	1.2	0.6	3.9	0.9	--	2.3	0.7	10.4	--	--

Planting Date = April 28 ; Harvest Date = August 24 ; Previous Crop = Flax

[1] Two-year average is for 2015 and 2017 as 2016 data is not available.

[2] Three-year average is for 2014, 2015 and 2017 as 2016 trial is not available.

Durum - Dryland Recrop Elite* **Carrington**

Variety	Days to Head	Plant Lodge	Plant Height	---- Grain Protein ---- 2017	3-yr. Avg.	1000 KWT	Test Weight	---------- Grain Yield ---------- 2017	2-yr. Avg.	3-yr. Avg.
		0-9	inch	---------- % ----------		gram	lb/bu	---------- bu/ac ----------		
Divide	64.3	0.0	36.5	14.0	13.8	40.8	61.0	45.6	41.0	35.3
Carpio	64.8	0.8	33.9	13.5	13.9	41.1	61.6	50.2	45.8	37.5
Alkabo	64.3	0.0	31.4	13.3	13.7	41.8	61.4	44.7	42.6	35.3
Joppa	64.8	0.8	35.1	13.2	13.4	40.5	61.8	52.4	48.0	39.6
Tioga	62.5	0.8	37.3	13.7	13.5	41.2	61.4	54.6	46.5	37.0
Lebsock	63.0	0.0	30.3	13.9	13.7	37.6	61.0	47.3	41.0	35.2
Mountrail	64.3	0.3	35.2	13.5	13.3	39.1	61.0	52.1	46.6	36.3
Grenora	62.5	0.0	28.9	13.9	13.5	38.6	60.1	47.4	44.4	37.5
Pierce	64.0	0.3	33.5	13.3	13.5	36.4	62.1	51.7	46.1	41.7
Ben	64.5	0.3	32.4	14.2	14.2	43.0	61.5	42.5	41.1	36.6
CDC Verona	64.3	0.0	34.3	14.4	14.6	41.5	61.4	48.7	43.1	34.8
ND Grano	65.3	0.0	35.5	13.7	--	38.2	61.9	52.6	47.1	--
ND Riveland	64.3	0.3	35.7	13.6	--	43.0	61.4	49.2	45.2	--
MEAN	64.1	0.2	33.8	13.7	--	40.2	61.4	49.3	--	--
C.V. (%)	1.2	136.4	6.8	1.8	--	3.0	0.7	8.3	--	--
LSD 0.10	0.9	0.4	2.7	0.3	--	1.4	0.5	4.8	--	--
LSD 0.05	1.1	0.5	3.3	0.4	--	1.7	0.6	5.8	--	--

Planting Date = May 1 ; Harvest Date = August 30 ; Previous Crop = Durum

** This trial was directly planted into an undisturbed durum stubble.

Organic oat seed rate evaluation.

Durum - Organic **Carrington**

Variety	Days to Heading	Plant Lodge	Plant Height	1000 KWT	--- Grain Protein --- 2017	3-yr. Avg.	Test Weight	------- Grain Yield ------- 2017	3-yr. Avg.
		0-9	inch	gram	---------- % ----------		lb/bu	---------- bu/ac ----------	
Maier	57.3	0.5	30.3	41.8	10.3	--	59.4	22.6	--
Mountrail	58.5	0.3	28.4	39.2	10.2	9.5	59.7	20.6	28.3
Alkabo	57.5	0.5	28.9	41.5	10.4	--	59.4	21.9	--
Divide	60.3	0.0	30.2	40.9	10.2	9.7	58.8	22.6	27.8
Grenora	56.5	0.3	29.0	42.6	10.7	--	59.2	23.9	--
Tioga	59.3	0.3	31.8	42.3	10.0	9.7	59.0	21.9	26.9
Carpio	60.3	0.8	31.2	41.7	10.2	10.0	59.7	21.1	26.7
Joppa	58.0	0.3	30.5	40.2	9.7	--	59.7	24.3	--
VT Peak	58.3	0.3	29.4	41.1	11.0	--	60.4	27.7	--
Mean	58.4	0.3	30.0	41.3	10.3	--	59.5	22.9	--
C.V. (%)	1.2	153	5.5	4.0	3.6	--	0.7	21.9	--
LSD 0.10	0.8	0.6	2.0	2.0	0.4	--	0.5	6.1	--
LSD 0.05	1.0	0.7	2.4	2.4	0.5	--	0.6	NS	--

Planting Date = May 3; Harvest Date = August 11; Previous Crop = Flax

Organic barley variety trial.

Variety	Days to Head	Plant Lodge	Plant Height	Plump >6/64	Thin <5/64	-- Grain Protein -- 2017	3-yr. Avg.	Test Weight	------- Grain Yield ------- 2017	2-yr. Avg.	3-yr. Avg.
		0 to 9	inch	%	%	--------- % ---------		lb/bu	---------- bu/ac ----------		
Six Row											
Lacey	59.0	1.0	33.1	87.4	1.3	12.9	14.6	48.0	98.5	77.5	80.4
Tradition	57.8	1.3	34.4	89.3	0.8	12.9	14.5	48.6	99.5	74.3	79.1
Stellar-ND	58.0	0.8	32.9	85.9	1.6	12.3	13.7	46.7	104.4	79.6	79.9
Celebration	58.8	1.8	34.4	81.6	1.9	14.7	15.5	45.8	95.0	76.1	83.4
Quest	58.0	1.8	34.0	77.7	2.6	13.6	14.8	46.9	102.2	75.1	78.3
Innovation	57.8	1.3	31.0	82.4	2.0	13.4	15.0	47.2	93.9	74.3	77.7
Two Row											
Conlon	53.3	3.8	32.9	91.0	1.4	13.0	13.8	49.9	86.5	69.7	75.4
Pinnacle	59.5	2.0	33.3	92.9	1.2	11.3	12.6	47.9	101.5	78.6	81.5
CDC Meredith	60.7	3.3	34.0	83.0	2.5	13.6	14.2	44.7	105.3	78.2	87.5
ND Genesis	57.8	1.5	33.1	88.1	1.9	11.8	--	48.7	103.4	78.5	--
AAC Synergy	59.7	1.7	33.3	92.5	1.1	12.9	--	48.9	117.4	83.0	--
Sirish	61.0	2.0	28.9	90.2	1.0	13.4	--	47.1	95.5	74.4	--
ABI Balster	58.8	2.8	31.4	84.9	2.7	13.5	--	47.1	110.7	83.3	--
ABI Growler	61.7	3.0	31.2	83.5	2.3	14.5	--	45.2	95.7	74.0	--
LCS Genie	62.0	3.3	29.0	84.5	3.1	13.1	--	47.4	100.7	76.3	--
LCS Odyssey	62.0	2.0	30.1	92.5	1.1	13.1	--	46.4	100.5	76.8	--
Explorer	57.3	3.0	27.8	80.7	3.3	13.1	--	46.4	105.9	--	--
MEAN	57.7	2	31.7	85.8	2.0	13.0	--	47.3	103.3	--	--
C.V. (%)	2.8	33.7	6.9	4.8	34.5	4.9	--	1.8	6.9	--	--
LSD 0.10	1.9	0.8	2.6	4.9	0.8	0.9	--	1.0	8.5	--	--
LSD 0.05	2.3	0.9	3.1	5.9	1.0	1.1	--	1.2	10.2	--	--

Planting Date = May 1; Harvest Date = August 1; Previous Crop = Field Pea

** Barley seeding rate used in this trial was 1,100,000 pure live seeds acre^{-1}.

Barley - Dryland Recrop Elite* **Carrington**

Variety	Days to Head	Plant Lodge	Plant Height	Plump >6/64	Thin <5/64	Grain Protein 2017	Grain Protein 3-yr. Avg.	Test Weight	Grain Yield 2017	Grain Yield 2-yr. Avg.	Grain Yield 3-yr. Avg.
		0 to 9	inch	%	%	-------- % --------		lb/bu	---------- bu/ac ----------		
Six Row											
Lacey	65.3	0.0	24.2	83.7	1.9	13.6	12.3	43.6	45.4	47.3	56.6
Tradition	64.8	0.3	25.9	83.1	1.8	13.0	12.0	44.0	49.6	49.9	60.7
Stellar-ND	66.3	0.0	21.8	78.9	3.3	14.4	12.4	40.6	39.1	41.8	53.3
Celebration	65.0	0.3	23.6	78.1	2.8	14.3	12.6	42.4	49.4	54.5	60.7
Quest	65.0	0.3	24.6	85.2	1.9	13.4	12.2	43.9	43.9	48.3	55.3
Innovation	64.8	0.3	24.3	83.4	1.6	13.8	12.2	43.7	53.3	53.3	62.2
Two Row											
Pinnacle	64.5	1.3	23.0	79.8	3.1	13.0	11.3	41.9	43.3	54.0	53.6
ND Genesis	66.8	0.3	26.8	89.1	1.2	12.7	10.9	44.2	43.2	46.6	54.5
AAC Synergy	69.8	0.3	23.6	86.3	1.5	13.0	--	44.4	58.9	61.6	--
Sirish	68.8	0.0	21.9	87.5	1.9	13.3	--	43.3	38.7	48.6	--
ABI Balster	69.3	0.0	24.0	79.0	2.6	14.1	--	42.9	52.6	57.4	--
ABI Growler	69.0	0.0	21.8	81.1	2.8	14.4	--	42.1	44.9	46.9	--
LCS Odyssey	69.0	1.0	22.7	91.0	1.0	11.9	--	42.9	58.6	61.0	--
Explorer	66.3	0.0	19.3	84.2	1.7	13.0	--	43.8	47.5	--	--
MEAN	66.7	0.3	23.4	83.6	2.1	13.4	--	43.1	47.7	--	--
C.V. (%)	1.2	196.2	11.8	5.6	38.0	8.5	--	2.5	16.2	--	--
LSD 0.10	0.9	0.6	6.3	5.6	0.90	NS	--	1.3	9.2	--	--
LSD 0.05	1.1	0.8	NS	6.7	1.10	NS	--	1.5	11.1	--	--

Planting Date = May 1 ; Harvest Date = August 30 ; Previous Crop = Barley

* This trial was directly planted into an undisturbed wheat stubble.

** Barley seeding rate used in this trial was 1,100,000 pure live seeds acre^{-1}.

Variety	Days to Head	Plant Lodge	Plant Height	Plump >6/64	Thin <5/64	-- Grain Protein -- 2017	3-yr. Avg.[2]	Test Weight	-------- Grain Yield -------- 2017	2-yr. Avg.[1]	3-yr. Avg.[2]
		0 to 9	inch	%	%	--------- % ---------		lb/bu	---------- bu/ac ----------		
Six Row											
Lacey	55.8	3.3	40.5	92.5	0.8	14.6	14.6	48.8	123.6	116.0	117.3
Tradition	57.5	2.8	40.1	92.0	0.7	14.1	14.3	48.7	126.0	121.5	119.2
Stellar-ND	56.8	2.3	37.9	95.5	0.7	14.0	14.1	47.2	120.8	114.0	116.8
Celebration	58.3	2.8	39.4	93.4	0.8	15.5	15.3	47.8	121.9	113.6	117.4
Quest	56.0	2.3	40.0	87.1	1.2	14.2	14.1	47.6	116.1	110.3	110.9
Innovation	55.0	2.8	40.0	89.4	0.9	13.9	14.4	47.6	119.5	116.8	118.5
Two Row											
Conlon	47.0	4.0	40.0	94.9	0.9	13.5	13.2	49.8	116.8	102.6	106.1
Pinnacle	58.0	2.5	39.8	95.1	0.9	11.8	12.1	48.6	117.3	103.1	108.5
CDC Meredith	61.5	4.5	39.2	90.5	1.4	12.3	--	47.0	116.5	106.1	--
ND Genesis	57.0	2.8	40.1	95.9	0.5	11.7	11.8	49.0	133.8	122.4	119.9
AAC Synergy	62.0	4.3	37.9	93.0	1.2	12.5	--	49.0	134.9	--	--
Sirish	62.8	3.5	34.3	88.6	1.4	12.7	--	46.2	112.3	--	--
ABI Balster	60.0	3.3	37.8	90.1	1.9	12.8	--	47.9	120.7	--	--
ABI Growler	59.0	3.3	38.4	90.9	1.4	12.2	--	46.8	123.2	--	--
LCS Genie	63.5	3.8	36.4	89.3	1.6	11.6	--	46.9	96.9	--	--
LCS Odyssey	64.5	4.0	35.5	93.5	1.1	11.6	--	45.9	108.7	--	--
Explorer	59.0	2.3	34.1	91.0	1.5	11.8	--	46.6	121.3	--	--
MEAN	57.2	2.8	38.0	91.9	1.2	12.8	--	47.7	121.5	--	--
C.V. (%)	2.1	40.5	5.5	2.5	35.7	4.6	--	1.2	7.5	--	--
LSD 0.10	1.4	1.3	2.4	3.1	0.6	0.7	--	0.8	12.5	--	--
LSD 0.05	1.7	1.6	2.9	3.7	0.7	0.8	--	0.9	14.9	--	--

Planting Date = May 1; Harvest Date = August 8; Previous Crop = Soybean

** Barley seeding rate used in this trial was 1,100,000 pure live seeds acre^{-1}.

[1] Two-year average is for 2015 and 2017 as 2016 trial experienced significant hail.

[2] Three-year average is for 2014, 2015 and 2017 as 2016 trial experienced significant hail.

Variety	Days to Head	Plant Height	Plant Lodge	Plump >6/64	Thin <5/64	--- Grain Protein -- 2017	3-yr. Avg.	Test Weight	--------- Grain Yield --------- 2017	2-yr. Avg.	3-yr. Avg.
		inch	0-9	%	%	---------- % ---------		lb/bu	---------- bu/ac ----------		
Six Row											
Lacey	56.5	30.7	5.5	78.2	1.9	14.6	14.4	44.5	101.6	111.9	109.9
Tradition	56.3	29.1	5.8	70.0	2.4	14.2	13.9	43.6	118.1	113.3	112.1
Stellar-ND	55.3	29.9	5.5	82.3	1.6	13.7	13.4	43.1	111.6	118.2	116.0
Celebration	56.5	29.3	7.3	73.7	2.1	15.3	15.3	43.3	118.2	119.4	115.0
Quest	56.0	30.5	5.8	74.0	3.1	14.7	14.4	43.6	107.9	101.3	102.9
Innovation	55.0	30.1	5.3	78.5	1.2	14.0	14.0	44.7	121.0	123.2	115.6
Two Row											
Pinnacle	57.0	29.5	6.3	91.2	1.6	12.5	12.2	45.1	106.6	92.0	97.4
ND Genesis	56.8	32.1	6.5	88.6	1.3	12.1	11.5	45.1	108.7	112.7	108.0
AAC Synergy	58.3	28.1	7.5	82.7	2.8	14.3	--	44.5	105.7	111.9	--
Sirish	59.5	27.4	5.5	87.7	1.2	14.5	--	45.2	97.8	93.5	--
ABI Balster	58.8	27.2	4.3	85.1	1.9	14.6	--	44.6	112.4	102.9	--
ABI Growler	58.0	27.0	6.8	87.3	1.7	15.1	--	43.0	98.0	90.7	--
LCS Odyssey	60.0	27.2	8.5	86.3	2.1	13.5	--	43.0	91.7	86.9	--
Explorer	57.0	25.8	6.0	81.4	2.2	13.7	--	44.0	110.8	--	--
MEAN	57.2	28.9	6.2	82.0	1.9	14.1	--	44.1	107.9	--	--
C.V. (%)	1.3	5.4	25.9	5.4	33.7	3.1	--	2.7	7.8	--	--
LSD 0.10	0.9	1.8	1.9	5.2	0.8	0.5	--	1.4	10.0	--	--
LSD 0.05	1.1	2.2	NS	6.3	0.9	0.6	--	NS	12.1	--	--

Planting Date = May 11 ; Harvest Date = August 17 ; Previous Crop = Soybean

** Barley seeding rate used in this trial was 1,100,000 pure live seeds acre^{-1}.

Variety	Days to Head	Plant Height	Plump >6/64	Thin <5/64	--- Grain Protein --- 2017	3-yr. Avg.	Test Weight	---------- Grain Yield ---------- 2017	2-yr. Avg.	3-yr. Avg.
		inch	%	%	---------- % ----------		lb/bu	---------- bu/ac ----------		
Six Row										
Lacey	56.8	22.9	69.0	2.6	14.1	14.4	43.8	36.1	63.6	70.3
Tradition	56.3	24.4	78.3	1.8	13.1	14.2	43.3	37.6	67.6	72.9
Stellar-ND	56.8	24.1	74.3	3.3	13.6	14.0	41.3	25.6	59.5	66.2
Celebration	57.3	24.9	76.2	1.7	14.3	15.2	41.8	30.3	70.7	73.4
Quest	57.3	24.9	74.7	3.5	13.7	14.1	43.1	34.9	65.8	67.7
Innovation	57.0	22.4	78.4	1.4	13.5	14.6	43.7	34.3	67.3	73.1
Two Row										
Pinnacle	56.0	23.2	88.0	1.0	13.0	12.7	42.4	30.7	64.0	71.5
ND Genesis	57.0	24.7	85.1	0.7	12.8	12.9	42.5	34.0	67.8	70.8
AAC Synergy	58.8	23.4	86.2	0.9	14.4	--	43.2	30.4	72.2	--
Sirish	59.0	22.1	91.2	0.4	14.8	--	45.1	33.0	63.6	--
ABI Balster	59.0	22.0	83.8	1.1	15.0	--	43.8	30.6	67.1	--
ABI Growler	58.5	23.3	85.8	1.1	14.9	--	42.9	33.1	67.8	--
LCS Odyssey	59.0	25.0	93.1	0.5	13.9	--	44.8	35.1	62.4	--
Explorer	57.5	22.4	82.1	1.3	13.7	--	42.9	39.8	--	--
MEAN	57.6	23.6	81.9	1.5	13.9	--	43.1	33.2	--	--
C.V. (%)	1.4	8.5	7.6	77.9	4.7	--	2.5	19.5	--	--
LSD 0.10	1.0	NS	7.5	1.4	0.8	--	1.3	NS	--	--
LSD 0.05	1.2	NS	9.0	1.7	0.9	--	1.6	NS	--	--

Planting Date = May 5; Harvest Date = August 11 ; Previous Crop = Soybean

Barley - Organic **Carrington**

Variety	Days to Head	Plant Height	Plant Lodge	Plump >6/64	Thin <5/64	--- Grain Protein --- 2017	3-yr. Avg.	Test Weight	---- Grain Yield ---- 2017	3-yr. Avg.
		inch	0-9	%	%	---------- % ----------		lb/bu	-------- bu/ac --------	
Six Row										
Lacey	56.5	26.6	0.0	88.1	0.7	9.4	--	46.6	74.8	--
Tradition	56.8	26.6	0.0	91.7	0.3	9.4	9.9	47.0	62.9	61.7
Stellar-ND	56.8	26.3	0.0	85.5	1.2	8.9	9.6	44.8	67.8	65.3
Celebration	57.8	27.6	0.0	86.8	0.7	10.2	--	45.0	70.9	--
Quest	56.5	25.8	0.0	78.9	1.6	9.5	9.8	45.8	66.7	64.5
Innovation	56.8	25.7	0.0	90.4	0.5	9.1	--	46.1	58.7	--
Two Row										
Conlon	55.5	24.7	0.0	95.8	0.6	9.2	10.0	47.8	66.7	59.9
Rawson	59.8	24.8	0.0	96.8	0.3	9.0	9.9	46.5	67.4	59.1
Pinnacle	59.0	24.3	0.0	95.3	0.6	8.0	8.8	47.8	76.7	69.8
ND Genesis	61.8	26.3	0.0	94.1	0.6	8.4	9.0	48.0	76.4	69.1
ABI Balster	62.5	23.1	0.0	92.0	1.0	8.2	--	45.4	77.1	--
ABI Growler	62.5	22.9	0.0	87.8	1.5	8.6	--	44.0	71.0	--
Mean	58.5	25.4	0.0	90.3	0.8	9.0	--	46.2	69.7	--
C.V. (%)	1.0	5.3	NA	1.8	25.5	4.2	--	1.1	9.9	--
LSD 0.10	0.7	1.6	NS	2.0	0.2	0.5	--	0.6	8.2	--
LSD 0.05	0.9	1.9	NS	2.4	0.3	0.5	--	0.7	9.9	--

Planting Date = May 3; Harvest Date = July 31; Previous Crop = Soybeans

Aronia berry cultivar evaluation.

Oat - Dryland **Carrington**

Variety	Days to Head	Plant Height	Plant Lodge	Grain Protein	Test Weight	Grain Yield 2017	Grain Yield 3-yr. Avg.[1]
		inch	0 to 9	%	lb/bu	bu/ac	bu/ac
Beach	58.0	34.6	0.0		37.5	90.1	106.0
CS Camden	57.3	31.5	0.3		34.2	99.8	--
CDC Dancer	57.8	34.4	0.5		35.8	111.6	101.7
Deon	61.3	33.7	0.3		35.9	107.3	--
GM423	62.8	33.3	0.5		31.3	93.5	--
Hayden	56.8	33.1	0.3		37.5	102.4	--
HiFi	61.3	34.1	0.0		35.7	84.7	98.2
Hytest	54.5	35.8	0.3		35.9	103.7	95.1
Jury	57.8	36.4	0.3		36.6	102.2	97.9
Killdeer	57.3	31.4	0.3		34.3	98.9	106.6
Legget	57.8	29.1	0.0		36.6	83.5	97.9
Minstrel CDC	60.0	30.9	0.0		34.8	98.9	107.1
Otana	58.0	33.5	0.3		36.0	88.6	96.7
Newburg	58.0	33.8	0.3		35.8	89.9	93.4
AC Pinnacle	62.3	33.3	0.0		35.2	97.8	108.2
Rockford	59.0	34.3	0.3		37.8	99.3	105.8
Souris	58.0	31.9	0.3		36.2	85.0	101.5
Stallion	58.8	34.8	0.0		35.7	98.1	105.3
Paul	63.8	34.7	0.5		43.6	52.0	--
MEAN	59.1	33.1	0.2		36.5	92.4	--
C.V. (%)	2.4	4.8	196		1.9	11.6	--
LSD 0.10	1.7	1.9	NS		0.8	14.5	--
LSD 0.05	2.0	2.2	NS		1.0	17.4	--

Planting Date = May 3 ; Harvest Date = August 7 ; Previous Crop = Flax

** Oat seeding rate used in this trial was 1,000,000 pure live seeds acre^{-1}.

[1] Three-year average is for 2013, 2014 and 2017 as 2016 trial experienced significant hail.

Oat - Organic **Carrington**

Variety	Days to Head	Plant Height	Test Weight	Grain Yield 2017	Grain Yield 3-yr.
		inch	lb/bu	bu/ac	bu/ac
Paul	65.3	28.8	48.0	34.5	47.4
Killdeer	62.3	25.3	36.6	56.5	84.3
HiFi	62.8	27.7	39.2	61.7	82.0
Souris	61.8	24.5	37.7	62.0	73.2
Rockford	62.0	27.0	40.4	61.2	78.6
Newburg	61.0	28.0	38.7	60.9	80.4
Jury	61.3	28.4	39.6	61.4	75.4
Deon	63.5	28.0	38.4	62.3	84.6
CDC Minstrel	63.8	26.3	37.6	59.1	85.3
CDC Dancer	63.5	26.2	38.9	53.8	75.0
AC Pinnacle	63.8	25.1	36.8	68.2	88.7
CS Camden	63.0	25.4	39.0	61.4	--
Reins	56.0	21.7	39.4	53.8	--
Betagene	60.5	26.3	37.5	60.5	--
Jerry	59.5	25.3	39.5	58.5	--
Mean	62.5	26.5	40.1	55.2	--
C.V. (%)	1.2	5.0	1.1	9.7	--
LSD 0.10	0.9	1.6	0.5	6.4	--
LSD 0.05	1.0	1.9	0.6	7.6	--

Planting Date = May 1; Harvest Date = August 7; Previous Crop = Cover Crop (sudangrass, sorghum/sudan, cowpea, soybean, crimson clover, turnip)

Canola - Clearfield Tolerant Cultivars **Carrington**

Brand	Cultivar		Status[1]	Oil Type[2]	Blackleg	Days to Bloom	Bloom Duration	Days to PM	Plant Height	Plant Lodge	1000 KWT	Test Weight	Oil Content	--- Seed Yield --- 2017	2-yr. Avg.
									inch	0 to 9	gram	lb/bu	% @ 8.5%M	------- lb/ac -------	
Cargill Inc.	V32-1	CL	Exp	HO	R	44.5	21.8	98.8	55.8	3.8	3.78	51.4	39.9	2475	--
Mycogen	2020 CL	CL	CA	HO	R	46.5	20.3	100.5	56.3	3.5	4.10	52.5	43.2	2505	2059
Mycogen	2022 CL	CL	CA	HO	R	46.3	20.0	101.3	51.4	2.0	4.26	52.1	42.4	2004	1693
Mycogen	2024 CL	CL	CA	HO	R	45.5	20.5	100.0	52.3	3.0	4.20	52.1	43.1	2201	--
Mycogen	CL6665383H	CL	CA	HO	R	47.5	19.3	101.8	57.0	2.5	3.98	52.3	43.0	2661	--
Canterra Seeds	CS2200CL	CL	CA	Trad	R	45.5	22.3	100.8	56.2	3.3	3.35	52.3	41.6	2181	2074
			MEAN			45.7	21.0	101.0	56.3	3.8	3.87	51.6	41.8	2429	--
			C.V. (%)			1.0	3.5	0.9	4.1	47.7	4.50	0.7	1.9	11.8	--
			LSD 0.10			0.6	0.9	1.1	2.8	NS	0.21	0.4	1.0	346	--
			LSD 0.05			0.7	1.1	1.3	3.4	NS	0.25	0.5	1.2	417	--

Planting Date = May 10 ; Harvest Date = August 22 ; Previous Crop = Lentils

[1] Status refers to availability to producers: CA = Commercially available, while EXP = Experimental line.

[2] Oil Type: Trad. = Traditional, and HO = High Oleic

** Statistics reflect analysis that included the 'SU' canola cultivars.

Canola - Sulfonylurea Tolerant Cultivars **Carrington**

Brand	Cultivar		Status[1]	Oil Type[2]	Blackleg	Days to Bloom	Bloom Duration	Days to PM	Plant Height	Plant Lodge	1000 KWT	Test Weight	Oil Content	------- Seed Yield ------- 2017	2-yr. Avg.
									inch	0 to 9	gram	lb/bu	% @ 8.5%M	---------- lb/ac	----------
Cibus	C5507	SU	CA	Trad	R	45.0	21.3	101.3	58.1	4.5	3.64	50.2	41.5	2534	2122
Cibus	C5522	SU	CA	Trad	R	44.5	21.8	101.8	59.8	5.3	3.81	50.5	41.1	2722	2053
Cibus	C5513	SU	CA	Trad	R	47.0	21.0	102.0	58.7	4.5	3.85	52.1	40.9	2366	1941
			MEAN			45.7	21.0	101.0	56.3	3.8	3.87	51.6	41.8	2429	--
			C.V. (%)			1.0	3.5	0.9	4.1	47.7	4.50	0.7	1.9	11.8	--
			LSD 0.10			0.6	0.9	1.1	2.8	NS	0.21	0.4	1.0	346	--
			LSD 0.05			0.7	1.1	1.3	3.4	NS	0.25	0.5	1.2	417	--

Planting Date = May 10 ; Harvest Date = August 22 ; Previous Crop = Lentils

[1] Status refers to availability to producers: CA = Commercially available, while EXP = Experimental line.

[2] Oil Type: Trad. = Traditional

** Statistics reflect analysis that included the 'Clearfield' canola cultivars.

UAS-view of canola plots.

