University of Nebraska Lincoln
Institute of Agriculture and Natural Resources
Department of Plant Pathology

2013 Evaluation of SCN Resistant Soybean Varieties in Nebraska

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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 nine susceptible "standards." The majority of varieties have the PI 88788 source of SCN resistance. However, additional varieties with Cyst-X or 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 Herman, Newman Grove and Peru 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 soybean 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.

Herman

The Herman site was located on a center pivot irrigated field with silty clay loam soils. The soil pH was 6.7 (Table 1). Soil organic matter (OM) was 3.8 % (Table 1). Rainfall totaled 15.3 inches and 4.5 inches of irrigation were applied throughout the growing season. Herman had the highest initial SCN population with an average of 1,740 eggs per 100 cc's soil (Table 1). SCN varieties with PI 88788 resistance were effective, only allowing an average Rf of 0.69. Varieties with Peking resistance had a Rf of 0.2 and Cyst-X had an Rf of 0.3. Hoegemeyer 2511NRR and Hoegemeyer X2402NRR with Peking resistance, LG C2916R2, Mycogen 5N275R2, Hoegemeyer 2993NRR, Stine 24RD03 and Channel 2800R2

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with PI 88788 resistance all exhibited the best control with an Rf of 0.2. The average Rf for susceptible varieties was 1.6. Yields were good with the highest yield being Stine 29RD22 with 87.4 bu/A. The lowest yielding variety was Mycogen 5N284R2 with 63.2 bu/A. The average yield was 76.4 bu/A. The 5 top yielding varieties in descending order were Stine 29RD22, Asgrow 2733, Asgrow 2933, LG C2916R2, and Channel 3303R2. There was statistical variance exhibited between yields producing an LSD (P = 0.10) of 10.9.

Newman Grove

The Newman Grove site was located on a non-irrigated field with silty clay loam soils. The soil pH was 7.4 (Table 1). Soil organic matter (OM) was 3.0 % (Table 1). Rainfall totaled 8.7 inches throughout the growing season. Newman Grove had an intermediate initial SCN population with an average of 1,438 eggs per 100 cc's soil (Table 1). SCN varieties with PI 88788 resistance were not very effective, allowing an average Rf of 1.8. Varieties with Peking resistance had a Rf of 10.5 and Cyst-X had an Rf of 6.1. Asgrow 2933 with PI 88788 resistances was the variety that exhibited the best control with an Rf of 0.95. Average Rf for susceptible varieties was 7.0. Yields were fair with the highest being Channel 2402R2 with 72.6 bu/A. The lowest yielding variety was Latham L2920R2X which yielded 56.8 bu/A. The average yield for this location was 64.2 bu/A. The 5 top yielding varieties in descending order were Channel 2402R2, Stine 29RD22, Asgrow 2733, NK S28-K1, Croplan RT2440 and Producers 2408R2 and Mycogen 5B261RR. There was statistical variance exhibited between yields producing an LSD (P = 0.10) of 4.9.

Peru

The Peru site was located on a non-irrigated field with silt loam soils. The soil pH was 7.3 (Table 1). Soil organic matter (OM) was 3.1 % (Table 1). Rainfall totaled 17.5 inches throughout the growing season. Peru had the lowest initial SCN population with an average of 985 eggs/100 cc's soil (Table 1). SCN varieties with PI 88788 resistance were not very effective, allowing an average Rf of 1.6. Varieties with Peking resistance had a Rf of 0.6 and Cyst-X had an Rf of 0.9. Hoegemeyer X2402NRR with Peking resistance exhibited the best control with an Rf of 0.3. Average Rf for susceptible varieties was 3.0. Yields were fair with the highest being Channel 3806R2with 83.2 bu/A. The lowest yielding variety was Producers 2408R2 which yielded 46.4 bu/A. The average yield for this location was 62.5 bu/A. The 5 top yielding varieties in descending order were Channel 3806R2, NK S34-Z1, Channel 2800R2, Asgrow 3231 and Asgrow 2933. There was statistical variance exhibited between yields producing an LSD (P = 0.10) of 7.3.

