KANSAS SOYBEAN COMMISSION FINAL REPORT OF PROGRESS

Principal Investigators: Schapaugh, W. - Agronomy
Todd, T. - Plant Pathology
Harold Trick – Plant Pathology

Title: "Breeding and Management of Soybean for Improved Performance"

Amount of Funding: $250,000

Department Heads: Gary Pierzynski, Marty Draper

Accomplishments for FY2017 (March 1, 2016 – February 28, 2017)

SCN Breeding and Management

SCN Screening Populations

Primary SCN screening populations included HG Types 7 and 1.2.3.5.6.7. Female indices on the HG Type 1.2.3.5.6.7 were >10% on all indicator lines except PI 437654 (line #4), and >20% on PI 88788 (line #2), the most common source of SCN resistance (Fig. 2). Female indices on the HG Type 7 population were <10% on all indicator lines except PI 548316 (line #7). A third screening population, HG Type 2.5.7, was added for FY 2017. This population produced female indices similar to those of HG Type 1.2.3.5.6.7 on PI 88788, but was more similar to the HG Type 7 population on indicator lines 1, 3, and 6 (Fig. 1).

Representative commercial cultivars are also included in all HG Type Tests. Commercial cultivars with resistance derived from standard resistance sources typically present lower levels of resistance than their source of resistance. KS4313N, for example, is only moderately resistant to our HG Type 7 population, while its resistance source PI 88788 is fully resistant (Fig. 2). This discrepancy increases as the level of resistance in PI 88788 decreases, with KS4313N exhibiting full susceptibility to HG Type 1.2.3.5.6.7, even though PI88788 displays moderate susceptibility to this population.

Figure 1. HG Type designations for primary SCN screening populations, FY 2016.

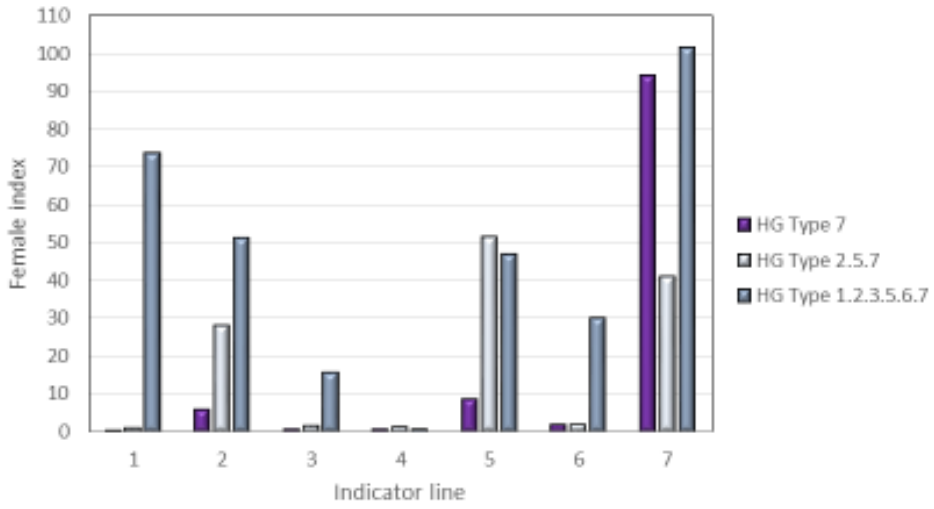
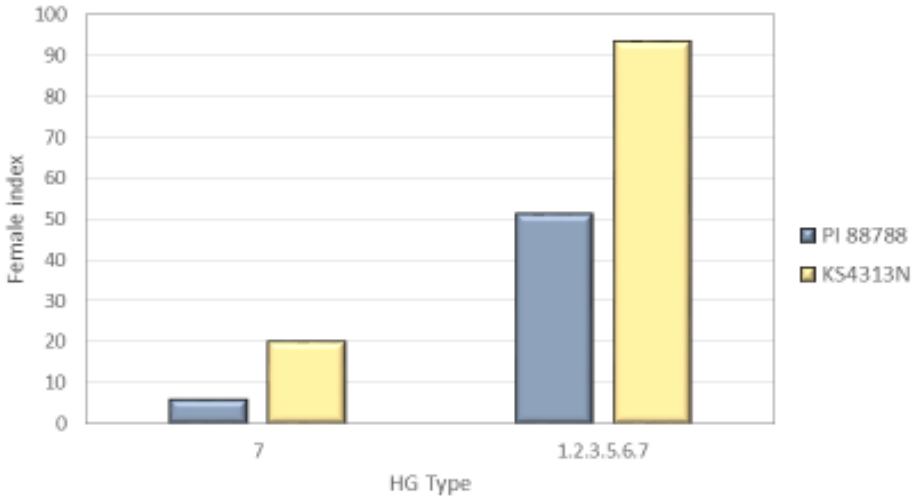


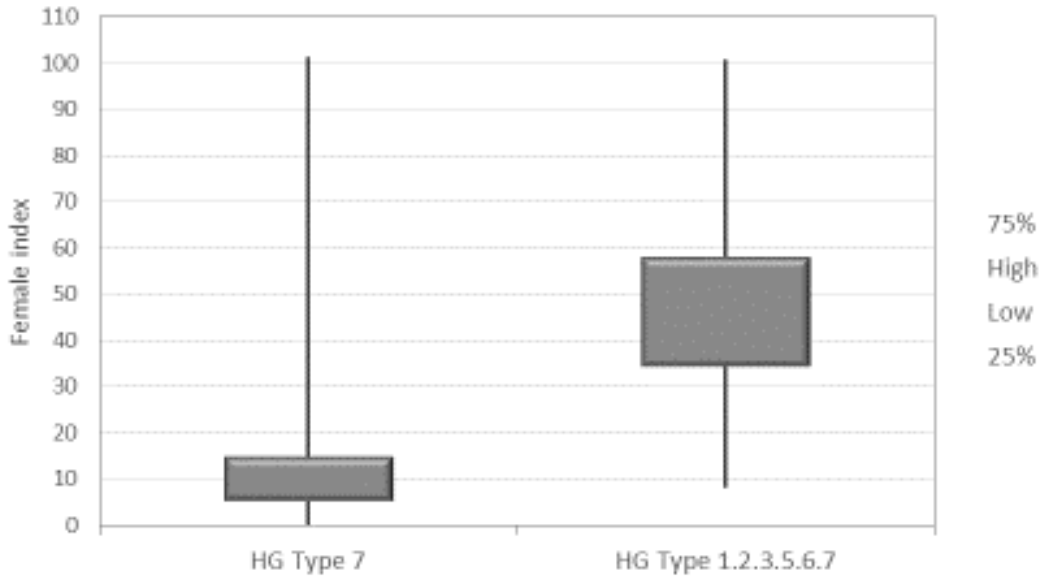
Figure 2. Female indices on KS4313N and its source of resistance PI 88788.



SCN Resistance Screening

Breeding lines: Soybean resistance to soybean cyst nematode (SCN) was evaluated in replicated screening trials for 156 breeding lines. Evaluations involved SCN populations HG Type 7, with a PI 88788 female index (FI) of 5.9 and HG Type 1.2.3.5.6.7, with a PI 88788 FI of 51.2. Approximately 50% of breeding lines exhibited a high level of resistance (FI < 10) to the HG Type 7 population, while 42% were moderately resistant (10 ≤ FI < 30). In contrast, <1% and 16% of breeding lines were resistant and moderately resistant, respectively, to the HG Type 1.2.3.5.6.7 population (Fig. 3).

Figure 3. Summary of FY 2017 SCN screening results for 156 Kansas soybean breeding lines.



Kansas Soybean Performance Test: Soybean resistance to soybean cyst nematode (SCN) was evaluated in replicated screening trials for 138 entries in the Kansas Soybean Variety Performance Test (KSVPT). Evaluations involved three SCN populations that varied in their virulence to the common resistance source PI 88788: HG Type 7, with a PI 88788 female index (FI) of 5.9; HG Type 2.5.7, with a PI 88788 FI of 28.0; and HG Type 1.2.3.5.6.7, with a PI 88788 FI of 51.2. Approximately 20% and 63% of KSVPT entries were resistant and moderately resistant, respectively, to the HG Type 7 population, while 3% and 16% of entries were resistant and moderately resistant, respectively, to the HG Type 2.5.7 population. Only 1% and 9% of entries were resistant and moderately resistant, respectively, to the HG Type 1.2.3.5.6.7 population. Mean FI across all entries was 28-31 points greater for the HG Type 2.5.7 and

1.2.3.5.6.7 populations compared to the HG Type 7 population. (Fig. 4). Kansas AES lines represented six of the ten most resistant KSVPT entries (Appendix I).

Figure 4a. Distribution of female indices for 138 FY 2017 Kansas Soybean Performance Test Entries.

