



New Jersey Agricultural
Experiment Station

Can Soil Fertility Improve Tomato Flavor?

Joseph Heckman, Ph.D., Extension Specialist in Soil Fertility, Rutgers New Jersey
Agricultural Experiment Station

Feb., 2009 - A sure way to initiate a passionate conversation in the Garden State is to bring up summer memories of eating the Jersey Tomato. This is especially true in the middle of winter when there is both remembrance and longing for the return of the locally grown vine ripened red fruit. In conversation the question is sometimes asked: Is there something special about the combination of New Jersey soils, climate, and cultural practices that contribute to the reputation of the superior taste and quality of Jersey Tomatoes? My presentation will explore the potential contribution of soil fertility management to this question.

Soil fertility and fertilizer practice has the potential to influence tomato quality in numerous ways. Provision of an optimum supply of every plant nutrient is essential to producing high quality fruit and good yield levels. A soil test and following the production guidelines in the Rutgers Vegetable Crop Production Guide is the way to set the stage for producing quality tomatoes. Potassium, sulfur, and boron are three of the essential nutrients that need special mention with regards to production of quality vegetables in general.

In the plant potassium has many roles but with respect to tomato quality this nutrient functions to move water into the cell of the developing tomato fruit. Thus, if you want juicy tomatoes, adequate potassium must be available. Soil testing and plant tissue analysis are the tools for monitoring potassium availability.

Sulfur is especially important because this nutrient forms organic compounds in the plant that gives flavor to vegetables. Sulfur nutrition is sometimes neglected or forgotten because its supply is generally not measured by way of a standard soil fertility test. Sandy soils with low organic matter content are the most likely to be deficient in sulfur. Good sources of sulfur include compost, or gypsum. There are several other fertilizer sources of sulfur, such as potassium sulfate, potassium magnesium sulfate, and super-phosphate, that supply sulfur but use of these materials depends on if the major nutrient that comes along with the sulfur is needed. An application of about 20 pounds of sulfur per acre is generally adequate to ensure that sulfur is not limiting for vegetable production.

Boron deficiencies in tomato production are fairly widespread and often go unrecognized. Research conducted in North Carolina has shown that boron fertilization improves tomato yield and fruit quality by decreasing the number of fruits with uneven ripening and preventing fruit cracking. Boron works together with potassium nutrition to keep enough potassium movement into the tomato plant tissue during the later part of the growing season. Based on the work in North Carolina, boron is effective when applied weekly during the season as either a foliar treatment or through the drip irrigation system.

Sodium and chlorine are also plant nutrients but they are rarely thought of as being potentially limiting or of much importance to tomato production. Nevertheless, a reexamination of traditional fertilizer practices in New Jersey suggests that the combination of these two nutrients (which together make sodium chloride or salt) may be a key factor missing from modern tomato cultural practices. In “the olden days” Chilean nitrate (sodium nitrate) was widely used as a nitrogen source in vegetable crop production. In personal communications with Dr. Roy Flannery, retired Extension Specialist in Soil Fertility, I was told that sodium nitrate was once widely used as the main form of nitrogen fertilizer on tomato. But in recent decades it has mostly been replaced with urea, UAN, ammonium nitrate, or other nitrogen fertilizers that do not provide sodium. Chloride, however, long has been, and still is, typically applied to vegetable crops in the form of potassium chloride (as called muriate of potash or 0-0-60). Evidence from one field trial conducted in New Jersey and a larger study in Israel appears to suggest that current near absence of sodium in fertilizer practice due to its replacement with modern nitrogen sources, may have had unanticipated consequences on the flavor of the Jersey tomato.

In 2000, my lab conducted a small trial where the objective was to evaluate the effect of amending soil with natural sea salt on the flavor of tomato. We drove to the Jersey shore and collected a barrel of sea water from the Atlantic Ocean and used this water to treat one group of tomato plants growing at Rutgers University Vegetable Research Farm in New Brunswick. The sea water treatment consisted of a one time over the top drench of the plants during early bloom. A control group was drenched with regular tap water. Although the sea water caused some burn to foliage, the plants soon recovered. Once the tomatoes were vine ripe the students working in my lab preformed a blind taste. The results, in terms of taste preference, were clearly in favor of the fruit produced by the sea water treated plants.

While this was just one small trial, the results are in agreement with Israeli research that evaluated the effect of fertilizing several varieties of tomato with salt (i.e. NaCl). The findings, (published in *Plant Physiology*) were described as follows: “From an applied point of view, the results show that the quality – in terms of chemical constituents (mainly sugars and acids), pigments, and especially taste – of fruits from saline-treated plants is superior to that of those from control plants. The improved taste under salinity may stem from salinity-increased acids and sugars and/or from an increase of other flavoring compounds, a question which should be studied further. Thus, there is compensation, in terms of quality, for the reduction in yield.”

In summary, my presentation at the New Jersey Vegetable Growers Meeting will provide an overview of the ways in which soil fertility management may influence tomato flavor with major focus on how judicious use of salt fertilization may restore the tradition of flavor in the Jersey Tomato.

References

Davis, Jeanine M., Douglas C. Sanders, Paul V. Nelson, Laura Lengnick, and Wade J. Sperry. 2003. Boron Improves Growth, Yield, Quality, and Nutrient Content of Tomato. *J. Amer. Soc. Hort. Sci.* 128:441-446.

Mizrahi, Y. 1982. Effect of Salinity on Tomato Fruit Ripening. *Plant Physiology*. 69: 966-970.

Websites:

SeaAgri: www.SeaAgri.com

High Brix Gardens: www.highbrixgardens.com/

The Quest for Nutrient-Dense Food--High-Brix Farming and Gardening:
www.westonaprice.org/farming/nutrient-dense.html