University of Nebraska Lincoln

Institute of Agriculture and Natural Resources
Department of Plant Pathology

2015 Evaluation of SCN Resistant Soybean Varieties in Nebraska

Loren J. Giesler, Extension Plant Pathologist
Nicholas Arneson, Extension Technologist
Kyle Broderick, Extension Technologist
John Wilson, Extension Educator – Burt County

Soybean cyst nematode (SCN) is the pest that causes the single largest loss to soybean producers in both Nebraska and the U.S. each year. Chemical treatment to the soil and/or soybean seed to control SCN has not achieved consistent economic success. Resistant varieties are the most effective way to maintain high yields in SCN-infested soybean fields. This report summarizes soybean variety testing from three SCN-infested locations in Nebraska. All of the soybean varieties in these tests were resistant to SCN with the exception of five susceptible "standards." The majority of varieties have the PI 88788 source of SCN resistance. However, additional varieties with Peking resistance were also included in the trials.

The three locations used for testing were all on producers' fields located throughout Nebraska. Sites near the towns of Columbus, Plattsmouth, and West Point were selected based on geographical location in the state and adequately high populations of SCN (Figure 1).

A non-infested control site was also planted near Mead at the Agricultural Research and Development Center (ARDC) to test SCN resistant soybean variety yields in the absence of SCN. All entries in the trial were replicated 4 times at each location. Each individual plot was 4 rows (10 feet) wide by 17 feet long. The spacing between rows was 30 in. Soil samples were collected from each plot in the spring shortly after soybean emergence. These samples were then processed in the lab to determine the number of SCN eggs per 100 cc's soil. These spring samples established the initial SCN count for each plot. Soil sampling was repeated in the fall following harvest to determine the final SCN population density. By comparing the final (fall) SCN population to the initial (spring) population a Reproduction Factor (Rf) was calculated. The Rf is calculated by dividing the final SCN count (plus minimum detectable level) by the initial SCN count (plus minimum detectable level).This number will indicate how much the population increased or decreased during the growing season. An Rf of 1.0 means there was no change in the SCN population. Any RF value above 1 indicates the population increased, and any value below 1 means it decreased. The graphs below, which report soybean yield (bu/A) and SCN reproduction (Rf), indicate SCN reproduction in terms of the Rf.

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Columbus

The Columbus site was located in a center pivot irrigated field with loamy sand soils. The soil pH was 6.2 (Table 1). Soil organic matter (OM) was 1.3 % (Table 1). Rainfall totaled 23.3 inches throughout the growing season. Columbus had the highest initial SCN population with an average of 3,912 eggs per 100 cc's soil (Table 1). Varieties with PI 88788 resistance were effective, allowing an average Rf of 0.61. Varieties with Peking resistance had an average Rf of 0.43. NK 26 P3 exhibited the best control with an RF of 0.24. The average Rf for susceptible varieties was 1.9. Yields were fair at this location with the highest being Asgrow 2935 with 88788 resistance which yielded 57.6 bu/A. The lowest yielding variety was LG C2605R2 an SCN susceptible variety which yielded 34.6 bu/A. The overall average yield for this location was 49.8 bu/A. The average of varieties with 88788 resistance was 50.4 bu/A, while the average yield with Peking resistance was 55.7 bu/A. The average susceptible yield was 42.3 bu/A. There was statistical variance exhibited between yields producing an LSD (P = 0.10) of 9.97.

Plattsmouth

The Plattsmouth site was located in a non-irrigated field with silt loam soils. The soil pH was 5.3 (Table 1). Soil organic matter (OM) was 4.0 % (Table 1). Rainfall totaled 29.2 inches throughout the growing season. Plattsmouth had the lowest initial SCN population with an average of 154 eggs/100 cc's soil (Table 1). Varieties with PI 88788 resistance were not very effective, allowing an average Rf of 1.65. Varieties with Peking resistance had an average Rf of 1.54. Nutech 7240 exhibited the best control with an RF of 0.5. The average Rf for susceptible varieties was 4.5. Yields were good with the highest being Channel 3008R2 with 88788 resistance which yielded 76.1 bu/A. The lowest yielding variety was NK 32L8 with 88788 resistance which yielded 60.4 bu/A. The overall average yield for this location was 67.0 bu/A. The average of varieties with 88788 resistance was 67.0 bu/A, while the average yield with Peking resistance was 65.3 bu/A. The average susceptible yield was 68.3 bu/A. There was statistical variance exhibited between yields producing an LSD (P = 0.10) of 7.1.

