NC STATE UNIVERSITY

GROWING HEIRLOOM & HEIRLOOM-TYPE TOMATO HYBRIDS IN ORGANIC & CONVENTIONAL PRODUCTION SYSTEMS

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INTRODUCTION

There is a strong market for organic heirloom tomatoes. Unfortunately, many heirloom tomatoes have little or no disease resistance, making organic production difficult in many areas.. In a wet season, for example, heirloom varieties often fall victim to blight before they get the chance to yield much fruit. Heirloom varieties also have a tendency to crack, may have very rough blossom end scars, and many are not uniform in size, which makes them difficult to pack and sell commercially. Tomato breeder, Dr. Randy Gardner, recently developed several new heirloom-type hybrids with the goal of combining the flavor and texture of heirloom tomatoes with the disease resistance, uniform size, and good shipping characteristics of more modern varieties.

Since 2002, we have conducted a number of trials on heirloom tomatoes; some in organic systems and some in conventional systems, but it wasn't until 2006 that we actually compared the two production systems in a replicated trial. To our great surprise we found that the organic plots actually outyielded the conventional plots! We received some criticism on that study, however, since we did not include any control plots without any kind of disease control and skeptics said “there probably wasn’t any disease pressure” that year. So, in 2007 we set up a study with untreated control plots to compare with the standard conventional system and two different organic systems.

The objectives of the 2007 study were to compare yield, disease resistance, and taste of two favorite heirloom tomatoes and two new heirloom-type hybrids grown in conventional and organic production systems.

METHODS

This study was conducted at the Mountain Research Station in Waynesville, NC. It was a split plot design with four replications. The main plots were four production systems: Conventional, Brandt (organic), Organic, and a Control separated by 50 foot buffers. The subplots were tomatoes varieties: two heirlooms (Stupice and Red Brandywine) and two new hybrids (NC05114 and NC0652). In the Conventional treatment, standard practices recommended by the NC Cooperative Extension Service were used, including synthetic fertilizers, fungicides, and insecticides. The Control plots were fertilized the same as the Conventional plots, but no disease or insect control products were used. Only National Organic Program approved practices were used for the two organic systems which were both fertilized with compost and fish emulsion. The Brandt (organic) system was treated with the Brandt OMRI approved fungicide (Sporatec) and insecticide (Ecotec). In the Organic system, Serenade and copper (Kocide) were used for disease control and Neem oil and BT (Dipel DF) for insect control. All the tomatoes were grown on raised beds with black plastic mulch, drip-irrigation, and high trellises. Plants were evaluated weekly for disease and insect damage. Weekly harvests were conducted. Three public taste tests were held.

RESULTS AND DISCUSSION

The top two winners in the taste tests included an heirloom variety and one of the new hybrids. They were the two small fruited varieties, Stupice and NC05114, with over 70% and 80% of the respondents, respectively, rating them as good or excellent.

The heirloom variety "Stupice" came into production much earlier than the other varieties (Fig. 1) and was the second highest producer over the whole season (Fig. 3). Both Stupice and NC05114 are small fruited varieties, similar in size to what are commonly grown as cluster tomatoes. The highest yielding variety for the season was NC0652, which like Red Brandywine, is a large fruited tomato.

At time of field planting, the organically produced transplants were much smaller in size than the conventionally produced transplants. This resulted in a delay in fruit set and harvests (Fig. 4-5). By the middle of the season, however, both organic systems caught up and were yielding as high or higher than the conventional system. Total season yields were not different for any of the treatments (Fig. 5). This translated into yields of 9.4, 9.4, 9.1 and 8.8 pounds of marketable fruit per plant for the Conventional, Organic, Brandt (organic), and Control treatments, respectively.

There was a large difference in disease and insect incidences among treatments (Fig. 6). Tomato spotted wilt virus showed up sporadically in all production systems and mostly on 'Red Brandywine'. The Control plots were heavily infested with disease and insects, regardless of the variety, and the vines were totally destroyed by the end of the season (Fig. 7). The Conventional plots had no insects and only one incidence of Alternaria (Fig. 6). The Brandt (organic) plots became infected with late blight towards the end of the season and even the resistant hybrid varieties were affected. This occurred shortly after the rates of Ecotec and Sporatec were cut in half and a spreader/sticker was added. The Organic plots, however, were almost as disease and insect free as the Conventional plots and looked very healthy at the end of the season (Fig. 6 and 8).

A comparison of the estimated costs of pest control for the two organic systems revealed that the Brandt system cost substantially less than did the other organic system (Table 1).

