1. Importance of controlling volunteer wheat

Now is a good time to plan for controlling volunteer wheat, if it hasn’t been done so already. Recent problems with wheat streak mosaic, High Plains Virus, and triticum mosaic virus in much of western and parts of central Kansas reminds us of the importance of controlling volunteer wheat well before this year’s crop is planted.

Volunteer wheat within a half-mile of a field that will be planted to wheat should be completely dead at least two weeks before wheat planting. This will help control wheat curl mites, Hessian fly, and greenbugs in the fall.

The most important threat from volunteer wheat is the wheat streak mosaic virus complex. These virus diseases cause stunting and yellow streaking on the leaves. In most cases, infection can be traced to a nearby field of volunteer wheat, although there are other hosts, such as corn, millet, and many annual grasses, such as yellow foxtail and prairie cupgrass. Control of volunteer is the main defense against the wheat streak mosaic virus complex.

Wheat streak mosaic virus is carried from volunteer to newly planted wheat by the wheat curl mite. These tiny, white, cigar-shaped mites are too small to be seen with the naked eye. The curl mite uses the wind to carry it to new hosts and can travel up to half a mile from volunteer wheat. The wheat curl mite is the vector for both wheat streak mosaic, the High Plains virus, and triticum mosaic virus. In addition, the mite can cause curling of leaf margins and head trapping.

Hessian flies survive over the summer on wheat stubble. When the adults emerge, they can infest any volunteer wheat that may be present, which will keep the Hessian fly population alive and going through the upcoming crop season. This insect often causes significant damage, especially in the eastern two-thirds of the state. Hessian fly larvae attack young wheat plants near the soil line. Tillers may be stunted and later may lodge. In heavy infestations, the whole stand may be
lost. The Hessian fly normally has a spring brood and a fall brood. In years with a wet summer and/or a long open fall, there can be two broods of Hessian fly in the fall; and this is even more likely where volunteer is allowed to grow and become infested early.

Volunteer wheat is a host of barley yellow dwarf virus, and the greenbugs and bird-cherry oat aphids which carry it.

Russian wheat aphids may also live over the summer on volunteer wheat. While this insect has wings and can be wind borne for hundreds of miles, the vast majority of fall infestations in Kansas appear to originate from nearby infested volunteer.

A number of other pests are also associated with the presence of volunteer wheat. An example in western Kansas is the Banks grass mite. During some years, infestations become established during late summer and early fall on volunteer wheat. Later, as the quality of the volunteer deteriorates, mites move from the volunteer into adjacent fields of planted wheat or other small grains. Occasionally mites will survive the winter and continue to spread into the planted wheat following greenup in the spring.

A concern in the eastern part of the state is the chinch bug. Occasionally, adult bugs will fly from maturing sorghum fields in late summer to nearby fields where volunteer wheat is growing. Where infested volunteer is allowed to grow right up until seedbed preparation just prior to planting, early planted continuous wheat is likely to become infested. Similarly, volunteer that is allowed to grow through the fall and into the following spring may also serve as an attractive chinch bug host.

Another reason to control volunteer is that volunteer and other weeds use up large amounts of soil moisture. When water storage is important, such as in summer fallow, volunteer must be destroyed.

Destroying volunteer after the new wheat emerges is too late. Producers should leave enough time to have a second chance if control is incomplete. Tillage and herbicides are the two options available for volunteer control.

Tillage usually works best when plants are small and conditions are relatively dry. Herbicide options depend on cropping systems and rotations. Glyphosate can be used to control emerged volunteer wheat and other weeds during the fallow period in any cropping system. However, it has no residual activity and will not control later germinating volunteer wheat or weeds.

If glyphosate is used too close to planting time, volunteer may stay green long enough to transmit diseases and insects to the new crop. It may take as long as one week following glyphosate application before the wheat will die, so that needs to be considered when timing the application to break the bridge for insects and diseases. The optimum time to treat with glyphosate is when most of the volunteer has emerged and is healthy and actively growing. Glyphosate can effectively control volunteer wheat that has tillered.

