

Winter Annual Weed Influence on Soil Temperature and Soybean Cyst Nematode Population Density

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Introduction

Soybean cyst nematode (*Heterodera glycines*; SCN) is ranked as one of the most economically important pathogens in soybeans. Two winter annual weeds (WAW) have been reported as strong alternative hosts for SCN. These WAW's are purple deadnettle (*Lamium purpureum*) and henbit (*Lamium amplexicaule*). In recent years these WAW's as well as volunteer soybean have been more prevalent in fields due to the adoption of conservation tillage, reduced usage of residual herbicides, and mild winters. Therefore, it will be important to know if timing of WAW and volunteer soybean management can influence SCN population density and it will be important to know if these WAW's can keep soils cooler in the spring and delay spring planting.

Objectives

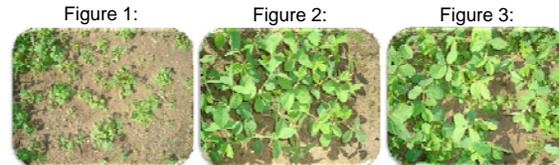
Determine if:

- *Lamium spp.* and volunteer soybean influence spring soil temperatures
- Fall or spring *Lamium spp.* and volunteer soybean removal timings influence SCN

Materials and Methods

- Factorial arrangement of treatments, 4 replications
- Weed and soybean densities established at the beginning of Sept. in 2006 and 2007.
 - Lamium* density: 0 or 161 m⁻²
 - Soybean density: 0 or 108 m⁻²
- Winter weed removal timings:
 - No weed removal
 - Mid-October
 - Beginning of December
 - Mid-May
- SCN population density at each sampling time (Pf) was divided by the initial population density before treatments were applied (Pi): which resulted in a population change factor (PCF)
 - PCF = 1 No change
 - PCF < 1 Populations decreasing
 - PCF > 1 Populations increasing
- Soil sample timings were Aug. (Pi), and at the weed removal timings (Pf).
- Temperature sensors were buried 10 cm below the soil surface and recorded temperatures every half hour in plots with no weed removal.
- SCN data were log₁₀ transformed, average daily temperatures were square root transformed, and means were separated at P=0.05 using PROC MIXED. Back-transformed means will presented for clarity.

Figures 1,2,3: Plots of *Lamium spp.* (1), soybean (2), and *Lamium spp.* and soybean (3) 26 days after planting.



Results and Discussion

Temperature

In this experiment there were no differences in spring temperatures in 2007 or 2008 between plots that were fallow, or had *Lamium spp.*, soybean, or both *Lamium spp.* and soybean (Tables 1 and 2). However, temperature sensors may have been buried too deep to detect a difference in soil temperature.

Figure 4: Influence of fallow ground, soybean, *Lamium spp.*, and both soybean and *Lamium spp.* on soil temperature in the spring of 2007. Means separated at P=0.05.

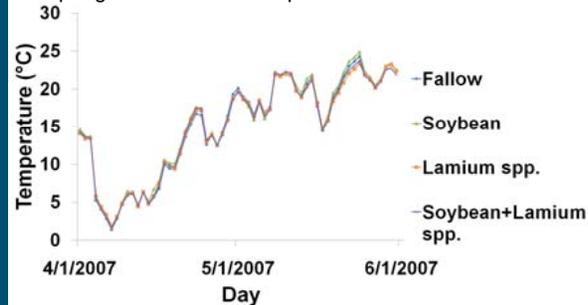
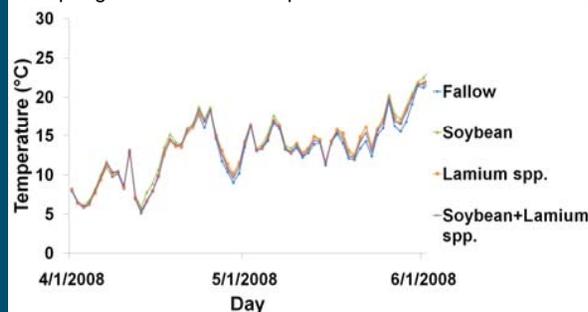


Figure 5: Influence of fallow ground, soybean, *Lamium spp.*, and both soybean and *Lamium spp.* on soil temperature in the spring of 2008. Means separated at P=0.05.



Soybean Cyst Nematode

In plots where *Lamium spp.* were removed in Dec. there was a reduction in SCN egg counts by August.
In plots where *Lamium spp.* were removed in May, SCN was higher in plots with *Lamium spp.* than weed free plots.

December weed removal timing:

Table 1: Three way interaction between *Lamium spp.* and soil timing (P=0.0143) for SCN PCF values for year one.

<i>Lamium spp.</i>	Soil sample timing*		
	Dec. '06	May '07	Aug. '07
- **	0.7 aA	1.3 aA	0.6 aA
+	1.3 aA	1.0 aA	0.3 aB

* Means with the same lowercase letter within a column were not different at P=0.05 and means with the same uppercase letter within a row were not different at P=0.05.

** (-) represents no *Lamium spp.* and (+) represents *Lamium spp.* present

May weed removal timing:

Table 2: Significant *Lamium spp.* main effect (P=0.0424) for SCN PCF values for year one.

<i>Lamium spp.</i>	SCN*
- **	0.4 b
+	0.9 a

* Means with the same letter within a column were not different at P=0.05

** (-) represents no *Lamium spp.* and (+) represents *Lamium spp.* present

Conclusions

- Soil temperatures were not influenced by volunteer soybean or *Lamium spp.* in this experiment.
- SCN egg counts were reduced when *Lamium spp.* were removed in Dec. suggesting fall removal of *Lamium spp.* may reduce SCN population density.
- When *Lamium spp.* were left in the field until May SCN egg counts were higher than in plots with no *Lamium spp.*
- *Lamium spp.* should be controlled before May in order to decrease SCN population density.

Acknowledgements

This research was funded by:

Purdue
Department of
Botany and Plant
Pathology

