



## Observations of Management Practices and Their Effect on Corn and Soybean Damage Due to Slug Feeding

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### Situation:

There is a widespread goal to increase the acreage of corn and soybean that are planted no-till. The benefits of no-till include: (1) a reduction in non-point source pollution; (2) improved farm profitability; and (3) carbon sequestering. In the mid-Atlantic region, however, farmers practicing no-till have a higher incidence of damage due to slug feeding compared to farmers using conventional tillage systems. Many farmers are beginning to wonder if there are specific no-till management practices that can increase or decrease the incidence of damage due to slugs. This survey was an attempt to isolate management practices that appear to result in a higher (or lower) incidence of slug feeding pressure.

### Method:

In the late summer of 2013, a survey was developed. It was reviewed by the Mid-Atlantic High Residue Working Group. Beginning in mid-October 2013, farmers throughout the Northern Shenandoah Valley (the Virginia Counties of Clarke, Frederick, Page, Northern Rockingham, Shenandoah, and Warren) were contacted. The original survey was designed to collect data for 2012 and 2013. After meeting with about five farmers, it became evident that no one could remember the incidence of slugs or their management well enough to report accurate data for the 2012 crop season. It also became evident that all farmers would need to be personally interviewed to complete the survey. Thus, all farmers were surveyed via direct communication (either by a personal visit or a telephone interview). Almost every farmer that was contacted were people who had interaction with the Extension Agent (Bobby Clark). This included all farmers who had participated in the Slug Cost Share Grant Program.

Forty-one farmers were surveyed representing 16,546 acres of corn and soybean. **It is important to note that this survey is not a statistically valid subsample of all acres within the Northern Shenandoah Valley.** The Census of Agriculture shows there was 33,000 acres of corn and soybean in the Northern Shenandoah Valley in 2007. Due to high grain prices, acreage likely increased to slightly above 40,000 by 2013. **Thus, results can only be stated as observations with no statistical confidence.** The questions asked of the farmers are summarized below:

- What was the cropping practice in 2012 (or what crops were grown in 2012)?
- How was the crop grown in 2013 (was it no-till or conventional)? All turbo-tilled crops were considered conventional.
- How many acres had slug damage?
- When no-till planting a field, how often is an insecticide sprayed with your pre-plant herbicide? [Always (on every acre of the past two to four years), sometimes (not on every acre) or never (never used insecticide with the spray.)]
- What crop rotation was used?

## Results:

Table 1 summarizes the acreages reported by tillage system and the number of farmers surveyed. Table 2 and 3 represent the data on no-till cropping systems and conventional cropping systems. It is important to note that the acres represented under some of the

Number of Farmers Surveyed	41
Total Acres Surveyed	16,546
No-Till Acres	12,608
Conventional Acres	3,938
Percent Acreage No-Tilled	76%

cropping systems are relatively small. This means the experience of a single farmer on a single field might have great influence on the percent of the crop injured by slugs. Table 2 shows that in 2013 the majority of the fields that had injury from slugs were no-till crops following corn for grain (either with or without cover crop). Table 4 more specifically shows that no-till corn or soybean following soybean had 23 percent reduction in slug injury compared to no-till corn or soybean following corn.

There was a decrease in the percentage of acres showing slug damage when no cover crop was used versus using a cover crop regardless of whether the crop followed corn as grain or corn for silage or after a soybean crop (Table 5). In no-till soybean systems, a large decrease occurred for the no-till soybean after corn system (a reduction of 42 percentage points).

There were several management practices that had a very low to no incidence of slug injury. For several of the practices, the fact that there was minimal crop residue on the soil surface (such as no-till corn or soybean after corn silage and no-till corn or soybean after small grain for hay or silage) is likely the explanation for the low amount of slug damage. One management practice that stood out was that no-till corn or soybean following grass hay had no slug feeding pressure. This is typically a high residue situation. Finally, all systems with no-till corn or soybean following small grain for grain (double-cropped) had no slug injury.

Table 6 sorts the incidence of slug injury by frequency of pre-plant insecticide use. When the survey was conducted farmers were asked the question: *“How often do you spray insecticides when you are spraying pre-plant herbicides to no-till corn and soybean?”* Always means every time either corn or soybean will be no-tilled, sometimes means that insecticide is used about half of the time, and never means that insecticide is never sprayed when applying pre-plant herbicides. These data reflect each farmer’s experience irrespective of acreage. Sixty-five percent of the farmers who always apply insecticide when spraying pre-plant herbicides experienced slug injury. The numbers drop to 27 percent and 13 percent of farmers who spray insecticide “some of the time” and “never,” respectively.

