

“Integrating Germplasm Evaluation, Genetic Engineering, Breeding and High-Throughput Phenotyping to Improve Sustainability of Soybean Production”

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Accomplishments for FY2020 (March 1, 2019 – February 28, 2020)

## **Variety Development**

### **Population development**

- A total of about 300 new populations were created in 2019 using over 48 different parents.
- Forty-one single cross populations involved **drought resistant** parents.
- About 1/3 of the single cross populations involved parents tolerant to **STS** herbicides.
- About 1/2 of the single cross populations involved at least one parent resistant to **soybean nematodes**.
- Eight single cross populations involved at least one parent that possessed genes from a plant introduction that has not contributed to the genetic improvement of US northern soybean varieties, and another 72 crosses with unique plant introductions were made to increase the **genetic diversity** of US germplasm to increase, or at least, maintain genetic gain.
- Seventy-nine populations involved incorporating **glyphosate tolerance** into a new GT line.
- One hundred populations involved parents with above average **seed protein**.
- Three populations were developed to incorporate the **Non-Nodulating** trait into adapted germplasm to better characterize the importance of nitrogen fixation and nitrogen fertility in modern soybean varieties.
- Twenty populations were created to incorporate **high oleic and low linolenic acid** traits into elite germplasm.

### **Yield trials**

- We completed evaluations of nearly **7000 genotypes** in over 19,000 plots in Kansas
- Over 1400 K-lines were evaluated in our preliminary trials.
- Over 190 K-lines were evaluated in our KS advanced yield trials.
- Over 400 (including 31 K-lines) breeding lines from programs across the country were evaluated in our KS Uniform Tests and Uniform Preliminary yield trials.
- Over 1000 genotypes, (experimental breeding lines and **plant introductions**) were evaluated in our drought, remote sensing, and diversity yield trials.

## Releases

- This project enabled the development and release of KS4120NSGT, KS4520NS and KS5120NS in FY20. Release announcements and descriptions of the lines are in Appendix 1. All of the lines have been licensed for commercial production.

## SCN Resistance Screening and Management

### ➤ SCN Screening Populations

Primary soybean cyst nematode (SCN) screening populations included HG Types 7, 2.7, and 1.2.3.5.6.7 (Figure 1). Female indices (FI) on the HG Type 1.2.5.6.7 population were >10% on all indicator lines except PI 90763 (line 3) and PI 437654 (line 4), while female indices on the HG Type 7 population were <10% on all indicator lines except PI 548316 (line 7). The third screening population, HG Type 2.5.7, is characterized by female indices >10% on PI88788 (line 2), PI209332 (line 5) and PI 548316 (line 7). Variation in female indices on PI 88788 (line 2) is of particular importance, since this line is the most common source of deployed SCN resistance.

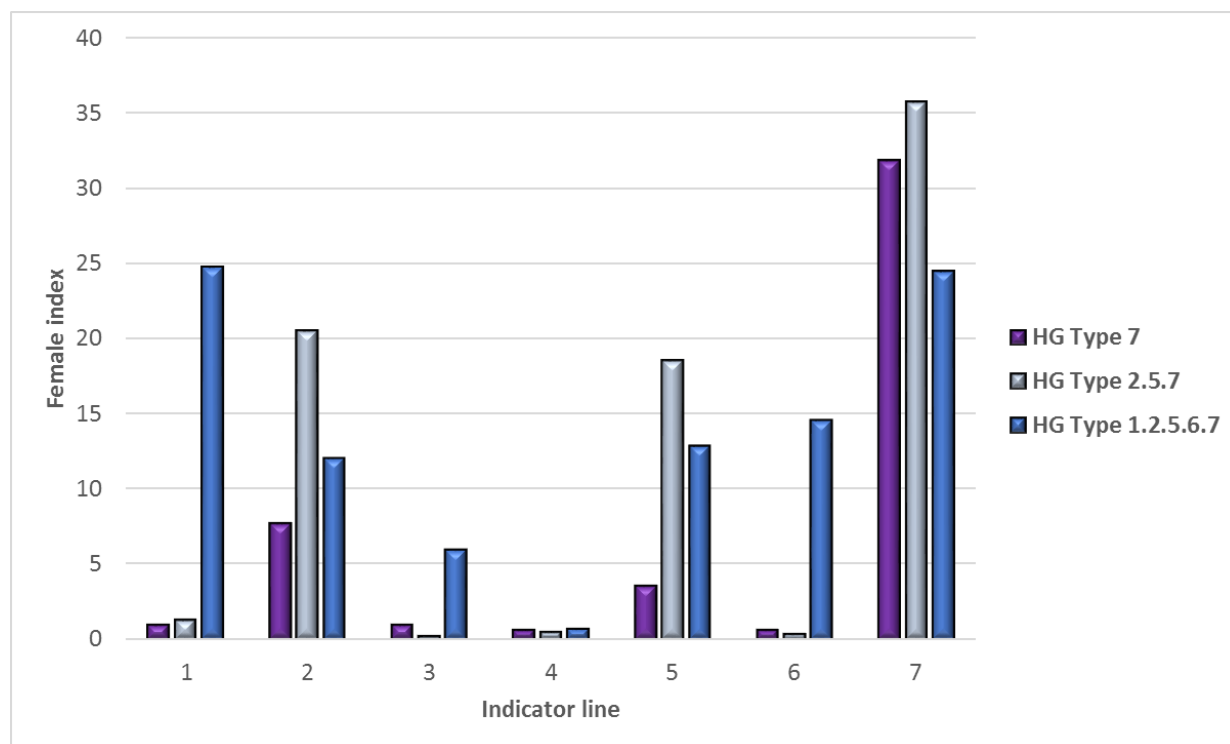
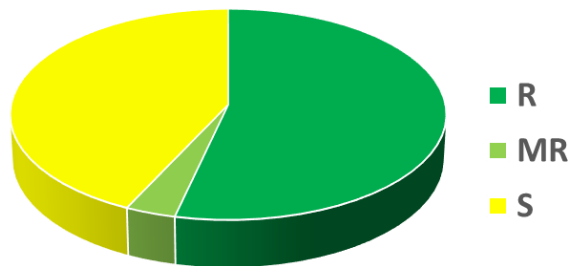


Figure 1.

### ➤ SCN Resistance Screening

*Breeding lines:* Soybean resistance to HG Type 7 was evaluated in replicated screening trials for >1,500 breeding lines. Approximately 60% of breeding lines in both the Preliminary and Advanced Tests displayed moderate or better levels of resistance (Figure 2).

### Preliminary Test (N = 1,342)



### Advanced Test (N = 249)

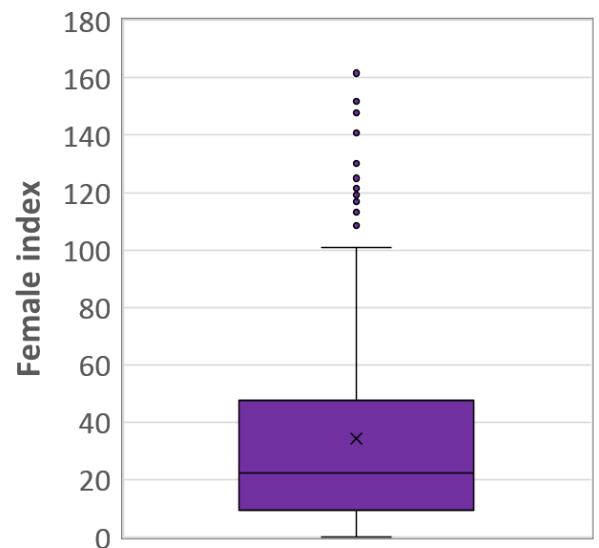


Figure 2.

*Kansas Soybean Performance Test:* Soybean resistance to SCN was evaluated in replicated screening trials for 94 entries in the Kansas Soybean Variety Performance Test (KSVPT). Evaluations involved SCN populations that varied in their virulence to the common resistance source PI 88788 (Figure 1). Eighty-five percent of KSVPT entries were resistant to moderately resistant to the HG Type 7 population, while only six entries were resistant to moderately resistant to the HG Type 2 populations (Figure 3). Female indices averaged ~50% for HG Type 2 populations compared to 23% for the HG Type 7 population, confirming that most KSVPT entries shared a common source of resistance (PI 88788). Results of these evaluations are posted online at: <https://www.agronomy.k-state.edu/services/crop-performance-tests/documents/soybean/2019%20SVPT%20SCN%20ratings.pdf>.

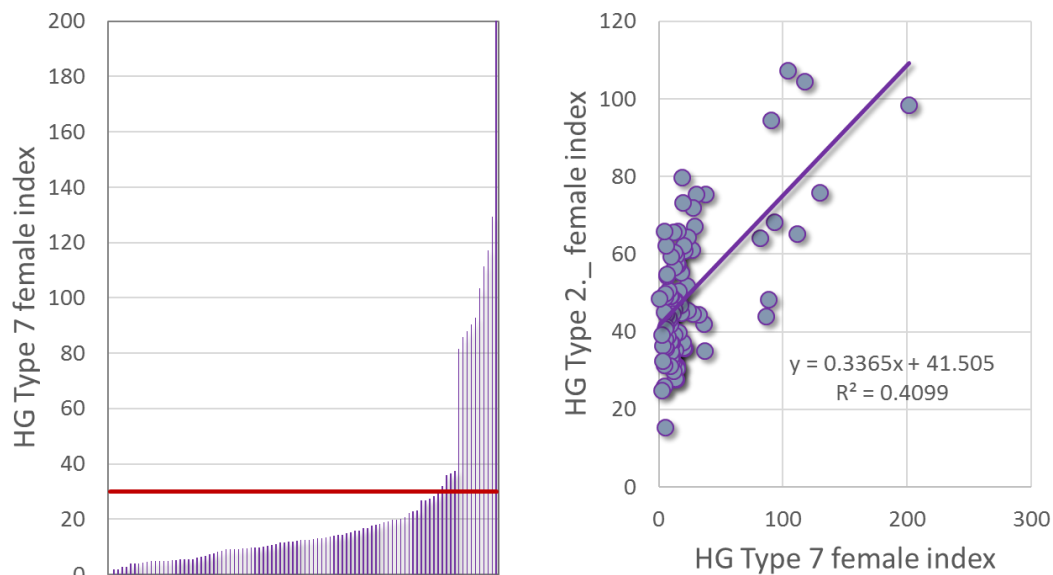


Figure 3.

*Field evaluation of stable transgenic lines:* Transgenic soybean lines developed with Kansas Soybean Commission funding were evaluated in naturally-infested soil to confirm their utility as sources of novel SCN resistance. With one exception (Entry 6), transgenic lines averaged 75% lower SCN egg densities compared to the non-transgenic background JackX (Figure 4). The best of these lines and being used as parents in crosses to transfer the resistance genes into adapted cultivars. Addition field testing of this transgenic material will be conducted in 2020.

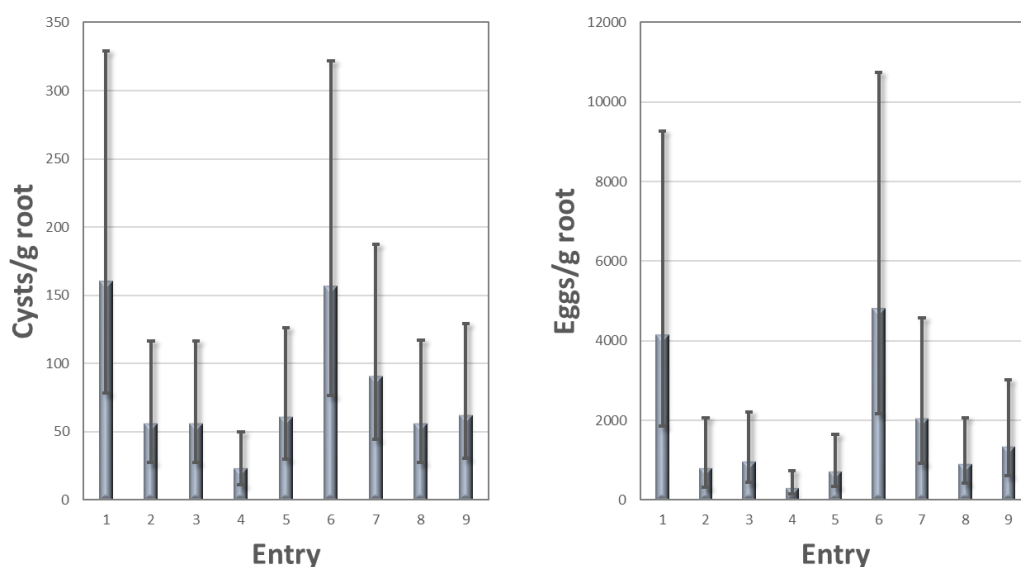


Figure 4.