West Point

The West Point site was located in a center pivot irrigated field with sandy loam soils. The soil pH was 6.5 (Table 1). Soil organic matter (OM) was 2.1 % (Table 1). Rainfall totaled 20.3 inches. West Point had the intermediate initial SCN population with an average of 500 eggs per 100 cc's soil (Table 1). Varieties with PI 88788 resistance were not effective, allowing an average Rf of 2.20. Varieties with Peking resistance had an average Rf of 2.94. Mycogen 5N275R2 exhibited the best control with an RF of 0.34. The average Rf for susceptible varieties was 6.96. Yields were fair with the highest yield being Asgrow 2935 with 88788 resistance which yielded 64.4 bu/A. The lowest yielding variety was Producers 2408NR2 an SCN susceptible variety with 44.0 bu/A. The overall average yield for this location was 57.1 bu/A. The average of varieties with 88788 resistance was 58.4 bu/A, while the average yield with

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Peking resistance was 54.2 bu/A. The average susceptible yield was 50.9 bu/A. There was statistical variance exhibited between yields producing an LSD (P = 0.10) of 5.9.

Statistics

A statistical analysis was performed on the yield (bu/A) at each location. LSD's were calculated at the 90% confidence level. An LSD (Least Significant Difference) indicates how much difference there has to be between two entries before they are considered statistically different from each other and not due to natural variations in the test data. The 90% confidence level means there is a 90% probability the difference between two yields or reproductive factors is significant and only a 10% chance the difference was due to random variability. Lower confidence levels will result in smaller differences required for significance, while higher confidence levels will make the LSDs larger. The LSDs in the charts below are intended to help visualize differences between varieties.

Table 1: Miscellaneous trial information.

Location	Soil Texture	pH	OM[1] (%)	Average Spring SCN Population All Plots (eggs/100 cc's soil)	HG Type[2]	Planting Date	Harvest Date
Columbus	Loamy Sand	6.2	1.3	3,912	2.5.7	5/22/2015	10/20/2015
Plattsmouth	Silt Loam	5.3	4.0	154	2.5.7	6/08/2015	10/26/2015
West Point	Sandy Loam	6.5	2.1	500	7	5/18/2015	10/13/2015

[1]OM = Organic Matter (%)
[2] See explanation of HG Type in Table 2

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Table 2: HG Types and sources of resistance. (ie, if SCN is HG type 1 then it will reproduce on soybeans with Peking resistance, if SCN is HG type 1.2 then it will reproduce on soybeans with Peking or PI 88788 resistance. If a number is not listed in the HG type, that source of resistance held SCN reproduction to 10% or less of the reproduction that occurred on a standard susceptible variety.)

HG Type	Source of Resistance
1	PI 548402 (Peking)
2	PI 88788
3	PI 90763
4	PI 437654
5	PI 209332
6	PI 89772
7	PI 5484316 (Cloud)

