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It Takes a Team to Trial New Crops

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New varieties are the life blood of the controlled environment industry whether a grower is producing food crops or ornamentals. The improvements being developed by food crop breeders are in direct response to the requests coming from growers who are asking for higher yields, shorter crop times, better disease and pest resistance and improved postharvest quality.

Tracy Lee Zogby, CEA sales lead at Sakata Seed, said her company has been breeding for high-tech greenhouse tomato production for over a decade, but has recently started branching out with additional leafy greens crops.

“Sakata has been breeding for the leafy greens market, but on a more worldwide scale and particularly for the large South American market,” Tracy said. “Controlled environment crops beyond tomatoes have not had any traction in the United States until the past five years.

“As the number of inquiries continued to increase, primarily from leafy greens growers, Sakata made the decision to explore the potential of this market. Sakata is a major breeder of many leafy greens crops that go along with lettuce in salads.”

Pictured: A key part of Area 2 Farms' plant variety trials is they're conducted in the company's vertical farm production area and not in a separate setup. Photo courtesy of Area 2 Farms.

To address the increasing demand from CEA growers, Sakata started with its breeding programs in other countries and began to test leafy greens crops for potential controlled environment production. In many cases, the plants stayed on the shelf because they had interesting traits potentially for CEA, but wouldn't work for field growers.

"We did a lot of screening of genetics, trialing and evaluation of these crops. We did the same thing with some of our current commercial field-grown varieties," Tracy said. "Some of these field varieties we found had good results in CEA production systems. We created a list of the items that we saw had promise and growers were having success within various CEA systems for leafy greens across all of the genetic material."



Sakata is now offering an assortment of leafy greens varieties that commercial CEA growers are producing.

"There are still some crops (lettuce, arugula and spinach) that we are missing and the growers are asking for that we are working on," Tracy added. "We have begun working closely with CEA growers who are willing to share their trialing data that can help us combine their needs with the potential needs of field growers to see if we can come up with dual-purpose varieties. Sakata is trying to maximize the genetics it already has, breeding with material that potentially has traits that will be needed for either CEA or field production."

More cooperation, communication, education

One of the biggest obstacles that Sakata had to overcome when it started working directly with CEA growers was the unwillingness on the part of the growers to share information about the varieties they were trialing, the data they were collecting and the production systems they were using to produce their crops.

"Many of the CEA growers have been close-mouthed about the information they are willing to share," Tracy said. "Over the past 18 months that has started to change. As a breeding company we need more detailed feedback before we are going to decide to start breeding crops specifically for certain growers."

"We are focusing on those growers who have committed to turning a profit and are committed to sharing information in a way that will actually move us forward with varieties, seed production and everything we can do to help them. It has to be a give and take, and it is getting there. It is definitely improving."

Another aspect that's changing is the need for exclusivity. Five years ago, growers were asking Sakata to breed a variety just for them.

"Since then, the crops they needed have changed and I expect they will continue to change in the future,"

Tracy said. “We are working hard on communication, education and developing trust so that when we talk to growers, they understand the entire timeline and the cost of a breeding program.”

Utilizing distributors

When Sakata started looking at breeding varieties for CEA production, the company quickly realized there was going to have to be an education component to working with the growers.

“There is a multi-tiered supply chain with the breeders, seed producers, distributors and the growers in regards to the CEA industry,” Tracy said. “This applies to both food crops and ornamentals. This wasn’t necessarily understood by some of the food crop growers. Sakata prefers to focus on its breeding and production and work closely with its distributors to forecast and inventory seed for sale. Some seed companies sell direct to the growers, but Sakata prefers to work with the distributors.

“There is a long-standing tradition on the part of both ornamental and vegetable growers to work with distributors and breeders as partners. From the start, controlled environment growers should find one to three distributors that they trust and can depend on. The distributors will have experts that the growers can turn to for advice and recommendations on any problems that arise.”



Pictured: Area 2 Farms is conducting plant trials in cooperation with several companies, including Rijk Zwaan, Enza Zaden, Hort Americas and Sakata Seed. Pictured: Lettuce from Hort Americas. Photo courtesy of Area 2 Farms.

She added having a strong three-way relationship between breeder, distributor and grower allows all of the parties to talk so they’re on the same page and can set priorities from the beginning. This type of relationship allows for regular check-ins with all parties as a grower’s priorities change.

“We prefer this type of relationship that allows for the flow of information,” she said. “It allows us to prioritize trials to better meet goals.”

