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eUpdate

12/11/2015

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, Jim Shroyer, Crop Production Specialist 785-532-0397 jshroyer@ksu.edu, or Curtis Thompson, Extension Agronomy State Leader and Weed Management Specialist 785-532-3444 cthompso@ksu.edu.

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1. Topdressing wheat with sulfur

In recent years, sulfur (S) deficiency in wheat has become common in many areas of Kansas, particularly in no-till wheat. Classic S deficiency symptoms, confirmed by soil and plant analysis, have been observed in many no-till wheat fields during periods of rapid growth in the spring. These observed deficiencies generally occur during periods of rapid growth prior to jointing, or during stem elongation.

There are two likely reasons for this: a reduction in sulfur additions to the crop from atmospheric deposition and phosphorus fertilizer applications, and cooler soil temperatures as a result of no-till planting, which slows S mineralization in the soil. The net effect of these factors is a significant reduction in the crop available S.

The photo below is a good representation of the problem. Generally the S-deficient wheat is yellow and stunted, and the problem is found in patches in the field, especially in areas where there has been previous soil erosion or soil movement. Sulfur deficiency on growing crops is often mistaken for nitrogen (N) deficiency. However, unlike N where the older leaves show firing and yellowing, with S deficiency, the pale yellow symptoms of S deficiency often appear first on the younger or uppermost leaves. Wheat plants with S deficiency often eventually become uniformly chlorotic. The patchy S-deficient areas of the field are often found on hilltops or sideslopes where erosion has occurred and soil organic matter is reduced, or where leaching is more pronounced. In terraced or leveled fields, wheat in areas where topsoil was removed or significant cuts were made also commonly shows symptoms.

Figure 1. Sulfur deficiency in wheat. Photo by Dave Mengel, K-State Research and Extension.

Sulfur deficiencies in wheat have been showing up early in the spring, shortly after greenup, before organic S is mineralized from soil organic matter, and before wheat roots can grow into the subsoil to utilize sulfate accumulated there. Deficiencies of S are often difficult to identify because the paling in crop color is not always obvious. Crops lacking S also may be stunted, thin-stemmed, and spindly. In the case of wheat and other cereal grains, maturity is delayed. Due to the slower growth and lack of good tillering, winter annual weed competition is also enhanced.

The majority of S in soils is present in organic forms in surface soils and as sulfate. Sulfate is relatively soluble, so it tends to leach down from the surface soil into the subsoil. In many of our Kansas soils it will accumulate in the B horizon in two forms. Some will be sorbed to clay surfaces and coatings similar to the processes whereby phosphates are sorbed, though sulfate will not be adsorbed as strongly. Sulfate will also be present in the subsoil of many Kansas soils as gypsum. Traditionally, S deficiency was most common on high-yielding crops grown on irrigated sandy soils low in organic matter and subject to leaching. However, due to the reduced additions from the atmosphere (there is less S in the air now) and continued crop removal, an increasing number of finer-textured soils have shown S deficiency in recent years.

A soil test for available sulfate-S in the soil profile is available. For proper interpretation of this test, soil organic matter, soil texture, the crop to be grown, and the expected yield level all need to be factored in. Since sulfate-S is mobile, sampling to a 24-inch depth is important. Accurate estimates of S needs cannot be made from a surface sample alone. However, due to the relatively high demand for S during the rapid vegetative growth phase of wheat growth, and relatively shallow rooting by the wheat crop at this time, the S measured in the deeper, subsoil levels by the test may not be available to wheat in the early spring, especially where soils are cold.

Many fields in North Central and Northeast Kansas now have an established history of S deficiency for wheat. In this situation rather than waiting for symptoms to appear in the spring, farmers may want to consider a winter topdressing application of S as a preventive measure.

There are many S-containing fertilizer materials. Several dry materials are available that can be blended with dry phosphorus or nitrogen fertilizers for winter/spring topdressing. Some of these products are best used in preplant applications, however.

- Elemental S (typically 90-95 percent S) is a dry material marketed by several manufacturers. Before it becomes available for plant uptake, elemental S must first be oxidized by soil microorganisms to sulfate-S and this can be a slow process when surface-applied. As a result, this material is well suited for preplant applications. Elemental S is not well suited for corrective applications to S-deficient wheat in the spring, however, due to the time requirement for oxidation to sulfate.

- Ammonium sulfate, AMS (21-0-0-24S) is a dry material that is a good source of both N and S. It has high acid-forming potential, however, and soil pH should be monitored. Ammonium sulfate is a good source to consider for both preplant or topdressing to correct existing sulfur deficiencies.

