



The Virtual Gardener—Tomato “Terroirism”

At the risk of getting into a rut, I’m going to write about tomatoes again this month. Last month when I wrote about San Marzano tomatoes, I was intrigued by the assertion made by some Italian tomato growers that San Marzano tomatoes grown around the slopes of Mount Vesuvius in the Campania region of Italy taste better than the same variety grown elsewhere. I said in the article perhaps it had something to do with the soil or climate, but there remained a nagging doubt in my mind about that. So this month I want to examine in a little more detail what influences the flavor of a tomato with an emphasis on soil and climate.

The technical term for the combined influences of geography, geology, climate, and genetics on the quality of an agricultural product is called *terroir* [pronounced something like “ter-wahr”). What we’re interested in discovering is whether there is such a thing as a San Marzano tomato terroir.

There’s little doubt that home-grown tomatoes are more flavorful than the ones you buy at the supermarket, but

the difference in flavor is easily explained without reference to soil or climate. The tomatoes you buy in the supermarket are especially bred to produce high yields, be spherical, red, blemish-free, and survive long trips to the market under (for a tomato) harsh conditions. In addition, they are picked green and artificially ripened with ethylene gas. Somewhere in the process of breeding and processing the “perfect” supermarket tomato, flavor gets lost.

Before we can discuss how to grow more flavorful tomatoes, we have to agree on what makes them flavorful in the first place. Discovering the components that produce the best tasting tomato is difficult because not everybody is going to agree that one tomato tastes better than another. The major influence on flavor is the balance between sweetness and acidity. Most people prefer sweeter tomatoes. Others prefer more acidic ones, but the balance

(Continued on Page 2)

Inside this issue:

Genetic Engineering	3
In a Desert Garden	4
Cuttings ‘N’ Clippings	4
Did You Know	4
At a Glance Box	5
Fremont’s cottonwood	5
Ask a Master Gardener	6
March Reminders	6



COLLEGE OF AGRICULTURE AND LIFE SCIENCES
COOPERATIVE EXTENSION
Cochise County

Cochise County Cooperative Extension

www.ag.arizona.edu/cochise/mg/

1140 N. Colombo, Sierra Vista, AZ 85635
(520) 458-8278, Ext. 2141

450 S. Haskell, Willcox, AZ 85643
(520) 384-3594

(Continued from page 1)

of sugars and acids alone is not the only factor that comes into play here. Subtle differences are introduced by certain volatile components.

We know that taste is confined to five basic categories: sweetness, sourness, saltiness, bitterness, and umami. (see [Wikipedia](#) for more information about this subject). Much of what we refer to when we speak of how something “tastes” is really an olfactory sensation. In tomatoes, these tastes are associated with a variety of volatile compounds that release chemicals into the air when we bite into the tomato. The kinds and concentrations of these flavor-enhancing compounds present in a tomato depend upon many factors including the variety, ripeness, and the conditions under which it is stored after picking. Storing tomatoes in a cool environment, for example, can cause these compounds—along with the flavors they produce—to escape. Harry Klee, a professor in the Horticultural Sciences Department of the University of Florida is studying this subject. If you would like to read more about flavor in tomatoes, check out his website [here](#).

So we’ve got a handle on why tomatoes taste good, but what we really want to know is how to grow good-tasting tomatoes. What’s the secret?

In 2009 Rutgers University published a [study](#) of how soil fertility and fertilizers can influence the taste of tomatoes. They began the study by asking whether there was something in the New Jersey soils, climate, or cultural practices that make Jersey Tomatoes so good. (Interestingly, the “fake” San Marzano tomatoes referred to in my previous article are grown in New Jersey!)

Ignoring for the moment the jingoistic assumption that New Jersey tomatoes are somehow better than tomatoes grown elsewhere, let’s see what the study came up with.

The study showed potassium, sulfur, and boron are three nutrients that deserve special attention for growing tasty tomatoes.

Potassium helps move water into the cells of the developing tomato fruits, creating juicier tomatoes. Our desert soils generally have adequate amounts of potassium but high alkalinity may limit its availability to plants. Tomatoes grown in containers using artificial soils may require additional potassium.

