Despite the growing interest in high tunnel vegetable production among organic farmers for producing high-value crops, research-based information is rather limited with respect to crop performance in organic high tunnel systems in Florida, where sandy soils with poor retention of water and nutrients and high pressure of diseases, pests, and weeds often present great challenges to organic production. This experiment conducted in Citra, FL, during the Spring 2015 season compared fruit yield and quality of tomatoes grown in organically managed high tunnel vs. open field plots. A split-split plot design with 3 replications was used, with production environment (high tunnel vs. open field) as the whole plot factor, cultivar as the subplot factor, and grafting as the subsubplot factor. Indeterminate tomato 'Cherokee Purple' and determinate tomato 'Tribute' were grafted onto an interspecific hybrid tomato rootstock 'Multifort', respectively, and non-grafted scions were used as controls. Although 'Cherokee Purple' had significantly higher average fruit weight, it produced significantly lower total marketable fruit weight and number as compared to 'Tribute'. Regardless of the tomato cultivar, plants grown in the high tunnel system showed significantly increased total marketable fruit weight and number in contrast to the open field. Average fruit weight and percentage of unmarketable fruit weight and number did not differ between high tunnel vs. open field. Grafting with 'Multifort' resulted in significantly higher average fruit weight and total marketable fruit yield than non-grafted tomato plants, but did not affect total marketable fruit number. Root-knot nematode galling index ratings were found significantly lower in grafted tomato plants in both high tunnel and open field plots. With the main purpose of comparing organic tomato fruit quality between high tunnel vs. open field production, tomatoes harvested from grafted and non-grafted plants were combined for quality assessment. 'Cherokee Purple' fruit from the open field demonstrated a decrease in postharvest shelf life in comparison with tomato fruit produced in high tunnels. Fruit soluble solids content and titratable acidity of 'Tribute' tomato were not affected by the production environment. Interestingly, high tunnel production led to significantly higher levels of lycopene and beta-carotene in 'Tribute' fruit, while total phenolic content exhibited similar levels between high tunnel vs. open field.

Specified Source(s) of Funding: AFRI

4:15–4:30 PM

Results of a Two-year Study into the Effect of Winter Cover Crops on Production of High-tunnel Vegetable Crops

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This two-year study investigated short-season winter cover crops to improve soil quality and reduce nitrogen fertilizer inputs in organic high tunnel production systems. Five winter cover crop treatments were investigated including a nontreated control, Austrian winter peas (*Pisum arvense*), bell beans (*Vicia faba*), mustard (*Brassica juncea* cv. Kodiak), and Daikon radish (*Raphanus sativus* var. longipinnatus). Cover crops were grown in a high tunnel from mid-Nov to mid-April in a randomized complete block design with three replications. After incorporation, the cover crops were followed by a succession of vegetable crops, including tomato (*Lycopersicon lycopersicum*, cv. 'Plum Dandy') and broccoli (*Brassica oleracea var. italica*, cv. 'Bay Meadows'). Crops were fertilized at a 0.5x rate (56 kg·ha^{-1} N) with the objective to determine the ability of the cover crop treatments to supplement fertilizer inputs. Yield and performance of the vegetable crops were measured to determine the effects of the cover crop treatments compared to a nontreated control. In both years of the study Austrian winter peas yielded significantly greater cover crop biomass and contributed a greater amount of biomass nitrogen than all other treatments. This led to a significantly lower soil C:N ratio 30 days after incorporation. Tomato leaf chlorophyll measurements were highest following winter pea with significant differences detected in 2015. Though statistical differences were not detected due to plot variation caused by environmental factors, the winter pea cover crop resulted in a 48% increase in mean tomato yield compared to the control. Broccoli early-season leaf chlorophyll was also increased by the winter pea treatment and plant biomass was significantly greater, but harvest data were not significantly different.

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4:30–4:45 PM

Trends in Bioproduct Use on Organic Vegetable Farms: A 2009–2014 Survey of Ohio Organic System Plans