## **Related Projects**

- A new SCN Coalition free soil-testing program for Kansas soybean producers was initiated in 2019. To date, 47% of samples received for testing were positive for the presence of SCN, with an average egg density of 311 eggs per 100 cm<sup>3</sup> soil.
- A new HG Type survey of SCN populations in Kansas was initiated in 2019 in collaboration with DuPont Pioneer. Preliminary results suggest that the average female index of Kansas SCN populations now exceeds 20% on PI 88788, with all populations tested to date identified as HG Type 2.

## **Outcomes of Research on Genetic Gain, Drought, and Remote Sensing**

- **Genetic gain.** In 2019 we initiated a project to use genomic selection to increase genetic gain. We are using a rapid cycling method where three cycles (three generations) of selection can be completed in 12 months by evaluating F1 plants. Two cycles of selection were completed in 2019 and a third cycle is being grown in the greenhouse. Selection criteria based on genotypic data includes seed yield, plant maturity, protein and oil concentrations in the seed, and genetic distance among the progeny. Following each cycle of selection, inbreeding of the selected and unselected F1s is being implemented to produce lines for evaluation in replicated field trials to characterize the effectiveness of the genomic selection and rapid cycling methodology.
- **High-throughput phenotyping to increase genetic gain and improve evaluations in stress environments.** We continue to develop models utilizing canopy reflectance and canopy thermal properties to estimate relative soybean maturity, seed yield, drought stress, and disease resistance. The focus in 2019 was obtaining remote sensing data on our progeny rows and on germplasm and varieties evaluated for drought stress and evaluate selections based on remote sensing in yield trials. Selections based on data collected using the UAVs were made in 2017 and 2018 progeny rows have been evaluated in replicated yield trials in 2018 and 2019 to characterize the benefits of using this technology. In both evaluation years, selections based on some remote sensing data base on the selection variable XNDVI (which is a vegetative index) resulted in selections with higher average seed yields than random (RAND) selections from progeny rows (Seed yield of 2018 selections in 2019 shown in Figure 5). This information is being summarized and will be submitted for publication.

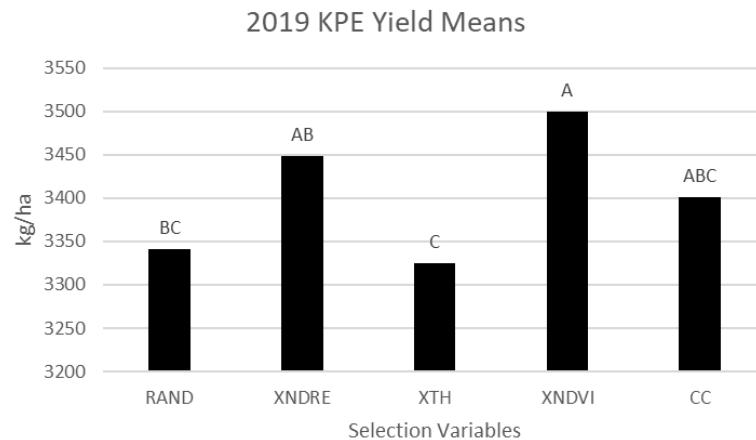


Figure 5.

While drought conditions were limited in Kansas in 2019, we were able to take some visual ratings for wilting, and also use an small unmanned aircraft to collect spectral reflectance data on the plots under evaluation. Drought research in previous projects funded by the United Soybean Board and the Kansas Soybean Commission has established a relationship between wilting ratings and canopy temperatures, as illustrated in Figure 6. With this knowledge we continue to move forward to develop a platform to use remote sensing to characterize drought stress.

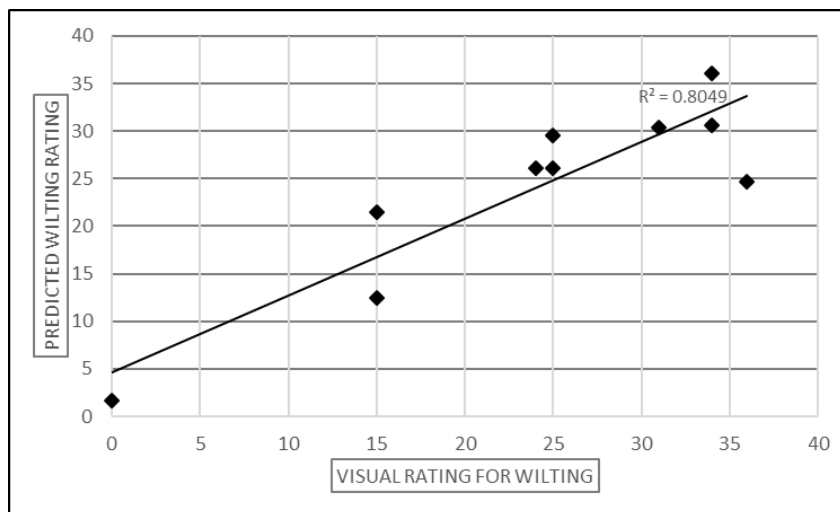


Figure 6.

## **Opportunities for Training and Professional Development**

- One graduate student worked on objectives related to this project in Agronomy, and one additional student in Bio and Ag Engineering worked cooperatively using the field plots developed and evaluated through this project.

## **Dissemination of Results**

- Extension publications, news releases, and experiment station reports, field days, extension meetings and tours are used to share the results of this project. Web pages have been developed to disseminate information on new releases and germplasm and pests. Distribution of results of genotype characterization for resistance published online. Distribution of SCN survey results to clientele will provide much-needed information for making informed decisions by producers regarding variety selections for SCN management and by soybean breeders for the development of varieties with improved levels of resistance. Effects of high temperature stress on soybean, and evaluations of host plant resistance were published at scientific conferences and published in peer reviewed publications.

## **Publications for FY20**

- **Journal articles**

Ye H, Song L, Schapaugh WT, Ali MDL, Sinclair TR, Riar MK, Raymond RN, Li Y, Vuong T, Valliyodan B, Neto PA, Klepadlo M, Song Q, Shannon JG, Chen P, Nguyen HT. 2019. The importance of slow canopy wilting in drought tolerance in soybean, *Journal of Experimental Botany* 71, 642–652. Maduraimuthu Djanaguiraman, William Schapaugh, Felix Frittschi, Henry Nguyen and P.V. Vara Prasad. 2018. Reproductive success of soybean cultivars and exotic lines under high daytime temperature. *Plant, Cell and Environment*. <https://doi.org/10.1111/pce.13421>.

Clinton J. Steketee, William T. Schapaugh, Thomas E. Carter and Zenglu Li. 2020. Genome-Wide Association Analyses Reveal Genomic Regions Controlling Canopy Wilting in Soybean. *G3: Genes, Genomes, Genetics*, 2020 vol. 10 no. 4 1413-1425; <https://doi.org/10.1534/g3.119.401016>.

Heng Ye, Li Song, William T Schapaugh, Md Liakat Ali, Thomas R Sinclair, Mandeep K Riar, Raymond N Mutava, Yang Li, Tri Vuong, Babu Valliyodan, Antonio Pizolato Neto, Mariola Klepadlo, Qijian Song, J Grover Shannon, Pengyin Chen, Henry T Nguyen, The importance of slow canopy wilting in drought tolerance in soybean, *Journal of Experimental Botany*, Volume 71, Issue 2, 7 January 2020, Pages 642–652, <https://doi.org/10.1093/jxb/erz150>.

## **Acknowledgment**

The faculty, graduate students and staff cooperating in this project greatly appreciate the opportunity to interact with the Kansas Soybean Commission. We also appreciate the financial support of the Kansas Soybean farmer to develop new varieties, germplasm and information that supports the improvement of soybean production.

## **APPENDIX 1.**

### **Release of KS4120NSGT**

Kansas Agricultural Experiment Station  
Kansas State University  
Manhattan, KS 66506

#### **Notice of Release of KS4120NSGT Glyphosate Tolerant (GMO) Soybean**

The Kansas Agricultural Experiment Station announces the release of 'KS4120NSGT' soybean [*Glycine max* (L.) Merr.]. Scientists contributing to this release are William Schapaugh, Professor, Jacob Petersen, Assistant Scientist, Rene Hessel, Assistant Scientist, and Alex King, Assistant Scientist, Department of Agronomy, and Tim Todd, Instructor and Tom Oakley, Assistant Scientist, Department of Plant Pathology.

KS4120NSGT is backcrosses derived variety from the cross KS4117Ns(5) by KS3406RR. KS4120NSGT has purple flowers, tawny pubescence, brown pods at maturity, indeterminate growth habit, and seeds with black hila. KS4120NSGT is an early maturity group 4 variety. KS4120NSGT is well adapted to a wide range of soil types and climates throughout Kansas and where other maturity group 4 varieties are grown.

KS4120NSGT was tested as experimental line K4117NSGT in Kansas and the Northern Regional Uniform Soybean Tests in 2019. In the 2019 Uniform IV Traited material evaluations, the yield of K4120NSGT was similar to the early maturity check. In a head-to-head comparisons between KS4117Ns (the recurrent parent) and KS4120NSGT in Kansas trials, the two lines did not differ significantly in seed yield, maturity, plant height or lodging. KS4120NSGT performed well compared with commercial varieties in 2019 with an average relative yield of 98% compared with all entries in the respective locations in the Kansas Soybean Performance Tests. KS4120NSGT is moderately resistance to Soybean Cyst Nematode HG Type 7 and possesses tolerance to STS® herbicides and glyphosate herbicide. The compositional characteristics of the seed are competitive with commercial varieties.

The Foundation Seed Program, Department of Agronomy, Kansas State University will maintain breeder's seed of this cultivar. Information on licensing for commercialization can be obtained from Christopher D. Brandt, President/CEO, Kansas State University Research Foundation, 2005 Research Park Circle, Suite 105, Manhattan, KS 66502-5020 (phone: 785-532-5720; email: tech.transfer@k-state.edu).

Small quantities of seed for research purposes can be obtained by request from William Schapaugh, Department of Agronomy, Kansas State University, Manhattan, KS (phone: 785-770-7906; email: wts@ksu.edu).



KS4120NSGT is backcrosses derived variety from the cross KS4117Ns(5) by KS3406RR. KS4120NSGT has purple flowers, tawny pubescence, brown pods at maturity, indeterminate growth habit, and seeds with black hila. KS4120NSGT is an early maturity group 4 variety. KS4120NSGT is well adapted to a wide range of soil types and climates throughout Kansas and where other maturity group 4 varieties are grown.

KS4120NSGT was tested as experimental line K4117NSGT in Kansas and the Northern Regional Uniform Soybean Tests in 2019. In the 2019 Uniform IV Trait material evaluations, the yield of K4117nsgr was similar to the early maturity check which does not possess STS or glyphosate tolerance (Table 1). In a head-to-head comparisons between KS4117Ns (the recurrent parent) and K4117nsgr in Kansas trials, the two lines did not differ significantly in seed yield, maturity, plant height or lodging (Table 2). K4117nsgr performed well compared with commercial varieties in 2019 (Tables 3 to 13) with an average relative yield of 98% compared with all entries in the respective locations in the Kansas Soybean Performance Tests (Table 3). K4117nsgr did not differ in yield from KS4117Ns in these commercial trials, except for the test in Thomas County. K4117nsgr is moderately resistance to Soybean Cyst Nematode HG Type 7 (Table 14) and possesses tolerance to STS® herbicides (Table 15) as does KS4117Ns. K4117nsgr has the added benefit of possessing tolerance to glyphosate herbicide (Table 15). The compositional characteristics of the seed are competitive with commercial varieties (Table 1).

K4117nsgr has been named ‘KS4120NSGT’. The ‘41’ refers to the relative maturity (4.1), ‘20’ refers to the year of release, ‘N’ refers to nematode resistance, ‘S’ refers to tolerance to STS® herbicides, and ‘GT’ refers to tolerance to glyphosate herbicide.

The Foundation Seed Program, Department of Agronomy, Kansas State University will maintain breeder’s seed of this cultivar. Information on licensing for commercialization can be obtained from Christopher D. Brandt, President/CEO, Kansas State University Research Foundation, 2005 Research Park Circle, Suite 105, Manhattan, KS 66502-5020 (phone: 785-532-5720; email: tech.transfer@k-state.edu).

Information about the variety or requests for small quantities of seed for research purposes can be obtained from William Schapaugh (phone: 785-770-7906; email: wts@ksu.edu) or Alex King, (phone: 785-826-8923; email: arking@ksu.edu) Department of Agronomy, Kansas State University, Manhattan, KS.