Sulfur, an important component of the organic compounds that give flavor to tomatoes, is unlikely to be present in sufficient quantities in our high pH, often sandy desert soils with low organic matter. In an [article](#) on growing tomatoes in the Maricopa County Cooperative Extension Journal, the author recommends the addition of soil sulfur to your tomato beds.

Boron improves yields and fruit quality, and helps prevent fruit cracking. Citing research done in North Carolina, the Rutgers study says that boron can be effectively applied by foliar sprays or through the drip irrigation system. Boron deficiencies may develop in our alkaline desert soils because boron tends to become bound in insoluble compounds making it unavailable to plants. Boron can be easily applied by mixing tiny amounts of laundry borax in water and sprinkling it on the plants. One [recommendation](#) is to use 1 tablespoon of laundry borax to a gallon of water. Be careful not to overdo it, though. Even tiny excess amounts of boron can be toxic to plants.

In a surprising result, the Rutgers study showed that tomato plants treated with a one-time drench of

ocean water produced more flavorful tomatoes, although the plants showed temporary stress from the treatment. This result was consistent with an Israeli [study](#) published in 1982 that showed that tomato plants sprayed with a solution of 3 or 6 grams of sodium chloride per liter of water at flowering time significantly improved the flavor of tomatoes.

Soil quality and cultural practices are under the control of the gardener, but what about the climate?

I’m convinced that weather conditions have a great influence on the quality of home-grown tomatoes. Most tomato gardeners have had the experience of having great success growing a certain variety of tomato one year only to have the same variety fall flat the next year. I believe a significant cause of these differences is due to the weather, especially the timing and quantity of moisture and temperature. Some people believe that tomatoes, like great wine grapes, need to suffer a little—but not too much—privation in order to produce the most flavorful fruit. Too much water, they say, will dilute the flavor.

Temperature too is important. It is common knowledge that fruit set occurs best in the temperature range of 50°F to 90°F, but some folks believe that nighttime temperatures in the 60s also produce the sweetest and most flavorful tomatoes. If you would like to read more about this fascinating subject, check out [this](#) website.

So where does this leave us with our original question? Is Campania the only place in the world to grow the best San Marzano tomatoes? Nah...I don’t think so.

Until next time, happy surfing!

Gary Gruenhagen, Master Gardener
virtualgardener@cox.net

Butterflies, Genetic Engineering, and Science

Do you remember the flap about Monarch butterflies being killed by exposure to pollen from genetically engineered (GE) corn? It was big news in 1999. Things got rolling with a one page letter that was published in the science journal *Nature* written by Cornell University entomologists. The letter described an experiment in which the monarch caterpillars were fed milkweed leaves coated with pollen from GE corn. The specific corn in question was genetically engineered to produce the toxin associated with *Bacillus thuringiensis* (Bt, a species of bacteria), a pesticide used to kill caterpillars. After eating the pollen coated milkweed leaves, some of the Monarch caterpillars, 44% of them to be exact, died and others exhibited stunted growth. By the way, the total number of dead larvae was 11; that's a pretty small experiment.

The news made the front page of the *New York Times* and was reported in print and on television. It was widely used to discredit genetic engineering in general. The environmental group, Friends of the Earth, used it to sell memberships asking in a letter, "If deadly toxins that kill butterflies are being introduced into our food supply, what effect are these toxins having on you and your family?" The entire thing was a public relations disaster for GE crops.

