Henry J. Stumpf International Wheat Center

Grant, NE

2020 Annual Research Summary

Contents

Spring Wheat Research in Western Nebraska 2

Improving Nitrogen Management in Dryland Winter Wheat Production 7

Soybean Fertility Study in Western Nebraska: What is limiting high yield and protein 9

2020 State Variety Trials 21

Perkins County Rainfed 2020 Winter Wheat Variety Trial 22

West Central Rainfed 2-Year Winter Wheat Variety Trail Averages 24

Perkins County Rainfed 2020 Spring Wheat Variety Trial 26

Perkins County Rainfed 2020 Dryland Sorghum Trial 27

Perkins County Rainfed 2020 Dryland Corn Hybrid Trial 29

Perkins County Irrigated 2020 Irrigated Corn Hybrid Trial 30

Spring Wheat Research in Western Nebraska

Strahinja Stepanovic, Justin Richardson, Robert Klein, Cody Creech, Bijesh Maharjan

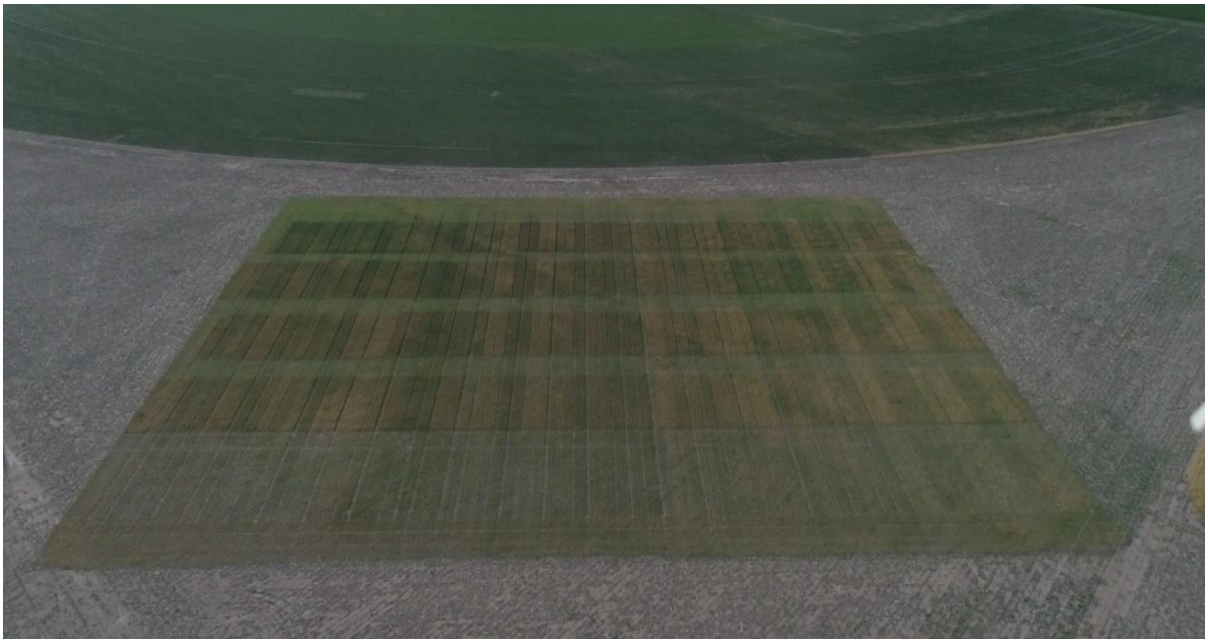

Figure 1. 2020 Areal immage of spring wheat demo plot at Henry J. Stumpf International Wheat Center near Grant, NE.

Spring wheat is a cool season cereal crop grown mostly in the northern parts of the US where cooler summers allow the crop to avoid heat stress and have extended grain filling period. As wheat production moves further south, climate conditions change towards milder winters and hotter summer, favoring production of winter wheat. In Nebraska, almost all wheat production comes from winter wheat.

Why spring wheat did not work in the past?

The past attempts to incorporate spring wheat into a dryland cropping system of semiarid western Nebraska often failed due to:

- Grain yield being approximately 40-60% lower than that of winter wheat
- Lack of infrastructure such as availability of seed, storage, crop insurance, and marketing opportunities.
- Favorable market prices for other crops commonly used in crop rotations (i.e. corn and winter wheat)
- High efficiency of fallow period in terms of lower cash rent and herbicide expenses.

Why spring wheat might work now?

Over the past several years, gradual decline in both corn and winter wheat prices, increased difficulties of efficiently controlling weeds during the fallow period, and penalties associated with low protein in winter wheat forced many farmers to abandon traditional wheat-corn-fallow rotation and attempt to meet financial goals by adopting a continuous crop rotation. Based on our most recent survey, most farmers decide to either grow continuous corn or replace fallow with an alternative crop (e.g. field peas, proso millet, soybeans, etc.) and grow it in three-year rotation with wheat and corn.

In a semiarid climate, such as western Nebraska, intensifying crop rotations will inevitably lead to reduction in yield of the subsequent crop in rotation. In case of continuous corn, yield penalties are also a consequence of gradual decline in residue cover and increase in weed, insect, and disease pressure that require additional management expenses. Many farmers view spring wheat as rotational crop with a purpose to break the weed and pest cycles, build up the residue cover, and increase yield of corn the following years. It is unlikely that spring wheat will generate high profits, but if farmers are able to break even at the expense of increasing corn yield the following 3-4 years, spring wheat has a good chance of being successfully implemented into a dryland crop rotation of western Nebraska.

Helping farmers grow and market spring wheat

In the spring of 2020, Nebraska Extension initiated the research on spring wheat to generate baseline information on variety performance and optimal agronomic practices that would help farmers successfully grow the crop. Besides yield, the objective of this research was to determine the impact of variety selection, fertility programs, and tillage on grain protein content as well as baking and milling qualities of spring wheat. Such information would allow farmers to adopt strategies that yield a more marketable product with easier access to niche markets.

The study was conducted at Henry J. Stumpf International Wheat Center near Grant, NE. Several breading companies (both public and private) were contacted to provide the varieties they believe would perform well in our environment. The soil type at the research site was Kuma silt loam with soil pH of 5.3, organic matter content of 1.9%, preplant soil P (0-8 in) 79 ppm, and preplant soil N (0-24 in 19 lbs/ac). The previous crop was corn that had 120 bu/ac in 2019. The growing conditions were hotter and dryer than normal, with seasonal precipitation (Mar-Jul) lower than 30-year average by 3.5 inches (Figure 2).

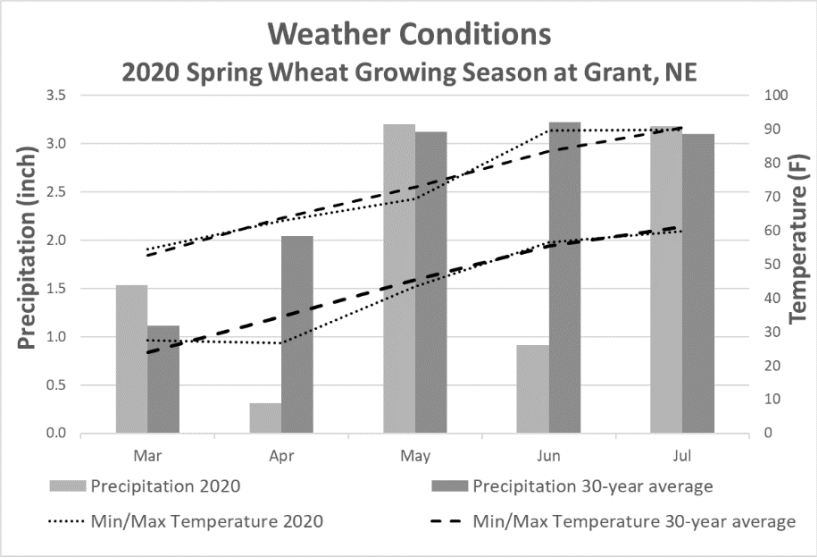

Figure 2. Monthly precipitation, minimum and maximum air temperatures during the 2020 spring wheat growing season including 30-year averages at Henry J. Stumpf International Wheat Center near Grant, NE.

Field trial treatments – Varieties, Tillage, and Nitrogen

Total of 19 spring wheat varieties were planted on Mar 6 in three tillage blocks (no-till, vertical till, and conventional till) at the seeding rate of 1.5 million live seeds/ac. Tillage treatments were performed prior to planting (Mar 2); vertical tillage chopped the residue leaving most of the it on the ground surface, while conventional tillage incorporated plant residue into the ground. On Mar 27, at

tillering stage five nitrogen (N) rates (0, 50, 100, 150, and 200 lbs of N/ac) in a form of liquid urea ammonium nitrate (32-0-0) were applied across all varieties and tillage blocks using fertilizer nozzles on the commercial sprayer. The field received 0.51 inches of rain shortly after fertilizer application incorporating applied fertilizer into a soil.

Variety performance

Variety yield performance (i.e. yield ranking) apeared not to be affected by different tillage and N management practises. These results suggest that verieies that performed well under no-till or low N also performed well under vertical tillage or high N and vice versa. Combined over all tillage and N rates, yield of spring wheat varieties ranged from 12.0 to 20.2 bu/ac averaging 16.8 bu/ac (Table 1).

Among the varieties evaluated, WestBred's hard red WB-9590 performed the best yielding 20.2 bu/ac, which was 42% of the yield obtained in a neighbouring field of winter wheat (47 bu/ac) planted after a fallow year (Table 1). WestBred also had a hard white variety, WB-7202CLP, that yielded 18.7 bu/ac and was ranked 3rd in the overall performance (Table 1). Montana State, Minnesota Crop Improvement Association, AgriPro (Syngenta), and South Dakota State University (SDSU) each had at least one variety in the upper half of the overall yield rankings, while all North Dakota State University (NDSU) varieties were in the bottom half (Table 1).

Table 1. Spring wheat variety performance averaged across three tillage and five nitrogen treatments. Study was conducted during the 2020 growing season at UNL's research center near Grant, NE. Yield of winter wheat planted after a fallow year and in close proximity of the plot was 47 bu/ac.

Company	Variety	Yield (bu/ac)	Rank
WestBred (Bayer)	WB 9590 HRS	20.2	1
WestBred (Bayer)	WB 9719 HRS	18.8	2
WestBred (Bayer)	WB 7202 CLP HWS	18.7	3
Montana State	Vida	18.5	4
WestBred (Bayer)	WB 9606 HRS	18.2	5
Minnesota Crop Improvement Association (MNCIA)	MN Torgy	18.0	6
AgriPro (Syngenta)	SY Rustler	17.7	7
WestBred (Bayer)	WB 7696 HWS	17.1	8
South Dakota State University (SDSU)	Surpass	17.0	9
WestBred (Bayer)	WB 9479 HRS	16.8	10
South Dakota State University	Prevail	16.8	11
North Dakota State University (NDSU)	Glenn HRS	16.3	12
Minnesota Crop Improvement Association	MN Lang	16.3	13
North Dakota State University (NDSU)	ND Vitpro HRS	16.1	14
North Dakota State University (NDSU)	Faller HRS	16.0	15
South Dakota State University (SDSU)	Boost	15.5	16
AgriPro (Syngenta)	SY Valda	15.3	17
AgriPro (Syngenta)	SY Ingmar	14.6	18
North Dakota State University (NDSU)	ND Frohberg HRS	12.0	19
	Plot average	16.8	
	Yield difference at 5 % level	4.7	

Tillage and Nitrogen Management

Spring wheat yield response to tillage was slightly better (~2-3 bu/ac) at low N rates (< 75 lbs of N/ac), possibly due to higher N mineralization (Figure 3). Better residue cover and soil water availability under no-till seemed to increase yield potential, which in turn resulted in better yield response to N rates exceeding 75 lbs of N/ac (Figure 3). At 200 lbs of N/ac, no-till yielded 27 bu/ac providing 7-10 bu/ac yield advantage over vartical and convnetional tillage (Figure 3).