**Table 1.** Uniform Test IV Traited Material, 2019 Regional Summary

					Plant	Seed	Seed	<u>Composition</u>	
No. of Tests	Yield	Rank	Maturity	Lodging	Height	Size	Quality	Protein	Oil
	7	7	8	8	7	8	8	3	3
Strain	bu/a	No.	Date	Score	In.	g/100	Score	%	%
LD06-7620 (IV)	61.7	6	10/1	1.5	27	14.6	2.0	35.5	18.7
K4117Nsgr	60.8	8	0.5	1.3	25	15.5	1.8	35.8	18.6
Mean	56.1			1.6	30.6	15.1	1.8		
C.V. (%)	11.1			28.1	6.5	5.3	25.3		
L.S.D. (0.05)	3.6			0.3	1.3	0.7	0.4		

123.3 Days After Planting

**Table 2.** Head-to-Head comparison in Kansas of KS4117Ns to K4117nsgr, 2019.

	Yield	Maturity	Lodging	Plant Height
No. of Tests	10	9	8	10
Strain	bu/a	Days after 31-Aug	Score	In.
KS4117Ns	62	38	1.1	29
K4117Nsgr	62	38	1.1	29
L.S.D. (0.05)	ns	ns	ns	ns

**Table 3.** Yield as a percentage of test average from 2019 Soybean Variety Performance Tests

Strain	Emmet	Kiro	Topeka	Ottawa		Columbus		Erie		Scandia	Assaria	Colby	Avg.
	dry	dry	irrig.	MG4	MG5	MG4	MG5	MG4	MG5	irrig.	dry	irrig.	
K13-1830	-	-	-	-	100	-	101	-	99	-	-	-	100
K15-1283	95	112	107	98	-	-	-	-	-	101	94	-	101
K15-1809	-	-	-	-	109	-	104	-	111	-	-	-	108
K15-1855	-	-	-	-	101	-	102	-	99	-	-	-	101
K15-1874	-	-	-	-	97	-	100	-	96	-	-	-	98
K4117Nsgr	94	106	100	103	-	99	-	94	-	97	98	88	98
KS3618Ngr	-	-	-	-	-	-	-	-	-	91	95	-	93
KS4117Ns	101	104	104	103	-	97	-	101	-	101	103	102	102
KS4919N	-	-	-	-	94	-	97	-	98	-	-	-	96
KS5004N	-	-	-	-	88	-	89	-	94	-	-	-	90
KS5518	-	-	-	-	93	-	96	-	99	-	-	-	96

**Table 4.** Riley, Riley Co. Dryland Soybean Performance Test, 2019.

Brand	Entry	Yield bu/ac	Yield as % Test Average	Maturity Date	Lodging Score	Plant Height
ASGROW	AG35x9	<b>66.4</b>	108	10/1	1.0	33
ASGROW	AG41x8	<b>64.4</b>	105	10/12	1.0	38
CHECK	19MG3.9	55.5	91	9/29	1.0	33
GOLDEN HARVEST	3728	58.2	95	9/30	1.0	32
GOLDEN HARVEST	S37-A4X	61.8	101	10/2	1.0	33
GOLDEN HARVEST	S39-G2X	63.0	103	10/8	1.0	35
GOLDEN HARVEST	S42-B9XS	<b>65.2</b>	106	10/16	1.0	34
GOLDEN HARVEST	S46-W2X	<b>64.6</b>	105	10/15	1.0	34
KANSAS AES	K15-1283	58.4	95	10/15	1.0	30
KANSAS AES	K4117Nsg	57.4	94	10/6	1.0	27
KANSAS AES	KS4117Ns	62.0	101	10/5	1.0	25
MIDLAND	3537NX	56.9	93	9/29	1.0	30
MIDLAND	3779NXS	59.8	98	10/7	1.0	34
MIDLAND	3930NXS	<b>67.4</b>	110	10/9	1.0	33
PHILLIPS	427 NR2XS	61.0	99	10/15	1.0	38
PHILLIPS	379 NR2XSE	54.4	89	10/8	1.0	32
PHILLIPS	387 NR2X	63.2	103	10/8	1.0	35
PHILLIPS	408 NR2XS	<b>63.8</b>	104	10/14	1.0	32
	AVERAGES	61.3				
	CV (%)	5.7				
	LSD (0.10)	3.9				

Values in bold are in the upper LSD group.

**Table 5.** Kiro, Shawnee Co. Dryland Soybean Performance Test, 2019

Brand	Entry	Yield bu/ac	Yield as % Test Average	Maturity Date	Lodging Score	Plant Height
ASGROW	AG35x9	82.9	100	10/6	3.0	43
ASGROW	AG41x8	83.7	101	10/12	2.5	51
CHECK	19MG3.1	73.9	89	9/29	3.0	39
CHECK	19MG3.9	66.1	80	10/4	1.8	42
GOLDEN HARVEST	3728	74.3	90	10/6	1.3	41
GOLDEN HARVEST	S37-A4X	75.8	91	10/5	1.5	41
GOLDEN HARVEST	S39-G2X	79.3	96	10/9	1.8	47
GOLDEN HARVEST	S42-B9XS	<b>88.8</b>	107	10/11	2.5	44
GOLDEN HARVEST	S46-W2X	<b>89.8</b>	108	10/12	2.3	43
KANSAS AES	KS4117Ns	86.7	104	10/7	1.0	38
KANSAS AES	K4117Nsgr	<b>87.6</b>	106	10/9	1.3	38
KANSAS AES	K15-1283	<b>93.2</b>	112	10/11	4.0	41
MIDLAND	4328NX	81.8	98	10/10	3.0	46
MIDLAND	3779NXS	82.9	100	10/9	2.5	46
MIDLAND	3930NXS	<b>89.5</b>	108	10/11	3.0	45
MIDLAND	4140NXS	<b>91.8</b>	111	10/11	3.8	44
	AVERAGES	83.0				
	CV (%)	6.0				
	LSD (0.10)	5.8				

Values in bold are in the upper LSD group.

**Table 6.** Topeka, Shawnee Co. Irrigated Soybean Performance Test, 2019.

Brand	Entry	Yield bu/ac	Yield as % Test Average	Maturity Date	Lodging Score	Plant Height
ASGROW	AG35x9	67.7	109	10/3	2.0	36
ASGROW	AG41x8	52.1	83	10/3	1.3	46
CHECK	19MG3.1	63.4	102	9/30	1.5	32
CHECK	19MG3.9	59.4	95	9/30	1.8	36
GOLDEN HARVEST	3934	59.2	95	10/5	2.0	41
GOLDEN HARVEST	4628	64.4	103	10/9	1.8	38
KANSAS AES	K15-1283	66.9	107	10/9	2.5	35
KANSAS AES	K4117Nsgr	62.2	100	9/30	1.8	33
KANSAS AES	KS4117Ns	65.1	104	10/3	1.3	31
MIDLAND	3930NXS	<b>74.6</b>	120	10/5	1.5	42
MIDLAND	4140NXS	62.3	100	10/10	2.3	39
MIDLAND	4328NX	63.9	102	10/9	1.5	40
MIDLAND	4488NXS	68.6	110	10/13	3.0	40
MISSOURI	S13-2743C	47.5	76	10/3	2.5	37
MISSOURI	S13-3851C	65.7	105	10/9	2.3	39
MISSOURI	S14-15138R	65.7	105	10/13	2.5	36
MISSOURI	S14-15146R	55.5	89	10/5	2.8	36
MORSOY	MS 3907 RXT	64.4	103	10/5	1.8	36
MORSOY	MS 4117 RXT	55.9	90	10/6	2.0	37
MORSOY	MS 4426 RXT	<b>73.8</b>	118	10/13	3.8	39
MORSOY	MS 4706 RXT	69.2	111	10/13	4.0	46
MORSOY	MS 4846 RXT	65.0	104	10/13	2.8	40
PHILLIPS	427 NR2XS	50.1	80	10/5	1.8	40
PHILLIPS	379 NR2XSE	62.1	100	10/3	1.3	38
PHILLIPS	387 NR2X	59.8	96	10/2	2.3	41
PHILLIPS	408 NR2XS	59.8	96	10/6	1.8	35
WILLCROSS	WX1038NGT/LL	69.0	111	10/10	3.0	41
WILLCROSS	WX1046NSGT/LL	39.8	64	10/2	2.8	40
WILLCROSS	WX1441NLL	52.9	85	10/2	1.0	38
WILLCROSS	WXE8038NS	61.0	98	9/29	1.0	33
WILLCROSS	WXE8043NS	<b>76.3</b>	122	10/8	2.0	38
WILLCROSS	WXX3386N	67.4	108	10/1	1.5	40
AVERAGES		62.4				
CV (%)		8.2				
LSD (0.10)		6.0				

Values in bold are in the upper LSD group.

**Table 7.** Ottawa, Franklin Co. Dryland Soybean Performance Test, Maturity Groups III-IV, 2019.

Brand	Entry	Yield bu/ac	Yield as % Test Average	Maturity Date	Lodging Score	Plant Height
ASGROW	AG35x9	<b>76.0</b>	104	10/2	1.0	35
ASGROW	AG41x8	67.0	92	10/7	1.5	39
CHECK	19MG3.1	72.5	99	9/23	1.3	31
CHECK	19MG3.9	72.4	99	9/30	1.3	35
DONMARIO	DM EXP (19E419)	<b>73.7</b>	101	10/3	1.0	35
GOLDEN HARVEST	3934	71.0	97	10/2	2.0	41
GOLDEN HARVEST	S42-B9XS	<b>78.3</b>	107	10/8	1.0	37
GOLDEN HARVEST	S43-V3X	73.4	101	10/5	1.5	40
GOLDEN HARVEST	S46-W2X	70.0	96	10/1	1.3	32
INTEGRA	S3809N	73.4	100	10/3	1.3	38
INTEGRA	4149NS	<b>74.5</b>	102	10/15	1.0	42
KANSAS AES	K15-1283	71.3	98	10/7	1.3	33
KANSAS AES	K4117Nsgr	<b>75.1</b>	103	10/4	1.0	31
KANSAS AES	KS4117Ns	<b>74.9</b>	103	10/4	1.0	31
MIDLAND	4140NXS	70.7	97	10/11	1.5	37
MIDLAND	4328NX	<b>73.9</b>	101	10/8	1.3	38
MIDLAND	4488NXS	<b>76.3</b>	105	10/15	2.0	41
MIDLAND	4677NXS	66.1	91	10/15	1.8	45
MISSOURI	S13-2743C	<b>78.0</b>	107	10/8	1.0	37
MISSOURI	S13-3851C	71.5	98	10/8	1.3	36
MISSOURI	S14-15146R	69.4	95	10/9	1.0	34
MORSOY	MS 3907 RXT	<b>74.9</b>	103	10/2	1.5	37
MORSOY	MS 4117 RXT	<b>74.1</b>	102	10/7	1.0	36
MORSOY	MS 4426 RXT	<b>77.6</b>	106	10/13	1.8	39
PHILLIPS	408 NR2XS	<b>76.3</b>	105	10/7	1.3	34
PHILLIPS	387 NR2X	70.5	97	10/11	1.8	38
PHILLIPS	427 NR2XS	69.6	95	10/10	1.0	39
PHILLIPS	430NR2XSE	<b>75.7</b>	104	10/10	1.3	40
WILLCROSS	WX1046NSGT/LL	68.8	94	10/13	1.5	41
AVERAGES		73.0				
CV (%)		5.48				
LSD (0.10)		4.63				

Values in bold are in the upper LSD group.

**Table 8.** Columbus, Cherokee Co. Dryland Soybean Performance Test, 2019.

Brand	Entry	Yield bu/ac	Yield as % Test Average	Maturity Date	Plant Height
ASGROW	AG35x9	<b>55.5</b>	108	10/15	31.0
ASGROW	AG41x8	52.6	102	10/19	34.0
CHECK	19MG3.1	48.4	94	10/15	26.5
CHECK	19MG3.9	48.1	93	10/16	30.5
DONMARIO	DM EXP (19E419)	46.7	91	10/19	26.8
GOLDEN HARVEST	S45-Z5XS	<b>59.0</b>	114	10/20	30.3
GOLDEN HARVEST	S46-W2X	<b>55.1</b>	107	10/19	33.8
KANSAS AES	K4117Nsgr	51.2	99	10/17	25.5
KANSAS AES	KS4117Ns	49.9	97	10/17	25.5
MIDLAND	4677NXS	45.9	89	10/24	32.8
MORSOY	MS 3907 RXT	50.1	97	10/18	32.5
MORSOY	MS 4117 RXT	53.7	104	10/19	29.5
MORSOY	MS 4426 RXT	<b>55.9</b>	108	10/21	35.8
PHILLIPS	430NR2XSE	49.8	97	10/19	31.3
PHILLIPS	427 NR2XS	50.7	98	10/19	37.0
PHILLIPS	456NR2XS	52.6	102	10/19	35.8
PHILLIPS	478 NR2XSE	<b>55.2</b>	107	10/23	36.5
STRATTON	Go Soy 40GL18	52.0	101	10/18	33.5
STRATTON	Go Soy 43C17S	50.7	98	10/17	25.3
STRATTON	Go Soy 44GL18	51.2	99	10/17	32.0
WILLCROSS	WX1046NSGT/LL	49.0	95	10/17	33.8
AVERAGES		51.6			
CV (%)		6.67			
LSD (0.10)		4.08			

Values in bold are in the upper LSD group.



