

Recruiting stronger veggies

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The U.S. military, which runs dining halls around the world, is spending nearly \$3 million to fund a Davis firm's quest for longer-lasting tomatoes and heads of lettuce.

Arcadia Biosciences, a 3-year-old agricultural biotech firm, has won a \$2.9 million Department of Defense contract to develop tomatoes and lettuce that can survive the rigors of long-distance sea shipping. The hope is that the seed money will fund research and commercialization of the produce, which the military could then buy and ship around the world.

"It's definitely a morale-builder," said Patrick Dunne, biochemist at the Defense Department's Massachusetts-based Combat Feeding Directorate. "We would like to have a guaranteed safe supply that could be shipped from a U.S. location and still get overseas around the globe in good condition."

Arcadia's goal is to have the new tomatoes on grocery store shelves by 2009 and heads of lettuce ready for sale by 2010.

Unlike the Flavr Savr tomato from another Davis company in the 1990s, Arcadia's tomato - and lettuce, as well - will not be genetically engineered. Calgene's Flavr Savr came to market, but the company's foray into selling tomatoes on a large scale ended in failure.

Arcadia aims to break through without the controversies attendant to genetic engineering. The start-up does plan to use genetic sleuthing to double the two-week shelf life of fresh lettuce and add 30 days to the normal three-week life of tomatoes.

"It's non-GMO (genetically modified organism)," said Eric J. Rey, Arcadia president and chief executive officer. "We're using analytical techniques to find genetic variations here."

The defense contract has major implications for the biotech firm's still unprofitable bottom line - and possibly for the nation's grocers, who sold more than \$6 billion in fresh lettuce and nearly \$5 billion in fresh tomatoes in 2003. Longer-lasting produce could curb spoilage and prove popular with shoppers, although some marketing experts say the industry should focus on better-tasting produce rather than longer shelf life.

The military just wants fresh produce that lasts a month.

"That's getting into our target range," Dunne said. "If you put something on a ship leaving the West Coast and going to Alaska or the Orient, you figure a couple of weeks or more in transit."

Inevitably, containers fail or aren't picked up quickly, Dunne said, spoiling produce long before it gets to a dining hall for combat troops.

Arcadia, a privately owned firm backed by Exeter Life Sciences venture capital, bought Seattle-based Anawah Inc. in June. Anawah was already working to extend the shelf life of produce.

Arcadia has licensed analytical technology that was invented at Seattle's Fred Hutchinson Cancer Research Center. It's called Targeting Induced Local Lesions In Genomes, or TILLING. The technological equivalent of finding a needle in a haystack, it helps plant scientists winnow through genetic codes of tens of thousands of tomato and lettuce plants.

After selecting plants with desirable genes, scientists will use traditional cross-breeding techniques to commercialize varieties that are slow to decay, grow well in California and Florida and taste good.

"Specifically, one of the goals is they have to taste good," said Rey. "In my mind, they've got to be at least as good-tasting" as regular varieties. "Hopefully, over the course of time they'll be better-tasting."

Much of the field work is being done locally; tomatoes are being harvested in Winters and Vacaville for seeds to be planted later in Galt, Davis and Woodland greenhouses.

Arcadia plans to eventually partner with a seed company to bring the tomatoes to market in 2008 or 2009 if things go well, said Rey. He said a similar arrangement would likely follow for lettuce about a year later.

The CEO foresees a financial payoff for the years of research that force many biotech companies like Arcadia to run in the red before becoming profitable. He said the company invests between \$5 million and \$10 million annually on its potential products.

Arcadia is developing plants that use nitrogen fertilizer more efficiently and grow well in high salinity conditions.

It's also experimenting with safflower plants that produce high levels of an omega-6 fatty acid, gamma linolenic acid, which is said to be beneficial to human health. The result could be nutritional supplements or foods formulated for people with medical conditions.

"When we put all these together, we see a business opportunity where the payout is going to look very good relative to the investment we're making in the first few years of the business here," Rey said.

The California Grocers Association, a Sacramento-based trade group for grocery stores, says retailers are interested in longer shelf life. But shoppers will be the "real deciders," said spokesman David Heylen.

They aren't clamoring for longer-lasting produce, said Dr. Devon Zagory, a Davis-based global produce consultant. The senior vice president of Davis Fresh Technologies said people would rather have tomatoes that taste good.

"In the North American produce market, that's the challenge. Not to extend the shelf life," he said, "but the taste."

Still, Zagory acknowledged the value of long-lasting produce to the military.

"Most of us do not want to eat American-grown produce when we're in the Middle East," he said. "We're sort of content to eat what they have. Military people are different. They want to eat peanut butter and American-grown tomatoes."

Said the Defense Department's Dunne, "If you build in some fresh things you get less menu fatigue. You're more likely to eat what's given to you and get more intake of fresh nutrients. You're just going to feel better. That's good for morale."