Greenhouse Extravaganza

University of Arizona’s Controlled Environment Agriculture Center short course draws interest from growers on both sides of the border.

By David Eddy
Senior Western Editor

In getting the third annual Greenhouse Crop Production and Engineering Design Short Course under way, longtime University of Arizona Professor and greenhouse guru Merle Jensen neatly summed up the goal of greenhouse vegetable growing program. “It’s a marriage of engineering and agriculture,” Jensen told the audience at the program, hosted in late January by the University of Arizona’s Controlled Environment Agriculture Center.

The attendees came from throughout the U.S. and Mexico — there was an especially large contingent from the University of Chapingo in Texcoco, MX — to hear the state of the art from industry’s top experts. In fact, there were so many growers and researchers from Mexico that the developer of the short course, CEAC Director Gene Giacomelli, noted that in future years they will consider adding a benefit for Spanish speakers: simultaneous translation.

The attendees were treated to the University of Arizona School of Agriculture’s philosophy, in which Jensen said they teach students “to think like a plant.” In other words, if you were a plant, what would you like? Jensen believes that plants like a comfortable atmosphere with few temperature swings, and noted that top-yielding tomato plants are grown in greenhouses that prevent such swings.

Jensen bemoaned the so-called greenhouses found more commonly closer to the equator that are little more than sheds. Growers can get away with it, to a degree, because of the mild climate. But such a greenhouse doesn’t meet a top grower’s standards, and certainly won’t cut it in today’s global market. “If you can’t manipulate the environment in your greenhouse adequately, you might as well go outside and be a field grower. You want to have power over that plant,” he said. “You want a greenhouse, ideally, in which you can turn the environment from the equator to the Sonoran Desert — and back.”

Don’t Get Dirty

Jensen also emphasized another huge advantage greenhouse growers have: No soil. “Absolutely, for sure, you don’t want to grow in soil,” he said. Soil hosts a lot of disease problems that greenhouse growers who utilize materials such as rock wool, the material used in the CEAC greenhouses, do not face. Field growers are going to have...
even more problems in the future, said Jensen, when methyl bromide becomes unavailable. Mexican growers will have it particularly rough because of the big problems they have with fusarium. “If you grow in soil in a greenhouse, you’re no better than a field grower,” said Jensen. “You’ll extend the season, but you won’t have better tasting fruit.”

The short course included extensive tours of the CEAC greenhouses that were hosted by numerous University of Arizona faculty members. The professors try to give students an experience akin to working in a real, commercial greenhouse, said Patricia Rorabaugh, a Plant Science professor. “Though we get less yields than commercial operations because we’re basically working with amateurs,” she said. Despite that, the greenhouses are impressive. They are able to extend the season out to 9 to 11 months, with plants growing 40 feet. Like many commercial growers, no beefsteak tomatoes are grown, only cluster varieties such as Bonita [Bonita Nursery is former name of the EuroFresh GH in Willcox...We use Rhapsodie which is a beef steak tomato, not a cluster]

One experiment Rorabaugh was conducting in her greenhouse was a side-by-side look at various varieties on certain rootstocks. For example, the Rhapsody Rhapsodie variety was grown on its own root, on a high-powered rootstock, and it was also severed off and then grafted back onto its own root. Not surprisingly, the plants grown on their own roots fared the poorest. But what was really interesting was that the plants that were severed off and regrafted onto their own rootstocks did as well as those grafted onto rootstocks such as Maxifort. Because stress often boosts yield in tomato plants, Rorabaugh said that perhaps the stress of being severed from its own rootstock served to boost the yield.

‘Farmaceuticals’

Another stop on the tour featured a look at the “farmaceuticals” being grown in one of the CEAC greenhouses. Giacomelli showed off plants that one wouldn’t normally find in a greenhouse, stinging nettles. It’s really just a weed, and not one most people like to see. But in this case it was being grown for medicinal purposes, to treat prostate cancer. The project, which was being supported by the National Institute of Health, in conjunction with Native American Botanics, an Arizona small business, and is part of a larger effort to essentially grow pharmaceuticals, thus the term “farmaceuticals.” In the not too distant future, tomato growers might be producing fruit that is not only delicious and nutritious, said Giacomelli, but also contains an edible vaccine. Greenhouse growers in particular should keep their eyes on developments in this area, advised Jensen. “This is where the real money will be,” he suggested.