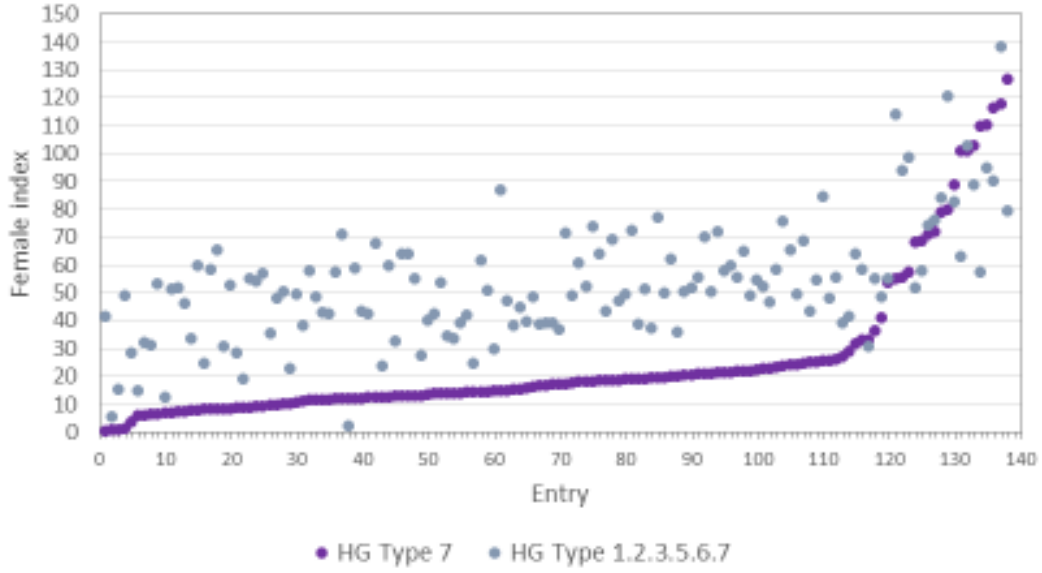
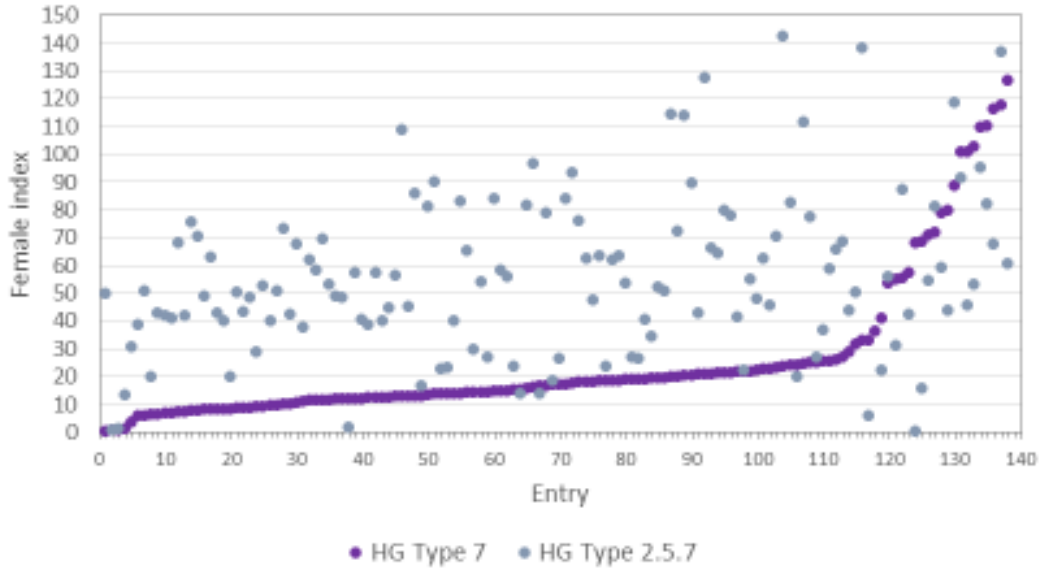


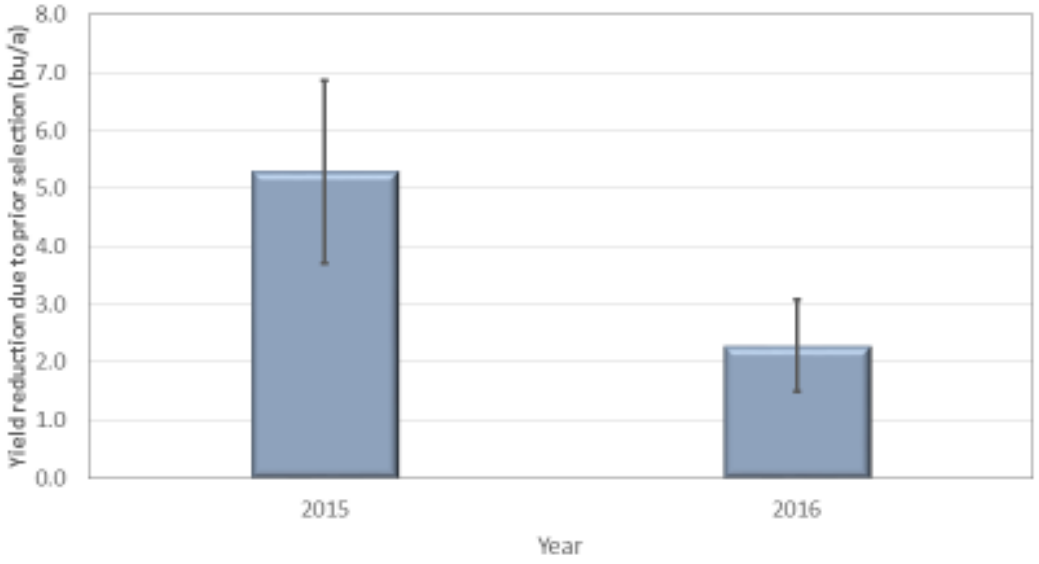
Figure 4b. Distribution of female indices for 138 FY 2017 Kansas Soybean Performance Test Entries.



Virulence Selection in SCN Field Populations

The effects of prior selection of a SCN field population on PI 88788-derived soybean cultivars on the current years SCN reproduction and damage potential on a PI 88788-derived soybean cultivar was determined in a long-term experiment. Legacy effects were observed for soybean yield in each of the past two years. Soybean yields were 5.3 and 2.3 bushels/a lower in 2015 and 2016, respectively, for plots previously planted to PI 88788-derived soybean cultivars compared to plots that were never planted to PI 88788-derived soybean cultivars (Fig. 5).

Figure 5. Effect of prior selection on yield of a PI 88788-derived soybean cultivar.



Incorporation of Transgenic Soybean Lines into Elite Cultivars

We have developed several lines with enhanced SCN resistance that have good for potential crossing into adapted cultivars. These events are expressing small RNAs targeting the down regulation of the SCN genes identified as Y25 and Prp17. The Y25 E12P3 and Y25 E13 transgenic lines are in the background, Jack and are homozygous at the T3 generation. The expression of RNAi constructs of these two plants were relatively high confirmed by RT-qPCR and the SCN bioassays have consistently demonstrated between a **50-60% SCN cyst reduction** (Figure 7). The transgenic lines Prp17 01-03 P6 and Prp17 01-03 P8 (T3 seeds) were also shown significant SCN reduction (~50-60% in cyst reduction and between 50-70% egg reduction) in the SCN bioassays Figure 8). We have identified two lines from the KSU breeding program to be used as recipients of these traits. K11-2363 is a moderately SCN resistant variety whereas K12-2333 is susceptible to SCN. Putting these traits into these two varieties we will be able to determine how these traits respond in field conditions and determine if there is a synergistic effect between conventional and the GM sources of SCN resistance. Currently we in the process of developing the crosses.

Figure 7. Y25: different transgenic lines showed significant resistance to SCN

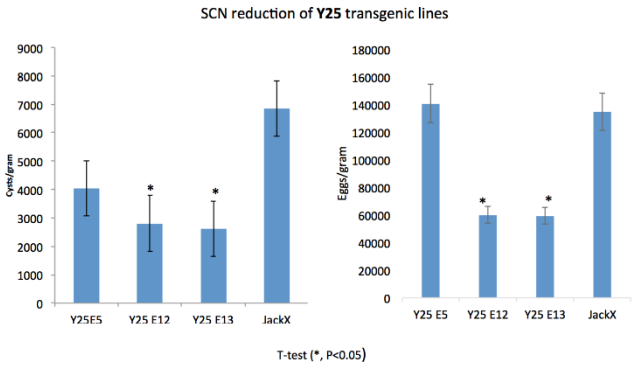
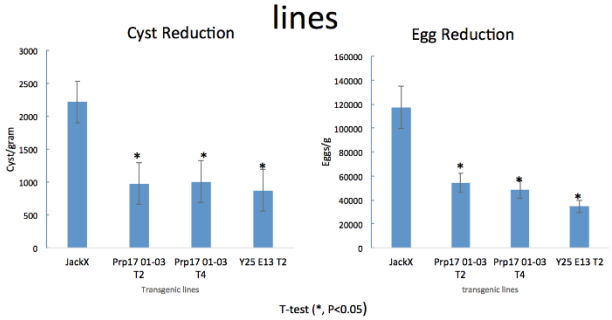


Figure 8. Recent SCN bioassay with different generations of transgenic lines



Host induced RNAi transgenic soybean had consistent and stable resistance to SCN during different generations.