Canola - Roundup Ready Cultivars **Carrington (Page 1 of 2)**

Brand	Cultivar	Status[1]	Oil Type[2]	Blackleg	Days to Bloom	Bloom Duration	Days to PM	Plant Height	Plant Lodge	1000 KWT	Test Weight	Oil Content	--- Seed Yield --- 2017	3-yr. Avg.
								inch	0 to 9	gram	lb/bu	% @ 8.5%M	------ lb/ac ------	
Dekalb	70-10	CA	Trad	R	44.0	20.8	88.3	49.0	1.3	3.51	51.3	44.1	3130	--
Dekalb	71-14BL	CA	Trad	R	43.0	21.0	91.3	51.6	1.5	3.10	52.1	45.3	2695	--
Dekalb	DKL 35-23	CA	Trad	MR	42.0	22.5	87.0	46.4	0.8	3.46	51.4	44.1	2806	--
Monsanto	G15P9374	Exp	Trad	R	47.3	20.0	94.5	53.0	2.8	3.39	51.6	43.5	3075	--
Proseed	300 Mag	CA	Trad	R	45.5	20.8	92.0	51.9	1.3	3.55	51.9	45.0	2651	2348
Proseed	PS 5000	CA	Trad	R	45.3	20.5	92.3	53.1	4.0	3.20	51.5	43.9	2887	2305
Dupont Pioneer	45CS40	CA	Trad	R	45.3	19.8	90.0	53.6	2.0	3.41	50.5	44.6	2448	--
Dupont Pioneer	45M35	CA	Trad	MR	45.0	20.3	90.0	46.5	1.8	3.19	51.7	46.1	2939	--
Dupont Pioneer	45CM36	CA	Trad	R	46.0	19.8	93.0	49.2	2.0	3.58	49.6	46.8	3054	--
Integra	7150RR	CA	Trad	R	43.0	22.3	92.3	50.4	3.3	3.39	51.5	45.4	2483	--
Integra	7257RR	CA	Trad	R	44.0	20.5	88.8	48.3	1.8	2.98	52.2	45.1	2594	--
Cargill Inc.	V12-3	CA	HO	R	45.3	18.8	91.3	49.8	1.8	3.33	51.3	45.9	2883	--
Cargill Inc.	V14-1	CA	HO	R	47.3	19.5	94.0	49.9	0.8	3.19	51.7	45.4	2979	--
Brett Young	4187 RR	CA	Trad	R	47.8	19.0	93.5	55.9	1.5	3.15	51.6	45.7	2951	--
Brett Young	4157 RR	CA	Trad	R	48.0	19.8	94.8	53.2	1.8	3.33	51.4	44.8	3215	--
Cargill Inc.	15RH1142	Exp	Trad	R	48.0	20.0	95.3	53.6	1.3	3.49	51.3	45.1	2829	--
Cargill Inc.	15RH1167	Exp	HO	R	48.0	19.8	91.8	52.9	0.5	3.20	51.8	45.7	2710	--
Croplan	HyClass 930	CA	Trad	R	42.0	22.5	90.8	44.6	3.0	3.35	51.6	46.2	3086	2528
Croplan	HyClass 955	CA	Trad	R	42.5	21.5	89.8	46.6	2.8	3.73	51.8	45.3	2909	2465
Croplan	HyClass 970	CA	Trad	R	44.5	20.8	94.0	47.3	1.3	3.48	52.0	44.3	2821	2468
Mycogen	1022 RR	CA	HO	R	49.5	18.8	94.0	53.6	0.3	3.73	50.3	45.9	3033	2370
Mycogen	1024 RR	CA	HO	R	49.0	17.3	93.8	54.9	1.0	3.91	52.3	45.5	2607	--
Mycogen	G6667223H	CA	HO	R	47.3	19.5	94.3	54.1	1.8	3.70	52.5	45.8	2875	--
		MEAN			45.3	20.6	92.6	52.3	1.8	3.42	51.4	45.1	2923	--
		C.V. (%)			1.5	6.1	2.1	8.0	75.5	10.8	0.7	2.4	12.6	--
		LSD 0.10			0.8	1.5	2.3	4.9	1.6	0.43	0.4	1.3	NS	--
		LSD 0.05			1.0	1.8	2.7	5.9	1.9	0.50	0.5	1.5	NS	--

Planting Date = May 9 ; Harvest Date = August 22 ; Previous Crop = Buckwheat.

Brand	Cultivar	Status[1]	Oil Type[2]	Blackleg	Days to Bloom	Bloom Duration	Days to PM	Plant Height	Plant Lodge	1000 KWT	Test Weight	Oil Content	--- Seed Yield --- 2017	3-yr. Avg.
								inch	0 to 9	gram	lb/bu	% @ 8.5%M	------ lb/ac ------	
Brett Young	6074RR	CA	Trad	R	44.8	21.5	93.3	53.7	1.0	3.09	51.6	45.0	3141	2644
Brett Young	6076RR	CA	Trad	R	44.8	22.5	95.5	60.0	2.3	3.51	50.8	43.9	3379	--
Brett Young	6080RR	CA	Trad	R	43.8	21.3	93.0	52.1	0.8	3.28	51.4	43.8	3054	--
Brett Young	6086CR	CA	Trad	R	45.3	20.3	94.5	51.7	3.0	3.51	49.9	44.7	2859	--
Brett Young	BY17-6185	Exp	Trad	R	46.5	21.3	93.8	62.6	1.3	3.19	51.2	45.0	2926	--
Brett Young	BY17-6189	Exp	Trad	R	47.0	21.3	97.3	56.0	1.3	3.58	51.0	44.3	3250	--
Canterra Seeds	CS2000	CA	Trad	R	45.0	20.8	93.3	57.8	3.8	3.66	51.3	43.9	3031	--
Canterra Seeds	CS2100	CA	Trad	R	43.8	21.8	91.5	53.5	2.0	3.26	52.2	44.7	2950	--
Canterra Seeds	CS2300	CA	Trad	R	45.0	23.5	96.8	58.5	1.0	3.83	50.8	44.1	3261	--
Star Specialty	Star 402	CA			43.3	21.0	91.3	53.9	1.5	3.41	51.4	47.5	3000	2478
		MEAN			45.3	20.6	92.6	52.3	1.8	3.42	51.4	45.1	2923	--
		C.V. (%)			1.5	6.1	2.1	8.0	75.5	10.8	0.7	2.4	12.6	--
		LSD 0.10			0.8	1.5	2.3	4.9	1.6	0.43	0.4	1.3	NS	--
		LSD 0.05			1.0	1.8	2.7	5.9	1.9	0.50	0.5	1.5	NS	--

Planting Date = May 9 ; Harvest Date = August 22 ; Previous Crop = Buckwheat.

[1] Status refers to availability to producers: CA = Commercially available, while EXP = Experimental line.

[2] Oil Type: Trad. = Traditional, and HO = High Oleic

Carinata **Carrington**

Variety	Vigor	Stand Uniformity	bbloom	ebloom	Flower Color[1]	Bloom Duration	Phys. Mat	Plant Height	Pod Height	Lodge	Kernal Weight	Yield	Test Weight	Protein	Oil
	1-7	0-100	DAP	DAP		days	DAP	in.	in.	0-9	g	lb/a	lb/bu	%	%
A120	7.0	93.8	47.0	78.3	Y	31.3	108.3	48.2	29.8	1.3	0.88	1860	52.0	23.63	43.33
EXP17002	6.5	91.3	45.0	72.5	Y	27.5	112.8	41.6	24.2	2.0	0.92	2308	50.0	25.83	41.85
EXP17003	5.8	65.0	44.0	72.3	Y	28.3	106.5	35.2	21.9	2.0	0.91	2133	52.0	23.98	43.48
EXP17004	7.0	99.0	50.0	74.0	Y	24.0	116.3	50.4	31.4	1.8	0.96	2234	51.5	23.13	44.78
EXP17005	6.8	86.3	47.3	77.5	Y	30.3	116.8	42.8	28.7	1.8	0.84	1849	50.0	24.95	40.85
EXP17006	7.0	92.5	49.3	80.8	Y	31.5	119.0	49.0	28.0	3.0	0.77	2302	52.1	27.05	38.68
EXP17007	6.0	90.0	49.0	70.8	Y	21.8	106.3	48.0	29.5	1.3	0.93	1668	51.5	22.33	44.90
EXP17008	7.0	96.8	51.3	75.5	Y	24.3	111.5	47.6	29.3	1.5	0.86	2635	51.3	20.80	47.43
EXP17009	7.0	92.5	47.8	78.3	Y	30.5	121.8	45.2	30.4	1.0	0.89	2380	51.0	20.53	48.03
EXP17010	6.5	97.0	47.3	74.8	Y and W	27.5	119.0	47.3	26.3	2.0	0.87	1910	51.9	28.38	39.35
Mean	6.7	90.4	47.8	75.5		27.7	113.8	45.6	28.0	1.8	0.88	2128	51.3	24.06	43.27
C.V. (%)	5.3	4.3	0.2	0.8		6.1	1.7	7.1	15.2	59.7	5.9	12.0	0.7	7.1	4.3
LSD (0.05)	0.5	5.7	0.5	2.4		2.4	6.0	4.7	6.2	1.5	0.08	371	0.5	2.49	2.67

Planting Date = May 8; Harvest Date = September 12; Previous Crop = Buckwheat

[1] Flower Color: Y = yellow; W = white

Oil Sunflower **Carrington (Page 1 of 3)**

Brand	Hybrid	Hybrid Type[1]	Tech Trait[2]	Plant Ht.	Plant Lodge	Days to Bloom	Days to PM	Moist. at Harvest	Test Weight	Oil Content[3]	Seed Yield 2017	Seed Yield 2-yr. Avg.	Seed Yield 3-yr. Avg.
				inch	0 to 9			%	lb/bu	%	lb/ac	lb/ac	lb/ac
USDA	894	Check Hybrid		54.6	1.0	68.0	125.0	9.6	30.2	39.6	1633	1616	1542
Croplan	559 CL	Check Hybrid		61.2	0.5	71.0	128.5	8.9	31.5	44.2	2762	2208	2099
Mycogen Seeds	8N270CLDM	Check Hybrid		53.5	0.8	67.0	123.3	8.5	30.5	43.9	1911	1876	1808
USDA	Honeycomb N	Check Hybrid		50.0	0.5	64.0	124.3	9.0	30.0	40.9	1858	1440	1348
Croplan	3732	NuSun	NA	59.3	0.8	71.5	126.8	9.6	31.6	47.5	2234	--	--
Croplan	3845 HO	HO	NA	55.2	1.0	71.3	127.3	8.9	31.4	47.8	2050	--	--
Croplan	432 E	HO	Clearfield	60.9	0.3	66.5	124.5	9.4	31.5	39.8	2844	2151	2072
Croplan	450 E HO	HO	ExpressSun	63.0	1.0	70.8	128.5	9.9	29.8	40.9	2052	--	--
Croplan	455 E HO	HO	ExpressSun	64.3	1.0	69.5	128.0	9.7	30.9	42.7	2232	2068	--
Croplan	458 E HO	HO	ExpressSun	65.5	1.0	69.3	127.5	9.8	29.8	43.8	2285	1942	1877
Croplan	545 CL	NuSun	Clearfield	57.9	0.8	72.5	129.5	9.9	30.9	45.9	2547	2229	2100
Croplan	549 CL	NuSun	Clearfield	66.2	0.0	67.8	123.3	8.8	32.2	46.3	2700	2109	2025
Croplan	568 CL HO	HO	Clearfield	57.1	0.8	74.5	131.5	9.9	30.1	45.3	2313	--	--
Croplan	7717 CL HO	HO	Clearfield	59.3	1.3	69.5	126.8	8.6	31.1	44.4	1917	--	--
Croplan	7919 CL HO	HO	Clearfield	59.0	1.0	73.3	129.8	9.7	30.3	45.8	2500	--	--
Dyna-Gro	XH71H11CL	HO	Clearfield	55.3	0.8	67.5	124.5	8.8	31.7	44.0	1929	--	--
Dyna-Gro	XH71N33CL	NuSun	Clearfield	55.1	1.3	67.5	124.5	8.2	32.8	47.9	1792	--	--
Dyna-Gro	XH72H38CL	HO	Clearfield	58.4	1.3	70.3	127.3	9.2	30.7	47.3	2496	--	--
Dyna-Gro	XH72H47CL	HO	Clearfield	60.2	1.3	72.3	128.0	8.9	30.0	48.2	1769	--	--
Dyna-Gro	XH72H61CL	HO	Clearfield	54.1	1.3	68.5	124.5	8.8	31.4	47.7	1840	--	--
Mycogen Seeds	8D310CL	NuSun	Clearfield	62.6	1.0	72.3	127.0	11.0	26.9	36.9	1934	2011	2025
Mycogen Seeds	8H449CLDM	HO	Clearfield	60.8	1.3	71.3	129.0	9.5	33.5	49.2	2477	2135	2158
Mycogen Seeds	8H456CL	HO	Clearfield	66.7	1.3	73.3	128.3	9.2	29.7	49.4	1749	--	--
			MEAN	60.9	1.0	70.4	126.7	9.4	30.4		2093	--	--
			C.V. (%)	8.1	61.5	1.4	1.7	5.7	2.3		15.0	--	--
			LSD 0.10	5.7	0.7	1.1	2.5	0.6	0.8		364	--	--
			LSD 0.05	6.8	0.9	1.3	2.9	0.7	1.0		434	--	--

Planting Date = May 25 ; Harvest Date = November 2 ; Previous Crop = Field Pea

Brand	Hybrid	Hybrid Type[1]	Tech Trait[2]	Plant Ht.	Plant Lodge	Days to Bloom	Days to PM	Moist. at Harvest	Test Weight	Oil Content[3]	Seed Yield 2017	Seed Yield 2-yr. Avg.	Seed Yield 3-yr. Avg.
				inch	0 to 9			%	lb/bu	%	lb/ac	lb/ac	lb/ac
Mycogen Seeds	E76437	HO	Clearfield	71.7	1.0	78.0	130.0	10.5	29.9	45.7	2125	--	--
Nuseed	Badger DMR	NuSun	Clearfield	62.8	1.5	66.8	123.5	9.9	29.9	37.6	2622	2164	2140
Nuseed	Camaro II	NuSun	Clearfield	56.7	0.5	69.8	125.8	9.2	30.7	47.4	2133	1898	1972
Nuseed	Falcon	NuSun	ExpressSun	60.4	1.3	70.3	126.3	9.1	31.8	44.8	1376	1449	1636
Nuseed	Hornet	HO	Clearfield	62.1	1.0	71.5	126.0	9.9	29.2	44.8	2319	1970	1850
Nuseed	N4HM340	HO	Clearfield	59.7	0.8	74.3	128.5	9.0	25.9	39.6	1800	--	--
Nuseed	N4HM354	NuSun	Clearfield	55.9	1.8	68.0	124.0	8.6	32.7	46.5	1774	1754	--
Nuseed	N4HP470	HO	Clearfield Plus	69.0	1.8	73.3	129.3	9.5	30.6	47.2	2262	--	--
Nuseed	N5LM307	NuSun	Clearfield	56.7	1.3	66.8	123.5	9.9	26.9	40.9	1644	1641	--
Nuseed	N4HE302	HO	ExpressSun	64.6	1.0	69.5	126.0	9.5	28.6	44.0	2443	--	--
Nutech	63C4 CL	NuSun	Clearfield	55.6	2.0	68.0	125.0	8.6	32.6	46.9	2148	1924	--
Nutech	68H7	HO	ExpressSun	64.2	1.5	71.8	127.5	9.8	31.5	40.1	1624	1787	1704
Nutech	69M2	NuSun	ExpressSun	63.0	1.8	72.5	127.8	9.5	30.2	44.9	2312	--	--
Pioneer	P63HE60	HO	ExpressSun	58.2	0.3	69.0	125.0	9.2	31.1	43.1	2110	1835	--
Pioneer	P63HE90	HO	ExpressSun	64.5	1.0	72.3	129.3	9.9	30.1	42.5	2285	2113	--
Pioneer	P64ME01	NuSun	ExpressSun	64.0	1.0	72.3	129.5	10.7	30.9	43.2	2322	2116	--
Proseed	12G25 CL	NuSun	Clearfield	59.8	1.3	72.0	126.0	9.8	31.8	46.8	2192	1923	--
Proseed	E 50016 CL	NuSun	Clearfield	64.2	1.0	72.0	127.0	9.1	29.6	44.5	2328	--	--
Proseed	E-21 CL	NuSun	Clearfield	69.1	1.5	72.0	127.8	9.8	28.3	38.1	1770	--	--
Proseed	E-31 CL	NuSun	Clearfield	66.1	1.3	72.0	128.8	10.2	27.8	40.2	2054	1794	1616
Proseed	E-362436	NuSun	Clearfield	68.0	1.0	69.8	125.5	9.2	32.5	43.8	2414	--	--
Proseed	E-71 CL	NuSun	Clearfield	64.7	0.8	71.8	128.3	9.8	26.8	38.6	2193	--	--
Proseed	E-72	NuSun	N/A	71.0	1.0	74.0	130.3	9.8	29.4	44.2	1909	--	--
			MEAN	60.9	1.0	70.4	126.7	9.4	30.4		2093	--	--
			C.V. (%)	8.1	61.5	1.4	1.7	5.7	2.3		15.0	--	--
			LSD 0.10	5.7	0.7	1.1	2.5	0.6	0.8		364	--	--
			LSD 0.05	6.8	0.9	1.3	2.9	0.7	1.0		434	--	--

Planting Date = May 25 ; Harvest Date = November 2 ; Previous Crop = Field Pea

Brand	Hybrid	Hybrid Type[1]	Tech Trait[2]	Plant Ht.	Plant Lodge	Days to Bloom	Days to PM	Moist. at Harvest	Test Weight	Oil Content[3]	Seed Yield 2017	Seed Yield 2-yr. Avg.	Seed Yield 3-yr. Avg.
				inch	0 to 9			%	lb/bu	%	lb/ac	lb/ac	lb/ac
Proseed	E-73 CL	NuSun	Clearfield	68.2	1.3	72.5	127.0	9.8	27.5	39.2	2312	--	--
Sunopta	4415HO/CLP/I	Traditional	Clearfield Plus	61.8	1.3	70.0	124.5	8.8	29.8	43.7	1924	1807	1617
Sunopta	4421 CL	Traditional	Clearfield	62.8	1.3	72.3	127.8	10.5	27.8	35.0	1805	1917	1901
Sunopta	4425 CL	Traditional	Clearfield	62.0	0.5	70.0	126.8	9.9	29.8	39.6	2267	2268	--
Thunder Seed	11N94	NuSun	Clearfield	64.1	0.8	70.8	126.5	9.1	31.6	45.3	2127	1833	1798
Thunder Seed	12N92	NuSun	Clearfield	56.3	1.3	68.3	125.0	8.5	32.7	47.4	1961	--	--
Thunder Seed	35H92	HO	Clearfield	58.2	1.0	68.8	125.0	8.9	31.6	43.7	1617	1391	1401
Thunder Seed	42H94	HO	Clearfield	63.8	1.3	73.0	128.5	8.8	29.3	44.7	1745	1800	1706
			MEAN	60.9	1.0	70.4	126.7	9.4	30.4	43.8	2093	--	--
			C.V. (%)	8.1	61.5	1.4	1.7	5.7	2.3	3.4	15.0	--	--
			LSD 0.10	5.7	0.7	1.1	2.5	0.6	0.8	1.7	364	--	--
			LSD 0.05	6.8	0.9	1.3	2.9	0.7	1.0	2.1	434	--	--

Planting Date = May 25 ; Harvest Date = November 2 ; Previous Crop = Field Pea

[1] Oil Type: HO = High Oleic, NS = NuSun, Trad = Traditional.

[2] Hybrid detail as provided by seed company.

[3] Oils reported at 10% moisture.

Non-Oilseed Sunflower **Carrington**

Brand	Hybrid	Tech Traits	Plant Height	Plant Lodge	Days to Bloom	Days to PM	Seeds >22/64	Seeds >20/64	Seeds >18/64	Harvest Moist.	Test Weight	Seed Yield 2017[1]	Seed Yield 2-yr. Avg.	Seed Yield 3-yr. Avg.
			inch	0 to 9			%	%	%	%	lb/bu	lb/ac	lb/ac	lb/ac
USDA	924	Traditional	54.7	1.5	68.0	129.5	35.7	61.0	80.7	10.4	24.6	1484	1547	1583
Valia Genetics	Valia 41	Traditional	57.8	1.0	71.8	132.0	69.6	87.6	95.4	10.7	23.3	1976	--	--
Red River Commodities	2215	Traditional	57.1	1.5	69.0	130.8	57.8	84.5	92.9	10.3	23.5	1677	1727	1720
Red River Commodities	2215CL	Clearfield	63.1	2.3	72.5	136.3	66.3	84.0	91.4	12.8	22.4	1723	1714	1679
Red River Commodities	2217CP	Traditional	53.5	2.0	74.0	136.5	72.5	86.4	93.2	11.8	21.8	1609	--	--
Nuseed	Panther DMR	NuSun	53.9	1.3	67.0	128.5	34.1	62.5	86.5	11.0	24.1	1897	1900	1839
Nuseed	NSKM53777	NuSun	48.4	0.5	68.0	129.5	57.5	82.0	92.7	10.5	22.2	1711	--	--
Nuseed	4334	NuSun	56.1	0.8	71.0	132.0	62.1	85.2	95.3	11.1	21.6	1769	--	--
Sunopta	9524	Traditional	62.0	1.3	71.8	136.3	83.4	92.1	95.6	11.4	22.2	1843	2041	1977
Sunopta	9510	Traditional	62.7	1.5	70.5	130.5	76.7	89.6	94.5	10.5	22.7	1803	--	--
Sunopta	9553	Traditional	61.0	2.0	71.0	132.3	79.6	90.4	93.8	10.3	20.6	1752	--	--
Sunopta	9549	Traditional	48.0	0.8	68.3	129.5	64.7	83.9	92.7	10.3	19.9	1592	--	--
		MEAN	57.1	1.5	70.6	132.6	63.5	82.9	92.1	10.9	22.4	1735	--	--
		C.V. (%)	6.4	52.4	0.7	0.8	13.1	6.7	3.2	8.2	4.4	14.3	--	--
		LSD 0.10	4.4	0.9	0.6	1.3	9.9	6.6	3.6	1.1	1.2	NS	--	--
		LSD 0.05	5.2	1.1	0.7	1.6	11.9	8.0	4.3	1.3	1.4	NS	--	--

Planting Date = May 25 ; Harvest Date = November 3 ; Previous Crop = Field Pea

[1] The trial did experience a moderate amount of bird predation, yields are projected to be about 15 to 20% higher than the reported seed yields.

Variety	Days to Bloom	Bloom Duration	Days to PM	Plant Height	Oil Content	Test Weight	Seed Yield 2017	Seed Yield 2-yr. Avg.	Seed Yield 3-yr. Avg.
				inch	% (9%M)	lb/bu	bu/ac	bu/ac	bu/ac
CDC Bethune	54.0	9.5	82.5	22.4	46.2	53.4	31.4	23.9	25.9
CDC Glas	54.3	8.0	80.5	23.4	47.1	52.9	30.7	24.2	27.8
CDC Sanctuary	50.0	14.5	83.5	23.0	46.3	53.4	30.0	24.2	27.1
CDC Sorrel	53.8	11.0	83.8	23.8	47.0	52.7	33.2	25.8	28.3
Neela	50.8	13.0	82.5	23.1	46.2	53.7	26.8	23.3	26.4
Carter[1, 2]	51.5	12.3	83.0	22.1	45.9	53.8	24.9	23.0	25.4
Gold ND[1]	55.0	10.8	84.8	25.4	47.2	54.1	28.5	24.6	28.6
Neche	50.5	13.5	83.8	24.2	45.7	53.6	27.5	22.5	24.2
Nekoma	53.0	12.5	84.5	24.6	46.6	53.8	29.0	25.0	27.8
Omega[1]	51.3	12.3	79.8	22.6	46.3	53.9	27.9	20.5	21.5
Pembina	52.0	12.8	84.0	25.0	46.1	53.0	26.9	22.0	23.2
Prairie Blue	46.3	15.3	76.0	19.7	46.4	52.5	25.3	19.5	21.8
Prairie Grande	52.3	11.8	83.3	24.0	46.6	52.9	30.1	23.9	26.1
Prairie Sapphire	47.3	14.5	76.5	21.3	45.1	52.9	28.4	23.0	26.1
Prairie Thunder	52.0	13.0	85.5	26.3	45.6	53.8	33.4	26.2	26.7
Rahab 94	50.8	13.8	80.3	24.7	45.8	53.1	30.8	24.6	26.4
Shape	51.5	11.5	80.5	24.0	46.3	53.9	28.6	23.8	25.5
Webster	52.0	12.8	83.3	25.6	46.7	53.9	32.0	26.9	27.1
York	52.0	11.8	85.5	22.7	45.4	53.7	33.4	24.0	26.1
CDC Plava	50.0	13.3	77.3	22.3	46.1	52.9	27.9	22.8	--
Carter @ 50% SR[3]	52.3	12.0	84.3	23.9	46.1	53.9	28.8	24.3	25.4
Carter @ 150% SR[3]	51.0	12.0	79.5	23.9	44.9	53.8	25.4	21.7	24.0
MEAN	51.7	12.2	82.2	23.6	46.1	53.4	29.9	--	--
C.V. (%)	1.3	7.2	2.3	9.3	1.3	0.6	12.1	--	--
LSD 0.10	0.8	1.0	2.2	2.6	0.7	0.4	4.3	--	--
LSD 0.05	0.9	1.2	2.6	3.1	0.9	0.5	5.1	--	--

Planting Date = May 11 ; Harvest Date = August 22 ; Previous Crop = Field Pea

[1] Denotes 'yellow' seeded varieties.

** All varieties were planted at adjusted seeding rates to attain the planting of 3.2 million PLS/acre

[2] The standard 'Carter' treatment required 49.2 lbs/acre of seed to attain the target trial plant population.

[3] The 'Carter @ 50% SR' was planted at 24.6 lbs/acre and 'Carter @ 150% SR planted at 73.8 lbs/acre.

Flax - Organic **Carrington**

Variety	Days to Bloom	Days to PM	Plant Lodge	Plant Height	Test Weight	Seed Yield 2017	Seed Yield 2-yr. Avg.
			0-9	inch	lb/bu	bu/ac	bu/ac
Omega	50.3	92.5	0.5	28.3	49.2	14.2	10.3
Carter	50.3	92.8	0.0	27.5	49.9	15.1	12.2
Gold ND	52.3	94.8	0.5	30.4	50.3	15.4	11.8
Pembina	50.3	92.8	0.5	28.8	48.9	13.1	10.8
York	52.0	96.0	0.8	26.7	49.9	13.9	11.1
Neela	51.0	92.8	0.5	28.1	49.6	15.9	--
Prairie Thunder	48.3	91.0	0.5	26.7	46.9	11.3	10.5
CDC Melyn	54.8	92.8	0.3	28.2	49.7	11.7	--
Shape	50.3	94.0	0.3	27.6	49.1	15.6	--
Webster	51.0	92.5	0.3	29.0	49.4	15.1	--
Prairie Blue	47.5	89.3	0.3	25.3	46.4	12.0	--
CDC Plava	51.8	88.3	0.8	25.3	49.3	14.2	--
Mean	50.8	92.4	0.4	27.7	49.0	14.0	--
C.V. (%)	3.4	1.0	146.0	4.6	3.0	20.6	--
LSD 0.10	2.1	1.1	0.7	1.5	1.8	3.4	--
LSD 0.05	2.5	1.3	NS	1.8	2.1	4.1	--

Planting Date = May 11; Harvest Date = August 30; Previous Crop = Cover Crop Oats (terminated hail-damaged oats)

Flax harvest management trial, harvest completed August 22, 2017.

Variety	Oil Type	Days to Bloom	Bloom Duration	Days to PM	Plant Height	1000 KWT	Oil Content	Test Weight	----- Seed Yield ----- 2017	3-yr. Avg.
					inch	gram	%	lb/bu	--------- lb/ac	--------
Cardinal	Linoleic	80.3	18.3	122.3	32.0	34.2	35.9	44.4	2977	1815
Finch	Oleic	79.3	20.0	128.3	30.3	31.0	33.9	44.4	2756	1675
Hybrid 200	Oleic	77.7	21.3	118.7	26.2	40.1	29.8	40.8	2740	1940
Hybrid 446	Oleic	77.3	21.3	123.3	29.3	41.3	28.8	43.2	3339	--
Hybrid 1601	Oleic	78.0	21.0	127.0	28.2	39.5	34.1	40.7	3395	2516
MonDak	Oleic	79.0	19.0	121.7	30.3	34.6	32.9	41.8	3398	2173
Montola 2003	Oleic	80.7	19.7	124.0	29.4	27.6	34.5	41.6	3220	1992
NutraSaff	Linoleic	80.0	19.0	127.0	28.9	27.9	46.1	37.9	2533	1329
MEAN		79.0	20.0	124.0	29.3	34.5	34.5	41.8	3045.0	--
C.V. (%)		1.0	2.9	0.9	7.2	4.9	1.4	1.6	9.2	--
LSD 0.10		1.1	0.8	1.5	NS	2.1	0.6	0.8	402	--
LSD 0.05		1.3	1.0	1.9	NS	2.5	0.7	1.0	490	--

Planting Date = May 3 ; Harvest Date = September 11 ; Previous Crop = Soybean

There was no plant lodging to record in this trial.

Lentil variety trial.

