In This Issue

Armyworm Pheromone Trap Report – 2019

(John Obermeyer)

County/Cooperator	Wk 1	Wk 2	Wk 3	Wk 4	Wk 5	Wk 6	Wk 7	Wk 8	Wk 9	Wk 10
Dubois/SIPAC Ag Center	5	24	91							
Jennings/SEPAC Ag Center	0	2	9							
Knox/SWPAC Ag Center	105	34	78							
LaPorte/Pinney Ag Center	0	127								
Lawrence/Feldun Ag Center	148	60	124							
Randolph/Davis Ag Center	0	193	183							
Tippecanoe/Meigs	8	5	127							
Whitley/NEPAC Ag Center	4	191	384							

Wk 1 = 4/4/19-4/10/19; Wk 2 = 4/11/19-4/17/19; Wk 3 = 4/18/19-4/24/19; Wk 4 = 4/25/19-5/1/19; Wk 5 = 5/2/19-5/8/19; Wk 6 = 5/9/19-5/15/19; Wk 7 = 5/16/19-5/22/19; Wk 8 = 5/23/19 – 5/29/19; Wk 9 = 5/30/19-6/5/19; Wk 10 = 6/6/19-6/12/19

2019 Black Cutworm Pheromone Trap Report

(John Obermeyer)

		BCW Trapped						
County	**Cooperator**	**Wk 1 3/28/19-4/3/19**	**Wk 2 4/4/19-4/10/19**	**Wk 3 4/11/19-4/17/19**	**Wk 4 4/18/19-4/24/19**	**Wk 5 4/25/19-5/1/19**	**Wk 6 5/2/19-5/8/19**	**Wk 7 5/8/19-5/15/19**
Adams	Roe/Mercer Landmark	0	7	20*	41*			
Allen	Anderson/Syngenta							
Allen	Gynn/Southwind Farms	0	0	14*	0			
Allen	Kneubuhler/G&K Concepts		1	65*				
Bartholomew	Bush/Pioneer Hybrids		0	2	2			
Boone	Emanuel/Boone County CES/Lebanon	0	2	13	5			
Clay	Bower/Ceres Solutions/Brazil		6	11	11			
Clay	Bower/Ceres Solutions/Clay City		1	2	5			
Clinton	Emanuel/Boone Co. CES	1	6	20*	9			
Clinton	Foster/Rossville		3	9				
DeKalb	Hoffman/ATA Solutions			0	1			
Dubois	Eck/Dubois Co. CES	4	14	23	19*			
Fayette	Schelle/Falmouth Farm Supply Inc.	1	11	24*	3			
Fountain	Mroczkiewicz/Syngenta	0	16*	24*	22*			
Fulton	Jenkins/Ceres Solutions/Talma		0	3	5			
Fulton	Ranstead/Ceres Solutions	0	0	0	0			
Hamilton	Campbell/Beck's Hybrids	0	4	20*	8			
Hendricks	Nicholson/Nicholson Consulting	0	1	8	8			
Hendricks	Tucker/Bayer				0			
Howard	Shanks/Clinton Co. CES		0	0				
Jasper	Overstreet/Jasper Co. CES	0	0	7	2			
Jasper	Ritter/Brodbeck Seeds		0	12				
Jay	Boyer/Davis PAC	2	24	52*	35			
Jay	Shrack/Ran-Del Agri Services	0	6	55*	32*			
Jay	Temple/Jay Co. CES/Redkey	0	0	4	0			
Jay	Temple/Jay Co. CES/Pennville	0	1	48*	1			
Jennings	Bauerle/SEPAC	1	5	8	5			
Knox	Bower/Ceres Solutions/Freelandville		0		0			
Knox	Bower/Ceres Solutions/Vincennes							
Lake	Kleine			7	7			
Lake	Moyer/Dekalb Hybrids/Shelby	0	3	14	4			
Lake	Moyer/Dekalb Hybrids/Scheider	0	2	6	0			
LaPorte	Rocke/Agri-Mgmt. Solutions	0	0	13				
Marshall	Barry				0			
Marshall	Harrell/Harrell Ag Services		2					
Miami	Early/Pioneer Hybrids	0	0	2	3			
Montgomery	Delp/Nicholson Consulting		23*	23*	7			
Newton	Moyer/Dekalb Hybrids/Lake Village	0	0	2	2			
Porter	Tragesser/PPAC	0	0	7				
Posey	Schmitz/Posey Co. CES	0	1		3			
Pulaski	Capouch/M&R Ag Services		0		28			
Pulaski	Leman/Ceres Solutions			32*	24			
Putnam	Nicholson/Nicholson Consulting		11*	8	2			
Randolph	Boyer/DPAC	0	2	6	14			
Rush	Schelle/Falmouth Farm Supply Inc.	0	0	1	0			
Shelby	Fisher/Shelby County Co-op		3	2	7			
Shelby	Simpson/Simpson Farms	1	21*	49*	39*			
Stark	Capouch/M&R Ag Services		0					
St. Joseph	Carbiener		0	3				
St. Joseph	Deutscher/Helena Agri-Enterprises	0	0	5				
Sullivan	Bower/Ceres Solutions/New Lebanon		12	6	8			
Sullivan	Bower/Ceres Solutions/Sullivan		0	16*	26*			
Sullivan	Bower/Ceres Solutions/Farmersburg		2	6	14*			
Tippecanoe	Bower/Ceres Solutions	0	9	0	9			
Tippecanoe	Nagel/Ceres Solutions	0	5	20*	34*			
Tippecanoe	Obermeyer/Purdue Entomology	0	0	0	4			
Tippecanoe	Westerfeld/Monsanto Research Farm	0	7	18	18			
Tipton	Campbell/Beck's Hybrids	0	25*	54*	0			
Vermillion	Bower/Ceres Solutions/Clinton		0	0	0			
Wabash	Enyeart/Ceres Solutions		0	8				
White	Foley/ConAgra	0	0	2	5			
Whitley	Richards/NEPAC/Schrader		10		36*			
Whitley	Richards/NEPAC/Kyler		4		19*			

