PROJECT SUMMARY

Cultural strategy offers promise for tomato disease management

Grafting tomatoes on disease resistant rootstocks for small-scale organic production

Organic tomato production is challenging in the Southeast due to weathered soil structure, high foliar and soilborne pathogen pressure, and mild winter temperatures. Herbaceous grafting is a site-specific management tool that can be tailored to the challenges of individual production systems using rootstock and scion selections. Grafting has been implemented successfully as an Integrated Pest Management (IPM) tactic in commercial tomato production in Asia, the Mediterranean, and northern Africa.

In Brief:

In this North Carolina-based study, investigators evaluated grafting as a means to manage intense tomato disease pressure. Trial results showed that grafting tomatoes onto disease-resistant rootstocks dramatically improved yields of marketable fruit, with top scion-rootstock pairings yielding 19.5 tons and net returns of $59,365 per acre.

Project objectives were to investigate the use of grafting to enhance organic field production of tomatoes at Black River Organic Farm in North Carolina. At this farm, high disease pressure from bacterial wilt (caused by *Ralstonia solanacearum*) has resulted in the grower abandoning open-field fresh-market tomato production.

Specific goals were to evaluate the use of tomato grafting in small-scale organic field production for soilborne disease resistance, fruit yield and quality, and improved nutrient uptake. Rootstocks were selected based on the farm's dominant soilborne disease profiles. Scions were selected for market fruit preference and early maturation to manage foliar disease pressure.

We compared 'Celebrity' scion grafted onto four different rootstocks to non-grafted and self-grafted (scion grafted back onto itself) controls.

The six treatments were:

1) 'Celebrity' non-grafted controls,
2) 'Celebrity-Celebrity' self-grafted controls,
3) 'Celebrity-RST-04-105-T' grafts,
4) 'Celebrity-Dai Honmei' grafts,
5) 'Celebrity-BWR' grafts, and
6) 'Celebrity-Sweet Olive' grafts.

Three of the four rootstocks ('RST-04-105-T,' 'BWR,' and 'Dai Honmei') are hybrids developed as tomato grafting rootstock. Both untreated 'RST-04-105-T'(D. Palmer Seed Co.) and 'Dai Honmei'

Suzanne O'Connell/NCSU

Organic producer and project collaborator Stefan Hartmann with tomato seedlings headed for grafting, 2009.

Investigator: Suzanne O'Connell, Horticultural Science Dept., North Carolina State University, Raleigh, NC (919) 609-1498, suzanne.oconnell@gmail.com **Collaborators:** Stefan Hartmann, Black River Organics, Ivanhoe, NC; Cary Rivard, Mary Peet and Frank Louws, Plant Pathology Dept., North Carolina State University

OFRF funding awarded: $11,174 fall 2007 (1 year) **Project period:** 2008 **Report submitted:** August 2009. *The complete project report (30 pages) includes detailed methods, economic analysis and discussion and is available at ofrf.org*

PROJECT SUMMARY

(Asahi Industries Group) are commercially available. The DeRuiter line 'BWR' is an unreleased cultivar under development for bacterial wilt resistance. 'Sweet Olive' is a grape tomato that has been grown at Black River Organic Farm. Previous experience by the grower indicated that it may confer intermediate resistance to bacterial wilt.

Project results. In 2008, soilborne disease pressure was very high as anticipated, but southern blight, caused by *Sclerotium rolfsii*, was the dominant disease rather than bacterial wilt. While the rootstocks utilized in this study were selected for resistance to bacterial wilt, surprisingly they also demonstrated a range of resistance to southern blight. The 'Celebrity' scion grafted to the three hybrid rootstocks had the lowest incidence of southern blight disease.

Grafting effects on leaf nutrient concentrations did not indicate greater nutrient uptake ability of grafted treatments although results were confounded by the high disease pressure experienced. However, differences among scion-grafting pairs for P, K, Mg, Zn, Cu and B uptake were present, indicating that selection of scion-rootstock pairings may offer site-specific tools for nutrient management.

The greatest total fruit yields were achieved with 'Celebrity–RST-04-105-T' grafts (19.5 T/A), followed by 'Celebrity–BWR' grafts (14.4 T/A), 'Celebrity-Dai Honmei' grafts (13.9 T/A), 'Celebrity-Sweet Olive' grafts (6.7 T/A), 'Celebrity' non-grafted (5.4 T/A), and 'Celebrity' self-grafted (4.6 T/A).

A cost and benefit analysis based on variable costs of grafted transplant production at the 1-acre scale estimated $2,275 of additional transplant costs associated with the grafted plants. The per acre net returns of the top yielding scion-rootstock combination, 'Celebrity-RST-04-105-T,' was $59,635 compared to the non-grafted 'Celebrity' crop which generated $8,780 per acre.

Because the grafted plants were able to maintain production under severe soilborne disease pressure, this study highlights the ability of grafting with disease resistant rootstocks to reduce the risk of pathogen outbreaks and therefore add to on-farm economic stability. Overall, the grower was very pleased with the results of this study and in 2009 continued to propagate and utilize grafted plants on-farm. ❄

Courtesy of Suzanne O'Connell

Research trial planted! Grower Stefan Hartmann, graduate students Cary Rivard and Suzanne O'Connell.

Suzanne O'Connell

Treatment effects begin to separate in the research trial, with diseased plants showing in the foreground.

Suzanne O'Connell

A successful crop of Celebrity fruit from the grafting research trial.