Integrated Pest Management
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Integrated Pest & Crop Management

Soil Sampling for Soybean Cyst Nematodes to Prevent Potential Yield Losses

by Amanda Howland and Manjula Nathan

Soybean planting is just weeks away, and it is important to test your fields for Soybean Cyst Nematodes (SCN) now before planting. SCN is a major concern to growers throughout the state. These plant-parasitic round worms invade the plant roots and suck nutrients from the plants, decreasing their ability to produce adequate yields. The challenge with preventing SCN is that infected plants do not easily express symptoms. Fields can sustain up to 30% yield loss due to SCN without displaying any symptoms, making sampling the only way to identify a problem that you might not actually be seeing. Producers often ignore the possibility of SCN because they plant resistant varieties, but it is important to realize that SCN can adapt to the resistance lines if the same resistant seed source is used year after year. Amanda Howland, the new coordinator for the MU Extension Plant Nematology labs, says 87% of the soil samples received since January 1, 2015 tested positive for having SCN, with egg counts ranging from 100 to over 100,000 eggs per cup of soil (250 cc3). Roughly 25% of the total samples tested had more than the threshold value of 10,000 SCN eggs/cup of soil. This proves it is important to sample soybean fields and check SCN egg counts periodically (every three years) to monitor whether the egg counts are increasing.

Although typically fall is the best time to check fields for SCN because the results will be available for use in making decisions and plans for the next growing season, especially in terms of crop rotation and soybean variety selection, it is still not too late to sample the fields now ahead of planting.

Since SCN egg counts are only as good as the sample taken, here are a few tips for sampling for SCN:

- Limit the size of the area being sampled: 10 - 20 acres is a good target.
- Using a bucket and probe or shovel, walk the area in a W or Z pattern, sampling about 8 inches deep in the root zone between the rows. Take about 20 cores (with a shovel take ¼ cup of soil from near the shovel tip). Mix the cores well into a composite sample, and bag about a pint of the soil for submission. Do not let the samples dry out! Nematodes are sensitive to heat. Do not leave samples in the sun or other areas of high temperature.
- Label the plastic bag and ship it as soon as possible.
- Fill out a submission form (available from our website or your local extension agent) or on a piece of paper indicate:
  1. Name, address, phone, and email (if you have email, results can be sent quickly)
  2. County and cropping history
  3. Type of test: SCN egg count ($20), modified HG type test (In state: $75; Out of state: $125),full HG type test(In state: $100; Out of state: $150), or Plant-Parasitic Nematode Analysis which includes plant-parasitic nematodes identification ($30)
  4. The mailing address for the lab is:
     Plant Nematology Lab, 23 Mumford Hall,
     University of Missouri, Columbia, MO 65211

(continued on pg. 3)

In This Issue

Don't Get Lost in the Weeds: 5 Thoughts on Soybean Weed Management in 2016

by Kevin Bradley

#1: Even when commodity prices are low, we cannot afford to skimp on weed management. There are few things more discouraging than listening to all the predictions about commodity prices and farm income right now. And when times are tight financially, one of the first things many farmers will try to figure out is how they can reduce input costs. I certainly don't have all the answers to this one, but I would submit that we cannot afford to cut costs when it comes to weed management. I have talked to many farmers who are tempted to cut costs by cutting the rate of their pre-emergence residual herbicide, or by choosing a cheaper, less-effective herbicide than they had originally planned on using. The problem is, many studies have shown that this just doesn't work out in the long-term. For example, a recent economic modeling study sanctioned by the Weed Science Society of America showed that following good weed resistance best management practices like mixing effective herbicide sites of action can involve higher weed-control costs initially, but provides better weed control, higher yields and more revenue over the long-term. In fact, depending on the cropping system, farmer profits were increased by 14 to 17 percent in this study over a 20-year period.

#2: Prevented plant acres and fields with weed failures last year will almost certainly be areas with high weed pressure this year. We set all kinds of records last year for the number of acres of corn and soybean that were never planted. Many of these prevented plant acres grew up into weedy messes. In some of those fields the weeds - mostly waterhemp or horseweed - produced viable seeds that were deposited back into the soil. Waterhemp produces about 300,000 to 500,000 seeds per plant and I would guess that the average density in those fields was about 2 to 3 plants per square foot so you can do the math. The bottom line is, the number of weed seed sitting in the soil waiting to germinate this spring may be unlike anything we've ever experienced before.