* = Intensive Capture…this occurs when 9 or more moths are caught over a 2-night period

Field Crop Disease Update 2019: Why is My Wheat Turing Yellow? Accurate Diagnosis of Potential Viruses Causing Disease in

Wheat.

(Darcy Telenko), *(Gail Ruhl)* & *(Tom Creswell)*

Wheat has greened-up and is actively growing across Indiana. Our southern field plots in Vincennes were at Feekes 8 (flag leaf emerged) earlier this week, while in West Lafayette plots are at Feekes 5 (leaf sheath strongly erect). There have been some concerns about fields with yellow, stunted patches of plants. A variety of factors can contribute to these symptoms including several wheat virus pathogens as well as soil pH, fertility and environmental factors. It is important to observe the whole field to determine the special distribution of symptoms – are they uniform, spotty or patterned in appearance? Are they in a low, wet area or are they along a field edge where insect vectors are moving off overwintering hosts.

There are four common viruses that cause disease in Indiana wheat. They include five strains of barley yellow dwarf virus (BYDV), wheat spindle streak mosaic virus (WSSMV), soilborne wheat mosaic virus (SBWMV), and wheat streak mosaic virus (WSMV). The Purdue Plant and Pest Diagnostic Lab (PPDL) received their first set of wheat samples this week and confirmed the presence of WSSMV.

Wheat Virus Identification

You can guess at wheat virus identification based on symptoms in the field however lab testing is essential for accurate diagnosis. Typically virus infected plants appear in uneven patches of yellow to light green areas in a field, this can easily be confused with environmental/site issues including low pH and related nutritional deficiencies.

Symptoms of Wheat spindle streak mosaic virus (WSSMV) and Soilborne wheat mosaic virus (SBWMV) are visible in the spring and are generally uniform across a section of the field. A yellow/green mottled, mosaic pattern will be visible on the leaves. The plants may be stunted with leaf tip dieback and lower leaves may have a reddish appearance. Plants infected by WSSMV or SBWMV may have fewer tillers, stems and heads with fewer kernels. Infection occurs in the fall. The viruses are transmitted to the wheat root by a soilborne fungus vector, *Polymyxa graminis,* and can survive in the soil for up to five years.

