Walking Your Fields®

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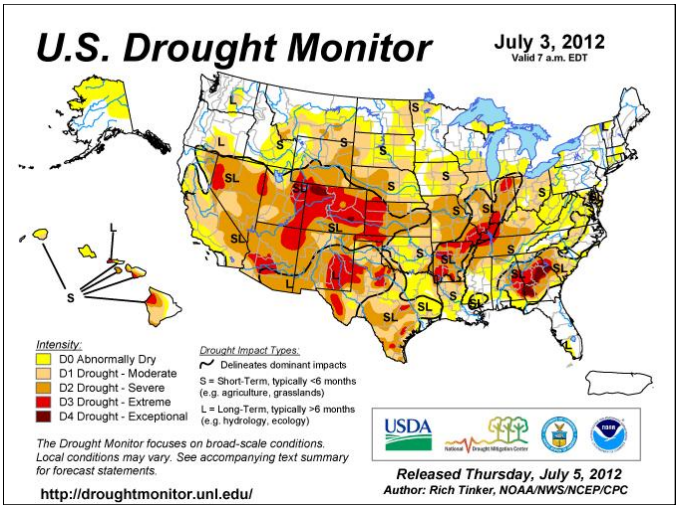
Heat and Drought Affecting Crops

Recent dry conditions have caused major concerns in many crop growing areas. You can find information about the drought effects on line at: http://droughtmonitor.unl.edu/. The map below is a national view snapshot as of July 3, 2012. Minnesota and North Dakota are less affected compared to areas to the south. However, drought stress is very apparent in fields where soils are lighter and/or rooting depth is shallow. Often the early-planted corn appears to have developed a deeper root system and is, therefore, withstanding the drought better than later-planted corn.



Drought Stress Effects on Corn

Once pollination has occurred, the total number of potential kernels is set. However, drought stress after pollination can cause direct yield loss due to kernel abortion and reduced kernel size. The following table shows yield loss per day of stress at various stages and the discussion focuses on effects during reproductive stages. Drought stress during grain-filling reduces yield 2.5 to 5.8% with each day of stress.

Once kernels have reached the dough stage of development, drought stress will cause yield losses mainly from reductions in kernel dry weight accumulation. Severe drought stress that continues into the early stages of kernel development (blister and milk stages) can easily abort developing kernels. Severe stress during dough and dent stages of grain fill decreases grain yield primarily due to decreased kernel weights. Once grain has reached physiological maturity (black layer formation), stress will have no further physiological effect on final yield nor will any rainfall received contribute to grain yield. Stalk and ear rots, however, can continue to develop after corn has reached physiological maturity and indirectly reduce grain yield through plant lodging.

Estimated Corn Yield Loss Per Stress Day During Various Stages of Growth

Growth Stage	% Yield Loss Per Day of Stress (min - avg - max)
Pollination (R1)	3.0 - 6.8 - 8.0
Blister (R2)	3.0 - 4.2 - 6.0
Milk (R3)	3.0 - 4.2 - 5.8
Dough (R4)	3.0 - 4.0 - 5.0
Dent (R5)	2.5 - 3.0 - 4.0
Maturity (R6)	0.0

Derived from Rhoads and Bennett (1990) and Shaw (1988)

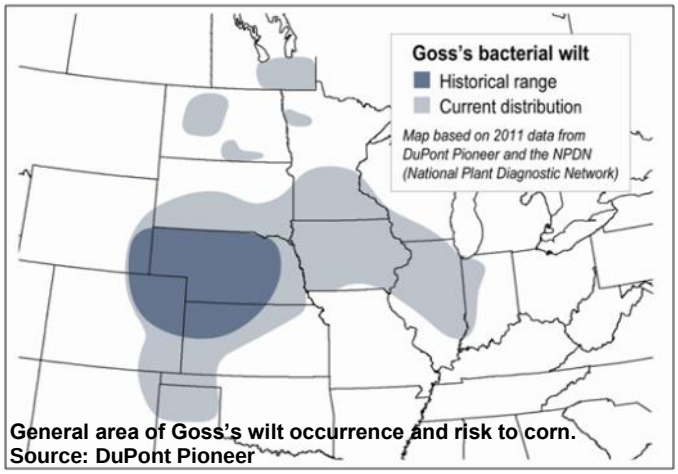
Check Pollination Progress

One way to track pollination success is to carefully remove the husk cover from the ear, being careful not to pull on the silks. Silks that remain attached are evidence of ovules (kernels) that have not been fertilized. If the silk falls away, ovules have been fertilized.