**Table 9.** Erie, Neosho Co. Dryland Soybean Performance Test, 2019.

Brand	Entry	Yield bu/ac	Yield as % Test Average	Maturity Date	Plant Height
ASGROW	AG35x9	41.3	80	10/5	28
ASGROW	AG41x8	52.9	102	10/16	36
CHECK	19MG3.9	40.4	78	10/8	29
DONMARIO	DM EXP (19E419)	56.2	108	10/17	31
GOLDEN HARVEST	4531	53.8	104	10/18	32
GOLDEN HARVEST	4628	55.1	106	10/19	33
KANSAS AES	K4117Nsgr	48.6	94	10/10	25
KANSAS AES	KS4117Ns	52.1	101	10/13	28
MIDLAND	4677NXS	<b>58.0</b>	112	10/25	37
MISSOURI	S13-2743C	52.5	101	10/14	32
MISSOURI	S13-3851C	52.2	101	10/17	28
MISSOURI	S14-15146R	47.7	92	10/14	33
MORSOY	MS 3907 RXT	48.9	94	10/9	29
MORSOY	MS 4117 RXT	54.8	106	10/15	27
MORSOY	MS 4426 RXT	<b>61.7</b>	119	10/22	38
PHILLIPS	408 NR2XS	49.5	96	10/17	29
PHILLIPS	387 NR2X	48.1	93	10/8	29
PHILLIPS	427 NR2XS	53.1	102	10/18	36
PHILLIPS	430NR2XSE	51.2	99	10/19	35
PHILLIPS	450NR2XSE	48.1	93	10/19	34
PHILLIPS	456NR2XS	52.3	101	10/20	31
PHILLIPS	478 NR2XSE	<b>57.6</b>	111	10/25	37
STRATTON	Go Soy 40GL18	55.7	108	10/19	35
STRATTON	Go Soy 43C17S	48.2	93	10/14	29
STRATTON	Go Soy 44GL18	54.4	105	10/17	33
WILLCROSS	WX1046NSGT/LL	53.1	102	10/20	32
AVERAGES		51.8			
CV (%)		7.38			
LSD (0.10)		4.49			

Values in bold are in the upper LSD group.

**Table 10.** Scandia, Republic Co. Irrigated Soybean Performance Test, 2019.

Brand	Entry	Yield bu/ac	Yield as % Test Average	Maturity Date	Lodging Score	Plant Height
ASGROW	AG35x9	<b>66.1</b>	104	10/7	1.0	35
ASGROW	AG41x8	59.9	94	10/17	1.0	41
CHECK	19MG3.1	61.7	97	9/30	1.0	33
CHECK	19MG3.9	62.4	98	10/14	1.0	35
KANSAS AES	K15-1283	<b>64.4</b>	101	10/14	1.0	31
KANSAS AES	K4117Nsg	61.4	97	10/7	1.0	27
KANSAS AES	KS3618Ngr	57.8	91	10/7	1.0	30
KANSAS AES	KS4117Ns	<b>64.0</b>	101	10/7	1.0	28
MIDLAND	3537NX	<b>67.7</b>	107	10/14	1.0	33
MIDLAND	3779NXS	<b>63.8</b>	100	10/14	1.0	38
MIDLAND	3930NXS	<b>64.7</b>	102	10/14	1.0	37
MIDLAND	4140NXS	61.6	97	10/17	1.0	38
MISSOURI	S13-2743C	<b>65.9</b>	104	10/14	1.0	34
MISSOURI	S13-3851C	63.3	100	10/14	1.0	33
MISSOURI	S14-15138R	61.0	96	10/17	1.0	34
MISSOURI	S14-15146R	<b>64.6</b>	102	10/14	1.0	31
PHILLIPS	379 NR2XSE	<b>66.2</b>	104	10/14	1.0	37
PHILLIPS	408 NR2XS	<b>66.5</b>	105	10/17	1.0	35
PHILLIPS	387 NR2X	<b>64.9</b>	102	10/14	1.0	37
	AVERAGES	63.5				
	CV (%)	4.7				
	LSD (0.10)	4.1				

Values in bold are in the upper LSD group.

**Table 11.** Assaria, Saline Co. Dryland Soybean Performance Test, 2019.

Brand	Entry	Yield bu/ac	Yield as % Test Average	Maturity Date	Lodging Score	Plant Height
ASGROW	AG35x9	<b>66.0</b>	113	9/29	1.0	31
ASGROW	AG41x8	<b>63.7</b>	109	9/30	1.0	34
CHECK	19MG3.1	52.3	89	9/27	1.0	28
CHECK	19MG3.9	<b>63.2</b>	108	9/28	1.0	30
DONMARIO	DM EXP (19E419)	56.3	96	9/30	1.0	28
KANSAS AES	K15-1283	55.1	94	9/29	1.0	26
KANSAS AES	K4117Nsgr	57.8	98	9/29	1.0	24
KANSAS AES	KS3618Ngr	55.8	95	9/28	1.0	25
KANSAS AES	KS4117Ns	60.6	103	9/29	1.0	26
PHILLIPS	408 NR2XS	61.7	105	10/5	1.0	29
PHILLIPS	387 NR2X	61.5	105	9/29	1.0	32
PHILLIPS	430NR2XSE	61.3	104	10/6	1.0	35
PHILLIPS	427 NR2XS	60.0	102	10/4	1.0	35
PHILLIPS	456NR2XS	56.5	96	10/7	2.0	42
PHILLIPS	478 NR2XSE	47.8	82	10/10	1.3	37
	AVERAGES	58.7				
	CV (%)	4.8				
	LSD (0.10)	3.3				

Values in bold are in the upper LSD group.

**Table 12.** Colby, Thomas Co. Irrigated Soybean Performance Test, 2019.

Brand	Entry	Yield bu/ac	Yield as % Test Average	Lodging Score	Plant Height
ASGROW	AG35x9	<b>67.7</b>	117	3	32
ASGROW	AG41x8	51.8	89	3	41
CHECK	19MG3.1	63.0	108	2	33
CHECK	19MG3.9	56.4	97	2	35
KANSAS AES	K4117Nsgr	51.0	88	2	28
KANSAS AES	KS4117Ns	59.4	102	1	27
LG SEEDS	C3550RX	58.4	101	2	33
LG SEEDS	CS3333RX	57.0	98	2	32
LG SEEDS	LGS2989RX	<b>63.6</b>	110	1	32
LG SEEDS	LGS3600RX	52.7	91	2	34
LG SEEDS	LGS3777RX	55.8	96	3	36
LG SEEDS	C3985RX	62.4	107	2	34
LG SEEDS	C4227RX	55.9	96	2	36
	AVERAGES	58.1			
	CV (%)	6.56			
	LSD (0.10)	4.52			

Values in bold are in the upper LSD group.

Table 13. Elite commercial soybean variety trial, Manhattan, KS 2019.						
br__st	en__st	seedyield	yld_pm	maturity	lodging	height
ASGROW	AG34X7	52.8	84	42	1.3	34
ASGROW	AG35x9	73.8	118	42	1.3	38
ASGROW	AG41x8	60.1	96	42	1.0	38
ASGROW	AG43X7	61.0	97	48	2.0	43
CHECK	19MG3.1	59.9	96	40	1.5	33
CHECK	19MG3.9	66.2	106	43	1.0	38
CHECK	MG3.9	49.1	78	42	3.0	43
DONMARIO	DM EXP (19E419)	68.7	110	47	1.0	34
GOLDEN HARVEST	3728	64.6	103	42	1.0	34
GOLDEN HARVEST	3934	62.6	100	45	1.3	39
GOLDEN HARVEST	4531	64.5	103	49	1.0	41
GOLDEN HARVEST	S37-A4X	69.4	111	42	1.0	38
GOLDEN HARVEST	S39-G2X	60.3	96	44	1.0	39
GOLDEN HARVEST	S45-Z5XS	65.3	104	48	1.0	36
KANSAS AES	K15-1283	67.7	108	46	1.3	35
KANSAS AES	K4117Nsgr	67.2	107	44	1.0	32
KANSAS AES	KS3406RR	61.2	98	41	2.0	33
KANSAS AES	KS3618Ngr	62.4	100	44	2.5	36
KANSAS AES	KS4117Ns	65.6	105	43	1.0	30
LG SEEDS	C3550RX	68.1	109	41	1.0	35
LG SEEDS	C3985RX	65.8	105	44	1.3	36
LG SEEDS	C4227RX	68.7	110	46	1.0	40
LG SEEDS	LGS3600RX	63.1	101	42	1.0	36
LG SEEDS	LGS3777RX	62.5	100	45	1.3	40
LG SEEDS	LGS4573RX	55.4	88	50	1.0	41
MIDLAND	3537NX	65.4	104	40	1.0	32
MIDLAND	4488NXS	57.1	91	51	1.8	39
MO	PANA	55.5	89	40	3.0	43
MO	PI567731	27.6	44	41	4.0	33
PHILLIPS	379 NR2XSE	64.2	103	46	1.0	40
PHILLIPS	387 NR2X	67.3	108	45	1.0	41
PHILLIPS	408 NR2XS	62.1	99	45	1.3	36
PHILLIPS	427 NR2XS	59.5	95	47	1.0	39
PHILLIPS	430NR2XSE	64.7	103	48	1.0	40
PHILLIPS	456NR2XS	55.8	89	50	2.0	43
PHILLIPS	478 NR2XSE	55.4	88	52	1.5	42
STRATTON	Go Soy 43C17S	64.8	103	44	1.0	31
WILLCROSS	WX3388N	68.2	109	45	1.0	39
CV		4.96	0	2.07	25.07	6.2
GRAND MEAN		62.65	0	44.75	1.42	37.77
LSD		3.64	0	1.08	0.42	2.74

Seed yield: bushels per acre

Maturity: days after August 31

Lodging: Lodging score 1 best to 5 worst


Height: Plant height in inches

**Table 14.** 2019 SCN Female Indices from Kansas Soybean Performance Tests.

SOURCE	ENTRY	Race 3 HG Type 7	Race 4 HG Type 1.2.3.5.6.7	Race 1 HG Type 2.5.7
KANSAS AES	K13-1830	36	38	32
KANSAS AES	K15-1283	88	54	43
KANSAS AES	K15-1809	11	46	43
KANSAS AES	K15-1855	20	21	51
KANSAS AES	K15-1874	2	55	23
KANSAS AES	K4117Nsg	18	57	53
KANSAS AES	KS3406RR	129	98	54
			2	
KANSAS AES	KS3618Ngr	13	2	34
KANSAS AES	KS4103sp	93	79	57
KANSAS AES	KS4117Ns	14	51	65
KANSAS AES	KS4607	201	98	99
KANSAS AES	KS4919N	13	8	48
KANSAS AES	KS5004N	5	57	42
KANSAS AES	KS5518	36	55	30
CV (%)		80.4	32.9	57.1
AVERAGES		24.6	43.3	55.2
LSD (0.05)		34.4	24.8	52.0
No. of Reps		3	3	3

\* SCN Female Index = Soybean Cyst Nematode female index, where the female index (FI) = (mean # of cysts on tested variety/mean # of cysts on susceptible checks) x 100. A low FI (<10) means that the SCN population was not able to reproduce well on the differential line, and a high FI means that the SCN population was able to reproduce well. Reproduction rates were measured on plants grown in the greenhouse.

Table 15. STS and Roundup tolerance results for K4117nsgr by KCIA.

	<b>Seed Analysis Report</b> <b>Kansas Crop Improvement Association</b>		2000 Kimball Avenue Manhattan, Kansas 66502 Phone (785) 532-6118 Fax (785) 532-6551		Sample Number <b>K-20-0335</b>
	Report Date: 2/5/2020		Variety / Kind: K-16-83GR Soybean Lot Number: 9RL27949		Field #: A44981
Seed Enhancements:					
KSU AGRONOMY DEPT 2200 KIMBALL AVENUE MANHATTAN, KS 66502			Test(s) Requested: Germination Roundup Tol. STS		Total Charge \$45.00

Purity Analysis		Germination Analysis		Other Tests	
Work Wt.	grams	%	Germ. %	Hard/Dorm. %	
Soybean		**	86	0	Moisture: 10.4 % Test Weight: 58.1 pounds / bushel Roundup Tolerance: 99.4 % Tolerance STS Tolerance: 100 % Tolerance
Inert Matter			Test Date		1/21/2020
Other Crop			** Purity and Noxious Tests not requested		
Weed Seed			Weight of Submitted Sample 1099 g.		
Other Crop Seeds	# / pound	Common Weed Seeds	# / pound	Noxious Weed Contaminants	
				Nox. Wt.	grams # / pound

Comments:	
Carbon Copy to:	

Tests were conducted according to Association of Official Seed Analysts rules where applicable. Unless otherwise stated, all other analysis were performed according to generally accepted practices. Kansas Crop Improvement Association (KCIA) warrants only that the analysis report is accurate for the sample as it was submitted to the laboratory. Unless otherwise stated, KCIA makes no claim as to the accuracy of the variety. KCIA makes no statement of fitness for any purpose of the seed represented by this analysis.