Figure 1. Wheat infected by wheat spindle streak mosaic virus (WSSMV). Typical display of spindle-like chlorotic lesions of WSSMV on foliage and mosaic pattern. Yellow, mottled, mosaic patterns can also be a symptom of SBWMV infection.

Symptoms caused by Wheat streak mosaic virus (WSMV) on wheat growing in Indiana may include yellowing, stunting and curling of leaves due to feeding by the wheat curl mite, the primary vector of WSMV. Time of infection and environmental conditions will determine severity of disease ; warm dry conditions favor WSMV due to an increase in the wheat curl mite population. Wheat curl mites can transmit the virus for up to a week after feeding on an infected plant and generally move in the wind from one plant to another in a field. Early colonization of the wheat by the wheat curl mite can lead to a more pronounced WSMV symptom development, premature plant death and greater yield loss.

Barley yellow dwarf virus (BYDV) has many different strains that can infect more than 150 different grass species, including wheat, oats, barley, rice and corn. These viruses are vectored by aphids. Once an aphid acquires the virus by feeding on an infected host it can transmit the virus to a new host for two to three weeks. It will take two to three weeks for symptoms to appear in wheat after the initial infection while fall infections may not appear until the following spring. Symptoms of BYD in wheat include stunted tillers and roots and discolored foliage. A reddish discoloration usually starts at the tip of the flag leaf and moves downward; eventually in wheat the leaves may appear yellow, red or purple in color. BYDV infection can lead to reduced tillering, poor flowering and kernel sterility or failure to fill.

Figure 2. A yellow patch of wheat in a field due to wheat spindle streak mosaic virus (WSSMV).

Management Options for Wheat Viruses

There are no control options to reduce viral symptoms in currently infected plants, however accurate diagnosis of wheat viruses is important for future disease management plans. Healthy plants can better tolerate infection so it is important to manage other foliar diseases in wheat and maintain adequate moisture and nutrients.

Many wheat varieties are available that have partial resistances to one or more of these wheat viruses and/or their vectors. Understanding the risk of field to a specific virus can aid in variety selection down the road, as planting a less susceptible variety is the first line of defense in viral disease management.

Removal of volunteer wheat or other grasses late in the season may also help reduced the “green bridge” for the vectors or virus survival into the next season.

If you suspect viral infection a sample can be submitted to the Purdue Plant and Pest Diagnostic Lab (PPDL) (https://ag.purdue.edu/btny/ppdl/Pages/Submit-A-Sample.aspx). The PPDL can test for the presence of ten wheat viruses. They include five strains of Barley Yellow Dwarf Virus (BYDV; strains PAV, MAV, RMV, SGV, and RPV); Wheat Spindle Streak Mosaic Virus (WSSMV); Soilborne Wheat Mosaic Virus (SBWMV); Wheat Streak Mosaic Virus (WSMV); High Plains Virus (HPV) and Triticum Mosaic Virus (TriMV). The cost of the wheat virus screen is $50, in addition to the usual sample handling fee of $11 for in-state samples and $22 for out-of-state samples.

For more information see Purdue Extension publication “Diseases of Wheat: Wheat Viruses” https://extension.purdue.edu/extmedia/BP/BP-146-W.pdf

How Much AMS Do I Need to Combat Hard Water Antagonism of Postemergence Herbicides?

(Bill Johnson), *(Bryan Young)* & *(Marcelo Zimmer)*

We have received a few questions this winter and spring about ammonium sulfate (AMS) rates to use with postemergence herbicides and how much is needed to overcome hard water issues. Because of lower commodity prices and grower interest in keeping input expenses as low as possible, I thought it would be a good time to review this topic and the AMS equation to help applicators and farmers plan for spring and summer herbicide applications.