Atrazine is a relatively inexpensive treatment for volunteer wheat control that can be applied anytime in the summer or fall, if rotating to sorghum or corn. In the September to October time period, using atrazine plus crop oil alone can often control small volunteer wheat that has not yet tillered, as well as later-emerging volunteer wheat and other weeds.
If the volunteer has tillered, most of the roots will have grown deep enough to be out of the reach of atrazine. This is when it helps to add glyphosate to the atrazine plus crop oil. Glyphosate is translocated from the leaf tissue throughout the plant. The combination of glyphosate and atrazine will provide a good combination of burndown and residual control on both volunteer that has tillered and later-emerging volunteer. Atrazine rates need to be adjusted to soil type and pH, and may not be appropriate for all areas.

In summary, the most important reasons to control volunteer wheat are:

- Wheat curl mite/wheat streak mosaic virus
- Hessian fly
- Russian wheat aphid
- Take-all
- Bird cherry oat aphid/greenbug/Barley yellow dwarf virus
- Banks grass mite
- Chinch bug
- Reduces moisture loss

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2. Soil calcium and magnesium levels: Does the ratio make a difference?

Is it important to have the proper ratio of calcium (Ca) and magnesium (Mg) in the soil? Producers may ask this question as they have their soil tested for nutrient levels in the summer before wheat planting begins. This question may also arise at the moment of lime purchase, which can be an important source of Ca and Mg.

Calcium and Mg are plant-essential nutrients. All soils contain Ca and Mg in the form of cations (positively charged ions, Ca$$^{++}$$ and Mg$$^{++}$$) that attach to the soil clay and organic matter; these are also the forms taken up by crops. The relative proportion of these elements, as well as the total amount in the soil, depends mainly on the soil parent material. In Kansas soils, the levels of Ca and Mg are typically high and crop deficiencies are rare.

Soils typically have higher Ca levels than Mg. Table 1 gives the amount and ratios of Ca and Mg for some soils in Kansas. Both nutrients are present in large quantities. Unusual cases of Ca or Mg deficiencies may be found in areas of very sandy soils.
Table 1. Calcium, magnesium, and Ca:Mg ratio for several Kansas soils.

<table>
<thead>
<tr>
<th>Soil</th>
<th>Ca</th>
<th>Mg</th>
<th>Ca:Mg ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canadian-Waldeck</td>
<td>42</td>
<td>11</td>
<td>3.7</td>
</tr>
<tr>
<td>Carwile</td>
<td>22</td>
<td>4</td>
<td>5.2</td>
</tr>
<tr>
<td>Chase</td>
<td>198</td>
<td>30</td>
<td>6.7</td>
</tr>
<tr>
<td>Crete</td>
<td>111</td>
<td>29</td>
<td>3.8</td>
</tr>
<tr>
<td>Harney</td>
<td>202</td>
<td>15</td>
<td>13.2</td>
</tr>
<tr>
<td>Harney-Uly</td>
<td>200</td>
<td>12</td>
<td>16.1</td>
</tr>
<tr>
<td>Keith</td>
<td>127</td>
<td>38</td>
<td>3.3</td>
</tr>
<tr>
<td>Las</td>
<td>176</td>
<td>37</td>
<td>4.8</td>
</tr>
<tr>
<td>McCook</td>
<td>35</td>
<td>8</td>
<td>4.5</td>
</tr>
<tr>
<td>Onawa</td>
<td>163</td>
<td>28</td>
<td>5.8</td>
</tr>
<tr>
<td>Ortello</td>
<td>19</td>
<td>6</td>
<td>3.3</td>
</tr>
<tr>
<td>Parsons</td>
<td>80</td>
<td>23</td>
<td>3.5</td>
</tr>
<tr>
<td>Tully</td>
<td>158</td>
<td>38</td>
<td>4.2</td>
</tr>
</tbody>
</table>