Another stop on the tour was hosted by a University of Arizona entomologist, Roger Huber. He noted, to the knowing nods of the growers on the tour, that despite the fact that greenhouses are enclosed, they are not immune to pests. He showed off an extensive monitoring program in which sticky tape is used to check on the detection of such pests as thrips, aphids and whiteflies. Huber said that perhaps the most important piece of advice he could give to greenhouse vegetable growers is to have at least one magnifier of one type or another available. Pests are simply too small to be distinguished with the naked eye, and a grower who doesn’t know what pests he is dealing with is at a tremendous disadvantage.
Greenhouse growers should also keep detailed, accurate records, said Huber. One of the biggest reasons for keeping good records is that year after year growers are likely to find the same problems crop up in the same places. It may be due to the fact that it’s near a heater, or the side of the greenhouse that gets the most light, but whatever the reason, growers need to be aware if the same problems are emerging. This allows them to spot-treat problems, saving money on pesticides and fungicides, and hopefully avoiding insects developing resistance to the controls. By the way, Huber noted that even when spot-treating, growers should avoid using the same product several consecutive times to avoid resistance build-up.

**SIDEBAR1:**

**Salt Greenhouse Tomatoes for Flavor**

It’s becoming increasingly obvious to greenhouse tomato growers that while high yields are important, nothing nets higher total returns than top-quality fruit. For years growers have gone after the best—tasting tomatoes, that is the tomatoes with the highest sugar content, or brix, by manipulating the environment and selecting the best varieties. While those are important influences on flavor, an associate professor at the University of Arizona’s Department of Plant Sciences has demonstrated that the most important factor is the electric conductivity (EC) of the nutrient solution.

EC, which is a factor of the salt content of the nutrient solution, is much more important, in fact, than cultivar selection, said Chieri Kubota, a researcher in the university’s Controlled Environment Agriculture Program. Environmental conditions, such as the air temperature of a greenhouse, can also be a significant factor, but it too pales in comparison to the EC in the plants’ nutrient solution. Growers have been concerned by high EC because it means placing the plants under greater stress and cutting yields, but Kubota and her research partner, Min Wu, didn’t see that great a difference. “Increasing EC may reduce yield,” said Kubota, “but results of our experiment showed no significant yield reduction.”

In fact, while yield was not significantly reduced, the lycopene content was increased. That’s very important because many studies have shown how lycopene, a powerful antioxidant abundant in red tomatoes and processed tomato products, may help prevent prostate cancer and some other forms of cancer, heart disease, and other serious diseases. Some U.S. grocery chains such Trader Joe’s have begun marketing higher lycopene tomatoes.

In other words, greenhouse tomato growers who target higher EC levels can boost both the brix and the lycopene content of their fruit. Increased flavor and better health? Sounds like a winning combination.

**SIDEBAR2:**

**Take Out The Trash**

Many greenhouse vegetable growers complain about disease problems cropping up near doorways. Those growers would be wise to clear their property of any decaying plant materials, said an extension specialist in the University of Arizona Department of Plant Pathology. Mary Olsen told attendees at the annual short course hosted by the Controlled Environment Agriculture Center that growers usually remove diseased plants
from their greenhouses, but don’t always get them off the property. But diseases can travel from the dead plants into the greenhouse doorways, making for a vicious cycle.

By the same token, growers shouldn’t use pots from diseased plants. In a similar fashion, the disease stays on the pot and then infects any new plants that are then potted. Growers should never forget that many diseases are extremely difficult to get rid of, so it’s a lot easier to keep plants free from infection than it is to treat them later. Botrytis, for example, is notorious for fungicide resistance. Another common disease that’s really become a problem in Mexico, fusarium, is similarly difficult to treat. “If it (fusarium) gets going in a cucumber house, it’s hard to get rid of,” said Olsen. “Few fungicides have efficacy.”

Another place where a disease can enter a greenhouse is through the soil. If you do use soil in your greenhouse — and many experts, such as Professor Merle Jensen believe you shouldn’t (see main story) — you should only use steam-treated soil. Finally, along that same line growers need to constantly be on the lookout, said Olsen. “You should be very careful whom you buy soil and plant materials from,” she said.