Herbicide Influence on Soybean Cyst Nematode (*Heterodera glycines*) Reproduction on Henbit (*Lamium amplexicaule*) Roots

Rodrigo Werle[1], Loren J. Giesler[1], Mark L. Bernards[2], and John L. Lindquist[1]

[1] University of Nebraska-Lincoln, Lincoln, Nebraska, [2] Western Illinois University, Macomb, Illinois

Introduction

Soybean cyst nematode (SCN) is the most yield limiting disease of soybeans in the United States. Henbit is a prevalent winter annual weed in no-till fields and can be an alternative host of SCN.

Figure 1. Henbit belongs to the mint (Lamiaceae) family.

Figure 2. Field infested with both henbit and SCN in NE.

Objective

A greenhouse study was conducted to evaluate the development of SCN on henbit roots as affected by time of herbicide application and herbicide active ingredient.

Materials and Methods

- Henbit plants were grown in watertight pots (10 cm in diameter x 12 cm deep) filled with 750 ml sterilized sand.
- Pots were placed in a water bath bench at constant 27±1 C.
- Ten days after transplanting, pots were inoculated with 1,000 SCN eggs (HG type 1.7)
- At 7, 14, or 21 days after inoculation (DAI), henbit plants were sprayed with either glyphosate (870 g ae ha^{-1}) + AMS (2,860 g ha^{-1}) or 2,4-D (1,070 g ae ha^{-1}) + NIS (350 ml ha^{-1}) + AMS (2,860 g ha^{-1}) .
- The control treatment was SCN-inoculated plants non-treated with herbicide.
- At 28 DAI, plants were cut at the soil surface and oven dried. SCN cysts were collected from soil using a sieving and decanting methodology (Faghihi et al. 1986). Roots were separated from soil and oven dried. Once enumerated, cysts were crushed to obtain SCN egg counts.

Figure 3. Water bath bench used to conduct the experiment.

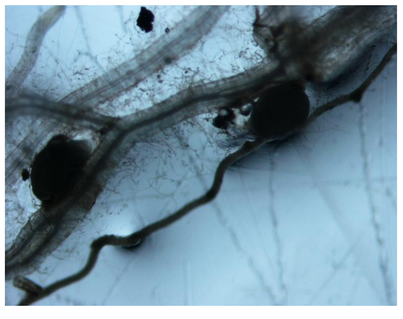

Figure 4. SCN cysts developing on henbit roots.

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Results

Table 1. Henbit biomass and soybean cyst nematode (SCN) development on the non-treated control henbit plants (NT) at 28 days after inoculation with 1,000 SCN eggs (DAI), and relative (% of non-treated control plants) henbit root and shoot biomass and SCN development at 28 DAI as influenced by glyphosate or 2,4-D application at 7, 14, or 21 DAI (n=10)[a].

		Plant biomass		SCN development	
		Root biomass (g $plant^{-1}$)	Shoot biomass (g $plant^{-1}$)	Cysts $plant^{-1}$	Eggs $cyst^{-1}$
Non–treated control henbit plants at 28 DAI		0.26	0.41	73	208
		Herbicide effects expressed as % of non–treated control plants at 28 DAI (% NT)			
Treatment	Time (DAI)	Root biomass (% NT)	Shoot biomass (% NT)	Cysts $plant^{-1}$ (% NT)	Eggs $cyst^{-1}$ (% NT)
Glyphosate	7	2.4 c	5.9 c	0[b]	0
Glyphosate	14	9.4 b	21.6 b	10.1 c	14.5 c
Glyphosate	21	38.2 a	68.2 a	80.1 a	46.3 b
2,4-D	7	5.5 b	6.0 c	3.2 d	11.8 c
2,4-D	14	9.9 b	19.2 b	41.2 b	34.6 b
2,4-D	21	50.0 a	57.0 a	81.2 a	90.8 a

[a] Henbit biomass and SCN development data were log transformed prior to analysis to meet the ANOVA assumptions. Backtransformed means are presented for ease of interpretation. Means within a column followed by the same letter are not different at $P \leq 0.05$.
[b] No cysts, consequently no SCN eggs, were observed in any plant were glyphosate was applied at 7 DAI. Thus, these values had no variance.

