Characterizing SCN in Missouri

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INTRODUCTION

Soybean Cyst Nematode (SCN; *Heterodera glycines*) was first confirmed in the Bootheel of Southeast Missouri in 1956. SCN is a serious soybean pathogen, costing Missouri producers an estimated average annual yield loss exceeding 3% and estimated revenue loss exceeding $90 million dollars (10). The two primary Integrated Pest Management (IPM) strategies are host resistance and crop rotation. A third being nematicides.

Management challenges for producers include (4):

- SCN eggs protected in a hardened cyst prolongs survival.
- Three to six generations in a single season.
- Up to 30% yield loss without visual symptoms.
- PI 88788 dominant SCN-resistance source for 30+ years.

Continued monitoring is critical for maintaining updated crop loss potential and devising strategic management plans with current resistant cultivars. University of Missouri (MU) has SCN surveys spanning across 37 years in 5 decades, 1980's – 2020's.

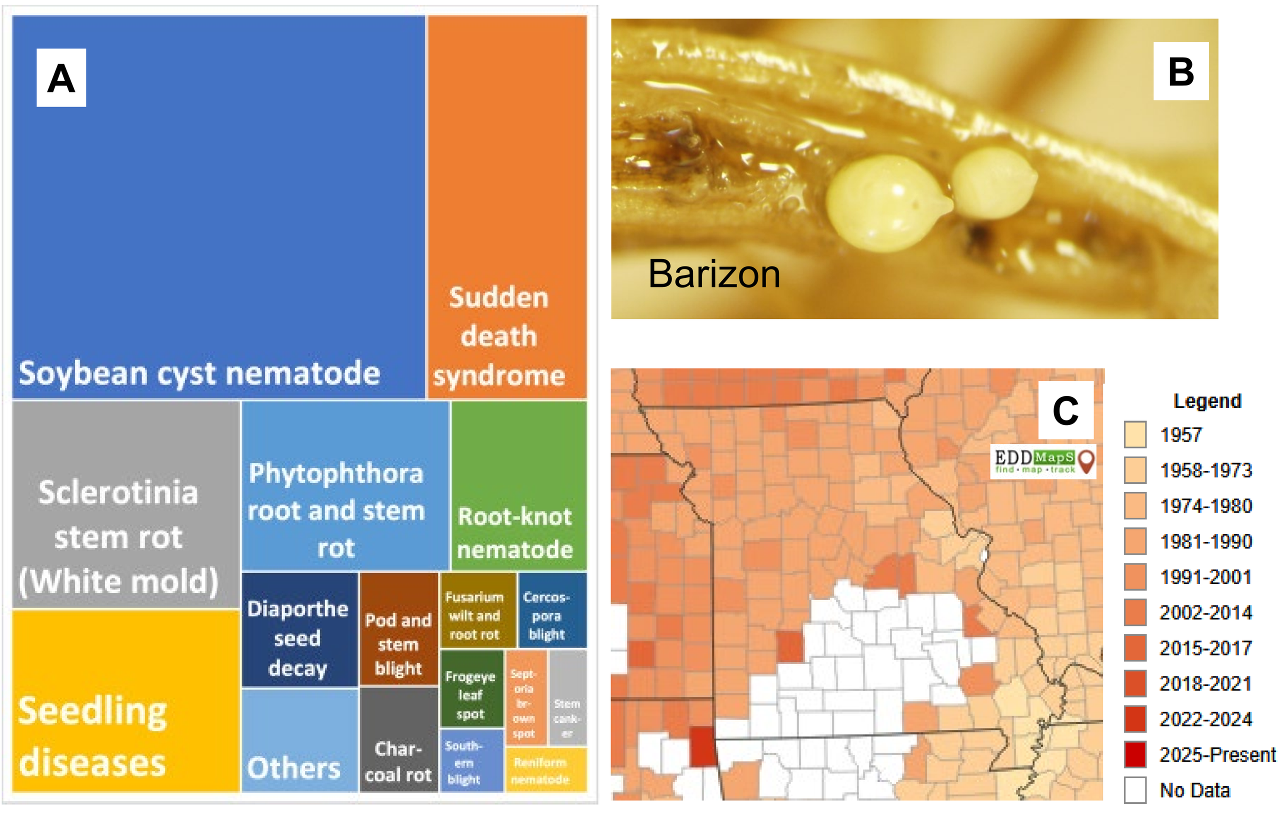


Fig. 1. A. Soybean disease loss estimate (10). **B.** SCN females. **C.** SCN spread in Missouri over time (2).

MATERIALS AND METHODS

SCN surveys were conducted across Missouri in May 1988 to July 1992 (6), November 1998 to March 1999 (8), October 2005 (5), Fall 2015 to Spring 2016 (3), and September-November 2024 - 2025 (1). Analysis included prevalence (frequency), density, and virulence phenotyping. The 1998-1999 (8) and 2005 (5) surveys used the USDA frame probability design. The 1988-1992, 2015-2016 and 2024-2025 surveys were based on grower participation. Grower participation survey locations for 2015-2016 and 2024-2025 growing seasons are shown in Fig. 2. The South Central (SC) district is dominated by the Ozark mountain terrain, historically not a soybean production region (Fig. 2).

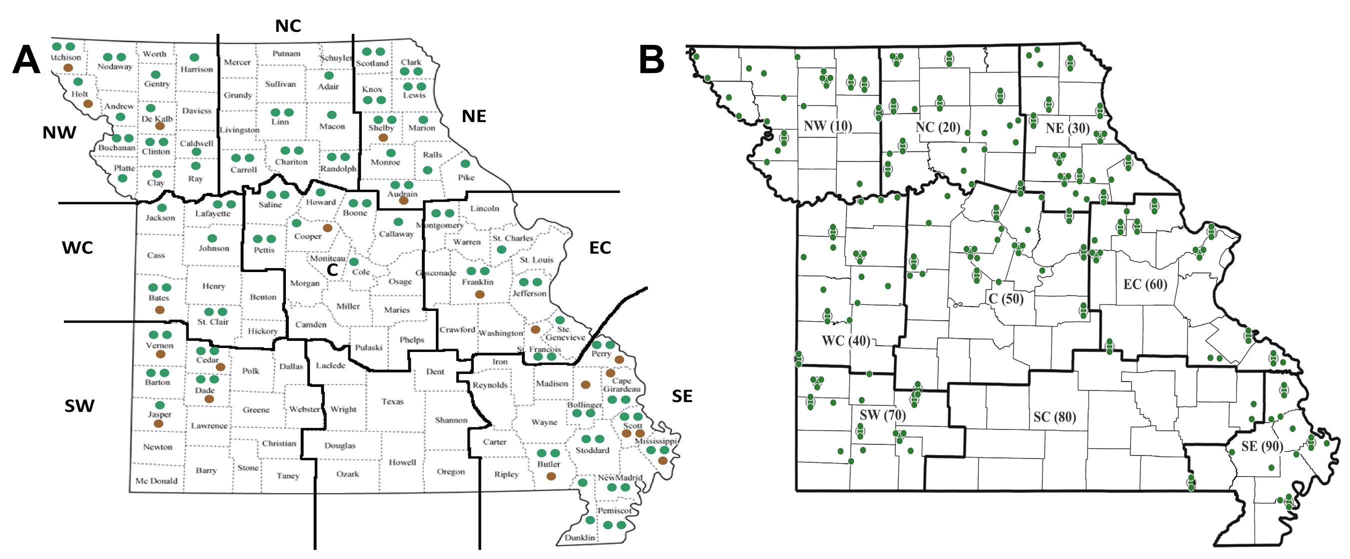


Fig. 2. A. 2015-2016 Survey Map divided by MU Extension Regions. **B.** 2024-2025 Survey Map divided by NASS-USDA crop districts.

