

Too Warm for Your Crops?

Tyler Williams
Extension Educator

It takes warm temperatures for crops to grow at their optimal capacity, but too much heat can also cause harm, even in the presence of adequate moisture. Some crops are more susceptible to heat stress at critical growth stages (corn pollination or soybean flowering), but crops can also be susceptible to stress during the early vegetative stages. Heat stress is often accompanied by moisture stress and may be difficult to differentiate between the two. One indicator of heat stress is when corn leaves roll in the early morning in areas where there is adequate soil moisture.

The extent of heat stress can depend on the intensity, duration, humidity and rate of increase in air temperature. The subsequent increase in soil temperature may also have an impact. When soil temperature rises above an optimum threshold, plant water and nutrient uptake can be impeded, causing damage to plant components.

Extreme heat stress can reduce plant photosynthetic and transpiration efficiencies and negatively impact plant-root development, ultimately impacting yield. Curled leaves can reduce the light/radiation interception and can negatively impact plant water and nutrient uptake and transpiration rates. The combined effect of heat and water stress on corn and soybean will be much stronger than one stress alone.

Corn maximizes its growth rate at 86°F.



Tom Dorn, Extension Educator Emeritus

One indicator of heat stress in corn is when leaves roll in the early morning in areas where there is adequate soil moisture.

Days with temperatures hotter than that cause stress. Cool night temperatures — at or below 50°F — reduces respiration rates and preserves plant sugars, which can be used for growth, reproduction or stored for yield. In years when we get high day and nighttime temperatures during pollination, this can impact silking, pollen production and viability. Temperatures in the mid-90s or above, especially when accompanied by low-relative humidity can desiccate exposed silks and pollen grains. Luckily, pollen shed typically occurs during the early- to mid-morning hours before temperatures climb to this level.

In soybeans, very high soil temperatures (90°F+) can cause decreased nodulation and nitrogen fixation. This is most likely to occur on coarse textured soils that lack residue or canopy cover.

High temperatures and moisture stress during the R3–R5 growth stage will also shorten the flowering period, cause leaf loss or decrease pod set, among other potential impacts.

Not much can be done when dealing with the weather; however, management practices conserving moisture in the soil profile and reducing soil temperatures, may be beneficial in reducing the impact of heat stress on crops. No-till or reduced-till fields can reduce surface evaporation, as well as decrease soil temperature. Research from Suat Irmak at University of Nebraska–Lincoln shows no-till or reduced-till corn and soybean fields can have soil temperatures up to 8–10°F lower than disk-tilled fields.

FOR MORE INFORMATION

- Nebraska Extension resource: "Heat Effects on Alfalfa," <http://extension.unl.edu/statewide/gage/Heat%20Effects%20on%20Alfalfa.pdf>
- Nebraska Extension resource: "Impacts of Extreme Heat Stress and Increased Soil Temperature on Plant Growth and Development," <http://cropwatch.unl.edu/2017/impacts-extreme-heat-stress-and-increased-soil-temperature-plant-growth-and-development>
- Michigan State University Extension resource: "Moisture stress and high temperature effects on soybean yields," http://msue.anr.msu.edu/news/moisture_stress_and_high_temperature_effects_on_soybean_yields
- Purdue University Agronomy Department resource: "Drought and Heat Stress Effects on Corn Pollination," www.agry.purdue.edu/ext/corn/pubs/corn-07.htm

Free Program: Opportunities for Growing and Grazing Cover Crops

Wednesday, Aug. 9
11 a.m.–5:30 p.m.

During the Lancaster County Super Fair
Lancaster Event Center –
Exhibit Hall (next to Pav. 3),
84th & Havelock, Lincoln

Nebraska Extension, North Central SARE, Lancaster County Farm Bureau and the Nebraska Corn Board have teamed up to provide a learning and networking opportunity for potential cover crop growers and cattle operators to partner and add mutual value to their operations. This program will feature a trade show, speakers from public and private organizations, as well as first-hand insight from producers who are making it work right here in Nebraska.