CONCLUSION

This study demonstrated that heirloom tomatoes can be grown organically in western NC, even with late blight present. For the third year, the combination of Serenade, Neem oil, Dipel, and copper was effective in disease and insect control. The new organic products tested, Ecotec and Sporatec, provided good insect control and some disease control until late season and resulted in yields comparable to the conventional and other organic treatments. The costs of using the Brandt (organic) system, however, were substantially less than that of the other organic system. The hybrid heirloom-type varieties, NC05114 and NC0652, performed well, exhibiting good late blight resistance and consumer acceptance. Yields were very good. Using the average yields obtained across all treatments, 9.2 pounds of fruit per plant, with 6290 plants per acre, and prices of $2.00 per pound, estimated gross returns would be $115,736 per acre.

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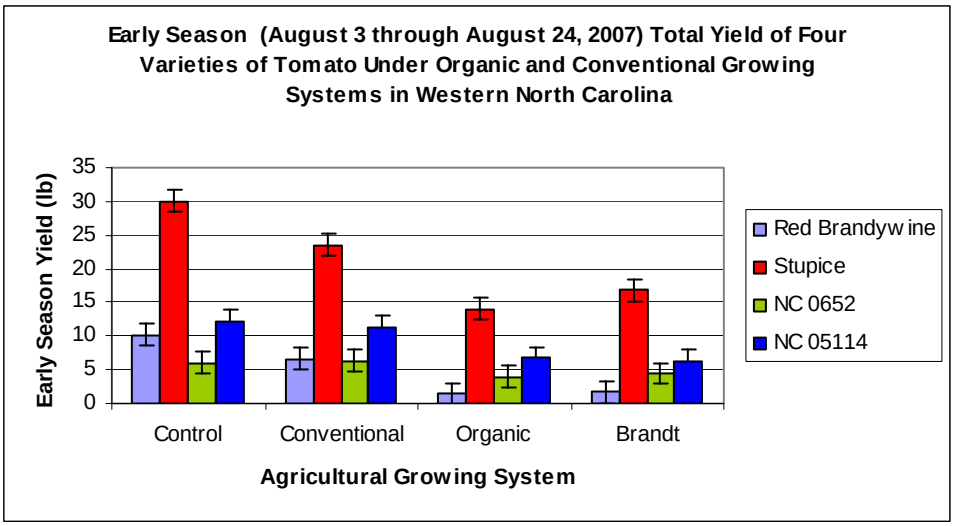

Figure 1 Total early season yield by production system and variety.

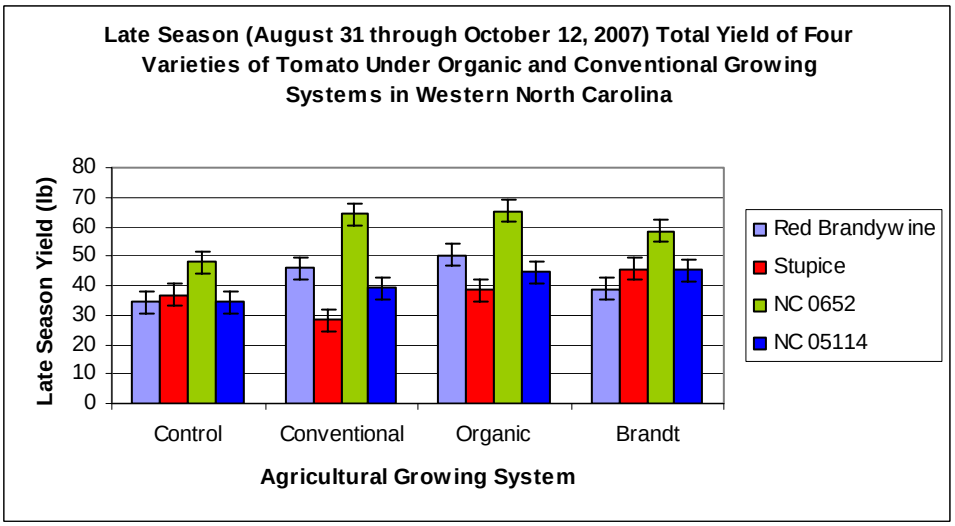

Figure 2. Total late season yield by production system and variety.