MATERIALS AND METHODS

I participated in the 2005, 2015-2016 and 2024 & 2025 surveys. I located fields in Southeast Missouri, and/or collected and submitted samples to SCN Diagnostics.

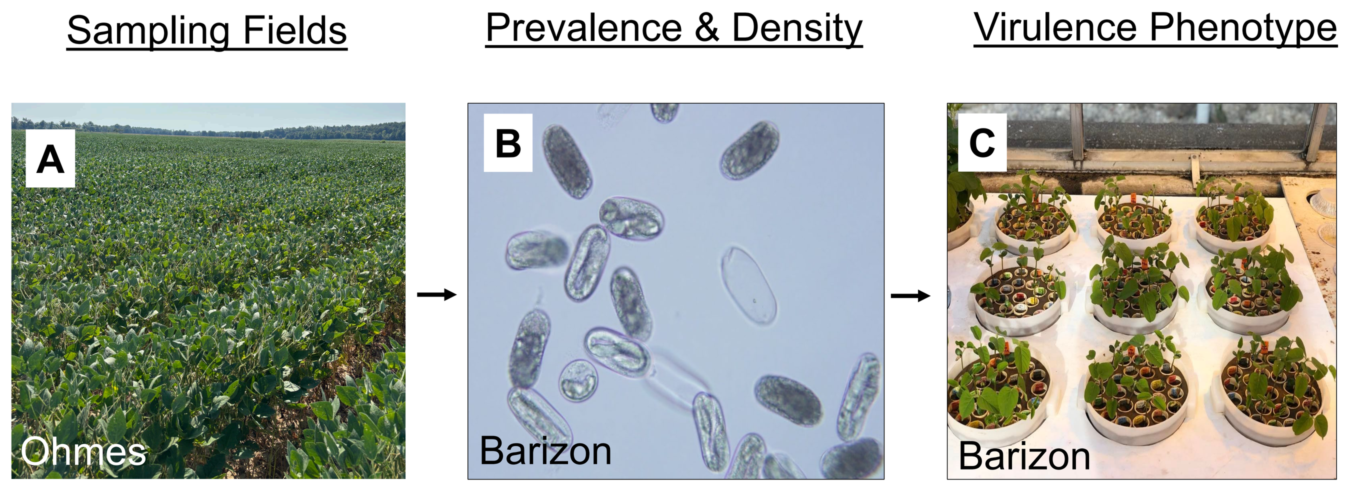


Fig. 3. A. 2025 Southeast MO survey field. **B.** SCN eggs extracted for counting. **C.** HG Type test (modified) for virulence phenotyping.

Soil samples were collected from soybean fields (Fig. 3A); however, sample locations and sample number varied. The 1988-1992 survey data was collected from 6,193 soybean producer submitted samples (6). In all subsequent surveys, a composite of 20 soil cores, 6-8 inches deep, were processed by MU's nematology lab. Standard methods were used to isolate SCN cysts in 100 cm³ subsample, extract eggs from cysts, and count SCN population density (Fig. 3B). Each survey year, samples were selected and populations increased for modified HG Type testing (Fig. 3C) (7).

HG Type #	SCN Resistance
1	PI 548402 (Peking)
2	PI 88788
3	PI 90763
4	PI 437654
5	PI 209332
6	PI 89772
7	PI 548316 (Cloud)

Fig. 4. SCN plant introductions (PI) used in HG type testing.

HG Type test measures the ability of a SCN population to reproduce on a plant introduction (PI) used to breed SCN-resistant soybeans (Fig. 4) (9). Female Index (FI) is the percent of SCN females that develop on a HG indicator line relative to susceptible line, with FI ≥10% classified a virulent phenotype to that source of resistance (9).

RESULTS

Contributing author, Jeff Barizon, under Dr. Mandy Bish, led the 2024 - 2025 surveys and summarized data as part of his doctorial research. Percentage of samples with detectable populations of eggs (black bars) and percentage of SCN prevalence at or above historical reference level (gold bars) presented in Fig. 5.