Eric Fabritzus, Seed Laboratory Manager

Rayshell Colson, RST #70

## **Release of KS4520NS**

Kansas Agricultural Experiment Station  
Kansas State University  
Manhattan, KS 66506

### Notice of Release of KS4520NS Conventional (non-GMO) Soybean

The Kansas Agricultural Experiment Station announces the release of 'KS4520NS' soybean [*Glycine max* (L.) Merr.]. Scientists contributing to this release are William Schapaugh, Professor, Jacob Petersen, Assistant Scientist, Rene Hessel, Assistant Scientist, and Alex King, Assistant Scientist, Department of Agronomy, and Tim Todd, Instructor and Tom Oakley, Assistant Scientist, Department of Plant Pathology.

KS4520NS is an F4 single plant selection from the cross LD06-7620 by 435.TCS. KS4520NS has purple flowers, light tawny pubescence, tan pods at maturity, indeterminate growth habit, and seeds with black hila. KS4520NS is a mid-group 4 maturity variety. It is well adapted to a wide range of soil types and climates throughout Kansas and where other maturity group 4 varieties are grown.

KS4520NS was tested as experimental line, K15-1283, in Kansas and the Northern Regional Uniform Soybean Tests. In 2017 to 2019, KS4520NS performed well in the Uniform Preliminary and Uniform IV Tests. Over the three years KS4520NS was similar in yield to the checks and the only entry to possess tolerance to STS® herbicides. KS4520NS performed well compared with commercial varieties in 2019 with an average relative yield of 101% compared with entries in the respective locations in the Kansas Soybean Performance Tests. Seed yield of KS4520NS was similar to KS4117Ns in many environments, but KS4520NS was about 5 days later in maturity than KS4117Ns which helped to take full advantage of the growing season, reduce risks of yield losses to environmental stresses and pests, and help spread out the harvest season and reduce harvest losses. In addition to possessing tolerance to STS® herbicides, KS4520NS is moderately resistance to Soybean Cyst Nematode HG type 0. The compositional characteristics of the seed are competitive with commercial varieties.

The Foundation Seed Program, Department of Agronomy, Kansas State University will maintain breeder's seed of this cultivar. Information on licensing for commercialization can be obtained from Christopher D. Brandt, President/CEO, Kansas State University Research Foundation, 2005 Research Park Circle, Suite 105, Manhattan, KS 66502-5020 (phone: 785-532-5720; email: tech.transfer@k-state.edu).

Small quantities of seed for research purposes can be obtained by request from William Schapaugh, Department of Agronomy, Kansas State University, Manhattan, KS (phone: 785-770-7906; email: wts@ksu.edu).



KS4520NS is an F4 single plant selection from the cross LD06-7620 by 435.TCS. KS4520NS has purple flowers, light tawny pubescence, tan pods at maturity, indeterminate growth habit, and seeds with black hila. KS4520NS is a mid-group 4 maturity variety. It is well adapted to a wide range of soil types and climates throughout Kansas and where other maturity group 4 varieties are grown.

KS4520NS was tested as experimental line K15-1283 in Kansas and the Northern Regional Uniform Soybean Tests. In 2017 to 2019, K15-1283 performed well in the Uniform Preliminary and Uniform IV Tests (Tables 1 to 4). Over the three years, K15-1283 was similar in yield to the checks the checks and the only entry to possess tolerance to STS® herbicides. K15-1283 performed well compared with commercial varieties in 2019 (Tables 5 to 12) with an average relative yield of 101% compared with all entries in the respective locations in the Kansas Soybean Performance Tests (Table 5). Seed yield of K15-1283 was similar to KS4117Ns in many environments, but K15-1283 was about 5 days later in maturity which helped to take full advantage of the growing season, reduce risks of yield losses to environmental stresses and pests, and help spread out the harvest season and reduce harvest losses. In addition to possessing tolerance to STS® herbicides (Table 13), K15-1283 is moderately resistance to Soybean Cyst Nematode HG type 0 (Table 14). The compositional characteristics of the seed are competitive with commercial varieties (Table 1).

K15-1283 has been named ‘KS4520NS’. The ‘45’ refers to the relative maturity (4.5), ‘20’ refers to the year of release, ‘N’ refers to nematode resistance and the ‘S’ refers to tolerance to STS® herbicides.

The Foundation Seed Program, Department of Agronomy, Kansas State University will maintain breeder’s seed of this cultivar. Information on licensing for commercialization can be obtained from Christopher D. Brandt, President/CEO, Kansas State University Research Foundation, 2005 Research Park Circle, Suite 105, Manhattan, KS 66502-5020 (phone: 785-532-5720; email: tech.transfer@k-state.edu).

Information about the variety or requests for small quantities of seed for research purposes can be obtained from William Schapaugh (phone: 785-770-7906; email: wts@ksu.edu) or Alex King, (phone: 785-826-8923; email: arking@ksu.edu) Department of Agronomy, Kansas State University, Manhattan, KS.

**Table 1.** 2017-2019 Preliminary and Uniform Test IV 3-year means.

	Yield	Rank	Maturity	Lodging	Plant Height	Seed Size	Seed Quality	Composition	
No. of Tests	30	30	29	30	29	25	25	7	7
Strain	bu/a	No.	Date	Score	In.	g/100	Score	%	%
LD06-7620 (IV)	58.9	3	9/30	1.5	32	14.6	2.1	34.7	18.9
LD00-2817 (L)	56.8	2	0.9	1.8	36	13.9	2.3	33.0	20.2
K15-1283	60.1	1	3.1	1.6	32	16.2	2.1	35.5	18.9

	Yield	Rank	Maturity	Lodging	Plant Height	Seed Size	Seed Quality	<u>Composition</u>	
No. of Tests	7	7	7	7	6	7	7	4	4
Strain	bu/a	No.	Date	Score	In.	g/100	Score	%	%
LD06-7620 (IV)	67.8	9	10/5	1.2	34	15.3	1.6	34.5	18.9
LD00-2817P (L)	65.8	16	0.3	1.4	41	15.0	1.9	32.5	20.2
LD07-3395bf (SCN)	68.1	7	-3.9	1.1	32	17.0	1.9	31.7	20.5
CR144155	55.8	28	-11.8	1.1	32	17.3	2.0	33.1	19.6
CR145524	65.0	21	-10.9	1.3	34	16.1	1.9	32.7	19.3
CR146116	61.1	26	-9.8	1.1	34	16.9	1.7	34.7	18.9
CR147814	62.5	24	-10.8	1.1	34	15.3	1.7	33.5	19.9
CR147839	58.9	27	-11.4	1.3	35	15.2	1.9	32.2	20.3
CR147881	62.0	25	-10.4	1.3	35	14.6	2.1	34.5	19.2
K15-1008	68.6	4	0.2	1.2	36	18.2	1.9	36.1	18.7
K15-1039	66.8	13	-1.1	1.1	31	16.2	1.8	35.6	18.9
K15-1278	65.5	19	-2.6	1.0	35	14.4	2.1	34.9	18.4
K15-1279	64.4	22	-1.2	1.1	35	16.9	2.1	35.0	18.9
K15-1283	69.8	2	1.1	1.2	36	17.3	1.9	35.6	18.5
K15-1294	67.2	11	-1.4	1.2	36	15.3	1.8	35.3	18.9
K15-1303	68.3	6	1.6	1.5	36	17.0	2.0	35.0	18.5
K15-1307	68.0	8	-1.1	1.6	37	15.6	1.9	34.9	19.0
K15-1310	70.1	1	1.4	1.2	36	16.7	1.6	35.2	18.8
LD14-2880	68.6	4	-3.0	1.2	40	17.1	2.1	34.0	18.4
LD14-3698	65.6	18	-5.0	1.1	36	17.8	2.0	34.7	19.6
LD14-6763	62.8	23	-2.2	1.0	32	16.2	2.1	35.2	18.8
LD14-6766	68.9	3	-2.1	1.2	35	16.2	1.9	33.6	19.8
LD14-6796	67.1	12	-3.2	1.1	35	16.3	1.9	34.0	19.1
LG15-2049	65.7	17	1.1	1.4	41	16.6	1.9	33.1	19.2
LG15-2224	65.9	15	-2.2	1.9	46	16.7	1.9	34.5	19.2
SA13-1464	65.4	20	-3.6	1.0	34	16.8	1.8	34.7	19.6
SA14-5754	67.8	9	-0.4	1.1	37	16.2	2.1	33.3	19.5
SA14-5854	66.8	13	-0.8	1.3	37	16.2	2.1	32.3	19.8

AVERAGES	65.7	31.5	1.2	35.8	16.3	1.9
C.V. (%)	8.1	6.3	25.8	5.8	4.8	18.0
L.S.D. (0.05)	3.3	1.2	0.2	1.4	0.7	0.3

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127.9 Days After Planting

**Table 2.** Preliminary Text IV, 2017 Regional Summary

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**Table 3.** Uniform Test IV, 2018 Regional Summary

No. of Tests Strain	Yield	Rank	Maturity	Lodging	Plant Height	Seed Size	Seed Quality	<u>Composition</u>	
	12 bu/a	12 No.	11 Date	12 Score	11 In.	7 g/100	7 Score	3 Protein %	3 Oil %
LD06-7620 (IV)	54.8	6	9/23	2.0	32	13.8	2.4	33.9	19.2
LD00-2817 (L)	52.8	10	3.5	2.2	37	12.5	2.6	32.5	20.4
LD07-3395bf (SCN)	54.1	8	-3.1	1.8	31	14.5	2.8	32.5	20.8
DSN11-03004	52.7	12	-4.1	2.1	36	15.6	2.0	34.6	19.9
DSN11-03174	52.6	15	-3.9	1.6	31	16.5	2.6	32.9	20.3
DSN11-10057	50.0	16	-4.9	1.7	32	14.1	1.9	32.7	19.6
DSN11-27183	52.7	12	-5.9	1.7	35	14.0	1.7	32.6	20.6
K15-1008	55.6	4	4.5	1.6	33	15.3	2.2	36.3	18.5
K15-1283	58.2	1	4.4	2.1	33	15.4	2.0	35.1	19.1
LD14-2880	54.4	7	-1.0	1.6	36	14.7	2.7	31.9	19.7
LD14-6766	52.7	12	-0.5	1.5	32	13.7	1.9	33.2	20.0
S13-10590C	53.9	9	5.5	2.0	36	15.0	2.3	34.4	19.6
S13-10592C	52.8	10	7.7	2.4	37	15.5	2.2	34.3	20.1
S13-2743C	57.6	2	4.2	2.0	40	12.9	1.9	34.0	19.5
S13-3851C	55.6	4	9.9	2.0	36	15.3	2.6	35.1	19.6
SA14-5754	47.5	17	2.5	1.8	32	13.9	2.3	33.2	20.5
SA14-5854	56.9	3	0.6	1.9	34	14.0	2.1	32.9	20.3
AVERAGES	52.5			1.9	34.0	14.4	2.4		
C.V. (%)	14.7			20.7	7.1	4.8	27.9		
L.S.D. (0.05)	3.2			0.1	0.8	0.5	0.4		

132.1 Days after planting

**Table 4.** Uniform Test IV, 2019 Regional Summary

No. of Tests Strain	Yield	Rank	Maturity	Lodging	Plant Height	Seed Size	Seed Quality	<u>Composition</u>	
	7	7	8	8	7	8	8	Protein	Oil
	bu/a	No.	Date	Score	In.	g/100	Score	%	%
LD06-7620 (IV)	57.7	10	10/3	1.2	29	15.0	2.2	35.6	18.7
LD00-2817 (L)	55.4	14	-1.3	1.5	34	14.4	2.2	33.4	20.1
LD07-3395bf (SCN) (E)	61.4	2	-2.9	1.2	28	16.7	2.1	33.8	20.2
CR15-0616	56.0	13	-2.5	1.1	30	14.5	2.1	34.5	19.9
CR15-0619	54.9	18	-2.6	1.1	30	14.4	2.2	34.1	20.0
CR15-1369	58.2	8	0.3	1.4	31	15.6	2.3	34.8	19.5
CR15-1382	55.4	14	-0.8	1.2	29	18.5	2.4	34.8	19.4
K15-1283	56.1	12	3.0	1.2	29	16.4	2.1	36.0	18.8
LD15-3818	60.5	5	-2.4	1.1	30	15.7	2.2	35.0	19.4
LG15-4348	58.1	9	-1.5	1.9	37	15.5	2.2	33.4	19.7
LG16-4634	60.8	4	-1.9	1.3	33	14.1	2.1	34.0	19.0
LG16-4642	61.4	2	-0.6	1.3	33	14.1	2.0	34.6	19.3
LG16-4644	58.8	7	-2.0	1.4	34	14.1	2.1	33.7	19.1
LG16-4655	62.1	1	1.7	1.4	36	14.4	2.0	34.0	19.4
S13-2743C	60.2	6	2.2	1.2	34	14.0	1.9	35.4	19.2
S15-10879C	55.4	14	0.8	1.3	33	14.5	2.1	37.4	16.8
S16-14161C	56.6	11	8.1	1.4	34	17.2	2.2	35.6	18.8
S16-9784C	55.3	17	3.5	1.5	32	16.4	1.9	35.3	18.5
SA14-5854	54.0	19	-0.2	1.3	30	15.9	2.1	35.0	19.4
Mean	57.0			1.3	31.6	14.5	2.1		
C.V. (%)	11.0			25.7	6.8	5.9	22.2		
L.S.D. (5%)	2.7			0.2	0.9	0.5	0.3		