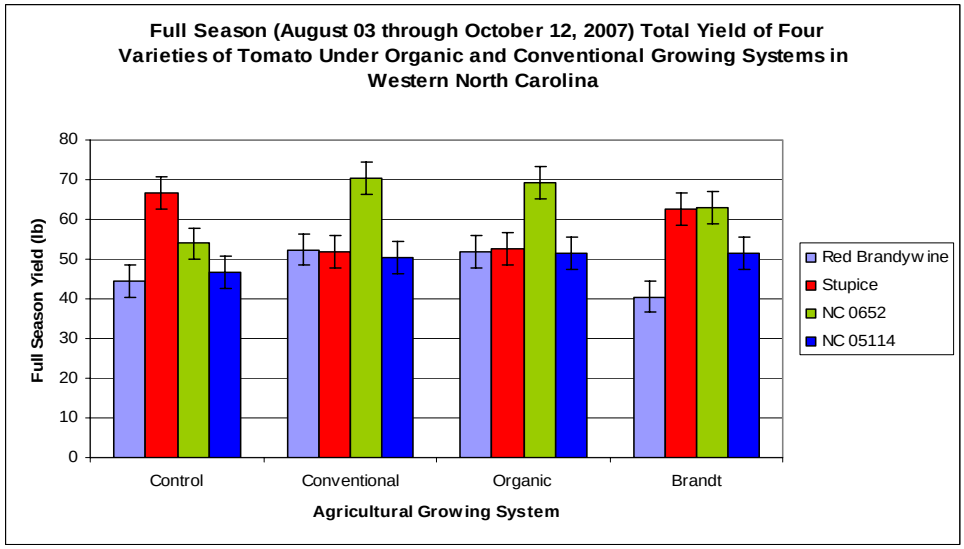

Figure 3. Total full season yield by production system and variety.

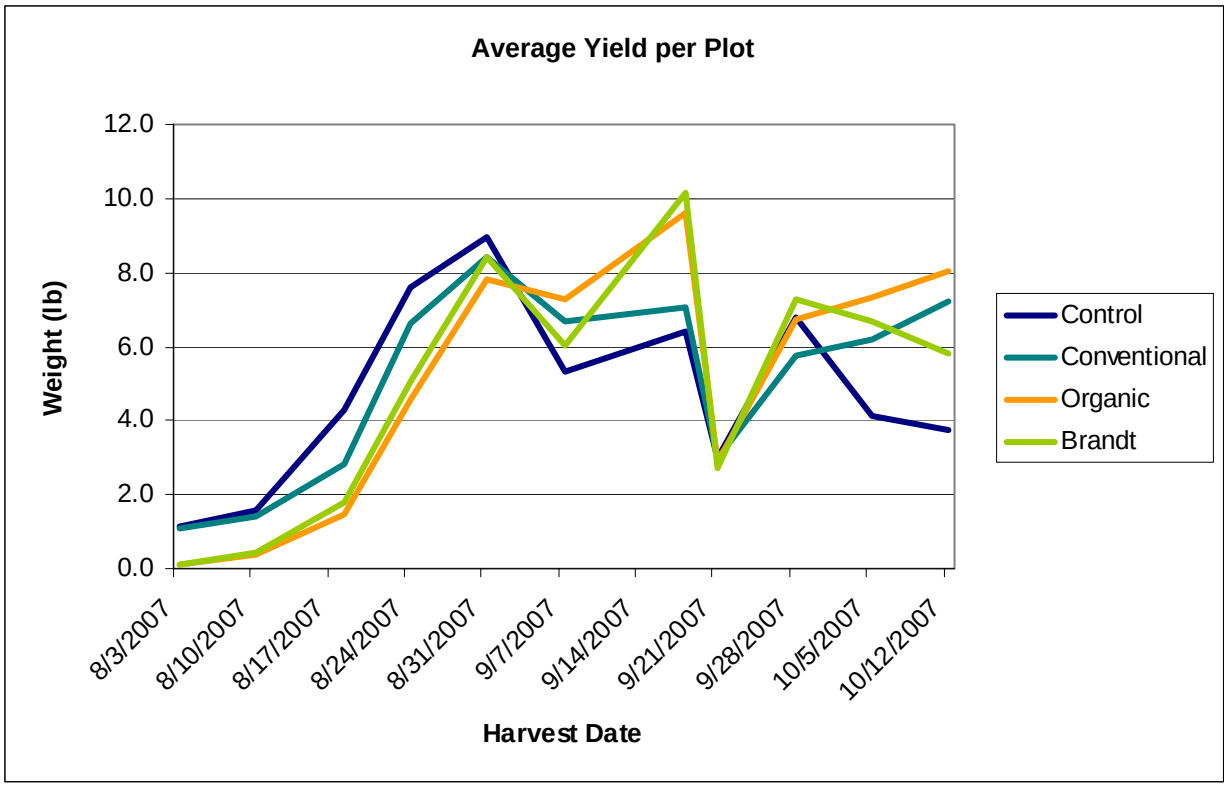

Figure 4. Weekly tomato harvests by production system.