First, we would like to review the reasons for using ammonium sulfate with postemergence herbicide treatments. It is fairly well-known that the weed control efficacy of many weak acid herbicides like glyphosate, 2,4-D, clethodim (Select and others), glufosinate (Liberty and others) can be reduced when water sources contain hard water cations like calcium (Ca^{+2}), iron (Fe^{+3}), magnesium (Mg^{+2}), and sodium (Na^{+}). The hard water cations, which have a positive charge, will bind to the negatively charged herbicide molecule and reduce the herbicide’s ability to be absorbed into the plant. Sometimes we call this process chelating and it is well known that glyphosate can chelate Ca^{2+} ions, and that calcium can tie up multiple glyphosate molecules (Figure 1). To correct this problem, when you add AMS $(NH_4)_2SO_4$ to the tank, the ammonium (NH_4^{+}) disassociates from the sulfate (SO_4^{-2}) and the sulfate preferentially binds to the positively charged hard water cations. The sulfate essentially sequesters the hard water cations and prevents them from binding to the herbicide (Figures 2 and 3). Additionally, after antagonistic minerals are neutralized by the sulfate, the ammonium can bind with the herbicide to form the ammonium herbicide salt, which can more effectively pass through the plant cuticle resulting in greater herbicide absorption, in some cases increased herbicide translocation, and overall greater herbicide efficacy. This ‘physiological’ effect of AMS enhancing foliar herbicide activity even in the absence of hard water is important to keep in mind when considering adjuvant products that contain less ammonium, yet claim to be a replacement for AMS.

A simple formula was developed by weed scientists at North Dakota State University to show the minimum amount of AMS needed to overcome hard water antagonism. Since we know which hard water cations are most problematic (K, Na, Ca, Mg, Fe), it is fairly easy to calculate the amount of ammonium sulfate needed to condition the water to reduce the negative implications of hard water antagonism.

The minimum amount of AMS needed to tie up hard water cations is calculated with this formula:

lbs AMS/100 gal = (0.002 X ppm K)
+ (0.005 X ppm Na)
+ (0.009 X ppm Ca)
+ (0.014 X ppm Mg)
+ (0.042 X ppm Fe)

While this formula can be used to overcome the hard water cations in the spray solution (spray tank), the formula does not take into account hard water cations on plant leaf surfaces, which are fairly prevalent. Many plants, such as velvetleaf (Figures 4 and 5), contain Ca on the leaf surface, and additional sulfate is needed to overcome the antagonism which can occur after the spray solution leaves the nozzle. It is difficult to calculate the amount of ammonium sulfate needed to overcome Ca on the leaf surface. This is the reason why herbicide labels typically contain statements that indicate that rates of AMS, 8 ½ to 17 pounds of AMS per hundred gallons of water, are recommended on many glyphosate labels. Since AMS has typically been a low cost spray water conditioner, the additional amount added to a spray tank has not been viewed as a major expense. However, in this era of low commodity prices and pressure on farmers to reduce input expenses, there may be an opportunity to reduce the amount of AMS applied and not compromise herbicide activity. It is highly likely that AMS rates can be reduced to the lower end of the recommended rate and herbicide activity will not be compromised. However, we would advise that it will be important to understand your water hardness test levels before severely reducing AMS rates.

Please keep in mind that the benefit of AMS goes beyond conditioning hard water since improved weed control with herbicides and AMS can even be observed when using de-ionized (distilled) water. Thus, a good rule of thumb would be to add more AMS to your spray solution than what is specifically calculated above for your hard water to account for this ‘physiological’ benefit and fall within the herbicide label requirements for AMS.

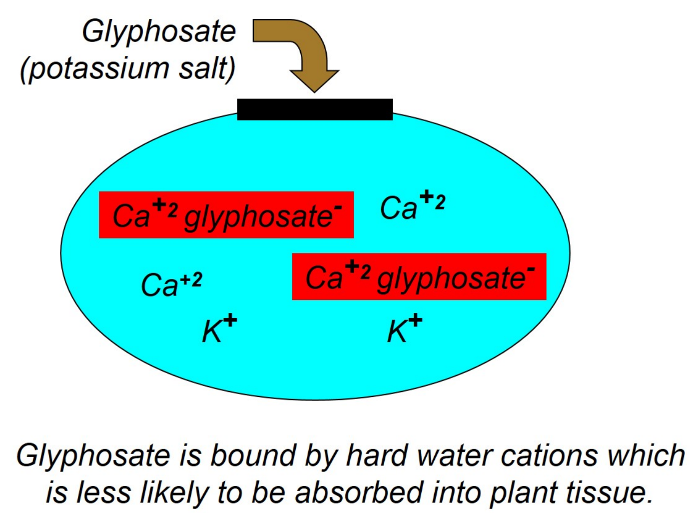


Figure 1. Glyphosate molecules in hard water.