Einkorn - Organic **Carrington**

PI #		Days to Heading	Plant Height	Plant Lodging	Grain Yield 2017	Grain Yield 2-yr. Avg.
			inch	0-9	lb/ac	lb/ac
PI	94743	60.8	33.6	2.0	1656.9	1760.2
PI	119422	60.0	33.6	0.8	1294.6	1580.8
PI	119423	59.8	36.3	2.5	1764.9	1890.8
PI	167526	61.5	37.7	2.8	1490.5	1688.1
PI	170196	62.5	38.7	0.0	1791.5	1780.9
PI	191381	63.0	37.1	1.8	1679.9	1851.6
PI	237659	59.3	35.7	0.5	1782.9	1882.9
PI	254195	61.8	40.0	3.5	1860.7	1821.9
PI	326317	62.5	36.7	1.5	1941.3	1918.4
PI	428149	58.0	34.7	1.0	1920.0	1901.7
PI	428150	66.0	38.8	0.0	1576.5	1807.0
PI	428155	62.8	36.9	0.5	1704.2	1808.0
PI	428156	67.0	39.6	0.0	1392.7	1501.9
PI	428158	59.0	39.1	1.3	1652.4	1644.0
PI	428163	61.5	35.9	1.8	1954.3	1998.4
PI	428164	61.0	33.3	0.8	1833.0	1926.0
PI	428171	59.8	38.8	1.5	1893.6	1777.6
PI	428172	63.5	36.3	1.3	1643.7	1653.8
PI	428173	62.0	36.5	1.0	1675.0	1790.8
	TM23	59.5	34.7	0.8	1648.4	1845.7
Mean		61.6	36.7	1.3	1707.9	--
C.V. (%)		1.8	5.1	52.9	20.0	--
LSD 0.10		1.3	2.2	0.8	401.5	--
LSD 0.05		1.5	2.7	0.9	480.9	--

Planting Date = May 2; Harvest Date = August 11; Previous Crop = Crimson Clover Cover Crop

Winter Rye **Carrington**

Variety	Vigor	Winter Survival	Jday of Head	Early Height	Plant Height	Plant Lodge	1000 KWT	Seed Protein	Test Weight	Grain Yield 2017	Grain Yield 3-yr. Avg.
	1-10	%		inch	inch	0-9	gram	%	lb/bu	bu/ac	bu/ac
Hancock	4.0	86.3	152.0	7.9	41.2	1.3	32.4	14.3	56.0	75.8	50.0
Spooner	2.3	82.5	151.3	6.7	41.5	1.5	31.6	14.9	55.1	69.1	45.1
Rymin	5.8	92.5	154.0	6.0	38.6	0.5	34.4	12.2	56.7	88.8	55.3
ND Dylan	9.3	96.3	153.3	6.5	43.3	2.5	28.1	12.9	55.0	86.8	60.8
Dacold	7.8	96.3	158.3	7.1	42.7	1.5	26.5	13.6	52.9	74.7	55.2
Aroostok	4.3	86.3	148.3	8.2	42.5	1.3	25.3	16.7	54.5	53.5	35.7
Hazlet	5.5	93.8	154.3	6.5	38.1	0.3	34.9	12.2	56.2	75.6	58.6
Wheeler	2.0	68.8	158.0	5.0	46.1	1.5	36.6	18.8	49.4	18.1	27.5
Brasetto	8.0	98.8	153.8	5.9	36.0	0.0	32.0	11.0	54.4	109.6	--
Mean	6.2	90.6	152.5	7.0	41.8	1.4	30.6	14.2	54.6	72.2	--
C.V. (%)	18.8	6.7	0.5	11.0	6.1	42.6	4.0	3.0	0.9	9.3	--
LSD 0.05	1.7	8.8	1.0	1.1	3.7	0.9	1.7	0.6	0.7	9.6	--
LSD 0.10	1.4	7.3	0.9	0.9	3.1	0.7	1.5	0.5	0.6	8.0	--

Planting Date = September 19, 2016; Harvest Date = July 25; Previous Crop = Flax

Vigor: 1 = worst and 10 = best

Winter Rye **Wishek**

Variety	Jday of Head	Plant Height	Plant Lodge	1000 KWT	Seed Protein	Test Weight	Grain Yield
		inch	0-9	gram	%	lb/bu	bu/ac
Hancock	149.8	48.1	1.3	30.3	12.2	55.3	21.4
Spooner	150.0	47.2	2.0	29.9	13.0	55.5	17.2
Rymin	153.3	46.9	1.0	32.1	10.9	55.4	26.8
ND Dylan	153.8	48.7	2.8	26.7	11.6	55.0	24.0
Dacold	154.3	49.2	1.5	26.9	12.2	53.6	19.6
Aroostok	148.8	47.5	2.8	25.1	14.4	55.6	14.9
Hazlet	152.3	45.4	0.3	32.5	10.7	56.4	24.6
Wheeler	148.0	54.0	1.0	35.5	16.1	54.1	13.6
Brasetto	152.3	37.0	0.8	26.9	10.3	54.3	33.4
Mean	150.4	47.5	1.7	28.9	12.4	55	22.7
C.V. (%)	1.3	6.9	32.1	4.3	3.5	0.9	18.3
LSD 0.10	2.3	3.9	0.7	1.5	0.5	0.6	5.0
LSD 0.05	2.8	4.7	0.8	1.8	0.6	0.7	6.0

Planting Date = September 21, 2016; Harvest Date = July 26; Previous Crop = Spring Wheat

Winter Rye - Dryland, Organic — Carrington

Variety	Vigor[1]	Winter Survival	Jday of Head	Early Height[2]	Plant Height[2]	Plant Lodge	1000 KWT	Seed Protein	Test Weight	Grain Yield 2017	Grain Yield 2-yr. Avg.
	1-10	%		inch	inch	0-9	gram	%	lb/bu	bu/ac	bu/ac
Hancock	4.8	75.0	145.3	18.2	55.9	2.8	30.1	9.7	55.7	71.0	63.0
Spooner	1.8	46.3	145.8	19.0	54.9	3.0	29.1	10.9	55.0	61.3	56.5
Rymin	7.5	81.3	148.0	16.4	52.8	0.3	35.3	9.5	56.3	83.8	67.8
ND Dylan	9.0	93.8	147.3	15.7	57.3	3.0	28.8	9.6	55.2	74.8	67.8
Dacold	6.8	82.5	152.8	15.8	57.8	3.0	29.0	9.8	53.8	72.7	67.7
Aroostok	4.5	66.3	138.5	23.2	56.3	3.8	25.2	13.0	53.9	45.8	40.6
Hazlet	8.0	92.5	147.5	16.2	53.3	0.3	35.0	8.7	56.4	79.1	72.8
Wheeler	9.3	91.3	148.0	16.8	63.5	0.0	35.9	16.8	51.6	23.7	27.2
Brasetto	8.5	93.8	147.0	15.1	46.3	0.3	30.9	7.5	54.7	82.4	--
Mean	7.2	82.3	145.1	18.3	56.3	2.1	29.9	10.6	54.6	64.2	--
C.V. (%)	14.1	9.9	0.4	9.6	4.9	33.8	7.8	8.9	0.7	12.8	--
LSD 0.10	1.2	9.8	0.7	2.1	3.3	0.8	2.8	1.1	0.4	9.9	--
LSD 0.05	1.5	11.8	0.9	2.5	4.0	1.0	3.4	1.4	0.5	11.9	--

Planting Date = September 19, 2016; Harvest Date = July 20; Previous Crop = Hail-damaged Dry Beans

[1] Vigor rating taken April 28: 1 = worst; 10 = best

[2] Early height taken May 9 and plant height taken at harvest.

Winter Triticale — Carrington

Variety	Heading Date	Plant Height	Lodge	Test Weight	Kernal Weight	Grain Yield 2017	Grain Yield 2-yr. Avg.
	date	in.	0-9	lb/bu	g/1000	bu/ac	bu/ac
NT05421	6/6	35.4	2.3	56.3	11.34	71.1	53.7
NE441T	6/9	37.2	2.0	55.6	11.46	75.5	--
NT01451	6/6	32.2	1.5	55.8	10.17	66.0	50.2
NT13483	6/6	40.1	2.8	55.8	11.99	65.6	--
NT11406	6/6	30.1	1.5	57.5	10.68	73.6	54.2
NT09423	6/7	31.4	1.3	57.8	10.74	72.5	53.1
NT07403	6/2	29.8	1.3	57.5	10.49	59.5	46.0
NT06422	6/5	33.6	1.8	53.6	9.99	65.5	47.3
NT426GT	6/6	32.4	2.5	56.3	10.81	65.6	51.9
NT11428	6/7	35.6	2.3	56.2	10.76	75.4	55.2
NT13416	6/6	32.5	2.5	56.4	10.96	68.9	--
NE422T	6/10	35.8	2.0	55.3	12.06	64.7	52.8
Mean	6/6	33.8	1.9	56.2	10.90	68.7	--
C.V. (%)	0.5	8.4	30.0	0.8	4.30	11.5	--
LSD (0.05)	1.0	4.1	0.8	0.7	0.68	11.4	--
LSD (0.10)	1.0	3.4	0.7	0.6	0.57	9.5	--

Planting Date = September 19, 2016; Harvest Date = July 26; Previous Crop = Flax

Variety	Heading Date	Plant Height	Lodge	Test Weight	Grain Yield 2017	Grain Yield 2-yr. Avg.
		in.	0-9	lb/bu	bu/ac	
NT05421	5/29	36.8	0.5	53.3	36.0	51.9
NE441T	6/1	38.4	0.8	53.5	24.8	--
NT01451	6/1	31.0	0.3	52.7	34.4	53.7
NT13483	5/29	38.3	1.0	53.8	31.9	--
NT11406	5/30	33.4	0.3	54.8	36.3	54.2
NT09423	5/30	33.4	0.5	55.0	32.6	53.7
NT07403	5/29	34.4	0.5	54.1	33.3	54.3
NT06422	5/29	35.5	0.8	50.6	34.3	54.1
NT426GT	5/29	33.8	0.8	53.6	36.7	53.6
NT11428	5/29	36.0	0.8	54.1	32.2	53.6
NT13416	5/29	37.1	1.0	54.4	44.6	--
NE422T	6/2	39.1	1.0	54.8	25.7	44.9
Mean	5/30	35.6	0.7	53.7	33.6	--
C.V. (%)	1.0	4.8	70.7	0.8	15.3	--
LSD (0.05)	2	2.4	0.7	0.6	7.4	--
LSD (0.10)	2	2.0	0.6	0.5	6.1	--

Planting Date = September 21, 2016; Harvest Date = July 26; Previous Crop = Spring Wheat

Field pea variety trial.

Brand	Variety	Mat. Group[1]	Days to PM[2]	Pod Ht	Plant Ht	Plant Lodge	Seeds/ pound	Seed Oil	Seed Protein	Test Weight	Seed Yield 2017	Seed Yield 2-yr. Avg.	Seed Yield 3-yr. Avg.
				inch	inch	0 to 9		%	%	lb/bu	bu/ac	bu/ac	bu/ac
NDSU	Ashtabula	0.4	121.0	2.2	23.4	0.0	3105	19.6	34.5	56.5	48.4	55.4	51.4
NDSU	Sheyenne	0.7	125.0	2.8	24.6	0.0	3251	18.7	34.5	57.6	57.1	60.3	56.0
NDSU	ND Benson	0.4	122.0	2.8	21.2	0.0	3224	18.1	37.6	57.8	47.3	51.5	48.2
NDSU	ND Bison	0.7	130.3	2.2	23.6	0.0	3078	18.5	35.0	57.4	56.0	--	--
NDSU	ND Henson	0.0	118.5	1.8	19.9	0.0	3277	19.0	35.1	57.9	40.9	46.7	44.6
NDSU	ND Stutsman	0.7	124.0	2.9	26.5	0.0	3194	18.9	34.1	57.8	62.2	64.3	58.6
Richland IFC	MK0249	0.2	124.0	2.2	23.1	0.0	4890	18.5	33.3	57.5	45.4	50.7	47.9
Richland IFC	MK0603	0.6	129.5	2.8	27.8	0.0	5619	16.6	36.3	57.2	44.2	47.5	46.0
Richland IFC	MK0508	0.5	130.0	2.5	25.0	0.3	5699	17.5	35.4	58.5	41.6	47.6	44.2
Richland IFC	MK808CN	0.8	128.3	2.8	28.6	0.0	3471	19.3	34.5	57.8	55.8	56.9	--
NDSU	ND Stutsman @ 150K		126.8	2.8	25.8	0.0	3169	19.0	34.1	57.5	59.3	--	--
	MEAN		123.3	2.4	23.9	0.1	3365	18.6	35.1	57.2	50.3	--	--
	C.V. (%)		2.1	29.2	13.6	446	4.4	1.5	1.8	0.4	11.6	--	--
	LSD 0.10		3.1	0.8	3.8	NS	176	0.3	0.8	0.27	6.9	--	--
	LSD 0.05		3.7	1.0	4.6	NS	210	0.4	0.9	0.33	8.2	--	--

Planting Date = May 12 ; Harvest Date = October 6 ; Previous Crop = Durum

[1] Maturity group based on data provided by seed company.

[2] Days to PM: average of 123 = September 12.

Soybean - Dryland, Liberty Link Varieties **Carrington**

Brand	Variety	Mat. Group[1]	Days to PM[2]	Pod Ht	Plant Ht	Seed Oil	Seed Protein	Seeds/ pound	Test Weight	Seed Yield 2017	Seed Yield 2-yr. Avg.	Seed Yield 3-yr. Avg.
				inch	inch	%	%		lb/bu	bu/ac	bu/ac	bu/ac
Nutech	3066L	0.6	125.3	2.8	22.1	18.4	37.1	2613.3	57.0	50.1	54.4	55.3
Nutech	2086L	0.8	127.8	3.0	20.1	18.0	36.5	2864.2	57.4	44.0	50.7	49.9
Integra	30208N	0.2	117.3	2.1	21.6	18.6	35.5	2528.2	57.0	48.1	--	--
Integra	30607N	0.6	121.5	3.1	23.1	18.3	36.9	2548.8	56.8	56.7	--	--
Credenz	CZ 0201 LL	0.2	117.0	2.6	22.6	18.5	36.0	2519.9	57.2	44.8	45.0	--
Credenz	CZ 0301 LL	0.3	122.0	3.3	23.0	19.5	34.7	2588.7	56.3	52.6	55.2	--
Credenz	CZ0448 LL	0.4	118.0	3.0	20.3	19.2	36.2	2526.6	56.0	49.0	--	--
Credenz	CZ 0525 LL	0.5	123.0	3.3	21.5	18.0	37.5	2616.6	56.9	48.5	54.3	--
Credenz	CZ 0601 LL	0.6	121.8	2.8	20.4	17.3	34.7	2523.8	57.8	44.9	52.4	--
Peterson Farm S	L04-16	0.4	120.5	2.8	21.9	19.1	36.5	2415.2	56.2	41.4	--	--
Peterson Farm S	L03-18	0.3	119.3	2.6	21.9	19.2	36.0	2470.1	56.0	44.8	--	--
Credenz	CZ 0525 LL @ 150K		124.3	3.3	23.4	18.3	36.8	2559.9	56.8	53.8	--	--
	MEAN		121.5	2.9	21.8	18.5	36.2	2565	56.8	48.2	--	--
	C.V. (%)		1.0	27.3	9.6	1.1	0.8	4.8	0.3	11.9	--	--
	LSD 0.10		1.5	NS	NS	0.25	0.37	148	0.2	6.9	--	--
	LSD 0.05		1.8	NS	NS	0.31	0.44	178	0.3	8.2	--	--

Planting Date = May 15 ; Harvest Date = October 4 ; Previous Crop = Durum

** Plant lodging scores were taken, however no degree of lodging was observed.

[1] Maturity group based on data provided by seed company.

[2] Days to PM: average of 122 = September 14.

Brand	Variety	Mat. Group[1]	Days to PM[2]	Pod Ht	Plant Ht	Plant Ldg	Seeds/ pound	Seed Oil[3]	Seed Protein[3]	Test Weight	--- Seed Yield --- 2017	3-yr. Avg.
				inch	inch	0 to 9		%	%	lb/bu	------ bu/ac ------	
Channel	0218R2X	0.2	120.0	4.3	32.9	0.3	2752	19.0	35.4	56.8	57.1	--
Channel	0317R2X	0.3	121.3	5.0	25.4	1.0	3172	18.3	36.0	57.1	61.5	--
Channel	0518R2X	0.5	125.3	7.7	30.8	1.5	3109	17.7	37.0	57.0	57.6	--
Channel	0616R2X	0.6	124.0	5.6	28.4	1.3	3032	16.7	36.3	57.1	61.8	--
Dairyland Seed	DSR-C918/R2Y	00.9	119.0	4.5	26.0	0.8	3263	17.4	37.1	56.7	58.4	44.4
Dairyland Seed	DST-00-003/R2Y	0.0	119.5	4.3	26.8	0.3	2731	19.2	34.7	56.0	61.7	--
Dairyland Seed	DSR-0225/R2Y	0.2	117.0	5.1	30.1	0.5	3368	19.3	35.5	56.8	58.4	--
Dairyland Seed	DSR-0418/R2Y	0.4	124.3	7.5	31.1	0.8	2807	17.5	37.2	57.7	58.5	--
Dyna-Gro	S03RY36	0.3	121.3	4.8	24.1	0.0	2658	17.8	37.6	57.4	62.5	49.1
Dyna-Gro	S04XT77	0.4	121.8	5.7	27.6	1.0	3217	18.5	36.1	56.8	62.3	--
Dyna-Gro	S05XT88	0.5	123.0	5.6	25.9	0.5	3224	18.3	37.1	56.0	56.3	--
Hefty	H02X7	0.2	120.8	6.7	34.0	1.0	2969	18.0	35.4	57.3	52.3	--
Hefty	H03X7	0.3	121.0	5.1	24.4	0.8	3201	18.5	36.0	56.7	57.7	--
Hefty	H05X7	0.5	124.8	6.2	27.6	1.8	3644	17.6	36.3	57.2	52.6	--
Integra	20215	00.9	118.3	5.1	24.3	0.0	3130	17.3	36.9	56.9	58.8	46.8
Integra	20300	0.3	121.0	5.6	25.6	0.0	3293	17.8	36.5	56.6	54.4	49.9
Integra	50319N Xtends	0.3	124.3	7.1	32.9	0.3	2750	18.0	34.9	57.5	56.9	--
Integra	50629N Xtends	0.6	125.8	6.5	30.9	1.5	3299	17.8	36.1	57.4	55.9	--
Legacy Seeds	LS-0337N RR2X	0.3	122.3	6.2	27.6	1.3	3144	18.3	36.2	57.0	62.7	--
Legacy Seeds	LS-0334 RR2	0.3	124.3	5.1	27.5	0.5	3456	17.8	37.3	57.2	58.2	53.0
Legacy Seeds	LS 0438 RR2	0.4	124.5	6.5	30.0	0.8	3253	17.9	37.3	56.7	60.1	--
Legacy Seeds	LS-0635N RR2	0.6	125.5	7.9	28.4	0.5	3168	17.4	37.8	57.2	55.2	45.8
Legacy Seeds	LS-0638N RR2X	0.6	126.0	5.5	30.8	1.0	3487	17.8	35.4	57.1	57.3	--
Legacy Seeds	LS-0738N RR2X	0.7	126.3	6.1	29.9	0.3	3495	17.8	36.4	57.1	55.8	--
Legacy Seeds	LS-0836N RR2X	0.8	126.5	7.4	34.2	1.3	3293	17.5	37.1	57.2	53.9	--
Legacy Seeds	LS-0935N RR2	0.9	125.8	6.8	28.2	0.5	2973	17.7	35.9	57.2	58.8	--
Legend	LS 009X852N	00.9	117.5	4.1	27.8	0.3	2940	19.2	34.6	57.3	53.3	--
Legend	LS 01X850	0.1	118.8	4.9	32.8	1.0	3440	17.4	35.3	57.8	57.5	--
Legend	LS 03R22	0.3	122.8	6.5	28.3	0.0	3270	18.1	35.9	56.3	58.6	--
Legend	LS 04X765N	0.4	122.5	4.3	24.7	0.8	3169	18.7	35.4	56.5	54.0	--
Legend	LS 06X860N	0.6	125.5	5.3	26.6	1.3	3312	18.4	35.6	57.4	59.3	--
Legend	LS 07X852N	0.7	126.3	7.3	32.4	1.0	3633	17.7	35.6	57.1	55.9	--
NDSU	ND17009GT		116.7	3.9	23.8	0.0	3129	18.5	36.5	57.9	49.2	--
Northstar	NS 60393NXR2	0.3	123.3	7.9	31.9	0.5	2800	18.3	34.8	56.9	59.0	--
Northstar	NS 0480NR2	0.4	123.8	6.9	29.7	1.0	3278	17.7	37.1	56.8	61.7	50.1
Northstar	NS 60442NXR2	0.4	120.3	5.4	25.4	0.5	3233	18.7	35.3	56.7	54.9	--
Northstar	NS 60513NXR2	0.5	124.8	5.3	28.1	1.0	3313	18.2	36.9	56.6	62.8	--
	MEAN		122.7	5.9	28.5	0.8		18.1	36.2	57.0	57.1	--
	C.V. (%)		1.0	25.3	11.8	84.8		1.6	1.4	0.7	9.4	--
	LSD 0.10		1.4	1.7	3.9	0.7		0.30	0.6	0.5	6.2	--
	LSD 0.05		1.7	2.1	4.7	0.9		0.40	0.7	0.6	7.4	--

Planting Date = May 12 ; Harvest Date = September 29 ; Previous Crop = Durum

Brand	Variety	Mat. Group[1]	Days to PM[2]	Pod Ht	Plant Ht	Plant Ldg	Seeds/ pound	Seed Oil[3]	Seed Protein[3]	Test Weight	--- Seed Yield --- 2017	3-yr. Avg.
				inch	inch	0 to 9		%	%	lb/bu	------ bu/ac ------	
Northstar	NS 0651NR2	0.6	124.8	7.2	30.3	1.3	3084	17.6	37.2	57.0	59.5	--
Nutech	6048	0.4	120.5	6.5	34.0	1.3	2907	17.9	37.0	57.3	59.6	--
Nutech	6097R2	0.9	123.3	5.9	26.9	1.0	2698	19.8	33.8	56.6	69.0	51.8
Peterson Farm Seed	17X04N	0.4	121.3	5.8	25.1	1.3	3451	18.4	36.0	56.6	57.3	--
Peterson Farm Seed	18X06N	0.6	123.8	5.8	28.1	0.5	3318	17.7	37.4	56.8	55.9	--
Prairie Brand	PB-0578R2	0.5	124.5	7.3	29.5	0.5	3041	17.3	37.7	57.7	55.2	--
Prairie Brand	PB-0777R2	0.7	126.8	6.4	30.8	0.5	3142	17.5	37.1	57.3	59.0	--
Prairie Brand	PB-0987R2	0.9	126.8	9.1	32.9	1.5	3577	17.2	37.0	57.4	59.1	--
Proseed	XT604	0.4	120.8	5.3	24.5	1.0	3251	18.6	35.8	56.8	58.7	--
Proseed	40-50N	0.5	123.0	7.1	26.2	0.8	3175	17.9	37.0	57.0	59.0	--
Proseed	50-60N	0.6	123.8	6.1	26.8	0.8	3049	17.9	36.9	57.1	58.6	--
REA	RX0228	0.2	120.3	5.0	33.9	0.8	2698	18.8	35.6	56.9	55.3	--
REA	RX0327	0.3	120.8	5.7	25.6	1.3	3396	18.6	35.9	56.5	52.5	--
REA	RX0628	0.6	124.3	6.1	28.9	0.5	3398	18.1	36.1	56.7	51.3	--
Thunder Seed	SB8703	0.3	120.8	6.7	33.7	0.5	2960	18.1	35.5	57.1	61.2	--
Thunder Seed	SB8805N	0.5	124.8	5.2	29.3	1.0	3194	18.2	36.9	56.3	60.2	--
Wensman	W1011RX	0.1	121.0	6.0	29.5	0.8	2991	19.1	35.0	57.2	47.6	--
Wensman	W1039NRX	0.3	122.8	4.6	28.0	0.0	2469	17.9	34.7	57.3	57.1	--
Wensman	W1048NRX	0.4	121.5	6.5	26.0	1.0	3136	18.5	35.8	56.6	61.4	--
Wensman	W1050NRX	0.5	125.3	6.1	30.1	1.0	3171	18.1	37.1	56.7	62.4	--
	MEAN		122.7	5.9	28.5	0.8	3164	18.1	36.2	57.0	57.1	--
	C.V. (%)		1.0	25.3	11.8	84.8	5.6	1.6	1.4	0.7	9.4	--
	LSD 0.10		1.4	1.7	3.9	0.7	207	0.30	0.6	0.5	6.2	--
	LSD 0.05		1.7	2.1	4.7	0.9	246	0.40	0.7	0.6	7.4	--

Planting Date = May 12 ; Harvest Date = September 29 ; Previous Crop = Durum

[1] Maturity group based on data provided by seed company.

[2] Days to PM: average of 123 = September 12.

[3] Seed oil and protein contents reported at 13% moisture.

Soybean - Irrigated, Conventional and Liberty Link Varieties — Carrington

Brand	Variety	Mat. Group[1]	Days to PM	Pod Ht	Plant Ht	Plant Lodge	Seeds/ pound	Seed Oil	Seed Protein	Test Weight	--- Seed Yield ---- 2017	3-yr. Avg.
				inch	inch	0 to 9		%	%	lb/bu	------- bu/ac --------	
NDSU	Ashtabula	0.4	118.5	1.7	34.1	0.3	3474	18.7	34.7	58.0	55.3	43.2
NDSU	Sheyenne	0.7	123.3	2.9	39.7	0.5	3349	17.6	35.4	59.0	53.9	46.0
NDSU	ND Benson	0.4	120.3	2.6	32.8	0.5	3536	17.4	37.5	58.8	55.6	45.2
NDSU	ND Bison	0.7	124.0	3.1	34.4	0.0	3105	17.4	35.7	58.9	57.3	44.3
NDSU	ND Henson	0.0	112.3	2.2	30.3	1.0	3408	18.1	35.8	59.4	54.8	41.5
NDSU	ND Stutsman	0.7	124.0	2.8	38.7	0.8	3459	17.7	35.3	59.2	60.1	48.3
Liberty Link Cultivars												
Nutech	3066L	0.6	124.8	3.1	34.4	1.0	2950	17.3	37.3	58.6	60.8	--
Nutech	2086L	0.8	132.8	3.7	34.7	1.0	3171	16.4	37.7	59.3	58.3	--
	MEAN		120.6	2.6	34.7	0.6	3272	17.6	36	58.6	57.0	--
	C.V. (%)		1.3	31.3	7.5	105	5.8	1.5	1.3	0.5	7.3	--
	LSD 0.10		1.8	1.0	3.1	0.8	225	0.3	0.6	0.3	4.9	--
	LSD 0.05		2.2	1.1	3.7	0.9	268	0.4	0.7	0.4	5.9	--

Planting Date = May 22 ; Harvest Date = October 12; Previous Crop = Corn

[1] Maturity group based on data provided by seed company.

[2] Days to PM: average of 121 = September 20.

Soybean herbicide trait demonstration plot.

Soybean - Irrigated, Roundup Ready Varieties **Carrington**

Brand	Variety	Mat. Group[1]	Days to PM[2]	Pod Ht	Plant Ht	Plant Lodge	Seeds/ pound	Seed Oil	Seed Protein	Test Weight	Seed Yield 2017	Seed Yield 2-yr. Avg.	Seed Yield 3-yr. Avg.
				inch	inch	0 to 9		%	%	lb/bu	bu/ac	bu/ac	bu/ac
Dairyland Seed	DSR-C918/R2Y	00.9	114.5	1.6	27.8	0.3	3295	17.0	37.2	57.4	59.4	--	--
Dairyland Seed	DST-00-003/R2Y	0.0	116.5	2.6	32.7	0.3	2587	18.2	35.5	56.7	61.5	--	--
Dairyland Seed	DSR-0225/R2Y	0.2	114.8	2.6	38.9	1.8	3247	18.6	35.4	57.7	62.1	--	--
Dairyland Seed	DSR-0418/R2Y	0.4	125.5	2.8	36.8	0.5	2738	17.1	37.7	58.3	61.0	--	--
Dyna-Gro	S03RY36	0.3	119.0	3.0	32.9	0.5	2576	17.4	37.1	57.8	66.5	61.0	56.7
Dyna-Gro	S04XT77	0.4	118.0	2.2	33.6	0.8	2924	17.8	36.3	57.6	63.6	59.1	--
Dyna-Gro	S05XT88	0.5	124.3	2.0	34.6	1.0	2864	17.6	36.9	57.1	63.2	--	--
Integra	20300	0.3	121.3	3.2	35.6	0.0	3256	17.1	36.9	57.7	64.0	--	--
Integra	50629N Xtends	0.6	127.5	2.6	37.4	1.3	3178	17.4	35.5	57.7	63.0	--	--
Integra	20617N	0.7	125.8	2.8	35.2	1.0	2816	16.8	38.1	57.7	59.3	--	--
Legacy Seeds	LS-0337N RR2X	0.3	118.5	2.8	35.0	1.0	2994	17.6	36.4	57.5	63.5	--	--
Legacy Seeds	LS-0334 RR2	0.3	127.5	3.5	38.0	1.3	3174	17.2	37.1	58.1	66.8	69.3	61.5
Legacy Seeds	LS 0438 RR2	0.4	123.5	2.2	34.4	0.8	3053	17.8	36.9	57.1	65.8	--	--
Legacy Seeds	LS-0635N RR2	0.6	124.3	3.3	34.4	1.0	2879	16.8	38.1	58.0	63.6	55.1	53.5
Legacy Seeds	LS-0638N RR2X	0.6	128.0	3.1	39.0	1.5	3088	17.1	35.7	57.8	60.0	--	--
Legacy Seeds	LS-0738N RR2X	0.7	128.8	2.6	36.8	1.3	2938	16.8	37.1	57.4	64.8	--	--
Legacy Seeds	LS-0836N RR2X	0.8	129.5	3.5	38.1	0.8	2785	17.2	36.9	57.5	64.4	--	--
Legacy Seeds	LS-0935N RR2	0.9	133.3	3.3	38.6	1.3	2640	16.8	36.2	58.0	67.4	66.7	--
Nutech	6048	0.4	120.0	3.0	39.6	0.5	2815	17.4	37.4	58.3	59.3	--	--
Nutech	6097R2	0.9	126.5	2.6	32.1	0.3	2656	19.6	33.5	57.8	69.7	61.1	57.7
Peterson Farm Seed	17X04N	0.4	118.5	1.8	33.5	0.8	2960	17.7	36.3	57.4	63.4	60.2	--
Peterson Farm Seed	18X06N	0.6	123.8	2.6	35.5	0.3	3029	17.2	37.3	57.8	63.9	--	--
Prairie Brand	PB-0578R2	0.5	127.0	3.5	37.2	0.5	2651	16.9	38.3	58.3	59.9	--	--
Prairie Brand	PB-0777R2	0.7	129.8	2.9	38.2	1.0	2816	17.0	37.0	57.9	65.6	--	--
Prairie Brand	PB-0987R2	0.9	132.5	3.7	39.4	1.3	3111	17.2	36.0	57.8	67.1	67.2	--
Proseed	40-50N	0.5	121.5	3.9	36.2	0.5	3077	17.5	37.0	57.8	62.3	--	--
Proseed	50-60N	0.6	125.5	3.3	35.2	1.0	3069	17.0	37.8	57.6	56.2	--	--
Proseed	30-80	0.8	131.0	3.3	38.2	1.3	2856	17.2	36.5	57.7	63.3	--	--
REA	RX0228	0.2	118.5	3.1	41.5	0.5	2794	18.1	35.8	58.0	58.8	--	--
REA	RX0327	0.3	118.8	2.3	33.2	0.5	2887	17.8	36.4	57.6	65.0	--	--
REA	RX0628	0.6	126.5	3.1	39.4	0.8	3032	17.8	36.2	56.8	62.7	--	--
Wensman	W1039NRX	0.3	124.5	3.5	40.2	1.5	2618	17.3	35.2	58.1	58.8	--	--
Wensman	W1050NRX	0.5	126.3	2.4	34.6	1.5	2955	17.4	37.0	57.4	67.2	--	--
Wensman	W1074NRX	0.7	128.3	2.4	39.7	1.5	3088	17.1	35.6	57.8	65.7	--	--
Wensman	W1086NRX	0.8	128.8	3.3	37.8	1.0	3095	16.6	37.9	58.1	63.4	--	--
	MEAN		124.0	2.8	36.1	0.9	2945	17.4	36.7	57.7	62.9	--	--
	C.V. (%)		1.3	19.2	5.6	62.3	4.0	1.3	0.8	0.5	4.9	--	--
	LSD 0.10		1.9	0.6	2.4	0.6	139	0.26	0.35	0.3	3.6	--	--
	LSD 0.05		2.3	0.8	2.8	0.8	166	0.31	0.42	0.4	4.4	--	--

Planting Date = May 22 ; Harvest Date = October 11; Previous Crop = Corn

[1] Maturity group based on data provided by seed company.