Variety Development/Genetics

Development of new populations

- A total of about 60 new populations were created in 2016 using over 35 different parents (Appendices II and III).
- Fourteen, single cross populations involved **drought resistant** parents.
- About half of the single cross populations involved parents tolerant to **STS** herbicides.
- About 85% of the single cross populations involved at least one parent resistant to **SCN**.
- About 30% of the 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 soybean varieties. The goal of using these parents is to increase the **genetic diversity** of US germplasm to increase, or at least, maintain genetic gain.
- Five populations involved **high oleic** parents.
- Several populations involved converting a conventional line to a line possessing the **glyphosate resistance**.
- Ten populations involved parents with higher **protein**.

Yield trials

- We completed evaluations of nearly **5000 genotypes** in over 16,000 plots in Kansas (APPENDIX IV).
- Over 1000 K-lines were evaluated in our preliminary trials.
- Over 150 K-lines were evaluated in our KS advanced yield trials.
- Over 300 (including 39 K-lines) breeding lines from programs across the country were evaluated in our KS Uniform Tests and Uniform Preliminary yield trials.
- Over 2500 genotypes, (experimental breeding lines and **plant introductions**) were evaluated in our drought, remote sensing, and diversity yield trials.

Seed Increases

- All K-lines entered into the 2016 Uniform Preliminary, Uniform Tests or final testing in KS were place in seed increase blocks (APPENDIX V). Of the 40 experimental varieties under increase, 13 will be advanced for more testing and increase, one will be advanced to a large-scale increase, with the intent to release in 2018, and one entry has been released.

Outcomes of Research on Drought, Remote Sensing and Variety Development

- **Canopy reflectance represents high-throughput opportunity for phenotyping 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 on 2016 was obtaining remote sensing data on SDS screening trials, and on germplasm and varieties evaluated for drought stress.

Significant gains were made in 2016 using drones to capture the spectral data. We continue to may progress towards developing platforms necessary to utilize this technology on a large scale.

- **Evaluations of plant introductions offers opportunities to identify new genetic variability for response to drought and heat stress and improved yield potential.** We conducted evaluations on over 2500 maturity groups 3 through 10 plant introductions along with checks, in KS in 2016. Data collected on the plots included traits such as: maturity, lodging, height, seed yield, shattering, 100 seed weight, seed quality, and wilting scores. Many PI's possess good agronomic traits, compared to the commercial checks. Environmental conditions favored wilting scores and over 14,000 wilting ratings were collected. Data is being combined with data from the Univ. of MO, Univ. of AR, Univ. of GA, NC-State and Clemson for additional analysis and selection of genotypes for further study.

- **Commercial wilting trials.** Forty maturity group 4 and 50 maturity group 5 soybean genotypes, consisting of commercial varieties and checks, were evaluated for wilting in replicated trials at two KS locations (Hays and Salina). These evaluations included several of the new Round Ready Xtend soybean varieties. Between two to four wilting scores were taken on each plot during late vegetative and early reproductive growth. In addition to the wilting ratings, seed yield, maturity, lodging and plant height were collected on all plots. The plants experienced moderate drought and heat stress during late vegetative and early reproductive growth. The varieties differed in wilting scores at both locations. Cultivar wilting scores averaged from near 0 to 29 across rating time and location. A score of 0 indicated no wilting present and a score of 25 indicated moderate wilting and rolling of leaves in the top of the canopy. Wilting scores of the slow-wilting checks ranged from 0 to 5, while wilting scores of the fast-wilting checks averaged from 20 to 25. The most severe rating of a cultivar on any day was 45, indicating severe leaf rolling at the top of the canopy and moderate wilting of the leaves throughout the canopy. Most of the commercial soybean varieties possessed wilting ratings similar to, or more severe, than the fast wilting checks, which possessed average wilting scores around 20. However, one commercial group 4 variety, and 2 commercial group 5 varieties possessed wilting scores similar to the slow wilting checks. Out of these 3 commercial varieties which exhibited slow-wilting characteristics in KS, the yield of the group 4 variety, and one of the group 5 varieties were similar in seed yield to the highest yielding entries across the two locations. These Commercial Wilting Trials were evaluated in Arkansas, South Carolina and North Carolina. Data from the KS trials will be combined with the other locations to develop a robust assessment of the wilting and drought resistant characteristics of currently available soybean varieties and help guide our breeding activities.

- **Release of K11-2363.** The Kansas Agricultural Experiment Station approved the release of K11-2363. The release announcement is below, with complete information about the variety presented in Appendix VI.

Kansas Agricultural Experiment Station
Kansas State University
Manhattan, KS 66506

Notice of Release of KS4117Ns Conventional (non-GMO) Soybean

The Kansas Agricultural Experiment Station announces the release of 'KS4117Ns' soybean [Glycine max (L.) Merr. Scientists contributing to this release are William Schapaugh, Professor, Department of Agronomy and Timothy Todd, Instructor, Department of Plant Pathology.

KS4117Ns is an F3 single plant selection from the cross 435.TCS X LD05-30578a. KS4117Ns has purple flowers, tawny pubescence, brown pods at maturity (with up to 0.5% tan pods), indeterminate growth habit, and seeds with black hila. KS4117Ns is an early group IV maturity variety and is well adapted to a wide range of soil types and climates throughout the central soybean belt.

KS4117s was tested as experimental line, K11-2363, throughout Kansas and the United States in the Soybean Cyst Nematode (SCN) Regional tests, the K-State Breeding program and the Kansas Soybean Variety Performance Tests from 2013 through 2016. Seed yield of KS4117Ns has equaled or exceeded the highest yielding checks in the SCN Uniform 4 trials. In Kansas breeding plots and the Soybean Variety Performance Test trials, KS4117Ns has performed well, yielding about 3 to 6 bu/a greater than KS4313N. KS4117Ns is resistant to Soybean Cyst Nematode HG Type 0, moderately resistant to Soybean Sudden Death Syndrome and possesses 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).

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) .

Opportunities for Training and Professional Development

- Two graduate students worked on projects related to the objectives of this project. One graduate student will complete his degree in 2017 and transfer to the University of Georgia to work on a Ph.D. degree.

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 cliental 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 2016

Journal articles

- Keep, N.R., **W.T. Schapaugh, Jr.,** P.V.V. Prasad, and J.E. Boyer, Jr. 2016. Changes in physiological traits in soybean with breeding advancements. Crop Sci. 56: 1: 122-131.
- Christenson, B., **W.T. Schapaugh**, N. An, K. Price, and Allan Fritz. 2016. Predicting soybean relative maturity and seed yield using canopy reflectance. Crop Sci. 56: 2: 625-643.
- Sadal Hwang. C. Andy King. Pengyin Chen. Jeffery D. Ray. Perry B. Cregan, Thomas E. Carter Jr., Zenglu Li. Hussein Abdel-Haleem. Kevin W. Matson, **William Schapaugh Jr.**, and Larry C. Purcell. 2016. Meta-analysis to refine map position and reduce confidence intervals for delayed-canopy-wilting QTLs in soybean. Mol Breeding DOI 10.1007/s11032-016-0516-5.

Conference papers and presentations

- Ethan Menke, **William T. Schapaugh Jr**. 2016. Evaluating Soybean Genotypes for SDS Resistance Using Canopy Spectral Reflectance. ASA Abstr.
- Avjinder Singh Kaler, Larry C. Purcell, and **William T. Schapaugh Jr**. 2016. Mapping of Canopy Coverage in Soybean. ASA Abstr.

- Avjinder Singh Kaler, Larry C. Purcell, and **William T. Schapaugh Jr**. 2016. Canopy Wilting in Diverse Soybean Genotypes. ASA Abstr.

Acknowledgment

The researchers 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 improves soybean production.

Appendix I. Kansas Soybean Variety Performance Test FY 2017 SCN ratings.