An attempt was made to remove three cropping systems that had no slug feeding pressure from the data to determine if the removal of this data would have an impact on the results shown in table 6. The cropping systems that were removed included: no-till corn or soybean following small grain for silage, no-till corn or soybean following grass or alfalfa hay, and no-till corn or soybean double cropped. Removing these cropping systems, however, did not have a noteworthy impact.

One management practice emerged as potentially resulting in less slug injury was growing small grain for grain. During the survey interviews, there were several instances when farmers would say “On field x, y, or z in 2012 I grew wheat (or barley) for grain followed by soybeans and the 2013 crop (either no-till corn or soybean) did not have injury.” The interviewer was not able to determine which fields specifically had this management so that these fields could be separated and reported individually. Two questions that could be asked are: 1) are there beneficial insects that thrive in fields where small grain is grown for grain production; and 2) does growing small grain for grain disrupt the slug life cycle. In contrast, Extension Specialists from other states noted that in past years, this particular crop rotation has been problematic for slugs.

	Total Acres	Acres Damaged	Acres Not Damaged	Percent Damaged
No-Till Soybean Following Corn with a Cover Crop	208	142	66	68%
No-Till Corn Following Corn with a Cover Crop	561	146	415	26%
No-Till Soybean Following Corn with No Cover Crop	1,832	468	1,364	26%
No-Till Corn Following Soybean with a Cover Crop	442	95	347	21%
No-Till Corn Following Corn with No Cover Crop	2,005	360	1,645	18%
No-Till Corn Following Soybean with No Cover Crop	2,629	357	2,272	14%
No-Till Soybean Following Soybean with No Cover Crop	733	82	651	11%
No-Till Corn Following Corn Silage with a Cover Crop	646	24	622	4%
No-Till Corn Following Corn Silage with No Cover Crop	1,025	10	1,015	1%
No-Till Soybean Following Corn Silage with No Cover Crop	65	0	65	0%
No-Till Soybean Following Soybean with a Cover Crop	40	0	40	0%
No-Till Corn Following Small Grain for Hay or Silage	673	0	673	0%
No-Till Soybean Following Small Grain for Hay or Silage	75	0	75	0%
No-Till Corn Following Grass Hay or Alfalfa	661	0	661	0%
No-Till Soybean Following Grass Hay	90	0	90	0%
No-Till Corn Double Cropped	39	0	39	0%
No-Till Soybean Double Cropped	884	0	884	0%
<b>Total Acreage</b>	<b>12,608</b>	<b>1,684</b>	<b>10,924</b>	

**Table 3: Survey Data for Conventional Tillage Cropping Systems Summarized and Sorted by Slug Damage Percentage**

	Total Acres	Acres Damaged	Acres Not Damaged	Percent Damaged
Conventional Soybean Following Corn with No Cover Crop	1,442	47	1,395	3%
Conventional Corn Following Corn with a Cover Crop	120	0	120	0%
Conventional Corn Following Corn with No Cover Crop	706	0	706	0%
Conventional Corn Following Soybean with a Cover Crop	200	0	200	0%
Conventional Corn Following Soybean with No Cover Crop	635	0	635	0%
Conventional Soybean Following Corn with a Cover Crop	675	0	675	0%
Conventional Soybean Following Small Grain for Hay or Silage	140	0	140	0%
Conventional Soybean Following Grass Hay	0	0	0	
Conventional Soybean Following Soybean with a Cover Crop	0	0	0	
Conventional Soybean Following Soybean with No Cover Crop	0	0	0	
Conventional Corn Following Grass Hay	0	0	0	
Conventional Corn Following Small Grain for Hay or Silage	20	0	20	0%
<b>Total</b>	<b>3,938</b>	<b>47</b>	<b>3,891</b>	

**Table 4: Percentage of Acres in No-Till Fields with Damage Following Corn for Grain versus Soybean**

Cropping System	% Following Corn	% Following Soybean	% Point Change
No-Till Corn with Cover Crop	26%	21%	-5%
No Till Corn with No Cover Crop	18%	14%	-4%
No-Till Soybean with Cover Crop	68%	0%	-68%
No-Till Soybean with No Cover Crop	26%	11%	-15%
Average			-23%