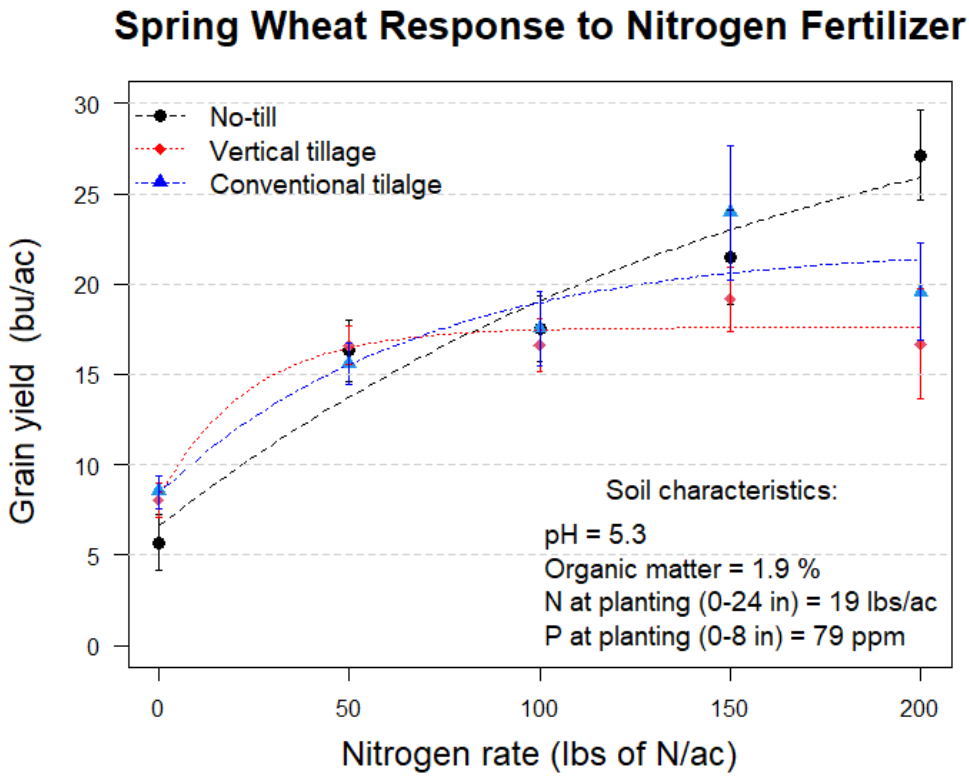

Figure 3. Spring wheat response to tillage (No-till, vertical tillage, and conventional tillage) and nitrogen rates (0-200 lbs of N/ac) during the 2020 growing season at Grant.

Economically Optimal N Rate

From the economical standpoint, gain in yield for each additional unit of N fertilizer can only be justified if the economic returns (i.e. yield x grain price) exceed the investement (i.e. N rate x price of fertilizer). In 2020, hot and dry weather coditions that did not favor growth and development of spring wheat (Figure 2); consequently, yield potential was reduced and spring wheat was not very responsive to higher N rates (Figure 3).

Based on curent price of spring wheat ($5/bu) and N fertilizer ($0.50/lb of N) the optimal N fertilizer rate for spring wheat during the 2020 growing season at Grant, NE was 51 lbs of N/ac, which coresponded to 15 bu/ac yield (Table 2). While spring wheat yielded 25 bu/ac at 200 lbs of N, investing additional 150 lbs of N (~$75/ac input) to increase yield by aproximatelly 10 bu/ac (~$50/ac in profit) was not economically justified (Figure 4, Table 2). However, if higher N inputs lead to increase in grain protein or baking and milling qualities that would make spring wheat more marketable, higher N inputs can be seen as a valuable investment. The economically optimal N rates for spring wheat across the range of grain market and N fertilizer prices is summarized in Table 2.

Conclusions

- Spring wheat has shown potential to be incorporated into a dryland crop production of western NE as a rotational crop to a continuous corn cropping sequence.
- The best variety in the trial yielded 20.2 bu/ac, which was 42% of the neighboring winter wheat.
- No-till was superior to vertical and conventional tillage, especially at higher N rates
- Economically optimal N rates for spring wheat in 2020 was 51 lbs of N/ac.

Prior to making any long-term recommendations, the study needs to be conducted for multiple year and at multiple location to account for environmental factors that influence variety performance and management practices.

Upcoming resources on spring wheat

- Grain protein, baking and milling qualities - added to this report.
- Spring wheat state-wide variety performance at four western Nebraska locations.

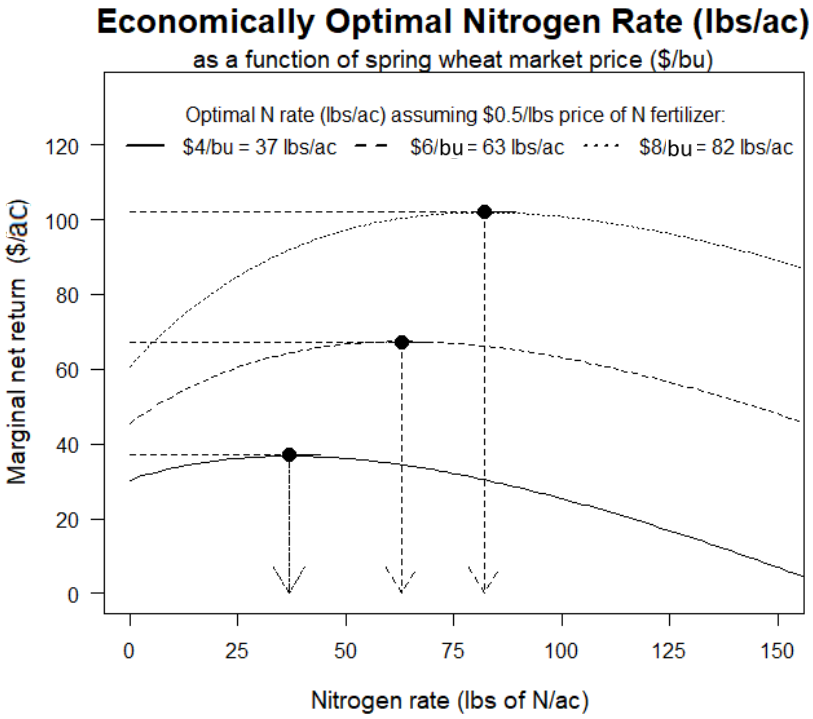

Figure 4. Economically optimal nitrogen rate (lbs of N/ac) as a function of spring wheat grain market price (4, 6, and 8 $/bu) at $0.5/ac N fertilizer price assuming yield response to N rates observed during the 2020 growing season at Grant, NE.

Table 2. Economically optimal N rate for spring wheat as a function of grain and fertilizer price assuming yield response to N rates observed during the 2020 growing season at Grant, NE.

Grain price	Fertilizer price ($/lbs of N)				
($/bu)	0.6	0.55	0.5	0.45	0.4
4	25	31	37	44	51
5	40	45	51	58	66
6	51	57	63	70	78
7	61	67	73	80	88
8	70	76	82	89	97

Project Title: Improving Nitrogen Management in Dryland Winter Wheat Production

PI: Bijesh Maharjan
Co-PIs: Deepak Ghimire, Cody Creech, Devin Rose, Nathan Mueller, Yeyin Shi, Dipak Santra, Amanda Easterly, Laila Puntel, and Teshome Regassa

Background:

Low protein levels caused an estimated $2.3 million to $9.6 million loss in income for producers in 2016 despite high grain yields. Similar low protein issues persisted in 2017. Wheat producers lose income as a discount kicks in at protein levels below 10%-11%, depending on the elevator. Among many potential factors, soil nitrogen (N) is probably the most central factor that affect protein.

A two-year study was initiated at Henry J. Stumpf International Wheat Center, Grant along with other three locations across Nebraska (Mead, Sidney, and Scottsbluff) in the fall of 2018. The specific objectives of the field study are:

- To evaluate effects of the combination of different rates and application timing of N on grain yield and quality.
- To evaluate the effect of sulfur rates and timings on yield and acrylamide accumulation.
- To explore use of crop sensors for in-season N management in winter wheat.

Study design:

Two hard red winter wheat varieties (Ruth and Freeman) were used as the main plot factor. The sub plot factor was combination of: Three fertilizer N application timing - 100% in fall, 100% in spring and Split (30% in fall and 70% in spring) and six N rate (0, 25%, 50%, 75%, 100% and 125% of recommended N rate). Recommended N rate was estimated based on soil test and yield goal using current UNL algorithm which resulted 100% N rate as 67 kg ha^{-1}. Hand-held sensor (RapidScan CS-45) was used to collect Normalized Difference Vegetation Index (NDVI) at Feekes GS 10 (booting stage) and 10.5.3 (flowering stage).

Results and Discussion:

In 2018/2019, N rate had significant effect on grain yield (Figure 1). The precipitation was above average from May through July, when the crop goes through tillering, booting, heading, and flowering, increasing daily crop water use. This resulted in considerably high yield across all N treatments. Nitrogen applied as split and spring application had significantly higher grain yield compared to fall application. No significant difference in yield and protein was observed by variety.

In 2019/2020, N application timing and N rate had no significant effect on grain yield (Figure 1). A drier soil environment in 2019/2020 due to lower precipitation during the growing season might have resulted in no differences in grain yield among N rates. Grain yield was significantly higher for Ruth (2.94 Mg ha^{-1}) compared to Freeman (2.77 Mg ha^{-1}).

A significant effect of N rate was observed on grain protein content (GPC) in both years. In 2018/2019, although there was an increase in GPC with increase in N rates, the highest GPC was only 10.13% (12% moisture basis) for 125% N applied plots. In 2019/2020, grains had higher GPC, as high as 16.06% for 125% N rate. The increase in GPC in the second year was observed in an inverse relation with the decline in yield. N application timing and variety did not have any effect on GPC.

Data from this study also suggest that crop sensors can be effective in letting producers know whether additional inputs are needed during the growing season. A significant linear

relationship was observed for NDVI and N rates at Feekes GS 10.5.3 in 2018/2019 (Figure 3). Wheat grains from Nitrogen-Sulfur study plots is yet to be analyzed for amino acids. The field trial will continue in 2020/2021 with revised treatments. Over years, the team will develop and share with producers optimized N management strategy to improve wheat grain yield and protein.