As is so often the case with science being presented by the popular media, the truth of the story is much different. Let's look at some of the problems here. First, no knowledgeable person was surprised that the caterpillars died from eating Bt. The corn in question was specifically engineered

to kill caterpillars of the corn ear worm, a significant corn pest. The caterpillars did not die because they consumed a GE crop, they died because they consumed Bt toxins. Bt is a widely used pesticide that specifically targets caterpillars, any caterpillar. Bt is a type of bacteria. Virtually all other creatures, including humans, can consume Bt with no ill effect. Bt is approved for use by certified organic growers. The EPA doesn't even require that crops sprayed with Bt (the traditional organic application method) be washed before consumption. Furthermore, the toxin that kills caterpillars isn't effective until it is exposed to a very alkaline environment, which is what the caterpillar's gut is; its pH ranges from 8 to 10. Your gut is acidic, with a pH of about 1 to 3; that's one reason why consuming Bt isn't bad for you. You've unknowingly consumed a lot of Bt in your day as these bacteria are "everywhere."

Next, Monarch caterpillars don't eat corn pollen. Their diet consists of 100% milkweed. Monarch adults consume flower nectar exclusively. For caterpillars in the wild to consume Bt pollen, the pollen must be blown onto milkweed. For this to happen, the monarchs must be in their larval stage when the pollen is being produced. The milkweed must be very close to a corn field in order to get a sufficient amount of pollen onto its leaves. Monarch "births" and corn pollen production occur (in this country) only along our northern border.

The Cornell experiment was poorly designed and was heavily criticized by fellow scientists. The sample size was far too small to be meaningful. No control larvae

were used. The larvae were not offered a non-pollen coated option to see if they would ignore leaves coated with pollen. Pollen was applied in unmeasured amounts and no attempt was made to determine if the amount applied represented a real world possibility.

In the end, the general public was given an erroneous lesson about GE crops. In truth, some monarchs will indeed succumb to Bt corn pollen. Estimates are that roughly 0.4 % of Monarch larvae will be exposed to GE corn pollen (1 in 250). There are no estimates of how many die as a result of traditional spray-on Bt applications, but undoubtedly some will die this way. You may have killed Monarchs in your garden if you have ever sprayed with Bt. As one person noted, more Monarchs are undoubtedly killed by mowing the sides of highways and roads than will ever be killed by Bt corn.

The details discussed are from a book entitled *Mendel in the Kitchen*, by Penn State geneticist Nina Federoff and Nancy Marie Brown, a science writer. The book is a detailed look at GE crops and, more broadly, some of the other techniques widely used by plant breeders. Unless you are very familiar with plant breeding, you'll be quite surprised to learn about some techniques; chemical mutagenesis and irradiation are standard (and unregulated). No matter where you stand on the GE issue, you owe it to yourself to read this book.

Happy gardening!

Bill Schulze, Master Gardener
billwithccmga@gmail.com

Cochise County Master
 Gardener Newsletter Editor
 Carolyn Gruenhagen

In a Desert Garden

Tradescantia - Wandering Jew

There are countless varieties in this plant family and several of them do quite well in our climate. They freeze to the ground, but recover quickly. They also make great house plants. Outside in my garden the plants are mostly grown in hanging baskets or as ground covers. In the house I have a *Tradescantia pallida* 'Purpurea' or Purple Queen in a hanging pot, and it is a monster. In my outside entry, I grow it in the ground. There it is not doing too well. It is a very dark spot and it would do better with more light. In the house the hanging pot is in my sunroom where it grows to be a monster every year and needs to be cut back severely. This *Tradescantia* variety is very impressive with its purple leaves and its pale pink flowers. It is native to Mexico.

Another pretty variety, *T. albiflora* or Wandering Jew, has green elongated leaves and small white flowers that come in drifts. This plant does well in sun or shade, is a strong grower, and needs a haircut from time to time to make it more compact. My plant is outside all year long. In the deep freeze we had a few years ago all my outside *Tradescantias* froze and I thought I had lost them, but they have come back. Now on below freezing nights, I cover those in pots with sheets of burlap. There are several variegated forms in this variety: green and white leaves, red and green ones, and green and yellow ones. The Wandering Jew is native to South America.

There is a plant that looks a lot like a Wandering Jew, only more



like a miniature variety. It is the 'Tahitian Bridal Veil'. Some of these have green leaves, some have purple leaves and an abundance of white flowers. This plant is not a *Tradescantia*, it is *Gibasis geniculata*.