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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
Herman	Silty Clay Loam	6.7	3.8	1,740	2.5.7	5/23/2013	10/17/2013
Newman Grove	Silty Clay Loam	7.4	3.0	1,438	1.3.6	6/3/2013	10/21/2013
Peru	Silt Loam	7.3	3.1	985	2.5.7	5/24/2013	10/11/2013

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

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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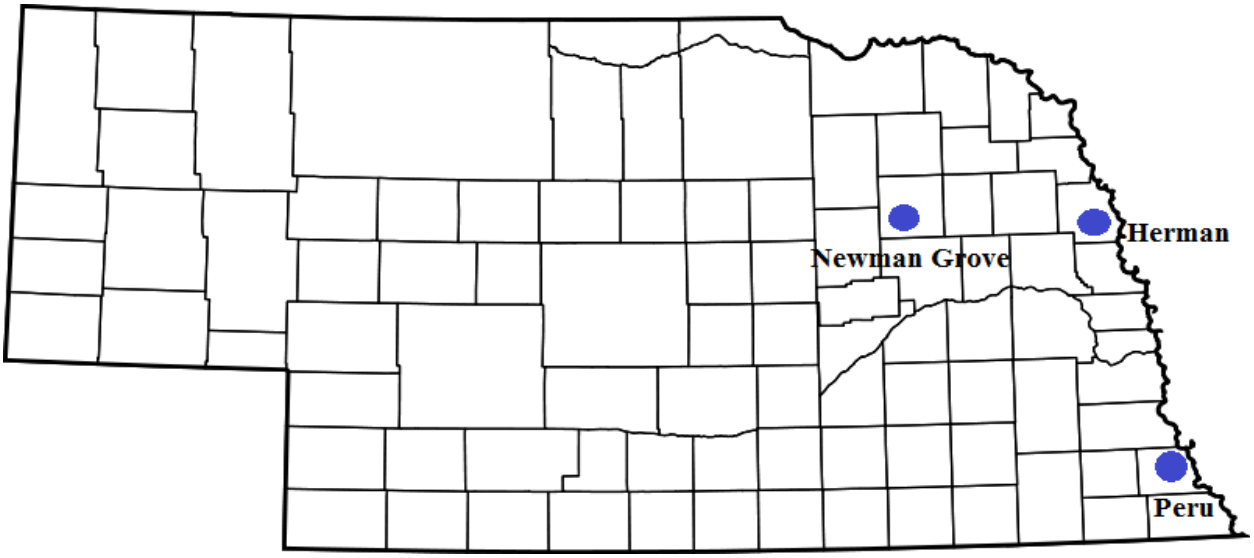
Table 3: Average SCN population for resistant and susceptible varieties.

Location	Average Spring SCN Population[1]	Average Fall SCN Population[1]	Average Spring SCN Population[1]	Average Fall SCN Population[1]
	Resistant Varieties		Susceptible Varieties	
Herman	1,660	912	1,830	2,567
Newman Grove	1,428	2,435	1,435	7,961
Peru	1,017	1,329	874	2,564

[1] SCN Population = eggs/100 cc's soil

Figure 1. Locations of UNL SCN-resistant Soybean Variety Trial Program experiments in 2013.