- Gypsum (analysis varies) is calcium sulfate, and is commonly available in a hydrated form containing 18.6 percent S. This material is commonly available in a granulated form that can be blended with other materials. Since it is a sulfate source, it would be immediately available, and is another good source for spring topdressing. But gypsum is not as water soluble as many fertilizer materials, such as ammonium sulfate.

- New N-P-S products such as Microessentials or Anchor D are ammonium phosphate materials formulated with sulfur, and in some cases micronutrients such as zinc. In most of these products the sulfur is present as a combination of elemental-S and sulfate-S.

There are also liquid sources of sulfur fertilizers available.

- Ammonium thiosulfate (12-0-0-26S) is the most popular S-containing product used in the fluid fertilizer industry, as it is compatible with N solutions and other complete liquid products.

- Potassium thiosulfate (KTS, 0-0-17-17S) is a clear liquid product that can be mixed with other liquid fertilizers.

Application guidelines supplied by the manufacturers of both these liquid products caution that these products should not be applied in a foliar application or as foliar sprays to actively growing plants. Topdressing with thiosulfate and UAN can be done early, before Feekes 5, and at temperatures below 70 degrees. But some burn can be expected, especially with KTS. These products would be good sources for preplant application, however.

For more information see *Sulfur in Kansas*, K-State publication MF-2264, http://www.ksre.ksu.edu/bookstore/pubs/MF2264.pdf

For estimations of required application rates of S see *Soil Test Interpretation and Fertilizer Recommendations*, K-State publication MF-2586
http://www.ksre.ksu.edu/bookstore/pubs/mf2586.pdf

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2. Sunflower moth: Behavior, scouting, and management

The sunflower moth, *Homoeosoma ellectellum*, is the most serious pest of commercial sunflowers in the central Great Plains. It is well adapted to exploiting commercial sunflowers where large fields of plants develop and flower all at the same time. The oversized flowers of commercial varieties may host hundreds of larvae, and their feeding damage permits infection by *Rhizopus,* a fungus that requires physical injuries to infect the plant. Without timely treatment, moth damage followed by *Rhizopus* infection can result in total yield loss over a large acreage. Losses from this pest, commonly known as the head moth, have deterred many growers from incorporating sunflowers into rainfed crop rotations where the plant is a natural fit.

Figure 1. Sunflower moth adult. Photo by J.P Michaud, K-State Research and Extension.

Figure 2. Sunflower moth larvae on exposed flower face. Photo by J.P Michaud, K-State Research and Extension.

Life history and behavior

The sunflower moth is a migratory pest that breeds year-round in northern Mexico and moves northward annually, usually increasing in numbers with successive generations. Migration is facilitated by seasonal weather patterns that prevail across the southern Great Plains during midsummer and generate a recurrent southerly wind pattern known as the 'low level jet' that is ideal for transporting airborne insects over long distances. The reproductive success of earlier generations probably affects the numbers of moths in each annual migration. Under warm conditions, the moths can complete a generation in 30 days. Kansas can experience secondary generations of local origin following the initial migration, especially in years when wild sunflowers are locally abundant. Early blooming fields where moths are not controlled can also serve as a source of infestation for later planted ones.

The large blooms of cultivated sunflowers represent a huge food supply compared to wild composite flowers and are capable of supporting the development of many larvae, while at the same time providing a refuge from parasitism. Research has shown that most wasps are unable to parasitize moth larvae within such large flowers and soon abandon them, probably because their ovipositors are not long enough to reach them deep within the receptacle. Certain parasitic flies of the family Tachinidae are slightly more successful because they deposit live larvae able to penetrate the flower in search of a host. Although biological control may contribute to suppression of sunflower moth in wild host plants, parasites and predators cannot prevent economically damaging infestations in commercial fields.

Management

Successful management of sunflower moth hinges on rigorous monitoring of individual fields and prompt insecticide application once threshold numbers are detected. Conventionally, the goal has been to kill adults and early instar larvae before physical injury to the flower occurs that can permit fungal infection. Recently, new control tactics became possible with diamide insecticides (chlorantraniliprole, flubendiamide); these have some systemic activity within the flower and thus a greater duration of efficacy. However, these are not contact insecticides and require consumption by larvae; they will not kill adult moths, but have the advantage of being safer for pollinators.

Fortunately, early instar larvae feed exclusively on pollen and remain vulnerable to contact insecticides for several days before they burrow into the receptacle and begin damaging seeds. Later instar larvae feed more aggressively and are less vulnerable to contact insecticides deep within the receptacle. *Rhizopus* fungus can quickly rot the entire head and will invade vascular tissues to become systemic within upper plant parts, inhibiting seed fill.