The most critical period of corn development are the two weeks before and after silking. During this period the corn plant requires its maximum amount of water at about one inch of water every three days (0.33 inches of evapo-transpiration per day).

Goss's Wilt in Corn

Goss's wilt is a bacterial disease that may cause wilting and leaf blight in corn. Until recently, significant Goss's wilt damage was largely confined to corn fields in Nebraska and parts of Colorado, Kansas, and South Dakota. In the last two years, however, significant damage has been reported in Iowa, Missouri, Illinois, Indiana, Minnesota, North Dakota, Wisconsin, and even regions of Canada. Higher levels of corn residue from corn-after-corn production and reduced tillage are likely contributing to the spread of this disease. Early infection of a corn field can lead to loss of leaves following pollination and yield losses of up to 50%.



General area of Goss's wilt occurrence and risk to corn. Source: DuPont Pioneer

Infection and Symptoms. Wet weather and high relative humidity favor development of Goss's wilt. Early leaf symptoms are oblong or elongated lesions of water-soaked, grayish-green tissue that progress to long dead streaks with wavy, irregular margins. These streaks extend along leaf veins. A sticky exudate forms in the streaks, which dries to form a glistening residue or varnish within the lesion. As lesions enlarge and coalesce, they form large areas of necrotic tissue on the leaves and eventually entire leaves may wilt and dry up.

Advanced Leaf Infection from Goss's Wilt. Source: DuPont Pioneer

Disease Management. Goss's wilt is caused by a bacterium, not a fungus. This is why foliar fungicides commonly used to control corn leaf diseases resulting from fungal pathogens are NOT effective against the Goss's wilt pathogen. No rescue measures are available to control Goss's wilt; therefore, preventing or avoiding the infection is crucial. Products vary in their level of resistance to Goss's wilt. Pioneer researchers screen commercial and potential new hybrids for resistance to Goss's wilt at sites with reliable annual disease pressure. In addition to screening under natural infestations, researchers also inoculate parent lines and hybrids with Goss's wilt bacteria and evaluate for disease symptoms. Your local Pioneer sales professional can assist in identifying products with Goss's wilt resistance and other traits needed for optimum production potential on your fields.

For more information on Goss's wilt, go to our web site and search for Goss's wilt. You can also go to this link: https://www.pioneer.com/home/site/us/agronomy/library/template.CONTENT/guid.EF9D7195-C257-1073-AF27-B58D862E3E5D

Drought Stress Effects on Soybeans

The following table shows yield loss due to four days of visible moisture stress in soybeans during reproductive stages.

Effect of 4 Days of Visible Moisture Stress on Soybean Yield

	% Yield Decrease
1st Week Flowering	8
1st Week Pod Development	19
2nd Week Flowering	
1st Week of Seed Filling	36
3rd Week of Pod Development	
4th Week of Flowering	
2nd – 4th Week of Seed Filling	39-45
5th Week of Seed Filling	12
Source: Iowa State	

The reproductive stages of soybeans overlap. The first week of pod development occurs same time as the second week of flowering, etc. Drought stress during reproductive stages causes abortion of flowers and small pods, reduced seeds per pod, and reduced seed size. The seed-filling period is particularly critical. Drought stress during seed filling results in the largest yield decreases. When a pod loses its green color, it is a sign that seed filling has ceased in that pod. Rainfall received before seed filling ceases will result in larger seed size and reduce yield losses.

Source: Donald Specker, Pioneer Product Agronomist

Soybean Aphid

Soybean aphid is an insect pest that can cause significant yield loss in soybeans. Scouting and proper management of this pest is critical to optimize profitability. Early season scouting for soybean aphids usually begins around third week June. Weekly scouting is a good practice until soybeans reach R6 or full seed stage.