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Growers increasingly seek biological alternatives to chemical inputs in the form of microbe-containing bioproducts (e.g., biofertilizers, biostimulants, biopesticides) (MCBPs) applied to seeds, plants, roots, or soils to promote growth, or limit disease or abiotic stress. Trends in MCBP use were tracked from 2009–14 by surveying the organic certification records of 86 Ohio organic vegetable farmers. A total of 22 biofertilizer products from 12 different manufacturers, and 10 biopesticide products from eight manufacturers were reportedly used over the 6-year period. Biopesticides were used by 65% of farmers and accounted for 4.3% of all inputs by number. Similarly, biofertilizers were used by 51% of farmers and accounted for 4.8% of all inputs by number. Biopesticides were grouped into three categories: BT (*Bacillus thuringiensis*), other insecticides, and fungal antagonists, which accounted for 65%, 13%, and 21% of all uses, respectively. All biopesticide products contained a single species as the active ingredient, which was identified at the strain level

in every case. In contrast, the most widely used biofertilizers were products containing mixtures of different bacterial and/or fungal species. These mixed products accounted for 40% of all biofertilizer use, and products containing unspecified "beneficial microorganisms" accounted for 28% of all biofertilizer use. Rhizobia and mycorrhizal fungi accounted for 21% and 10% of use, respectively, and asymbiotic nitrogen fixing inoculants accounted for the remaining 2%. These patterns of MCBP use are consistent with what is available commercially. A potential biopesticide strain must go through extensive testing in order to be registered by the EPA, whereas there are virtually no regulations for biofertilizers. The vast majority of commercially available biofertilizers are mixed inoculants, and many products have imprecisely labeled ingredients and unclear application instructions. Furthermore, little independent, research-based, and publically available information is available to substantiate claims of product efficacy. That so many farmers use biofertilizers despite the present lack of reliable information about them suggests a need for more research and extension.

4:45–5:00 PM

High Tunnel Pest Exclusion (HTPE) System Using Shade Cloth for Reducing Leaffooted Bugs and Caterpillars from Vegetable Crops

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Organic vegetable production is increasing in the South with many beginning and experienced farmers growing crops in the high tunnels. Although high tunnels are useful for season extension, they also extend the life cycle of insect pests that complete generations rapidly inside the protected structures. In Alabama, organic vegetable production is severely challenged by insect pests that can cause 30% to 50% direct crop loss or contamination of produce if uncontrolled. Therefore, in organic farming, pest prevention is certainly better than cure. This paper describes a pest exclusion system suitable for high tunnel producers. The authors evaluated 0 (check), 30%, 40%, and 50% knitted shade cloth in the laboratory for their potential to stop large insect pests of tomatoes using high tunnel pest exclusion models. Six types of shade cloth were installed on the side- and end-walls to get optimum pest exclusion. We focused on leaffooted bugs (*Leptoglossus* spp.) and moths since they are universal problems for producers. A 40% or 50% knitted shade cloth from Poly-Tex (MN) and Green-Tek (WI) significantly reduced leaffooted bug numbers and protected vegetables placed inside the model. Large moths were not able to penetrate the fabric. This paper will end with a discussion of on-farm successes with the HTPE system.

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5:00–5:15 PM

Hoop House and Open Field Organic Tomato Trials for Production and Quality Characteristics in the Upper Midwest

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Tomato (*Solanum lycopersicum*) is a key crop for diversified organic vegetable growers. Farmers selling in local markets can often charge a premium for high quality organic tomatoes. Heirloom tomatoes are prized for their flavor, but may be low-yielding and susceptible to splitting and disease. Tomatoes bred for high yield, disease resistance, and uniform ripening often lack fresh-eating quality. Combining superior quality with productivity and regional adaptation are important priorities. In addition, hoop houses have gained popularity in recent years as tools for extending the tomato season by as much as two months, and potentially obtaining higher yields and higher quality than from field-grown tomatoes. In 2014 and 2015, a total of 60 tomato varieties (40 per year with 20 varieties trialled in both years), were grown in a hoop house and an adjacent field, all under organic management, at the West Madison Agricultural Research Station in Wisconsin. Varieties were chosen for evaluation based on private and public-sector tomato breeder recommendations for good performance in organic systems and good fresh eating quality. Heirlooms, modern open pollinated varieties and modern heirlooms and new breeding populations were included. Varieties were evaluated for total marketable yield by weight and fruit number, average fruit weight, unmarketable yield by weight, percentage of unmarketable yield, disease resistance, earliness, and sugar and acid content. Marketable yield in the hoop house was 20% higher than the field in 2014, and 45% higher in 2015. Heirloom yield did not differ from modern varieties in the hoop house in 2014 but was significantly lower in the field both years and slightly lower in the hoop house in 2015. Management system (hoop house vs. field) had a larger contribution than variety to the variation for marketable yield. The percent unmarketable fruit was not different between field and hoop house, although there were different principle causes between management systems. Foliar disease was much more severe in the field than in the hoop house. The °Brix was higher in the hoop house than in the field, and titrateable acidity was the same between the two management systems. For these two traits, variety had a greater contribution to the variation than management system. Flavor evaluations by local chefs have helped characterize promising varieties for culinary quality.