# FOCUS on South Plains Agriculture

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# Editorial: Why We Need Transgenic Crops

Patrick Porter

My job is to provide pest control options for everyone, be they organic, conventional or transgenic growers. A recent exchange of opinions on one of the social media sites made it clear to me that there is a lot of misunderstanding about transgenic crops. I have worked with them for 23 years and, as an agricultural entomologist and agronomist, my perspective comes from the trenches.

First of all, we will soon have 9 billion people in the world and will have to feed them on less land and with less water. Although it is counter-intuitive, population growth goes down when food supplies are adequate and stable, and population growth goes up when the reverse is true. (This is documented fact but we know it anyway: think of population growth in Europe vs. India or China before the One Child policy.) Organic agriculture has lower yields and higher risk of crop failure than either conventional (chemical) agriculture or transgenic crop agriculture. There is no way organic agriculture can feed the world. However, I'm glad we live in a wealthy nation where we have the option of buying more expensive organic food but, then again, we spend only about 9.8 percent of our incomes on food.

Now think about many of the poorer nations in the world where people spend 30 -40 percent of their incomes on food (http://wsm.wsu.edu/researcher/WSMaug11_billions.pdf). If food production declines or supply can't meet increasing demand then world food prices will go up. We in the wealthy nations will not stop buying the more expensive food on the world market. We will pay more and the people in the poor countries will have less and it will cost them more. We need to grow more food on less land, else the poorer nations in the world will suffer disproportionate deprivation. (We saw this a few years ago when lower U.S. corn production and the ethanol mandate in the U.S. created a world shortage of corn. Corn went from $2.50/bushel to $8.50 and we barely noticed in the U.S. Our farmers then shifted production to corn by reducing the acres planted to wheat and soybeans; less of these commodities were produced and their prices skyrocketed on the world market. Developing nations could no longer afford to buy wheat, soybeans or corn.)

Given this, there are really no other options than to use transgenic technology – or vastly increase the use of crop protectant chemicals that are expensive and often dangerous to apply without the proper technology and protective equipment. We have transgenic crops that grow more yield on less water and fertilizer, produce more yield due to less insect damage and loss to disease, and some contain far more nutrients than conventional crops.

Transgenic crops are expensive to develop and seed companies must invest large amounts of money in research, testing, seed production and in meeting regulatory requirements. No one is forced to buy transgenic seed; farmers do it because these crops increase their yields and/or save money through reduced input costs. Yes, many farmers, because of the cost, hold their noses when they buy seed, but they understand that transgenics reduce the risk of farming and often result in higher net farm income even after paying the higher price for transgenic seed than for conventional seed.

Do I wish we could feed the world without using chemicals or transgenics? Yes. Can we? No, not even close. I work with transgenic crops because I believe they are the only way to feed the world in the future. Transgenic crops are relatively new and we have never done this before. There will be stumbles, like insects becoming resistant to some of the technology or like herbicide tolerant weeds. Part of my job is to help determine where things went wrong and help avoid making other mistakes in the future. Seed companies want to avoid these mistakes because they would reduce the value of their technology, and also because they know that transgenic crops are the best hope of feeding an increasing world population. I will also say that I know many people that work for seed companies and they are people just like us. Their motivation is not world market dominance or monopoly, it is creating crops that can feed people. I'm not going to get in to Mitt Romney's statement that corporations are people, but I am going to say that there are many fine and well meaning people working for Monsanto, Dow, Syngenta, Bayer and Pioneer. The truth is that the world needs them and their technology. RPP

# Freeze Damage to Corn and Sorghum

### Freeze Injury Potential on Young Corn & Grain Sorghum

I have received several reports on freeze injury concerns in corn (Reeves, Hockley and Lamb counties) and grain sorghum (Lubbock County). Overall, there is not much concern at this point for reasons noted below.

The Texas A&M AgriLife Extension document, "Assessing Hail and Freeze Injury to Field Corn and Sorghum" B-6014, is available for dowload. The first table notes the percent adjustment in yield potential with leaf loss at certain growth stages. For example, a 50% loss of leaf area at the 8-leaf stage translates into a 3% yield loss. If 50% loss occurred at 12 leaf stage, then 9% yield loss. The growing point is first below, then at the soil line through at least leaf stage 6, and even then it is low to the ground for a couple more leaves. These numbers are for corn that is further

along than what we see in the South Plains. The earliest corn I am aware of was planted about April 5. Yes, growth will be slowed, and it may take up to a week of heat unit accumulation to 'catch up,' but 1 day in early July is worth 2 days in early May, so the long-term delay in maturity is not large. Though damage may look bothersome, the corn will grow out of it.