Why would the ratio of Ca to Mg be important? The concept of an optimum Ca:Mg ratio started in the 1940s under the “basic cation saturation ratio” theory. The theory is that an “ideal soil” will have a balanced ratio of Ca, Mg, and potassium (K). According to this theory, fertilization should be based on the soil’s needs rather than crop’s needs -- focusing on the ratio of crop nutrients present in the soil. This concept of an ideal Ca:Mg ratio has been debated by agronomists over the years. The suggested ideal ratio according to the theory is between 3.5 and 6.0, but this has never proven to be of significance.

There is very little research evidence to support any effect, either positive or negative, of the soil Ca:Mg ratio on crop production and yield. What research studies have been conducted in the laboratory and in the field show no effect of Ca:Mg ratio on crop yield. Despite this, the promotion of the ratio concept persists today. Furthermore, the initial work that derived this concept did not differentiate between crop response (alfalfa) due to the change in Ca:Mg ratio and the improvement in soil pH from lime application. It is reasonable to conclude that crop response can be expected from changes in soil pH rather than any change in the ratio of Ca:Mg.

One example of research conducted on this topic over the years is shown in Table 2. In that experiment, McLean and coworkers demonstrated the lack of relationship between Ca:Mg ratio and crop yield for several crops. The range of Ca:Mg ratios observed for the highest yields were not different from those observed for the lowest yields. The conclusion from that study was that to achieve maximum crop yield, attention should center on providing sufficient levels of these nutrients rather than attempting to find an adequate ratio. Therefore when these nutrients are present in optimum levels for plant growth, the relative ratio in the soil seems irrelevant.
Table 2. Ratio of Ca:Mg for five crop-years comparing the highest and lower yields obtained

<table>
<thead>
<tr>
<th>Yield level</th>
<th>Corn Ca:Mg</th>
<th>Corn Ca:Mg</th>
<th>Soybean Ca:Mg</th>
<th>Wheat Ca:Mg</th>
<th>Alfalfa Ca:Mg</th>
<th>Alfalfa Ca:Mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highest five</td>
<td>5.7 - 26.8</td>
<td>5.7 - 14.2</td>
<td>5.7 - 14.9</td>
<td>5.7 - 14.0</td>
<td>5.7 - 26.8</td>
<td>6.8 - 26.8</td>
</tr>
<tr>
<td>Lowest five</td>
<td>5.8 - 21.5</td>
<td>5.0 - 16.1</td>
<td>2.3 - 16.1</td>
<td>6.8 - 21.5</td>
<td>8.2 - 21.5</td>
<td>5.7 - 21.5</td>
</tr>
</tbody>
</table>


In conclusion, trying to manage the ratio of Ca:Mg should not be used for a nutrient application or liming program. The center of attention should be to ensure that levels of Ca and Mg in the soil will not limit optimum plant growth. The relative concentration of Ca and Mg in commercial ag lime can be highly variable, and application should be based on the effective calcium carbonate (ECC) to achieve a target soil pH.

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3. Garden webworms in soybeans

Garden webworms have been active in soybeans in the eastern two-thirds of Kansas since early to mid-June. These insects have at least 2-3 generations per year in Kansas. Young soybeans (up to about the R2 stage) are most at risk for defoliation by these larvae, but once the beans have a well-established canopy they should be able to withstand the feeding damage. Thus, most of the early planted beans should be reaching the point where webworms won’t affect development and most larvae are about finished feeding and are ready to pupate. The beans at most risk at the moment are the later-planted, doublecropped beans.

Garden webworm. Photo by Holly Davis, K-State Research and Extension.
There is no established treatment threshold but if there are 4 or more ½ inch webworms and 50% plant defoliation, it would probably justify treatment. Keep in mind that often there may be other larvae present contributing to the defoliation. Soybeans are very resilient and can tolerate considerable defoliation without affecting yield but some fields in 2009 were reduced to stems, but only in large patches. Therefore, this insect is worth watching to avoid infestations reaching this stage in 2010.

