1. Spider mites infesting soybeans

Over the last several days, we have received several calls about spider mites in soybean. Spider mites are usually a problem in soybean when the weather turns warmer and drier, and plants are experiencing drought stress.

Feeding will occur on the underside of the leaves, causing them to initially turn yellow, then gray-green, and eventually bronze. If infestations are severe enough, the leaves will eventually fall off. Spider mites will generally create webbing on the underside of the leaves and often in the middle part of the crop canopy which can make control measures very difficult. If available, using drop nozzles can help the insecticide penetrate the canopy and hopefully increase coverage.

Areas that have received rain in the last few days are at a lower risk of spider mite damage due to less stress on the soybean. Also, with rains there will be less mite activity due to an increase in fungal pathogens that attack the spider mites.
Many of the soybeans throughout the southeast Kansas area are in the R1 beginning bloom stages up to the R4 stage, or full length pods. Much of the yield potential is occurring during these growth stages. With the hot and dry conditions forecasted for the week ahead, the decision on whether to spray can be a difficult one. If soybeans are in R1-R4 growth stages, and spider mite activity is in the mid-canopy approaching the upper canopy, it might be a good idea to treat the infested areas in the field. Reducing the spider mite pressure will help alleviate the stress on the soybeans over the next week to 10 days until our next chance of rain.

Several insecticides have efficacy on mites including chlorpyrifos (numerous products including Lorsban, Eraser, etc.), chlorpyrifos + gamma-cyhalothrin (Cobalt), dimethoate (Dimethoate or Dimate), and zeta-cypermethrin + bifenthrin (Hero). Read and follow all label directions and rates when using any pesticide.

For more information, please see the K-State Soybean Insect Management guide at:

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2. Effect of heat stress on corn, grain sorghum, soybeans, and cotton

Daily high temperatures have been at or above 90° F in most of the state for close to three weeks. Several days have exceeded 100° F in many locations. In some areas it is also starting to dry out.

Producers in Kansas are familiar with the effects of drought stress on summer row crops. But high-temperature stress can also affect crop development and yields, and this is not always
associated with drought stress. Row crops grown under full irrigation sometimes have below average yields in years when temperatures are unusually hot during the sensitive stages of crop development. If crop yields are less than expected given adequate rainfall or irrigation, look at temperatures during flowering and grain fill, which can explain part of yield variability across years.

The following is a brief discussion of the impact of high temperatures on the major row crops grown in Kansas.

**Corn** – By early August, most of the corn in Kansas has been pollinated and is moving into grain filling. Within 10 to 14 days after pollination, a corn kernel can be aborted in response to drought stress combined with high temperatures. Once the kernels are at or beyond blister stage, the final kernel number won’t change much but kernel weight can. After the blister stage, yield is determined by grain fill rate and duration. Research has indicated that 72°F is the ideal temperature for grain fill in corn.

The rate of grain fill usually goes up with higher temperatures, meaning that more dry matter is deposited in the grain on a daily basis at warm temperatures than at cool temperatures. The problem is that the duration of grain fill typically is reduced at high temperatures. There are fewer days available to deposit dry matter in the grain. The balance of these two responses to high temperatures determines how much yield might be reduced, if any.

A controlled-environment study in Canada in the 1980s showed that increasing the day temperature (day/night temperatures of 95/59 vs. 77/59°F) reduced yield by 42%. A more recent study at Iowa State compared increases in both day and night temperatures (93/77 vs. 77/68°F) during grain fill. The higher temperatures increased grain fill rate by 19%, but cut the duration of grain fill by 5 days, resulting in a 7% reduction in kernel size and 10% reduction in protein content. It is important to remember that these temperatures were imposed during most of the grain fill period. Actual temperatures can be even higher than these, but typically do not last the entire grain fill period.

**Sorghum** – According to research conducted by Vara Prasad, K-State crop physiologist, and others, the two stages of grain sorghum reproductive development most sensitive to high temperature stress are flowering and 10 days prior to flowering. In their research they used controlled environments to impose a day/night temperature regime of 104/86°F for 10-day periods at various stages of plant development.

High temperature stress in the pre-flowering and flowering stages caused maximum reduction in seed set, seed numbers, and seed yields. Early seed filling periods were more sensitive to high temperature stress than later periods. Seed yield losses during post-flowering stages were mainly due to decreases in seed size.

How are high temperatures reducing yields in sorghum? Lower seed yields were not the result of decreased leaf photosynthetic rates -- the rate of photosynthesis remained constant even under continuous exposure to high temperature stress. This suggests that high temperature stress reduced seed size by decreasing seed filling duration, without an increase in seed filling rate to help compensate.
**Soybean** – Exposure to heat stress during flowering results in pollen sterility and reduced seed set. Lower seed set under heat stress can be caused either by problems with pollen release or by decreased pollen viability or ovule function.

The impact of high-temperature stress will be different for determinate and indeterminate varieties. Indeterminate varieties (typically maturities of Group IV and below) develop flowers over a longer period of time. Plants that are stressed by heat can compensate and form new flowers and seed set later if environmental conditions improve. Also, a decrease in seed set and numbers can sometimes be partially offset by greater seed size.

In contrast, determinate varieties (typically maturities of Group V and above) flower over a shorter period of time. Stress during this period can have a great influence on reproductive development. High temperatures soon after seed-set cause abortion of embryos, leading to fewer seeds per pod.