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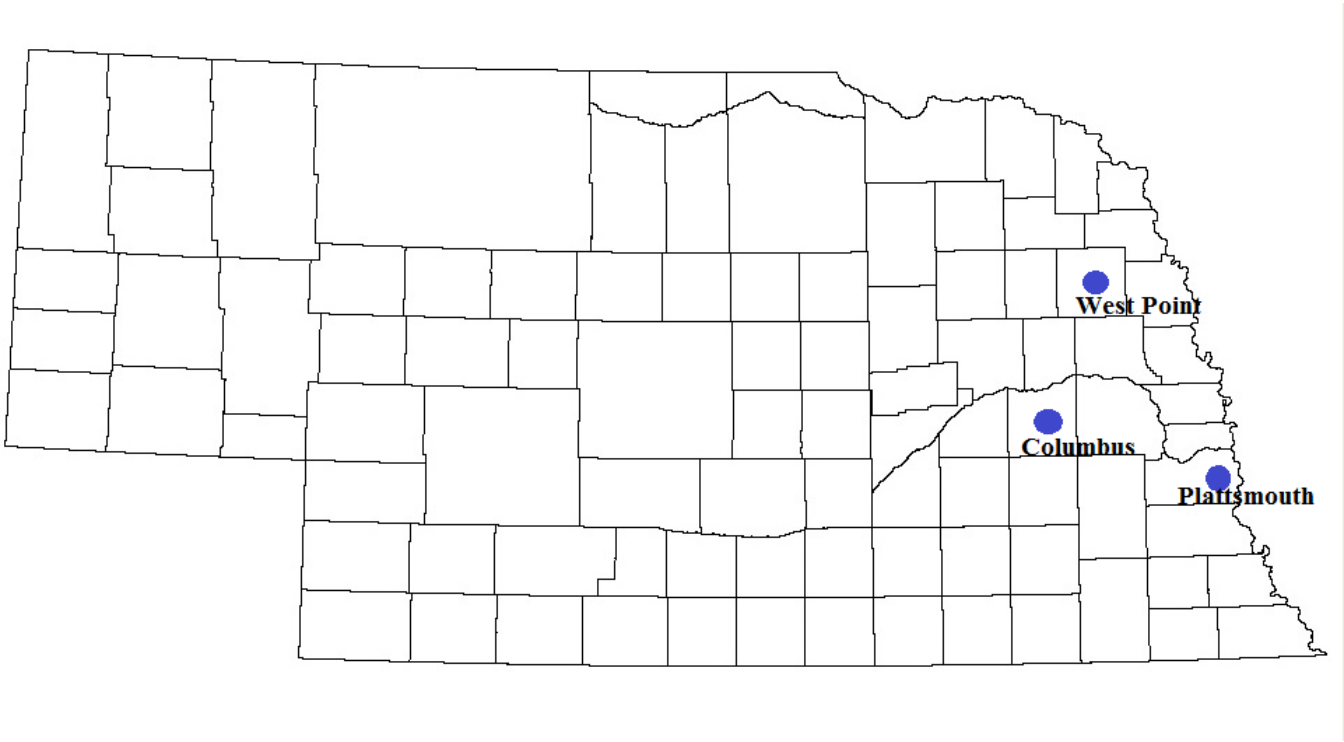
Figure 1. Locations of UNL SCN-resistant Soybean Variety Trial Program experiments in 2015.



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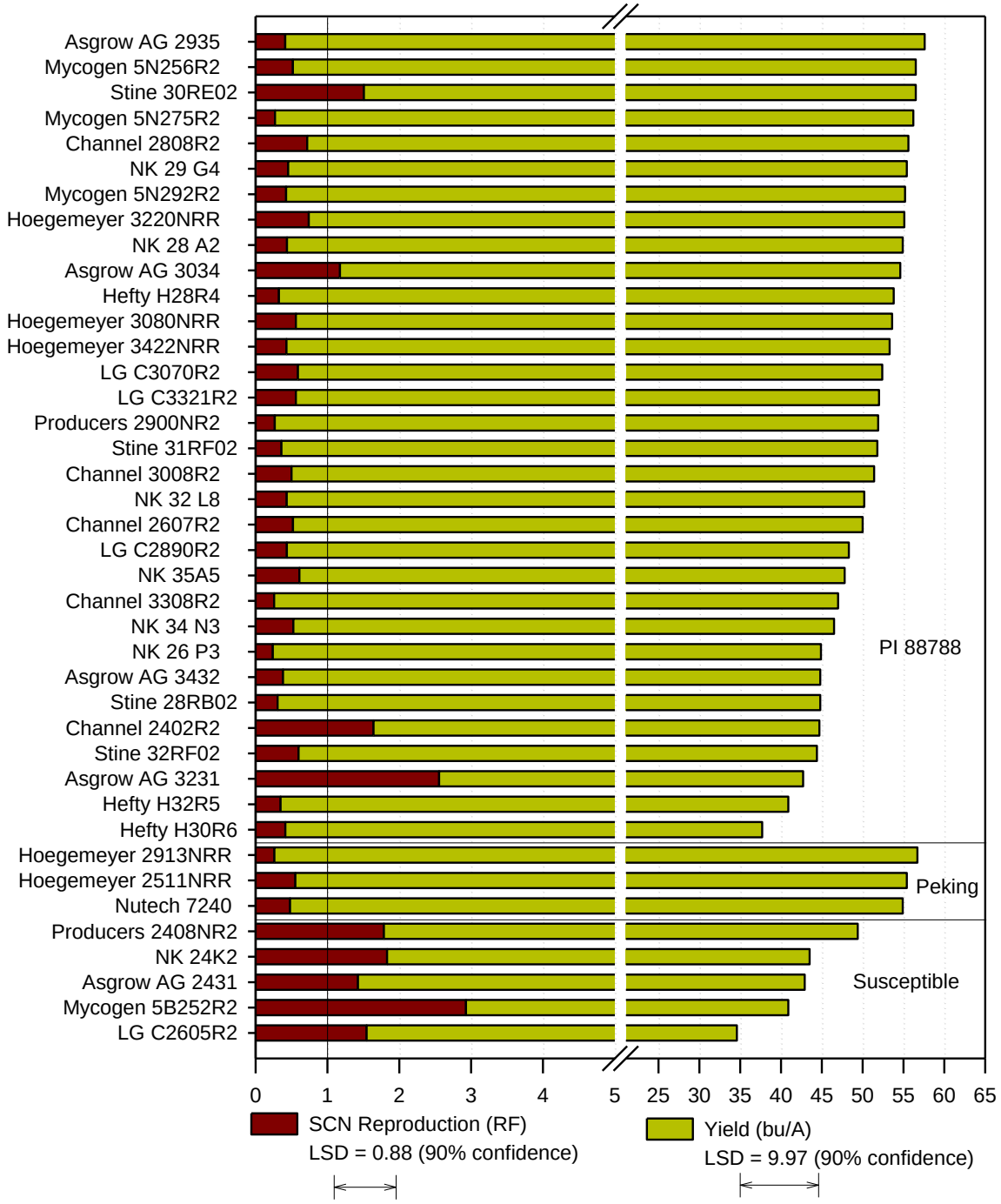
Columbus, NE SCN Plot Results