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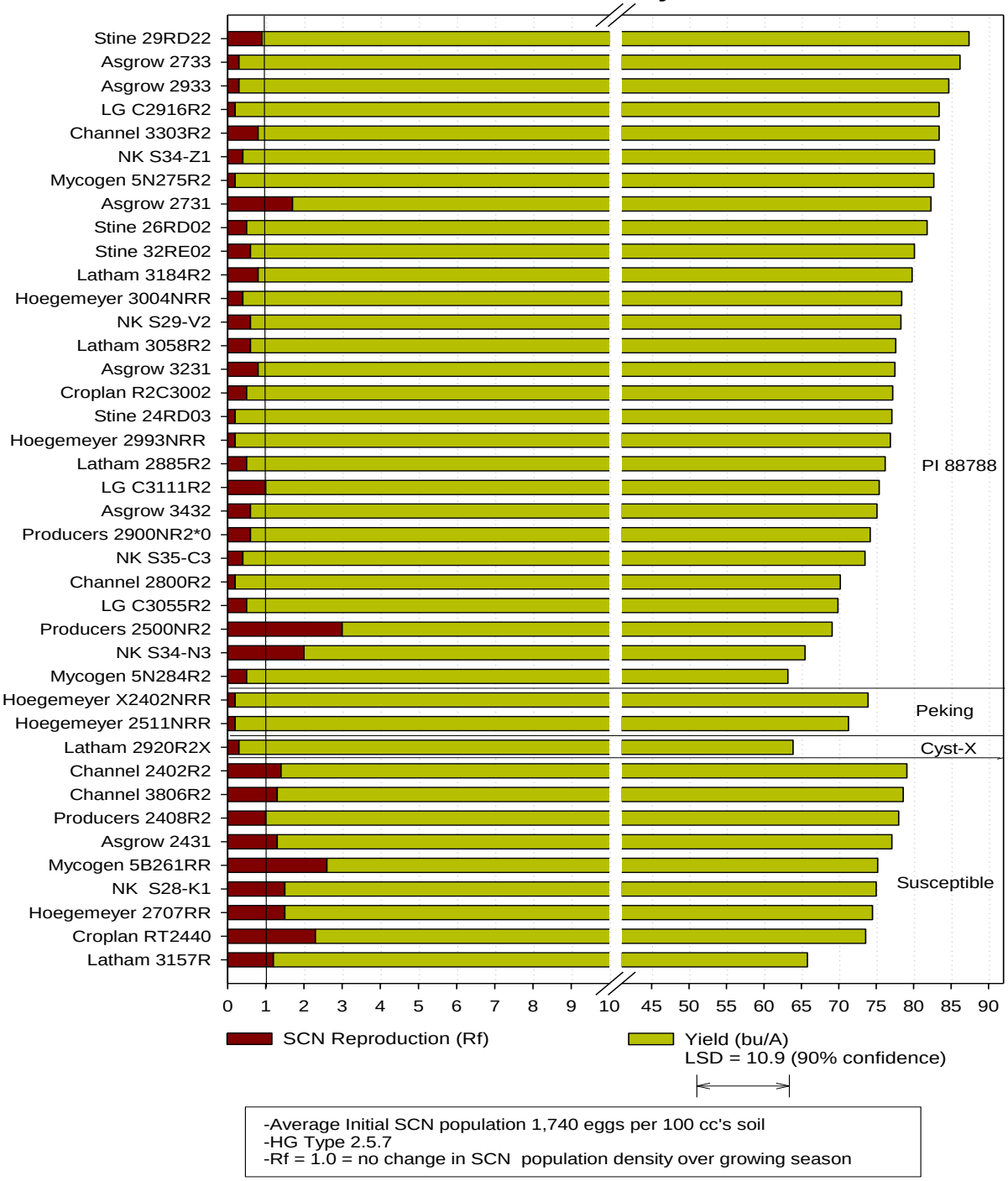
Herman SCN Variety Trial Results



-Average Initial SCN population 1,740 eggs per 100 cc's soil
-HG Type 2.5.7
-Rf = 1.0 = no change in SCN population density over growing season