Early-planted fields typically suffer the most damage from migratory flights of sunflower moth in Kansas. Fields planted in early July or those that bloom after August 10 are less likely to develop economic infestations. They may still be affected by second-generation moths that emerge from patches of wildflowers or adjacent early-planted fields where the pest has not been adequately controlled. Geographically, average moth pressure tends to decrease from eastern to western Kansas, reflecting the prevailing paths of summer winds.

Scouting

Because migratory moths can appear in large numbers virtually overnight, scouting should begin as soon as the first flowers open (R5.1) and continue every 2 - 3 days until pollen shed is complete in a majority of plants. Because moth migrations are spotty and each field has its own unique developmental schedule, it is not advisable for growers to follow the management decisions of neighbors; there is no substitute for scouting individual fields. Fields that have been sprayed should be revisited to determine the efficacy of treatment as soon as the re-entry interval expires. The treatment threshold for application of contact insecticides is 1 - 2 moths per 5 plants. Projected crop value can be used to elect the low or high end of this range.

Moths usually rest underneath leaves in the daytime and fly up when disturbed. If moths are abundant, they will be apparent during the day. If marginal numbers are present, scouting should be conducted an hour after sunset when moth activity on flowers reaches its peak. Use a flashlight to count the moths on a series of 20 flower faces in at least five locations in the field.

Trapping

Historically, sunflower moth activity has also been monitored with commercially available pheromone traps that attract and capture male moths. Traps are best placed on T-posts above canopy level at least 10 rows into the field on north and south sides, with at least four traps per field. Trapping should begin as plants enter the R-5.1 stage (ray petal emergence) and trap catches monitored daily through the R-5.8 stage (80 percent pollen shed). Insecticide applications should be considered whenever pheromone traps average four moths per trap per day. If trap catches average fewer than four per day, field scouting is recommended to determine whether the action threshold has been reached. Trap catches averaging less than one per day usually have resulted in noneconomic infestations. However, it is questionable whether the information provided by trapping is sufficiently useful to justify the labor it requires, especially when certain outcomes dictate manual scouting before a decision can be made. Strong winds can lead to 'passive catch' of other moth species that may be difficult to distinguish from sunflower moths once they are stuck to glue in the trap. In addition, doubts have been raised about the persistence of the pheromone lure under Kansas field conditions that typically involve high temperatures and strong winds.

For more information on scouting and monitoring, see the most recent edition of the K-State Research and Extension publication, *Sunflower Insect Management*, MF814: http://www.ksre.ksu.edu/bookstore/pubs/MF814.pdf

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(Note: This article is an updated excerpt from K-State Research and Extension publication MF3108, *Sunflower Moth*, MF3108: http://www.ksre.ksu.edu/bookstore/pubs/MF3108.pdf)

3. Sunflower moth: Treatment options and pollinator safety

Treatment options

If sunflower moths are above threshold, an insecticide treatment should be applied once the majority of blooms have opened and begun shedding pollen (stage R5.1). Most failures to obtain control result from delayed treatments.

The objective of an early application with contact insecticides is to kill female moths before they lay eggs, and young larvae while they are still feeding on pollen and before they bore deep into the head. Diamide insecticides (chlorantraniliprole, flubendiamide) are different in that they do not have contact activity and thus do not kill adult moths, although they have some systemic activity and very effective against larvae, while being more selective for pollinators.

Scouting should continue after an early treatment as additional applications may be required when moth pressure is heavy. Whereas some growers opt to spray automatically at R-5.1, the advantage of scouting is the possibility that treatment can be avoided if moths remain below threshold, or delayed until later in the flowering cycle when blooms are fully expanded, increasing the chance that a single application will suffice. A diamide insecticide would be the best choice for an early 'insurance' treatment as these materials have more residual efficacy because they are absorbed by the flowers.

Once flower disks are fully expanded or significant numbers of larvae have hatched, treatment is far more effective when applied directly into the flower faces. This is best accomplished in aerial applications by flying each pass from an easterly direction, rather than back and forth over the field. Use of a ground rig is best; although more time consuming, it permits more effective application of insecticide in a larger volume of water to provide better coverage.

Organophosphate materials have somewhat better residual activity than pyrethroids, whereas the latter have repellent properties. Both can lose their efficacy quickly under Kansas summer field conditions. Several new formulations combine active ingredients with different modes of action (organophosphate + pyrethroid, or organophosphate + neonicotinoid) to increase efficacy. However, recent observations suggest rising levels of resistance to organophosphates may be evolving in sunflower moth populations.