Studies at the University of Florida have shown that reduced seed size in soybean is a result of decreased seed filling rate. In addition to the impact on seed number and size, heat stress can reduce grain or seed quality. Heat stress increased the percentage of shriveled seed and influenced seed composition. Oil concentration increased with increasing temperature, with an optimum at 77 to 82°F, above which the oil concentration declined. Seed protein concentration of soybean was constant at temperatures between 60 and 77°F, but increased at temperatures above 77°F. Oil and protein concentration were inversely related to heat stress during seed fill.

Soybean plants grown at high day (95°F) and high night (86°C) temperatures produced seed with reduced germination and subsequent seedling vigor. Greater reductions in seed germination and seedling vigor were observed with longer duration of exposure to high temperatures, especially during seed fill and maturation.

**Cotton** – Cotton functions well in high temperatures. Arizona researchers reported that well watered cotton yields continued to increase when daytime temperatures were above 105°F. The optimum range in air temperatures for cotton photosynthesis was determined by researchers to be from 77°F to 113°F. High temperatures during the day speed up chemical reactions in the plants at the cellular level resulting in faster photosynthesis and growth.

However, when temperatures remain high at night the plant is unable to cool itself and respiration increases. When that happens, the plants burn up stored carbohydrates (energy). Also, without adequate moisture from rainfall or irrigation, high air temperatures will decrease lint yields. During peak bloom, nighttime temperatures above 80°F will cause the plant to shed many of its small bolls and can result in pollen sterility of those squares in early development.

The energy shortage from excessive nighttime respiration results in fewer seeds per boll – smaller bolls – and boll shed. Boll shed of small bolls will begin four to five days after a heat wave begins. Larger bolls will be shed if the high temperature stress continues, and leaf damage can also occur.

Lint quality is usually less sensitive to high temperatures than yield, but fiber developing under high temperatures tends to have higher micronaire, potentially leading to discounts at harvest. In addition, hot temperatures can shorten the boll-setting period, speeding the plant to cut out (stop producing nodes) rather than set a top crop. If the cotton had the majority of bolls set and stuck
prior to the onset of high temperatures, the crop can benefit from high temperatures because maturity and boll opening will be accelerated.

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3. Viability of treated, carryover wheat seed

The wet conditions last fall prevented some farmers from planting all the wheat they may have intended. If they had purchased certified seed treated with a fungicide, some of that seed may have never been planted. Can it be used as seed this year?

There are two issues:
* Germination quality of the seed, and
* The viability of the seed treatment.

Assuming the seed was stored under dry conditions and did not get wet, the germination quality of the seed will likely be fine. It would, however, be a good idea to have a germination test done on the seed by the Kansas Crop Improvement Association or another seed laboratory, to insure the seed has maintained quality. In general, given proper storage, wheat maintains germination quite well, treated or untreated, when carried over for just one year. It is also noteworthy that storage temperature is the most critical aspect of maintaining seed viability. While little can be done with bulk seed in a bin, bagged seed should be kept in the coolest environment possible at low humidity. This can dramatically slow the natural decline of seed viability, which will be somewhat higher during the hot summer days we are experiencing right now.

The effectiveness of a fungicide seed treatment should not be adversely affected by being in storage for a year, provided the seed was stored under dry conditions. The fungicide seed treatment should still provide protection from common bunt, loose smut, and other seed-borne diseases, as well as whatever soil-borne diseases are on the label for the product used to treat the seed.

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4. New herbicide-tolerant sorghum getting closer

Two new types of herbicide-resistant grain sorghum originally developed by Kassim Al-Khatib and Mitch Tuinstra, former faculty in K-State Agronomy, are getting closer to the commercial market. This includes ALS-resistant sorghum and Assure II-resistant sorghum. Both of these new traits are non-GMO.

These new hybrids will provide producers for the first time with a means of postemerge annual grass control in grain sorghum. The new traits were licensed to DuPont, which is developing both the commercial lines of these herbicide-resistant hybrids and the herbicides to be used on these hybrids. Other seed companies are working with DuPont to develop their own hybrids that incorporate these traits.

At a demonstration field day in Manhattan on July 13, DuPont unveiled more details.

The hybrids will go under the name of “Inzen” technologies. The ALS-resistant sorghum will be called “Inzen Z,” and the ALS herbicide to be used on these hybrids will be called Zeal. The Assure II-resistant sorghum will be called “Inzen A II,” and the herbicide to be used on these hybrids will be Assure II.

According to DuPont representatives, the new hybrids and the herbicides developed for use with the new hybrids will be released at the same time. Registration and early acreages of this new technology are scheduled for 2012.

The development of ALS and Assure II-resistance in sorghum was made possible in part by funding from the Kansas Grain Sorghum Commission and the United Sorghum Checkoff Program.

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5. Comparative Vegetation Condition Report: July 20 – August 3

K-State’s Ecology and Agriculture Spatial Analysis Laboratory (EASAL) produces weekly Vegetation Condition Report maps. The most recent VCR maps from EASAL are below:
The Vegetation Condition Report for July 20 – August 3, from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that the continued heat and dry weather have increased the extent of areas showing vegetative stress. Ness and Trego counties in west central Kansas, and Clark and Comanche counties in southwest Kansas, are particularly noticeable.
Map 2. The U.S. Corn Belt comparison to the 21-year average shows that fairly typical conditions prevail across much of the Corn Belt. Favorable moisture and cooler temperatures have resulted in much-above-normal biomass production in the western portions of North Dakota, South Dakota, and Nebraska.
Map 3. During this period, much of the mainland U.S. is showing average to above-average vegetative production. Particularly notable is the much-above-average production across most of Texas. According to the U.S. Drought Monitor, only 10% of Texas is currently abnormally dry, while last year 50% was abnormally dry or worse. Last year, more than 16% of the state was under exceptional drought conditions.

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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