		Female index		
SOURCE	**ENTRY**	**HG Type 7**	**HG Type 1.2.3.5.6.7**	**HG Type 3.5.7**
PUBLIC	**LS09-1920**	**0.0**	**41.3**	**49.6**
KANSAS AES	**KS5502N**	**0.2**	**5.2**	**0.6**
KANSAS AES	**KS5507NRR**	**0.3**	**15.0**	**0.9**
KANSAS AES	**KS5004N**	**1.0**	**48.7**	**12.9**
KANSAS AES	**K13-1515**	**3.2**	**27.8**	**30.5**
KANSAS AES	**K4313NRRT**	**5.3**	**14.5**	**38.4**
PHILLIPS	**447 NR2XS**	**5.5**	**31.5**	**50.7**
MORSOY	**5050 RXT**	**6.1**	**31.0**	**19.8**
LG SEEDS	**C3321R2**	**6.2**	**53.0**	**42.7**
KANSAS AES	**KS4313N**	**6.6**	**12.0**	**41.5**
WILLCROSS	**WXE 3486NS**	**6.7**	**50.7**	**40.5**
PHILLIPS	**506 NR2XS**	**6.8**	**51.4**	**67.8**
MIDLAND	**4956NXS**	**7.0**	**45.6**	**41.5**
MORSOY	**4616 RXT**	**7.2**	**33.3**	**75.4**
MORSOY	**4486 RXT**	**7.6**	**59.3**	**70.1**
MORSOY	**48X22**	**7.7**	**24.1**	**48.5**
MORSOY	**41X04**	**7.9**	**58.0**	**62.8**
CHECK	**MG3.1**	**7.9**	**65.0**	**42.4**
CHECK	**MG4.5**	**8.0**	**30.5**	**39.8**
ASGROW	**AG5335**	**8.1**	**52.1**	**19.5**
MORSOY	**52X25**	**8.3**	**27.9**	**50.1**
PUBLIC	**LD06-7862**	**8.4**	**18.6**	**42.9**
GOLDEN HARVE	**S35-A5**	**8.4**	**54.9**	**48.2**
EMERGE GENET	**e4394**	**8.7**	**54.0**	**28.7**
MIDLAND	**3537NX**	**9.0**	**56.4**	**52.3**
WILLCROSS	**WXE 3456NS**	**9.2**	**35.1**	**39.6**
MIDLAND	**5286NRS2**	**9.3**	**47.5**	**50.7**
WILLCROSS	**WXE 3386N**	**9.6**	**50.0**	**73.1**
PHILLIPS	**499 NR2YS**	**9.9**	**22.5**	**42.0**
MIDLAND	**4247NXS**	**10.1**	**48.9**	**67.5**
WILLCROSS	**WXX 3426NS**	**10.7**	**38.0**	**37.5**
MIDLAND	**3884NR2**	**11.0**	**57.4**	**61.6**
MORSOY	**4706 RXT**	**11.1**	**48.2**	**57.9**
KANSAS AES	**K13-1615**	**11.1**	**42.6**	**69.2**
LG SEEDS	**C4615RX**	**11.2**	**41.8**	**53.0**
LG SEEDS	**C4322R2**	**11.6**	**56.9**	**48.8**
MIDLAND	**3983NR2**	**11.6**	**70.5**	**48.1**
FRONTIER	**51GT02**	**11.7**	**2.0**	**1.6**
GOLDEN HARVE	**S34-P7**	**11.8**	**58.5**	**56.8**

MORSOY	**4272 RXT**	**11.9**	**43.0**	**40.4**
WILLCROSS	**WXE 3396N**	**12.0**	**42.1**	**38.2**
MORSOY	**40X46**	**12.0**	**67.5**	**57.2**
KANSAS AES	**K12-1348**	**12.0**	**23.4**	**39.8**
MIDLAND	**3746NR2**	**12.2**	**59.5**	**44.5**
MORSOY	**LL 4775**	**12.6**	**32.4**	**56.3**
MIDLAND	**4677NXS**	**12.7**	**63.6**	**108.6**
MIDLAND	**4806NRS2**	**12.7**	**63.6**	**45.0**
MIDLAND	**3926NRS2**	**12.7**	**54.9**	**85.6**
BAYER	**CZ4540LL**	**12.8**	**27.3**	**16.5**
LG SEEDS	**C4867R2**	**13.1**	**39.6**	**81.0**
MIDLAND	**3657NR2**	**13.4**	**42.0**	**89.7**
LG SEEDS	**C3550RX**	**13.4**	**53.3**	**22.5**
MIDLAND	**3976NR2**	**13.5**	**34.0**	**23.1**
CHECK	**MG3.5**	**13.5**	**33.2**	**39.8**
FRONTIER	**3SR92**	**13.7**	**38.7**	**82.8**
PHILLIPS	**392 NR2YS**	**14.0**	**41.4**	**64.9**
MIDLAND	**3877NXS**	**14.0**	**24.1**	**29.3**
LG SEEDS	**C4221R2**	**14.1**	**61.4**	**53.9**
GOLDEN HARVE	**S28-N6**	**14.2**	**50.7**	**26.4**
PHILLIPS	**387 NR2X**	**14.4**	**29.5**	**83.7**
EMERGE GENET	**e4993s**	**14.4**	**86.4**	**57.9**
MORSOY	**4206 RXT**	**14.6**	**46.8**	**55.7**
EMERGE GENET	**e4892s**	**14.7**	**38.0**	**23.5**
CHECK	**MG4.9**	**15.0**	**44.4**	**13.4**
MORSOY	**4426 RXT**	**15.5**	**39.3**	**81.3**
MIDLAND	**4797NRS2**	**15.8**	**48.3**	**96.2**
ARKANSAS	**R07-6614RR**	**16.2**	**38.2**	**13.6**
MIDLAND	**4963NRS2**	**16.3**	**38.7**	**78.6**
MIDLAND	**3465NR2**	**16.7**	**38.6**	**18.2**
WILLCROSS	**WXX 3446NS**	**16.8**	**36.3**	**26.1**
MORSOY	**4656 RXT**	**17.0**	**70.9**	**83.7**
GOLDEN HARVE	**S39-T3**	**17.5**	**48.7**	**92.9**
EMERGE GENET	**e4194**	**17.6**	**60.5**	**75.8**
EMERGE GENET	**e4310s**	**17.8**	**51.6**	**61.9**
EMERGE GENET	**e4510s**	**17.8**	**73.2**	**47.4**
MIDLAND	**4263NRS2**	**18.0**	**63.7**	**63.3**
GOLDEN HARVE	**S36-Y6**	**18.1**	**42.8**	**23.1**
PHILLIPS	**469 NR2YS**	**18.2**	**68.8**	**61.6**
ASGROW	**4232**	**18.4**	**46.7**	**63.0**
MIDLAND	**4373NR2**	**18.5**	**49.0**	**53.4**
LG SEEDS	**C4145R2**	**18.7**	**71.9**	**26.7**
GOLDEN HARVE	**S38-W4**	**18.7**	**38.4**	**26.2**

LG SEEDS	**C3070R2**	**18.9**	**51.0**	**40.4**
MIDLAND	**4636NXS**	**18.9**	**36.8**	**34.2**
WILLCROSS	**WXE 3466NS**	**19.1**	**76.7**	**51.8**
MIDLAND	**3887NX**	**19.3**	**49.3**	**50.5**
EMERGE GENET	**e3865**	**19.4**	**61.8**	**113.9**
KANSAS AES	**K11-2363T**	**19.6**	**35.5**	**72.1**
KANSAS AES	**K11-2363B**	**20.0**	**49.8**	**113.6**
LG SEEDS	**C3989R2**	**20.3**	**51.4**	**89.2**
ARKANSAS	**UA 5213C**	**20.4**	**55.2**	**42.7**
EMERGE GENET	**e3692s**	**20.5**	**69.8**	**127.0**
MORSOY	**4535 RXT**	**20.7**	**49.8**	**65.7**
CHECK	**MG3.9**	**21.1**	**71.5**	**63.9**
PHILLIPS	**427 NR2XS**	**21.2**	**57.5**	**79.4**
CHECK	**MG5.0**	**21.2**	**59.6**	**77.8**
GOLDEN HARVE	**S30-C1**	**21.3**	**55.0**	**41.0**
LG SEEDS	**C3911RX**	**21.3**	**64.6**	**22.0**
EMERGE GENET	**e4765**	**21.5**	**48.6**	**54.8**
LG SEEDS	**C4845RX**	**22.0**	**54.0**	**47.8**
MIDLAND	**3633NR2**	**22.2**	**52.0**	**62.2**
WILLCROSS	**WXE 3496N**	**22.6**	**46.3**	**45.3**
WILLCROSS	**WXX 3376N**	**23.0**	**57.8**	**70.3**
LG SEEDS	**C3333RX**	**23.3**	**75.5**	**142.1**
WILLCROSS	**WXE 3546N**	**23.6**	**65.1**	**82.2**
ARKANSAS	**R09-430**	**24.0**	**49.2**	**19.4**
EMERGE GENET	**e4996**	**24.4**	**68.3**	**111.4**
CHECK	**MG4.2**	**24.7**	**43.2**	**76.9**
PHILLIPS	**411 NR2Y**	**24.7**	**54.4**	**26.7**
PHILLIPS	**433 NR2YS**	**25.2**	**84.0**	**36.4**
PHILLIPS	**375 NR2YS**	**25.3**	**47.8**	**58.4**
PHILLIPS	**456 NR2XS**	**25.5**	**55.0**	**65.3**
PUBLIC	**SPENCER**	**26.7**	**38.6**	**68.1**
MORSOY	**3932 RXT**	**28.3**	**40.9**	**43.2**
KANSAS AES	**K13-1830**	**31.4**	**63.7**	**49.8**
LG SEEDS	**C3466R2**	**32.6**	**58.1**	**138.1**
KANSAS AES	**K12-1355**	**32.7**	**30.5**	**5.4**
LG SEEDS	**C4780R2**	**35.7**	**54.8**	**184.4**
ARKANSAS	**UA 5612**	**40.5**	**48.0**	**21.8**
ASGROW	**AG3432**	**53.3**	**54.5**	**55.5**
KANSAS AES	**K12-1575**	**54.9**	**113.5**	**30.9**
KANSAS AES	**K12-2333**	**55.3**	**93.4**	**87.0**
PUBLIC	**RIPLEY**	**57.2**	**98.3**	**42.0**
PUBLIC	**MORGAN**	**67.9**	**51.5**	**.**
FRONTIER	**4SR82**	**68.4**	**57.4**	**15.2**