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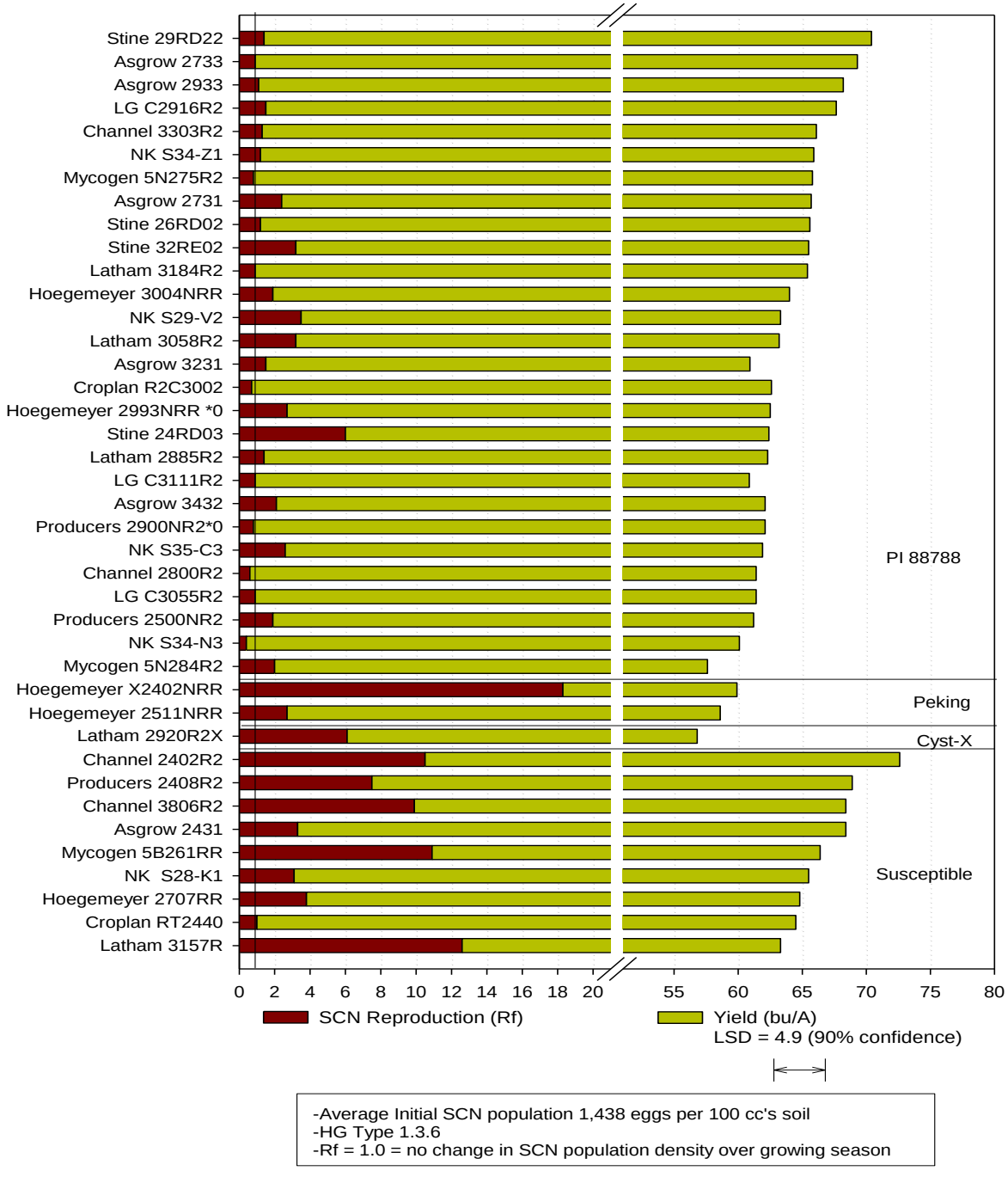
Newman Grove SCN Variety Trial Results



-Average Initial SCN population 1,438 eggs per 100 cc's soil
-HG Type 1.3.6
-Rf = 1.0 = no change in SCN population density over growing season