Pollinator safety

The need to control pests on a crop in bloom raises concerns about potential impacts on pollinators. Sunflower growers also should be aware that most insecticide applications against sunflower moth carry a hidden cost in terms of yield reduction. Although commercial varieties have been bred to be self-compatible, and hence less pollinator-dependent, studies have shown that cross-pollination by insects improves seed weight and oil content.

Insecticide should be applied in the early morning or late evening when pollinators are not flying. Evening is preferable because this permits overnight dissipation of material before pollinators return to the field. However, the requirement for low-wind conditions is a priority that may trump this concern.

Because of their repellency, pyrethroids tend to be safer for bees than organophosphates, provided bees are not sprayed directly. Dusts and wetable powders tend to be more toxic than solutions and emulsions, and microencapsulated insecticides are especially hazardous. Studies suggest that diamides, a new class of insecticides that disrupt insect muscle contraction, have a high degree of safety for pollinators. Diamides act to paralyze insect muscles, preventing further feeding, but must be consumed by the insect to reach their active site.

Both Bayer and Dupont have registered diamide insecticides for use on commercial sunflowers in Kansas (Belt and Prevathon, respectively). Preliminary trials indicate that good levels of control can be achieved with these materials without endangering bees.

Growers and applicators should refer to the most recent edition of the K-State Research and Extension publication, *Sunflower Insect Management*, MF814, for a table of registered materials and application rates. See: http://www.ksre.ksu.edu/bookstore/pubs/MF814.pdf

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(Note: This article is an updated excerpt from K-State Research and Extension publication MF3108, *Sunflower Moth*, MF3108: http://www.ksre.ksu.edu/bookstore/pubs/MF3108.pdf)

4. K-State Corn Production Management Schools scheduled for January

Three K-State Corn Production Management Schools will be offered in early January 2016 in southeast, southwest, and central Kansas. Each school will provide in-depth training targeted for corn producers. Primary sponsors of the schools include the Kansas Corn Commission and DuPont Pioneer.

The one-day schools will cover several current corn topics relevant to corn producers in Kansas: drought-tolerant hybrids, high-yielding corn factors, weed control, soil fertility, and price and market perspectives.

Typical agenda:

8:45 a.m. - Registration and Introductions

9:00 a.m. - Program starts

noon - Lunch/ Kansas Corn Commission Update

2 or 2:30 p.m. (depending on the location) - Program Ends

Highlighted Presentation* or Tour**

* Presentation for Independence: N. Barkley, VP of Coffeyville Resources Nitrogen Operations

** Tour for Garden City: Conestoga Energy's "Bonanza Bio Energy" Plant
http://www.conestogaenergy.com/bonanza-bioenergy

** Tour for Salina: Great Plains Manufacturing, http://www.greatplainsmfg.com

All the Schools will offer CEU (Certified Crop Advisor) and Commercial Pesticide Applicators credits.

The dates and locations are:

Jan. 11: **Independence:** Civic Center. N Penn Ave & W Locust St

Local Research and Extension office contacts:

- Jeri Geren, Montgomery County- Wildcat District, jlsigle@ksu.edu, 620-331-2690

- Josh Coltrain, Crawford County- Wildcat District, jcoltrain@ksu.edu, 620-724-8233

- Keith Martin, Labette County- Wildcat District, rkmartin@ksu.edu, 620-784-5337

- Dale Helwig, Cherokee County, dhelwig@ksu.edu, 620-429-3849

- Chris Petty, Bourbon County- Southwind District, cgp@ksu.edu, 620-223-3720

Jan. 14: **Garden City:** Clarion Inn, 1911 E Kansas Ave, Garden City, KS 67848

Local Research and Extension office contacts:

- Katelyn Barthol, Finney County, kbarth25@ksu.edu, 620-272-3670

- Andrea Burns, Ford County, aburns@ksu.edu, 620-227-4542

- Kurt Werth, Grey County, kwerth@ksu.edu, 620-855-3821

- Lacey Noterman, Haskell County, lnote@ksu.edu, 620-675-2261

- Bill Haney, Kearny County, haney@ksu.edu, 620-355-6551

- John Beckman, Scott County, jbeckman@ksu.edu, 620-872-2930

Jan. 15: **Salina:** Great Plains Manufacturing, 1525 E North St

Local Research and Extension office contacts:

- Tom Maxwell, Central Kansas District, tmaxwell@ksu.edu, 785-309-5850

- Jonie James, McPherson County, jjames@ksu.edu, 620-241-1523

- James Coover, Dickinson County, jcoover@ksu.edu, 785-263-2001

- Michelle Buchanan, Midway District, mbuchanan@ksu.edu, 785-472-4442

- Kim Larson, River Valley District, kclarson@ksu.edu, 785-243-8185

Lunch will be provided, courtesy of the sponsors. There is no cost to attend, but participants are asked to pre-register before Jan. 8.