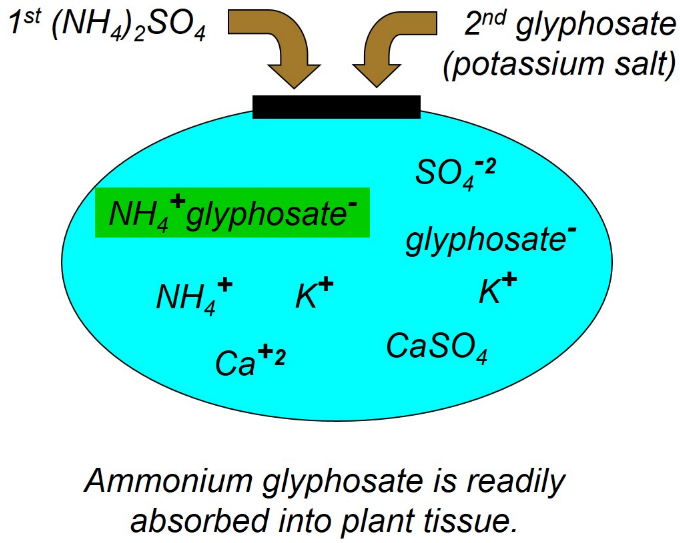


Figure 2. Glyphosate molecules in hard water plus Ammonium Sulfate (AMS).

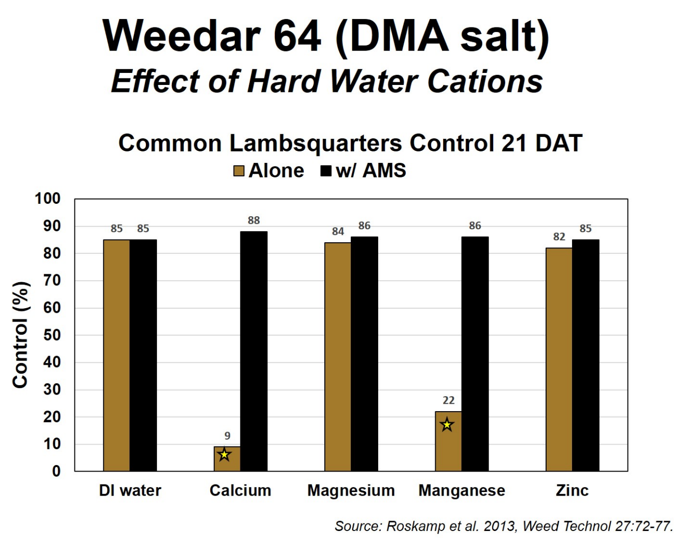


Figure 3. Effect of hard water cations on herbicide efficacy of weak acid herbicides.

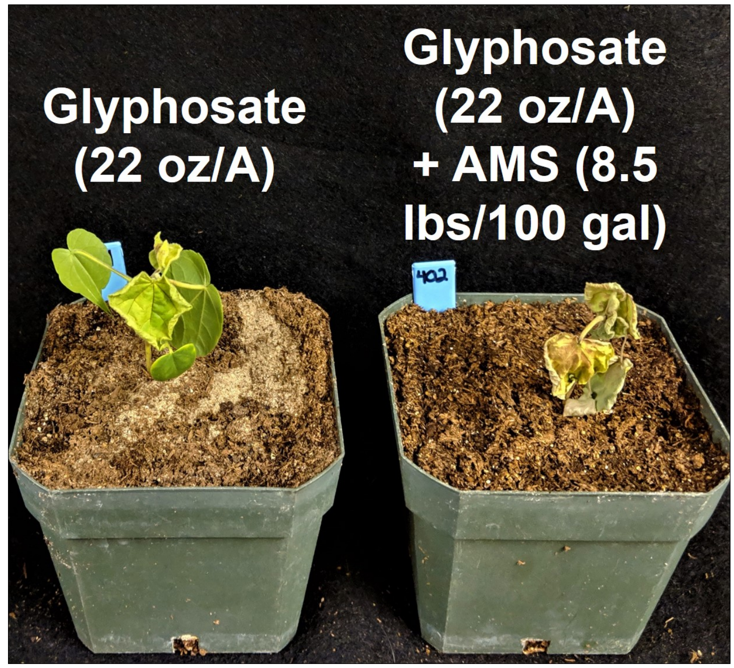


Figure 4. Effect of Ammonium Sulfate (AMS) on velvetleaf control with glyphosate in the greenhouse.