Acknowledgment:
This research is funded by IANR ARD and Nebraska Wheat Board.

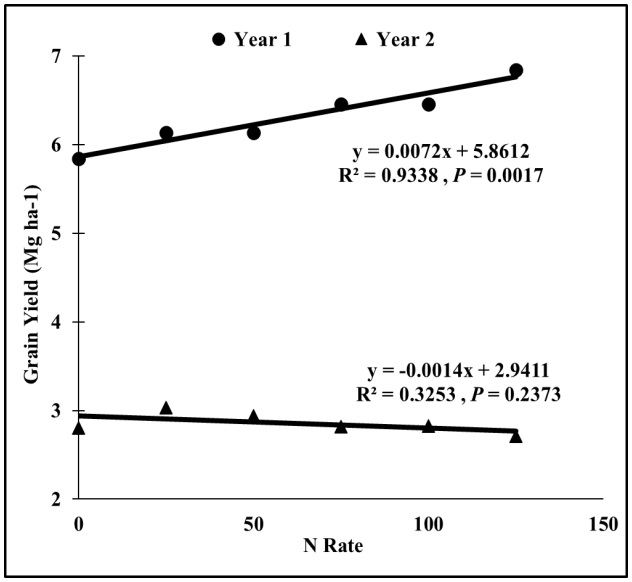

Figure 1. Linear regression of winter wheat grain yield against different N rates (% of recommended rate) at GRANT, NE.

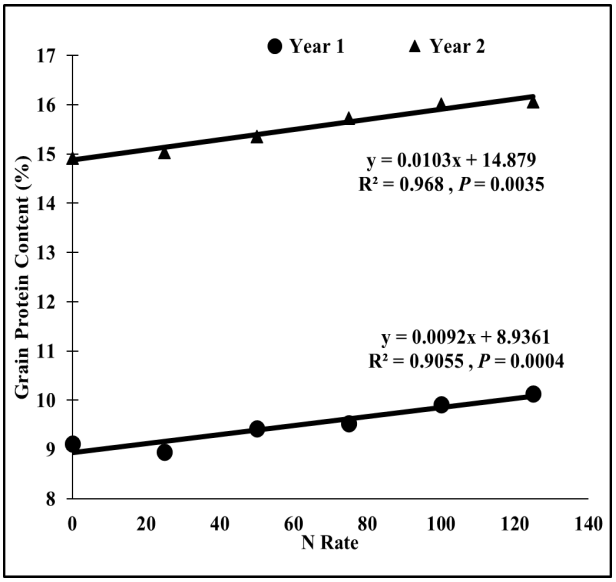

Figure 2. Linear regression of winter wheat grain protein content against different N rates (% of recommended rate) at GRANT, NE.

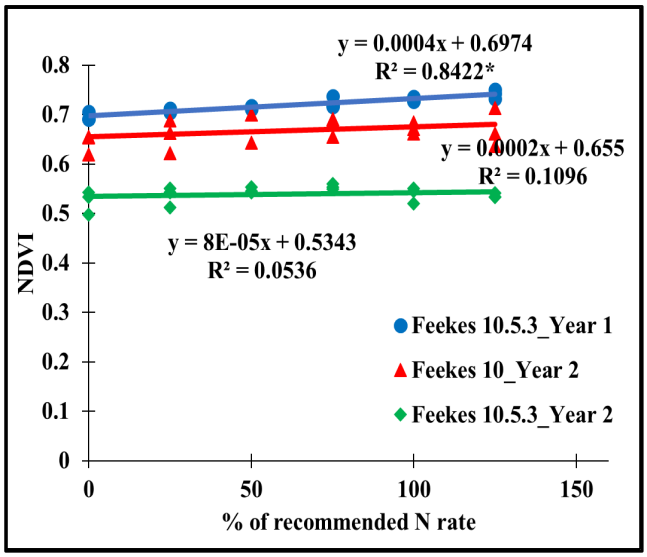

Figure 3. Linear regression between NDVI and N rates different winter wheat growth stages.

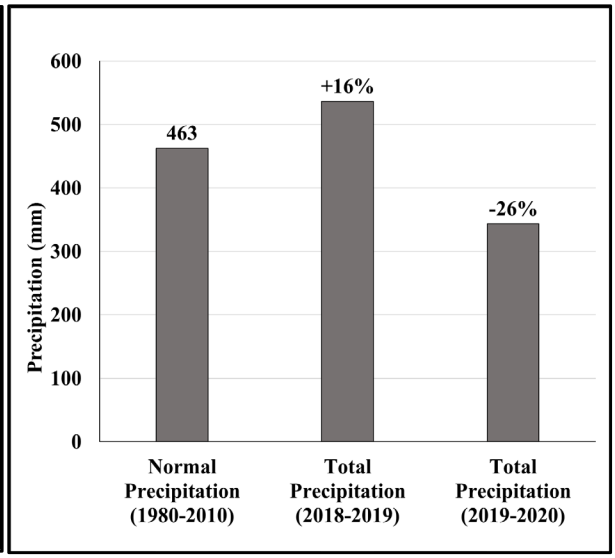

Figure 4. Total annual precipitation during study period at GRANT, NE.

Soybean Fertility Study in Western NE: What is limiting high yield and protein?

Strahinja Stepanovic, Justin Richardson, Kelly Bruns

Figure 1. Farmers examining different fertility treatments during 2019 August Field Day near Grant, NE.

Background

Is nitrogen (N) limiting high soybean yield?

Based on surveys conducted during seven teaching sessions in 2019 and 2020, 40% of the attendees representing 137,000 acres of irrigated soybean production in western NE reported to chemigate some level of N fertilizer during the soybean reproductive stages (25-50 lbs N /ac most common rate). The main reasons for adopting this practice are based on the notion that biological fixation and residual soil N are often not able to meet N demand of high-yielding soybean (≥70 bu/ac).

Mortzinis et al. (2017) reported a minimal effect of N on soybean yield (0-2 bu/ac increase) in 207 environments (site-years) across the 16 land-grant universities. There are a few studies from eastern parts of Nebraska (Cafaro La Menza et al. 2018, Wortmann et al. 2012) and Kansas (Wesley et al. 2014), where researchers quantified yield responses to fertilizer N sufficient to justify the additional expense associated with the application. In one study, the application of 27 lb/ac N at R3 increased an average yield by 1.1. bu/ac across 44 locations with > 60 bu/ac yield, while no additional yield increase was observed with the application of 54 lbs of N/ac. Variability in yield response to N can depend on differences in soybean cultivars, soil properties, weather conditions, and agronomic practices (Mortzinis et al. 2017).

Soybean response to late-season N in western NE

In 2017, on-farm research studies were conducted in three southwest counties (Perkins, Chase, and Lincoln) with no increase in soybean yield or grain protein with 80 lbs of N/ac at R3 (beginning pod). In addition, low efficiency in fertilizer N utilization (~13%) was observed, with the only notable difference being a 5-14 lbs of N/ac increase in crop residue. The study protocol was changed in 2018 to chemigate less fertilizer (50 lbs of N/ac) at later growth stages (R5-beginning seed) growth stages, and that did not change the outcomes. Leaf tissue analysis in all studies tested low on magnesium (Mg). At the same time, N and all other macronutrients and micronutrients remained within the sufficiency range for most of the soybean growing season.

Will compost and other biological products work?

When Jimmy Frederick from Rulo, NE (eastern NE) raised 138 bu/ac soybeans to win 2017 state and national dryland soybean yield competition, many farmers wanted to learn from his approach. Mr. Frederick did not apply any synthetic fertilizer N and based his entire fertility program on biological products. In our 2018 fertility study in western NE, early planted soybeans in 15-inch rows benefited from pre-plant application of compost at 5 ton/ac, yielding as much as 107 bu/ac (the result of one site-year). Such an outcome initiated a need to repeat the study and look more into the other fertility treatments that might increase soybean yield.

Soybean fertility study in 2019 and 2020

The study was conducted at Henry J. Stumpf International Wheat Center near Grant, NE in 2019 and 2020. In both years, soybean was planted at 30-inch row spacing in early May. Soybean variety GH2499X (Golden Harvest 2.4 maturity) was used in 2019 and AG27X98 (Asgrow Xtend, 2.7 maturity) in 2020.

Total of 12 fertility programs were compared, including inoculant only, high N control (400 lbs of N/ac), cow and chicken manure applied both broadcast and in-furrow, two levels of Mg fertilizer, and four programs based on seed and foliar treatments recommended by our local fertilizer suppliers (Table 1).

Experimental treatments were replicated three times, with individual plots being 20 ft wide by 60 ft long in 2019 and 10 ft wide x 100 ft long in 2020. The following data were collected in each experimental plot: bi-weekly soil and tissue samples, yield, grain quality (protein and oil), and yield components (plants/acre, nodes/plant, branches/plant, pods/plant, seed weight).

The main objective was to identify the nutrients that limit high soybean yield and grain protein.

Key takeaways from the study:

1. Fertility treatments had no impact on soybean. Fertility treatments had minor to no impact on soybean yield, grain protein, seed oil content in both 2019 and 2020 (Table 2). Although broadcasted chicken manure had slightly elevated levels of micro and macro nutrients in 2020 soil and tissue samples, this led to no significant yield increase.

2. N supply was not a yield-limiting factor. Multiple evidence suggest that N supply was sufficient: (1) N levels in tissue samples did not reach the critical level at any point during the growing season, except at crop maturity-R8 (Figure 3 and 4); (2) The High N control, the treatment designed to provide sufficient N supply throughout the growing season, had significantly higher end-of-season residual soil N than any other fertility treatment (N demand did not exceed supply); (3) Yield and grain protein did not differ by fertility treatments (Table 2).

3. Soil pH was the main factor limiting soybean yield and grain protein. Despite the relatively flat topography, uniform soil type, similar soil organic matter (OM), and cation exchange capacity across the study area, soil pH varied significantly from plot to plot. In 2019, 10 bu/ac reduction in yield and 1.5% reduction in grain protein was observed when soil pH > 7.5 (Figure 1). In 2020, soil pH levels throughout the study area were in the optimal level for soybean growth and development (5.6 to 7.3), thus had no impact of soil pH on soybean yield and protein (Figure 1).

4. Magnesium (Mg) deficiency. Magnesium levels in tissue samples were at the lower end of sufficiency range in the early reproductive (R1-R3) and were approaching the critical level during late reproductive stages (R3-R7; Figure 2). The decrease in Mg levels at late reproductive stages (R3-R4) coincided with the sharp increase of Ca concentration in the soybean tissue, suggesting a plausible inhibitory (i.e. unlikely preferential) uptake of Ca over Mg (Figure 2). As soil pH increased, Ca concentration in soil solution increased disproportionally compared to Mg, causing a sharp increase in Ca:Mg saturation ratio (and K:Mg), especially at soil pH levels > 6.7 (Figure 2). We hypothesize that Mg uptake in soybean, especially in late reproductive stages, may be hindered due to soil replenishing with a disproportional amount of Ca into the soil solution.