[2] Days to PM: average of 124 = September 23.

Soybean - Conventional Varieties **Barnes County - Dazey**

Brand	Variety	Mat. Group[1]	Days to PM[2]	Pod Ht	Plant Ht	Plant Lodge	Seeds/ pound	Seed Oil[3]	Seed Protein[3]	Test Weight	Seed Yield 2017	Seed Yield 2-yr. Avg.	Seed Yield 3-yr. Avg.
				inch	inch	0 to 9		%	%	lb/bu	bu/ac	bu/ac	bu/ac
NDSU	Ashtabula	0.4	113.5	3.0	30.7	0.0	3551	18.3	35.8	57.3	52.3	56.2	53.2
NDSU	Sheyenne	0.7	115.0	4.3	33.1	0.0	3774	17.8	35.8	57.8	56.1	59.7	57.1
NDSU	ND Benson	0.4	114.0	3.3	30.7	0.0	3524	17.3	38.1	58.0	56.4	57.6	53.3
NDSU	ND Bison	0.7	115.5	3.0	31.5	0.0	3511	17.6	36.4	58.1	61.1	64.3	57.8
NDSU	ND Henson	0.0	110.8	3.5	30.9	0.0	3577	17.6	36.3	58.4	54.2	56.6	52.6
NDSU	ND Stutsman	0.7	115.5	5.1	36.0	0.0	3964	17.7	36.0	58.2	63.4	66.4	61.0
Richland IFC	MK0249	0.2	112.8	3.0	28.9	0.0	5615	16.7	36.6	58.1	50.1	53.8	51.0
Richland IFC	MK0603	0.6	116.8	4.7	37.4	0.7	6425	14.1	40.3	58.4	44.3	49.1	47.5
Richland IFC	MK0508	0.5	115.0	3.7	33.3	0.3	6766	16.0	38.2	59.0	49.0	49.6	47.5
Richland IFC	MK808CN	0.8	117.3	3.7	34.6	0.3	3901	17.9	36.4	58.3	56.4	59.9	--
Richland IFC	MK42	Other Late	113.5	3.9	33.5	0.3	2818	16.0	39.9	58.1	58.4	60.6	55.3
Richland IFC	MK1016	Other Late	115.3	3.7	36.4	0.3	6765	15.6	38.9	58.9	47.1	50.2	49.0
Richland IFC	MK9101	Other Late	118.7	5.1	35.8	0.3	3030	--	--	58.1	48.5	52.5	49.4
Richland IFC	MK41	Other Late	117.3	3.9	33.7	0.0	3253	15.0	41.0	57.9	54.7	62.2	--
	MEAN		113.9	3.7	32.3	0.1	3823	17.2	37.0	57.7	54.9	--	--
	C.V. (%)		0.7	19.0	8.5	315	5.2	2.0	1.3	0.8	6.6	--	--
	LSD 0.10	1.664	0.9	0.8	3.2	NS	232	0.4	0.6	0.5	4.3	--	--
	LSD 0.05	1.987	1.1	1.0	3.9	NS	277	0.5	0.7	0.6	5.1	--	--

Planting Date = May 19 ; Harvest Date = October 10 ; Previous Crop = Spring Wheat

[1] Maturity group based on data provided by seed company.

[2] Days to PM: average of 114 = September 10.

[3] Seed oil and protein contents reported at 13% moisture.

Soybean - Liberty Link Varieties **Barnes County - Dazey**

Brand	Variety	Mat. Group[1]	Days to PM[2]	Pod Ht	Plant Ht	Plant Lodge	Seeds/ pound	Seed Oil	Seed Protein	Test Weight	--- Seed Yield --- 2017	2-yr. Avg.
				inch	inch	0 to 9		%	%	lb/bu	------ bu/ac ------	
Nutech	3066L	0.6	116.5	4.1	34.1	0.3	3067	17.5	37.9	57.4	57.5	65.1
Nutech	2086L	0.8	119.0	4.5	33.9	0.0	3223	16.9	38.0	58.2	55.4	61.3
Credenz	CZ 0201 LL	0.2	113.8	3.7	33.5	0.0	3054	18.2	35.4	57.5	53.3	57.1
Credenz	CZ 0301 LL	0.3	115.5	3.7	33.9	0.0	3066	18.4	35.4	56.8	58.4	64.1
Credenz	CZ0448 LL	0.4	113.5	3.0	29.3	0.0	2686	18.5	36.0	56.5	57.9	--
Credenz	CZ 0525 LL	0.5	115.8	4.1	32.3	0.3	3008	17.4	38.1	57.2	63.7	66.4
Credenz	CZ 0601 LL	0.6	116.5	3.9	33.9	0.0	2737	16.6	35.6	57.7	61.6	68.0
Credenz	CZ 1028 LL	1.0	119.5	4.5	35.6	0.3	2896	16.7	38.0	58.2	67.2	--
Credenz	CZ 0601 LL @150K	0.6	117.5	3.3	32.7	0.0	2986	16.5	36.4	57.9	51.5	--
	MEAN		116.4	3.9	33.2	0.1	2969	17.4	36.8	57.5	58.6	--
	C.V. (%)		1.0	14.0	6.3	342	4.0	1.4	1.6	0.8	6.4	--
	LSD 0.10		1.5	0.7	2.5	NS	145	0.3	0.7	0.5	4.5	--
	LSD 0.05		1.8	0.8	3.0	NS	175	0.4	0.9	0.6	5.4	--

Planting Date = May 19 ; Harvest Date = October 10 ; Previous Crop = Spring Wheat

[1] Maturity group based on data provided by seed company.

[2] Days to PM: average of 116 = September 12.

Soybean - Dryland, Roundup Ready Varieties **Barnes County - Dazey (Page 1 of 2)**

Brand	Variety	Mat. Group[1]	Days to PM[2]	Pod Ht	Plant Ht	Plant Lodge	Seeds/ pound	Seed Oil	Seed Protein	Test Weight	-------- Seed Yield -------- 2017	2-yr. Avg.	3-yr. Avg.
				inch	inch	0 to 9		%	%	lb/bu	---------- bu/ac ----------		
Channel	0518R2X	0.5	116.5	4.3	34.8	0.3	3423	16.6	38.2	57.0	58.7	--	--
Channel	0616R2X	0.6	116.0	3.5	32.3	0.0	3219	16.6	36.4	56.7	60.3	--	--
Channel	0916R2X	0.9	117.8	4.7	35.2	0.0	3711	16.7	38.4	56.7	59.2	--	--
Channel	1017R2X	1.0	118.0	4.3	35.0	0.0	3394	16.7	37.9	56.6	57.0	--	--
Dairyland Seed	DSR-0807/R2Y	0.8	116.8	4.7	36.2	0.0	3320	16.8	37.7	56.8	62.5	62.2	--
Dairyland Seed	DSR-0988/R2Y	0.9	118.8	4.3	38.2	0.0	3929	16.8	37.4	56.4	61.1	65.6	--
	MEAN		117.4	4.2	35.6	0.1	3558	17.0	37.5	56.7	59.1	--	--
	C.V. (%)		0.9	21.9	5.5	316	4.3	1.4	1.1	0.8	6.8	--	--
	LSD 0.10		1.2	1.1	2.3	0.3	176	0.3	0.5	0.5	4.7	--	--
	LSD 0.05		1.5	NS	2.8	0.3	215	0.3	0.6	0.6	5.6	--	--

Planting Date = May 19 ; Harvest Date = October 10 ; Previous Crop = Spring Wheat

Brand	Variety	Mat. Group[1]	Days to PM[2]	Pod Ht	Plant Ht	Plant Lodge	Seeds/ pound	Seed Oil	Seed Protein	Test Weight	Seed Yield 2017	Seed Yield 2-yr. Avg.	Seed Yield 3-yr. Avg.
				inch	inch	0 to 9		%	%	lb/bu	bu/ac	bu/ac	bu/ac
Dyna-Gro	S07RY45	0.7	116.8	3.9	33.7	0.0	3761	17.4	36.5	56.2	63.9	66.4	63.6
Dyna-Gro	S07XT28	0.7	116.8	5.3	35.0	0.0	3678	16.7	37.8	56.1	61.2	--	--
Dyna-Gro	S09XT67	0.9	119.0	3.9	35.8	0.0	3823	16.7	38.5	56.8	60.3	--	--
Integra	50629N Xtends	0.6	117.0	4.1	37.2	0.0	3555	17.0	36.5	56.3	56.4	--	--
Integra	20775N	0.7	117.0	3.1	35.0	0.0	3718	17.2	36.8	56.8	62.7	67.3	63.4
Legacy Seeds	LS-0638N RR2X	0.6	116.5	4.1	36.8	0.3	3595	17.0	36.8	56.2	60.6	--	--
Legacy Seeds	LS-0738N RR2X	0.7	117.0	3.9	35.6	0.0	3660	16.9	37.4	55.9	60.9	--	--
Legacy Seeds	LS-0836N RR2X	0.8	118.0	5.1	37.6	0.0	3548	16.6	38.4	56.7	56.2	--	--
Legacy Seeds	LS-0935N RR2	0.9	119.0	3.1	38.0	0.0	3301	17.0	37.0	56.9	61.2	66.2	62.9
Legacy Seeds	LS-1138N RR2X	1.1	121.0	4.5	33.7	0.0	3660	17.3	37.8	57.1	60.7	--	--
Legacy Seeds	LS-1134N RR2X	1.1	121.8	5.3	41.5	0.8	3811	17.2	37.9	57.4	51.9	57.3	--
Legacy Seeds	LS-1136N RR2	1.2	121.8	4.9	37.8	0.3	3767	16.9	38.1	56.8	56.5	--	--
Legacy Seeds	LS-1335N RR2	1.3	121.8	4.7	38.0	0.0	3688	17.3	37.8	57.0	57.8	65.4	--
NDSU	ND17009GT	00.9	111.0	3.5	32.7	0.0	3040	17.6	37.5	57.2	53.1	--	--
Nutech	6097R2	0.9	116.0	4.1	31.3	0.0	2937	18.9	34.8	56.7	60.3	61.3	59.0
Peterson Farm Se	18X06N	0.6	116.0	3.3	35.0	0.0	3606	17.0	38.2	56.3	58.3	--	--
Peterson Farm Se	18X07N	0.7	116.8	3.5	37.6	0.0	3738	16.9	36.9	56.4	55.7	--	--
Peterson Farm Se	18X08N	0.8	116.8	4.1	36.4	0.0	3578	16.6	38.0	56.7	63.2	--	--
Prairie Brand	PB-0578R2	0.5	116.0	4.7	34.1	0.0	3151	16.8	38.2	57.3	60.7	--	--
Prairie Brand	PB-0777R2	0.7	118.0	4.1	36.6	0.0	3370	17.0	37.6	57.0	64.4	68.6	64.6
Prairie Brand	PB-0987R2	0.9	117.5	4.3	35.0	0.0	3774	16.9	37.2	56.7	59.5	--	--
Proseed	40-50N	0.5	115.0	4.5	33.7	0.0	3545	17.2	37.4	56.3	59.5	--	--
Proseed	50-60N	0.6	116.0	3.5	33.3	0.0	3092	17.2	37.6	56.6	60.8	--	--
Proseed	30-80	0.8	116.8	4.5	37.6	0.3	3506	17.0	37.8	56.7	60.3	64.3	61.3
Proseed	XT609	0.9	118.0	4.5	34.1	0.0	3762	16.7	38.5	56.8	56.1	--	--
Proseed	XT610	1.0	119.0	4.7	35.0	0.3	3614	17.0	37.8	56.5	58.0	63.6	--
Wensman	W1050NRX	0.5	115.8	4.1	33.9	0.5	3673	17.2	38.3	56.5	58.9	--	--
Wensman	W1060NRX	0.6	117.0	3.5	34.4	0.0	3658	17.7	36.7	57.1	57.3	--	--
Wensman	W1074NRX	0.7	116.5	4.1	35.4	0.0	3820	16.7	37.0	56.1	53.1	--	--
Wensman	W1086NRX	0.8	117.8	4.3	37.0	0.3	3644	16.5	38.8	56.7	58.2	--	--
	MEAN		117.4	4.2	35.6	0.1	3558	17.0	37.5	56.7	59.1	--	--
	C.V. (%)		0.9	21.9	5.5	316	4.3	1.4	1.1	0.8	6.8	--	--
	LSD 0.10		1.2	1.1	2.3	0.3	176	0.3	0.5	0.5	4.7	--	--
	LSD 0.05		1.5	NS	2.8	0.3	215	0.3	0.6	0.6	5.6	--	--

Planting Date = May 19 ; Harvest Date = October 10 ; Previous Crop = Spring Wheat

[1] Maturity group based on data provided by seed company.

[2] Days to PM: average of 117 = September 9.

Soybean - Dryland, Conventional Varieties **Wishek**

Brand	Variety	Mat. Group[1]	Days to PM[2]	Pod Ht	Plant Ht	Plant Lodge	Seeds/ pound	Seed Oil[3]	Seed Protein[3]	Test Weight	Seed 2017	Seed 2-yr. Avg.
				inch	inch	0 to 9		%	%	lb/bu	bu/ac	bu/ac
Richland IFC	MK0603	0.6	118.8	4.1	30.3	0.3	5621	15.4	38.8	58.5	33.9	44.2
Richland IFC	MK0508	0.5	119.0	4.3	31.3	1.0	6231	16.2	38.2	59.4	35.1	44.9
Richland IFC	MK808CN	0.8	120.3	3.7	35.0	1.0	3701	18.2	36.4	58.9	49.1	52.6
Richland IFC	MK42		116.5	4.1	34.6	0.8	3055	15.5	41.0	58.4	45.4	50.6
Richland IFC	MK1016		117.3	3.3	35.4	0.8	6265	16.1	38.9	59.2	36.4	42.5
Richland IFC	MK9101		125.3	4.3	37.0	1.0	2794	na	na	58.9	40.1	45.1
Richland IFC	MK41		124.0	3.9	31.9	0.3	3192	15.6	40.0	59.6	43.5	50.0
NDSU	Ashtabula	0.4	115.0	3.0	27.4	0.0	3331	18.6	35.7	56.0	40.8	46.9
NDSU	Sheyenne	0.7	116.5	3.1	29.5	0.0	3514	17.6	36.2	57.5	46.0	44.7
NDSU	ND Benson	0.4	116.5	3.5	31.1	0.0	3949	17.3	38.7	58.6	40.7	45.1
NDSU	ND Bison	0.7	116.3	3.7	30.5	0.0	3493	17.2	36.9	58.7	44.2	49.6
NDSU	ND Henson	0.0	113.0	3.0	26.0	0.0	3747	17.9	36.5	57.4	40.6	48.8
NDSU	ND Stutsman	0.7	117.3	3.3	30.7	0.0	3713	17.8	35.9	57.7	47.7	56.5
	MEAN		117.8	3.6	31.5	0.4	4056	17.0	37.8	58.3	41.6	--
	C.V. (%)		1.2	18.5	8.1	123	5.1	2.0	1.6	0.7	11.3	--
	LSD 0.10		1.6	0.8	3.0	0.5	246	0.4	0.7	0.46	5.6	--
	LSD 0.05		2.0	1.0	3.6	0.7	296	0.5	0.9	0.55	6.7	--

Planting Date = May 18 ; Harvest Date = October 12 ; Previous Crop = Spring Wheat

[1] Maturity group based on data provided by seed company.

[2] Days to PM: average of 118 = September 13.

[3] Seed oil and protein contents reported at 13% moisture.

Soybean - Dryland, Liberty Link Varieties **Wishek**

Brand	Variety	Mat. Group[1]	Days to PM[2]	Pod Ht	Plant Ht	Seeds/ pound	Seed Oil	Seed Protein	Test Weight	----- Seed Yield ----- 2017	2-yr. Avg.
				inch	inch		%	%	lb/bu	-------- bu/ac --------	
Nutech	2086L	0.8	120.8	3.0	27.0	3886	16.7	38.5	59.1	33.7	47.9
Nutech	3103L	1.0	118.5	3.3	26.6	4069	16.8	38.8	58.5	30.0	--
Nutech	3115L	1.1	123.3	3.9	29.3	3647	15.7	39.1	59.6	27.2	46.7
Credenz	CZ 0601 LL	0.6	117.5	3.7	26.4	3425	16.3	37.0	58.9	34.3	--
Credenz	CZ 1028 LL	1.0	122.0	3.7	30.1	3442	16.6	37.5	59.5	38.0	--
Credenz	CZ 1201 LL	1.2	122.0	4.5	28.7	3613	15.6	39.7	59.7	31.0	--
	MEAN		120.7	3.7	28.0	3680	16.3	38.4	59.2	32.3	--
	C.V. (%)		1.0	23.0	6.8	7.5	1.6	1.0	0.8	7.8	--
	LSD 0.10		1.4	NS	2.3	342	0.3	0.5	0.6	3.7	--
	LSD 0.05		1.8	NS	NS	416	0.4	0.6	0.7	4.6	--

Planting Date = May 18 ; Harvest Date = October 12 ; Previous Crop = Spring Wheat

[1] Maturity group based on data provided by seed company.

[2] Days to PM: average of 121 = September 16.

Navy and black bean row spacing and plant population study.

Brand	Variety	Mat. Group[1]	Days to PM	Pod Ht	Plant Ht	Plant Lodge	Seeds/ pound	Seed Oil	Seed Protein	Test Weight	-- Seed Yield -- 2017	3-yr. Avg.
				inch	inch	0 to 9		%	%	lb/bu	----- bu/ac -----	
Channel	0916R2X	0.9	121.5	6.3	38.6	0.3	2970	16.5	38.8	57.7	53.7	--
Channel	1017R2X	1.0	119.0	5.7	35.2	0.0	3249	16.4	38.5	57.6	54.2	--
Channel	1117R2X	1.1	122.3	5.5	37.2	0.3	3203	16.8	38.8	58.1	57.1	--
Channel	1318R2X	1.3	116.8	5.1	34.3	0.0	3826	16.5	38.2	57.2	59.9	--
Integra	20775N	0.4	119.3	5.2	36.7	0.3	3261	16.7	38.2	57.2	55.8	48.5
Integra	50629N Xtends	0.6	119.0	4.9	38.2	0.5	3997	16.4	37.9	57.7	55.6	--
Integra	20617N	0.7	116.3	5.1	34.6	0.0	3290	16.8	38.8	56.7	59.6	--
Legacy Seeds	LS-0935N RR2	0.9	122.0	5.7	39.6	0.5	3776	16.7	37.3	57.8	60.4	54.6
Legacy Seeds	LS-1138N RR2X	1.1	124.3	5.3	37.0	0.5	3785	16.8	38.4	57.8	57.7	--
Legacy Seeds	LS-1134N RR2X	1.1	121.0	6.3	38.4	0.8	3722	16.6	39.2	58.0	51.3	49.2
Legacy Seeds	LS-1136N RR2	1.2	123.3	3.9	36.2	0.3	3653	16.0	39.5	58.1	47.6	--
Legacy Seeds	LS-1335N RR2	1.3	123.3	6.7	38.8	0.5	3442	17.1	38.2	57.8	57.7	--
Legacy Seeds	LS-1338N RR2X	1.3	124.8	5.1	37.0	0.5	3622	16.3	38.6	58.2	51.9	--
Nutech	6097R2	0.9	114.0	3.5	31.7	0.0	3972	18.9	34.9	56.6	57.7	50.1
Nutech	7109	1.0	120.3	5.7	37.2	0.5	3704	16.4	39.0	58.0	56.5	--
Peterson Farm Seed	18X08N	0.8	120.3	4.7	38.8	0.3	3821	16.4	38.8	57.7	60.1	--
Peterson Farm Seed	17X09N	0.9	121.8	4.9	36.4	0.3	3687	16.3	39.1	57.9	50.5	--
Proseed	XT609	0.9	122.0	6.1	37.8	0.5	3368	16.2	39.2	57.9	52.5	--
Proseed	XT610	1.0	122.0	5.7	36.4	0.0	3759	16.1	39.3	57.9	51.5	--
Proseed	XT612	1.2	124.5	5.3	36.8	0.3	3865	16.6	38.1	57.5	49.8	--
REA	RX0628	0.6	115.5	4.9	37.2	0.5	3874	17.3	37.0	56.2	52.6	--
REA	RX0826	0.8	120.8	5.3	36.8	0.5	3473	16.1	39.7	57.6	57.2	--
REA	RX1027	1.0	120.5	5.9	35.4	0.0	3561	16.3	38.5	57.8	56.7	--
Thunder Seed	SB8807N	0.7	117.0	3.5	35.4	0.0	3466	16.4	38.0	57.8	50.6	--
Thunder Seed	SB8710N	1.0	120.8	4.1	32.9	0.0	3421	16.4	39.1	58.1	50.0	--
Thunder Seed	SB8811N	1.1	123.3	4.3	35.0	0.0	3244	16.5	39.4	58.3	58.5	--
Wensman	W1060NRX	0.6	119.3	3.9	34.1	0.0	3681	17.3	37.5	57.5	56.5	--
Wensman	W1074NRX	0.7	117.3	5.3	38.8	0.3	3945	16.3	37.9	57.7	58.2	--
Wensman	W1086NRX	0.8	121.3	5.7	37.0	0.0	3371	16.0	39.7	57.8	55.1	--
Wensman	W1121NRX	1.2	123.5	5.3	35.6	0.3	3729	16.4	39.8	58.3	57.0	--
Wensman	W1129NRX	1.2	121.0	4.1	33.9	0.0	3512	16.4	39.4	58.2	51.1	--
Wensman	W1140NRX	1.4	122.3	6.1	36.8	0.0	3399	16.0	39.5	58.7	50.1	--
	MEAN		120.6	5.2	36	0.2	3583	16.5	38.6	57.7	54.8	--
	C.V. (%)		1.7	19.6	7.4	169	7.2	2.5	2.2	0.8	9.9	--
	LSD 0.10		2.4	1.2	3.2	NS	303	0.5	1.0	0.6	6.4	--
	LSD 0.05		2.8	1.4	3.8	NS	362	0.6	1.2	0.7	7.6	--

Planting Date = May 18 ; Harvest Date = October 12 ; Previous Crop = Spring Wheat

[1] Maturity group based on data provided by seed company.

Brand	Variety	Mat Group[1]	Days to Mat.	Plant Lodge[2]	Seeds/ Pound	Seed Oil	Seed Protein	Test Wt	Seed Yield 2017	Seed Yield 2-yr Avg.
				0 to 9		%	%	lb/bu	-- bu/ac --	
NDSU	Ashtabula	0.4	121.3	8.3	2580	18.6	33.2	56.9	65.2	--
NDSU	Sheyenne	0.7	123.0	3.5	2578	17.7	33.7	57.7	78.5	--
NDSU	ND Benson	0.4	121.3	5.0	2580	17.0	37.3	57.4	61.8	--
NDSU	ND Bison	0.7	122.3	1.8	2375	17.4	34.7	58.0	72.5	--
NDSU	ND Stutsman	0.7	124.0	5.0	2611	17.9	33.8	57.4	86.7	--
Richland IFC	MK0603	0.6	123.3	8.5	4503	16.3	36.3	57.6	55.6	48.4
Richland IFC	MK0508	0.8	124.0	9.0	5055	16.6	34.4	58.7	46.7	44.0
Richland IFC	MK808CN	0.8	123.5	8.3	2745	18.3	33.8	58.6	60.7	53.8
Richland IFC	MK42	0.7	123.3	8.5	2198	16.1	37.6	57.8	54.1	49.2
Richland IFC	MK1016	1.0	123.8	6.3	4679	16.0	36.9	58.4	52.0	48.7
Richland IFC	MK9101	1.0	124.5	3.3	1933	20.1	35.8	57.8	67.0	57.6
Richland IFC	MK41	1.1	125.3	3.3	2158	16.4	37.3	58.5	75.0	65.7
	Mean		123.3	5.9	3000	17.4	35.4	57.9	64.6	--
	C.V (%)		0.8	28.3	2.5	1.5	0.9	1.2	8.0	--
	LSD 0.10		1.12	1.99	90	0.3	0.4	0.81	6.2	--
	LSD 0.05		1.3	2.4	108	0.4	0.5	1.0	7.4	--

Planting Date = May 19; Harvest Date = October 12; Previous Crop = Field corn

Height notes were not submitted because a high wind and rain event mid-July resulted in severe lodging.

[1]Maturity group based on data provided by seed company.

[2]Plant lodge: 0 = no lodging; 9 = plants lying flat.

Soybean - Irrigated Liberty Link Varieties **Dickey County - Oakes**

Brand	Variety	Mat Group[1]	Days to Mat.	Plant Lodge[2]	Seeds/ Pound	Seed Oil	Seed Protein	Test Wt	Seed Yield 2017	Seed Yield 2-yr Avg.	Seed Yield 3-yr Avg.
				0 to 9		%	%	lb/bu	---- bu/ac ----		
NuTech	2086L	0.8	124.0	2.0	2431	17.1	36.6	57.8	64.1	56.2	62.02
NuTech	3103L	1.0	125.0	7.3	2334	18.0	36.0	57.2	66.9	--	--
NuTech	3115L	1.1	125.3	8.0	2035	17.3	36.1	58.7	75.1	68.4	--
Credenz	CZ0448 LL	0.4	120.5	5.8	2190	18.5	35.3	56.6	64.6	--	--
Credenz	CZ 0525 LL	0.5	122.5	6.5	2236	17.6	36.0	58.1	69.4	63.5	67.17
Credenz	CZ 0601 LL	0.6	122.8	5.0	2152	17.0	34.4	59.7	69.8	61.3	--
Credenz	CZ 1028 LL	1.0	124.5	4.0	2205	16.6	36.6	58.2	75.0	--	--
Credenz	CZ 1201 LL	1.2	126.0	8.8	2048	17.5	35.7	58.1	71.1	63.7	--
Credenz	CZ 1332 LL	1.3	125.8	4.8	2095	16.5	36.4	58.3	77.4	--	--
	Mean		124.0	5.8	2192	17.3	35.9	58.1	70.4	--	--
	C.V (%)		0.7	29.61	2.5	0.9	0.8	2.2	7.4	--	--
	LSD 0.10		1.03	2.07	66	0.2	0.3	1.6	6.3	--	--
	LSD 0.05		1.2	2.5	80	0.2	0.4	1.9	7.6	--	--

Planting Date = May 19; Harvest Date = October 12; Previous Crop = Field corn

Height notes were not submitted because a high wind and rain event mid-July resulted in severe lodging.

[1]Maturity group based on data provided by seed company.

[2]Plant lodge: 0 = no lodging; 9 = plants lying flat.

