2010 Heirloom Tomato Report:
Blistering Temperatures and Blister Beetles

George Kuepper, Sustainable Agriculture Specialist
Seth Stallings, 2010 Student Intern

Kerr Center for
Sustainable Agriculture
P.O. Box 588
Poteau, OK 74953
Phone: 918.647.9123
Fax: 918.647.8712
mailbox@kerrcenter.com
www.kerrcenter.com

Editing: Wylie Harris and
Maura McDermott
Photo: Maura McDermott
Design: Tracy Clark

Background

The main focus of work with tomatoes in 2010 was an evaluation trial of grafted heirlooms. The results are reported in a separate publication. This document discusses a few of the other interesting observations we made in 2010. It was a challenging year! Blistering summer temperatures dominated; they routinely soared above 100° F. Insect pest problems followed in the wake of the heat. Blister beetles, in particular, reached biblical plague proportions.

Materials and Methods

We located our tomato plots at the Cannon Horticulture Project on the Kerr Center Ranch. The project was established in the fall of 2007 and is in transition to certified organic status. The Cannon site features a loam soil with moderately-poor drainage. It has organic matter levels around 3.1% with pH ranging from 6.6 to 7.0. Native phosphorus and potassium levels on these soils are typically low. However, compost applications in 2009 have improved the phosphorus status considerably and the potassium moderately. The previous crop in 2009 was sorghum-sudangrass planted as green fallow. This was followed by a winter cover crop of triticale, purple vetch, and volunteer crimson clover.

We prepared the plot by mowing the winter cover crop on April 29. The residue was raked to the side and a 2.5-foot wide ridge was formed using a BCS walk-behind tractor and rotary plow. Drip tape was installed and the residue raked back into place as mulch. Supplemental grass mulch was added where needed. The earliest transplants (Ozark Pink, Eva Purple Ball, Principe

Borghese, Goldman's Italian American, Henderson's Pink Ponderosa) were set out on May 6; Cherokee Purple and Brandywine transplants were set out on May 21. The latter transplanting was done much later than desirable, especially considering the mild spring weather and warm soil temperatures, which were 3-4 degrees above the recommended 65° F minimum. Cages were set in place in the days that followed.

We applied supplemental organic fertilizer for the first transplants on May 10 and on May 26 for the second set, providing the NPK equivalent of 10.6-2.0-8.6 pounds per acre. Dilute foliar fertilizer sprays made from fish emulsion, liquid kelp, humic acids, micronized minerals, and plant extracts were applied four times throughout the season. Irrigation was applied as needed.

Yields and Varietal Performance

With the exception of our grafted trial, remaining heirlooms were not arranged in an experimental plot design, so fine differences in yield could not be measured. Our observations, therefore, are much more general.

While it was certainly troubled by the high summer temperatures, Cherokee Purple was the best performer by far. Cherokee Purple is a very popular heirloom tomato in Oklahoma. It is believed to be over 100 years old and was reportedly grown by the Cherokee, hence the name. It is indeterminate and disease-resistant. Fruits are relatively large, about 10-12 ounces, with a dark tinted red color.

By comparison, Cherokee Purple's performance in our 2009 trial was mediocre. However, that was a very different growing season, with moderate temperatures and abundant moisture. Varieties less hardy than Cherokee Purple were able to show their full potential in the absence of stress.

Principe Borghese was also an excellent performer. It seemed the least affected by the heat and high temperatures. Principe Borghese is a semi-determinate variety that produces a great abundance of small, 1-2 ounce pear-shaped fruits, suited for sun-drying. The fruits are firm, but tasty, and resistant to cracking.

Ozark Pink VF was originally developed by the University of Arkansas for vine-ripe harvest by market growers and home gardeners. It has an indeterminate growth habit and was specifically bred for staked production in our hot, humid, and disease-prone region. It was the top performer in our 2009 trial, but did less well in 2010.

Similarly, Eva Purple Ball - an excellent performer in 2009 - did not do nearly as well this past year. The Southern Exposure Seed Exchange catalog claims it is well adapted to hot and humid climes, which it appears to be, but not when temperatures become too extreme.

We grew Henderson's Pink Ponderosa for the first time in 2010. It produces large pink-red beefsteak-type fruits. It had good taste and was very productive, given the tough season. We definitely think this variety has potential for SE Oklahoma. We sourced the seed from Baker Creek Heirloom Seed, Mansfield, Missouri.

I was excited at the prospect of growing Goldman's Italian American, another first for us at Kerr Center. This is a Roma-type tomato with pear-shaped fruits - the kind usually grown for canning. It is reputed to have one of the highest Brix (dissolved solids) levels of any tomato. Unfortunately, Goldman's was not only highly susceptible to blossom drop (see the discussion that follows), but the plants had very poor heat tolerance. All died during the month of August despite irrigation; no plants from any other variety succumbed in this manner.

Blossom Drop

As mentioned earlier, high temperatures and heat were the compelling issues of the season. As expected, these led to significantly lower yields for all varieties. The yield loss was due largely to a condition called "blossom drop," in which the tomato flowers simply abort and do not set fruit. High temperatures - daytime temperatures exceed-

ing 85° F combined with nighttime temperatures over 72° F - are responsible. However, exposure time is also a factor. Short exposure times (a week or less) have a limited effect on fruit set and yield; longer exposure, by comparison, can be quite serious. It certainly proved so in 2010.