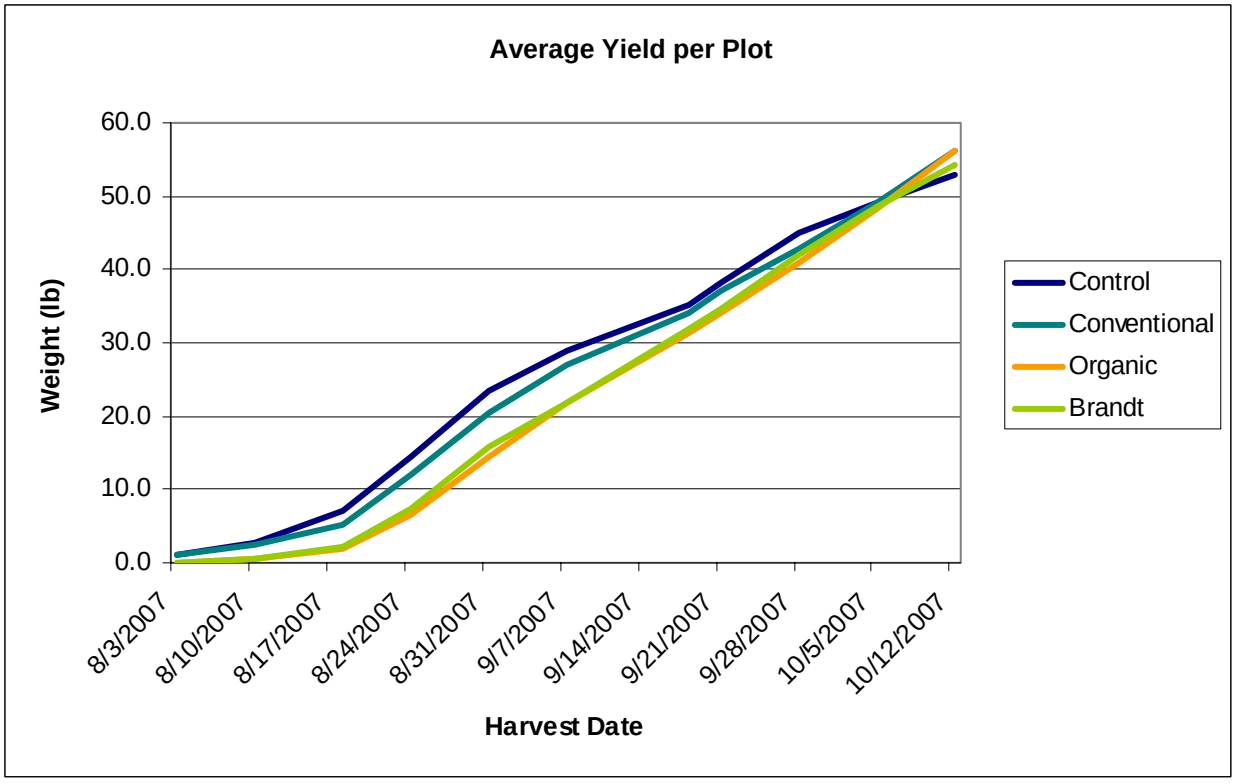

Figure 5. Cumulative weekly tomato yields by production system

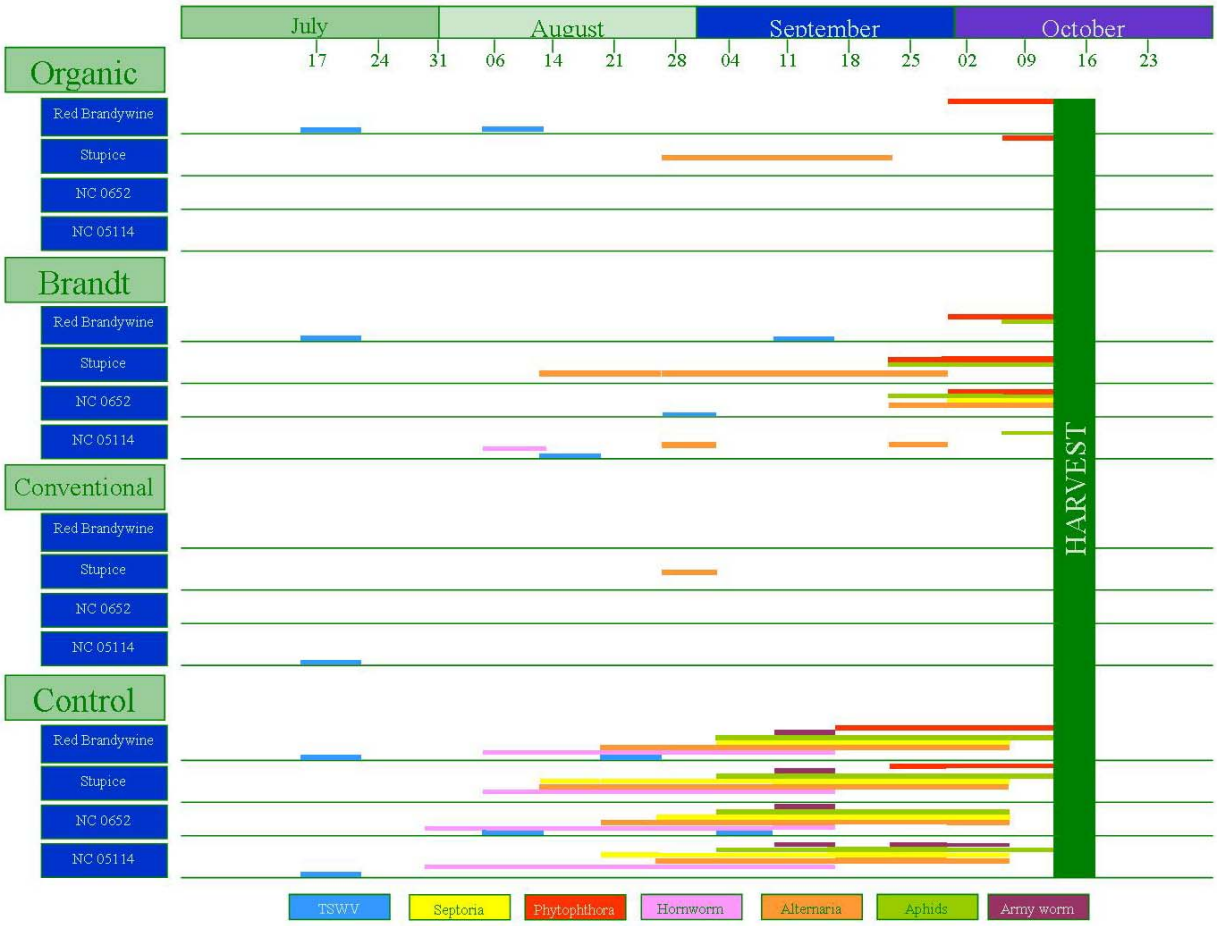

Figure 6. Timeline of new disease and insect incidences throughout the season. Each colored bar indicates the date new incidences were noted.. TSWV=tomato spotted wilt virus. Phytophthora=late blight.

Figure 7. Control plot at the end of the growing season. Septoria and late blight had destroyed the vines.

Figure 8. Organic 2 plot at the end of the growing season. Vines were healthy and strong.

Table 1

COMPARISON OF ESTIMATED COSTS OF THE TWO ORGANIC SYSTEMS: DISEASE & INSECT CONTROL

Purchase Cost

Ecotec (Insecticide)	$96.00/gallon
Sporatec (Fungicide)	$109/gallon
Matratec (Herbicide)	$87/gallon
Biolink (Surfactant)	$30/gallon
Serenade (Fungicide)	$26/gallon
Trilogy Neem Oil (Insecticide)	$70/gallon
Kocide 2000 (Fungicide)	$70/ 18 lb
Dipel DF (Insecticide)	$21.00/1b

Yearly Totals:

Product	Rate/ acre	Price/ Acre	# of Apps/ Year	Price / year / acre
Brandt Full Rate				
Ecotec*	1.25 pint (0.1563 gallons)	$15	12	$180
Sporatec*	1.5 pint (0.1875 gallons)	$20	12	$240
Biolink Surfactant*	2 pints (0.25 gallons)	$7.50	12	$90
			Total	$510
Brandt Half Rate				
Ecotec/Sporatec Blend *+	.07815 gallons + .09375 gallons	$18	12	$213
Biolink Surfactant*	2 pints (0.25 gallons)	$7.50	12	$90
			Total	$303
Organic				
Serenade	1.015 gallons	$26	12	$315
Trilogy Neem Oil*	0.375 gallons	$26	12	$315
Kocide*`	4.5 lb	$17.50	12	$210
Dipel DF	0.625 lb	$13	12	$158
			Total	$998

***Note: When a range of rates is given on a product label, the midpoint between the highest and lowest application rate was chosen.**
+Note: when treating with both Ecotec and Sporatec, rates were halved.
`Note: Although Kocide was listed on the Organic Materials Review Institute list of approved products on October 31, 2006, it was removed from the list on November 30, 2007.
***Prices were obtained from the distributor, local agricultural chemical supply store, and on-line.**