I also grow one very unusual *Tradescantia*. Unfortunately, I cannot find any record of it in my books, but this must be my favorite. The leaves on this one are grayish-green and velvety, and the flowers are sky blue. I have several big pots all over my yard filled with a variety of these plants, as they are easy to grow and take care of. They are drought tolerant and easy to propagate. To make more just cut off some of the long stems and stick them into a vase with water, and in no time they root and can be planted. They make good additions to planters with a variety of plants in them.

Angel Rutherford. Master Gardener
Photographer



Cuttings 'N' Clippings

✿ CCMGA will hold its next meeting on **Thursday, March 6**, in the Public Meeting Room in Groth Hall at UASV, from **5:00—7:00 p.m.** The speaker will be Maryhelen Henthorn, talking with us about her tips for successful tomato gardening, her favorite varieties for our climate, and her "not-so-favorites." Then, she'll break out the cooking pans and demonstrate two of her favorite recipes for "garden-to-stove" dishes. As always, the public is welcome.

✿ The next Water Wise talk will be **Saturday, March 1, 9-11:00 a.m.** titled **Basics of Drip Irrigation**. Wondering about your drip irrigation system? Want to put one in? Come learn about the parts of a drip irrigation system and water/soil relationships. The presenter will be Dr. Stephen Poe, UA Extension Specialist, and the location is the University of Arizona Sierra Vista, 1140 N. Colombo Ave, Sierra Vista, AZ.

For information call (520) 458-8278, Ext 2141, or contact Joyce at: jwilliam@ag.arizona.edu
You can visit Water Wise at: waterwise.arizona.edu

✿ *High on the Desert*

It's not too late to register for the 21st High Desert Gardening & Landscaping Conference to be held March 13 & 14 at Cochise College. Information, including the Conference registration form, is available here: <http://eals.arizona.edu/cochise/mg/events.htm>

Did You Know . . .

Tohono Chul Spring Plant Sale will be held on Saturday, March 22 from 9:00 a.m. to 5:00 p.m. and Sunday, March 23 from 10:00 a.m. to 4:00 p.m. at 7356 N. Paseo Del Norte, Tucson. For info: www.tohonocho.org

At a Glance Box

It's a Bloomin' Cochise County Native Plant of the Month

Plant: Fremont cottonwood, *Populus fremontii*

Description: Large, deciduous tree

Blooms: Early spring

Use: Excellent riparian forest tree

Culture: Native to southwestern U.S. rivers and streams. Must have a constant available water supply.

Other: Not recommended for a landscape plant. Weak wood, short lived.

Learn more: Cochise County Herbarium,

www.cochisecountyherbarium.org

For an in-depth article, see below.

Cado Daily

Water Resources Coordinator, Water Wise Program

University of Arizona Cochise County Cooperative Extension

Fremont cottonwood

Here in Cochise County, we get blizzards – guaranteed twice a year even when the temperatures are above freezing and the sky is robin's egg blue. They typically occur once in February or March and once in October or November.

The “snow” is a bit different from the wet stuff paralyzing parts of the U.S. this year. Ours is dry and floats around in the air until it lands on the ground or goes up your nose (or so it seems) .

OK, it isn't really snow or a blizzard, but it seems like it because the seeds of two plants take to the air with great gusto and fill it with white floating stuff. Coincidentally, we sneeze.

In the November 2013 newsletter issue, I wrote about the Desert broom, *Baccharis sarothroides*, when the female plant releases profuse amounts of seeds carried on the wind by silky white hairs called “pappus.”

Our other season of “snow” occurs in the early spring from the cottonwood trees (appropriately named!).

These majestic trees are “phreatophytes” or “riparian obligates” meaning that they are naturally found near surface or shallow sub-surface water. In the Sierra Vista Subwatershed, a forest of cottonwoods intermixed with willow trees creates a verdant canopy along the San Pedro River.

In the spring, usually before the leaves emerge, the female cottonwood (*Populus* are in the Willow Family, *Salicaceae*, whose members are dioecious meaning that the male and female flowers are on separate plants) disperses piles of seeds nestled in cottony down.