Brand	Variety	Mat Group[1]	Days to Maturity	Plant Lodge[2]	Seeds/ Pound	Seed Oil	Seed Protein	Test Wt.	Seed Yield 2017	Seed Yield 2-yr Avg.	Seed Yield 3-yr Avg.
				0 to 9		%	%	lb/bu	---- bu/ac ----		
NuTech	6097R2	0.9	123.8	5.3	2138	19.1	32.3	57.4	76.5	64.4	67.8
NuTech	7109	1.0	126.0	3.8	2183	17.5	35.5	57.3	70.1	--	--
REA	RX1027	1.0	124.5	3.0	2312	17.0	36.1	57.3	73.6	--	--
REA	RX1327	1.3	126.8	5.3	2415	17.2	35.4	57.9	61.7	--	--
REA	RX1428	1.4	124.8	5.5	2395	16.6	36.0	57.1	63.0	--	--
Integra	20915N	0.9	125.0	6.5	2531	17.4	34.8	57.6	66.8	62.0	68.8
Thunder Seed	SB8710N	1.0	125.0	6.8	2469	17.1	36.2	57.4	68.2	58.7	--
Thunder Seed	SB8811N	1.1	126.5	5.3	2341	17.6	35.9	58.3	66.9	--	--
Dyna-Gro	S09RY64	0.9	124.5	4.5	2574	17.5	34.7	57.2	73.5	71.3	74.4
Dyna-Gro	S11XT78	1.1	124.5	5.3	2366	17.6	35.8	57.2	64.6	--	--
Dyna-Gro	S12RY44	1.2	124.8	5.0	2361	16.9	36.9	57.4	70.4	68.5	71.9
Dyna-Gro	S12XT07	1.2	126.0	8.0	2421	17.6	35.2	57.3	72.7	--	--
Dairyland Seed	DSR-0807/R2Y	0.8	124.8	6.0	2286	16.8	36.4	57.5	72.6	63.1	--
Dairyland Seed	DSR-0988/R2Y	0.9	125.5	5.3	2528	17.1	34.8	57.4	75.9	62.5	--
Dairyland Seed	DSR-1120/R2Y	1.1	129.8	8.8	2146	18.0	34.7	56.7	67.5	58.0	64.1
Dairyland Seed	DSR-1313/R2Y	1.3	125.8	7.3	2370	17.8	35.3	57.3	70.1	64.9	--
Dairyland Seed	DSR-1475/R2Y	1.4	129.8	7.3	2472	17.1	35.9	57.8	69.9	--	--
Proseed	XT609	0.9	124.8	5.5	2516	17.2	36.1	57.7	63.3	--	--
Proseed	XT610	1.0	125.3	5.3	2510	17.2	36.0	57.3	68.0	61.2	--
Proseed	XT612	1.2	125.8	7.0	2520	17.2	35.6	57.0	68.6	--	--
Wensman	W1086NRX	0.8	124.0	4.0	2652	16.9	36.4	56.9	68.4	--	--
Wensman	W1106NRX	1.0	124.5	3.0	2549	17.1	36.1	57.4	71.4	62.7	--
Wensman	W1121NRX	1.2	125.3	4.8	2433	17.4	35.7	57.3	68.3	--	--
Wensman	W1129NRX	1.2	127.0	5.0	2390	17.7	35.1	57.5	73.7	65.9	--
Wensman	W1140NRX	1.4	125.8	4.0	2535	17.3	35.3	57.6	76.0	--	--
Legacy Seeds	LS-0935N RR2	0.9	124.5	5.3	2321	17.2	35.2	57.9	73.6	64.8	69.6
Legacy Seeds	LS-1136N RR2	1.2	125.5	6.3	2431	17.2	35.6	57.3	67.4	--	--
Legacy Seeds	LS-1138N RR2	1.1	124.5	3.8	2360	17.5	35.9	57.7	72.6	--	--
	Mean		125.6	5.6	2426	17.4	35.4	57.4	70.2	--	--
	C.V (%)		1.2	30.6	2.7	1.1	0.7	1.0	7.7	--	--
	LSD 0.10		1.8	2.0	78	0.2	0.3	0.7	6.3	--	--
	LSD 0.05		2.1	2.4	93	0.3	0.3	0.8	7.6	--	--

Planting Date = May 19; Harvest Date = October 13; Previous Crop = Field corn

Height notes were not submitted because a high wind and rain event mid-July resulted in severe lodging.

[1]Maturity group based on data provided by seed company.

[2]Plant lodge: 0 = no lodging; 9 = plants lying flat.

Soybean - Irrigated, Roundup Ready Varieties — Dickey County - Oakes (Page 2 of 2)

Brand	Variety	Mat Group[1]	Days to .	Plant Lodge[2]	Seeds/ Pound	Seed Oil	Seed Protein	Test Wt.	Seed Yield 2017	Seed Yield 2-yr Avg.	Seed Yield 3-yr Avg.
				0 to 9		%	%	lb/bu	---- bu/ac ----		
Legacy Seeds	LS-1134N RR2X	1.1	125.5	6.8	2496	17.9	35.2	58.4	69.8	60.7	65.5
Legacy Seeds	LS-1335N RR2X	1.3	127.0	6.3	2328	17.5	35.4	57.6	73.3	64.6	71.2
Legacy Seeds	LS-1338N RR2X	1.3	127.3	5.3	2507	17.3	35.3	57.5	75.4	--	--
Peterson Farm Seed	17X09N	0.9	124.8	6.5	2514	17.2	35.7	56.8	67.3	--	--
Peterson Farm Seed	18X11N	1.1	124.3	3.8	2407	17.7	35.5	57.1	71.5	--	--
Peterson Farm Seed	18X13N	1.3	125.3	4.3	2380	18.0	35.2	57.3	72.0	--	--
Prairie Brand	PB-0777R2	0.7	124.0	4.5	2468	17.3	35.6	57.6	72.5	62.8	68.1
Prairie Brand	PB-0987R2	0.9	125.3	6.8	2506	17.2	34.9	57.3	70.2	61.5	--
Prairie Brand	PB-1257R2	1.2	128.3	8.3	2619	17.5	34.1	56.9	71.8	64.6	--
	Mean		125.6	5.6	2426	17.4	35.4	57.4	70.2	--	--
	C.V (%)		1.2	30.6	2.7	1.1	0.7	1.0	7.7	--	--
	LSD 0.10		1.8	2.0	78	0.2	0.3	0.7	6.3	--	--
	LSD 0.05		2.1	2.4	93	0.3	0.3	0.8	7.6	--	--

Planting Date = May 19; Harvest Date = October 13; Previous Crop = Field corn

Height notes were not submitted because a high wind and rain event mid-July resulted in severe lodging.

[1]Maturity group based on data provided by seed company.

[2]Plant lodge: 0 = no lodging; 9 = plants lying flat.

Soybean - Organic — Carrington

Variety	Days to PM	Pod Height	Plant Height	Plant Lodge	Seed Oil	Seed Protein	Test Weight	Seed Yield 2017	Seed Yield 2-yr. Avg.	Seed Yield 3-yr. Avg.
		inch	inch	0-9	%	%	lb/bu	---------- bu/ac ----------		
ND Benson	116.0	4.9	23.5	0.0	18.5	37.6	57.4	32.6	37.4	32.3
ND Stutsman	115.5	4.7	25.2	0.0	18.9	34.9	57.3	37.1	39.1	--
ND Bison	117.0	5.3	26.2	0.0	18.4	35.4	57.9	39.1	39.3	34.5
ND Henson	112.5	5.1	25.3	0.0	19.6	34.5	57.2	32.1	33.2	29.8
Ashtabula	113.8	5.1	26.4	0.0	19.6	34.7	56.1	31.9	33.6	30.6
Sheyenne	116.0	3.9	26.2	0.0	18.7	35.3	56.8	33.2	34.0	30.9
Traill	108.0	3.7	27.3	0.0	18.8	36.2	57.4	30.3	26.1	23.7
Prosoy	118.5	5.5	29.6	0.0	17.8	38.6	57.4	40.2	41.3	36.8
ND1406HP	114.3	4.3	27.4	0.3	17.4	38.5	57.2	34.0	33.3	--
Mean	113.8	4.7	26.1	0.1	18.7	35.8	56.9	34.3	--	--
C.V. (%)	1.3	24.6	10.0	697	0.8	1.0	0.5	15.4	--	--
LSD 0.10	1.7	1.37	3.1	0.1	0.1	0.4	0.3	6.2	--	--
LSD 0.05	2.1	1.65	3.7	0.2	0.2	0.5	0.4	7.4	--	--

Planting Date = May 19; Harvest Date = October 12; Previous Crop = Oats

Soybean - Dryland, Conventional and Liberty Link Varieties **LaMoure County**

Brand	Variety	Mat. Group[1]	Type / Traits[2]	Maturity Date[3]	Seed Oil[4]	Seed Protein[4]	Seed Yield 2017	Seed Yield 3-yr. Avg.
				%	%	%	bu/ac	bu/ac
Richland IFC	MK0603	0.6	Conv	18-Sep	17.0	33.4	47.4	50.7
Richland IFC	MK0508	0.5	Conv	15-Sep	17.3	31.9	38.6	45.2
Richland IFC	MK808CN	0.8	Conv	21-Sep	18.9	33.0	52.4	--
Richland IFC	MK42	0.7	Conv	16-Sep	16.9	36.9	49.1	50.4
Richland IFC	MK1016	1.0	Conv	18-Sep	17.2	34.1	45.2	44.3
Richland IFC	MK9101	1.0	Conv	20-Sep	16.1	36.8	47.4	48.4
Richland IFC	MK41	1.1	Conv	22-Sep	16.7	36.2	55.1	55.1
NDSU	ND Henson	0.0	Conv	7-Sep	20.5	31.7	42.3	--
NDSU	Sheyenne	0.7	Conv	16-Sep	19.1	32.9	55.5	56.4
NDSU	ND Benson	0.4	Conv	12-Sep	18.7	34.8	44.6	--
NDSU	ND Stustman	0.7	Conv	17-Sep	19.3	31.7	61.0	--
NDSU	ND Bison	0.7	Conv	16-Sep	19.5	32.2	52.2	53.8
Credenz	CZ 0525 LL	0.5	LL	17-Sep	18.9	35.0	57.8	60.9
Credenz	CZ 0601 LL	0.6	LL	18-Sep	18.1	32.5	61.7	--
Credenz	CZ 1028 LL	1.0	LL	23-Sep	17.8	34.3	59.7	--
Credenz	CZ 1201 LL	1.2	LL	26-Sep	17.7	35.5	61.8	--
Credenz	CZ 1332 LL	1.3	LL	22-Sep	17.7	35.3	58.8	61.8
	MEAN			17-Sep	18.2	33.9	51.5	--
	C.V. (%)			14.9	na	na	8.3	--
	LSD 0.10			3.5	na	na	5.9	--
	LSD 0.05			4.2	na	na	7.1	--

Planting Date = May 7 ; Previous Crop = Spring Wheat

[1] Maturity group based on information provided by seed company.

[2] Type or Trait: Conv = Conventional variety & LL = Liberty Link.

[3] Date of 95% brown pods.

[4] Seed quality reported at 13% moisture.

Soybean - Dryland, Roundup Ready Varieties **LaMoure County**

Brand	Variety	Mat. Group[1]	Maturity Date[2]	Seed Oil[3]	Seed Protein[3]	Seed Yield 2017	Seed Yield 2-yr. Avg.	Seed Yield 3-yr. Avg.
				%	%	bu/ac	bu/ac	bu/ac
Nutech	6097R2	0.9	11-Sep	18.2	35.9	55.5	69.4	62.3
Nutech	7109	1.0	21-Sep	20.6	32.4	58.0	--	--
Integra	20915N	0.7	13-Sep	18.9	33.9	57.2	69.2	--
Thunder Seed	SB8807N	0.7	15-Sep	20.0	31.3	53.9	--	--
Thunder Seed	SB8710N	1.0	20-Sep	18.7	35.6	54.6	--	--
Thunder Seed	SB8811N	1.1	21-Sep	19.5	34.4	62.1	--	--
Dyna-Gro	S07RY45	0.7	15-Sep	19.7	33.3	62.9	74.9	65.2
Dyna-Gro	S07XT28	0.7	14-Sep	17.9	33.4	51.9	--	--
Dyna-Gro	S09RY64	0.9	18-Sep	17.1	36.9	58.7	70.0	63.4
Dyna-Gro	S11XT78	1.1	20-Sep	17.9	33.8	61.4	--	--
Dairyland Seed	DSR-0807/R2Y	0.8	16-Sep	19.1	33.7	56.8	69.3	--
Dairyland Seed	DSR-0988/R2Y	0.9	19-Sep	19.7	33.2	60.5	68.5	--
Dairyland Seed	DSR-1120/R2Y	1.1	19-Sep	19.7	32.5	55.0	63.7	57.3
Dairyland Seed	DSR-1313/R2Y	1.3	20-Sep	18.7	34.7	64.9	--	--
Proseed	30-80	0.8	16-Sep	18.8	34.2	61.8	--	--
Proseed	XT609	0.9	19-Sep	20.6	32.0	59.6	--	--
Proseed	XT610	1.0	17-Sep	19.7	33.9	52.8	--	--
Wensman	W1050NRX	0.5	11-Sep	18.3	35.8	51.0	--	--
Wensman	W1060NRX	0.6	13-Sep	18.8	34.5	49.4	--	--
Wensman	W1086NRX	0.8	18-Sep	18.9	33.9	59.4	--	--
Wensman	W1106NRX	1.0	16-Sep	19.9	33.5	44.9	--	--
Wensman	W1121NRX	1.2	21-Sep	19.2	36.0	58.6	--	--
Legacy Seeds	LS-0836N RR2X	0.8	18-Sep	18.4	34.7	53.8	--	--
Legacy Seeds	LS-0935N RR2	0.9	12-Sep	19.5	33.8	55.3	66.8	60.3
Legacy Seeds	LS-1136N RR2	1.2	20-Sep	20.8	33.6	57.9	--	--
Legacy Seeds	LS-1138N RR2X	1.1	20-Sep	18.0	36.1	61.5	--	--
Legacy Seeds	LS-1134N RR2X	1.1	18-Sep	18.3	35.5	53.7	62.9	57.6
Legacy Seeds	LS-1335N RR2	1.3	19-Sep	18.2	36.8	56.7	68.3	61.2
Legacy Seeds	LS-1338N RR2X	1.3	22-Sep	20.2	33.6	57.7	--	--
Peterson Farm Seed	18X08N	0.8	15-Sep	19.0	34.5	52.1	--	--
Peterson Farm Seed	15R07N	0.7	16-Sep	18.7	34.5	60.8	70.1	62.5
Peterson Farm Seed	17X09N	0.9	19-Sep	17.9	34.1	55.4	--	--
Prairie Brand	PB-0777R2	0.7	14-Sep	19.8	33.7	51.9	65.4	--
Prairie Brand	PB-0987R2	0.9	12-Sep	20.8	31.3	57.7	70.4	--
	MEAN		16-Sep	19.1	34.1	55.8	--	--
	C.V. (%)		15.0	na	na	11.0	--	--
	LSD 0.10		3.4	na	na	8.4	--	--
	LSD 0.05		4.0	na	na	10.0	--	--

Planting Date = May 7 ; Previous Crop = Spring Wheat

[1] Maturity group based on information provided by seed company.

[2] Date of 95% brown pods.

[3] Seed quality reported at 13% moisture.

Dry Edible Bean - Dryland **Carrington**

Variety	Market Class	Days to PM	Growth Habit[1]	Direct Harvest[2]	Seed Protein	Seeds/ Pound	Test Weight	Seed Weight	----- Seed Yield ----- 2017	3-yr. Avg.
			1 to 9	%	%		lb/bu	gram/100	--------- lb/ac	---------
LaPaz	Pinto	99.0	7.3	91.0	19.0	1248	60.7	36.4	3054	2478
Lariat	Pinto	99.3	5.5	83.8	19.3	1175	59.4	38.7	3021	2832
Stampede	Pinto	97.3	7.5	91.3	19.5	1269	58.5	35.9	2901	2755
Maverick	Pinto	95.3	4.8	80.5	19.7	1232	59.5	36.9	2562	2602
ND-307	Pinto	100.8	6.5	85.0	20.3	1130	58.4	40.2	2649	2566
Windbreaker	Pinto	96.8	6.0	81.3	21.6	1125	57.7	40.4	2620	2775
Palomino	Pinto	99.5	5.5	77.5	21.9	1198	58.8	37.9	2590	2502
Monterrey	Pinto	98.5	7.5	93.3	20.3	1217	60.5	37.4	2840	--
HMS Medalist	Navy	102.8	8.3	94.5	19.4	2529	63.5	18.0	2801	2490
T9905	Navy	103.5	8.5	96.0	20.1	2204	63.8	20.6	2765	2618
Eclipse	Black	99.8	9.0	97.5	18.4	2369	62.4	19.2	2610	2284
Merlot	Small Red	100.3	7.0	90.0	18.3	1211	61.0	37.9	2328	2275
Loreto	Black	102.8	7.8	95.8	19.1	2342	62.2	19.4	2304	2012
Zorro	Black	99.3	8.8	94.8	21.2	2577	61.7	17.7	2202	2254
Rosetta	Pink	103.5	8.8	92.0	18.9	1357	62.0	33.5	2549	--
Powderhorn	Great Northern	98.0	7.5	87.5	20.6	1372	57.9	33.1	2804	--
	MEAN	99.6	7.2	89.3	19.7	1555	60.5	32.1	2668	--
	C.V. (%)	1.6	10.7	3.7	5.2	5.1	1.2	5.0	11.7	--
	LSD 0.10	1.9	0.9	4.0	1.2	94	0.8	1.9	371	--
	LSD 0.05	2.3	1.1	4.8	1.5	113	1.0	2.3	445	--

Planting Date = May 24 ; Harvest Date = September 8 ; Previous Crop = Field Pea

[1] Growth Habit: Scored on scale of 1 to 9: 1 = longer vine, low stature plant, pods lower to ground; 9 = very upright plant stature, pods held well off ground.

[2] Direct Harvest : A relative score to estimate % beans that would be successfully harvested in a direct/straight harvest system.

Dry Edible Bean - Irrigated **Carrington**

Variety	Market Class	Days to PM	Growth Habit[1]	Direct Harvest[2]	White Mold[3]	Seed Protein	Seeds/ Pound	Test Weight	Seed Weight	--- Seed Yield --- 2017	3-yr. Avg.
			1 to 9	%	%	%		lb/bu	gram/100	------- lb/ac -------	
LaPaz	Pinto	102.3	2.8	76.5	22.0	21.3	1301	60.4	35.4	3541	3197
Lariat	Pinto	102.8	2.0	56.3	7.5	20.6	1122	60.0	40.5	3422	3042
Stampede	Pinto	101.5	1.3	66.3	7.8	21.8	1218	58.6	37.3	3302	2824
Maverick	Pinto	102.0	1.0	30.0	14.8	21.5	1149	59.0	39.6	4075	3209
ND-307	Pinto	102.8	2.0	58.8	17.0	23.7	1160	57.6	39.5	3305	2854
Windbreaker	Pinto	102.3	1.0	56.3	23.0	22.9	1119	58.3	40.6	3372	2985
Palomino	Pinto	103.0	3.0	76.3	4.0	23.1	1138	59.0	39.9	3489	2682
Monterrey	Pinto	102.3	2.5	77.5	8.5	21.1	1231	61.1	37.0	3977	--
HMS Medalist	Navy	105.5	3.0	82.3	2.0	21.1	2381	63.9	19.1	3856	2843
T9905	Navy	105.5	3.0	77.5	2.0	23.5	1957	63.5	23.2	3902	2973
Eclipse	Black	102.5	6.5	87.5	6.0	20.1	2219	62.3	20.5	3603	2600
Merlot	Small Red	101.5	1.0	45.0	7.5	20.4	1199	60.1	38.1	3171	2779
Loreto	Black	105.3	3.0	77.5	2.3	20.9	2211	62.5	20.5	3321	2652
Zorro	Black	101.8	8.5	93.8	7.0	21.1	2458	62.4	18.5	3193	2300
Rosetta	Pink	102.0	3.5	81.3	2.3	20.7	1240	61.6	36.7	4049	--
Powderhorn	Great Northern	102.8	2.3	80.0	6.3	22.3	1211	58.0	37.5	3905	--
	MEAN	102.8	2.8	69.5	9.4	21.6	1489	60.5	33.2	3578	--
	C.V. (%)	0.6	26.9	7.8	100.3	2.8	4.6	0.9	5.5	9.8	--
	LSD 0.10	0.8	0.9	6.5	11.2	0.7	82	0.6	2.2	417	--
	LSD 0.05	0.9	1.1	7.7	13.4	0.9	98	0.8	2.6	499	--

Planting Date = May 24 ; Harvest Date = September 11 ; Previous Crop = Corn ;

[1] Growth Habit: Scored on scale of 1 to 9. 1 = longer vine, low stature plant, pods lower to ground; 9 = very upright plant stature, pods held well off ground.

[2] Direct Harvest: A relative score to estimate the percentage of beans that would be successfully harvested in a direct/straight harvest system.

[3] White Mold: An assessment of the incidence of plants that expressed some level of white mold (sclerotinia).

Dry Bean, Misc - Irrigated **Oakes**

Variety	Market Class	Days to PM	Seeds/ Pound	Seed Weight	Test Weight	Seed Yield 2017	Seed Yield 2 or 3-yr. Avg.
				grams/100	lb/bu	lb/ac	lb/ac
Eclipse	Black	92.8	2064	22.0	63.1	4256	3638.2
Merlot	Small Red	96.3	1116	40.7	61.3	3924	3694.4
Loreto	Black	97.0	2085	21.8	63.6	4023	3533.7
Zorro	Black	95.8	1950	23.3	64.4	4827	3834.7
Rosetta	Pink	95.8	1165	39.1	61.8	4522	3871.9
Powderhorn	Great Northern	91.5	1173	38.8	58.9	3787	--
Mean		94.9	1592	30.9	62.2	4223	--
C.V. (%)		1.4	3.8	4.9	0.6	12.9	--
LSD 0.10		1.7	75	1.9	0.5	673	--
LSD 0.05		2.0	91	2.3	0.5	818	--

Planting Date = May 26; Harvest Date = September 11 and 12; Previous Crop = Soybeans

Dry Bean, Navy - Irrigated **Oakes**

Variety	Days to PM	Seeds/ Pound	Seed Weight	Test Weight	Seed Yield 2017	Seed Yield 3-yr. Avg.
			grams/100		lb/ac	lb/ac
HMS Medalist	95.3	2307	19.7	64.1	3872	3291.9
Ensign	91.5	2249	20.3	63.7	3230	3208.5
T9905	95.3	2124	21.4	64.2	3553	3377.6
Mean	94.0	2226	20.5	64.0	3552	--
C.V. (%)	0.8	2.4	2.2	0.6	6.7	--
LSD 0.10	1.0	72	0.6	0.5	327	--
LSD 0.05	1.3	91	0.8	0.6	412	--

Planting Date = May 26; Harvest Date = September 11 and 12; Previous Crop = Soybean

Dry Bean, Pinto - Irrigated — Oakes

Variety	Days to PM	Seeds/ Pound	Seed Weight	Test Weight	Seed Yield 2017	Seed Yield 2 or 3-yr. Avg.
			grams/100	lb/bu	lb/ac	lb/ac
LaPaz	96.0	1165	39.0	61.9	4249	3618.2
Lariat	96.8	1011	44.9	61.2	4112	3640.9
Stampede	93.5	1013	44.9	59.1	3343	3454.4
Maverick	93.8	1043	43.6	60.5	3651	3351.8
ND-307	95.0	1004	45.2	59.6	3947	3875.8
Windbreaker	90.5	1037	43.8	59.3	3985	3826.8
Palomino	97.0	992	45.8	59.8	4040	3336.4
Monterrey	95.5	1114	40.8	62.5	4134	3540.3
Mean:	94.8	1047	43.5	60.5	3932	--
C.V.(%)	1.3	3.7	3.8	0.7	11.4	--
LSD 0.10	1.5	47	2.0	0.5	548	--
LSD 0.05	1.8	57	2.4	0.6	662	--

Planting Date = May 26; Harvest Date = September 11 and 12; Previous Crop = Soybean

Buckwheat - Organic — Carrington

Variety	Plant Stand	Seedling Vigor[1]	Days to Bloom	Days to Bloom	Plant Height	Test Weight	Seed Yield 2017	Seed Yield 2-yr. Avg.
	sq ft	1-5	10%	90%	inch	lb/bu	lb/ac	lb/ac
Springfield	32.7	4.5	31.0	36.3	34.2	46.4	616.7	646.9
Horizon	26.3	3.8	32.0	38.8	32.7	48.0	607.1	562.6
Koma	27.8	2.0	33.0	39.8	28.4	49.7	428.1	417.3
Koto	24.7	2.8	31.5	37.3	30.8	49.0	545.7	444.0
Manor	33.7	5.0	32.0	38.3	33.9	45.9	583.9	494.8
Mean	29.0	3.6	31.9	38.1	32.0	47.8	556.3	--
C.V. (%)	6.6	12.7	0.8	1.1	5.3	1.0	21.0	--
LSD 0.10	2.4	0.6	0.3	0.5	2.1	0.6	146.9	--
LSD 0.05	3.0	0.7	0.4	0.6	2.6	0.8	179.8	--

Planting Date = June 5; Harvest Date = September 13; Previous Crop = Oats

[1] Seedling vigor: 1 = worst and 5 = Best

Variety	Days to Bloom[1]	Bloom Duration	Days to PM[1]	Vine Length	Canopy Ht at Harvest	Height Index[2]	Lodge at PM	-- Harvest Ease[3] -- 2017	3-yr. Avg.	Seed Protein	Seeds/ Pound	1000 KWT	Test Weight	--- Seed Yield -- 2017	3-yr. Avg.
Yellow				inch	inch	%	0 to 9	------- 0 to 9 -------		%		gram	lb/bu	------ bu/ac ------	
Cotyledon Type															
Agassiz	50.0	15.3	78.7	32.2	27.3	86.0	0.0	0.3	2.2	25.5	2020	225	62.2	55.2	57.1
DS Admiral	51.7	12.0	77.3	26.8	23.9	89.4	0.0	0.0	1.9	25.8	1933	235	63.3	48.5	56.0
Spider	56.0	10.7	81.0	31.0	27.4	88.8	0.3	0.7	3.1	26.2	1966	231	62.8	36.6	44.9
Jetset	53.0	10.7	77.3	27.7	25.9	93.5	0.0	0.0	2.6	25.1	1855	245	63.1	46.0	50.1
Earlystar	51.3	13.5	77.8	29.7	26.7	89.8	0.5	0.8	3.0	24.4	2094	217	62.8	54.5	54.2
AAC Carver	54.8	10.8	78.8	27.9	26.8	96.1	0.0	0.0	2.2	24.3	1962	232	63.0	44.8	53.2
CDC Inca	56.8	9.8	80.5	28.7	26.6	92.4	0.0	0.0	--	25.7	2121	214	63.1	43.2	--
CDC Amarillo	57.8	9.3	81.5	32.1	28.1	87.9	0.0	0.0	1.3	25.3	2001	227	62.6	42.8	55.1
CDC Saffron	57.0	9.3	80.8	27.1	24.4	91.4	0.3	0.3	2.2	25.6	1978	230	63.1	43.7	50.0
Navarro	45.8	17.0	78.0	22.9	21.7	96.3	0.0	0.0	3.2	24.7	1777	256	62.8	47.8	46.7
Salamanca	52.8	12.0	78.8	34.3	28.0	82.0	0.0	0.5	2.1	25.8	1834	248	63.4	49.5	49.5
Bridger	49.8	14.0	77.8	26.4	24.1	92.9	0.0	0.0	1.6	24.9	2037	223	63.5	49.6	49.9
Gunner	53.5	12.3	79.0	30.5	26.3	87.7	0.0	0.8	--	25.7	2057	221	63.4	45.2	--
PSTSP27	48.5	15.3	78.3	30.2	25.6	84.9	0.3	0.5	--	25.9	1750	260	63.9	48.5	--
PP-0004	55.7	10.3	79.0	27.2	25.1	92.8	0.0	0.0	--	25.4	2007	227	63.5	48.6	--
PP-9132	57.3	8.3	79.0	28.1	26.2	94.3	0.0	0.0	--	25.7	2024	225	63.3	47.8	--
PP-0555	53.0	12.3	78.0	28.0	26.5	94.9	0.0	0.3	--	25.5	2240	203	64.1	49.9	--
PP-0667	53.3	12.0	78.7	30.3	26.1	86.0	0.0	0.3	2.4	25.4	2249	202	63.7	49.7	52.1
PG6150	53.0	12.7	77.3	30.8	28.5	92.3	0.0	0.0	--	25.8	2141	212	64.0	44.4	--
PG3308	55.0	10.0	78.0	26.5	24.1	91.1	0.0	0.0	--	24.8	2107	216	62.4	53.4	--
PG2601	54.0	10.0	77.7	26.8	23.9	89.5	0.0	0.0	--	25.4	2028	224	63.8	53.9	--
Hyline	55.7	9.7	79.7	30.7	26.0	86.3	0.0	0.0	4.1	25.2	1993	229	63.6	50.4	49.2
MP 1907	56.3	9.0	79.0	28.6	26.0	90.7	0.0	0.0	--	26.7	2019	225	63.2	50.3	--
MEAN	52.7	12.1	79.3	28.6	25.6	89.9	0.1	0.3	--	25.3	1972	233	63.0	47.4	--
C.V. (%)	2.2	11.6	1.3	11.4	9.3	9.5	319	213	--	2.1	3.2	3.3	1.1	14.3	--
LSD 0.10	1.4	1.6	1.2	3.8	2.8	NS	0.4	0.8	--	0.6	75	9	0.8	7.9	--
LSD 0.05	1.6	1.9	1.4	4.5	3.3	NS	0.5	1.0	--	0.7	89	11	1.0	9.4	--