All the products evaluated in experiments and observed in commercial fields last year worked very well as long as the beans were still small, i.e. they had not yet reached the point where the canopy protected the worms. The beans recovered nicely unless they were more than 50-60% defoliated. Results from last year's insecticide trials are available at http://entomology.ksu.edu/DesktopDefault.aspx?tabindex=203&tabid=476

As of mid-July, we currently are between generations for the most part, at least in central Kansas. There have been a lot of adults observed in the last week or two, and thus egg laying has begun again. New, very small worms will start feeding soon.

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The Department of Agronomy Bio Energy Field Day is scheduled for Thursday, August 19. Developing alternatives to traditional fossil fuels continues to be a national and international priority. The purpose of the field day is to highlight current K-State Department of Agronomy research and education efforts related to sustainable bio energy crop production systems for the central Great Plains.

Program Summary:

* Feedstock Production: Scott Staggenborg
A discussion of ongoing work comparing several bio energy crop alternatives, from corn and sorghum to native perennial grasses and miscanthus.

* Residue Removal and Soil Quality: DeAnn Presley
The impact of residue removal on soil quality and the implications for long-term sustainability of bio energy cropping systems.

* Cover Crops and Soil Quality: Oliver Freeman (graduate student) and Kraig Roozeboom
The role cover crops may play in maintaining soil quality in bio energy cropping systems, and the impact of cover crops in no-till cropping systems.
* Soil Quality and Carbon Credits: Charles Rice
The relationship between crop residue management and carbon sequestration.

Biomass Harvesting and Collection  (potential stop)

* Dinner following program

The field day will take place at the Kansas State University - North Agronomy Farm, 2200 Kimball Avenue - Manhattan, KS. Check-in will be at 5:00 pm, Thursday, August 19.

To register online, go to: http://ksuagronomyfieldday.eventbrite.com
Enter Password: ksuagronomy
Select the quantity of tickets
Click the orange Register button
Enter your Name and e-mail address
Click "Complete Registration"

*Note: Although this is a ticket system, there is no fee associated with "buying a ticket" for the event

For questions, please contact either myself at kraig@ksu.edu or Scott Staggenborg at (785) 532-7215, sstaggen@ksu.edu

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5. Comparative Vegetation Condition Report: Photos from northwest Kansas

The usual Vegetative Condition Report (VCR) maps from K-State’s Ecology and Agriculture Spatial Analysis Laboratory (EASAL) are not available this week. We will continue with updated VCR maps next week.

In its place, we thought we’d include some photos to illustrate vegetative conditions “on the ground” in northwest Kansas, which has been showing up as an area that has been greener-than-normal in Kansas in the VCR maps in recent weeks.

The pictures below were taken on Wednesday, July 7 by Kevin Price in Logan County in northwest Kansas. These photos were taken just after a rainstorm that dropped between 0.3 to 0.5 inches of rain. Notice the grasslands are still green and the corn is about 6 feet high. Notice that the grassland areas are still quite green and the corn is doing very well. The green area in the distance in the lower left picture is corn. Some wheat had not yet been harvested as of July 7. If you have any questions, please feel free to email Kevin Price at kpprice@ksu.edu
These e-Updates are a regular weekly item from K-State Extension Agronomy and Steve Watson, Agronomy e-Update Editor. All of the Research and Extension faculty in Agronomy will be involved as sources from time to time. If you have any questions or suggestions for topics you'd like to have us address in this weekly update, contact Steve Watson, 785-532-7105 swatson@ksu.edu, or Jim Shroyer, Research and Extension Crop Production Specialist and State Extension Agronomy Leader 785-532-0397 jshroyer@ksu.edu