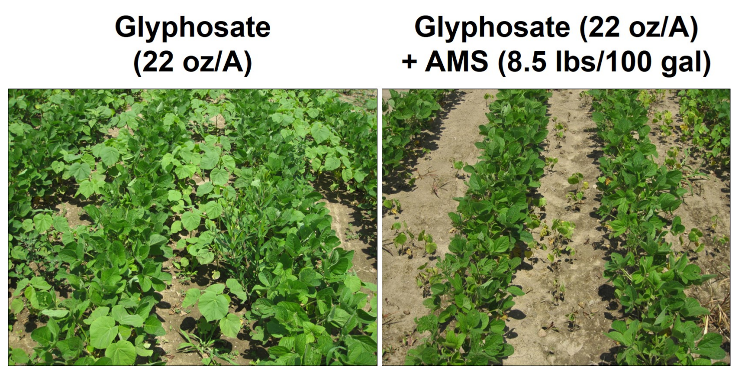


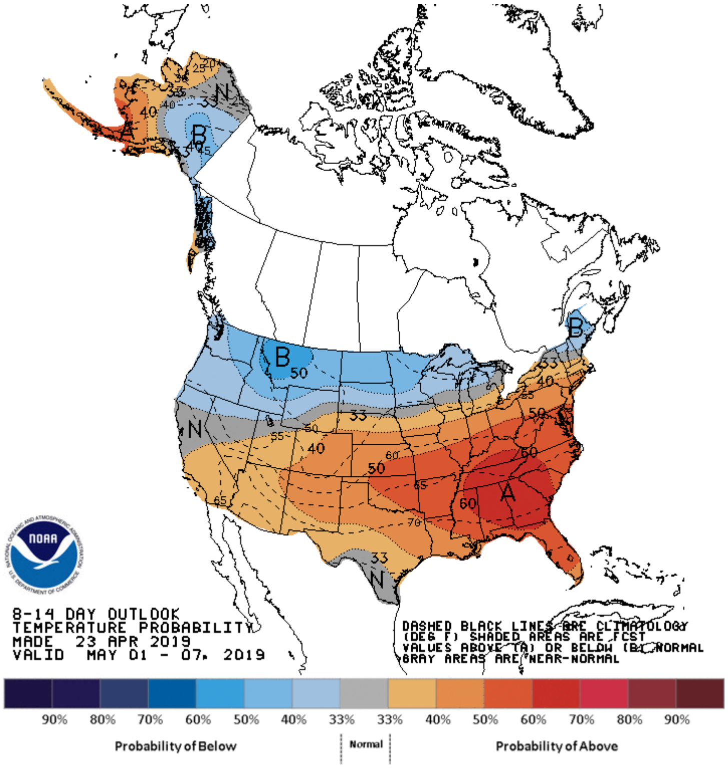
Figure 5. Effect of Ammonium Sulfate (AMS) on velvetleaf control with glyphosate in the field.

Indiana Climate and Weather Report – 4/23/2019

(Hans Schmitz)

No reason exists to expect drought anytime soon in Indiana, with much of the state remaining rather wet after last weekend's showers. One good new development exists. The precipitation pattern that has existed since nearly January seems to be becoming a little less predictable, which could mean more periods of drier weather between fronts on the horizon. Another bit of good news exists in above normal temperatures predicted on both the 7-10 and 8-14 day forecasts, according to the Climate Prediction Center, which would allow for quicker drying of soils after any precipitation that does fall.

Current growing degree days (base 50) for 2019, as of April 22, vary from 206 in Indianapolis to 322 in Evansville to 111 in Angola, marking a clear gradient in insect development and greening from south to north. The entire state is now monitoring conditions for issuance of frost/freeze warnings from the NWS, as sensitive vegetation exists state-wide.



8-14 Day Outlook Temperature Probability Made 23 Apr 2019 Valid May 01-07, 2019.

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