**Table 5: Percentage of Acres in No-Till Fields with Damage Following a Cover Crop or No Cover Crop**

Cropping System	% With Cover Crop	% Without Cover Crop	% Point Change
No-Till Corn after Corn	26%	18%	-8%
No-Till Corn after Soybean	21%	14%	-7%
No-Till Corn after Corn Silage	4%	1%	-3%
No-Till Soybean after Corn	68%	26%	-42%
Average			-6%

	Total Number of Farmers	Farmers with Damage	Percent of Farmers with Damage
Always Use Insecticide	20	13	65%
Sometimes Use Insecticide	13	3	23%
Never Use Insecticide	8	1	13%

\* When the survey was conducted farmers were asked the question: *“How often do you spray insecticides when you are spraying pre-plant herbicides to no-till corn and soybean?”* Always means every time either corn or soybean will be no-tilled, sometimes means that insecticide is used about half of the time, and never means that insecticide is never sprayed when applying pre-plant herbicides.

### Summary/Conclusions:

This is a summary of observations by 41 farmers located in the Northern Shenandoah Valley of Virginia representing 16,546 acres of corn and soybean (with 12,608 of these acres no-tilled). There are several limitations to the data summarized in this report. First it is important to remember that these data are a collection of observations that cannot be statistically validated. Second, this survey only encompasses one growing year. It will be necessary to collect data for two or three years before solid conclusions are possible. A few farmers stated that in the prior year their slug damage was worse in a different cropping system. Finally, the report summarizes farmers observations about damage caused by slugs. There may have been slugs present and possibly a small amount of injury in fields with no damage (i.e. don't assume that “no damage” means there were no slugs present or there was no feeding injury).

- In this survey slug damage appeared to be higher anytime either corn or soybean was no-till planted followed corn for grain compared to anytime either corn or soybean was no-till planted following soybean. Specialists from other states noted that in prior years corn planted following a wheat/soybean double crop had typically been the most problematic.
- In this survey, planting a cover crop appeared to increase the incidence of slug damage. It is likely that 90% of the cover crop planted in the Northern Shenandoah Valley is a small grain (wheat, barley or rye) that is planted at two bushels per acre. This survey did not distinguish how the cover crops was planted (i.e. was it no-tilled or was the ground disked)? There is some thought that heavy disking prior to planting cover crop will destroy slugs and slug eggs. Also this survey does not differentiate different cover crop species or blends. The majority of cover crop planted in this area is small grain. There are also diakon radish, crimson clover and daikon radish/oat mixes represented in this survey that did not have slug injury (it was simply classified in the broad category “cover crop”).

- Based on this data and prior years' observations, planting no-till corn or soybean following grass hay (a perennial grass sod such as Orchardgrass, fescue, or bluegrass) does not appear to result in slug damage. Alfalfa is not included in this statement because the survey only included one or possibly two fields where corn followed alfalfa.
- Based on this data and prior years' observations, planting no-till corn or soybean following small grain for hay or silage does not appear to result in slug damage. This survey does not distinguish how the small grain was planted (i.e. was it no-tilled or was the ground disked)? There is some thought that heavy disking prior to planting cover crop will destroy slugs and slug eggs.
- Based on this data and prior years' observations, planting no-till corn or soybean double-crop (i.e. following small grain for grain) does not appear to result in slug damage.
- This survey attempted to assess the effect of broadcast application of insecticide pre-plant (i.e. applying insecticide mixed with the pre-plant herbicide application) on slug damage. The general theory is that these broadcast applications of insecticides may be killing a beneficial insect that could potentially limit the number of slugs in a field. There are many aspects of this issue that need further study before any major conclusions can be reached. First we do not know if there are beneficial insects that actually control slugs in any situations. Second, we do not know if a single application of insecticide in the early spring causes long term damage to the population of these beneficial insects. Also, we know that there are areas within the mid Atlantic region where farmers need to spray pre-plant insecticides to control cutworms or armyworms. Thus, while the data in this report is intriguing, more study is needed to better assess the impact of pre-plant broadcast application of insecticide on slug damage.

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