Real world trials

Tyler Baras, co-founder and chief science officer at Area 2 Farms in Arlington, Virginia, has done food crop plant trials at every commercial production operation he’s worked at. Area 2 Farms is a vertical farm operation with 2,000 sq. ft. of production, selling to 200 community supported agriculture (CSA) customers.

“Since our company is only two years old, we are still doing a lot of R&D where about 5% of the production area is used for trials,” Tyler said. “Operating a larger-scale facility, the amount of space designated for trials wouldn’t be that large a percentage.”

One key concept is to conduct the trials in the actual production area and not in a separate setup, Tyler added. They try to do trials in the commercial system so that the trial plants will be saleable, as well. He added the number of varieties that are trialed is based on how much of a crop is part of the total production.

“With spinach we might be having a production issue,” he said. “We might trial 20 varieties because we want to figure out quickly what’s the problem. There is so much variation between varieties with both spinach and

mint.

“For a crop like butterhead lettuce or crystal lettuce varieties, we may have a favorite and talk to the seed suppliers, such as Rijk Zwaan or Enza Zaden. They might recommend trialing three varieties that are similar. We will trial those side by side with our current standard.”

In the early stages of the farm, Tyler said he was doing more trialing of varieties.

“If we were producing an oakleaf lettuce, we might trial at least four different varieties so that if one underperforms then there is a buffer with the other varieties that were grown,” he said. “As a grower starts to build confidence in producing a particular variety, he may decide to allocate 90% to 100% of a crop to one variety.”

Greenhouse vs. vertical farm

Tyler said when growing in a greenhouse, there's less pressure on the value of the growing space. On the vertical farm side, the cost per square foot for growing space is more than in a greenhouse. That equals a bigger risk in a vertical farm if a crop doesn't work out. Another consideration is how crops perform differently in a greenhouse vs. a vertical farm.

“Varieties that perform well in a greenhouse may not perform as well in a vertical farm,” Tyler said, noting one of the biggest variables is often light. “When growing in a vertical farm, the quantity and quality of light are about the same year-round. A grower can feel confident that the environmental parameters are going to be nearly the same year-round. In a vertical farm when a variety works, it's probably going to work all the time.”

In a greenhouse, however, varieties will likely have to be shifted by season.

“There are winter butterhead and summer butterhead lettuce varieties,” Tyler said. “There are butterhead varieties that do better under LED supplemental light. The variety selection for a greenhouse is more dynamic and trialing varieties is more difficult.”

He said one of the advantages of variety trialing in a greenhouse is that most of the seed providers know whether a particular variety is recommended for summer high light or winter low light growing conditions. That kind of information is more limited when it comes to growing in vertical farms.

“When starting to trial varieties in a vertical farm the number of varieties to choose from is much larger,” he said. “In a greenhouse, growers will try multiple varieties in different seasons to determine what works best in a particular season. In a vertical farm, there's a less-narrow starting point, but when a grower finds a variety that works under his production conditions it's probably going to work all the time.”

Seed for trial data

Some seed companies have begun to indicate in their seed catalogs that a variety is recommended for indoor farms or vertical farms. This is a separate classification from varieties recommended for greenhouse production or for hydroponic production.

“Indoor farm quality is being noted by some seed companies, including Rijk Zwaan, Enza Zaden and Sakata,” Tyler said. “More companies are building up their seed production focus to include both greenhouse and vertical farms and the distinction between them. Some are indicating that a variety might be good for indoor farms. They are recommending varieties, but there is variability in the production systems in vertical farms, so growers should look at a number of varieties when conducting their trials.”

He added that many of the seed companies are relying on vertical farm growers for data when it comes to variety trials due to the costly nature of replicating an indoor farm and the different production systems.

“They are leaning on the growers when it comes to plant performance in vertical farms,” Tyler said. “I’m doing trials for several seed companies. It’s usually an exchange of seed for data.”

Trialing takes time to collect data, Tyler noted, so don’t trial so many varieties that it slows down the production team.

“It’s best to assign one person who is dedicated to doing the trialing. If a trial variety performs just as well or better than a currently grown variety, if there isn’t any noticeable difference and the seed cost is comparable or less, then we run it through several production cycles before potentially switching one of our main varieties,” he said. “This is easier to do when a grower is operating a CSA rather than selling to grocery stores and/or restaurants, which may want specific varieties produced.”

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