The comments from Reeves on the trapped leaves and buggy-whipping observed in corn are mentioned on pages 3-4. It does note that in worst-case scenarios you could mow the tops off, but my guess you are safe to wait 7-10 days before you do so to see how much is truly needed. The document notes that 85-90% of the plants with buggy-whipping eventually do push through the damage to resume normal growth (though that percent changes with fields, severity). CT

# Cotton Chilling Injury

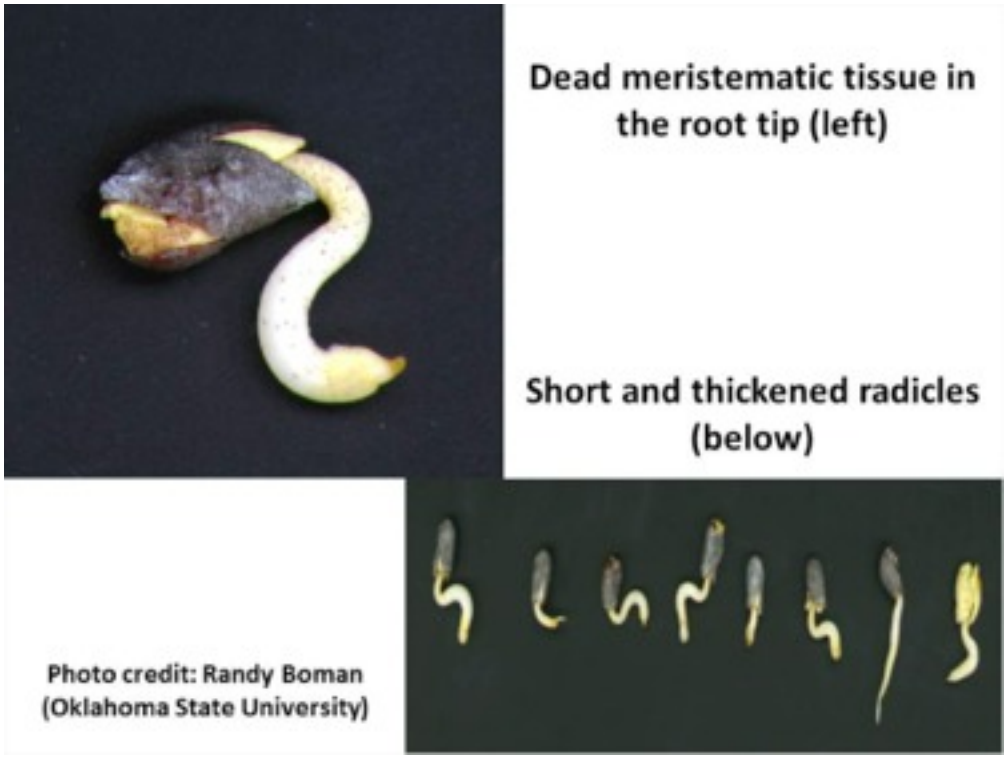
### Increased risk for chilling injury and seedling disease

It appears the rollercoaster ride of temperature extremes will continue throughout the first week of May on the Southern High Plains. As a result of several cold fronts and warming trends in addition to pre-watering, soil temperature readings are all over the place. Many producers are simply waiting for the last 'last' cold front to move through before they start planting; however, some folks have already started planting in order to cover a large number acres or take advantage of planting moisture that is available. As referenced in the First 40 Days: The Most Critical Period in Cotton Production, less vigorous varieties are more susceptible to stresses caused by inadequate moisture, cool temperatures and seedling disease, as well as early season insects, such as thrips.

Optimum conditions are to have adequate moisture and a 10-day average soil temperature of ≥65°F at the 8-inch depth. Temperatures of soil in the seed zone will lag ambient air temperatures by about 3-5 hours; however, the application of irrigation to water the crop up may reduce soil temperatures more rapidly. Soil temperatures below 50°F can have a detrimental effect on the germination of cotton seed causing chilling injury. Cotton is most susceptible to chilling injury as water is taken up (the first 2-4 days) and becomes less of a problem once the radicle emerges. Growth and development of roots and seedling emergence can be slowed in cool temperatures are experienced for an extended period. Symptoms of chilling injury may vary, but plants exhibiting symptoms have a shortened tap root, as the meristematic tissue in the root tip is killed, often resulting in a proliferation of secondary roots, commonly referred to as crow-footing. These plants will generally survive and secondary lateral roots compensate for this loss; however, they are more susceptible to water stress. Additional information on chilling injury can be found on the 2011 Cotton Resource DVD.