Planting Date = May 2 ; Harvest Date = July 28 ; Previous Crop = Barley

Variety	Days to Bloom[1]	Bloom Duration	Days to PM[1]	Vine Length	Canopy Ht at Harvest	Height Index[2]	Lodge at PM	-- Harvest Ease[3] -- 2017	3-yr. Avg.	Seed Protein	Seeds/ Pound	1000 KWT	Test Weight	--- Seed Yield -- 2017	3-yr. Avg.
Yellow				inch	inch	%	0 to 9	------- 0 to 9 -------		%		gram	lb/bu	------ bu/ac ------	
Cotyledon Type															
LGPN4906	50.0	14.3	77.3	27.4	25.2	92.4	0.0	0.0	--	25.2	1980	229	62.6	46.3	--
LGPN4908	49.5	14.5	78.0	23.9	21.3	89.2	0.0	0.0	--	24.0	1949	233	63.3	50.7	--
LGPN4909	48.5	15.3	78.8	27.4	26.3	97.3	0.0	0.0	--	24.8	1770	257	62.9	50.2	--
LGPN4910	51.3	15.3	79.0	30.0	26.0	86.5	0.0	0.0	--	25.6	1990	228	62.4	50.6	--
LG Amigo	52.8	11.8	78.5	25.2	22.8	91.0	0.0	0.0	--	24.6	2043	222	62.5	50.2	--
Durwood	50.5	14.0	77.8	33.9	29.2	87.5	0.0	0.0	1.1	26.2	1948	233	63.7	47.3	50.6
Korando	45.8	19.0	78.0	26.8	24.2	91.0	0.0	0.0	3.3	25.1	1690	269	62.9	49.5	45.6
Mystique	55.0	11.3	80.5	31.0	28.7	93.1	0.3	0.3	1.5	25.3	1895	240	62.6	53.3	51.4
Nette 2010	48.8	14.0	77.0	25.5	21.9	86.4	0.0	0.0	1.6	23.9	2036	223	63.2	50.5	51.1
SW Midas	53.5	10.3	77.0	24.4	22.4	92.2	0.0	0.0	3.1	24.3	2265	201	62.9	45.8	47.2
PUSA 0614	47.0	16.0	77.5	30.0	25.2	84.6	0.0	0.3	1.8	26.1	1961	232	63.5	50.6	48.2
PUSA 1608	50.0	14.0	78.8	28.9	24.2	83.1	0.0	0.3	--	26.6	1830	248	63.9	56.9	--
PUSA 1610	55.0	10.0	78.5	27.9	24.8	89.7	0.0	1.0	--	25.5	1844	246	63.3	48.8	--
PUSA 1612	49.0	14.3	79.5	30.7	27.2	88.7	0.0	0.8	--	25.1	2144	212	63.6	47.8	--
PUSA 1614	49.0	14.3	78.5	28.9	26.2	91.1	0.0	0.5	--	24.8	2035	223	63.7	50.0	--
Majestic	55.0	9.3	79.0	29.3	27.4	93.7	0.0	0.0	--	26.0	1904	239	63.5	49.5	--
Marquee	52.7	12.3	77.7	26.6	25.2	94.2	0.0	0.0	--	26.4	2420	188	63.1	42.1	--
Pro 133-6248	46.0	16.3	78.0	26.0	24.1	93.0	0.0	0.0	--	24.4	1652	275	63.4	51.2	--
Green															
Cotyledon Type															
Cruiser	50.3	15.7	79.0	28.7	23.5	82.0	0.0	1.0	3.6	26.3	2238	203	62.4	37.5	41.5
CDC Greenwater	57.5	9.3	82.5	28.8	27.4	94.7	0.0	0.0	--	25.8	1979	229	62.8	43.7	--
CDC Striker	49.3	14.0	78.0	24.5	20.7	85.6	0.3	0.7	5.3	24.9	2329	195	62.3	49.1	48.1
MEAN	52.7	12.1	79.3	28.6	25.6	89.9	0.1	0.3	--	25.3	1972	233	63.0	47.4	--
C.V. (%)	2.2	11.6	1.3	11.4	9.3	9.5	319	213	--	2.1	3.2	3.3	1.1	14.3	--
LSD 0.10	1.4	1.6	1.2	3.8	2.8	NS	0.4	0.8	--	0.6	75	9	0.8	7.9	--
LSD 0.05	1.6	1.9	1.4	4.5	3.3	NS	0.5	1.0	--	0.7	89	11	1.0	9.4	--

Planting Date = May 2 ; Harvest Date = July 28 ; Previous Crop = Barley

Variety	Days to Bloom[1]	Bloom Duration	Days to PM[1]	Vine Length	Canopy Ht at Harvest	Height Index[2]	Lodge at PM	-- Harvest Ease[3] -- 2017	3-yr. Avg.	Seed Protein	Seeds/ Pound	1000 KWT	Test Weight	--- Seed Yield -- 2017	3-yr. Avg.
Green				inch	inch	%	0 to 9	------- 0 to 9 -------		%		gram	lb/bu	------ bu/ac ------	
Cotyledon Type															
Arcadia	52.7	11.7	78.3	24.3	21.5	88.7	0.0	0.0	4.8	24.7	2285	199	62.6	49.6	48.4
AAC Comfort	59.8	6.8	84.8	26.8	25.6	95.8	1.0	1.0	--	25.8	1846	246	61.8	47.9	--
Shamrock	58.0	8.0	82.0	28.6	26.6	93.1	0.8	1.3	--	24.9	2020	225	63.4	35.6	--
PSTSP28	52.3	12.8	79.8	31.3	28.5	92.1	0.0	1.0	--	25.0	2131	213	63.4	48.2	--
PSTSP29	56.3	10.0	82.8	35.6	31.3	87.4	1.5	2.0	--	25.2	1935	235	62.4	50.8	--
PG8001	48.7	15.0	79.3	23.5	20.5	87.3	0.0	0.0	--	25.4	2184	208	62.8	40.1	--
LGPN1904	56.0	10.3	81.3	35.4	33.1	93.4	0.3	0.3	--	24.8	2099	217	61.6	48.4	--
LGPN1125	56.0	7.8	80.3	26.3	24.0	91.7	0.0	0.0	--	25.2	1798	253	63.1	47.1	--
LGPN1906	49.0	13.8	79.5	31.1	26.4	85.0	0.0	0.5	--	24.4	1808	251	63.5	51.4	--
LG Koda	56.0	9.3	80.0	29.1	25.2	86.3	0.0	0.3	--	24.0	1994	228	63.6	53.2	--
Matrix	56.5	7.8	80.8	20.3	17.9	89.3	0.0	0.0	3.4	24.6	1818	251	63.2	44.7	50.4
Viper	49.8	13.5	80.3	34.3	28.7	84.2	0.3	0.5	2.5	24.4	2144	212	63.0	43.9	46.7
PUSA 1621	52.7	11.3	79.7	31.5	29.0	92.4	0.0	0.0	--	24.7	2242	203	62.8	44.3	--
Bluemoon	55.3	8.0	78.7	28.1	24.4	87.7	0.0	0.0	2.6	26.0	1935	235	63.2	42.8	50.5
Marrowfat Type															
Orka	49.0	15.3	81.3	27.9	23.2	82.9	1.0	2.3	--	25.3	1242	366	62.6	37.7	--
PUSA 1536	56.3	10.3	83.5	31.3	30.1	96.5	0.0	0.5	--	27.8	1440	316	60.5	32.7	--
MEAN	52.7	12.1	79.3	28.6	25.6	89.9	0.1	0.3	--	25.3	1972	233	63.0	47.4	--
C.V. (%)	2.2	11.6	1.3	11.4	9.3	9.5	319	213	--	2.1	3.2	3.3	1.1	14.3	--
LSD 0.10	1.4	1.6	1.2	3.8	2.8	NS	0.4	0.8	--	0.6	75	9	0.8	7.9	--
LSD 0.05	1.6	1.9	1.4	4.5	3.3	NS	0.5	1.0	--	0.7	89	11	1.0	9.4	--

Planting Date = May 2 ; Harvest Date = July 28 ; Previous Crop = Barley

[1] Crop development notes, equate to days from planting.

[2] Harvest Index: Plant height at time of harvest relative to plant height at end of bloom.

[3] Harvest Ease scores: 0 = all plants upright; very easy harvest, to 9 = all plants flat; very difficult to harvest direct.

Variety	Plant Stand	Days to Bloom	Bloom Duration	Days to PM	Plant Height 1[1]	Plant Height 2[1]	Plant Height 3[1]	Plant Lodge	Seeds/ lb	Test Weight	Seed Protein	-- Seed Yield -- 2017	3-yr. Avg.
	sq ft				inch	inch	inch	0-9		lb/bu	%	----- bu/ac -----	
Yellow cotyledon type													
Banjo	8.1	50.7	16.3	82.3	36.0	33.5	32.2	0.3	2219	63.0	26.3	46.8	--
Fiddle	8.7	50.7	17.0	86.0	31.6	29.9	31.0	0.0	2149	63.0	26.9	42.2	--
DS Admiral	10.1	49.7	14.7	80.3	30.4	30.2	28.2	0.0	2017	62.9	24.7	42.7	34.5
Nette 2010	9.9	47.0	16.7	78.0	29.8	27.7	25.7	0.0	2253	62.4	23.5	46.1	39.9
Agassiz	8.8	48.7	19.0	79.3	31.1	28.9	25.7	0.0	2109	62.3	24.9	47.6	37.6
Spider	8.3	49.7	18.0	83.0	34.0	30.6	29.0	1.7	2158	63.1	26.2	46.1	--
PUSA 1604	9.6	47.0	16.0	79.0	32.8	29.7	29.0	0.3	2037	61.2	26.0	50.7	--
G161528	11.6	56.0	12.7	85.0	35.8	35.7	33.7	0.0	2481	63.3	25.8	43.3	--
G161529	10.4	57.0	11.3	87.0	35.3	34.6	31.4	0.3	2449	62.9	26.5	40.5	--
PUSA 1701	9.9	46.0	18.0	79.0	30.6	31.2	28.6	0.0	1820	62.0	25.4	49.8	--
PUSA 1703	10.3	49.0	16.0	81.3	38.3	36.0	34.1	0.7	1876	62.0	26.3	49.1	--
PUSA 1705	10.3	50.3	16.3	82.3	39.0	32.2	30.7	0.3	1652	62.5	27.2	53.1	--
PUSA 1707	10.4	46.3	17.0	80.7	33.5	34.0	32.8	0.0	1635	63.0	24.8	48.4	--
Green cotyledon type													
Flute	8.9	53.3	14.3	85.7	35.3	33.6	31.4	0.0	2469	63.3	25.4	43.8	--
Matrix	7.3	56.0	9.3	83.7	27.6	25.5	24.8	0.0	1837	62.9	23.7	42.2	--
LG Koda	6.8	54.0	12.3	84.0	28.5	30.1	27.8	0.0	2146	63.6	23.6	38.2	--
Cruiser	8.5	48.0	18.3	79.7	31.5	28.0	28.3	0.0	2373	62.1	23.8	41.7	30.3
CDC Striker	9.4	49.3	15.7	79.7	27.4	23.4	24.0	0.0	2306	62.2	24.8	47.2	37.2
Arcadia	9.4	49.0	16.0	80.3	26.0	24.7	24.7	1.0	2335	62.1	25.0	47.6	--
PUSA 1723	9.6	50.3	14.0	83.3	32.4	31.1	27.2	0.0	1767	63.2	25.6	52.0	--
Mean	9.3	50.4	15.5	82.0	32.3	30.5	29.0	0.2	2104	62.7	25.3	45.9	--
C.V. (%)	11.7	0.9	5.8	1.3	6.2	7.0	10.3	262.6	3.9	0.7	2.3	9.6	--
LSD 0.10	1.5	0.6	1.2	1.4	2.8	2.9	4.1	0.8	113	0.6	0.8	6.1	--
LSD 0.05	1.8	0.8	1.5	1.7	3.3	3.5	4.9	1.0	136	0.8	1.0	7.3	--

Planting Date = May 2; Harvest Date = August 1; Previous Crop = Einkorn

[1] Height 1 taken @ end bloom; Height 2 taken @ PM; Height 3 taken @ harvest

Faba Bean - Dryland — Carrington

Variety	Plant Stand	Days to Bloom	Bloom Duration	Plant Lodge	Plant Height	Test Weight	Seed Yield 2017	Seed Yield 2-yr. Avg.	Seed Yield 3-yr. Avg.
	sq ft			0-9	inch	lb/bu	lb/ac	lb/ac	lb/ac
CDC Snowdrop	3.5	50.8	22.0	0.0	25.0	61.0	1247.0	636.5	--
Tiffany	5.3	46.8	22.0	0.8	28.1	61.3	1858.3	945.1	--
Trumpet	4.3	47.5	23.8	0.8	25.1	61.8	2093.0	1060.7	--
Fabelle	6.3	46.0	23.8	0.5	26.4	61.8	1657.5	842.6	586.9
Tabasco	5.0	47.3	22.8	0.8	26.3	60.4	1422.2	722.7	504.2
Boxer	4.9	46.8	24.5	0.8	26.3	61.9	1736.7	880.1	613.7
Fanfare	4.8	48.3	22.8	1.0	28.4	62.1	1729.0	878.6	--
BOR14018	4.8	40.5	19.3	0.5	18.1	60.8	913.6	--	--
BOR15001	5.5	41.0	19.5	0.0	15.6	61.5	1082.7	--	--
Mean	5..0	46.1	22.3	0.6	24.4	61.4	1526.7	--	--
C.V. (%)	17.4	0.9	5.9	124.3	8.4	0.7	10.8	--	--
LSD 0.10	1.0	0.5	1.6	0.8	2.5	0.5	198.6	--	--
LSD 0.05	1.3	0.6	1.9	NS	3.0	0.6	239.5	--	--

Planting Date = May 2; Harvest Date = August 7, August 14; Previous Crop = Barley

Lodging Score: 0 = no lodging; 9 = plants lying flat.

Faba Bean - Irrigated — Carrington

Variety	Plant Stand	Days to Bloom	Bloom Duration	Plant Lodge	Plant Height	Test Weight	Seed Yield
	sq ft			0-9	inch	lb/bu	lb/ac
Boxer	5.8	46.5	33.5	2.5	48.6	62.7	5490.0
Fanfare	4.6	47.8	32.0	2.5	47.2	63.1	5245.1
BOR14018	4.4	41.3	32.5	2.3	38.6	62.3	4255.7
BOR15001	5.7	42.3	30.8	5.5	36.2	63.1	3683.5
Mean	5.1	44.4	32.2	3.2	42.7	62.8	4668.6
C.V. (%)	22.9	1.1	3.3	26.7	5.8	0.6	8.3
LSD 0.10	NS	0.6	1.4	1.1	3.2	0.5	500.0
LSD 0.05	NS	0.8	1.7	1.4	4.0	0.6	617.1

Planting Date = May 2; Harvest Date = August 28; Previous Crop = Corn Silage

Faba Bean - Organic **Carrington**

Variety	Plant Stand	Days to Bloom	Bloom Duration	Plant Lodge	Plant Height	Test Weight	Seed Yield
	sq ft			0-9	inch	lb/bu	lb/ac
CDC Snowdrop	3.3	51.3	20.5	0.0	25.9	60.6	1239.7
Tiffany	7.0	48.0	21.0	0.0	28.2	61.0	2143.2
Trumpet	6.7	48.0	23.5	0.0	28.2	61.4	2203.8
Tabasco	6.5	48.0	22.3	0.0	26.4	61.2	1912.0
Boxer	6.5	44.8	26.3	0.0	29.7	62.0	2172.7
Fanfare	5.0	47.8	22.0	0.0	30.6	62.6	2068.1
Mean	5.8	48.0	22.6	0	28.2	61.5	1956.6
C.V. (%)	15.7	2.2	5.4	0	5.9	0.7	6.0
LSD 0.10	1.1	1.3	1.5	NS	2.6	0.5	145.6
LSD 0.05	1.4	1.6	1.8	NS	2.5	0.6	177.0

Planting Date = May 3; Harvest Date = August 14; Previous Crop = Oats

Faba bean variety trial.

Chickpea **Carrington**

Variety	Market Type	Days to Bloom	Days to PM	Plant Height	Seed Size > 10 mm	Seed Size > 9 mm	Seed Size > 8 mm	Seed Size < 8 mm	1000 KWT	Seeds / Pound	Test Weight	Seed Yield
				inch	%	%	%	%	gram		lb/bu	lb/ac
CDC FRONTIER	Small Kabuli	54.0	93.8	16.8	2	41	50	7	369	1230	60.8	2468
CDC LUNA	Small Kabuli	49.8	90.5	14.8	5	40	39	16	364	1254	60.8	2196
MARVEL	Small Kabuli	54.8	91.3	17.5	1	1	12	86	264	1724	61.3	2512
SIERRA	Small Kabuli	53.0	94.3	17.8	41	36	15	9	480	952	58.9	1487
SAWYER	Small Kabuli	50.8	90.8	15.9	14	34	37	15	397	1144	60.4	1608
CDC Orion	Small Kabuli	46.0	88.0	14.7	14	38	32	16	380	1201	59.7	1952
	MEAN	50.2	90.8	16.5	11.6	31.8	37.6	19.0	374	1242	60.5	2153
	C.V. (%)	0.8	1.4	7.3	47.5	13.5	12.1	17.0	4.9	4.5	0.6	11.9
	LSD 0.10	0.5	1.5	1.4	6.6	5.1	5.4	3.8	22	66	0.4	304
	LSD 0.05	0.6	1.9	1.7	7.9	6.1	6.5	4.6	26	80	0.5	365

Planting Date = May 2 ; Harvest Date = August 24 ; Previous Crop = Barley

Corn - Dryland, Conventional **Carrington**

Brand	Hybrid[1]	R.M.	Days to Silk	Ear Height	Plant Height	Plant Lodge	Grain Protein	Starch Content	Harvest Moisture	Test Weight	Grain Yield 2017	Grain Yield 2-yr. Avg.
				inch	inch	0 to 9	%	%	%	lb/bu	bu/ac	bu/ac
REA	2C872	87	82.5	25.7	89.2	0.0	8.0	72.6	13.7	56.2	139.2	--
Mustang	0288CONV	88	82.8	26.0	86.4	0.0	8.5	72.3	14.3	55.1	147.1	--
Mustang	0292CONV	92	86.3	30.3	89.5	0.0	8.7	72.6	14.9	53.9	140.8	--
Mustang	0994CONV	94	82.8	28.6	99.2	0.0	8.4	73.2	16.7	52.8	151.2	--
Proseed	GX681	81	78.7	25.9	90.3	0.0	8.9	72.0	16.0	57.2	132.3	--
Proseed	1083	83	82.0	26.7	93.2	0.0	8.3	72.5	13.9	55.3	149.1	--
Proseed	GX684	84	83.5	26.4	87.3	1.3	8.0	72.7	14.0	55.5	149.8	--
Proseed	GX687	87	82.3	28.2	92.9	0.0	8.1	72.8	14.4	56.3	150.3	--
Proseed	PX689	89	82.5	28.5	91.6	0.0	8.3	72.5	14.1	55.1	143.0	--
Dairyland Seed Co.	DS-1091	91	84.0	28.4	89.0	0.0	7.9	73.5	15.5	55.7	146.8	135.5
Thunder Seed	2784	84	83.5	30.4	92.6	0.0	8.9	72.4	14.7	56.2	150.8	135.9
Proseed	1385	85	82.5	28.8	96.5	0.0	8.0	72.5	13.9	55.8	137.3	--
Thunder Seed	4585 RR	85	82.8	30.1	94.4	0.0	8.7	72.3	13.9	56.1	143.2	--
Latham	LH3877	88	83.5	29.0	91.5	0.8	8.4	72.3	14.1	55.9	145.3	--
Northstar	NS 86-194	86	83.5	24.5	95.5	0.0	8.1	72.9	14.2	55.7	140.7	--
	MEAN		82.9	27.9	91.8	0.1	8.3	72.6	14.5	55.5	144.5	--
	C.V. (%)		1.3	14.5	3.3	352	6.4	0.6	3.8	0.9	7.0	--
	LSD 0.10		1.2	NS	3.6	0.6	0.6	0.5	0.7	0.6	NS	--
	LSD 0.05		1.5	NS	4.3	0.7	NS	0.6	0.8	0.7	NS	--

Planting Date = May 3 ; Harvest Date = November 3 ; Previous Crop = Barley ; Final plant population = 28,000 plant acre^{-1}

[1] Hybrid traits as reported by seed company when hybrids submitted for evaluation.

Corn - Dryland **Carrington (Page 1 of 3)**

Brand	Hybrid	R.M.	Hybrid Traits[1]	Days to Silk	Ear Height	Plant Height	Plant Lodge	Grain Protein	Starch Content	Harvest Moisture	Test Weight	Grain Yield 2017	Grain Yield 2-yr. Avg.	Grain Yield 3-yr. Avg.
					inch	inch	0 to 9	%	%	%	lb/bu	bu/ac	bu/ac	bu/ac
Channel	181-11	81	VT2PRIB	79.3	29.0	88.8	0.0	8.3	72.0	17.4	56.6	170.1	--	--
Channel	182-62	82	VT2PRIB	79.5	30.3	96.0	0.0	9.0	71.7	18.7	56.4	153.7	133.5	131.6
Channel	185-15	85	VT2PRIB	81.8	29.9	93.0	0.0	8.2	72.3	20.4	56.0	175.5	159.9	157.4
Channel	187-49	87	VT2PRIB	80.8	29.4	95.8	0.0	8.4	71.9	19.9	54.5	176.1	170.3	--
Channel	189-29	89	VT2PRIB	80.5	28.7	95.5	0.0	9.7	71.2	21.2	55.0	165.5	--	--
Dairyland Seed Co.	DS-7185	85	3220	80.5	28.2	90.8	0.0	8.8	71.8	19.4	54.6	156.1		--
Dairyland Seed Co.	DS-9686	86	3000GT	79.8	29.7	95.0	0.0	8.6	72.1	20.4	56.6	181.1	167.1	--
Dairyland Seed Co.	EXP-08906	89	3010	80.8	28.1	92.5	0.0	8.7	72.4	18.9	54.0	161.4	--	--
Frontiersmen	087-E7VT2P	87	VT2PRO RIB	80.5	28.1	99.0	0.0	8.5	72.3	20.9	54.4	173.3	--	--
Frontiersmen	090-H8VT2P	90	VT2PRO RIB	81.0	30.8	94.7	0.0	10.0	71.3	25.0	53.5	179.6	--	--
Frontiersmen	091-C6VT2P	91	VT2PRO RIB	82.3	29.4	94.4	0.0	9.5	72.1	24.7	51.2	168.8	166.4	--
Hefty	H2802	78	RR	79.8	26.4	93.3	0.0	8.3	72.2	17.5	56.9	146.0	--	--
Hefty	H3202	82	RR	81.0	29.6	90.7	0.0	8.8	71.6	19.0	55.9	137.1	--	--
Hefty	H3302	83	RR	80.5	29.7	93.7	0.3	8.6	71.9	18.8	54.9	169.1	--	--
Hefty	H3502	85	RR	80.0	25.8	91.9	0.0	8.3	71.9	19.3	55.2	150.4	--	--
Hefty	H3702	87	RR	79.8	28.3	99.8	0.0	9.1	72.0	21.1	54.4	174.7	--	--
Hefty	H3902	89	RR	79.8	30.3	97.5	0.0	9.1	71.7	20.8	54.6	169.4	--	--
Integra	3142	81	VT2PRIB	79.8	28.4	94.4	0.0	9.3	71.3	18.8	57.0	154.2	129.6	128.1
Integra	3236	82	VT2PRIB	80.8	30.3	91.4	0.0	9.4	71.6	19.3	55.8	138.5	134.9	--
Integra	3325	83	3010A	81.0	24.0	87.9	2.0	9.2	71.4	19.6	55.3	169.5	155.3	--
Integra	3537	85	VT2PRIB	80.0	31.1	95.0	0.0	8.4	72.0	19.8	55.5	153.2	150.6	150.8
Integra	3718	87	VT2PRO	80.3	28.0	96.2	0.0	9.4	71.8	23.4	53.9	173.4	--	--
Latham	LH3487	84	VT2P	80.5	30.3	90.7	0.0	8.8	71.7	19.6	55.5	148.1	--	--
	MEAN			80.3	29.5	94.5	0.1	8.8	71.9	20.4	55.2	165.9	--	--
	C.V. (%)			1.5	14.4	4.7	365	7.5	0.7	6.3	1.8	8.1	--	--
	LSD 0.10			1.4	4.9	5.1	0.4	0.8	NS	1.5	1.2	15.7	--	--
	LSD 0.05			1.6	5.9	6.1	0.5	NS	NS	1.8	1.4	18.7	--	--

Planting Date = May 3 ; Harvest Date = October 17 ; Previous Crop = Barley ; Final plant population = 28,000 plant acre^{-1}

Brand	Hybrid	R.M.	Hybrid Traits[1]	Days to Silk	Ear Height	Plant Height	Plant Lodge	Grain Protein	Starch Content	Harvest Moisture	Test Weight	Grain Yield 2017	Grain Yield 2-yr. Avg.	Grain Yield 3-yr. Avg.
					inch	inch	0 to 9	%	%	%	lb/bu	bu/ac	bu/ac	bu/ac
Latham	LH3612	86	GTA	79.8	32.0	94.8	0.0	8.6	72.2	20.1	55.7	180.3	--	--
Latham	LH3695	86	VT2P	81.5	31.4	98.6	0.0	9.6	71.8	22.2	54.1	161.4	--	--
Latham	LH3877	88	VT2P	80.5	35.7	93.0	0.0	8.4	72.0	21.2	56.4	182.7	169.7	--
Latham	LH4147		VT2P	81.3	33.4	98.2	0.0	9.5	71.3	22.8	52.9	174.5	--	--
Legacy Seeds	L-2643	86	VT2P	79.8	31.4	100.5	0.0	8.3	72.5	20.1	54.5	156.2	145.2	145.1
Legacy Seeds	L-2817	86	VT2P	81.5	29.7	99.9	0.0	8.8	71.6	20.6	55.3	179.9	--	--
Legacy Seeds	L-2847	87	VT2P	81.3	32.5	98.5	0.0	9.4	72.1	22.6	53.6	178.0	--	--
Legacy Seeds	L-2836	88	3010 (GTCBLL)	80.0	28.9	96.6	0.0	8.4	72.4	20.2	55.2	149.9	--	--
Legacy Seeds	L-2916	88	VT2P	79.3	30.5	96.0	0.0	8.7	72.0	21.3	54.7	172.8	156.8	--
Legacy Seeds	L-3017	90	VT2P	80.5	35.9	97.7	0.0	9.6	71.7	26.5	53.0	185.6	--	--
Legacy Seeds	L-3115	92	VT2P	82.0	30.3	95.6	0.0	9.1	71.9	23.0	53.5	179.9	--	--
Mustang	3287VT2P	87	RR	79.5	29.2	96.7	0.3	8.8	71.7	20.1	55.3	180.2	--	--
Mustang	2289VT2P	89	RR	78.8	25.5	91.5	0.0	8.8	72.0	20.3	54.2	161.5	--	--
Mustang	2290VT2P	90	RR	81.5	33.8	98.7	0.0	9.3	72.1	21.9	54.0	174.8	--	--
Northstar	NS 83-538	83	VT2P	79.8	28.1	99.9	0.0	8.6	71.7	19.1	56.1	145.5	--	--
Northstar	NS 84-350	84	3110A	81.3	25.5	87.1	1.8	8.6	71.8	19.3	56.7	168.0	--	--
Northstar	NS 85-369	85	GTA	79.8	29.3	95.7	0.0	8.8	72.0	21.2	56.0	188.9	--	--
Northstar	NS 86-194	86	VT2P	80.3	29.1	95.8	0.0	8.9	71.9	20.0	55.6	166.3	153.7	--
Northstar	NS 87-545	87	VT2P	81.3	33.0	101.8	0.0	8.7	72.1	21.6	54.2	179.7	--	--
Northstar	NS 88-124	88	VT2P	81.0	25.5	94.2	0.0	8.8	71.9	21.5	54.1	175.7	--	--
Nutech	5N-183	83	3000GT	80.3	31.7	95.3	0.8	8.7	71.9	19.7	55.2	178.5	161.8	157.9
Nutech	5GN8484	84	3110	80.8	26.2	85.4	0.5	8.7	71.7	19.4	56.6	164.6	--	--
Nutech	5N-886	88	3000GT	79.3	29.8	91.6	0.0	8.6	72.0	19.2	56.9	173.5	165.5	--
	MEAN			80.3	29.5	94.5	0.1	8.8	71.9	20.4	55.2	165.9	--	--
	C.V. (%)			1.5	14.4	4.7	365	7.5	0.7	6.3	1.8	8.1	--	--
	LSD 0.10			1.4	4.9	5.1	0.4	0.8	NS	1.5	1.2	15.7	--	--
	LSD 0.05			1.6	5.9	6.1	0.5	NS	NS	1.8	1.4	18.7	--	--

Planting Date = May 3 ; Harvest Date = October 17 ; Previous Crop = Barley ; Final plant population = 28,000 plant acre^{-1}

Brand	Hybrid	R.M.	Hybrid Traits[1]	Days to Silk	Ear Height	Plant Height	Plant Lodge	Grain Protein	Starch Content	Harvest Moisture	Test Weight	Grain Yield 2017	Grain Yield 2-yr. Avg.	Grain Yield 3-yr. Avg.
					inch	inch	0 to 9	%	%	%	lb/bu	bu/ac	bu/ac	bu/ac
Latham	LH3612	86	GTA	79.8	32.0	94.8	0.0	8.6	72.2	20.1	55.7	180.3	--	--
Latham	LH3695	86	VT2P	81.5	31.4	98.6	0.0	9.6	71.8	22.2	54.1	161.4	--	--
Latham	LH3877	88	VT2P	80.5	35.7	93.0	0.0	8.4	72.0	21.2	56.4	182.7	169.7	--
Latham	LH4147		VT2P	81.3	33.4	98.2	0.0	9.5	71.3	22.8	52.9	174.5	--	--
Legacy Seeds	L-2643	86	VT2P	79.8	31.4	100.5	0.0	8.3	72.5	20.1	54.5	156.2	145.2	145.1
Legacy Seeds	L-2817	86	VT2P	81.5	29.7	99.9	0.0	8.8	71.6	20.6	55.3	179.9	--	--
Legacy Seeds	L-2847	87	VT2P	81.3	32.5	98.5	0.0	9.4	72.1	22.6	53.6	178.0	--	--
Legacy Seeds	L-2836	88	3010 (GTCBLL)	80.0	28.9	96.6	0.0	8.4	72.4	20.2	55.2	149.9	--	--
Legacy Seeds	L-2916	88	VT2P	79.3	30.5	96.0	0.0	8.7	72.0	21.3	54.7	172.8	156.8	--
Legacy Seeds	L-3017	90	VT2P	80.5	35.9	97.7	0.0	9.6	71.7	26.5	53.0	185.6	--	--
Legacy Seeds	L-3115	92	VT2P	82.0	30.3	95.6	0.0	9.1	71.9	23.0	53.5	179.9	--	--
Thunder Seed	6785 VT2P	85	VT2P	79.0	27.9	92.9	0.0	8.8	71.6	18.8	55.3	144.7	137.6	--
	MEAN			80.3	29.5	94.5	0.1	8.8	71.9	20.4	55.2	165.9	--	--
	C.V. (%)			1.5	14.4	4.7	365	7.5	0.7	6.3	1.8	8.1	--	--
	LSD 0.10			1.4	4.9	5.1	0.4	0.8	NS	1.5	1.2	15.7	--	--
	LSD 0.05			1.6	5.9	6.1	0.5	NS	NS	1.8	1.4	18.7	--	--

Planting Date = May 3 ; Harvest Date = October 17 ; Previous Crop = Barley ; Final plant population = 28,000 plant acre^{-1}

[1] Hybrid traits listed as reported by seed company when hybrids submitted for evaluation.