There has been a large amount of research conducted over the past several years to determine when soybean aphid populations reach a level at which they should be controlled. This research indicates that soybean aphid insecticide treatments should be applied when there are >250 aphids per plant on at least 80% of plants in a field. This economic threshold (ET) provides the least yield risk and economic risk. This threshold refers to a field average and not field borders or hotspots. The ET is reached well in advance (seven days or more) of when cumulative aphid injury is expected to cause yield loss, allowing time for an insecticide application to be made before economic yield loss occurs.

Common recommendations are to scout five plants at each of five locations for every 20 acres in a field. With a threshold of 250 aphids per plant, this would be a lengthy process. Fortunately, there is a faster way. Researchers at the University of Minnesota (U of M) have developed a 'speed scouting' method that is much quicker than conventional scouting. With a little practice, you can scout as fast as you can walk. A worksheet and details of this scouting method can be obtained at this web site: http://www.soybeans.umn.edu/pdfs/2007/aphid/speed_scouting_2007.pdf

Growers may be tempted to spray before ET has been reached or add an insecticide when they apply herbicides for weed control even when few, if any, aphids are present. This is called the 'insurance approach.' The insurance approach can occasionally work out when it coincides with ET. There is, however, much data demonstrating yield risk with the insurance approach. U of M researchers Ken Ostlie, Dave Ragsdale, and Bruce Potter noted their concerns regarding this approach for soybean aphid control. The following is an excerpt from their writings.

Concerns about the Insurance Approach to Insecticide Treatments for Soybean Aphids:

1. ***Cost.*** *There is* ***no*** *data to suggest that very low aphid populations reduce yield. Early applications are more likely to be re-colonized and require re-treatment. Claims of insecticide residual activity lasting a month or longer have little factual basis.*
2. ***Resistance.*** *The more often soybean aphids are exposed to insecticide the more quickly insecticide resistant populations will develop.*
3. ***Increasing populations of soybean aphid, or other arthropod pests (e.g. spider mites) by removal of beneficial species.*** *Removal of beneficials (predators and parasites) can have unexpected consequences. Yes, this really does happen! Imagine how quickly newly arrived aphids reproduce when you've already removed the beneficials for them. When we do this with cages that exclude predators, aphid populations go from 10 to more than 1000 in a little more than a week.*
4. ***Compromises leading to poor insect and/or weed control.*** *Ideal nozzle, water volume and pressure selection for insecticide and herbicide applications may not be the same. Herbicide and insecticide timings should be based on when to apply to the target pest (weed or aphid) to be most successful.*

You *are responsible for managing* ***your*** *crop for a profit. There is nothing illegal about applying an insecticide labeled for soybean when aphid populations are below threshold. However, insecticide applications do have consequences in the environment. We wish only to point out that there are potential short and long term risks when insecticide applications are made without regard to pest populations.*

Common questions about soybean aphids and their control:

- **What effect does temperature have on soybean aphids?** Optimum temperatures for soybean aphid reproduction are in the low 80s. The rate of reproduction decreases as temperature increases and is near zero at 95^{o}F. However, when the temperature drops back down into the 70s at night, soybean aphids will actively reproduce.
- **What effect does rainfall have on soybean aphid populations?** Rainfall intensity, wind, and plant size all impact aphid response to rainfall. High intensity rainfall with high wind can reduce aphid populations the most. Moist weather conditions may also increase the fungal pathogens that infect the aphids. However, some aphids are likely to survive any rainfall event and can quickly re-infest plants. Rainfall may knock the population back but do not count on it. Keep scouting!
- **Can soybean aphids re-infest the same field after it has been sprayed?** Yes. Research shows that insecticides typically protect plants 14 days or less. The insecticide degrades over time and any new growth is unprotected. Aphids can migrate back into the field. Aphid scouting should commence about 10 days after insecticide application on plants that are not yet at R6.

For additional information on soybean aphids, go to this web site: http://www.soybeans.umn.edu/crop/insects/aphid/aphid.htm

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