ARKANSAS	**UA 5414RR**	**70.4**	**74.0**	**54.3**
IOWA AES	**IA3023**	**71.5**	**75.8**	**80.8**
KANSAS AES	**KS3406RR**	**78.6**	**83.9**	**58.8**
IOWA AES	**IA4004**	**79.5**	**120.3**	**43.4**
ARKANSAS	**OSAGE**	**88.4**	**82.1**	**118.4**
PHILLIPS	**454 R2YSE**	**100.3**	**62.4**	**91.2**
ARKANSAS	**UA 5814HP**	**100.7**	**102.6**	**45.3**
ARKANSAS	**UA 5102**	**102.4**	**88.4**	**52.7**
ARKANSAS	**R10-230**	**109.3**	**56.9**	**94.8**
ARKANSAS	**UAX 51010C**	**109.8**	**94.2**	**81.6**
ARKANSAS	**R11-89RY**	**115.8**	**90.0**	**67.4**
ARKANSAS	**R10-197RY**	**117.4**	**137.9**	**136.6**
ARKANSAS	**UA 5014C**	**126.5**	**79.0**	**60.4**

APPENDIX II. Parents used in 2016 crossing block.			
NAME	MG	TRAITS	PEDIGREE
K16-1 BC1F1 RR1	5	Yield, GR	K12-1355/K15-75 (K12-1355 / K4313NRRB)
K16-4 BC1F1 RR1	5	Yield, GR	K12-1348/K15-74 (K12-1348 / K4313NRRB)
K16-6 BC1F1 RR1	4	Yield, GR	K11-2363B/K15-1 (K11-2363B / K4313NRRB)
K16-5 RR1	5	Yield, SCN, GR	K13-1830/KS3406RR
K15-15	4	Yield, STS, SCN	LD00-3309 / K11-2363T
K15-45	5	Diversity, Yield	LG11-6208 / R10-2346
K15-63	4	Yield	K12-1575 / U11-614093
K15-70	4	Yield, SCN, SDS	K12-2333 / LD07-3395bf
HM11-W192	3	Protein, Yield	OHS305/OHS303
K11-2363B	4	SCN, STS, Yield	435.TCS / LD05-30578a
K12-1348	5	Yield	R04-357/JTN-5503
K12-1355	5	Yield, SCN	R04-357/JTN-5503
K13-1515	4	Yield	LG06-5920 / LD04-13265
K13-1830	5	Yield	DS-880/R04-357
K13-1845	4S	STS, SCN	NCC05-1261/435.TCS
K4313NRRT	4	YLD, SCN,GR	KS4313N_5/KS3406RR
KS4103sp	4	Protein, Yield	Flyer/BARC 6
KS5202sp	5	Protein, Yield	Hutcheson/BARC 9
LD00-2817P	4	SDS	
LD06-7762	4	SDS	
LG10-12313	2	Diversity	F3 Dwight (5) x PI 441001 (Tomentella)
LG11-2963	3	Diversity	F6 Dwight (4) x PI 441001 (Tomentella)
LG11-3370	4	Diversity	F6 Dwight (4) x PI 441001 (Tomentella)
LG11-5178	4	Protein, Yield	
LG11-5195	4	Protein, Yield	
LG11-6759	4	Yield, Diversity	LG00-3372/LD00-3309
LG11-6760	4	Yield, Diversity	LG00-3372 x LD00-3309
LG13-1006	3	Yield, Diversity, Protein	LG05-4229/LG04-5187
LG13-3925	4	Yield, Diversity, Protein	
LG13-4001	3	Yield, Diversity, Protein	LG04-5187/LG05-4092
LG13-7332	4	Protein	
N05-7432 (N8002)	7	Yield, Drought, Diversity	N7002 x N98-7265 (12.5% PI)
N10-7404	7	Yield, Drought, Diversity	N01-11136 x N98-7265 (25% PI471938)
R10-2436	5	Drought	R01-52F/R02-6232F
R10-2622	5	Drought	R01-888F/R05-5559
S12-2418	5	YIELD,STS, PRO, SCN	S07-5117/S08-18569
S13-16716	4S	High Oleic, GR	
S14-17636	5	High Oleic	

APPENDIX III. 2016 Populations created.			
POPULATION		PEDIGREE	PRIMARY FOCUS
K16-	1 BC1F1 RR1	K12-1355/K15-75	Glyphosate Resistance
K16-	2 RR1	K12-1355/K15-1	Glyphosate Resistance
K16-	3 RR1	K12-1348/K15-75	Glyphosate Resistance
K16-	4 BC1F1 RR1	K12-1348/K15-74	Glyphosate Resistance
K16-	5 RR1	K13-1830/KS3406RR	Glyphosate Resistance
K16-	6 BC1F1 RR1	K11-2363B/K15-1	Glyphosate Resistance
K16-	7 BC2F1 RR1	K12-1355 / K16-1 BC1F1 RR1	Glyphosate Resistance
K16-	8 BC2F1 RR1	K12-1348 / K16-4 BC1F1 RR1	Glyphosate Resistance
K16-	9 BC2 F1 RR1	K11-2363B / K16-6 BC1F1 RR1	Glyphosate Resistance
K16-	10 BC1 F1 RR1	K13-1830 / K16-5 RR1	Glyphosate Resistance
K16-	11 RR1	K13-1845 / K16-1 BC1F1 RR1	Glyphosate Resistance
K16-	12	K15-63 / K15-15	Yield
K16-	13	K15-70 / K15-45	Yield
K16-	14	LG10-12313 / K15-15	Diversity
K16-	15	N05-7432 (N8002) / K15-45	Drought
K16-	16 RR1	S13-16716 / K13-1830	High Oleic
K16-	17 RR1	K11-2363B / S13-16716	High Oleic
K16-	18	K11-2363B / S14-17636	High Oleic
K16-	19	K12-1348 / S14-17636	High Oleic
K16-	20	K12-1355 / S14-17636	High Oleic
K16-	21	HM11-W192 / K11-2363B	Protein
K16-	22	LG11-5178 / K11-2363B	Protein
K16-	23	LG11-5195 / K11-2363B	Protein
K16-	24	LG13-4001 / K11-2363B	Protein
K16-	26	S12-2418 / K11-2363B	Protein
K16-	27	LG11-5178 / K12-1355	Protein
K16-	28	LG11-5195 / K13-1515	Protein
K16-	29	LG13-4001 / K13-1845	Protein
K16-	32	K11-2363B / R10-2436	Drought
K16-	33	K11-2363B / R10-2622	Drought
K16-	34	K12-1348 / N05-7432 (N8002)	Drought
K16-	35	K12-1348 / N10-7404	Drought
K16-	36	K12-1348 / R10-2622	Drought
K16-	37	K12-1355 / N05-7432 (N8002)	Drought
K16-	38	K12-1355 / N10-7404	Drought
K16-	39	K12-1355 / R10-2436	Drought
K16-	42	K13-1515 / R10-2622	Drought
K16-	43	K13-1830 / N05-7432 (N8002)	Drought
K16-	44	K13-1830 / N10-7404	Drought
K16-	45	K13-1830 / R10-2436	Drought
K16-	46	LG13-1006 / K11-2363B	Diversity
K16-	48	LG11-2963 / K11-2363B	Diversity
K16-	49	LG11-3370 / K11-2363B	Diversity
K16-	50	LG11-6760 / K11-2363B	Diversity

K16-	51	LG13-4001 / K12-1355	Diversity
K16-	52	S12-2418 / K12-1355	Diversity
K16-	53	LG10-12313 / K12-1355	Diversity
K16-	54	LG11-6759 / K12-1355	Diversity
K16-	55	LG11-6760 / K12-1355	Diversity
K16-	56	LG13-3925 / K12-1355	Diversity
K16-	57	LG13-1006 / K13-1845	Diversity
K16-	58	S12-2418 / K13-1845	Diversity
K16-	59	LG10-12313 / K13-1845	Diversity
K16-	60	LG11-2963 / K13-1845	Diversity
K16-	61	LG11-6759 / K13-1845	Diversity
K16-	62	LG13-3925 / K13-1845	Diversity
K16-	63	LD00-2817P / K11-2363B	Sudden Death
K16-	64	LD06-7762 / K11-2363B	Sudden Death
K16-	65	KS4103sp / K11-2363B	Protein
K16-	66	KS5202sp / K11-2363B	Protein
K16-	67	K13-1845 / N05-7432 (N8002)	Drought
K16-	68	K13-1845 / R10-2622	Drought