Furthermore, the compromised root systems may be more readily affected by seedling disease pathogens. Rhizoctonia solani is capable of causing seed decay as well as a pre- and post-emergence damping off with seed decay and pre-mature damping off occurring when seed is

planted into cool soils. Symptoms of seedling disease caused by Pythium spp. are similar to those caused by R. solani; however, the seed and radicle are very susceptible to infection. In older plants, infections by Pythium spp. are restricted to feeder roots. Both R. solani and Pythium spp. are capable of killing plants after they emerge. Thielaviopsis basicola, causal agent of Black root rot, attacks the roots and lower stems of pants infections, with disease being more severe under cool conditions. Infected plants rarely die; rather they are delayed in development exhibiting severe stunting. A swelling of the root cortex may also be observed. Roots of infected plants are black and rotted, but generally recover after soil temperatures increase. If you have any questions about the content presented in this article, contact Jason Woodward at 806-632-0762 or via e-mail jewoodward@ag.tamu.edu. JW


Dead meristematic tissue in the root tip (left)
Short and thickened radicles (below)
Photo credit: Randy Boman (Oklahoma State University)


"Crow-footing"
Photo credit: Randy Boman (Oklahoma State University)

# Cotton Agronomy

## Soil moisture and seed quality considerations

As cotton planting quickly approaches, the Texas High Plains are still experiencing moderate to extreme drought conditions. Although we have received 3.24" of rain since October 2012 (Lubbock Airport – National Weather Service), more is needed to achieve adequate moisture for planting and replenish the soil profile under dryland production systems. If a significant amount of precipitation does not occur prior to planting, pre-plant irrigation may need to be applied for stand establishment. In some areas, especially where irrigation capacities are low, or under sub-surface drip, pre-watering has recently begun or has been going for some time now. However, some producers may opt to plant to dry soil and irrigate to a stand under sprinkler irrigation systems. This practice can potentially increase the occurrence of seedling disease with the application of cool irrigation water. Also, if watering to a stand, producers should take special precautions in order to prevent seed from settling deeper into the seed bed during the irrigation process, which can result in delayed or reduced emergence and decreased cotton seedling vigor. This is especially important in extremely "powder" dry soils and light "sandy" soils.

Whether pre-watering, planting dry and watering to a stand, or relying on available moisture from precipitation, planting into a firm, moist seed bed with the proper soil temperature and good seed to soil contact is imperative for achieving optimum stand establishment. Other important factors to consider for optimum stand establishment include variety selection, seed quality, seeding rate and timing.

Producers in the Texas High Plains and Panhandle regions by now have selected cotton varieties with desired technologies for planting that best fit their management practices. In addition to variety selection, seed quality is highly important and can easily be determined. Prior to transgenic cotton seed production, producers could catch their seed and have TDA perform a cool-germ test and a warm-germ test to determine the Cool Warm Vigor Index (CWVI). Since then, producers have relied on seed companies to provide good quality seed and, for the most, part have not been disappointed. If desired, the CWVI can still be determined by adding the "standard germ" (printed on the seed tag) and the cool-germ (provided by seed companies) for individual seed lots. If the sum of the standard and cool-germs, or CWVI, are 160 or better, it is considered excellent. Good CWVI is between 140-159, Fair is 120-139, and below 120 is poor. Once seed quality has been determined, sorting seed lots by CWVI is recommended for planting sequence. Planting seed with highest quality first, if planting early, will help insure adequate stands under marginal planting conditions. Lower quality seed lots should only be planted under optimum conditions. Additionally, if producers plan to cut back on seeding rates, high quality (160 CWVI) or better should be used to increase the chances for obtaining optimum plant stands between 2 and 4 plants/row-foot on 40 inch row spacing.