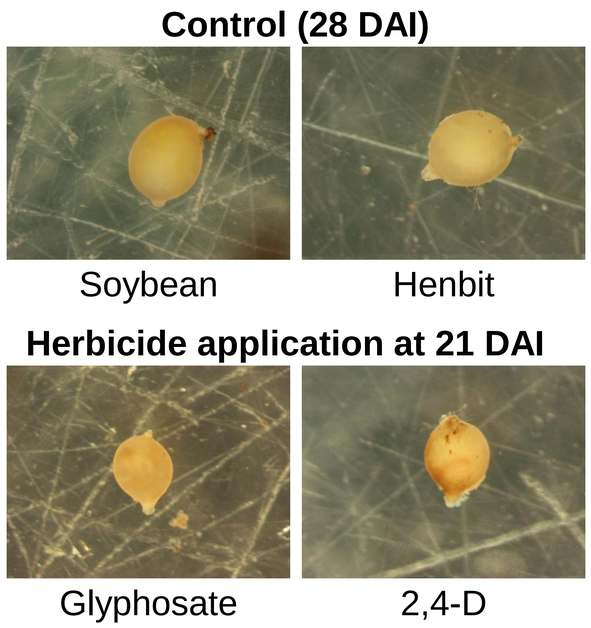

Figure 5. Herbicide effect on SCN-cyst development on henbit roots. Cysts were harvested at 28 days after inoculation (DAI). A picture from a cyst developed on soybeans is included for comparison.

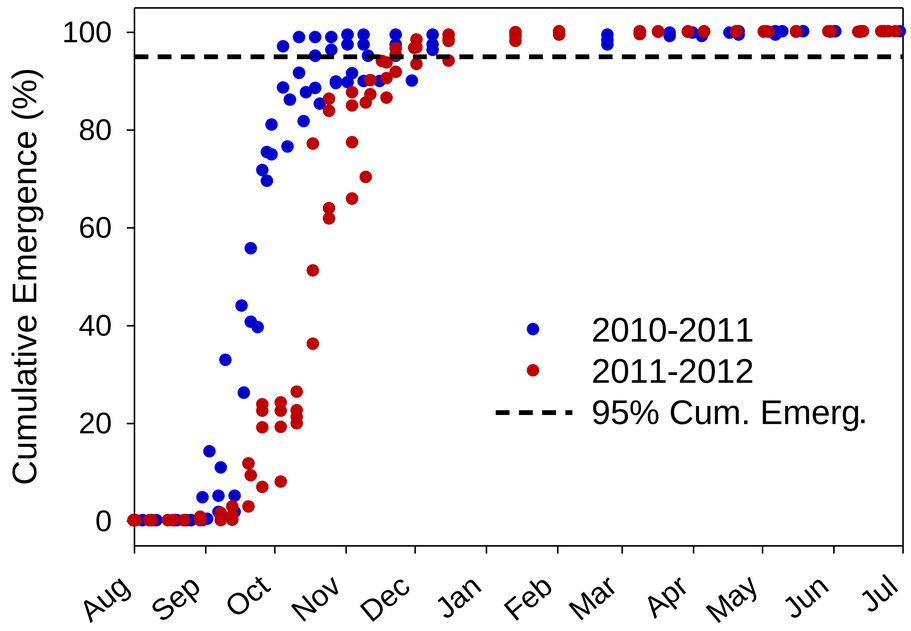

Figure 6. Emergence pattern of henbit seedlings in Nebraska. Data collected at 4 sites during two years. For more information about this study please visit poster 200-10.

Conclusions

- Early control of henbit plants resulted in less root and shoot biomass and SCN reproduction on henbit roots.
- Treatment with glyphosate had a more negative effect on SCN reproduction than did treatment with 2,4-D.
- We hypothesize that modification of the shikimate pathway by glyphosate results in a reduced capacity for the SCN to maintain feeding sites.
- The majority of the henbit seedlings (>95 %) emerge by end-October/mid-November, indicating that henbit control after crop harvest would be the ideal time to manage this weed and consequently reduce potential SCN reproduction.

References

Faghihi, J., J. M. Ferris, and V. R. Ferris. 1986. *Heterodera glycines* in Indiana: I. Reproduction of geographical isolates on soybean differentials. Journal of Nematology. 18:169–172.