124.8 Days After Planting

**Table 5.** Yield as a percentage of test average from 2019 Soybean Variety Performance Tests

Strain	Emmet	Kiro dry	Topeka irrig.	Ottawa MG4	MG5	Columbus MG4	MG5	Erie MG4	MG5	Scandia irrig.	Assaria dry	Colby irrig.	Avg
K13-1830	-	-	-	-	100	-	101	-	99	-	-	-	100
K15-1283	95	112	107	98	-	-	-	-	-	101	94	-	101
K15-1809	-	-	-	-	109	-	104	-	111	-	-	-	108
K15-1855	-	-	-	-	101	-	102	-	99	-	-	-	101
K15-1874	-	-	-	-	97	-	100	-	96	-	-	-	98
K4117Nsg	94	106	100	103	-	99	-	94	-	97	98	88	98
KS3618Ngr	-	-	-	-	-	-	-	-	-	91	95	-	93
KS4117Ns	101	104	104	103	-	97	-	101	-	101	103	102	102
KS4919N	-	-	-	-	94	-	97	-	98	-	-	-	96
KS5004N	-	-	-	-	88	-	89	-	94	-	-	-	90
KS5518	-	-	-	-	93	-	96	-	99	-	-	-	96

**Table 6.** Kiro, Shawnee Co. Dryland Soybean Performance Test, 2019

Brand	Entry	Yield bu/ac	Yield as % Test Average	Maturity Date	Lodging Score	Plant Height
ASGROW	AG35x9	82.9	100	10/6	3.0	43
ASGROW	AG41x8	83.7	101	10/12	2.5	51
CHECK	19MG3.1	73.9	89	9/29	3.0	39
CHECK	19MG3.9	66.1	80	10/4	1.8	42
GOLDEN HARVEST	3728	74.3	90	10/6	1.3	41
GOLDEN HARVEST	S37-A4X	75.8	91	10/5	1.5	41
GOLDEN HARVEST	S39-G2X	79.3	96	10/9	1.8	47
GOLDEN HARVEST	S42-B9XS	<b>88.8</b>	107	10/11	2.5	44
GOLDEN HARVEST	S46-W2X	<b>89.8</b>	108	10/12	2.3	43
KANSAS AES	KS4117Ns	86.7	104	10/7	1.0	38
KANSAS AES	K4117Nsg	<b>87.6</b>	106	10/9	1.3	38
KANSAS AES	K15-1283	<b>93.2</b>	112	10/11	4.0	41
MIDLAND	4328NX	81.8	98	10/10	3.0	46
MIDLAND	3779NXS	82.9	100	10/9	2.5	46
MIDLAND	3930NXS	<b>89.5</b>	108	10/11	3.0	45
MIDLAND	4140NXS	<b>91.8</b>	111	10/11	3.8	44
AVERAGES		83.0				
CV (%)		6.0				
LSD (0.10)		5.8				

Values in bold are in the upper LSD group.

**Table 7.** Riley, Riley Co. Dryland Soybean Performance Test, 2019.

Brand	Entry	Yield bu/ac	Yield as % Test Average	Maturity Date	Lodging Score	Plant Height
ASGROW	AG35x9	<b>66.4</b>	108	10/1	1.0	33
ASGROW	AG41x8	<b>64.4</b>	105	10/12	1.0	38
CHECK	19MG3.9	55.5	91	9/29	1.0	33
GOLDEN HARVEST	3728	58.2	95	9/30	1.0	32
GOLDEN HARVEST	S37-A4X	61.8	101	10/2	1.0	33
GOLDEN HARVEST	S39-G2X	63.0	103	10/8	1.0	35
GOLDEN HARVEST	S42-B9XS	<b>65.2</b>	106	10/16	1.0	34
GOLDEN HARVEST	S46-W2X	<b>64.6</b>	105	10/15	1.0	34
KANSAS AES	K15-1283	58.4	95	10/15	1.0	30
KANSAS AES	K4117Nsg	57.4	94	10/6	1.0	27
KANSAS AES	KS4117Ns	62.0	101	10/5	1.0	25
MIDLAND	3537NX	56.9	93	9/29	1.0	30
MIDLAND	3779NXS	59.8	98	10/7	1.0	34
MIDLAND	3930NXS	<b>67.4</b>	110	10/9	1.0	33
PHILLIPS	427 NR2XS	61.0	99	10/15	1.0	38
PHILLIPS	379 NR2XSE	54.4	89	10/8	1.0	32
PHILLIPS	387 NR2X	63.2	103	10/8	1.0	35
PHILLIPS	408 NR2XS	<b>63.8</b>	104	10/14	1.0	32
	AVERAGES	61.3				
	CV (%)	5.7				
	LSD (0.10)	3.9				

Values in bold are in the upper LSD group.

**Table 8.** Topeka, Shawnee Co. Irrigated Soybean Performance Test, 2019.

Brand	Entry	Yield bu/ac	Yield as % Test Average	Maturity Date	Lodging Score	Plant Height
ASGROW	AG35x9	67.7	109	10/3	2.0	36
ASGROW	AG41x8	52.1	83	10/3	1.3	46
CHECK	19MG3.1	63.4	102	9/30	1.5	32
CHECK	19MG3.9	59.4	95	9/30	1.8	36
GOLDEN HARVEST	3934	59.2	95	10/5	2.0	41
GOLDEN HARVEST	4628	64.4	103	10/9	1.8	38
KANSAS AES	K15-1283	66.9	107	10/9	2.5	35
KANSAS AES	K4117Nsg	62.2	100	9/30	1.8	33
KANSAS AES	KS4117Ns	65.1	104	10/3	1.3	31
MIDLAND	3930NXS	<b>74.6</b>	120	10/5	1.5	42
MIDLAND	4140NXS	62.3	100	10/10	2.3	39
MIDLAND	4328NX	63.9	102	10/9	1.5	40
MIDLAND	4488NXS	68.6	110	10/13	3.0	40
MISSOURI	S13-2743C	47.5	76	10/3	2.5	37
MISSOURI	S13-3851C	65.7	105	10/9	2.3	39
MISSOURI	S14-15138R	65.7	105	10/13	2.5	36
MISSOURI	S14-15146R	55.5	89	10/5	2.8	36
MORSOY	MS 3907 RXT	64.4	103	10/5	1.8	36
MORSOY	MS 4117 RXT	55.9	90	10/6	2.0	37
MORSOY	MS 4426 RXT	<b>73.8</b>	118	10/13	3.8	39
MORSOY	MS 4706 RXT	69.2	111	10/13	4.0	46
MORSOY	MS 4846 RXT	65.0	104	10/13	2.8	40
PHILLIPS	427 NR2XS	50.1	80	10/5	1.8	40
PHILLIPS	379 NR2XSE	62.1	100	10/3	1.3	38
PHILLIPS	387 NR2X	59.8	96	10/2	2.3	41
PHILLIPS	408 NR2XS	59.8	96	10/6	1.8	35
WILLCROSS	WX1038NGT/LL	69.0	111	10/10	3.0	41
WILLCROSS	WX1046NSGT/LL	39.8	64	10/2	2.8	40
WILLCROSS	WX1441NLL	52.9	85	10/2	1.0	38
WILLCROSS	WXE8038NS	61.0	98	9/29	1.0	33
WILLCROSS	WXE8043NS	<b>76.3</b>	122	10/8	2.0	38
WILLCROSS	WXX3386N	67.4	108	10/1	1.5	40
AVERAGES		62.4				
CV (%)		8.2				
LSD (0.10)		6.0				

Values in bold are in the upper LSD group.



**Table 9.** Ottawa, Franklin Co. Dryland Soybean Performance Test, Maturity Groups III-IV, 2019.

Brand	Entry	Yield bu/ac	Yield as % Test Average	Maturity Date	Lodging Score	Plant Height
ASGROW	AG35x9	<b>76.0</b>	104	10/2	1.0	35
ASGROW	AG41x8	67.0	92	10/7	1.5	39
CHECK	19MG3.1	72.5	99	9/23	1.3	31
CHECK	19MG3.9	72.4	99	9/30	1.3	35
DONMARIO	DM EXP (19E419)	<b>73.7</b>	101	10/3	1.0	35
GOLDEN HARVEST	3934	71.0	97	10/2	2.0	41
GOLDEN HARVEST	S42-B9XS	<b>78.3</b>	107	10/8	1.0	37
GOLDEN HARVEST	S43-V3X	73.4	101	10/5	1.5	40
GOLDEN HARVEST	S46-W2X	70.0	96	10/1	1.3	32
INTEGRA	S3809N	73.4	100	10/3	1.3	38
INTEGRA	4149NS	<b>74.5</b>	102	10/15	1.0	42
KANSAS AES	K15-1283	71.3	98	10/7	1.3	33
KANSAS AES	K4117Nsgr	<b>75.1</b>	103	10/4	1.0	31
KANSAS AES	KS4117Ns	<b>74.9</b>	103	10/4	1.0	31
MIDLAND	4140NXS	70.7	97	10/11	1.5	37
MIDLAND	4328NX	<b>73.9</b>	101	10/8	1.3	38
MIDLAND	4488NXS	<b>76.3</b>	105	10/15	2.0	41
MIDLAND	4677NXS	66.1	91	10/15	1.8	45
MISSOURI	S13-2743C	<b>78.0</b>	107	10/8	1.0	37
MISSOURI	S13-3851C	71.5	98	10/8	1.3	36
MISSOURI	S14-15146R	69.4	95	10/9	1.0	34
MORSOY	MS 3907 RXT	<b>74.9</b>	103	10/2	1.5	37
MORSOY	MS 4117 RXT	<b>74.1</b>	102	10/7	1.0	36
MORSOY	MS 4426 RXT	<b>77.6</b>	106	10/13	1.8	39
PHILLIPS	408 NR2XS	<b>76.3</b>	105	10/7	1.3	34
PHILLIPS	387 NR2X	70.5	97	10/11	1.8	38
PHILLIPS	427 NR2XS	69.6	95	10/10	1.0	39
PHILLIPS	430NR2XSE	<b>75.7</b>	104	10/10	1.3	40
WILLCROSS	WX1046NSGT/LL	68.8	94	10/13	1.5	41
AVERAGES		73.0				
CV (%)		5.48				
LSD (0.10)		4.63				

Values in bold are in the upper LSD group.

**Table 10.** Scandia, Republic Co. Irrigated Soybean Performance Test, 2019.

Brand	Entry	Yield bu/ac	Yield as % Test Average	Maturity Date	Lodging Score	Plant Height
ASGROW	AG35x9	<b>66.1</b>	104	10/7	1.0	35
ASGROW	AG41x8	59.9	94	10/17	1.0	41
CHECK	19MG3.1	61.7	97	9/30	1.0	33
CHECK	19MG3.9	62.4	98	10/14	1.0	35
KANSAS AES	K15-1283	<b>64.4</b>	101	10/14	1.0	31
KANSAS AES	K4117Nsg	61.4	97	10/7	1.0	27
KANSAS AES	KS3618Ngr	57.8	91	10/7	1.0	30
KANSAS AES	KS4117Ns	<b>64.0</b>	101	10/7	1.0	28
MIDLAND	3537NX	<b>67.7</b>	107	10/14	1.0	33
MIDLAND	3779NXS	<b>63.8</b>	100	10/14	1.0	38
MIDLAND	3930NXS	<b>64.7</b>	102	10/14	1.0	37
MIDLAND	4140NXS	61.6	97	10/17	1.0	38
MISSOURI	S13-2743C	<b>65.9</b>	104	10/14	1.0	34
MISSOURI	S13-3851C	63.3	100	10/14	1.0	33
MISSOURI	S14-15138R	61.0	96	10/17	1.0	34
MISSOURI	S14-15146R	<b>64.6</b>	102	10/14	1.0	31
PHILLIPS	379 NR2XSE	<b>66.2</b>	104	10/14	1.0	37
PHILLIPS	408 NR2XS	<b>66.5</b>	105	10/17	1.0	35
PHILLIPS	387 NR2X	<b>64.9</b>	102	10/14	1.0	37
	AVERAGES	63.5				
	CV (%)	4.7				
	LSD (0.10)	4.1				

Values in bold are in the upper LSD group.