#3: Continue to be on the lookout for Palmer amaranth. Waterhemp (*Amaranthus rudis*) is still the most common and troublesome weed in corn and soybean production throughout most of Missouri, and I'm not sure if that will ever change. But Palmer amaranth (*Amaranthus palmeri*) is the #1 "weed to watch" in most of Missouri and throughout most of the U.S. right now. I say most of Missouri because the bootheel has had Palmer amaranth for decades, but it has not been present in the rest of the state until recently. Palmer amaranth is a much more aggressive and competitive pigweed than waterhemp, and over the past four to five years, we have watched this weed move northward into areas of the state where it did not previously occur. Palmer amaranth seed can be transported in used equipment; in feed, seed, or hay coming out of the southern U.S.; and as we have shown in a recent study, waterfowl can also transport Palmer amaranth seed. One of the primary ways to differentiate Palmer amaranth from waterhemp is by the presence of the leaf petioles that are usually as long as or longer than the leaf blades themselves. Palmer amaranth leaves are also more diamond-shaped in outline, and often have a poinsettia-like leaf arrangement when viewed from above.

#4: Herbicide resistance in waterhemp is here to stay. I wish it weren't the case, but so far I haven't seen any evidence to the contrary. The fact is, so far in our history with waterhemp we've never seen resistance disappear from a given population or geography. On the contrary, we've only seen herbicide resistance permeate throughout more waterhemp populations over a wider geography. A case in point is with the group 2 ALS herbicide resistance that started to appear in the late '80's/early '90's in waterhemp. This was a result of the continuous application of herbicides like Scepter and Pursuit at that time. Fast-forward a couple of decades to today and now we can't find any waterhemp populations in Missouri that don't have resistance to these group 2 ALS herbicides, and none of them provide any appreciable control of waterhemp. Another obvious example is with glyphosate; we discovered the first glyphosate-resistant waterhemp population in Missouri in 2004. At that time there were no other "official" glyphosate-resistant waterhemp populations identified anywhere in the U.S. By 2009, we conducted a survey of soybean fields at harvest and found that 69% of the waterhemp populations were resistant to glyphosate. By then, 7 other states had also found glyphosate resistance in waterhemp. Five years

(continued on pg. 3)

after that we conducted another survey and found a similar or higher percentage of glyphosate-resistant waterhemp populations, but by this time most of the waterhemp populations exhibited resistance to 2 or 3 other classes of herbicides, some even with 4- and 5-way resistance. And at this same time in 2014, 13 states other than Missouri now had glyphosate-resistant waterhemp, most of which were also starting to see outbreaks of multiple resistance. My fear is that we don't appreciate the significance of resistance in waterhemp, how quickly it can spread throughout a wide geography, and how quickly we can lose an entire herbicide site of action that once provided effective control of this weed. Consider the timelines I have described above when you decide on your waterhemp management program for 2016. We have very few effective herbicide sites of action left for waterhemp, so we have to preserve those herbicides sites of action that still work by using them appropriately.

#5: We must preserve the new herbicide-resistant trait technologies, and use them wisely. Most are aware by now that there will be Roundup Ready 2 Xtend soybean varieties commercially available during the 2016 season. The Xtend trait confers resistance to dicamba and glyphosate but at the time of this writing there is still no label for over-the-top applications of any dicamba product to these varieties. Also at the time of this writing, Enlist soybean varieties have not been approved for sale yet during the 2016 season. Whenever these traits and accompanying herbicides get approval, it is very important that we preserve these technologies. What I mean by that is that we cannot afford to misuse the Xtend or Enlist traits right out of the gate and/or view them as the answer to all our weed resistance problems. If they are being promoted as the "solution" to weed resistance, those who are doing so are wrong. Both traits offer another tool in the toolbox to help with resistant weeds like waterhemp. But if you don't use pre-emergence residual herbicides, mix effective herbicide sites of action at every application, and make timely applications to small weeds, you will not be happy with the results. Also, let's not forget that there are 2,4-D and dicamba-resistant weeds already. In fact, we have recently confirmed the presence of a 2,4-D resistant waterhemp population in a corn/soybean field in Missouri, as have weed scientists in Illinois. And although there are no known dicamba-resistant pigweeds in the U.S. yet, weed scientists in Arkansas selected for a dicamba-resistant Palmer amaranth in a greenhouse setting using less than labeled rates of dicamba over 3 generations. Although this was done in a controlled environment, this study proved that "abusing" the technology will result in weeds that are resistant to dicamba as well. If we do get a label for the use of any dicamba product in Xtend soybean in 2016, we must use these herbicides appropriately. This means using full-labeled rates on weeds that are less than 4 inches tall at the time of application, and preferably mixing more than one effective herbicide site of action at each application. It also means being aware of the risks of off-target movement of dicamba.

(*Soil Sampling for Soybean Cyst Nematodes to Prevent Potential Yield Losses, continued.*)

The **SCN Egg Count test** is what most soybean growers would need. If you notice a field that is slipping in yield, had high egg counts years ago, or you haven't had your soils tested for SCN in the last three years, a $20 SCN Egg Count test is a worthwhile investment that can offer peace of mind and save considerable yield loss.