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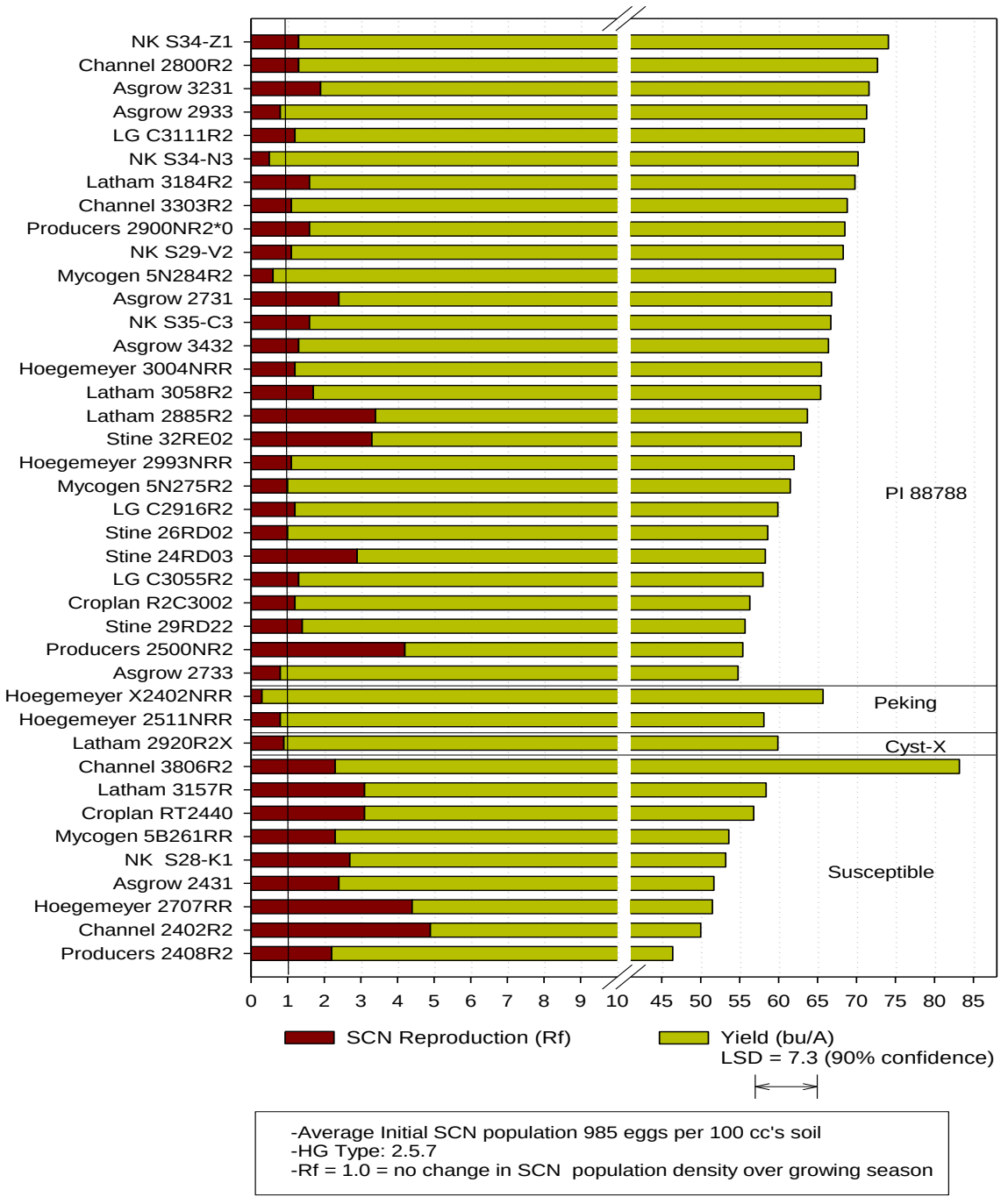
Peru SCN Variety Trial Results



-Average Initial SCN population 985 eggs per 100 cc's soil
-HG Type: 2.5.7
-Rf = 1.0 = no change in SCN population density over growing season