5. Molybdenum (Mo) levels low at late reproductive stages. Molybdenum levels in soybean tissue were at the lower end of sufficiency range during the seed filling period (Figure 5 and 6). Molybdenum plays an important role in soybean N-fixation, and increasing its availability to the plant at late reproductive stages may help soybean maintain high rates of N-fixation. All other micronutrients were within the sufficiency range throughout the growing season (Figure 5 and 6).

Recommendations

The results of this study validate the current UNL fertilizer recommendations for soybean, especially when it comes to avoiding the routine application of N fertilizer. Soil tests cannot predict the need for N fertilizer; therefore, an in-season tissue sampling as well as inspecting root nodule number, spread and activity are advised before making such a decision. Soybean response to N is, however, more likely to occur in high-yielding environments (> 80 bu/ac) and in certain conditions such as soil pH < 5.5, organic matter < 1.5 %, or poor nodulation (Wortmann et al. 2018). When it comes to applications of compost, manure, and other specialty products (micronutrients, foliar products, etc.), more research is needed to identify specific environmental conditions and soybean varieties where those applications might be warranted.

Soil pH was found to be the main factor influencing soybean yield and grain protein content. Significant decline in soybean yield and grain protein was observed at pH > 7.5., which is outside the optimal soil pH range (5.5-7.0) for soybean nutrient uptake and biological N-fixation. Recent advances in on-the-go field mapping for various soil properties and areal/satellite imagery can help farmers identify areas of the field with high soil pH and treat them as site-specific zones. Improving soybean management when soil is calcareous with pH > 7.5, especially if symptoms of lime induced chlorosis have been previously observed, may include: careful use of herbicides, planting iron-deficiency tolerant varieties at higher seeding rates in 30 inch rows, avoiding high soil nitrate levels, and applying chelated-iron products in the seed furrow at planting.

Tissue analysis in the past few years has consistently showed low/critical levels of magnesium both in our soybean research studies and on-farm samples. Soil analysis, however, always indicated an adequate supply of Mg and a range of Ca:Mg saturation ratio that is considered optimal for soybean production. Significant amounts of Mg are applied in irrigation water. Furthermore, we observed no yield increase (or increase in levels of Mg in tissue) with the application of 140 and 270 lbs of Mg/ac; approximately 30 lbs of Mg/ac was applied through the irrigation water. Although it appears that Mg uptake is somewhat hindered by large amounts of Ca, soybeans had no yield response to applied Mg fertilizer in western NE.

References

Cafaro La Menza N, Monzon JP, Specht JE, Grassini P. 2017. Is soybean yield limited by nitrogen supply?. Field Crops Res. 213, 204-212.

Balboa G. R., D.R. Hodgins, I.A. Ciampitti. 2015. Late-Season Nitrogen Fertilizer Application in Soybean. Kansas Agricultural Experiment Station Research Reports: Vol. 1: Iss. 2. https://doi.org/10.4148/2378-5977.1016, link: https://newprairiepress.org/cgi/viewcontent.cgi?article=1016&context=kaesrr

Cafaro La Menza N., P. J. Specht, J. Rees, A. Timmerman, T. Whitney, and K. Glewen. 2018. Is Soybean Yield Limited by Nitrogen Supply? Nebraska Extension Crop Watch (January 8, 2018), link: https://cropwatch.unl.edu/2018/soybean-yield-limited-nitrogen-supply

Grassini P., J. Rees N. Cafaro La Menza, and J. Specht. 2016. What does it take to produce 80+ bu/ac soybean? (EC 3000) UNL Extension Circular, link: http://extensionpublications.unl.edu/assets/pdf/ec3000.pdf

Jimmy Frederick Booms 163 Bu. 2017. AgWeb Farm Journal (Feb 27, 2018), link: https://www.agweb.com/article/jimmy-frederick-booms-163-bu-soybeans-NAA-chris-bennett

Mortzinis S., G. Kaur, J. Orlowski, C. Shapiro, C. Lee, C. Wortmann, D. Holshouser, E. Nafziger, H. Kandel, J. Niekamp, J. Ross, J. Lofton, J. Vonk, K. Roozeboom, K. Thelen, L. Lindsey, M. Staton, S. Naeve, S. Casteel, W. Wiebold, and S. Conley. 2017. Soybean response to nitrogen application across the United States: a synthesis-analysis. Field Crops Res. 215:74-82. doi.org/10.1016/j.fcr.2017.09.035

Stepanovic S. N. Arsenijevic, Z. Ugljic. 2018a. Is Late Season N Fertilization Warranted for Irrigated Soybean in Western Nebraska? Nebraska Extension Crop Watch (November 2, 2018), link https://cropwatch.unl.edu/2018/late-season-n-soybeans

Stepanovic S., N. Arsenijevic, Z. Ugljic. 2018b. Seeding Practices and Nitrogen Management for Western Nebraska Soybean: What Matters and Why. Nebraska Extension Crop Watch (December 18, 2018), link: https://cropwatch.unl.edu/2018/soybean-seeding-N-mgmt-western-NE

Wesley, R. E. Lamond, V. L. Martin and S. R. Duncan. 2013. Effects of Late-Season Nitrogen Fertilizer on Irrigated Soybean Yield and Composition. J. Prod. Agric., Vol. 11 No. 3, p. 331-336 https://newprairiepress.org/cgi/viewcontent.cgi?article=1016&context=kaesrr

Wortmann, C.S., B.T. Krienke, R.B. Ferguson, B. Maharjan. 2018. Fertilizer recommendations for soybean. G859, revised, link: http://extensionpublications.unl.edu/assets/pdf/g859.pdf

Wortmann, C.S., C.A. Shapiro, R. Ferguson, and M. Mainz. 2012. Irrigated soybean has a small response to nitrogen applied during early reproductive growth. J. Crop Manage.

Balboa G. R., D.R. Hodgins, I.A. Ciampitti. 2015. Late-Season Nitrogen Fertilizer Application in Soybean. Kansas Agricultural Experiment Station Research Reports: Vol. 1: Iss. 2. https://doi.org/10.4148/2378-5977.1016, link: https://newprairiepress.org/cgi/viewcontent.cgi?article=1016&context=kaesrr

Table 1. The list of 12 soybean fertility treatments and their application time, product rates, and application method evaluated during the 2020 growing season at Grant, NE.

Trt	Fertility treatment	Application time	Application method	Products and rates used
1	Control - Inoculant	Planting	seed treatment	Inoculant - Verdesian @ 2x rate
2	Control - High N	Pre-plant Planting	broadcast seed treatment	Urea (46-0-0) @ 869 lbs /ac (400 lbs of N/ac) Inoculant - Verdesian @ 2x rate
3	Chicken manure broadcast	Pre-plant Planting	broadcast seed treatment	Beju chicken manure (pelleted) @ 12 ton/ac Inoculant - Verdesian @ 2x rate
4	Cow manure broadcast	Pre-plant Planting	broadcast seed treatment	Beju cow manure (pelleted) @ 12 ton/ac Inoculant - Verdesian @ 2x rate
5	Chicken manure in-furrow	Planting	seed treatment insecticide box	Inoculant - Verdesian @ 2x rate Beju chicken manure (powdered) @ 25 lba/ac
6	Cow manure in-furrow	Planting	seed treatment insecticide box	Inoculant - Verdesian @ 2x rate Beju cow manure (powdered) @ 25 lba/ac
7	Mg High Rate	Pre-plant Planting	broadcast seed treatment	$MgSO_4$ @ 750 lbs/ac (270 lbs Mg/ac) Inoculant - Verdesian @ 2x rate
8	Mg Low Rate	Pre-plant Planting	broadcast seed treatment	$MgSO_4$ @ 388 lbs/ac (140 lbs Mg/ac) Inoculant - Verdesian @ 2x rate
9	Aurora Starter + Foliar	Planting Planting V3 V6 R2 R5	seed treatment seed treatment foliar foliar foliar foliar	Inoculant - Verdesian @ 2x rate Hustle @ 1 gal/ac Heighten @ 8 oz/ac (no product label) + Realize @ 2 oz/ac Heighten @ 8 oz/ac (no product label) + Realize @ 2 oz/ac Realize @ 4 oz/ac + N-cline @ 1 gal/ac + Evito @ 2 oz/ac Boron + Molybdenum (no product label) @ 1 qt/ac
10	Nutrien 1 Starter only	Pre-plant Planting	broadcast seed treatment	Micro Starter @ 0.3 gal/ac (no product label) Inoculant - Verdesian @ 2x rate
11	Nutrien 2 Starter + Foliar	Pre-plant Planting R2	broadcast seed treatment foliar	Micro Starter @ 0.3 gal/ac (no product label) Inoculant - Verdesian @ 2x rate NutriSyncD @ 10 oz/ac
12	Kugler Foliar products	Planting V2 V3 R2 R5	seed treatment foliar foliar foliar foliar	Inoculant - Verdesian @ 2x rate KS178c @ 1 gal/ac + LS624 @ 1 gal/ac + FA20 @ 1 gal/ac KS2075 @ 1.5 gal/ac + LS624 @ 0.5 gal/ac + FA20 @ 1 pt/ac KS2075 @ 2 gal/ac + FA20 @ 1 pt/ac KS2075 @ 1 gal/ac + LS624 @ 1 gal/ac + FA20 @ 1 pt/ac

Table 2. Yield (bu/ac), grain protein (%), grain oil for 12 soybean fertility treatments evaluated during 2029 and 2020 growing season at Grant, NE.

Trt #	Treatment name	2019			2020		
		Yield (bu/ac)	Grain protein (%)	Grain oil (%)	Yield (bu/ac)	Grain protein (%)	Grain oil (%)
1	Control - Inoculant	77	35.7	21.1	76	37.7	19.1
2	Control - High N	74	35.7	21.0	67	38.4	19.0
3	Chicken manure - broadcast	78	34.9	20.8	74	37.1	18.7
4	Cow manure - broadcast	73	35.5	20.9	79	37.4	19.2
5	Chicken manure - in-furrow	74	35.5	21.0	73	38.2	19.1
6	Cow manure - in furrow	76	35.3	21.4	74	38.1	19.1
7	Mg - High rate	78	35.3	20.9	74	37.8	19.4
8	Mg - Low rate	78	35.7	20.7	74	37.8	19.0
9	Aurora - Starter + Foliar	74	34.5	20.6	73	37.6	19.1
10	Nutrien 1 - Starter only	77	36.0	20.9	70	38.0	19.3
11	Nutrien 2 - Starter + Foliar	76	36.0	21.0	72	38.1	20.0
12	Kugler - Foliar products	76	35.5	21.0	69	37.6	19.4
	Average of all treatments	**75.9**	**35.4**	**20.9**	**73**	**37.8**	**19.2**
	Difference for significance at 5%	12	1.4	0.94	8	0.7	1.3
	Coefficient of variation (CV)	11	2.5	2.83	7	1.1	4.2