The **HG Type test** would be for the grower who has high egg counts after growing resistant lines for years. This test indicates the HG type (or race) of SCN in the field, and what sources of resistance would be good to choose when buying seed.

The **Plant-Parasitic Nematode Analysis test** is a count of all the plant-parasitic nematodes in the sample. (It does not give an SCN egg count.) This test is used if you feel you may have a nematode problem other than SCN. This test would also be important for growers in SE Missouri who may have the rootknot nematode as well as SCN.

The Extension Nematology Lab has a website with more information on how to sample, the tests we provide, and how samples are analyzed in the lab. A submission form can also be downloaded from the site http://soilplantlab.missouri.edu/nematode. The turnaround time for the lab is typically 3-5 to working days.
For management decisions regarding SCN please refer the University of Missouri Extension Guide on Soybean Cyst Nematode: Diagnosis and Management.

This guide can be downloaded at: http://extension.missouri.edu/publications/DisplayPub.aspx?P=g4450.

Weather Data for the Week Ending March 29, 2016

Station	County	Weekly Temperature (°F)						Monthly Precipitation (in.)		Growing Degree Days‡	
		Avg. Max.	Avg. Min.	Extreme High	Extreme Low	Mean	Departure from long term avg.	March 1-28	Departure from long term avg.	Accumulated Since Apr 1	Departure from long term avg.
Corning	Atchison	61	33	79	24	48	+2	0.77	-1.18	*	*
St. Joseph	Buchanan	58	35	75	28	48	+1	0.72	-1.24	*	*
Brunswick	Carroll	62	39	75	31	49	+1	2.11	-0.12	*	*
Albany	Gentry	57	32	72	24	45	-1	1.52	-0.57	*	*
Auxvasse	Audrain	62	38	73	31	49	+2	1.40	-1.23	*	*
Vandalia	Audrain	61	37	69	30	48	+2	2.20	-0.56	*	*
Columbia-Bradford Research and Extension Center	Boone	62	37	74	30	48	0	1.34	-1.53	*	*
Columbia-Capen Park	Boone	64	35	77	25	48	-1	1.64	-1.13	*	*
Columbia-Jefferson Farm and Gardens	Boone	63	38	73	29	49	+1	1.41	-1.45	*	*
Columbia-Sanborn Field	Boone	63	39	75	30	50	+1	1.55	-1.28	*	*
Columbia-South Farms	Boone	63	38	73	28	49	+1	1.47	-1.44	*	*
Williamsburg	Callaway	62	37	73	28	48	+1	2.03	-0.82	*	*
Novelty	Knox	58	36	66	28	47	+1	1.87	-0.49	*	*
Mosow Mills	Lincoln	62	38	69	29	49	+1	1.22	-1.52	*	*
Linneus	Linn	59	38	70	28	47	+1	2.43	+0.20	*	*
Monroe City	Monroe	60	34	69	25	48	+1	1.31	-1.13	*	*
Versailles	Morgan	64	39	75	29	51	+2	1.34	-1.43	*	*
Green Ridge	Pettis	63	38	73	28	49	+1	1.43	-1.20	*	*
Unionville	Putnam	55	35	66	28	45	0	2.50	-0.05	*	*
Lamar	Barton	63	36	75	27	50	0	1.61	-1.68	*	*
Butler	Bates	63	37	75	25	50	+1	1.89	-0.98	*	*
Cook Station	Crawford	65	36	73	27	49	-1	2.49	-0.91	*	*
Round Spring	Shannon	67	35	72	27	49	0	2.36	-1.16	*	*
Mountain Grove	Wright	63	38	71	31	49	+1	2.05	-1.52	*	*
Delta	Cape Girardeau	63	39	74	34	51	0	2.94	-1.03	*	*
Cardwell	Dunklin	65	42	76	35	53	0	6.08	+2.13	*	*
Clarkton	Dunklin	64	41	76	34	52	0	4.78	+1.24	*	*
Glennonville	Dunklin	64	41	76	35	52	0	3.40	-0.08	*	*
Charleston	Mississippi	65	42	76	35	53	+2	5.34	+1.78	*	*
Hayward	Pemiscot	64	42	77	36	53	0	5.75	+2.08	*	*
Portageville	Pemiscot	65	43	77	37	54	+1	6.67	+2.97	*	*
Steele	Pemiscot	66	42	78	36	54	+1	5.75	+1.79	*	*

‡Growing degree days are calculated by subtracting a 50 degree (Fahrenheit) base temperature from the average daily temperature. Thus, if the average temperature for the day is 75 degrees, then 25 growing degree days will have been accumulated.

Weather Data provided by Pat Guinan | GuinanP@missouri.edu | (573) 882-5908

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