-Average initial SCN population density 3,912 eggs per 100 cc soil with HG Type 2.5.7.
-RF 1.0 = No change in SCN population density over growing season.

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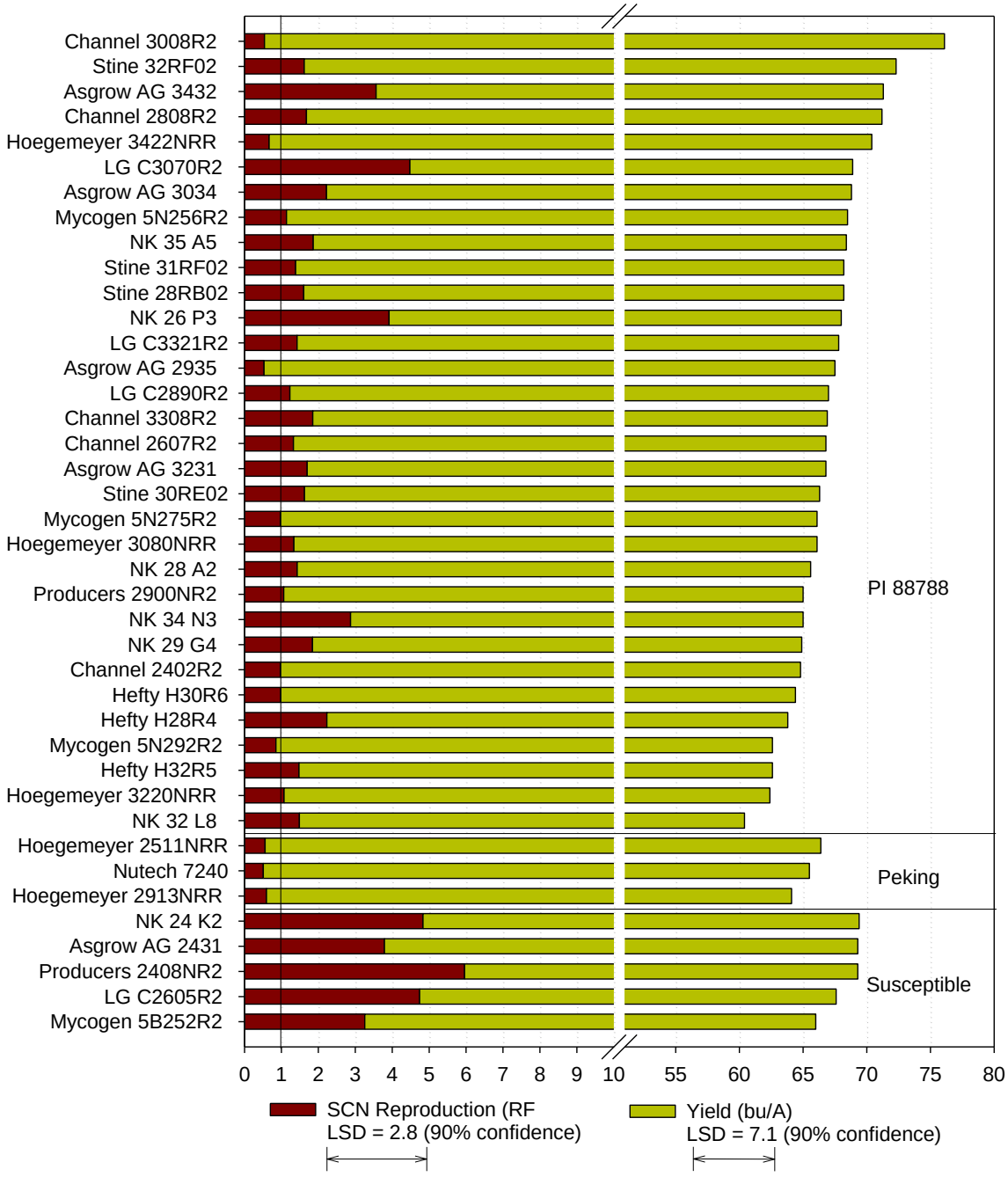
Plattsmouth, NE SCN Plot Results