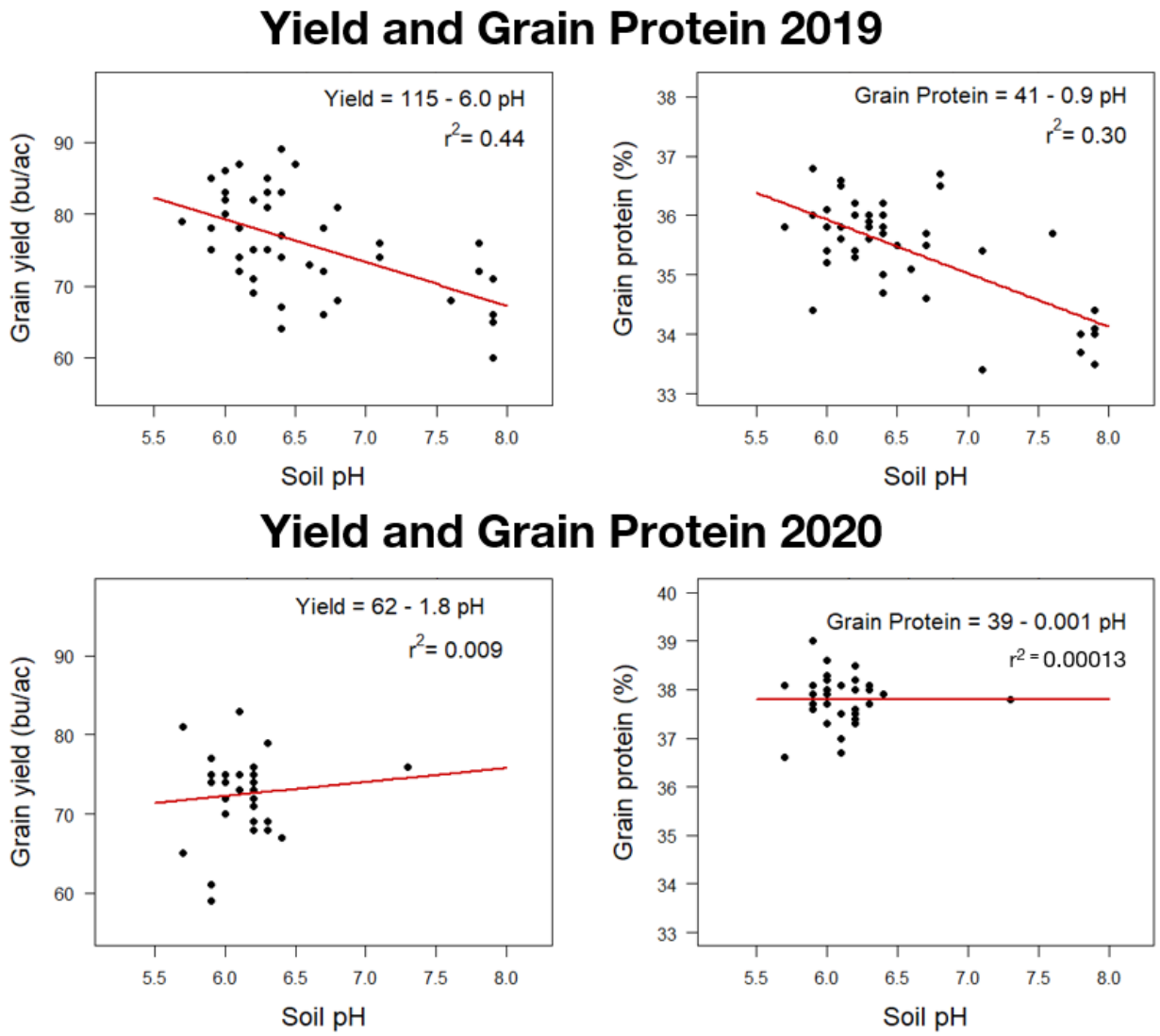

Figure 1. Effects of soil pH on soybean grain yield (bu/ac) and protein content (%) averaged over 12 soybean fertility treatments; study conducted during 2019 and 2020 growing season at Grant, NE.

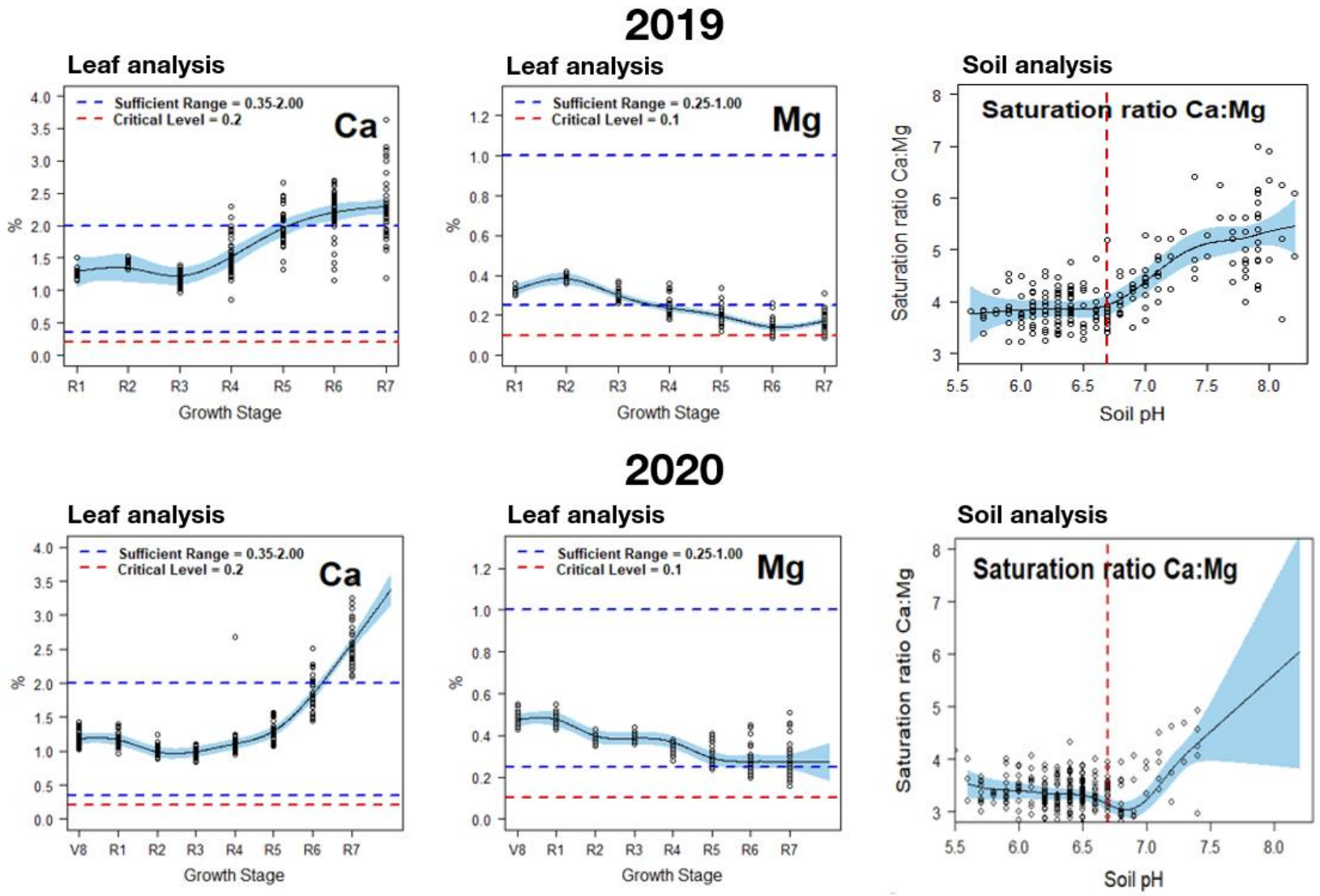

Figure 2. Change in concentration of macronutrients (N, P, K, S, Ca, Mg) in soybean leaf tissue during the reproductive growth stages (R1-R7) averaged over 12 fertility treatments; study conducted during 2020 growing season at Grant, NE.

Appendix:

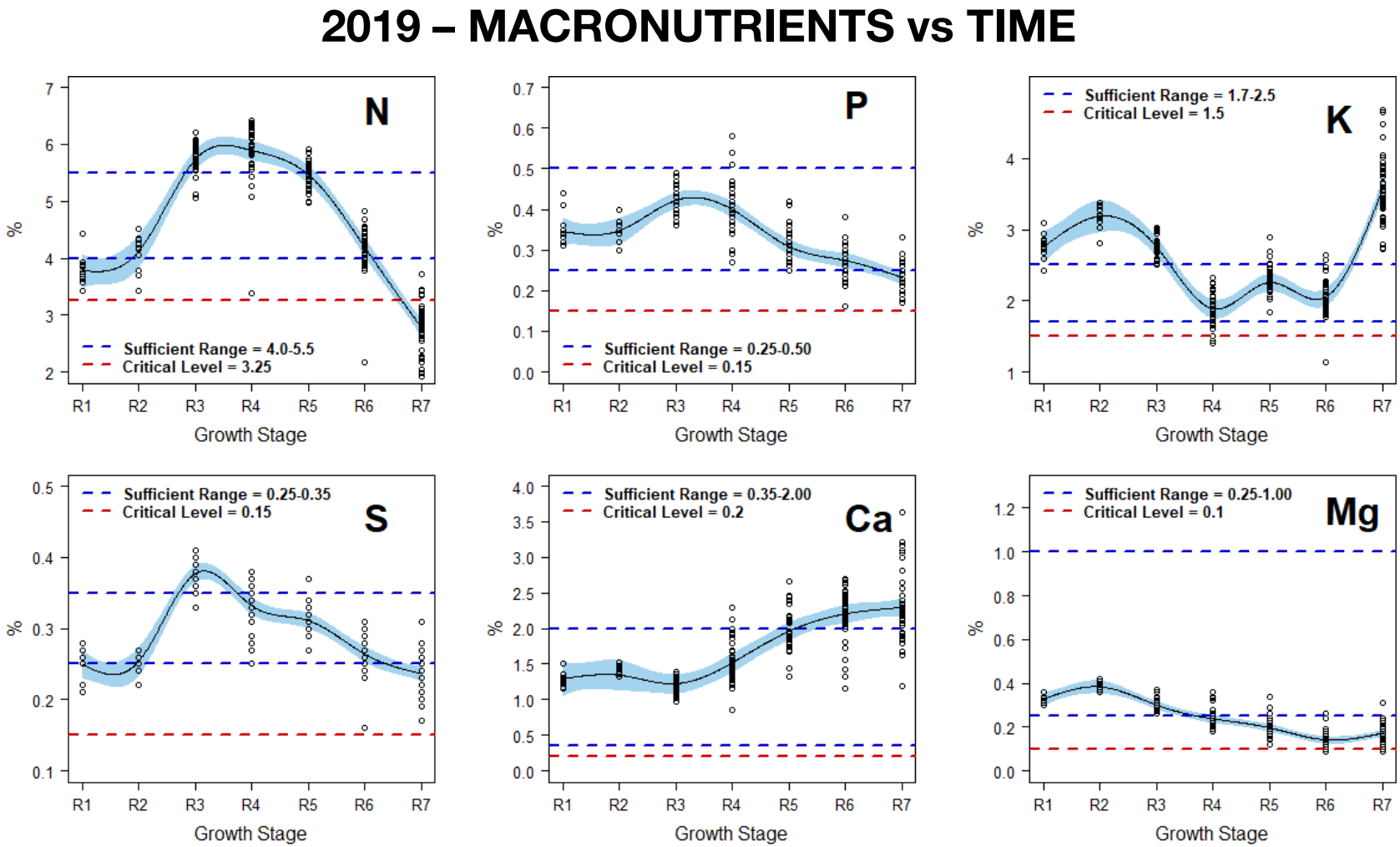

Figure 3. Change in concentration of macronutrients (N, P, K, S, Ca, Mg) in soybean leaf tissue during the reproductive growth stages (R1-R7) averaged over 12 fertility treatments; study conducted during **2019** growing season at Grant, NE.