* Four (4) replications were utilized to record each of the traits reported.

Corn - Irrigated **Carrington (Page 1 of 3)**

Brand	Hybrid	R.M.	Hybrid Traits[1]	Days to Silk	Ear Height	Plant Height	Stalk Lodge	Grain Protein	Starch Content	Harvest Moisture	Test Weight	Grain Yield 2017	Grain Yield 2-yr. Avg.	Grain Yield 3-yr. Avg.
					inch	inch	0 to 9	%	%	%	lb/bu	bu/ac	bu/ac	bu/ac
Dairyland Seed Co.	DS-7185	85	3220	79.3	25.7	96.5	0.5	9.7	71.7	17.1	55.7	201.5	--	--
Dairyland Seed Co.	DS-9686	86	3000GT	78.8	28.4	97.1	0.0	9.2	72.2	17.2	56.6	231.0	197.3	--
Dairyland Seed Co.	EXP-08906	89	3010	78.8	31.8	101.7	0.0	9.8	71.9	16.7	56.5	220.4	--	--
Dairyland Seed Co.	DS-9090SSX	90	SSX	80.0	30.2	96.9	0.0	8.7	72.7	18.0	55.9	208.1	--	--
Dairyland Seed Co.	DS-6091	91	RR	79.0	29.5	101.1	0.0	8.6	73.2	17.9	58.2	228.8	--	--
Innotech	IC4016-3010	90	Agrisure/3010	79.3	31.7	100.5	0.0	9.6	72.2	17.3	57.1	229.3	--	--
Integra	3537	85	VT2PRIB	78.8	28.3	101.8	0.0	8.6	72.5	16.9	57.2	205.9	182.2	174.1
Integra	3718	87	VT2PRO	79.0	31.6	105.3	0.0	9.0	72.4	17.9	56.9	236.5	--	--
Integra	3922	89	VT2PRIB	78.8	33.4	104.0	0.0	8.4	72.7	17.3	56.9	219.4	193.7	--
Latham	LH3487	84	VT2P	78.3	33.9	103.5	1.0	9.0	72.1	16.5	55.4	199.7	--	--
Latham	LH3612	86	GTA	79.0	36.4	105.8	0.3	9.2	72.1	17.2	56.9	229.9	--	--
Latham	LH3695	86	VT2P	79.5	30.8	99.7	0.0	8.8	72.2	16.7	56.8	226.0	--	--
Latham	LH3877	88	VT2P	78.8	32.4	106.6	0.3	8.6	72.4	17.1	56.4	220.1	190.7	--
Latham	LH4147	91	VT2P	80.8	36.9	101.8	0.0	9.2	72.1	18.1	55.4	231.6	198.7	187.2
Legacy Seeds	L-2643	86	VT2P	78.5	30.7	104.4	0.0	8.8	72.4	16.8	57.1	210.0	186.9	178.8
Legacy Seeds	L-2817	86	VT2P	79.3	25.2	104.1	0.0	8.7	72.1	16.4	56.3	232.9	--	--
Legacy Seeds	L-2847	87	VT2P	79.3	32.5	104.7	0.0	9.1	72.1	17.3	56.9	220.4	--	--
Legacy Seeds	L-2836	88	3010 (GTCBLL)	78.8	33.4	104.7	0.0	9.3	72.3	17.0	55.5	226.1	--	--
Legacy Seeds	L-2916	88	VT2P	78.5	30.0	101.7	0.5	9.1	72.4	17.2	55.4	222.1	192.8	--
Legacy Seeds	L-3017	90	VT2P	79.3	32.7	102.4	0.0	9.7	71.7	18.4	56.2	248.2	--	--
Legacy Seeds	L-3115	92	VT2P	80.8	34.7	107.0	0.0	8.9	72.1	17.4	55.7	236.4	--	--
	MEAN			79.1	31.3	102.1	0.1	9.0	72.2	17.2	56.6	217.5	--	--
	C.V. (%)			0.8	15	4.8	231	4.1	0.5	2.9	1.6	7.9	--	--
	LSD 0.10			0.8	5.5	5.7	0.37	0.4	0.4	0.6	1.0	20.0	--	--
	LSD 0.05			0.9	NS	6.8	0.44	0.5	0.5	0.7	1.2	23.9	--	--

Planting Date = May 4 ; Harvest Date = November 14 ; Previous Crop = Soybean

Brand	Hybrid	R.M.	Hybrid Traits[1]	Days to Silk	Ear Height	Plant Height	Stalk Lodge	Grain Protein	Starch Content	Harvest Moisture	Test Weight	Grain Yield 2017	Grain Yield 2-yr. Avg.	Grain Yield 3-yr. Avg.
					inch	inch	0 to 9	%	%	%	lb/bu	bu/ac	bu/ac	bu/ac
Nutech	5GN8484	84	3110	79.3	28.8	94.5	1.3	9.3	72.0	17.0	56.3	200.4	--	--
Nutech	5N-886	88	3000GT	78.5	32.2	105.5	0.0	9.2	72.3	18.1	57.3	218.0	187.1	--
Nutech	X5BN8905	89	3000GT	79.0	30.4	98.5	0.0	9.3	72.5	17.9	56.9	248.6	--	--
Nutech	5G-293	93	3110	80.3	36.8	110.2	0.0	10.1	72.0	18.2	57.4	233.2	--	--
Peterson Farms Seed	71D83	81	VT2P	79.0	29.5	99.2	0.0	9.2	71.8	16.9	58.2	189.8	156.9	150.5
Peterson Farms Seed	79M93	83	VT2P	78.8	29.5	104.4	0.0	9.3	72.0	17.0	57.0	185.2	--	--
Peterson Farms Seed	75K85	85	VT2P	78.5	33.8	102.8	0.0	8.5	72.5	16.7	56.9	209.2	--	--
Proseed	1383	83	GT	79.0	29.4	105.2	0.0	9.4	71.6	16.1	55.8	183.8	--	--
Proseed	1483	83	VT2P	78.8	29.8	98.5	0.3	8.9	72.1	16.7	55.7	217.9	170.5	157.3
Proseed	1385	85	VT2P	79.0	31.8	109.0	0.0	8.8	72.3	17.2	57.1	212.7	180.2	--
Proseed	1487	87	VT2P	78.5	30.7	101.1	0.3	8.7	72.4	16.7	56.7	210.3	186.3	--
Proseed	PX689	89	VT2P	78.5	30.9	100.8	0.0	8.7	72.3	17.3	56.8	208.8	--	--
REA	1B811	81	VT2PRO	78.8	29.2	96.0	0.3	9.3	71.8	15.9	56.2	189.9	--	--
REA	2B840-RIB	84	VT2PRO	78.5	27.2	101.0	1.0	8.7	72.4	16.7	56.0	197.0	171.0	--
REA	2B861	86	VT2PRO	78.5	32.1	101.6	0.0	8.7	72.4	17.0	56.6	210.1	--	--
Renk	RK270RR	85	RR2	78.8	39.1	103.1	0.0	8.7	73.1	17.7	58.9	216.0	--	--
Renk	RK264VT2P	85	VT2P	78.8	29.6	100.8	0.0	8.5	72.7	17.0	57.6	223.3	--	--
Renk	RK287VT2P	87	VT2P	79.5	32.4	109.5	0.0	9.2	71.9	17.3	56.9	223.2	--	--
Renk	RK299VT2P	88	VT2P	79.0	29.6	101.2	0.0	8.8	72.1	16.9	57.1	219.5	--	--
Renk	RK408RR	90	VT2P	80.0	31.1	100.2	0.5	9.1	72.0	17.3	56.6	236.3	--	--
Rob-See-Co	RC3418-3220A	84	Agrisure/Vip/3220A	80.5	28.8	93.8	0.0	9.5	72.0	16.8	56.0	201.6	--	--
	MEAN			79.1	31.3	102.1	0.1	9.0	72.2	17.2	56.6	217.5	--	--
	C.V. (%)			0.8	15	4.8	231	4.1	0.5	2.9	1.6	7.9	--	--
	LSD 0.10			0.8	5.5	5.7	0.37	0.4	0.4	0.6	1.0	20.0	--	--
	LSD 0.05			0.9	NS	6.8	0.44	0.5	0.5	0.7	1.2	23.9	--	--

Planting Date = May 4 ; Harvest Date = November 14 ; Previous Crop = Soybean

Brand	Hybrid	R.M.	Hybrid Traits[1]	Days to Silk	Ear Height	Plant Height	Stalk Lodge	Grain Protein	Starch Content	Harvest Moisture	Test Weight	Grain Yield 2017	Grain Yield 2-yr. Avg.	Grain Yield 3-yr. Avg.
					inch	inch	0 to 9	%	%	%	lb/bu	bu/ac	bu/ac	bu/ac
Rob-See-Co	RC3601-3011A	86	Agrisure/Vip/3011A	79.0	32.2	101.8	0.0	9.3	72.3	17.8	56.9	238.5	199.8	188.0
Rob-See-Co	RC3834-3010	88	Agrisure/3010	79.0	30.4	102.1	0.0	9.4	72.2	17.5	55.9	221.6	175.3	--
	MEAN			79.1	31.3	102.1	0.1	9.0	72.2	17.2	56.6	217.5	--	--
	C.V. (%)			0.8	15	4.8	231	4.1	0.5	2.9	1.6	7.9	--	--
	LSD 0.10			0.8	5.5	5.7	0.37	0.4	0.4	0.6	1.0	20.0	--	--
	LSD 0.05			0.9	NS	6.8	0.44	0.5	0.5	0.7	1.2	23.9	--	--

Planting Date = May 4 ; Harvest Date = November 14 ; Previous Crop = Soybean

[1] Hybrid traits as reported by seed company when hybrids submitted for evaluation.

** Four (4) replications were utilized to record each of the traits reported.

Impact of CO2 in the form of gas and carbonated water on corn.

Corn - Dryland **Fingal (Page 1 of 2)**

Brand	Hybrid	R.M.	Hybrid Traits[1]	Plant Lodge	Ear Height	Plant Height	Grain Protein	Starch Content	Harvest Moist.	Test Weight	Grain Yield 2017	Grain Yield 2-yr. Avg.	Grain Yield 3-yr. Avg.
				0 to 9	inch	inch	%	%	%	lb/bu	bu/ac	bu/ac	bu/ac
Channel	187-49	87	VT2PRIB	5.5	37.2	102.8	8.8	72.9	19.1	56.5	222.4	--	--
Channel	189-29	89	VT2PRIB	4.3	33.3	97.0	10.0	71.8	18.3	56.6	202.7	--	--
Channel	193-53	93	VT2PRIB	6.3	33.7	95.5	9.4	72.8	19.9	56.8	194.0	--	--
Channel	195-18	95	VT2PRIB	4.0	36.8	98.6	9.8	72.4	20.1	57.6	188.0	--	--
Dairyland Seed Co.	DS-7185	85	3220	2.5	33.3	90.0	9.7	71.9	18.1	56.3	185.6	--	--
Dairyland Seed Co.	DS-9686	86	3000GT	4.0	34.1	94.9	9.8	72.6	19.4	56.9	178.1	177.0	--
Dairyland Seed Co.	EXP-08906	89	3010	1.0	35.6	100.6	9.6	73.0	19.8	56.8	185.0	--	--
Dairyland Seed Co.	DS-9090SSX	90	SSX	0.5	35.2	93.1	9.6	72.8	20.5	54.9	177.7	--	--
Dairyland Seed Co.	DS-6091	91	RR	7.8	38.8	101.6	9.4	73.0	20.2	57.0	190.4	--	--
Dairyland Seed Co.	DS-7294	94	3110	6.3	40.9	98.2	10.2	72.7	20.6	55.6	206.0	197.7	--
Integra	3922	89	VT2P	3.5	36.0	101.4	9.1	72.6	18.3	57.2	219.6	--	--
Integra	4122	91	VT2P	6.3	36.4	93.5	9.8	72.7	20.6	55.2	186.0	191.6	--
Integra	4338	93	GTCBLL	5.3	40.4	98.0	10.4	72.8	21.3	55.2	181.7	--	--
Latham	LH3695	86	VT2P	6.0	37.8	101.0	9.4	72.5	18.5	56.7	204.8	--	--
Latham	LH3877	88	VT2P	2.0	39.6	99.0	9.2	72.4	18.6	57.1	202.1	203.9	--
Latham	LH4147	91	VT2P	4.0	37.0	94.1	9.8	72.6	20.2	55.5	168.1	182.0	183.3
Latham	LH4242	92	VT2P	6.3	38.0	97.0	9.8	73.5	22.3	56.0	194.8	193.8	200.9
Legacy Seeds	L-3017	90	VT2P	5.5	38.8	98.6	9.9	72.4	20.3	56.5	208.5	--	--
Legacy Seeds	L-3011	90	VT2P	4.3	38.2	100.0	9.3	73.1	19.9	55.0	192.3	--	--
Legacy Seeds	L-3115	92	VT2P	4.8	39.4	97.0	9.5	72.4	19.4	56.0	189.5	188.1	190.4
Legacy Seeds	L-3416	94	VT2P	5.5	35.8	96.7	9.5	73.7	21.3	56.1	205.8	207.2	--
Legacy Seeds	L-3517	95	VT2P RIB	6.3	40.0	95.9	9.9	73.6	22.1	56.4	193.7	--	--
Legacy Seeds	L3626	96	GENSS RIB	2.0	37.8	94.3	9.4	73.6	22.0	55.7	194.2	--	--
			MEAN	5.0	37.2	97.6	9.6	72.7	19.9	56.2	195.6	--	--
			C.V. (%)	42.6	7.3	4.5	4.2	0.6	3.5	1.3	10.8	--	--
			LSD 0.10	2.5	3.2	5.1	0.5	0.5	0.8	0.9	24.5	--	--
			LSD 0.05	2.9	3.8	6.1	0.6	0.6	1.0	1.0	29.2	--	--

Planting Date = May 12 ; Harvest Date = November 8 ; Previous Crop = Soybean

Brand	Hybrid	R.M.	Hybrid Traits[1]	Plant Lodge	Ear Height	Plant Height	Grain Protein	Starch Content	Harvest Moist.	Test Weight	Grain Yield 2017	Grain Yield 2-yr. Avg.	Grain Yield 3-yr. Avg.
				0 to 9	inch	inch	%	%	%	lb/bu	bu/ac	bu/ac	bu/ac
Mustang	2289VT2P	89	RR	4.3	36.2	96.9	9.9	72.4	19.4	57.1	197.3	--	--
Mustang	2290VT2P	90	RR	6.0	38.6	102.2	9.2	72.6	18.7	57.2	211.1	--	--
Mustang	3294VT2P	94	VT2P	6.8	38.4	100.0	9.4	73.4	21.2	55.6	210.8	--	--
Mustang	4296VT2P	96	VT2P	7.0	37.8	98.0	10.0	73.0	21.8	55.4	191.9	--	--
Nutech	X5BN8905	89	3000GT	3.8	38.2	96.3	10.0	72.3	19.3	56.4	189.2	--	--
Nutech	5G-293	93	3110	4.0	40.6	100.0	10.5	72.4	20.5	54.8	164.3	181.0	--
Nutech/G2	5F-894	94	AM	4.3	35.8	98.2	9.5	73.0	20.0	54.5	172.2	192.4	--
Nutech/G2	5F-196	96	AM	6.8	40.9	104.7	9.2	73.7	21.4	54.8	223.8	215.4	211.8
Nutech/G2	5FB-5096	96	AM	5.8	37.0	99.0	10.1	73.2	21.7	55.7	216.9	--	--
Peterson Farms Seed	77H87	87	VT2P	2.3	36.2	96.5	9.3	72.4	18.4	57.5	186.8	188.0	187.8
Peterson Farms Seed	72A91	91	VT2P	6.3	39.2	96.7	9.6	72.5	20.0	55.3	187.5	--	--
Peterson Farms Seed	76Y96	96	VT2P	7.5	36.8	96.3	10.0	73.3	22.0	56.1	197.8	--	--
Proseed	PX689	89	VT2P	5.8	36.4	102.0	9.6	72.3	19.0	56.8	218.6	--	--
Proseed	1591	91	VT2P	6.3	39.8	99.2	9.7	72.5	19.8	56.1	198.7	--	--
REA	2B861	86	VT2PRO	4.8	34.3	95.3	8.8	72.9	18.2	57.2	206.8	--	--
REA	3B902	90	VT2PRO	6.0	34.3	98.0	9.5	72.8	19.7	55.0	192.7	--	--
REA	3B910-RIB	91	VT2PRO	4.8	36.8	100.6	9.2	72.8	19.0	57.2	221.4	--	--
Renk	RK408RR	90	VT2P	7.5	40.2	98.8	9.6	72.6	19.5	55.2	187.9	193.2	--
Renk	RK433RR	92	RR2	8.3	39.6	99.4	9.6	73.2	21.3	55.7	198.7	202.2	--
Renk	RK568VT3P	95	VT3P	4.3	37.0	95.1	9.6	73.4	21.4	56.8	214.7	--	--
Thunder Seed	6882 VT2P	82	VT2P	4.3	33.7	90.6	9.4	72.1	17.7	57.9	177.4	--	--
Thunder Seed	4585 RR	85	RR	4.0	33.9	95.3	9.3	72.5	18.3	57.2	195.4	--	--
Thunder Seed	6785 VT2P	85	VT2P	4.8	33.7	91.3	10.1	72.1	18.2	56.7	169.3	172.6	--
			MEAN	5.0	37.2	97.6	9.6	72.7	19.9	56.2	195.6	--	--
			C.V. (%)	42.6	7.3	4.5	4.2	0.6	3.5	1.3	10.8	--	--
			LSD 0.10	2.5	3.2	5.1	0.5	0.5	0.8	0.9	24.5	--	--
			LSD 0.05	2.9	3.8	6.1	0.6	0.6	1.0	1.0	29.2	--	--

Planting Date = May 12 ; Harvest Date = November 8 ; Previous Crop = Soybean

[1] Hybrid traits as reported by seed company when hybrids submitted for evaluation.

Corn - Dryland **Dickey County - Oakes (Page 1 of 3)**

Brand	Hybrid	RM	Hybrid Traits[1]	Days to Silk	Ear Height	Plant Height	Grain Protein	Starch Content	Oil Content	Harvest Moisture	Test Weight	--Grain Yield-- 2017	2 yr. Avg.
					inch	inch	%	%	%	%	lb/bu	bu/ac	bu/ac
Channel	193-53	93	VT2PRIB	58.8	30.7	73.7	9.7	72.9	2.9	17.9	57.6	195.6	214.7
Channel	195-18	95	VT2PRIB	60.0	31.8	74.3	9.9	72.4	3.3	19.9	58.5	183.4	205.5
Channel	197-50	97	VT2PRIB	59.8	38.1	78.8	9.2	73.2	3.0	20.2	56.3	215.6	228.1
Channel	201-28	101	VT2PRIB	62.3	36.0	78.4	9.0	73.0	3.3	20.2	56.2	212.5	--
Dairyland Seed Co.	DS-7294	94	3110	60.5	42.3	80.5	10.8	72.5	2.7	17.3	57.4	183.6	208.7
Dairyland Seed Co.	DS-9599	99	3000GT	61.8	39.2	78.8	10.2	72.6	2.9	21.6	54.5	202.0	210.0
Dairyland Seed Co.	EXP-08906	89	3010	58.5	35.6	77.0	10.8	72.7	2.4	15.5	57.0	176.1	--
Frontiersmen	094-D7VT2P	94	VT2PRO RIB	58.8	32.5	75.9	9.6	72.6	3.1	18.8	56.2	200.2	--
Frontiersmen	095-R4VT2P	95	VT2PRO RIB	61.8	33.3	74.2	9.7	72.5	3.2	21.0	56.8	189.9	--
Frontiersmen	097-R8VT2P	97	VT2PRO RIB	61.8	33.3	73.2	10.2	72.5	2.8	19.1	56.7	188.2	--
Innotech	IC4521-3110A	95	Agrisure/Vip/3110	59.0	37.7	79.9	9.8	73.2	2.7	16.6	57.2	193.4	--
Innotech	IC4730-3010	97	Agrisure/3010	61.3	38.0	78.0	10.2	72.8	3.0	21.3	56.5	181.9	197.8
Integra	4342	93	VT2P	60.5	34.2	74.9	9.5	72.5	3.4	18.2	57.1	185.6	--
Latham	LH4437	94	VT2P	58.5	32.5	73.0	9.6	72.7	3.1	18.8	56.5	194.9	215.2
Latham	LH4645	96	VT2P	59.5	32.9	73.7	9.9	72.5	3.1	17.7	56.7	189.3	--
Latham	LH4727	97	VT2P	62.8	38.3	79.5	9.4	72.6	3.2	18.6	55.8	192.8	217.9
Latham	LH4919	99	SS	63.5	38.0	77.5	9.7	73.0	3.0	21.5	56.3	198.9	--
Legacy Seeds	L-3416	94	VT2P	58.5	34.5	75.2	9.6	72.9	3.0	18.7	56.2	197.0	212.7
Legacy Seeds	L-3517	95	VT2P RIB	62.8	34.8	76.1	10.0	72.3	3.2	19.5	57.3	189.0	--
Legacy Seeds	L3626	96	VT2P RIB	59.8	33.2	73.2	9.7	72.8	3.0	19.0	56.1	176.8	--
Legacy Seeds	L3715	96	GENSS RIB	59.5	35.1	73.7	9.6	73.4	2.7	18.4	57.5	188.3	199.4
	MEAN			60.9	35.6	75.6	9.8	72.7	3.0	19.2	56.3	191.2	--
	C.V. (%)			1.3	6.4	4.3	2.2	0.5	5.7	3.7	1.0	6.63	--
	LSD 0.10			0.9	2.6	3.8	0.2	0.4	0.2	0.8	0.6	14.9	--
	LSD 0.05			1.1	3.2	4.5	0.3	0.5	0.2	1.0	0.8	17.8	--

Planting Date = May 8; Harvest Date = October 25 & 26; Previous Crop = Soybean

Brand	Hybrid	RM	Hybrid Traits[1]	Days to Silk	Ear Height inch	Plant Height inch	Grain Protein %	Starch Content %	Oil Content %	Harvest Moisture %	Test Weight lb/bu	--Grain Yield-- 2017 bu/ac	2 yr. Avg. bu/ac
Legacy Seeds	L-3712	96	VT2P RIB	61.5	34.9	75.8	9.8	72.2	3.3	21.0	56.8	197.4	--
Legacy Seeds	L3816	99	VT2P RIB	60.8	32.9	74.4	9.2	72.6	3.3	23.3	55.7	213.9	--
Legacy Seeds	L3916	99	GENSS RIB	63.0	38.1	78.7	10.0	72.6	3.1	19.5	56.9	191.3	--
Mustang	3294VT2P	94	VT2P	58.8	30.1	69.8	9.6	72.9	3.0	19.3	56.4	195.7	--
Mustang	4296VT2P	96	VT2P	62.0	34.2	75.4	10.0	72.6	3.1	19.1	57.4	179.7	--
Mustang	4295CT2P	95	VT2P	61.3	33.2	73.9	9.9	72.5	3.2	19.8	57.4	192.0	--
Mustang	4297VT2P	97	VT2P	60.5	38.7	80.9	9.2	72.9	3.3	20.6	55.7	215.2	--
Nutech/G2	5F-196		AM	60.3	36.2	77.4	9.5	73.1	2.8	18.3	55.6	195.3	218.4
Nutech/G2	5FB-5096		AM	58.5	34.7	72.5	9.7	72.5	3.3	20.3	56.6	200.5	--
Nutech/G2	5F-894		AM	59.8	34.8	70.7	10.2	72.3	2.9	16.6	57.0	172.2	204.1
Nutech/G2	5F-198		AM	60.5	32.8	72.4	9.9	72.6	3.0	18.0	54.0	181.5	--
Peterson Farms Seed	76S92	96	VT2P	60.5	36.7	76.2	9.5	72.8	3.2	17.5	57.0	186.2	205.3
Peterson Farms Seed	81W95	95	SmartStax	60.0	34.5	74.8	9.9	72.6	3.1	17.3	56.6	186.9	203.9
Peterson Farms Seed	77P94	94	VT2P	58.0	31.0	73.3	9.5	73.0	3.0	19.3	56.2	199.5	221.3
Peterson Farms Seed	78B98	98	VT2P	59.5	34.5	75.9	9.4	72.4	3.3	19.9	55.8	211.0	--
Proseed	1595	95	VT2P	58.8	31.3	70.3	9.6	73.1	2.8	17.9	58.1	206.6	--
Proseed	GX695	95	3110 VIP	60.8	41.8	81.6	10.7	72.6	2.6	17.4	57.3	185.3	--
Proseed	1598	98	VT2P	62.5	36.6	76.9	9.6	72.5	3.0	20.3	55.1	190.5	--
Proseed	16101	101	VT2P	62.3	33.2	71.9	9.7	72.6	3.2	21.8	55.9	185.6	--
Renk	RK433RR	92	RR2	60.8	36.6	76.5	9.4	73.3	2.9	16.9	56.3	194.6	--
Renk	RK568VT3P	95	VT3P	61.3	33.8	73.0	9.9	72.6	3.2	19.7	57.3	172.9	201.7
	MEAN			60.9	35.6	75.6	9.8	72.7	3.0	19.2	56.3	191.2	--
	C.V. (%)			1.3	6.4	4.3	2.2	0.5	5.7	3.7	1.0	6.63	--
	LSD 0.10			0.9	2.6	3.8	0.2	0.4	0.2	0.8	0.6	14.9	--
	LSD 0.05			1.1	3.2	4.5	0.3	0.5	0.2	1.0	0.8	17.8	--

Planting Date = May 8; Harvest Date = October 25 & 26; Previous Crop = Soybean

Brand	Hybrid	RM	Hybrid Traits[1]	Days to Silk	Ear Height	Plant Height	Grain Protein	Starch Content	Oil Content	Harvest Moisture	Test Weight	--Grain Yield-- 2017	2 yr. Avg.
					inch	inch	%	%	%	%	lb/bu	bu/ac	bu/ac
Rob-See-Co	RC4343-3110A	93	Agrisure/Vip/3220A	60.3	42.4	79.4	10.7	72.9	2.6	17.3	57.7	182.5	211.1
Rob-See-Co	RC4453-3110	94	Agrisure/Vip/3110A	60.8	39.7	78.2	11.2	72.4	2.5	17.4	56.9	178.0	--
Rob-See-Co	RC4915-3120	99	Agrisure/3120	64.3	42.5	82.0	9.9	72.5	3.2	21.0	51.9	184.0	--
Thunder Seed	6791 VT2P	91	VT2P	61.5	34.8	78.1	10.1	72.4	3.1	17.8	56.9	185.6	216.5
Thunder Seed	6798 VT2P	98	VT2P	62.0	37.2	77.8	9.5	72.5	3.2	18.6	55.9	198.3	--
Thunder Seed	4600 RR	100	RR	61.5	33.6	72.2	9.5	73.1	2.9	21.1	55.5	184.8	--
	MEAN			60.9	35.6	75.6	9.8	72.7	3.0	19.2	56.3	191.2	--
	C.V. (%)			1.3	6.4	4.3	2.2	0.5	5.7	3.7	1.0	6.63	--
	LSD 0.10			0.9	2.6	3.8	0.2	0.4	0.2	0.8	0.6	14.9	--
	LSD 0.05			1.1	3.2	4.5	0.3	0.5	0.2	1.0	0.8	17.8	--

Planting Date = May 8; Harvest Date = October 25 & 26; Previous Crop = Soybean

[1] Hybrid traits as reported by seed company when hybrids submitted for evaluation.