APPENDIX IV. 2016 Field Trials.													
			Entries	Plots/	Locations/Number of plots								
EXPT	TEST		Total	Test	MAN (1)	MAN(2)	Onaga	MAN(3)	OTT	MCC	PIT	SAL	TOP/HAY
Kansas Advanced Tests													
1601	KAE1, G3/4 + inc		50	200	200		200		200				
1602	KAE2, G3/4 + inc		40	160	160		160		160				
1605	KAE5, G5 + inc		40	160	160					160	160		
1606	KAE6, G5 + inc		40	160	160					160	160		
		Total entries	170										
Kansas Preliminary Tests													
1661	KPE-1		865	865	865								
1663	KPL-1		509	509	509								
		Total entries	1374										
Northern Uniform Tests													
1630	U3		25	75	75				75				
1631	P3A		30	60	60				60				
1632	P3B		30	60	60				60				
1640	U4		15	45	45		45		45				
1641	P4		30	90	90		90		90				
SCN Uniform Tests			10										
1634	U3SCN		25	30	30		30		30				
1635	P3SCN		10	50	50								
1643	U4SCN		20	30	30		30		30				
1644	P4SCN			40	40		40		40				
Southern Uniform Tests													
1646 RS	U4S		20	80						80	80		
1647 RS	P4S		40	80						80	80		
1650 RS	U5		30	120						120	120		
1651 RS	P5		50	100						100	100		
		Total entries	335										
MISC Tests													
16	SP1	ONAGA	37	148			148						
16	SP6E	MCCUNE 4'S	16	64						64			
16	SP6L	MCCUNE 5'S	18	72						72			
16	SP10	ASSARIA	32	128								128	
16	SP14	PIT, NOT DC	24	96							96		
16	SP16E	OTTAWA	21	84					84				
16	SP16L	OTTAWA	23	92					92				
16	SP19	SVPT SDS SCREEN	140	420		420							420
16	NAM10sds	SDS SCREEN	160	640		640							640
		Total entries	471										
Drought/Diversity Tests													
16 CR08-911	MO Drought	MagellanX PI567731	140	280		280						280	
16 CR13-248	MO Drought	S05-11482/PI 458515	289	578		578						578	
16 NCSRP-MG3	MO Drought	MG3 WGS Set	200	400		400						400	
16 NCSRP-MG4	MO Drought	MG4 WGS Set	254	508		508						508	
16 NCSRP-MG5	MO Drought	MG5 WGS Set	90	180		180						180	
16 COMWILT-4	Private evaluation	Carter	40	160								160	160
16 COMWILT-5	Private evaluation	Carter	46	184								184	184
16 TLCP 751	NC drought	MG 6 and 7, Wilting	45	180								180	
16 TLCP 752	NC drought	MG 6 and 7, Wilting	40	160								160	
16 TLCP 753	NC drought	MG 6 and 7, Wilting	45	180								180	
16 ARK	GWAS Arkansas		377	754								754	
16 DT-02 MG3-4	Georgia, MG 3-4		26	78								78	
16 DT-02 MG5-7	Georgia, MG 5-7		126	378								378	
16 DT-02 MG8-10	Georgia, MG 8-10		54	162								162	
16 DT-04	Georgia RIL		136	272								272	
		Total entries	1908										
Diversity													
16 KS3A-1	Germplasm sample	MG3 PI's	27	54	54								
16 KS3A-2	Germplasm sample	MG3 PI's	27	54	54								
16 KS3B-1	Germplasm sample	MG3 PI's	27	54	54								
16 KS3B-2	Germplasm sample	MG3 PI's	27	54	54								
16 KS3C-1	Germplasm sample	MG3 PI's	26	52	52								
16 KS3C-2	Germplasm sample	MG3 PI's	26	52	52								
16 KS3D-1	Germplasm sample	MG3 PI's	26	52	52								
16 KS3D-2	Germplasm sample	MG3 PI's	26	52	52								
16 KS4A-1	Germplasm sample	PG4 PI's	30	60	60								
16 KS4A-2	Germplasm sample	PG4 PI's	30	60	60								
16 KS4B-1	Germplasm sample	PG4 PI's	30	60	60								
16 KS4B-2	Germplasm sample	PG4 PI's	30	60	60								
16 KS4C-1	Germplasm sample	PG4 PI's	30	60	60								
16 KS4C-2	Germplasm sample	PG4 PI's	30	60	60								
16 KS4D-1	Germplasm sample	PG4 PI's	29	58	58								
16 KS4D-2	Germplasm sample	PG4 PI's	29	58	58								
16 KS4E-1	Germplasm sample	PG4 PI's	29	58	58								
16 KS4E-2	Germplasm sample	PG4 PI's	29	58	58								
16 KS4F-1	Germplasm sample	PG4 PI's	29	58	58								
16 KS4F-2	Germplasm sample	PG4 PI's	29	58	58								
16 KS4G-1	Germplasm sample	PG4 PI's	29	58	58								
16 KS4G-2	Germplasm sample	PG4 PI's	29	58	58								
16 TOM MG3	Diversity, Nelson		32	64	64								
16 TOM MG4	Diversity, Nelson		16	32	64								
		Total entries	672										
					MAN (1)	MAN(2)	Onaga	MAN(3)	OTT	MCC	PIT	SAL	OTHER
		Total # plots at each location			3910	3006	743	0	966	836	796	4582	1404
		Grand total # plots		16243									

APPENDIX V. 2016 Seed Increase.			
ENTRY		PEDIGREE	
	2016 Test*		2017 STATUS
NON-GMO CONVENTIONAL ENTRIES			
Breeder's Seed plots			
K13-1515	U4 SCN	LG06-5920 / LD04-13265	D, save 2 pounds for CB
K13-1615	U4 SCN	LS07-3125 / 435.TCS	Retest, Foundation production
K13-1830	P5	DS-880 / R04-357	U5, Foundation production
K14-1269	P4	LG06-5920 / 435.TCS	Retest, U
K14-1347	P4	NCC05-1261 / 435.TCS	D**
K14-1357	P4	NCC05-1261 / 435.TCS	D
K14-1358	P4	NCC05-1261 / 435.TCS	U4
K14-1387	P4	NCC05-1261 / LD00-3309	D
K14-1401	P4	LS07-3125 / 435.TCS	D
K14-1468	P4	F3:5 06JR205000 x LG07-6911	D
K14-1486	P4	F3:5 03JR309156 x LG07-2640	D
K14-1493	P4	F3:5 03JR309156 x LG07-2640	D
K14-1094	P4 SCN	K07-1633 / LD04-13265	U4
K14-1140	P4 SCN	LD04-13265 / K07-1633	D
K14-1141	P4 SCN	LD04-13265 / K07-1633	D
K14-1153	P4 SCN	LD04-13265 / K07-1633	U4
K14-1263	P4 SCN	LG06-5920 / 435.TCS	D
K14-1266	P4 SCN	LG06-5920 / 435.TCS	D
K14-1267	P4 SCN	LG06-5920 / 435.TCS	D
K14-1277	P4 SCN	LG06-5920 / 435.TCS	D
K14-1404	P4 SCN	LS07-3125 / 435.TCS	D
K14-1405	P4 SCN	LS07-3125 / 435.TCS	D
K14-1715	P4S	NCC05-1261 / 435.TCS	D
K14-1717	P4S	NCC05-1261 / 435.TCS	U4S
K14-1719	P4S	NCC05-1261 / 435.TCS	U4S
K14-1730	P4S	KS5004N / 435.TCS	D
K14-1736	P4S	KS5004N / 435.TCS	D
K14-1737	P4S	KS5004N / 435.TCS	D
K14-1657	P5	S05-11482 / KS5004N	D
K14-1661	P5	S05-11482 / KS5004N	D
K14-1686	P5	S05-11482 / DS-880	U5
K14-1694	P5	S05-11482 / DS-880	D
K14-1707	P5	S05-11482 / DS-880	D
K14-1726	P5	NCC05-1261 / 435.TCS	U5
K12-1348	SVPT	R04-357/JTN-5503	RETEST, Foundation production
KS5005sp	KA		KA
KS5007sp	KA		KA
Foundation Seed Production			
K11-2363B	SCN U4, SVPT	435.TCS / LD05-30578a	RELEASE
K12-1355	SVPT		LARGE INCREASE
K12-1575	SVPT	on of LG09-5256 (I need to get the	D
K12-2333	SVPT	LG04-5993 x LG04-5187	MED INCREASE
	GMO ENTRIES		
K4313NGRT	SVPT	KS4313N_5/KS3406RR	INCREASE
KS3406RR			INCREASE

* U, P, SVPT, KA = Uniform Tests, Preliminary Tests, Soybean Variety Performance Tests, Kansas Advance Tests, respectively. ** D = discard.

APPENDIX VI. Release of K11-2363.

KANSAS STATE UNIVERSITY | Research Foundation

February 28, 2017

To: Interested parties

From: Chris Brandt, President & CEO

Re: New Conventional (non-GMO) Soybean Variety for release

Recently, the K-State Plant Genetic Materials Release Committee approved the release of a new conventional soybean variety tested under the experimental designation of K11-2363 on February 20, 2017. K11-2363 is an F3 single plant selection from the cross 435.TCS X LD05-30578a. K11-2363 is an early ground IV maturity variety and is well adapted to a wide range of soil types and climates throughout the central soybean belt.

K11-2363 was under Foundation Seed increase in 2016 and approximately 2200 bushels of seed are available for spring planting or sale in 2017. K11-2363 has been named 'KS4117Ns'. Supporting information is attached.

Kansas State University Research Foundation ('KSURF') is now accepting licensing proposals from interested parties. Please note that the cost of K-State Foundation Seed is $35 per bushel (weight per bushel 60 lb) and standard royalty rates will apply. KSURF requests that you submit proposals as soon as practical. All proposals will be reviewed by KSURF as they are received and license agreements will be quickly negotiated and finalized.