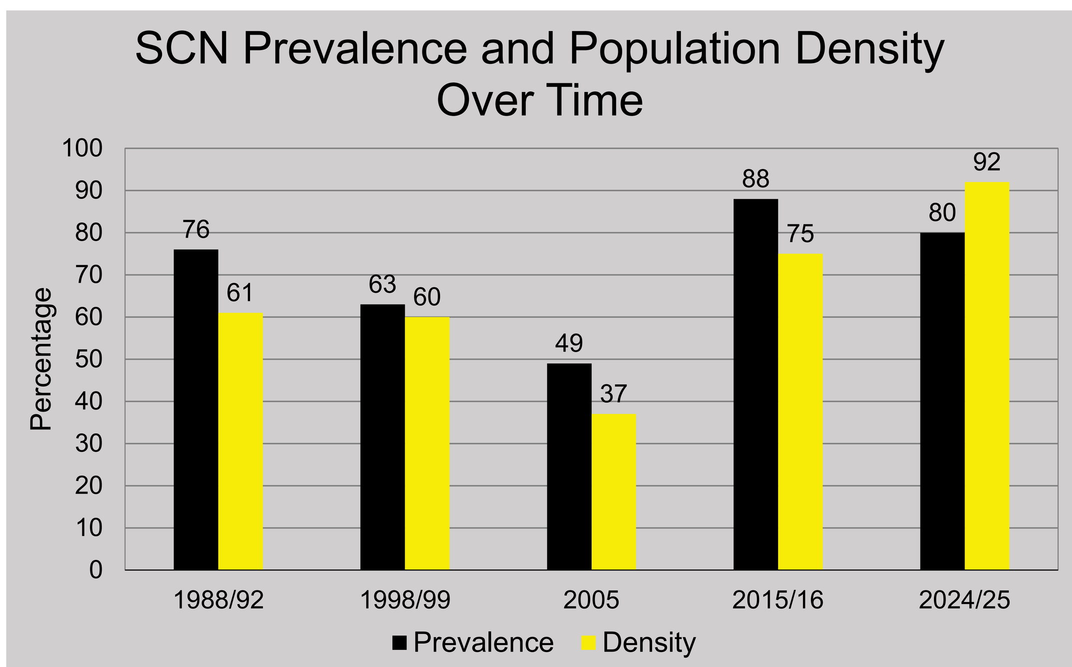


Fig. 5. SCN prevalence and percentage of SCN-positive samples with population densities at or above the historical reference level (≥200 eggs per 100 cm³ soil).

RESULTS

HG type 2- (virulence to PI 88788) increased from 31% in 1988-1992 and 1998-1999 to >45% from 2005 to 2025 (Fig. 6). In contrast, HG type 1.2- (virulence to Peking and PI 88788) doubled from 2005 to 2015 and was the most common phenotype in 2024-2025 (Fig. 6).

