



Kathy Demchak and Richard P. Marini, Dept. of Plant Science

Research and extension projects.

Objective 1 - Develop improved small fruit germplasm through cooperative breeding and evaluation programs:

Blueberry: *Blueberry cultivar comparison on an "upland" soil.* R. Marini and K. Demchak, Penn State Univ., University Park, PA; J. Luby, Univ. of Minnesota, Minneapolis, MN; Jim Hancock, Michigan State Univ., East Lansing, MI

Objective 2 - Develop practices for small fruit production tailored for climatic and market needs of growers.

Blueberry: *Soil amendments and mulch for blueberry plant establishment.* R. Marini and K. Demchak, Penn State Univ., University Park, PA.

Raspberry and Strawberry: *Optimizing Protected Culture Environments for Berry Crops.* E. Hanson, R. Isaacs, and A. Schilder, Michigan State Univ.; K. Demchak, R. Marini, W.J. Lamont, K. Kelley, D. Decoteau, Penn State University; E. Hoover and M. Rogers, Univ. of Minnesota; M. Pritts and L. Levitan, Cornell Univ.; D. Conner, Univ. of Vermont; B. Sideman, Univ. of New Hampshire; K. Lewers, USDA-Beltsville; M. Glenn (retired), USDA-Kearneysville; N. Paul and C. Halsall, Lancaster Univ., U.K.

Objective 3 - Explore the association between fruit constituents and human health impacts
None.

How have the results been disseminated to communities of interest?

The following talks were given on topics related to the above work::

Nov. 15, 2019. Leesport, PA. Strawberry School. 50 in attendance.

Strawberry Production Systems for Mid-Atlantic Growers.

Jan. 29 – 30, 2020. Hershey, PA. Mid-Atlantic Fruit and Vegetable Convention.

Strawberry Production Systems – Basic to Advanced. 140 in attendance.

Tips for Minimizing Wind Damage to High Tunnels. 25 in attendance.

Feb. 1, 2020. New Brunswick, NJ. NOFA-NJ Winter Conference.

Improving Berry Production in Organic Systems. 40 in attendance.



Feb. 7, 2020. Lancaster, PA. Farming for the Future (PASA) Conference.

Getting the Most Profit from Your High Tunnel (co-presented with A. King). 80 attended.

Feb. 14, 2020. Fleetwood, PA. Berks-Schuylkill Winter Vegetable Meeting. 50 in attendance.

Keys to Successfully Establishing a Blueberry Planting.

A series of 5 videos was completed that utilized knowledge gained as part of the project on high tunnel production. The entire series is called: "High Tunnel Structures: The Basics".

<https://extension.psu.edu/high-tunnel-structures-the-basics>

Provided, organized and conducted a day and half workshop of extension educators and other PSU personnel on high tunnel and soilless systems production with F. Di Gioia and E. Sánchez.

What we plan to do during the next reporting period to accomplish the goals.

The blueberry variety and mulch/amendment study will be continued.

A trial to optimize media type for containerized production will be undertaken, as using the correct media type, along with having a long growing season, is a major key to obtaining high yields.

Outreach efforts will continue.

Research results

In the day-neutral variety x high tunnel strawberry trial, 'Albion', 'Cabrillo', 'San Andreas' and 'Sweet Ann' were grown in containers in high tunnels with or without plastic covers. The experiment was a randomized complete block design with 3 blocks. Plants were irrigated with a complete fertilizer at 100 ppm N, which the nursery suggested might encourage 'Cabrillo' and 'Sweet Ann' remain vegetative. This wasn't the case with 'Cabrillo', but 'Sweet Ann' and 'San Andreas' took longer to bloom than 'Albion' or 'Cabrillo' did. High nitrogen could have been a factor in quality with 'Cabrillo' however, which produced the highest total yields, but its fruit was soft and somewhat bitter when temperatures were hot. 'Cabrillo' was the most susceptible variety to fruit anthracnose when grown without a cover (10.2% of fruit affected). Fruit anthracnose incidence was reduced greatly (by four-fifths with 'San Andreas') or eliminated ('Sweet Ann') in tunnels compared to outside when no fungicides were used. Increasingly, PA growers are indicating interest in tunnels or greenhouses to give them greater control over certain diseases. This could be especially valuable for organic producers.



Might disease control be the factor that finally drives U.S. strawberry producers to adopt protected culture?

Our blueberry mulch/amendment study is a multi-year study designed mainly to look at differences between incorporating hardwood (oak of unknown species) or softwood (white pine) sawdust into the planting whole compared to incorporating peat moss as a control. A second question we wanted to answer was whether it made a difference if hardwood or softwood sawdust was used as a mulch when peat moss was incorporated into the planting hole. This has been a recurring question from growers. Yields were highest when peat moss was incorporated into the planting hole compared to hardwood sawdust, and numerically higher when peat moss was used compared to softwood sawdust. If peat moss is incorporated into the planting hole, yields are very similar regardless of which type of sawdust is used as a mulch. If sawdust must be used instead of peat moss as both a mulch and a planting hole amendment, softwood sawdust tended to result in higher yields than hardwood. There were no significant difference in leaf nitrogen levels among treatments.

'Northland' has been the most productive variety out of the ten varieties in our trial, which also includes 'Bonus', 'Chandler', 'Draper', 'Huron', 'Legacy', 'Liberty', 'Nelson', 'Reka', and 'Superior'. 'Northland', 'Nelson', and 'Reka' has been the favorites for flavor (subjectively rated) though 'Patriot' in our neighboring mulch study also scores high marks. Unfortunately, 'Northland' is tied with 'Superior' and 'Reka' for smallest berry size. This means that it may be better suited as a variety for home gardens or commercial operations if it can be mechanically harvested, but it probably isn't ideal for you-pick or farm market sales.

4. List retrievable or archived publications arising from your collaborative research projects including journal articles, book chapters, review articles, theses, proceedings, and extension publications. Please use ASHS style.

Cramer, M.E., K. Demchak, R. Marini, and T. Leskey. 2019. UV-Blocking High Tunnel Plastics Reduce Japanese Beetle (*Popillia japonica*) in Red Raspberry. HortScience 54:903-909.