-Average initial SCN population density 154 eggs per 100 cc soil with HG Type 2.5.7.
-RF 1.0 = No change in SCN population density over growing season.

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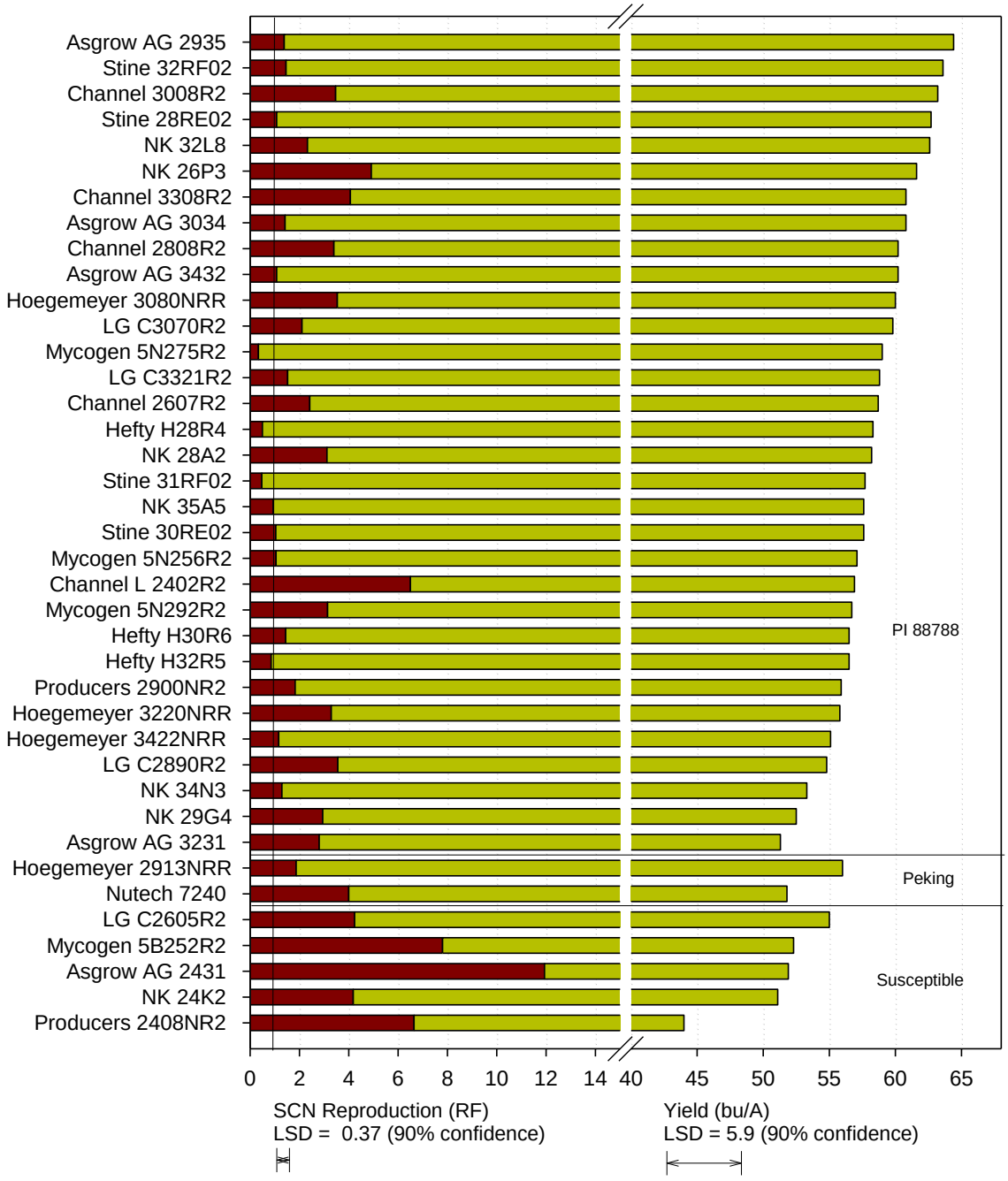
West Point, NE SCN Plot Results



-Average initial SCN population density 500 eggs per 100 cc soil with HG Type 7.
-RF 1.0 = No change in SCN population density over growing season.