Finally, timing of planting can be difficult to determine in the Texas High Plains, especially in northern areas. Temperature readings from the National Weather Service – Lubbock Airport

have fluctuated drastically during the month of April with lows dipping into the lower 30s and upper 20s during the 1st week, on the 9th through the 11th, on the 18th and 19th, and on the 23rd and 24th. Unfortunately, this has prevented cotton producers from getting off to an early start with planting. In addition, we are currently experiencing another round of cool temperatures. On the bright side, a slight chance of precipitation is also in the forecast at this time. After this potentially late freeze event, producers will likely start planting as soon as temperatures rebound.

Getting off to a good start is critical to a successful growing season and optimizing yields and profitability. Planting high quality seed at recommended seeding rates to a firm, moist seed bed at 65° F or better with a favorable five to seven day forecast will greatly increase chances for success. MK

## Soil and water salinity

As a result of the continued drought conditions, some producers in the Southern High Plains region have decreased emergence and/or cotton yield due to soil and irrigation water salinity. Cotton is considered a salt tolerant row crop. However, there are soil and water thresholds that when reached or exceeded can result in significant emergence reductions and/or cotton lint and seed yields. If producers suspect a salinity issue in their fields or irrigation water, samples should be taken and sent to a soil and water testing facility for detailed "SALINITY" analyses.

Some general signs of saline soil can include white crusting at the soil surface in the furrow, side of seed bed, or top of seed bed, and/or decreased seed emergence or poor vigor. We suggest that soil samples be taken prior to planting from the 0-3", 3-6, and 6-12" depths to determine severity of salinity if present. By definition a saline soil is a soil containing sufficient soluble salt to adversely affect the growth of most crop plants with a lower limit of electrical conductivity of the saturated extract ($EC_e$) being 4 deciSiemens/meter (dS/m), which is equivalent to a value of 4 mmhos/cm (or 4,000 µmhos/cm), and a Sodium Adsorption Ratio ($SAR_e$), another parameter measured from the soil extract, below 13. Cotton seedlings, although somewhat susceptible to salts, in general will survive higher levels than 4 dS/m (mmhos/cm). When $EC_e$ levels reach 15.5 dS/m, a 50% reduction in emergence may be observed. However, if a normal (3-4 seed/row ft) stand is established, cotton can tolerate soil salinity up to a level of 7.7 dS/m before significant yield reductions are observed. At 17.0 dS/m, a 50% yield reduction may occur, and at levels greater than 25 dS/m, crop development may cease with a 100% cotton yield reduction observed.

Irrigation water quality can also influence the level of soil salinity and thereby cotton crop performance. Salts are naturally occurring in groundwater, and they can accumulate in soil, especially when there is insufficient rainfall to aid in diluting or leaching of salts from the root zone. Several sources have indicated that irrigation water quality, in terms of salinity, should be closely monitored. One of the sources, Irrigation Management With Saline Water by Dr. Dana Porter and Thomas Merek, is available online. This article suggests that cotton performance is not negatively impacted by salinity in irrigation water up to an electrical conductivity of water ($EC_w$) threshold of 5.1 dS/m. However, when the $EC_w$ reaches 12.0 dS/m, a yield reduction of 50% may be observed. MK

If drought conditions persist, areas of the Texas High Plains may experience increased levels of soil and water salinity which can significantly impact cotton emergence and productivity. Due to space constraints, not all information is available in this article. The statements above should be used as a general guideline, or starting point, as other factors, such as soil type, fertility level, and irrigation practices can influence salinity levels in the soil. If a producer does determine that a saline soil/water situation is present, they can contact Texas A&M AgriLife Extension Service personnel for more information. MK and DP.

# Pesticide News

### European Union Bans Many Uses of Neonicotinoids for Two Years

In a split vote, the European Union has decided to ban the use of neonicotinoid insecticides for two years beginning on Dec. 1 of this year. The ban will not apply to their use on winter cereals and plants not attractive to bees.This action was taken in response to scientific evidence that these insecticides harm insect pollinators. RPP.

The following are links to news articles provide more detail.
The Times (London)
The Guardian
More detail on the scientific studies: The Guardian

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## Useful Web Links

Water Management Website, TAMU, Irrigation at Lubbock, IPM How-To Videos, Lubbock Center Homepage, Texas AgriLife Research Home , Texas AgriLife Extension Home, Plains Cotton Growers

## County IPM Newsletters

Castro/Lamb, Dawson/Lynn, Crosby/Floyd, Gaines, Hale/Swisher, Hockley/Cochran, Lubbock, Parmer/Bailey, Terry/Yoakum