These items will be heavily weighted during the proposal evaluation process:

- The awardee could demonstrate an ability to provide a needed solution for farmers or a particular geography with the variety.
- The awardee could demonstrate a significant capacity to get the variety on a large acreage; market the seed; or, return royalties.
- The awardee could demonstrate a significant ability to expand the market for a variety.
- The awardee would provide an improved strategic position for K-State.

KSURF reserves the rights to reject any and all license proposals.

Questions about the variety can be directed to William Schapaugh, soybean breeder, KSU (cell: 785-770-7906; email: wts@ksu.edu).

All submitted business plans will be held in strict confidence, and will be shared only with employees of Kansas State University and KSURF who participate in decisions regarding this invitation.

License Proposal Cover Sheet
for
Kansas State University Developed Soybean Variety

Company Name:

_____

Contact Person:

_____

Phone:

_____

Email:

_____

_

Proposed names: 1. _____ 2. _____ 3.

_____

Exclusivity requested? ___ YES ___ NO

Geographic area for which an exclusive license is requested:

_____

_____

_____

Attach your proposal to this cover sheet. It is recommended that you address these items:

- How you would provide an improved strategic position for K-State.
- How you would demonstrate a significant ability to expand the market for a variety.
- How you would demonstrate a significant capacity to get the variety on a large acreage; market the seed; or, return royalties.
- How you would demonstrate an ability to provide a needed solution for farmers or a particular geography with the variety.

Proposals must be received by the KSURF office no later than 5:00 pm March 31, 2017.
Submit proposals to:
Kansas State University Research Foundation
2005 Research Park Circle, Ste 105
Manhattan, KS 66502

Or email tech.transfer@ksu.edu

K11-2363 Conventional (non-GMO) Soybean Variety

K11-2363 is an F3 single plant selection from the cross 435.TCS X LD05-30578a. K11-2363 has purple flowers, tawny pubescence, brown pods at maturity (with up to 0.5% tan pods), indeterminate growth habit, and seeds with black hila. K11-2363 is an early group IV maturity variety and is well adapted to a wide range of soil types and climates throughout the central soybean belt.

K11-2363 was tested throughout Kansas and the United States in the Soybean Cyst Nematode (SCN) Regional tests from 2013 through 2016. (Tables 1 through 5). Seed yield of K11-2363 has equaled or exceeded the highest yielding checks in the SCN Uniform 4 trials. In Kansas breeding plots and the Soybean Variety Performance Test trials, K11-2363 has performed well, yielding about 3 to 6 bu/a greater than KS4313N (Tables 6-9). K11-2363 was rated Resistant (R) or Highly Resistant (HR) to Soybean Cyst Nematode HG Type 0, and Moderately Resistant (MR) to Not Resistant (NR) to HG Type 2.5.7 in the SCN Uniform Test evaluations (Table 10 a-d). In Soybean Sudden Death evaluations, K11-2363 exhibited more resistance (lower DX ratings) than the susceptible checks and in some environments, the DX rating of K11-2363 was not significantly different from the resistant check (Table 10 b-d). K11-2363 possesses tolerance to STS® herbicides and derives its tolerance to STS® from 435.TCS (Table 11). STS® is a registered trademark of E.I. DuPont Nemours & Co.

TABLE 1. 4-year summary (2013-2016) of K11-2363 with checks in SCN Uniform and Prelim 4.

					Seed			
Entry	Yield bu/a	Maturity date	Lodging score	Height inches	quality score	weight g/100	protein @13%	oil @13%
Locations	32	20	32	32	31	31	20	20
K11-2363	60.7a†	9/26b	1.4c	30c	2.1b	16.0a	33.8a	19.1b
LD00-2817P	58.6b	9/28a	2.1a	38a	2.4a	13.4c	33.2b	19.6a
LD06-7620	59.6ab	9/26b	1.7b	32b	2.3a	14.5b	34.2a	18.9b

Table 2. 2013 SCN Prelim 4 Summary, K11-2363 with checks (A total of 16 entries).

	Yield							Seed			
	Infested		Non-infested		Maturity	Lodging	Height	quality	weight	protein	oil
Entry	bu/a	rank	bu/a	rank	date	score	in.	score	g/100	@13%	@13%
Locations	4		4		6	8	8	8	8	5	5
LD06-7620	53.9	10	63.6	1	9/26	1.5	33	2.0	13.9	33.0	19.2
IA4005	47.6	16	54.2	15	9/23	1.2	31	2.0	13.6	33.7	19.1
LD00- 2817P	54.5	9	57.1	10	9/27	1.9	37	2.0	13.0	32.4	19.3
K11-2363	57.3	1	58.6	7	9/25	1.2	30	1.7	15.2	33.0	19.7

Table 3. 2014 SCN Uniform 4 Summary, K11-2363 with checks (A total of 25 entries).

	Yield									Seed			
	All		Infested		Non-infested		Maturity	Lodging	Height	quality	weight	protein	oil
Entry	bu/a	rank	bu/a	rank	bu/a	rank	date	score	in.	score	g/100	@13%	@13%
Locations			5		2		7	7	7	7	7	6	6
LD06-7620	52.7	11	50.0	13	59.8	10	9/27	1.7	29	2.5	14.9	34.7	18.1
IA4005	52.3	13	49.5	15	59.6	11	9/26	1.3	28	2.2	15.0	35.2	18.4
LD00- 2817P	53.2	10	51.4	8	57.6	14	9/29	2.0	34	2.6	14.0	33.6	18.9
K11-2363	57.5	1	55.5	1	61.7	9	9/28	1.2	27	2.3	16.8	34.3	17.4
Mean	50.9		48.6		56.6		9/27	1.9	31.8				
LSD(.05)	4.2		5.1		5.2		1.6	0.4	1.5				
C.V. %	13.6		14.5		8.0		9.6	34.3	8.0				

Table 4. 2015 SCN Uniform 4 Summary, K11-2363 with checks (A total of 15 entries).

	Yield									Seed			
	All		Infested		Non-infested		Maturity	Lodging	Height	quality	weight	protein	oil
Entry	bu/a	rank	bu/a	rank	bu/a	rank	date	score	in.	score	g/100	@13%	@13%
Locations	9		5		4		8	9	9	8	8	4	4
LD06-7620	55.7	6	55.5	3	56.4	12	9/23	1.5	29	2.5	13.9	34.0	19.5
LD07-3395bf	53.8	13	52.3	9	56.0	13	9/23	1.6	29	2.5	14.6	33.0	20.6
LD00-2817P	56.2	5	54.3	6	59.0	6	9/26	2.0	34	2.5	12.8	33.0	20.3
K11-2363	56.2	4	52.3	9	61.6	2	9/26	1.7	28	2.2	15.5	34.0	19.7
Mean	55.2		53.1		58.3		9/25	1.9	32.5	2.4	13.9	34.3	19.8
LSD(.05)	3.4		5.2		4.1		1.7	0.2	1.4				
C.V. %	11.6		13.5		8.7		12.0	20.3	7.8				
Replications	25		13		12		22	25	25				

Table 5. 2016 SCN Uniform 4 Summary.

	Yield									Seed			
	All		Infested		Non-infested		Maturity	Lodging	Height	quality	weight	protein	oil
Entry	bu/a	rank	bu/a	rank	bu/a	rank	date	score	in.	score	g/100	@13%	@13%
Locations	10		7		3		10	10	10	9	9	5	5
LD06-7620	63.9	3	61.2	3	69.7	3	9/27	2.2	37	2.2	15.0	35.1	19.3
LD07-3395bf	66.3	1	64.2	1	70.8	2	9/26	2.3	34	2.7	15.5	32.6	20.6
LD00-2817P	62.7	5	61.1	4	66.2	6	9/29	2.5	43	2.6	13.6	33.2	20.3
K11-2363	64.4	2	62.4	2	68.9	4	9/27	1.4	34	2.2	16.3	34.4	20.4
K13-1515	59.2	7	57.1	8	63.7	7	10/1	3.5	42	2.5	15.0	33.3	20.9
K13-1615	62.6	6	60.2	5	67.9	5	9/27	2.0	39	2.1	14.8	34.5	20.6
LD12-8677	59.2	7	57.9	7	62.2	8	9/25	2.4	39	2.3	16.3	34.6	21.2
LD12-10534	63.8	4	60.2	5	72.1	1	9/27	2.1	37	2.2	14.7	33.2	20.3
Mean	62.8		60.5		67.7		9/28	2.3	38.1	2.4	15.2	33.9	20.4
LSD(.05)	2.7		3.6		3.6		1.0	0.2	1.2				
C.V. %	8.4		9.6		5.7		6.8	20.9	6.1				
Replications	28		19		9		28	28	28				

Table 6. Performance of K11-2363 with checks across 9 KS breeding locations (2014-2016).

Entry	Yield bu/a	Maturity date	Lodging score	Height inches	Seed weight g/100
Locations	9	8	8	8	7
K11-2363	53.0a	9/30a	1.0c	30c	16.1a
KS4313N	50.3b	9/27c	2.2a	38a	13.9c
LD00-2817P	50.6b	9/28a	1.8b	35a	13.7c
LD06-7620	52.7a	9/26b	1.5b	34b	14.1b
Average	52.3	9/29	1.7	37.3	14.9
C.V %	6.5	7.1	35.5	7.2	7.4

Table 7. Seed yield (bu/a) of K11-2363 with checks in KS breeding trials, by location.