**Table 11.** Assaria, Saline Co. Dryland Soybean Performance Test, 2019.

Brand	Entry	Yield bu/ac	Yield as % Test Average	Maturity Date	Lodging Score	Plant Height
ASGROW	AG35x9	<b>66.0</b>	113	9/29	1.0	31
ASGROW	AG41x8	<b>63.7</b>	109	9/30	1.0	34
CHECK	19MG3.1	52.3	89	9/27	1.0	28
CHECK	19MG3.9	<b>63.2</b>	108	9/28	1.0	30
DONMARIO	DM EXP (19E419)	56.3	96	9/30	1.0	28
KANSAS AES	K15-1283	55.1	94	9/29	1.0	26
KANSAS AES	K4117Nsgr	57.8	98	9/29	1.0	24
KANSAS AES	KS3618Ngr	55.8	95	9/28	1.0	25
KANSAS AES	KS4117Ns	60.6	103	9/29	1.0	26
PHILLIPS	408 NR2XS	61.7	105	10/5	1.0	29
PHILLIPS	387 NR2X	61.5	105	9/29	1.0	32
PHILLIPS	430NR2XSE	61.3	104	10/6	1.0	35
PHILLIPS	427 NR2XS	60.0	102	10/4	1.0	35
PHILLIPS	456NR2XS	56.5	96	10/7	2.0	42
PHILLIPS	478 NR2XSE	47.8	82	10/10	1.3	37
	AVERAGES	58.7				
	CV (%)	4.8				
	LSD (0.10)	3.3				

Values in bold are in the upper LSD group.

Table 12. Elite commercial soybean variety trial, Manhattan, KS 2019.						
Brand	Entry	seedyield	yld_pm	maturity	lodging	height
ASGROW	AG34X7	52.8	84	42	1.3	34
ASGROW	AG35x9	73.8	118	42	1.3	38
ASGROW	AG41x8	60.1	96	42	1.0	38
ASGROW	AG43X7	61.0	97	48	2.0	43
CHECK	19MG3.1	59.9	96	40	1.5	33
CHECK	19MG3.9	66.2	106	43	1.0	38
CHECK	MG3.9	49.1	78	42	3.0	43
DONMARIO	DM EXP (19E419)	68.7	110	47	1.0	34
GOLDEN HARVEST	3728	64.6	103	42	1.0	34
GOLDEN HARVEST	3934	62.6	100	45	1.3	39
GOLDEN HARVEST	4531	64.5	103	49	1.0	41
GOLDEN HARVEST	S37-A4X	69.4	111	42	1.0	38
GOLDEN HARVEST	S39-G2X	60.3	96	44	1.0	39
GOLDEN HARVEST	S45-Z5XS	65.3	104	48	1.0	36
KANSAS AES	K15-1283	67.7	108	46	1.3	35
KANSAS AES	K4117Nsgr	67.2	107	44	1.0	32
KANSAS AES	KS3406RR	61.2	98	41	2.0	33
KANSAS AES	KS3618Ngr	62.4	100	44	2.5	36
KANSAS AES	KS4117Ns	65.6	105	43	1.0	30
LG SEEDS	C3550RX	68.1	109	41	1.0	35
LG SEEDS	C3985RX	65.8	105	44	1.3	36
LG SEEDS	C4227RX	68.7	110	46	1.0	40
LG SEEDS	LGS3600RX	63.1	101	42	1.0	36
LG SEEDS	LGS3777RX	62.5	100	45	1.3	40
LG SEEDS	LGS4573RX	55.4	88	50	1.0	41
MIDLAND	3537NX	65.4	104	40	1.0	32
MIDLAND	4488NXS	57.1	91	51	1.8	39
MO	PANA	55.5	89	40	3.0	43
MO	PI567731	27.6	44	41	4.0	33
PHILLIPS	379 NR2XSE	64.2	103	46	1.0	40
PHILLIPS	387 NR2X	67.3	108	45	1.0	41
PHILLIPS	408 NR2XS	62.1	99	45	1.3	36
PHILLIPS	427 NR2XS	59.5	95	47	1.0	39
PHILLIPS	430NR2XSE	64.7	103	48	1.0	40
PHILLIPS	456NR2XS	55.8	89	50	2.0	43
PHILLIPS	478 NR2XSE	55.4	88	52	1.5	42
STRATTON	Go Soy 43C17S	64.8	103	44	1.0	31
WILLCROSS	WX3388N	68.2	109	45	1.0	39
CV		4.96	0	2.07	25.07	6.2
GRAND MEAN		62.65	0	44.75	1.42	37.77
LSD		3.64	0	1.08	0.42	2.74


Seed yield: bushels per acre

Maturity: days after August 31

Lodging: Lodging score 1 best to 5 worst

Height: Plant height in inches

Table 13. Roundup and STS tolerance results from KCIA.

	<b>Seed Analysis Report</b> <b>Kansas Crop Improvement Association</b>		2000 Kimball Avenue Manhattan, Kansas 66502 Phone (785) 532-6118 Fax (785) 532-6551		Sample Number <b>K-20-0336</b>																																																																								
	Report Date: 2/5/2020		Variety / Kind: K15-1283 Soybean Lot Number: 9RL27950		Field #: A44982																																																																								
Seed Enhancements:																																																																													
KSU AGRONOMY DEPT 2200 KIMBALL AVENUE MANHATTAN, KS 66502			Test(s) Requested: Germination Roundup Tol. STS		Total Charge \$45.00																																																																								
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Eric Fabritzus, Seed Laboratory Manager

Rayshell Colson, RST #70

**Table 14.** Soybean Cyst Nematode in Uniform Regional Tests IV, 2018.

Entry	HG Type 0		HG Type 2.5.7	
	FI	Rating	FI	Rating
LD06-7620	12	R	81	NR
LD00-2817P	1	HR	1	HR
S13-2743C	13	R	41	LR
S13-10590C	65	NR	50	LR
K15-1283	13	R	52	LR

\* SCN Female Index = Soybean Cyst Nematode female index, where the female index (FI) = (mean # of cysts on tested variety/mean # of cysts on susceptible checks) x 100. A low FI (<10) means that the SCN population was not able to reproduce well on the differential line, and a high FI means that the SCN population was able to reproduce well.

## **Release of KS5120NS**

Kansas Agricultural Experiment Station  
Kansas State University  
Manhattan, KS 66506

### **Notice of Release of KS5120NS Conventional (non-GMO) Soybean**

The Kansas Agricultural Experiment Station announces the release of 'KS5120NS' soybean [*Glycine max* (L.) Merr.]. Scientists contributing to this release are William Schapaugh, Professor, Jacob Petersen, Assistant Scientist, Rene Hessel, Assistant Scientist, and Alex King, Assistant Scientist, Department of Agronomy, and Tim Todd, Instructor and Tom Oakley, Assistant Scientist, Department of Plant Pathology.

KS5120NS is an F4 single plant selection from the cross NCC05-1262 by 435.TCS. KS5120NS has white flowers, grey pubescence, tan pods at maturity, determinate growth habit, and seeds with brown hila. KS5120NS is an early maturity group 5 variety. It is well adapted to a wide range of soil types and climates throughout Kansas and where other maturity group 5 varieties are grown.

KS5120NS was tested as experimental line K15-1855 in Kansas and the Southern Regional Uniform Soybean Tests. In 2017, KS5120NS performed well in the Southern Uniform Preliminary V tests. The yield of KS5120NS was similar to the early maturity check, Ellis. In head-to-head comparisons with KS5518, KS4919N and KS5004N in Kansas, KS5120NS had higher seed yield than either KS5518 or KS5004N. The maturity of KS5120NS is similar to KS5518, while 2 and 4 days later than KS4919N and KS5004N, respectively. Plant lodging resistance of KS5120NS was superior to and plant height was shorter than KS5518, KS4919N and KS5004N. KS5120NS performed well compared with commercial varieties in 2019 with an average relative yield of 101% compared with entries in the respective locations in the Kansas Soybean Performance Tests. KS5120NS possesses moderate resistance to Soybean Cyst Nematode Race 3 (HG Type 7 and HG Type 5.7) and Race 5 (HG Type 2.5.7), Stem Canker and also possesses tolerance to STS® herbicides. The compositional characteristics of the seed are competitive with commercial varieties

The Foundation Seed Program, Department of Agronomy, Kansas State University will maintain breeder's seed of this cultivar. Information on licensing for commercialization can be obtained from Christopher D. Brandt, President/CEO, Kansas State University Research Foundation, 2005 Research Park Circle, Suite 105, Manhattan, KS 66502-5020 (phone: 785-532-5720; email: tech.transfer@k-state.edu).

Small quantities of seed for research purposes can be obtained by request from William Schapaugh, Department of Agronomy, Kansas State University, Manhattan, KS (phone: 785-770-7906; email: wts@ksu.edu).

KS5120NS is an F4 single plant selection from the cross NCC05-1262 by 435.TCS. KS5120NS has white flowers, grey pubescence, tan pods at maturity, determinate growth habit, and seeds with brown hila. KS5120NS is an early maturity group 5 variety. It is well adapted to a wide range of soil types and climates throughout Kansas and where other maturity group 5 varieties are grown.

KS5120NS was tested as experimental line K15-1855 in Kansas and the Southern Regional Uniform Soybean Tests. In 2017, K15-1855 performed well in the Southern Uniform Preliminary V tests (Tables 1 and 2). The yield of K15-1855 was similar to the early maturity check (Ellis). K15-1855 possessed better Soybean Cyst Nematode (SCN) resistance than Ellis (Table 1), better Stem Canker resistance than JTN-5203 (Table 1), and performed well in Kansas, so the entry continued to be evaluated further in Kansas. In head-to-head comparisons with KS5518 (Table 3), KS4919N (Table 4) and KS5004N (Table 5) in Kansas, K15-1855 had higher seed yield than either KS5518 or KS5004N. The maturity of K15-1855 was similar to KS5518, while 2 and 4 days later than KS4919N and KS5004N, respectively. Plant lodging resistance of K15-1855 was superior to and plant height was shorter than KS5518, KS4919N and KS5004N. K15-1855 performed well compared with commercial varieties in 2019 with an average relative yield of 101% compared with all entries in the respective locations in the Kansas Soybean Performance Tests (Table 6). K15-1855 possesses SCN resistance similar to KS4919N (Table 7). In addition to possessing resistance to Stem Canker and SCN, K15-1855 also possesses tolerance to STS® herbicides (Table 8). The compositional characteristics of the seed are competitive with commercial varieties (Table 2).

K15-1855 has been named 'KS5120NS'. The '51' refers to the relative maturity (5.1), '20' refers to the year of release, 'N' refers to nematode resistance and the 'S' refers to tolerance to STS® herbicides.

The Foundation Seed Program, Department of Agronomy, Kansas State University will maintain breeder's seed of this cultivar. Information on licensing for commercialization can be obtained from Christopher D. Brandt, President/CEO, Kansas State University Research Foundation, 2005 Research Park Circle, Suite 105, Manhattan, KS 66502-5020 (phone: 785-532-5720; email: tech.transfer@k-state.edu).

Information about the variety or requests for small quantities of seed for research purposes can be obtained from William Schapaugh (phone: 785-770-7906; email: [wts@ksu.edu](mailto:wts@ksu.edu)) or Alex King, (phone: 785-826-8923; email: [arking@ksu.edu](mailto:arking@ksu.edu)) Department of Agronomy, Kansas State University, Manhattan, KS.



