Gene Helps Crops Fight Heat Stress

Though *E. coli* bacteria are notorious for making people sick, a University of Florida study shows that a gene found in the microbes can keep plants healthy by improving their resistance to heat stress — a discovery that may help researchers develop food crops that withstand harsh climates and global warming.

Tobacco plants carrying the gene thrived after spending a week in nonstop 95-degree heat, said Bala Rathinasabapathi, an associate professor of horticultural sciences with UF's Institute of Food and Agricultural Sciences. The gene poses no threat to human health.

Researchers believe the plants were unusually resilient because they contained up to four times the normal amounts of vitamin B-5 and one of its components, the amino acid beta-alanine, he said.

The UF study appeared in the journal *Plant Molecular Biology*.

"We're already researching the gene's effect on tomatoes and lettuce, which are economically important to Florida and vulnerable to heat," said Rathinasabapathi, who co-authored the study with graduate student Walid Fouad. "Large-scale application is several years away but we believe this technology will be practical and affordable. It's certainly needed."

Up to 20 percent of the world's food crop is lost to heat stress each year, he said. That figure is likely to increase if predictions of future global warming prove correct.

According to the U.S. Environmental Protection Agency, many scientists believe the Earth's average surface temperatures will increase by up to 10 degrees in the next century.

Besides fighting crop loss, the gene could enable farmers in tropical and subtropical areas to grow a wider variety of foods, Rathinasabapathi said.

The connection between the gene and heat tolerance was discovered by accident, as researchers tried to learn how plants make beta-alanine. The process is well understood in bacteria, so the researchers decided to take a gene that helps regulate beta-alanine production in *E. coli* and observe its effects in plants.

They transferred the gene to tobacco, a species popular in genetic research. During an experiment on heat stress, Fouad was surprised to find plants carrying the gene were taller than their ordinary counterparts.

"We hypothesized that the plants grew taller and larger under higher than optimal temperatures because something associated with the gene protected them from heat," Rathinasabapathi said. "One possibility was that the large amounts of beta-alanine and vitamin B-5 they were producing played a role."

In the current study, researchers found tobacco plants modified with the gene contained four times as much beta-alanine and vitamin B-5 as ordinary tobacco plants. And modified plants exposed to 95-degree heat for one week weighed almost twice as much as ordinary plants grown under the same conditions.

But when the modified plants were kept at temperatures typical for tobacco farming — about 75 degrees — they grew at the same rate as their ordinary counterparts.

"The practical applications for this gene may be limited to situations where crops will be exposed to temperatures of 90 degrees or more," Rathinasabapathi said. "We're conducting follow-up studies to learn more about how the gene works, so we can maximize its benefits."

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Tom Nordlie

UF horticultural sciences researcher Bala Rathinasabapathi holds genetically modified tomato plants that contain a gene found in E. coli *bacteria that enables plants to withstand heat better.*

Marisol Amador

Molecular Force Field Protects Cancer Cells

Much as the famed starship Enterprise would deploy a deflector shield to evade enemy attack, tumor cells are capable of switching on a molecular force field of their own to fend off treatments aimed at killing them. Now University of Florida researchers have found a chink in their armor.

The cells churn out an enzyme that bonds with a protein, creating a protective barrier that deflects damage from radiation or chemotherapy and promotes tumor cell survival. But in laboratory experiments, UF scientists were able to block the union, and the malignant cells died. The findings are opening new avenues of research that could lead to improved cancer therapies, the researchers reported in the journal *Cancer Research*.

"We have found a gene called focal adhesion kinase which is produced at very high levels in human tumors, and this makes the tumors more likely to survive as they spread throughout the body and grow," said Dr. William G. Cance, chair of the Department of Surgery in the College of Medicine. "It also makes them more resistant to our attempts to kill them."

Focal adhesion kinase, or FAK, has spawned a flurry of research to develop new drug therapies. These medicines would prevent FAK from linking with another protein tied to the growth of channels in the lymph system that serve as cellular superhighways for cancer.

"If you block the binding of these two proteins, the tumor cells are more prone to being killed," Cance said. "We think it's one of the Achilles' heels for tumor cells."

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Melanie Fridl Ross

Alligator Farmers Cash In On Fashion Trend

While some agricultural producers are facing tough times, Florida alligator farmers are cashing in on reptile chic — the growing worldwide demand for alligator skins on everything from belts and boots to $10,000 designer handbags.

"The market for high-end alligator leather products is very strong right now, and farmers are getting top dollar for their gator skins," said Perran Ross, a wildlife ecologist with the UF's Institute of Food and Agricultural Sciences. "Florida alligator farming has had its ups and downs in recent years, but it's definitely a good time for those who are already established in the business."

Louisiana is the nation's leading producer, harvesting about 300,000 alligators every year compared to 60,000 in Florida, but Hurricanes Katrina and Rita damaged alligator egg production in Louisiana. As a result, luxury-goods manufacturers in the United States and Europe need to secure future supplies of alligator skins, which is helping Florida farmers who can provide high-quality products.

Allen Register, owner of Gatorama in Palmdale, Fla., one of 60 licensed alligator farms in the state, said prices for alligator bellies range from $40 to $50 per foot, which is up by almost 50 percent from a few years ago.

Like other Florida alligator farmers, Register harvests gators when they reach four or five feet in length, which requires about two years of growth. He said Louisiana farmers typically harvest three- or four-foot long alligators.

Christy Plott Redd, marketing director for American Tanning and Leather Company in Griffin, Ga., buys skins from producers all over the world but prefers American alligator skins because of their high quality.

"Florida is key to our business because we need those grade-one skins to sell to handbag manufacturers and fashion designers," she said.

Ross, an alligator and crocodile expert in UF's wildlife ecology and conservation department, said alligator farming has about a $25 million impact on Florida's economy.

Marisol Amador

Wildlife ecologist Perran Ross holds an alligator being raised for its meat and skin.

He said the vast majority of alligator skins are produced from eggs purchased and collected from wild alligators in the state.

Ross said the commercial harvest of alligators actually helps conserve the species and their habitats because the economic incentives from egg production and legal harvesting encourage landowners to maintain wetlands. In addition, license fees from the program help support research, monitoring and wildlife management programs that conserve alligators.

"In other words, alligators pay their own way for their conservation," he said. "Florida has a model program that is emulated all over the world for managing alligators and their habitat for sustainable economic gain."

Alligator farming is also an efficient way to utilize meat and meat products that are not suitable for human consumption. Aged or freezer-burned meat, unused fish from commercial trawlers and offal from poultry processing plants are good sources of food for farms, Ross said.

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