Entry	2014 Manhattan	2014 Ottawa	2015 Manhattan	2015 Onaga	2015 North Farm
K11-2363	57.7a	33.9b	46.9ab	26.3a	52.5a
KS4313N	43.7c	34.5ab	51.4a	26.5a	51.0a
LD00-2817P	-	-	40.9b	-	-
LD06-7620	50.4b	36.7a	47.2ab	29.5a	56.4a
CV %	5.1	4.2	10.9	7.8	9.0

Entry	2015 Ottawa	2016 Manhattan	2016 Onaga	2016 Ottawa
K11-2363	49.8a	68.5a	69.3a	74.2a
KS4313N	43.4cd	68.2a	66.4bc	69.5b
LD00-2817P	46.2bc	67.7a	64.5c	74.3a
LD06-7620	41.1d	69.6a	68.8ab	75.7a
CV %	5.2	6.0	5.5	5.1

Table 8. Performance of K11-2363 in Soybean Variety Performance Tests (SVPTs) (2015-2016).

Entry	Yield bu/a	Maturity date	Lodging score	Height inches
Locations	6	4	5	4
K11-2363	56.9a	10/6d-f	1.0c	29j
Asgrow 4232	55.8ab	10/10a	1.2b	41a
e3692s	54.1a-c	10/5f	1.1bc	34f-h
e3865	55.3ab	10/3gh	1.2bc	34f-h
e4194	52.6b-e	10/6ef	1.2bc	35d-g
e4310s	54.5a-c	10/6d-f	1.0c	37c
e4394	49.6ef	10/7c-e	1.3b	37bc
e4510s	52.8b-e	10/9ab	1.3b	36cd
IA3023	51.3c-f	10/1i	1.1bc	31i
IA4004	51.5c-e	10/3gh	1.2b	34e-g
KS3406RR	50.9c-f	10/2hi	1.2bc	33gh
KS4313N	50.6d-f	10/4g	1.2b	35d-f
C.V. %	11.1	5.5	24.0	5.9

Table 9. Seed Yield (bu/a) of K11-2363 in KS SVPTs, by location.

Entry	2015 Parsons	2015 Ottawa	2015 Scandia	2016 Parsons	2016 Ottawa	2016 Scandia
K11-2363	58.8a	56.3ab	64.7a-c	37.6a-d	76.1a	52.3b-g
Asgrow 4232	60.6a	58.1a	53.6e	42.5a	71.1b-d	41.9j
e3692s	55.6ab	51.7ab	57.8c-e	35.7b-e	69.9c-e	54.2a-d
e3865	-	-	-	38.9ab	69.9c-e	53.4b-e
e4194	-	-	-	38.1a-c	65.6e-h	45.5h-j
e4310s	55.7ab	53.3ab	45.6f	38.5a-c	74.2a-c	59.3a
e4394	-	-	-	34.8b-e	62.7g-i	43.3ij
e4510s	-	-	-	34.5b-e	67.6d-f	44.1h-j
IA3023	45.8d	50.4b	69.0a	31.8d-f	65.2f-i	49.7c-h
IA4004	47.8cd	53.3ab	64.0a-d	33.3c-e	66.5e-g	48.2e-i
KS3406RR	-	-	-	31.0ef	60.7i	54.3a-c
KS4313N	48.2cd	55.0ab	57.8de	27.8f	65.7e-h	48.3e-i
C.V.%	8.0	10.4	8.1	12.6	5.8	8.5

† Numbers within a column, or within a location, followed by the same letter, not significantly different at the 0.1 level of probability.

Table 10. Results of disease screening in SCN Uniform Tests.

Table 10 a. 2013 SCN Preliminary 4.

	IL SCN screening			
	HG 0		HG 2.5.7	
Entry	FI	rating	FI	rating
1 LD06-7620	6	HR	52	LR
2 IA4005	63	NR	65	NR
3 LD00- 2817P	0	HR	4	HR
4 K11-1336	5	HR	50	LR
5 K11-1666	3	HR	59	LR
6 K11-1868	6	HR	61	NR
7 K11-2006	9	HR	63	NR
8 K11-2363	6	HR	63	NR
9 K11-2371	2	HR	68	NR

Table 10 b. 2014 SCN Uniform 4.

	IL SCN screening				SIU SDS	SIU SDS
	HG 0		HG 2.5.7		Shawneetown	Valmeyer
Entry	FI	rating	FI	rating	DX	DX
1 LD06-7620	8	HR	40	LR	7	2
2 IA4005	77	NR	83	NR	10	28
3 LD00- 2817P	0	HR	3	HR	1	1
4 AR13-331019	0	HR	2	HR	0	2
5 K11-1868	9	HR	34	MR	20	17
6 K11-2363	9	HR	37	MR	9	23

Table 10 c. 2015 SCN Uniform 4.

	IL SCN screening				SIU SDS	
	HG 0		HG 2.5.7		Valmeyer	
Entry	FI (Lee 74)	rating	FI (Lee 74)	rating	DX	
1 LD06-7620	14	R	23	R	12	
2 LD07-3395bf	1	HR	1	HR	6	
3 LD00-2817P	1	HR	1	HR	3	
4 AR13-331019	1	HR	2	HR	6	
5 K11-2363	11	R	27	MR	14	
6 K13-1385	5	HR	36	MR	6	
7 K13-1515	3	HR	12	R	25	
8 K13-1613	3	HR	33	MR	28	
9 K13-1615	20	R	40	LR	6	
10 K13-1636	13	R	26	MR	39	
11 K13-1643	14	R	25	MR	25	
12 K13-1644	14	R	56	LR	31	
13 LD12-2117	4	HR	16	R	22	
14 LD12-7900	17	R	21	R	17	
15 LD12-8677	4	HR	27	MR	9	
	** rep data too variable to rate				0	Ripley (res)
					56	Spencer(sus)
					16	LSD

Table 10 d. 2016 SCN Uniform 4.

	IL SCN screening				SIU SDS	SIU SDS	SIU FLS
	HG 0		HG 2.5.7		Shawneetown	Valmeyer	Shawneetown
Entry	FI	rating	FI	rating	DX	DX	severity
1 LD06-7620	17	R	62	NR	2.5	22.2	8.0
2 LD07-3395bf	1	HR	32	MR	0.1	0.0	8.0
3 LD00-2817P	1	HR	2	HR	11.1	0.0	7.5
4 K11-2363	20	R	62	NR	1.9	0.0	7.0
5 K13-1515	10	R	62	NR	8.3	22.2	6.5
6 K13-1615	20	R	93	NR	5.0	1.7	0.0
7 LD12-8677	6	HR	54	LR	0.1	.	8.0
8 LD12-10534	61	NR	52	LR	6.1	0.0	6.0
	** rep data too variable to rate			Spencer(sus)	50.0	1.7	8.0
				CM 497 (sus)	18.3	72.2	8.0
				Ripley (res)	0.0	0.0	1.0
				LSD	13.0	26.5	1.7

Table 11a. STS® tolerance test for K11-2363.

Seed Analysis Report

Kansas Crop Improvement Association

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

EV

Sample Number
K-16-0206

Report Date: 2/15/2016

Variety / Kind: K11-2363 B Soybean
Lot Number: 2015 Foundation

Seed Enhancements:

Test(s) Requested: Roundup Tol.
STS

Total Charge
$20.00

KSU AGRONOMY DEPT
3008 THROCKMORTON
MANHATTAN, KS 66506

Purity Analysis			Germination Analysis		Other Tests
Work Wt.	grams	%	Germ.%	Hard/Dorm. %	
		**	***		Roundup Tolerance: 0.25 % Tolerance STS Tolerance: 100 % Tolerance
Inert Matter			Test Date		
Other Crop			** Purity and Noxious Tests not requested *** Germination Test not requested		Weight of Submitted Sample 163 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 Fabrizius, Seed Laboratory Manager Rayshell Colson, RST #70 Pam Steinmeyer, RST #95

Table 11b. STS® tolerance test for K11-2363.

Seed Analysis Report

Kansas Crop Improvement Association

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

EV

Sample Number
K-17-0066

Report Date: 1/23/2017

Variety / Kind: KS 2363 Soybean
Lot Number:

Seed Enhancements:

Test(s) Requested: Germination
STS

Total Charge
$30.00

KSU AGRONOMY DEPT
2200 KIMBALL AVENUE
MANHATTAN, KS 66502

Purity Analysis			Germination Analysis		Other Tests
Work Wt.	grams	%	Germ.%	Hard/Dorm. %	Moisture: 8.4 %
Soybean		**	98	0	Test Weight: 56 pounds / bushel
					STS Tolerance: 100 % Tolerance
Inert Matter			Test Date	1/23/2017	
Other Crop			** Purity and Noxious Tests not requested		Weight of Submitted Sample 668 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 Fabrizius, Seed Laboratory Manager Rayshell Colson, RST #70 Pam Steinmeyer, RST #95