Fall and Spring Development of Soybean Cyst Nematode on Winter Annual Weeds

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Introduction

Soybean cyst nematode (SCN) is found throughout soybean growing regions of the U.S and can devastate soybean yields. Certain winter annual weed species (including henbit and purple deadnettle) were identified as alternative hosts to SCN in the greenhouse (Venkatesh et al. 2000). A 2004 survey of 55 SCN infested fields in Indiana revealed that winter annual weed hosts of SCN were present in 93% of fields and occurred at an average density of ~100 plants/m^2 (Creech and Johnson, unpublished). The ability of SCN to complete a reproductive cycle on winter annual weeds has recently been documented at a single field site in southern IN (Creech et al. 2005). However, an attempt to quantify SCN reproduction on winter annual weeds across a range of environmental conditions has not been conducted.

Figure 1. An Indiana field infested with both winter annual weeds and SCN. Can these winter annuals serve as a mechanism of SCN reproduction and population increase under field conditions?

Objectives

To document the distribution of fall and spring SCN development and reproduction on winter weeds in Indiana and Illinois.

To increase our understanding of winter weed management timing to minimize SCN reproduction.

Materials & Methods

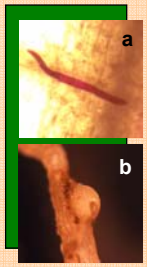
Research sites

Six sampling sites with both SCN and winter weeds were selected across IN and IL (see map). SCN infestation levels in IN were 528, 264, and 300 eggs/100 cc soil at Wanatah, Lafayette, and Vincennes, respectively. SCN infestations at all 3 IL sites were ~50 eggs/100cc soil.

Plant collection

Twenty purple deadnettle (IN) or Henbit (IL) plants were removed from each field and transported to the laboratory for further processing. Sampling occurred in mid-December 2004 (IN) and early May 2005 (IN and IL).

Materials & Methods cont.



Measurements

-SCN juveniles inside the roots

-SCN cysts (IN) or eggs (IL) produced on the roots

Statistics

-Means were compared using *t*-tests (P≥0.05)

Figure 2. (a) An SCN juvenile stained with acid-fuschin inside a purple deadnettle root. (b) An SCN cyst on a purple deadnettle root.

Results & Discussion – *Indiana*

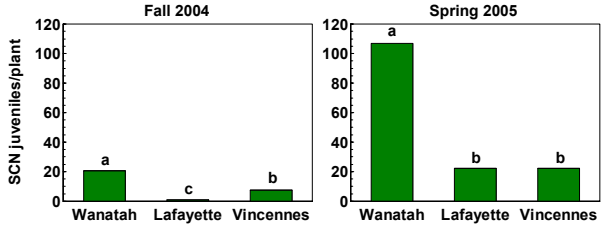


Figure 3. SCN juveniles inside the roots of purple deadnettle at spring and fall sampling timings in IN. Means (n=20) with same letter are not statistically different (P≥0.05). Juvenile activity in spring and fall was highest at Wanatah, the site with the highest nematode infestation. Spring juvenile counts were ~5X higher at all sites in the spring than the fall. To prevent these SCN juveniles from completing a reproductive cycle, a timely burndown application in April may be necessary.

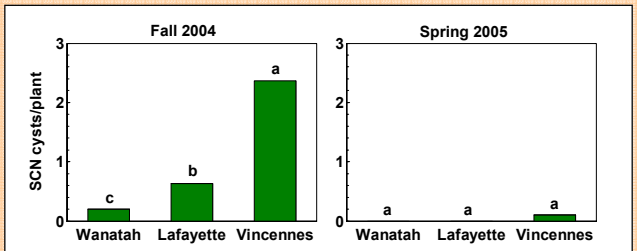


Figure 4. Number of SCN cysts on purple deadnettle at each IN site. In fall 2004, reproduction appeared to be dependent on environment as cyst counts increased from north to south. At the spring sample timing, however, SCN reproduction at all locations was negligible. Thus, fall winter weed management appears to be more beneficial from an SCN management standpoint than in spring.

Results & Discussion - *Illinois*

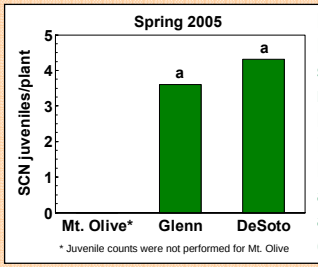


Figure 5. SCN juveniles in henbit roots at the IL sampling sites. IL counts may have been lower than IN because (1) the IL SCN infestation levels were lower and (2) henbit is not as strong a host for SCN as purple deadnettle (Venkatesh et al. 2000).

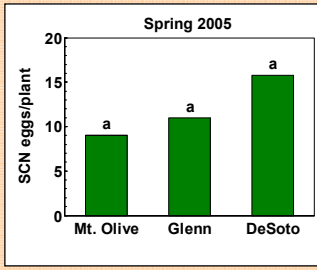
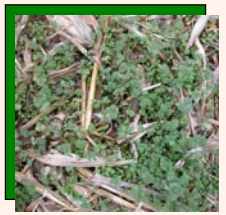


Figure 6. SCN eggs produced in cysts found on the roots of henbit in IL. Differences between sites were not significant. Spring SCN reproduction in IL was more common than in IN, a trend that might be due to a 10-day later sampling date in IL.

Conclusions

SCN reproduction on henbit and purple deadnettle was widespread in IN and IL and SCN juveniles were present in highest numbers in the spring.

From the results of this survey, a late September residual herbicide treatment appears to be the most promising option to eliminate fall SCN reproduction and to place less reliance on an early spring burndown application to prevent spring cyst formation.



References

Creech, J. E., W. G. Johnson, J. Faghihi, V. R. Ferris, and A. Westphal. 2005. First report of soybean cyst nematode reproduction on purple deadnettle under field conditions. Online. Crop Manage. doi:10.1094/CM-2005-0715-01-BR.

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Acknowledgments

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