It is interesting to note that the nighttime temperatures are the most important in triggering blossom drop. High nighttime temperatures, alone, can cause it, whereas high daytime temperatures, alone, generally, do not.

There is variable heat tolerance and susceptibility to blossom drop among varieties. Heirlooms, in general, are more susceptible than most hybrids.(1) The standard recommendation for countering blossom drop is simply to wait it out. Keep plants watered, weeded and fertilized. As temperatures moderate, flowers will again set fruit for a later harvest. While this strategy should work in most years, the high summer temperatures of 2010 were truly prolonged. Our late harvest was extremely small and did not justify keeping our plants watered past mid-September.

Sunscald

Sunscald is a physiological disorder of tomato fruit caused by too much direct exposure to bright sunlight. Affected fruits soon rot and are not marketable.

As our harvest season opened, we lost a high percentage of fruits to sunscald. Dense foliage is the first defense against this problem and, though we do not prune our plants, there was not enough canopy to forestall serious damage.

As a solution, we tried spraying the plants with Surround®, a product comprised of kaolin clay, which adheres to plant surfaces, giving them a whitish cast. The white film reflects sunlight to reduce sunscald and repel insect pests. Surround® was amazingly effective in eliminating sunscald losses.

We had never used Surround® prior to this and quickly learned that the challenge of using it is in the application. The formulated clay does not dissolve in water, but is dispersed. Therefore, the spray mix must be kept agitated so the clay does not settle out. If your sprayer has a powered agitator, this is no problem. Backpack and other hand-pump sprayers are another matter. When using those, we needed to pause often to shake the tank and keep the material in suspension. It is hard work! Moreover, applications need to be repeated as new fruits emerge, and after each rain. Still, it was well worth the effort this past year.

Surround® is not especially difficult to mix, though one is using rather more actual material per acre than is common with most pesticides - conventional or organic. The difficulty is keeping the clay in suspension.

Shade cloth is another means for reducing sunscald. In 2011, we are planning to grow in-season tomatoes using high tunnels (hoophouses), covered variously with plastic and shade cloth. We hope to see effects not only on sunscald, but on blossom drop, foliar diseases, and possibly, even on pest infestation. Look for our report in 2012!

For more information on how kaolin-based sprays work, see ATTRA's Insect IPM in Apples: Kaolin Clay at http://www.attra.ncat.org/attra-pub/PDF/kaolin-clay-apples.pdf or Kaolin Clay for Management of Glassy-winged Sharpshooter in Grapes at http://www.attra.ncat.org/attra-pub/PDF/kaolin-clay-grapes.pdf

Striped Blister Beetles

It was not clear how well Surround® worked to repel insect pests. It was clear, however, that it did little to deter the Striped Blister Beetle.

Striped Blister Beetle (Epicauta vittata) is usually a minor pest for us. A few massed hordes appear each year, but the damage is usually limited in time and space. In 2010, however, the numbers were far larger, and feeding continued for weeks. It was especially problematic in the tomatoes.

After realizing we couldn't ignore the pest this year, we tried several natural pesticides, including diatomaceous earth, insecticidal soap, neem, and

pyrethrum. Most of these materials had little effect, except for pyrethrum. The formulation we used is marketed under the name of Pyganic®, which is OMRI-listed for organic crop use. Pyganic clearly knocked the beetles down, but it was not clear that they were being killed. Many appeared to wobble off into the vegetation and few corpses remained visible. We later added d-limonene (orange oil) and neem (Green Light Neem Concentrate®) to the Pyganic spray, and believe it gave us a more effective kill, though we were still not entirely satisfied.

We prefer to use botanical pesticides like pyrethrum, d-limonene, and neem only as a last resort, since they are all rather hard on beneficial insects and are a bit more hazardous to handle. This was not a major concern in our battle with striped blister beetles. Their feeding occurred in clusters and spot-spraying could be done, without impacting beneficials unduly. In 2011, we will try using Mycotrol-O® - a formulation of Beauvaria bassiana - should blister beetles again become a problem. Assuming it will work, however, this alternative has its own challenges. It is a biological pesticide, like the more-familiar Bt (Bacillus thuringiensis). However, B. bassiana is comparatively broad-spectrum and can be hard on beneficial insects as well as pests.(2) For this reason we will still need to apply it as a spot spray, much as we did with the botanical mix.

Despite the damage they cause, blister beetles play an important role in biological control. The larval stage of the beetle lives in the soil and feeds primarily on grasshopper eggs. Each larva can consume about 30 eggs - roughly the size of the egg "pods" laid by grasshoppers.(3) Though we want to control these beetles in our crops, in no way do we want to exterminate them!

A Final Note

It is not certain when we'll again see summer temperatures like those of 2010. The only certainty of climate change appears to be the increased unpredictability of the weather. Perhaps the best lesson we can take from this tough year is our need to identify resilient vegetable crops, varieties, and cultural tools that allow us to continue producing high quality produce through wide weather swings of the uncertain times ahead.

References

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About the Authors

George Kuepper is Sustainable Agriculture Specialist for the Kerr Center for Sustainable Agriculture. Prior to this, he was Midwest Office Coordinator and Technical Specialist for the National Center for Appropriate Technology and the ATTRA Project, specializing in issues related to organic certification, compliance, and transition.

Seth Stallings was a student intern and program assistant at the Kerr Center in 2010-11. He was born in Ft. Smith, Arkansas, and raised in Heavener, Oklahoma. He has an associate's degree from Carl Albert State College and a Bachelor of Arts in Anthropology from Oklahoma Baptist University.