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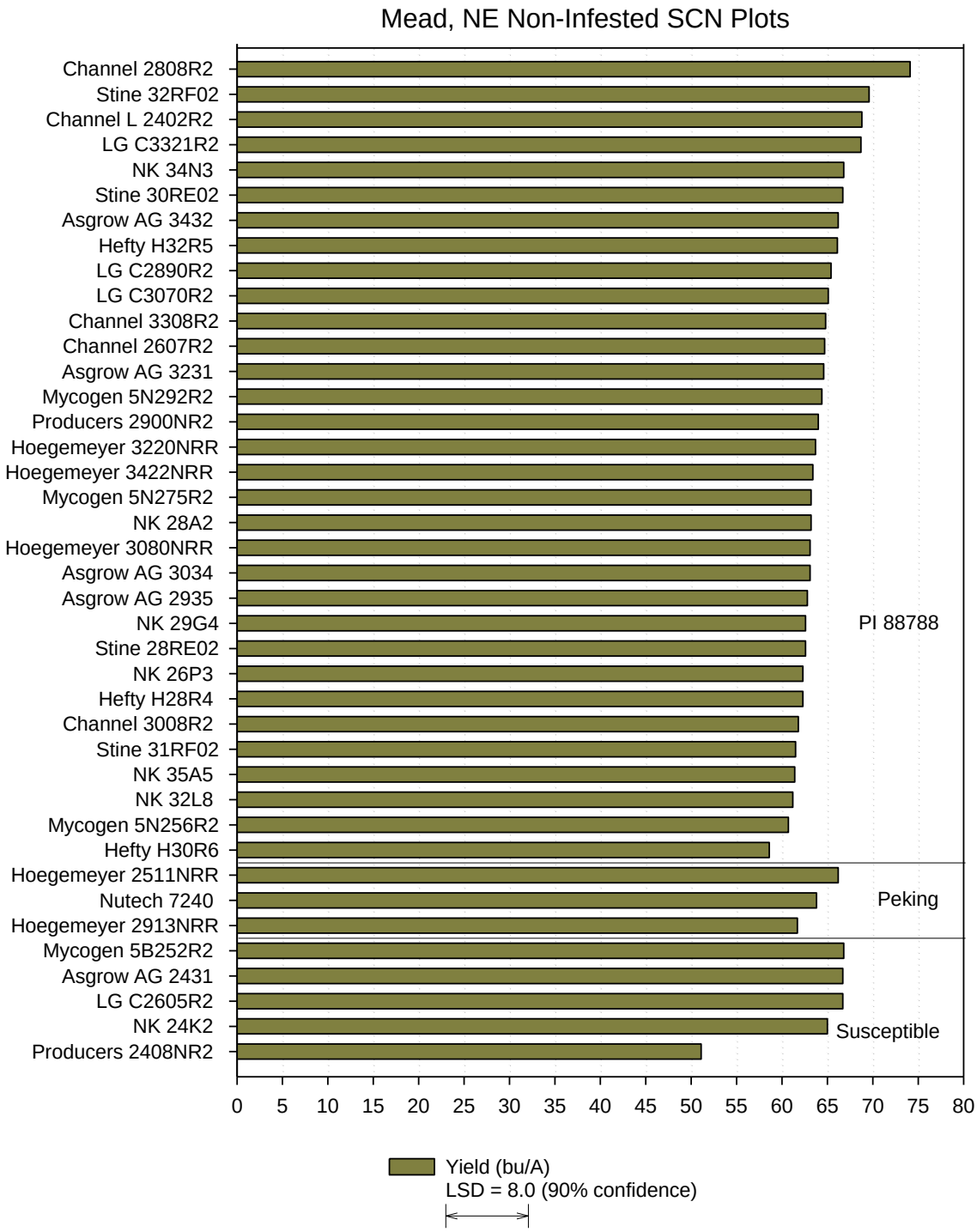

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