Corn - Irrigated **Dickey County - Oakes (Page 1 of 3)**

Brand	Hybrid	RM	Hybrid Traits[1]	Days to Silk	Ear Height	Plant Height	Grain Protein	Content Starch	Content Oil	Moisture	Test Weight	--Grain Yield-- 2017	--Grain Yield-- 2 yr. Avg.
					inch	inch	%	%	%	%	lb/bu	bu/ac	bu/ac
Channel	193-53	93	VT2PRIB	63.8	39.8	90.4	9.0	72.6	3.4	18.1	58.5	271.8	258.2
Channel	195-18	95	VT2PRIB	66.8	39.7	89.3	9.6	72.4	3.3	22.0	57.8	299.8	--
Channel	197-50	97	VT2PRIB	66.5	45.5	96.0	8.6	73.1	3.1	20.5	57.5	287.4	--
Channel	201-28	101	VT2PRIB	68.3	47.8	96.0	8.9	72.7	3.4	20.3	56.8	307.5	--
Dairyland Seed Co.	DS-9090SSX	90	SSX	65.5	39.5	85.1	8.4	73.5	3.0	17.1	57.0	245.3	--
Dairyland Seed Co.	DS-6091	91	RR	65.5	48.7	95.9	8.8	74.0	2.8	19.5	58.7	264.4	--
Dairyland Seed Co.	DS-7294	94	3110	68.0	55.4	102.3	10.1	72.7	2.9	18.9	59.2	298.5	--
Dairyland Seed Co.	DS-9599	99	3000GT	68.3	51.4	98.0	9.3	73.1	3.0	21.0	56.8	289.1	272.8
Innotech	IC4521-3110A	95	Agrisure/Vip/3110	65.5	48.7	98.6	9.8	73.0	2.7	18.5	58.2	283.8	--
Innotech	IC4688-3120	96	Agrisure/3120	69.3	51.9	97.9	8.7	73.9	2.8	19.3	56.9	304.8	--
Integra	4652	96	VT2P	64.3	40.6	89.8	9.1	73.2	3.0	20.0	58.5	262.5	--
Latham	LH4437	94	VT2P	65.0	41.2	91.3	9.2	72.8	3.2	19.8	57.2	282.9	--
Latham	LH4645	96	VT2P	66.3	43.4	92.4	9.4	72.6	3.2	19.2	57.5	279.2	--
Latham	LH4727	97	VT2P	68.5	46.0	96.3	9.1	72.4	3.3	19.1	57.1	291.1	283.3
Latham	LH4919	99	SS	69.8	47.6	96.5	9.4	72.8	3.3	22.2	57.6	316.6	--
Legacy Seeds	L-3416	94	VT2P RIB	64.5	39.4	91.5	8.9	72.7	3.3	19.5	57.5	266.2	249.6
Legacy Seeds	L-3517	95	VT2P RIB	67.5	44.7	93.3	9.6	71.8	3.6	20.7	58.4	298.6	--
Legacy Seeds	L3626	96	VT2P RIB	65.8	45.8	92.0	9.2	72.4	3.4	20.2	56.6	295.1	--
Legacy Seeds	L3715	96	GENSS RIB	66.0	45.5	91.5	8.9	73.5	2.9	19.2	58.0	266.9	259.7
	MEAN			67.1	45.9	94.6	9.1	72.7	3.2	19.9	57.3	283.5	--
	C.V. (%)			1.4	4.2	2.1	1.9	0.5	5.1	4.5	1.0	5.1	--
	LSD 0.10			1.1	2.3	2.4	0.2	0.4	0.2	1.0	0.7	16.9	--
	LSD 0.05			1.3	2.7	2.8	0.2	0.5	0.2	1.3	0.8	20.2	--

Planting Date= May 5; Harvest Date=October 25; Previuos Crop= Soybeans

Corn - Irrigated **Dickey County - Oakes (Page 2 of 3)**

Brand	Hybrid	RM	Hybrid Traits[1]	Days to Silk	Ear Height	Plant Height	Grain Protein	Content Starch	Content Oil	Moisture	Test Weight	--Grain Yield-- 2017	--Grain Yield-- 2 yr. Avg.
					inch	inch	%	%	%	%	lb/bu	bu/ac	bu/ac
Legacy Seeds	L-3712	96	VT2P RIB	67.5	43.0	91.2	9.1	72.4	3.4	19.9	58.3	275.9	--
Legacy Seeds	L3816	99	VT2P RIB	67.5	41.0	93.3	8.6	72.4	3.4	22.1	55.7	291.2	--
Legacy Seeds	L3916	99	GENSS RIB	68.8	50.4	100.6	9.2	72.7	3.4	20.3	58.0	287.3	--
Nutech/G2	5F-196			67.5	47.7	97.2	8.7	72.4	3.2	19.9	55.1	296.6	282.0
Nutech/G2	5FB-5096			66.5	42.0	88.2	9.0	73.0	3.2	20.9	56.7	256.0	--
Nutech/G2	5FN-7099		AM	70.0	44.5	93.5	9.0	72.0	3.4	22.3	52.7	289.7	--
Nutech/G2	5F-198		AM	67.5	45.2	97.0	8.7	72.2	3.4	18.9	53.8	306.4	291.9
Peterson Farms Seed	76S92	96	VT2P	67.3	42.8	93.8	9.1	72.4	3.6	19.1	58.4	262.7	251.0
Peterson Farms Seed	81W95	95	SmartStax	66.3	43.6	96.0	9.2	72.6	3.3	19.5	56.9	282.0	--
Peterson Farms Seed	77P94	94	VT2P	65.0	39.4	92.5	9.0	73.0	3.2	19.7	57.2	275.7	253.3
Peterson Farms Seed	78B98	98	VT2P	66.8	46.1	94.2	9.1	72.6	3.3	20.8	56.7	284.5	--
Proseed	1595	95	VT2P	65.3	39.5	88.8	9.0	73.2	3.0	19.3	58.7	261.3	--
Proseed	GX695	95	3110 VIP	68.0	55.4	101.7	10.1	72.2	3.0	19.5	59.0	289.6	--
Proseed	1598	98	VT2P	68.8	49.1	95.8	9.1	72.5	3.1	19.2	56.9	289.3	--
Proseed	16101	101	VT2P	68.0	43.3	92.8	9.1	72.0	3.6	21.9	57.3	304.3	--
REA	4B931-RIB	93	VT2PRO	65.8	44.0	92.9	8.9	73.1	3.1	19.2	57.0	282.2	264.8
REA	4B973	97	VT2PRO	66.8	40.8	91.4	9.8	72.2	3.4	19.1	58.6	280.1	--
REA	5A982-RIB	98	SmartStax	68.5	48.8	97.0	8.7	72.4	3.6	21.3	57.7	288.3	263.0
Renk	RK433RR	92	RR2	67.8	47.7	96.3	9.1	72.6	3.4	19.3	58.0	275.5	--
	MEAN			67.1	45.9	94.6	9.1	72.7	3.2	19.9	57.3	283.5	--
	C.V. (%)			1.4	4.2	2.1	1.9	0.5	5.1	4.5	1.0	5.1	--
	LSD 0.10			1.1	2.3	2.4	0.2	0.4	0.2	1.0	0.7	16.9	--
	LSD 0.05			1.3	2.7	2.8	0.2	0.5	0.2	1.3	0.8	20.2	--

Planting Date= May 5; Harvest Date=October 25; Previuos Crop= Soybeans

Corn - Irrigated **Dickey County - Oakes (Page 3 of 3)**

Brand	Hybrid	RM	Hybrid Traits[1]	Days to Silk	Ear Height	Plant Height	Grain Protein	Content Starch	Content Oil	Moisture	Test Weight	--Grain Yield-- 2017	--Grain Yield-- 2 yr. Avg.
					inch	inch	%	%	%	%	lb/bu	bu/ac	bu/ac
Renk	RK522SSTX	94	SSTX	67.3	44.5	94.8	9.1	72.7	3.3	19.9	56.8	268.0	256.5
Renk	RK566SSTX	94	SSTX	66.5	43.8	91.7	8.9	73.4	2.9	19.5	57.7	270.0	256.0
Renk	RK568VT3P	95	VT3P	67.3	44.0	92.9	9.2	72.4	3.4	20.6	57.8	265.2	259.9
Rob-See-Co	RC4343-3110A	93	Agrisure/Vip/3220A	67.3	56.3	100.8	9.8	72.9	2.8	18.5	58.7	287.6	271.4
Rob-See-Co	RC4453-3110	94	Agrisure/Vip/3110A	67.5	54.3	100.2	10.1	72.7	2.9	18.7	59.1	287.7	--
Rob-See-Co	RC4915-3120	99	Agrisure/3120	71.0	59.2	103.8	8.9	72.1	3.6	21.8	53.0	304.7	--
	MEAN			67.1	45.9	94.6	9.1	72.7	3.2	19.9	57.3	283.5	--
	C.V. (%)			1.4	4.2	2.1	1.9	0.5	5.1	4.5	1.0	5.1	--
	LSD 0.10			1.1	2.3	2.4	0.2	0.4	0.2	1.0	0.7	16.9	--
	LSD 0.05			1.3	2.7	2.8	0.2	0.5	0.2	1.3	0.8	20.2	--

Planting Date= May 5; Harvest Date=October 25; Previuos Crop= Soybeans

[1] Hybrid traits as reported by seed company when hybrids submitted for evaluation.

Cool-Season Cereal-Pea Forage **Carrington**

Forage Treatment	Forage Type	Harvest Stage	Days to Bloom	Days to Heading	Plant Height Legume	Plant Height Cereal	Plant Lodge	Harvest Moisture	Forage DM Yield
					inch	inch	0-9	%	ton/ac
4010/Stockford	forage pea/forage barley	flat pod/2 days after head	55.7	59.0	42.4	35.0	1.0	75.1	3.45
4010/AKF Axcel	forage pea/forage barley	flat pod/2 days after head	56.0	58.7	40.4	35.4	0.7	71.8	4.03
4010/Everleaf 114	forage pea/forage oat	flat pod/late boot	55.0	.	37.8	30.1	0.7	76.8	3.80
4010/Rockford	forage pea/grain oat	flat pod/3 days after head	56.0	57.3	38.8	38.2	0.3	75.6	3.65
Flex/Everleaf 126	forage pea/forage oat	flat pod/boot	57.0	.	35.6	30.6	0.7	80.1	3.28
Fergie/Stockford	forage pea/forage barley	flower/2 days after head	53.0	58.7	36.4	35.0	0.0	71.7	4.22
Fergie/AKF Axcel	forage pea/forage barley	flower/2 days after head	52.7	58.7	40.4	34.6	0.0	70.7	4.19
Fergie/Everleaf 126	forage pea/forage oat	flower-flat pod/boot	54.0	.	32.7	30.6	0.0	81.9	3.01
Fergie/Rockford	forage pea/grain oat	flat pod/watery ripe	52.7	57.7	38.7	40.3	0.0	75.6	3.55
Fergie/Everleaf 114	forage pea/forage oat	flat pod/boot	60.3	.	30.3	29.0	0.0	80.7	3.17
Icicle/Everleaf 114	forage pea/forage oat	flower/boot	60.3	.	30.2	30.2	0.0	80.6	3.43
Icicle/Everleaf 126	forage pea/forage oat	flower/late boot	52.7	.	33.7	31.6	0.0	79.1	3.12
Mean			55.4	58.3	36.5	33.4	0.3	76.6	3.58
C.V. (%)			1.4	0.8	4.9	4.7	164.8	2.6	13.8
LSD 0.10			1.1	0.7	2.5	2.2	0.6	2.8	0.70
LSD 0.05			1.3	0.9	3.0	2.7	0.8	3.3	0.84

Planting Date = May 5; Harvest Date = July 5; Previous Crop = Soybean

Cool-Season Cereal-Pea Forage **Carrington**

Forage treatment	CP	ADF	NDF	TDN	Ash	Ca	P	Mg	K	S	RFV	RFQ
	%	%	%	%	%	%	%	%	%	%		
4010/Stockford	17.0	32.4	49.8	61.0	10.8	0.88	0.33	0.29	2.83	0.27	119	144
4010/AKF Axcel	17.5	32.0	48.7	60.8	10.6	0.94	0.32	0.31	2.60	0.29	122	145
4010/Everleaf 114	19.1	31.0	46.6	63.3	11.3	0.89	0.37	0.29	3.07	0.31	129	154
4010/Rockford	16.6	33.4	48.9	59.0	10.1	1.01	0.30	0.31	2.59	0.28	120	137
Flex/Everleaf 126	19.9	31.6	43.8	63.5	11.4	1.12	0.37	0.31	3.37	0.32	137	153
Fergie/Stockford	16.9	30.9	50.1	62.3	10.8	0.77	0.33	0.28	2.77	0.28	121	153
Fergie/AKF Axcel	17.8	31.2	49.3	60.4	11.3	0.84	0.33	0.30	2.72	0.29	122	144
Fergie/Everleaf 126	19.0	29.3	43.8	66.3	11.1	0.95	0.36	0.30	3.24	0.30	141	170
Fergie/Rockford	14.8	35.1	55.1	57.6	9.7	0.67	0.32	0.26	2.61	0.26	105	134
Fergie/Everleaf 114	18.6	29.9	47.4	65.4	11.0	0.68	0.38	0.28	3.18	0.31	129	166
Icicle/Everleaf 114	20.4	30.2	46.0	64.7	11.5	0.86	0.39	0.31	3.17	0.34	132	160
Icicle/Everleaf 126	20.6	28.5	44.1	66.5	11.9	0.83	0.40	0.30	3.15	0.33	141	169
Mean	18.2	5.3	47.8	62.6	10.9	0.87	0.35	0.30	2.9	0.30	127	152
C.V. (%)	6.5	31.3	6.3	3.0	3.6	18.6	3.8	7.9	5.5	6.5	7.9	5.9
LSD 0.10	1.7	2.3	4.2	2.7	0.6	0.22	0.02	0.03	0.23	0.03	14	13
LSD 0.05	2.0	2.8	5.1	3.2	0.7	0.28	0.02	0.04	0.27	0.03	17	15

Planting Date = May 5; Harvest Date = July 5; Previous Crop = Soybean

Cool-Season Cereal Forage **Carrington**

Forage Treatment	Forage Type	Harvest Stage	Days to Heading	Plant Height	Plant Lodge	Harvest Moisture	Forage DM Yield
				inch	0-9	%	ton/ac
Proleaf 234	forage oats	2 days after heading	61.0	37.0	0.0	74.0	4.70
Rockford	grain oats	6 days after heading	57.3	41.7	0.0	69.2	5.36
Everleaf 126	forage oats	late boot	.	32.4	0.0	79.9	4.67
Everleaf 114	forage oats	20 % headed	.	34.3	0.0	73.0	4.89
Stockford	forage barley	6 days after heading	57.3	35.7	0.0	68.0	5.16
AKF Axcel	forage barley	7 days after heading	56.7	33.5	0.0	69.3	4.74
NS 126	forage triticale	5 days after heading	58.0	41.9	0.0	67.3	4.05
NS 567	forage triticale	50 % headed	62.0	42.7	0.0	72.4	4.59
Paul	naked oats	3 days after heading	60.0	42.5	0.0	73.1	4.32
Mean			58.9	37.5	0	72.2	4.69
C.V. (%)			0.8	3.5	.	3.0	7.6
LSD 0.10			0.7	1.8	NS	3.0	0.51
LSD 0.05			0.9	2.2	NS	3.7	0.61

Planting Date = May 5; Harvest Date = July 5; Previous Crop = Soybean

Cool-Season Cereal Forage **Carrington**

Forage Treatment	CP	ADF	NDF	TDN	Ash	Ca	P	Mg	K	S	RFV	RFQ
	%	%	%	%	%	%	%	%	%	%		
Proleaf 234	13.1	39.5	62.1	51.3	10.3	0.45	0.31	0.21	2.90	0.25	87	109
Rockford	12.8	40.1	61.4	51.3	10.1	0.47	0.30	0.20	2.72	0.24	88	108
Everleaf 126	15.7	34.8	54.8	59.1	11.8	0.63	0.37	0.23	3.27	0.27	105	135
Everleaf 114	13.8	37.0	58.8	54.9	11.2	0.52	0.33	0.21	3.09	0.25	95	122
Stockford	13.3	34.4	56.7	57.2	11.1	0.55	0.31	0.23	2.44	0.25	102	133
AKF Axcel	11.9	33.3	54.8	57.6	10.2	0.51	0.29	0.21	2.29	0.21	107	135
NS 126	13.8	38.7	61.2	49.7	11.1	0.56	0.28	0.22	2.39	0.22	89	104
NS 567	14.2	37.9	61.0	51.4	11.5	0.52	0.30	0.22	2.71	0.23	90	109
Paul	13.1	36.9	59.6	52.6	9.3	0.52	0.28	0.22	2.23	0.24	94	118
Mean	13.7	36.6	58.6	54.4	10.7	0.52	0.31	0.22	2.69	0.24	96	121
C.V. (%)	8.4	5.2	3.6	3.3	3.8	11.4	3.5	7.2	5.8	9.40	6.2	6.2
LSD 0.10	1.6	2.7	3.0	2.5	0.6	0.08	0.01	0.02	0.22	0.03	8	11
LSD 0.05	2.0	3.3	3.6	3.1	0.7	0.10	0.02	0.03	0.27	0.04	10	13

Planting Date = May 5; Harvest Date = July 5; Previous Crop = Soybean

Cool-Season Pea Forage **Carrington**

Variety	Days to Flower	Plant Canopy Height	Vine Length	Plant Lodge	Harvest Moisture	Forage DM Yield
		inch	inch	0-9	%	ton/ac
Flex	57.3	30.4	43.7	3.3	83.0	2.28
Icicle	60.3	27.1	36.5	3.3	83.5	1.97
4010	54.5	32.0	45.7	2.8	81.8	2.47
Fergie	52.8	33.7	41.5	2.0	81.2	1.94
H3-2	55.3	33.3	45.5	2.5	81.6	2.44
Mean	56.0	31.3	42.6	2.8	82.2	2.22
C.V. (%)	0.9	12.7	11.8	49.1	1.8	9.4
LSD 0.10	0.6	5.0	6.3	NS	1.9	0.26
LSD 0.05	0.7	6.1	7.7	NS	NS	0.32

Planting Date = May 5; Harvest Date = July 5; Previous Crop = Soybean

Cool-Season Pea Forage **Carrington**

Variety	CP	ADF	NDF	TDN	Ash	Ca	P	Mg	K	S	RFV	RFQ
	%	%	%	%	%	%	%	%	%	%		
Flex	21.2	32.7	42.7	64.5	11.3	1.33	0.36	0.35	3.10	0.30	139	156
Icicle	20.3	31.2	42.5	65.8	11.6	1.33	0.37	0.36	3.13	0.31	141	165
4010	19.6	32.3	42.9	63.4	11.6	1.39	0.34	0.36	2.91	0.30	139	151
Fergie	20.1	33.3	44.2	63.7	10.9	1.26	0.36	0.35	3.10	0.28	133	148
H3-2	17.0	38.0	50.7	59.8	10.3	1.20	0.32	0.34	2.98	0.26	109	120
Mean	19.6	33.5	44.6	63.4	11.1	1.30	0.35	0.35	3.0	0.29	132	148
C.V. (%)	5.1	5.3	4.7	2.4	6.5	6.1	4.7	5.0	4.5	8.0	6.1	7.3
LSD 0.10	1.5	2.7	3.2	2.3	1.1	0.12	0.02	NS	0.21	0.03	12	16
LSD 0.05	1.9	3.4	3.9	2.9	NS	0.15	0.03	NS	NS	0.04	15	20

Planting Date = May 5; Harvest Date = July 5; Previous Crop = Soybean

Winter Rye Forage **Carrington**

Variety	Harvest Date	Vigor[1]	Stand	Jday of Heading	Plant Height	Harvest Moisture	Forage DM Yield
		1-10	%		inch	%	ton/ac
Rymin	8-Jun	7.0	96.3	153.5	38.6	70.4	2.29
ND Dylan	8-Jun	8.0	98.8	153.0	43.1	68.0	2.72
Dacold	8-Jun	4.3	93.8	157.5	44.7	69.3	2.43
Aroostok	1-Jun	2.3	80.0	147.5	34.4	73.6	1.79
Wheeler	8-Jun	3.5	88.8	156.5	44.4	70.2	2.07
Mean		6.1	93.8	151.5	39.8	70.9	2.28
C.V. (%)		20.5	5.1	0.4	5.8	2.3	10.4
LSD 0.10		1.5	5.8	0.8	2.8	2.0	0.29
LSD 0.05		1.9	7.0	1.0	3.4	2.5	0.35

Planting Date = September 19, 2016; Harvest Dates = June 1, June 8; Previous Crop = Flax

[1] Vigor: 1 = worst; 10 = best

Winter Triticale Forage, single cutting **Carrington (Page 1 of 2)**

Variety	Winter Survival	Jday of Heading	Plant Height	Harvest Moisture	Forage Yield DM
	%		inch	%	ton/ac
Tri Cal 718	38.8	161.3	34.7	72.1	1.15
Tri Cal 336	55.0	157.5	33.1	69.7	1.61
Tri Cal 154	72.5	155.5	34.8	67.7	1.70
NS204719	56.3	161.0	35.8	71.5	1.51
Mean	55.6	158.8	34.6	70.2	1.50
C.V. (%)	19.2	0.5	10.0	1.9	15.5
LSD 0.10	13.9	1.0	NS	1.7	0.30
LSD 0.05	17.1	1.3	NS	2.1	0.37

Planting Date = September 19; Harvest Date = June 12 (Jday 163); Previous Crop = Flax

Winter Triticale Forage, single cutting **Carrington (Page 2 of 2)**

Variety	CP	ADF	NDF	TDN	Ash	Ca	P	Mg	K	S	RFV	RFQ
	%	%	%	%	%	%	%	%	%	%		
Tri Cal 718	12.9	33.2	56.8	58.6	9.2	0.42	0.28	0.20	2.40	0.17	103	142
Tri Cal 336	12.2	33.9	57.8	58.1	9.1	0.41	0.27	0.20	2.28	0.17	101	139
Tri Cal 154	10.2	35.4	59.1	56.5	7.7	0.39	0.24	0.19	1.99	0.15	97	132
NS204719	10.5	36.1	60.3	55.9	9.0	0.38	0.26	0.18	2.42	0.14	95	128
Mean	11.9	5.7	58.5	57.3	8.8	0.40	0.26	0.19	2.27	0.16	99	135
C.V. (%)	11.5	34.7	5.0	3.7	7.6	13.0	7.0	5.9	8.7	11.3	7.5	7.3
LSD 0.10	2.2	NS	NS	NS	1.1	NS	0.03	0.02	0.31	0.03	NS	NS
LSD 0.05	NS	NS	NS	NS	1.3	NS	0.04	NS	0.40	NS	NS	NS

Planting Date = September 19; Harvest Date = June 12 (Jday 163); Previous Crop = Flax

Winter Triticale Forage, two cuttings **Carrington (Page 1 of 2)**

Variety	Winter Survival	Jday of Heading	Plant Height	Harvest Moisture	Forage Yield DM	Plant Height 2	Forage Yield 2 DM	Total Forage Yield DM
	%		inch	%	ton/ac	inch	ton/ac	ton/ac
NT05421	98	157.0	38.7	67.0	2.32	27.4	0.55	2.87
NE441T	96	160.0	38.3	71.0	2.15	27.6	0.63	2.78
NT01451	96	158.0	35.5	68.2	2.19	22.0	0.43	2.62
NT13443	89	157.5	41.4	66.0	2.38	29.4	0.42	2.80
NT11406	100	158.5	36.6	67.8	2.54	23.3	0.29	2.83
NT09423	98	158.8	34.0	67.4	2.52	23.3	0.50	3.02
NT7403	94	154.5	33.6	64.4	2.24	24.3	0.54	2.77
NT06422	95	156.3	34.9	67.5	2.30	23.5	0.24	2.54
NT426GT	91	156.8	35.6	67.1	2.16	23.7	0.40	2.56
NT11428	96	157.8	40.5	69.9	2.40	24.5	0.33	2.73
NT13416	93	158.0	38.9	68.6	2.26	26.4	0.39	2.65
NE422T	95	160.8	42.1	72.8	2.35	29.5	0.47	2.82
Mean	95	157.8	37.5	68.1	2.32	25.4	0.43	2.75
C.V. (%)	5.5	0.6	7.3	1.8	19.0	8.7	35.2	16.1
LSD 0.10	7	1.1	3.3	1.5	NS	2.7	0.18	NS
LSD 0.05	8	1.3	3.9	1.7	NS	3.2	0.22	NS

Planting Date = September 19; Harvest Date = June 12 (1st harvest, Jday 163, anthesis) and July 19 (2nd harvest, heading); Previous Crop = Flax

Winter Triticale Forage, two cuttings **Carrington (Page 2 of 2)**

Variety	CP	ADF	NDF	TDN	Ash	Ca	P	Mg	K	S	RFV	RFQ
	%	%	%	%	%	%	%	%	%	%		
NT05421	10.5	34.1	57.7	55.3	8.8	0.49	0.22	0.20	1.74	0.15	101	127
NE441T	11.4	33.6	58.2	56.0	9.1	0.47	0.25	0.21	2.20	0.16	101	132
NT01451	10.4	34.4	58.6	56.0	8.8	0.45	0.23	0.20	1.89	0.15	99	130
NT13443	11.2	31.7	54.8	57.5	8.6	0.48	0.22	0.21	1.65	0.16	110	138
NT11406	10.5	33.2	57.3	55.6	8.9	0.48	0.22	0.19	1.86	0.16	103	129
NT09423	10.2	32.6	56.9	56.5	8.6	0.45	0.22	0.19	1.87	0.16	104	132
NT7403	10.8	32.6	55.5	57.4	8.4	0.45	0.23	0.20	1.73	0.16	107	137
NT06422	10.6	33.6	57.5	58.0	8.1	0.45	0.22	0.19	1.86	0.16	102	125
NT426GT	10.9	31.5	55.5	58.1	8.5	0.47	0.23	0.21	1.70	0.16	108	140
NT11428	10.8	33.9	58.8	57.2	8.9	0.46	0.23	0.20	1.88	0.16	99	123
NT13416	9.5	35.2	60.0	54.6	8.4	0.48	0.21	0.19	1.66	0.15	96	123
NE422T	11.0	34.9	59.7	54.8	9.3	0.48	0.24	0.20	2.16	0.17	97	126
Mean	10.6	33.4	57.5	56.4	8.9	0.47	0.23	0.20	1.85	0.16	102	130
C.V. (%)	7.6	3.9	2.9	2.9	4.9	6.8	5.8	4.5	9.0	7.1	4.7	5.8
LSD 0.10	1.1	1.8	2.3	2.3	0.6	NS	0.02	0.01	0.23	0.01	7	11
LSD 0.05	1.4	2.2	2.8	2.7	0.7	NS	0.02	0.02	0.28	0.02	8	13

Planting Date = September 19; Harvest Date = June 12 (1st harvest, Jday 163, anthesis) and July 19 (2nd harvest, heading); Previous Crop = Flax

Organic sorghum nursery.

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Throughout the year, the Center hires individuals on a part-time basis to help in the research effort. Many of these are students and local residents. We would like to acknowledge the following who helped at some time during the year: Brittney Aasand, Seth Abaurrea, Eric Allmaras, Ross Allmaras, Ryan Allmaras, Skyler Bergstad, Trace Beumer, Harley Burgard, Colton Buskness, Ann Endres, Jill Endres, Savanna Friedt, Jesse Hafner, Christine Halvorson, Mathias Kubal, Marlys Lange, Brandon Larson, Jonathan Lura, Nicolas Lyman, Casey Mack, Sadie Magnuson, Shayna Mosbrucker, Ashley Neumiller, Sean Nichols, Jesper Nielsen, Sylvie Pate, Brett Paulson, Travis Pedersen, Jacob Rau, Beau Retzlaff, Madison Richter, Sam Richter, Mikayla Schlegel, Kaitlyn Thompson, McCoy VandeHoven, Gabrielle Volk, Kaylee Weninger, Elizabeth Widmer, and Larissa Wolff.

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