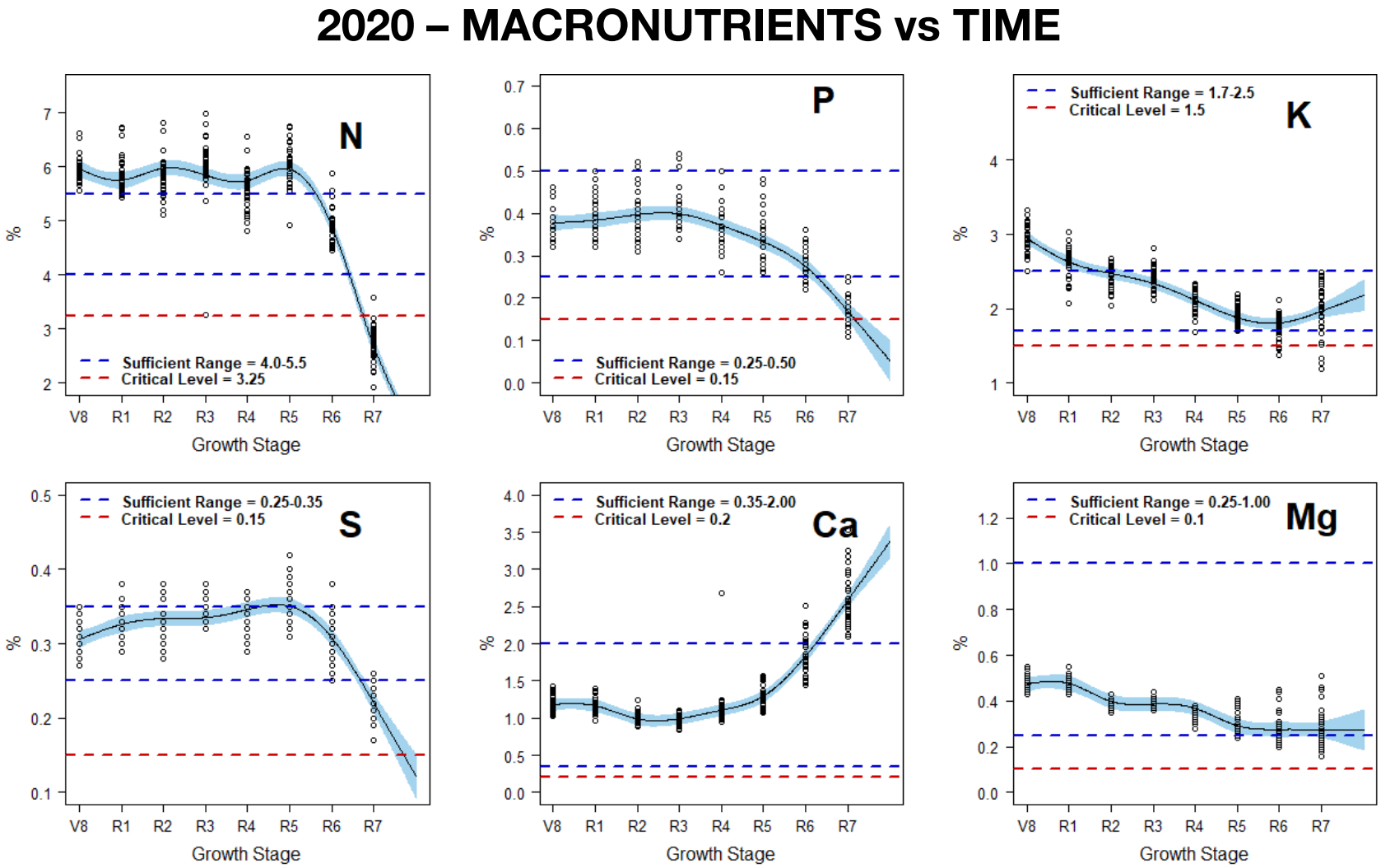

Figure 4. Change in concentration of macronutrients (N, P, K, S, Ca, Mg) in soybean leaf tissue during the reproductive growth stages (R1-R7) averaged over 12 fertility treatments; study conducted during **2020** growing season at Grant, NE.

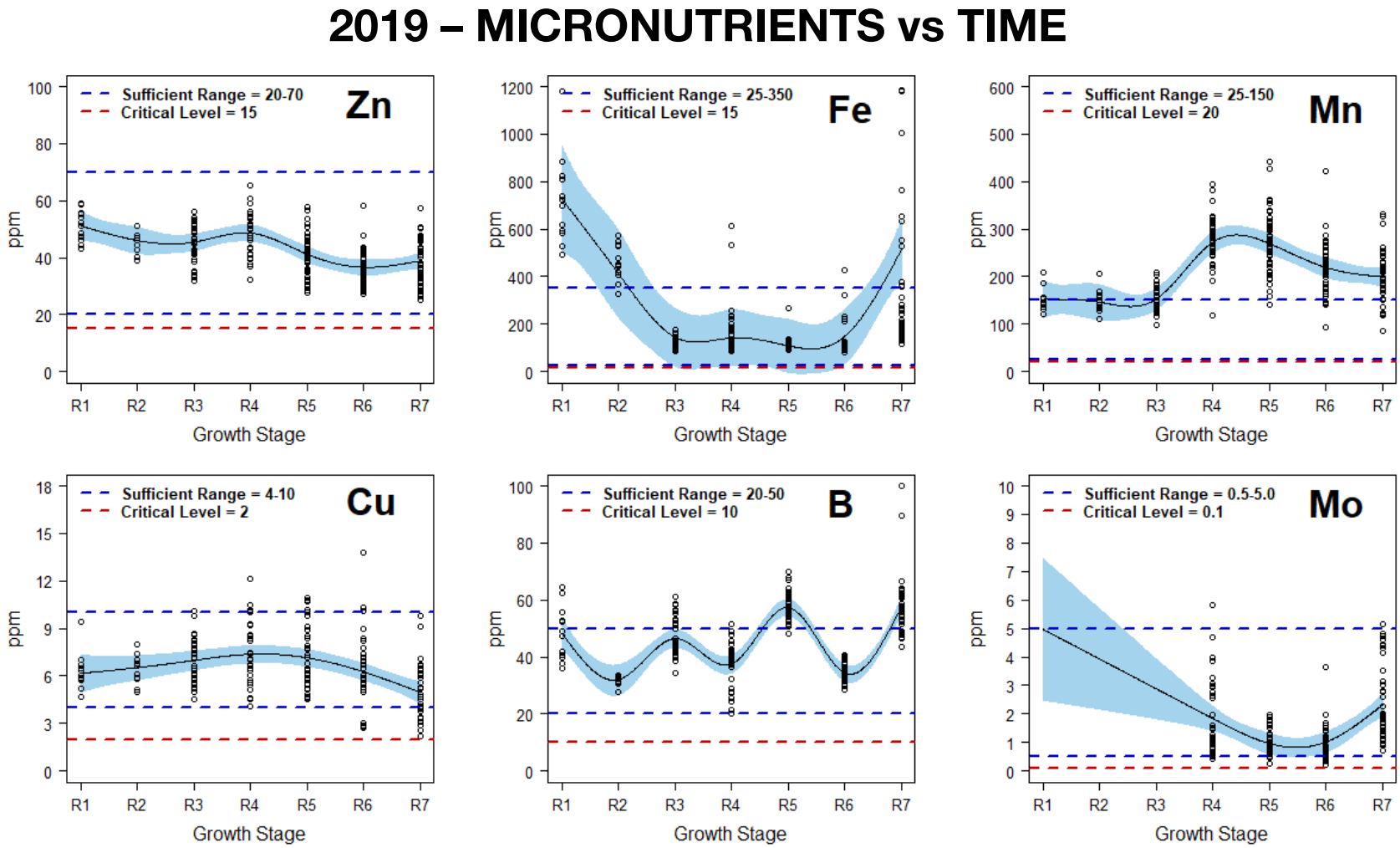

Figure 5. Change in concentration of micronutrients (Zn, Fe, Mn, Cu, B, Mo) in soybean leaf tissue during the reproductive growth stages (R1-R7) averaged over 12 fertility treatments; study conducted during **2019** growing season at Grant, NE.