The other plant part that flies around in the wind that is not as visible, is the pollen from the male plant released by catkins. Achoo! This is what causes allergic reactions in some people, not

the cottony fluff. (It is too big to go up noses. Most noses anyway)

Cottonwood trees make terrible landscape plants. Besides being prolific pollen producers, there are several other reasons why cottonwoods are best left to grow in their natural environment.

If you take a walk along the river in the spring when the cottonwoods are blooming, your shoes will begin to collect sticky, resinous buds that have fallen off the trees. Sticking to the buds that are sticking to your shoes are catkins that look like knobby brown or green strings and caught up in the catkins are clumps of cottony white hairs and sticking to the hairs are small seeds. If you have a cottonwood in your yard, all of that is quite a mess to clomp into your house.

As you walk the river, you will also notice A LOT of dead, fallen cottonwood branches. Along with copious amounts of sticky buds, pollen and cottony seeds, cottonwoods drop branches because the tree grows fast resulting in weak wood. If you look at some of the older cottonwoods at the river, you will see terrific hiding places for animals because much of the tree's inner core has disintegrated. Wind storms are known to easily break branches off cottonwoods. Great tree for those in the roof repair business!

If the above reasons to not grow a cottonwood in your yard aren't enough, maybe your water bill will be the best reason. If a cottonwood doesn't get enough water, it struggles (and the branches and leaves

(Continued on page 6)

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(Continued from page 5)

fall off, etc.). Additionally, considering a mature cottonwood can have a trunk bigger than you can hug and a proportionally enormous canopy, watering at the drip line can take a mile or so of soaker hose (just kidding—I think). Even gray water from the washing machine won't be enough water to support a cottonwood.

We are very lucky that Mother Nature has these magnificent trees in HER yard. A cottonwood forest is rare in the southwest and the riparian habitat for migratory and resident birds is unequalled. If you have a chance to take a walk in this cottonwood "blizzard" down at the San Pedro River this spring, do. It is a special place, but don't bring any cottonwoods home on your shoes.

*Cado Daily, M.A.
Water Resources
Coordinator*



Fremont cottonwood—Photo courtesy
<http://extension.arizona.edu/yavapai/county/> web site



Ramsey canyon cottonwood, winter 2014
Photo courtesy Gary Gruenhagen

March Reminders

- ◆ Prune roses
- ◆ Start seeds indoors
- ◆ Check cactus for fungus
- ◆ Plant cool-season veggies
- ◆ Reconsider your water usage
- ◆ (Call Water Wise for a free audit—520-458-8278, Ext 2139)
- ◆ Remove and replace winter mulches

Ask a Master Gardener

Cochise County Master Gardeners are available to answer your gardening questions either by telephone call to the Cooperative Extension Office or on-line on our web site at:

<http://ag.arizona.edu/cochise/mg/question.htm>

Although we have had a mild winter so far, it is still possible to have a late frost. The following comes from our web site's Frequently Asked Questions:

Question: How can I tell if my apples, pear, peach, cherry and apricot flowers suffered freeze damage from freezing temperatures?

Answer: Most of the fruit mentioned will freeze if in full bloom during temperatures from 23 to 28° F. To examine a flower or fruit, remove one from the tree. Make a horizontal cut with a knife through the base of the flower just beneath where the flower petals are attached. If small fruits have already formed, cut horizontally through them, also. If the center of flower or fruitlet seed tissue is brown in the center then the flower or seed(s) is/are dead. If the flower or seed tissue is green, they are alive. If the seed(s) die then the hormonal stimulus that the seed(s) produce which signals fruit growth will not occur; therefore no fruit will be produced. Go around each tree and cut 10 or 20 flowers or fruitlets to determine the percent of survival. If only 5 to 10% of peach flowers survived there will be a crop. If only 10 to 20% of apple or pears survived you will have a full crop. If more survive you will probably have to thin the fruit in a few weeks to produce large fruit. If thinning is not done either by man or Mother Nature's freezes, small, inferior fruit will be produced.