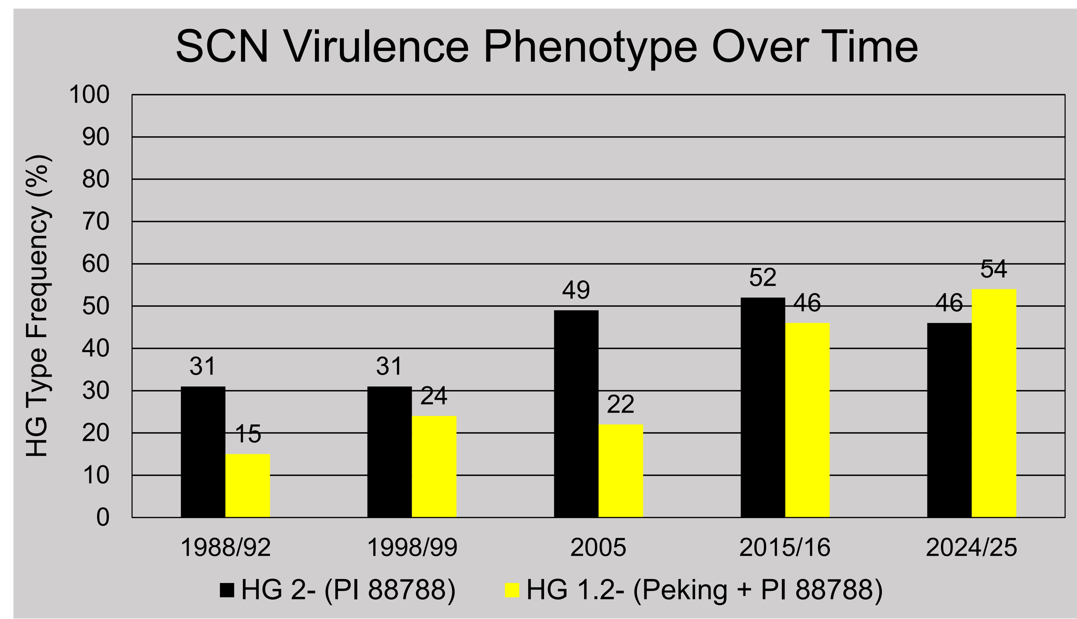
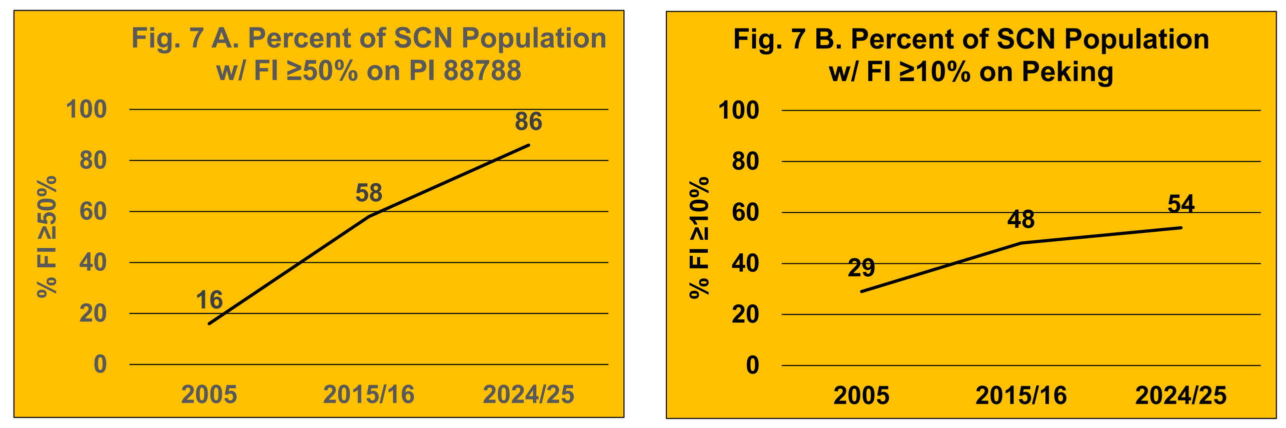


Fig. 6. Comparison of predominant HG type frequency of SCN population.

Because 100% of SCN populations in 2015-2016 had FI ≥ 10% on PI 88788 (vs. 78% in 2005) (3,5), results are presented as percentage FI ≥ 50% for PI 88788 (Fig. 7A). For Peking, percentage FI ≥ 10% is reported (Fig. 7B). Female index increased over time for both resistance sources (Fig. 7).



CONCLUSIONS

Populations continue to adapt to the two dominant SCN-resistance sources. SCN pressure is statewide with higher egg counts likely due to increased SCN virulence on PI 88788 soybean, costing yield. Virulence to Peking remains lower. Continued education on stewarding Peking soybeans in rotation with PI 88788 soybeans will be necessary to ensure both types of SCN-resistance have utility until new genetics are available.

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