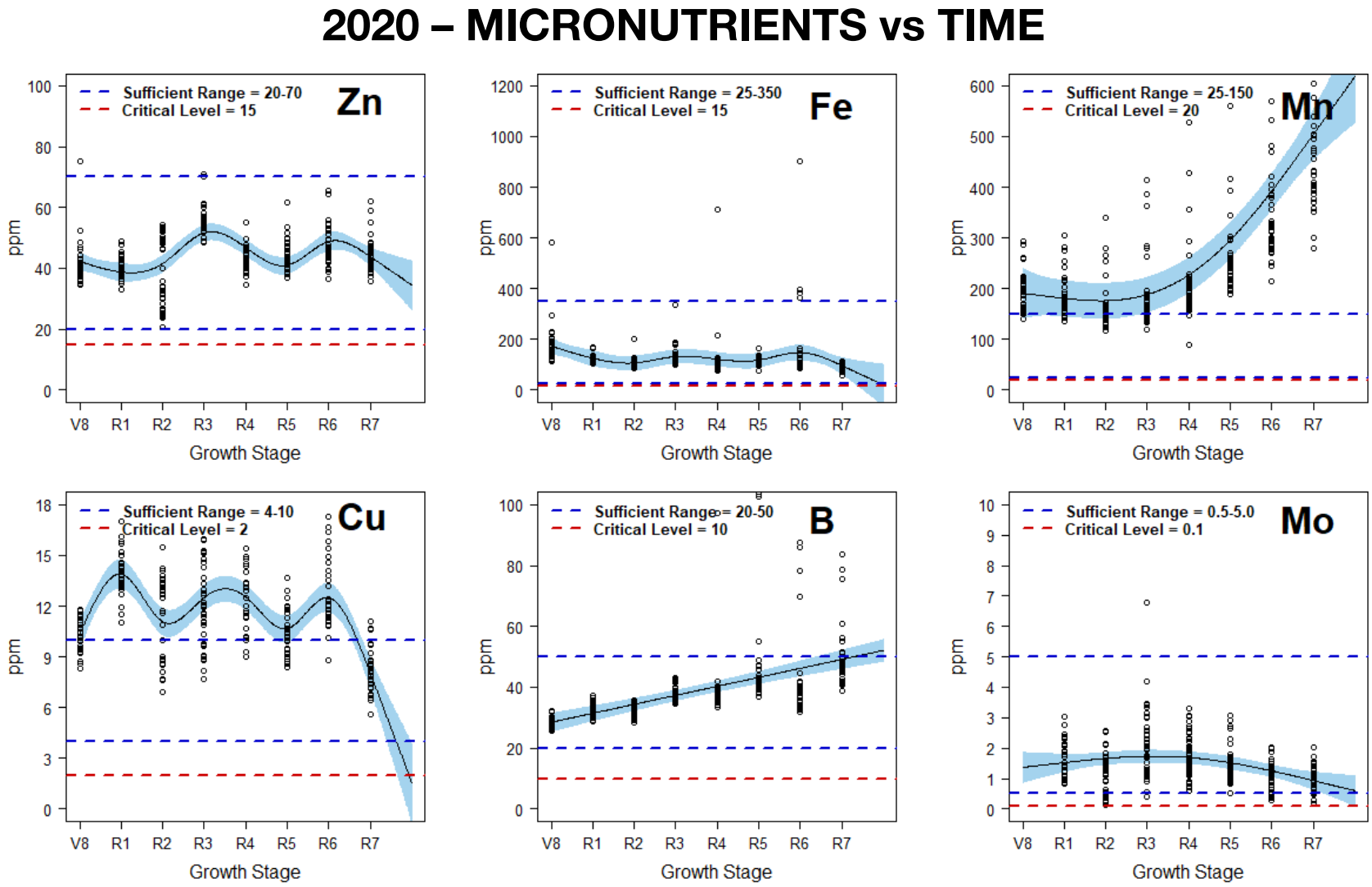

Figure 6. Change in concentration of micronutrients (Zn, Fe, Mn, Cu, B, Mo) in soybean leaf tissue during the reproductive growth stages (V8-R7) averaged over 12 fertility treatments; study conducted during **2020** growing season at Grant, NE.

UNIVERSITY of NEBRASKA
LINCOLN

2020 State Variety Trials
Stumpf Farm, Grant, NE

In 2019, the State Variety Testing program (SVT) was relocated to the High Plains Ag Lab under the supervision of Drs. Cody Creech and Amanda Easterly. In the 2019/2020 seasons, there were SVT trials conducted in dryland winter wheat, dryland spring wheat, dryland corn, dryland grain sorghum, and irrigated corn. The summaries of these results and associated 2- and 3- year averages are included below. Overall, Grant had a fairly good year for winter wheat, though higher than normal temperatures at flowering and less than normal spring/summer rainfall limited yields in comparison with the 2019 and 2018 harvest years. The winter wheat SVT and spring wheat SVT now are planted on a seeds/acre basis to ensure equal comparisons of varieties and account for differences in seed weight. This change has already improved the consistency of our data and reflects UNL recommendations for wheat seeding. For corn, both dryland and irrigated trials had averages on par with the surrounding areas, though the entries also included organic and experimental hybrids that may or may not be eventually marketed in the area by the sponsoring companies. The grain sorghum trial showed excellent stands, but yields were slightly diminished due to being planted in pea residue that did not have much residual moisture. This year marked the first that a spring wheat variety trial has been conducted as part of the SVT program and had some good interest both from growers and the seed industry.

Our plans for the 2021 season include the same crops as in 2020, and we hope to be able to showcase these variety trials at field days. A significant update in 2020 was the design and building of a new research drill. This drill is set up to accommodate both tilled and no-till conditions and has coulters that allow precision placement of starter fertilizer. It is also set up for GPS tripping and provides very clean alleys, which will improve the consistency and quality of the data collected from the plots. We used it for the first time in fall 2020 for the winter wheat planting across the state and anticipate that it will enhance the quality and applicability of our data in the future.

In completing this research, we owe a debt of gratitude to Justin Richardson as the farm supervisor at the Grant site, as well as to our technical support: Stephan Geu, Bill Struckmeyer, Brian Maust, and our interns and graduate students.

Perkins County Rainfed
2020 Winter Wheat Variety Trial

Name	Company	Yield (bu/ac)[1]	Test Weight (lb/bu)	Height (in)	Protein (%)[2]
LCS Link	Limagrain Cereal Seeds	45.7	56.9	32.0	11.7
KS Dallas	Kansas Wheat Alliance	45.5	56.9	30.5	11.7
Canvas	PlainsGold	45.2	57.0	30.0	9.8
Tatanka	Kansas Wheat Alliance	45.1	56.9	31.8	9.7
WB-Grainfield	WestBred	44.7	57.1	33.0	11.3
SY Monument	AgriPro-Syngenta	44.7	54.0	32.5	11.6
Robidoux	Husker Genetics	44.4	55.3	33.3	10.9
CP7010	CROPLAN by Winfield Unit	44.3	57.6	30.0	11.4
Crescent AX	PlainsGold	44.2	55.6	31.8	11.5
WB4462	WestBred	43.7	57.0	34.0	12.2
NW15443	UNL-Experimental	42.8	56.0	33.8	11.6
Freeman	Husker Genetics	42.8	52.9	29.8	12.1
KS Western Star	Kansas Wheat Alliance	42.7	57.4	30.5	11.1
Wesley	Husker Genetics	41.9	54.5	30.3	11.6
SY Rugged	AgriPro-Syngenta	41.5	55.2	29.8	11.1
Settler CL	NuPride Genetics	41.2	56.6	30.3	10.9
LCS Chrome	Limagrain Cereal Seeds	40.7	56.0	31.0	11.9
Long Branch	Dyna-Gro Seed	40.6	57.0	30.5	12.1
CP7050AX	CROPLAN by Winfield Unit	40.6	59.1	30.8	12.3
NW13493	UNL-Experimental	40.3	55.9	29.5	11.9
SY Wolverine	AgriPro-Syngenta	39.8	58.4	29.8	11.3
WB4418	WestBred	39.8	55.0	31.3	11.7
WB4792	WestBred	39.7	55.5	29.0	11.8
NE14434	UNL-Experimental	39.7	56.1	32.3	11.8
NE15624	UNL-Experimental	39.5	56.9	30.8	12.0
LCS Valiant	Limagrain Cereal Seeds	39.3	57.8	30.8	10.4
NHH144913-3	UNL-Experimental	39.1	53.4	31.8	12.8
Ruth	Husker Genetics	38.9	58.4	32.3	10.7
NE14691	UNL-Experimental	38.5	53.4	32.0	11.3
CP7909	CROPLAN by Winfield Unit	38.5	56.7	29.8	10.9
CP7869	CROPLAN by Winfield Unit	38.4	56.4	29.4	11.1
AP 18AX	AgriPro-Syngenta	38.3	55.5	30.3	11.9
NE16562	UNL-Experimental	37.9	53.1	30.8	12.7

[1] Yield values corrected to 12% moisture.

[2] Protein corrected to 14% moisture, the correction factor used in analytical standards.

WB4595	WestBred	37.8	57.5	31.0	11.0
CP7017AX	CROPLAN by Winfield Unit	37.7	56.5	28.8	11.8
SY Sunrise	AgriPro-Syngenta	37.0	56.4	28.5	11.1
NE15410	UNL-Experimental	36.0	55.0	33.0	12.6
SY 517CL2	AgriPro-Syngenta	36.0	55.5	28.3	11.3
SY LegendCL2	AgriPro-Syngenta	35.4	55.8	29.0	12.8
Goodstreak	Husker Genetics	33.4	53.9	36.8	13.0
Scout 66	Check	32.4	54.5	37.8	10.8
Siege	NuPride Genetics	32.4	57.2	31.0	12.5
Turkey	Check	28.6	52.4	37.8	13.4
	Standard Error	4.6	1.5	1.3	0.7
	LSD[3]	7.6	2.4	2.2	1.3
	Mean	39.9	55.9	31.3	11.6
	CV[4]	9.7	2.8	6.9	6.7
	Reps	4	4	4	2

SITE INFORMATION

Planting Date: September 19, 2019
Seeding Rate: 900,000 seeds/acre
Harvest Date: July 8, 2020
Herbicide/Fungicides: Prowl H2O (1.75 pt/acre)
Soil Type: Ascalon fine sandy loam & Kuma silt loam
Notes: Some damage from late spring freezes, test weights low across the area.

[3] For differences between varieties that are equal to or greater than the LSD value, the chance that the difference is significant is 90%.

[4] Coefficient of Variation (CV) indicates the quality of a trial, and lower than 15 indicates a high quality trial. For CV>15, there was higher than expected variability in the field or the data and the results should be used with caution.

West Central Rainfed
2-Year Winter Wheat Variety Trial Averages

Name	Company	Average Yield (bu/ac)[5]	Average Test Weight (lb/bu)	Average Height (in)	Average Protein (%)[6]
WB4595	WestBred	73.2	57.5	31.7	11.7
SY Monument	AgriPro-Syngenta	72.4	54.6	32.2	12.2
WB4792	WestBred	72.0	55.9	32.0	11.8
NW15443	UNL-Experimental	71.7	56.5	34.9	11.9
CP7869	CROPLAN by Winfield United	71.3	58.2	30.0	11.8
NHH144913-3	UNL-Experimental	69.8	54.5	31.4	12.3
AP18AX	AgriPro-Syngenta	69.7	56.9	31.1	11.8
LCS Valiant	Limagrain Cereal Seeds	69.5	57.1	31.0	12.2
LCS Link	Limagrain Cereal Seeds	69.4	56.7	32.9	12.0
WB4462	WestBred	69.4	57.1	33.1	12.5
Settler CL	NuPride Genetics	68.9	58.0	31.4	11.7
Tatanka	Kansas Wheat Alliance	68.7	57.1	30.0	11.3
WB-Grainfield	WestBred	68.4	56.7	32.2	11.9
SY Rugged	AgriPro-Syngenta	68.2	56.1	29.4	11.9
NE14434	UNL-Experimental	68.0	54.9	33.5	12.0
Robidoux	Husker Genetics	67.7	56.8	32.0	12.1
SY Legend CL2	AgriPro-Syngenta	66.7	57.0	30.0	12.8
Freeman	Husker Genetics	66.6	55.6	31.3	11.9
NW13493	UNL-Experimental	66.5	56.7	31.2	12.4
Canvas	PlainsGold	66.4	57.8	30.1	11.5
WB4418	WestBred	66.2	57.0	30.6	12.5
SY Sunrise	AgriPro-Syngenta	66.1	57.7	29.5	12.2
SY Wolverine	AgriPro-Syngenta	65.9	58.3	29.4	12.4
Long Branch	Dyna-Gro Seeds	65.4	56.4	31.1	12.3
LCS Chrome	Limagrain Cereal Seeds	65.2	57.6	31.9	12.8
Ruth	Husker Genetics	65.0	57.0	32.6	12.0
CP7909	CROPLAN by Winfield United	64.5	56.8	28.7	11.9
NE15624	UNL-Experimental	63.5	57.0	29.7	12.6
Siege	NuPride Genetics	63.3	58.2	31.8	12.8
NE14691	UNL-Experimental	62.7	55.4	32.9	12.6
CrescentAX	PlainsGold	61.8	57.6	31.2	12.1
Turkey	Check	54.7	56.7	36.6	13.6

[5] Yield values corrected to 12% moisture.
[6] Protein corrected to 14% moisture.