Online registration is available at K-State Corn Schools: **http://bit.ly/KSCORNSchools**

You can also register by emailing or calling the nearest local Research and Extension office for the location you plan to attend.

For more information, contact:

Greg Krissek, CEO Kansas Corn
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2016 CORN SCHOOLS

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KANSAS CORN COMMISSION

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5. The length of the 2015 Kansas summer growing season

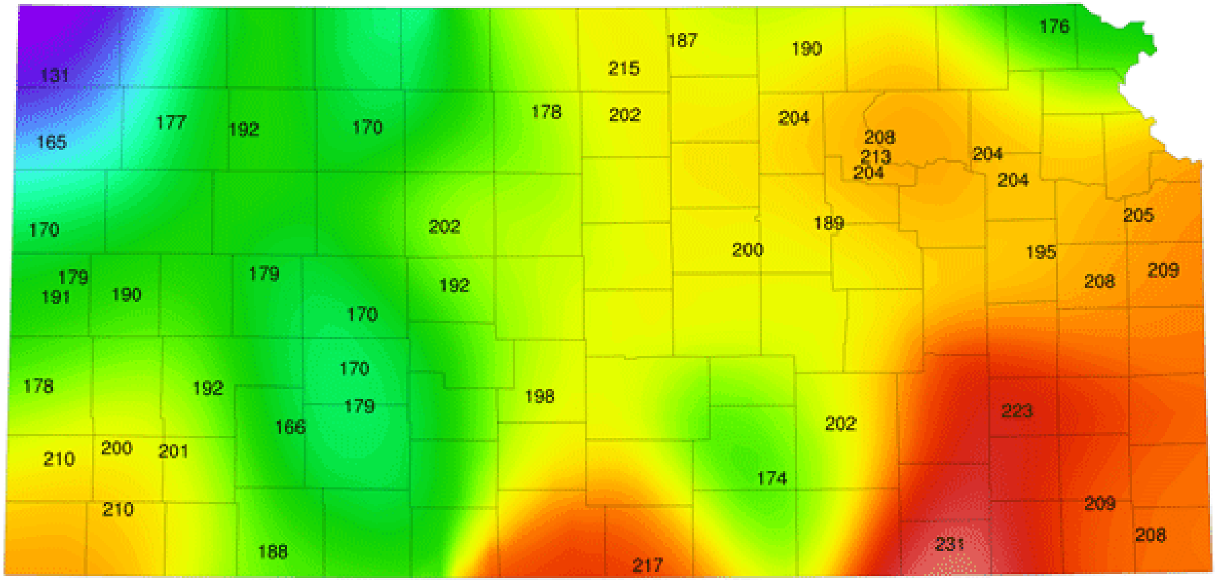
The summer growing season length for warm-season plants is defined as the number of days between the last spring freeze and the first fall freeze. For warm-season annual plants, planting should generally be delayed until after the final freeze of spring due to the risk of plant injury. The first freeze of fall typically kills summer annual plants and forces warm-season perennials to go dormant.

The summer growing season length varies greatly across Kansas due to a substantial climate gradient from northwest to southeast. The average summer growing season length for warm-season plants in Kansas is 176 days, as measured at our Kansas Mesonet stations. In 2015, the state average was 193 days, almost 20 days longer than typical.

Also, despite several late-May freezes, the average final spring reading of 32 degrees F or less was April 18th, a week later than the climatology average of April 11th. The 2015 fall freezes averaged two weeks later than the climatological average of October 28th.

Interestingly enough, with freeze date averages only suggesting a seven-day lengthening of the growing season, there was a wide range depending on location. This result likely stems from the fact that many of the early freeze locations had a very late fall freeze (mid-to-late November). For example, Cheyenne County had a summer growing season of 131 days (26 days less than the climatology average) with a last spring freeze in May and a first fall freeze in September. Meanwhile, Sedan in Chautauqua County had a summer growing season for of 231 days (28 days more than the climatology average), with a last spring freeze in April and the first fall freeze in November. That is a 100-day difference across Kansas!

See all the data on our Kansas Mesonet webpage: www.mesonet.ksu.edu/downdraft/summary/2015/



2015 Growing Season Length (days) - Kansas Mesonet

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6. Update on the comparative vegetation report Easal maps

There will be a brief break in the availability of the vegetative condition index maps (known as the Easal maps) that normally appear every week in the Agronomy eUpdate. This product is undergoing improvements and upgrades. Look for the new versions of these maps in the Agronomy eUpdate starting again after the first of the year.

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