**Table 1.** General summary of performance, preliminary Test, V-Early 2017 Results.

Strain	Yield	Rank	Maturity Index	Lodging Score	Height In.	SCN Cyst Score (1-5) <sup>a</sup>		SC <sup>b</sup> Rating	SC Score
						Race 3	Race 5		
Ellis	60.4	11	0	1.4	28	5	5	R	1
JTN-5203	58.0	22	1	1.7	29	1	1	SS	3
AG 5335	59.1	19	1	1.7	35	2	4	R	1
GoSoy 54G16	54.5	34	1	1.8	33	1	1	S	5
DA0912-07F	57.9	23	5	1.9	29	5	-	R	1
DA0912-10F	56.5	25	5	1.9	29	-	5	R	1
DA1037-25F	62.1	8	3	1.9	27	5	5	R	1
DA1139-031F	56.0	30	2	1.9	30	5	1	R	1
K13-1830	59.7	14	1	1.6	30	3	4	MS	4
K15-1788	64.8	4	1	1.8	27	5	5	R	1
K15-1800	65.3	1	2	1.5	26	5	5	R	1
K15-1809	65.1	3	4	1.6	28	4	5	R	1
K15-1853	59.9	13	-2	1.8	29	2	1	R	1
K15-1854	58.8	20	-1	2.1	28	3	1	R	1
K15-1855	59.4	15	-1	1.7	29	1	1	R	1
LW13-2096	46.6	37	3	2.8	40	4	4	R	1
R13-10658	54.7	32	5	2.4	34	5	5	R	1
R14-356	62.0	9	2	2.5	31	5	5	R	1
R14-898	59.1	17	3	2.3	36	5	4	R	1
R14-2893RR	56.0	29	3	2.3	33	5	5	MR	2
R14-14797RR	58.7	21	4	2.0	36	5	5	R	1
S15-12298C	59.2	16	6	3.4	36	1	1	SS	3
S15-13637C	56.2	27	5	3.2	47	5	5	MR	2
S15-16535C	56.2	28	6	2.6	34	5	4	MS	4
S15-16592C	54.5	33	1	2.0	31	5	4	MS	4
S15-16886C	60.3	12	1	2.4	34	5	1	MS	4
S15-17108C	56.8	24	0	2.3	30	5	5	S	5
S15-17812C	59.1	18	-1	2.1	31	5	2	R	1
TN13-4304	62.4	7	1	1.8	32	5	5	R	1
TN15-5012	54.9	31	1	1.5	28	5	5	R	1
TN16-510	65.1	2	1	1.7	29	5	5	R	1
TN16-630	62.7	6	0	1.6	32	5	5	R	1
TN16-5817RR1	60.6	10	3	1.7	30	5	5	R	1
TN16-5858R1	63.6	5	3	1.7	31	2	1	R	1
V12-3446	53.2	35	-3	1.5	28	5	5	SS	3
V12-4590	51.5	36	0	1.8	31	5	5	S	5
V13-3833	56.2	26	-3	1.4	26	5	4	R	1
Mean	58.6	-	2	2.0	31	-	-	-	-
LSD (0.05)	5.3	-	3	-	3	-	-	-	-
CV(%)	12.3	-	21	-	11	-	-	-	-

<sup>a</sup>The race 3 and 5 SCN populations used in these tests were typed as HG (*Heterodera glycines*) Type 5.7, and HG Type 2.5.7, respectively.

<sup>b</sup>Stem Canker

**Table 2.** General summary of performance (continued), preliminary Test, V-Early 2017 Results.

Strain	Seed Quality	Seed Size	% Protein <sup>a</sup>	% Oil	FL Color	Pubescence Color	Pod Color
Ellis	1.7	13	35	18.4	W	G	T
JTN-5203	1.9	13	35	19.1	W	G	T
AG 5335	1.9	16	35	19.5	W	G	T
GoSoy 54G16	1.6	14	33	19.4	W	G	T
DA0912-07F	1.7	14	36	18.6	P	G	T
DA0912-10F	1.8	15	35	18.7	P	G	T
DA1037-25F	2.1	15	35	18.5	P	G	T
DA1139-031F	1.7	12	35	19.2	P	T	T
K13-1830	1.8	13	35	18.7	P	G	T
K15-1788	1.7	14	37	18.5	S	G	T
K15-1800	1.7	13	37	18.4	W	G	T
K15-1809	1.8	14	37	18.4	S	G	T
K15-1853	1.8	13	35	18.5	W	G	T
K15-1854	2.0	13	35	18.0	W	G	T
K15-1855	1.7	13	35	18.1	W	G	T
LW13-2096	2.0	15	36	18.5	W	T	T
R13-10658	1.9	15	35	18.9	P	G	T
R14-356	1.8	13	35	19.0	W	G	T
R14-898	2.0	16	35	19.1	W	G	T
R14-2893RR	1.9	16	35	19.2	P	T	T
R14-14797RR	1.9	16	36	18.6	P	T	T
S15-12298C	2.0	15	35	19.0	W	G	T
S15-13637C	2.2	15	35	19.5	W	T	Br
S15-16535C	2.1	16	34	20.7	W	T	Br
S15-16592C	2.1	15	35	19.7	W	G	Br
S15-16886C	1.8	12	35	19.4	W	G	T
S15-17108C	1.8	13	35	18.9	W	G	T
S15-17812C	2.0	14	35	19.3	W	G	T
TN13-4304	1.9	15	37	18.5	W	G	T
TN15-5012	1.7	12	37	18.3	W	G	T
TN16-510	1.8	12	35	18.4	W	G	T
TN16-630	1.8	12	35	18.6	W	G	T
TN16-5817RR1	1.8	13	34	19.8	W	G	T
TN16-5858R1	1.7	13	33	19.4	W	G	T
V12-3446	2.0	14	35	19.0	P	T	T
V12-4590	2.0	17	37	19.2	P	G	T
V13-3833	1.7	14	35	18.8	P	G	T
Mean	1.9	14	35	18.9			
LSD(0.05)	0.3	1	1	0.6			
CV(%)	17.5	6	3	3.3			

<sup>a</sup>Protein percentage and oil percentage are reported on a 13% moisture basis.

**Table 3.** K15-1855 head-to-head comparison with KS5518 in East Central and Southeast Kansas.

Table 3. K15-1855 heads-to-head comparison with KS5518 in East Central and Southeast Kansas.				
	Yield (bu/ac)	Maturity (mo/day)	Lodging (score)	Plant Height (inches)
No. of environments	14	13	12	14
<b>Combined results (2016-2019)</b>				
K15-1855	60 a†	10/23 a	1.1 b	29 b
KS5518	54 b	10/22 b	2.3 a	33 a
<b>By location</b>	<b>Years</b>	<b>K15-1855</b>	<b>KS5518</b>	
			<b>Seed Yield (bu/ac)</b>	
Erie	2017-2019	49 a	47 a	
McCune	2016, 2018	63 a	58 b	
Ottawa	2017-2019	65 a	56 b	
Parsons	2017-2019	56 a	53 a	
Pittsburg	2016-2018	65 a	60 b	

†Combined means within a column, or location means within a row followed by the same letter are not significantly different at the 0.05 level of probability.

**Table 4.** K15-1855 head-to-head comparison with KS4919N in East Central and Southeast Kansas.

Table 4. K15-1855 head-to-head comparison with KS4919N in East-Central and Southeast Kansas.					
		Yield (bu/ac)	Maturity (mo/day)	Lodging (score)	Plant Height (inches)
No. of environments		8	8	6	8
<b>Combined results (2016-2019)</b>					
K15-1855		60 a†	10/22 a	1.1 b	28 b
KS4919N		58 a	10/20 b	1.6 a	35 a
By location	Years	K15-1855	KS4919N		
		Seed Yield (bu/ac)			
Erie	2017-2019	55 a	57 a		
McCune	2016, 2018	63 a	64 a		
Ottawa	2017-2019	68 a	61 b		
Parsons	2017-2019	57 a	54 b		
Pittsburg	2016-2018	54 a	57 a		

†Combined means within a column, or location means within a row followed by the same letter are not significantly different at the 0.05 level of probability.

**Table 5.** K15-1855 head-to-head comparison with KS5004N in East Central and Southeast Kansas.

Table 2. K15-1855 heads to head comparison with KS5004N in East Central and Southeast Kansas.					
		Yield (bu/ac)	Maturity (mo/day)	Lodging (score)	Plant Height (inches)
No. of environments		13	12	11	13
<b>Combined results (2016-2019)</b>					
K15-1855		60 a†	10/22 a	1.2 b	30 b
KS5004N		52 b	10/18 b	1.6 a	33 a
By location	Years	K15-1855		KS5004N	
		Seed Yield (bu/ac)			
Erie	2017-2019	50 a		53 a	
McCune	2016, 2018	63 a		54 b	
Ottawa	2017-2019	67 a		54 b	
Parsons	2017-2019	55 a		48 b	
Pittsburg	2016-2018	64 a		56 b	

†Combined means within a column, or location means within a row followed by the same letter are not significantly different at the 0.05 level of probability.

**Table 6.** Yield as a percentage of test average from 2019 Soybean Variety Performance Tests

Strain	Emmet	Kiro dry	Topeka irrig.	Ottawa MG4	MG5	Columbus MG4	MG5	Erie MG4	MG5	Scandia irrig.	Assaria dry	Colby irrig.	Avg
K13-1830	-	-	-	-	100	-	101	-	99	-	-	-	100
K15-1283	95	112	107	98	-	-	-	-	-	101	94	-	101
K15-1809	-	-	-	-	109	-	104	-	111	-	-	-	108
K15-1855	-	-	-	-	101	-	102	-	99	-	-	-	101
K15-1874	-	-	-	-	97	-	100	-	96	-	-	-	98
K4117Nsgr	94	106	100	103	-	99	-	94	-	97	98	88	98
KS3618Ngr	-	-	-	-	-	-	-	-	-	91	95	-	93
KS4117Ns	101	104	104	103	-	97	-	101	-	101	103	102	102
KS4919N	-	-	-	-	94	-	97	-	98	-	-	-	96
KS5004N	-	-	-	-	88	-	89	-	94	-	-	-	90
KS5518	-	-	-	-	93	-	96	-	99	-	-	-	96

**Table 7.** 2018 and 2019 SCN reactions from Kansas Soybean Performance Tests

Entry	2019 SCN Female Index*			2018 SCN Female Index		
	Race 3 (HG Type 7)	Race 4 (HG Type 1.2.3.5.6.7)	Race 1 (HG Type 2.5.7)	Race 3 (HG Type 7)	Race 4 (HG Type 1.2.3.5.6.7)	Race 1 (HG Type 2.5.7)
K13-1830	36	38	32	39	75	55
K15-1283	88	54	43	-	-	-
K15-1809	11	46	43	38	100	84
K15-1855	20	21	51	25	45	42
K15-1874	2	55	23	0	69	12
K4117Nsg	18	57	53	-	-	-
KS3406RR	129	98	54	107	124	105
KS3618Ngr	13	22	34	12	43	45
KS4103sp	93	79	57	-	-	-
KS4117Ns	14	51	65	43	53	66
KS4607	201	98	99	-	-	-
KS4919N	13	8	48	64	23	37
KS5004N	5	57	42	3	128	56
KS5518	36	55	30	34	89	23
CV (%)	80.4	32.9	57.1	50.8	46.9	42
GRAND MEAN	24.6	43.3	55.2	28	59.2	57.6
LSD (0.10)	34.4	24.8	52	23.56	46.5	48.6
No. of Reps	3	3	3	3	3	3

\* SCN Female Index = Soybean Cyst Nematode female index, where the female index (FI) = (mean # of cysts on tested variety/mean # of cysts on susceptible checks) x 100. A low FI (<10) means that the SCN population was not able to reproduce well on the differential line, and a high FI means that the SCN population was able to reproduce well. Reproduction rates were measured on plants grown in the greenhouse.

Table 8. Roundup and STS tolerance results from KCIA.



# Seed Analysis Report

## Kansas Crop Improvement Association

2000 Kimball Avenue  
Manhattan, Kansas 66502  
Phone (785) 532-6118  
Fax (785) 532-6551

EWV

Sample Number  
K-20-0444

Report Date: 2/5/2020

Variety / Kind: K15-1855 Soybean  
Lot Number:

Seed Enhancements:

KSU AGRONOMY DEPT  
2200 KIMBALL AVENUE  
MANHATTAN, KS 66502

Test(s) Requested: Germination  
Roundup Tol.  
STS

Total Charge  
\$45.00

Purity Analysis		Germination Analysis		Other Tests	
Work Wt.	grams	%	Germ. %	Hard/Dorm. %	
Soybean	**	94	0	Moisture: 10.2 % Test Weight: 59.8 pounds / bushel Roundup Tolerance: 0 % Tolerance STS Tolerance: 98.9 % Tolerance	
Inert Matter		Test Date 1/24/2020			
Other Crop		** Purity and Noxious Tests not requested		Weight of Submitted Sample 1182 g.	
Weed Seed					
Other Crop Seeds	# / pound	Common Weed Seeds	# / pound	Noxious Weed Contaminants	
				Nox. Wt.	grams # / pound
Comments:					
Carbon Copy to:					

Tests were conducted according to Association of Official Seed Analysts rules where applicable. Unless otherwise stated, all other analysis were performed according to generally accepted practices. Kansas Crop Improvement Association (KCIA) warrants only that the analysis report is accurate for the sample as it was submitted to the laboratory. Unless otherwise stated, KCIA makes no claim as to the accuracy of the variety. KCIA makes no statement of fitness for any purpose of the seed represented by this analysis.

Eric Fabritzus, Seed Laboratory Manager

Raysell Colson, RST #70