Scout 66	Check	54.1	56.5	36.5	12.7
	Standard Deviation	4.3	1.0	1.8	0.5
	Overall Average	66.7	56.8	31.6	12.2
	Trials Included in Average	8	7	5	7

SITE INFORMATION

Sites included: Winter Wheat Variety Trials harvested in 2019 and 2020 in Keith, Red Willow, Lincoln, and Perkins Counties.

Perkins County Rainfed
2020 Spring Wheat Variety Trial

Name	Company	Yield (bu/ac) [7]	Protein (%)[8]
LCS Cannon	Limagrain Cereal Seeds	14.2	17.9
ND VitPro	North Dakota Crop Improvement Association	13.7	18.8
WB9606	WestBred	11.2	17.4
ND Frohberg	North Dakota Crop Improvement Association	10.8	18.7
WB9590	WestBred	13.1	19.1
LCS Rebel	Limagrain Cereal Seeds	11.2	19.5
Surpass	South Dakota State University	12.0	18.5
WB7202CLP	WestBred	12.8	18.4
WB7696	WestBred	11.3	19.1
LCS Trigger	Limagrain Cereal Seeds	9.1	19.1
CP3530	CROPLAN by WinfieldUnited	12.0	19.2
WB9719	WestBred	13.4	18.8
Prevail	South Dakota State University	14.4	18.2
Boost	South Dakota State University	11.6	18.4
LNR-2076	Limagrain Cereal Seeds	10.7	18.0
CP3915	CROPLAN by WinfieldUnited	9.8	19.7
SY Rustler	AgriPro-Syngenta	10.7	18.7
	Standard Error	2.0	0.3
	LSD[9]	NS	0.5
	Mean	11.9	18.7
	CV[10]	.	3.1

SITE INFORMATION

Planting Date	3/11/2020
Harvest Date	7/23/2020
Seeding Rate	1.5 million seeds/acre

Notes: There were no significant differences between varieties for yield. Four replications were evaluated at each site.

[7] Yield values corrected to 12% moisture.
[8] Preliminary protein values, awaiting final data from lab analysis. Corrected to 14% moisture.
[9] For differences between varieties that are equal to or greater than the LSD value, the chance that the difference is significant is 90%.
[10] Coefficient of Variation (CV) indicates the quality of a trial, and lower than 15 indicates a high quality trial. For CV>15, there was higher than expected variability in the field or the data and the results should be used with caution.

Perkins County Rainfed
2020 Dryland Sorghum Trial

Name	Company	Plant Height (in)	Test Weight (lb/bu)	Population (plants/acre)	Yield (bu/a)[11]
KS310	S&W Seeds/Sorghum Partners	44.2	55.4	31,189	71.6
M59GB57	Dyna-Gro Seed	39.8	55.4	28,866	69.6
2620C	LG Seeds	43.2	54.7	30,608	67.9
DKS44-07	DEKALB	45.0	56.5	32,409	67.4
SP 31A15	S&W Seeds/Sorghum Partners	44.6	54.3	32,525	67.1
18072	Gayland Ward Seeds	47.6	53.9	29,156	66.3
DKS38-16	DEKALB	48.6	56.0	25,671	65.8
DKS36-07	DEKALB	45.4	54.1	29,969	65.1
DKS37-07	DEKALB	45.2	56.0	31,363	64.3
GX18919	Dyna-Gro Seed	39.8	55.8	25,497	63.3
2950B	LG Seeds	36.8	54.4	29,272	62.9
ADV XG116IG	ADVANTA	42.8	54.5	27,530	62.8
AG1201	ADVANTA	36.6	54.0	33,628	62.6
18567	Gayland Ward Seeds	47.4	50.9	24,975	62.4
18057	Gayland Ward Seeds	44.2	53.9	30,202	62.0
SP 25C10	S&W Seeds/Sorghum Partners	43.0	55.6	26,659	60.9
1510C	LG Seeds	33.4	54.5	28,401	60.5
M60GB88	Dyna-Gro Seed	44.8	54.1	20,154	60.4
ADV XG9127	ADVANTA	45.4	53.3	26,659	59.9
SP 43M80	S&W Seeds/Sorghum Partners	45.0	56.0	25,729	59.8
19015	Gayland Ward Seeds	47.2	54.4	35,545	59.3
ADV G2106	ADVANTA	45.8	53.4	30,957	59.0
19014	Gayland Ward Seeds	49.6	53.7	36,148	58.5
AG1301	ADVANTA	40.0	53.1	24,219	58.4
AS212	Arrow Seed	40.6	55.9	32,641	58.2
GX17912	Dyna-Gro Seed	41.2	43.2	27,762	57.8
LGS 5002	Legend Seeds	42.0	55.2	31,537	57.6
NK 2212	S&W Seeds/Sorghum Partners	38.1	56.5	25,112	57.4
M57GC29	Dyna-Gro Seed	37.8	54.3	16,959	55.3
2730B	LG Seeds	47.8	53.0	27,472	54.9
AG 1401	ADVANTA	41.0	54.9	25,149	54.6
M54GR24	Dyna-Gro Seed	41.6	54.4	27,530	52.6

[11] Adjusted to 56 lb/bu and 14% moisture.

M60GB31	Dyna-Gro Seed	45.4	43.3	25,381	52.2
Check	NA	46.0	54.5	26,542	50.8
ADV G1329	ADVANTA	36.8	54.1	16,669	50.4
ADV XG076	ADVANTA	43.2	51.3	15,043	50.2
19016	Gayland Ward Seeds	45.8	47.7	28,750	49.3
M59GB94	Dyna-Gro Seed	44.6	55.2	25,207	47.2
AS248FG	Arrow Seed	43.2	32.2	17,482	43.9
M57GB19	Dyna-Gro Seed	46.2	44.5	34,500	42.8
LGS 5508W	Legend Seeds	45.8	44.0	15,682	39.3
18036	Gayland Ward Seeds	47.8	54.9	31,305	31.0
19017	Gayland Ward Seeds	45.8	25.5	27,936	30.3
ADV XG390IG	ADVANTA	42.8	41.7	21,548	26.4
	Standard Error	2.9	5.9	4,386	9.3
	LSD[12]	4.8	9.8	7,255	15.5
	Mean[13]	43.4	51.9	27,217	56.4
	CV[14]	6.7	11.4	16.1	16.5
	Reps	5	5	5	5

SITE INFORMATION

Planting Date: May 20, 2020

Harvest Date: October 30, 2020

Seeding Information: 55,000 seeds per acre using precision vacuum seeder with liquid in-furrow starter fertilizer (5 gal/acre 10-34-0).

Planting Conditions: Seeding depth of 1" into very low moisture. Planted into no-till pea residue. Very little residue was remaining.

Notes: High variability in stand and yield due to dry planting and growing conditions. Field received approximately 10" of precipitation, which is at least 5" less than average during growing season. Recommended to consider multi-year and multi-site averages. Weed control pre-plant with 32 oz Roundup.

[12] For differences between varieties that are equal to or greater than the LSD value, the chance that the difference is significant is 90%.

[13] Mean performance of all entries in the trial.

[14] Coefficient of Variation (CV) indicates the quality of a trial, and lower than 15 indicates a high quality trial. For CV>15, there was higher than expected variability in the field or the data and the results should be used with caution.

Perkins County Rainfed
2020 Dryland Corn Hybrid Trial

Name	Company	Yield (bu/a)[15]	Test Weight (lb/bu)	Average Ear Height (in)
D43SS81	Dyna-Gro Seed	68.7	56.3	21.4
D52DC82	Dyna-Gro Seed	67.3	54.3	25.4
HFG1091	Hi Fidelity Genetics	64.1	52.6	27.5
D52SS91	Dyna-Gro Seed	63.5	53.9	21.1
HFG1111	Hi Fidelity Genetics	60.8	50.3	24.9
D48QV22	Dyna-Gro Seed	59.4	53.6	26.4
96 Day Maturity Check	DeKalb	58.6	56.4	19.0
D51VC41	Dyna-Gro Seed	57.5	52.8	23.0
93 Day Maturity Check	NA	57.0	54.8	20.1
HFG1071	Hi Fidelity Genetics	56.2	55.6	22.4
	Standard Error	3.9	0.5	1.0
	LSD[16]	6.7	0.8	1.7
	Mean[17]	61.3	54.0	23.1
	CV[18]	6.4	0.9	4.3
	Reps	5	5	5

SITE INFORMATION

Planting Date: June 4, 2020

Harvest Date: October 8, 2020

Seeding Information: 17,500 seeds per acre using precision vacuum seeder with liquid in-furrow starter fertilizer.

Planting Conditions: Seeding depth of 1.5” into decent moisture.

[15] Yield adjusted to 15.5% moisture and assuming 56 lb/bu test weight.

[16] For differences between varieties that are equal to or greater than the LSD value, the chance that the difference is significant is 90%.

[17] Mean performance of all entries in the trial.

[18] Coefficient of Variation (CV) indicates the quality of a trial, and lower than 15 indicates a high quality trial. For CV>15, there was higher than expected variability in the field or the data and the results should be used with caution.

Perkins County Irrigated
2020 Irrigated Corn Hybrid Trial

Name	Company	Final Stand (plants/acre)	Yield (bu/a)[19]	Test Weight (lb/bu)	Average Ear Height (in)
D51VC41	Dyna-Gro Seed	33,106	212.8	56.4	31.6
D48QV22	Dyna-Gro Seed	28,633	192.7	57.6	32.6
D43SS81	Dyna-Gro Seed	28,991	190.9	59.9	32.6
D52DC82	Dyna-Gro Seed	27,007	182.7	56.2	35.0
D54SS74	Dyna-Gro Seed	31,131	181.8	55.5	32.8
96 Day Maturity Check	NA	30,899	168.8	59.8	27.0
D53VC33	Dyna-Gro Seed	30,666	167.3	57.1	32.8
D52SS91	Dyna-Gro Seed	30,376	160.6	56.8	32.7
93 Day Maturity Check	NA	30,492	140.7	59.3	30.8
	Standard Error	1,310	18.0	0.7	1.6
	LSD[20]	2,221	30.5	1.1	2.7
	Mean[21]	30,145	177.6	57.6	32.0
	CV[22]	7.4	17.2	1.9	8.4
	Reps	5	5	5	5

SITE INFORMATION

Planting Date:	April 30, 2020
Harvest Date:	October 8 and 24, 2020
Seeding Information:	34,000 seeds/acre
Notes:	Further details regarding hybrid characteristics, maturities, and cultural practices will be forthcoming in the Spring Seed Guide.

Do not reprint without permission. Contacts: Amanda Easterly or Cody Creech

[19] Yield adjusted to 15.5% moisture and assuming 56 lb/bu test weight.
[20] For differences between varieties that are equal to or greater than the LSD value, the chance that the difference is significant is 90%.
[21] Mean performance of all entries in the trial.
[22] Coefficient of Variation (CV) indicates the quality of a trial, and lower than 15 indicates a high quality trial. For CV>15, there was higher than expected variability in the field or the data and the results should be used with caution.