Please register by Friday, Aug. 4 by going to <http://lancaster.unl.edu/ag/covercrops> or calling 402-441-7180

FREE thanks to our sponsors (includes lunch)

Improving Acreage Garden Soil: Consider Using Cover Crops

Sarah Browning
Extension Educator

Acreage and home gardeners often think only large-scale farm producers use cover crops and their acreage garden is too small to use a cover crop appropriately. This really is not true — no matter the size of the garden plot, cover crops can be used to add organic matter to the soil and improve soil structure.

Rebuilding Soil Aggregates

Soil quality in a flower or vegetable garden can degrade over time, especially if the soil is tilled frequently. Or maybe you've never been happy with the quality of your garden soil. Either way, the answer to improving soil is addition of organic matter and natural rebuilding of soil aggregates.

Frequent soil tillage, with little to no incorporation of plant residues, hastens the decomposition of soil organic matter and breaks up soil aggregates. Working garden soil by weeding, harvesting and other foot traffic also degrades soil texture by increasing soil compaction.

Soil is much more than individual particles of sand, silt and clay. Ideally soil should be one-half solid materials (sand, silt, clay, nutrients, minerals, organic materials and biological



Anthony LeBude, NC State University, Bugwood.org

Buckwheat used as a cover crop.

life) and one-half pore space. The pore space is very important! An old horticulture riddle asks, "Where do plant roots grow?" The answer is they grow in the pore spaces.

What are soil aggregates and what do they have to do with pore space? Soil aggregates are clusters of sand, silt or clay particles held together in tiny, irregularly shaped groups. These tiny groupings are surrounded by pore space. In soil with good aggregation, these pore spaces are larger than those found in a soil with poor aggregation, where soil particles are tightly packed together individually.

Compacted soil with poor aggregation is hard. It's hard to

dig and difficult for plant roots to penetrate. It is also difficult for water and oxygen to move into the soil, which influences plant root growth and quality.

How Does Organic Matter Benefit Soil Quality?

Organisms living in the soil, like earthworms, bacteria and fungi create sticky waste substances that "glue" soil particles together, creating larger soil aggregates. Adding organic matter to your soil creates a more favorable environment for earthworms, bacteria, fungi and other soil life to inhabit.

Organic matter has other

great benefits for soil quality, too. It increases the water-retention potential in sandy soils and improves water percolation in heavy soil.

Organic matter can be added to soil through the addition of compost, tree leaves, grass clippings, manure or animal bedding. But another great way to add organic matter is to grow your own through the use of a cover crop. Growth of the cover crop's roots help open up the soil, creating pathways for oxygen and water penetration into the soil, and when the cover crop is tilled or spaded into the soil, it decomposes and increases the soil's organic matter content.

Cover Crops

Several types of plants are commonly used as cover crops, including buckwheat, sweet clover, oats, peas, radish, winter rye, annual rye and winter wheat. Choose a cover crop based on your goals for improving the soil and the time of year for seeding.

One of the best grains to use is annual rye. If it is planted by early September, it should get tall enough to help prevent the erosion that often occurs when a garden is left bare during winter. Annual rye dies over winter, so gardeners don't have to worry about it becoming a long-term weed in the garden.

The recommended method for planting in small gardens

is to disk or work the ground; broadcast the seed; then work the soil again. Mulches, such as leaves, can be worked into the ground at the same time or left in a thin layer on the surface. When it begins to grow, the rye may even help to hold the leaves in place and keep them from blowing off of your garden.

You don't have to wait until the garden is all cleaned up to plant your cover crop. You can sow it in the areas surrounding such late crops as potatoes, squash, carrots and Brussels sprouts.

In spring, when the rye is six inches or so in height, it can be mowed or tilled under. If it gets too tall, mow first, then till. And remember, the cover crop does not have to be tilled under all at once. Areas where early vegetables are to be planted can be tilled early while other areas are left to stand later in spring providing additional weed prevention.

Stock Seed Farm is one good local Nebraska source for cover crop seeds. Find them online at www.stockseed.com.

FOR MORE INFORMATION

"Cover Crops and Green Manure Crops," University of Missouri Extension online at <http://ipm.missouri.edu/MEG/2011/8/Cover-Crops-and-Green-Manure-Crops>