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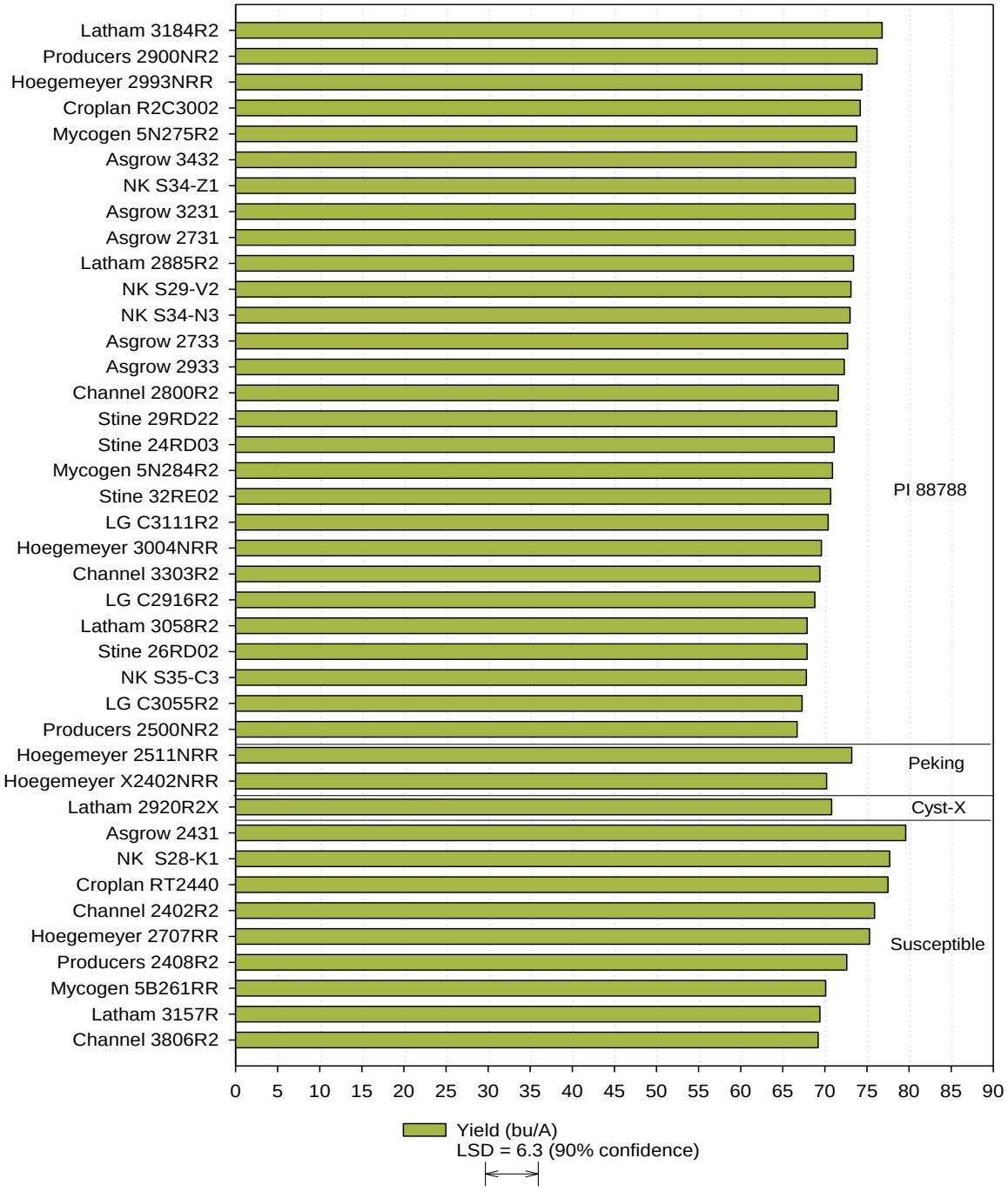
Mead Non-Infested SCN Variety Trial Results



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