

Gene developed through conventional breeding to improve cowpea aphid resistance

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The cowpea or black-eyed pea, as it is more commonly known, is a New Year's tradition for good luck. But disease and particularly aphids, which can wreck a crop within a few a days, are especially bad luck for the cowpea, according to scientists. Several new lines of cowpeas with genes that are aphid-resistant and less susceptible to disease are currently being tested by researchers with Texas AgriLife and other Texas A&M System entities.

"The cowpea has been an important and popular food crop throughout the southern U.S.," said Dr. B.B. Singh, a visiting professor in the soil and crop sciences department at Texas A&M. "It's commonly known as the southern pea, field pea, crowder pea, black-eyed pea, purple-hull pea and pinkeye pea widely grown in the southern states."

The researchers' discoveries could yield big rewards. An international food crop, the cowpea was most popular in the southern U.S. from the 1930s through '70s, and East Texas remains a large U.S. cowpea-producing region.

And during times of drought, the cowpea can be a viable alternative forage crop for livestock producers, due to its ability to fix nitrogen, tolerate drought and provide high-quality fodder, Singh said. It is a high-quality forage for cattle producers, with a protein content as high as 28 percent in seeds and 17 percent to 20 percent in the fodder after harvesting the seeds.

However, the aphid is currently the biggest threat to cowpea producers, Singh said.

"(Aphids) like dry weather," explained Singh, who has spent his entire career studying the cowpea. "Immediately after infestation, they start sucking the juice (sap) from cowpea leaves, stem, flowers and pods of the plants reducing their growth and development and causing severe reduction in yield. They also spread viruses. Aphids can ruin a crop within a few days."

Singh, came to the department as a visiting professor following his retirement two years ago from the International Institute of Tropical Agriculture, considered the epicenter of cowpea research.

At Texas A&M, Singh is working with colleagues Dr. J. Creighton Miller, D.C. Sheuring and Dr. Bill Payne using field trials in College Station to find a solution to the aphid problem.

Singh has brought more than 35 lines of cowpeas with drought and aphid tolerance, as well as resistance to other diseases and higher yield potential, to College Station. His work there has involved using conventional breeding methods to cross those lines with six Texas and California varieties in greenhouse and field settings.

"Many of the IITA lines are resistant to aphid, bacterial blight, powdery mildew and drought, whereas most of the U.S. lines are susceptible," Singh said. "A number of crosses were made to transfer the resistance to aphids and drought from the IITA lines to the U.S. lines."

In mid July, an aphid infestation hit the College Station trials, putting the new varieties to the test.

"It's been fairly severe, permitting selection of resistant plants from the

F2 and F3 populations," he said. "Due to drought and [aphids](#) this crop season, all of the susceptible cowpea varieties and segregating plants have been completely damaged, showing 80 percent to 100 percent yield loss, while the aphid resistant varieties and segregating plants are completely healthy with normal yield. The resistance is simply inherited, very effective and highly stable across environments."

From the segregating populations, the resistant plants with diverse maturity dates, plant type, growth habits and seed types have been selected to meet the need for grain type, fodder-type and pasture-type cowpea varieties, he said.

"These are being advanced to achieve uniformity and multi-location testing for stability of resistance and yield potential," Singh added. The new aphid-resistant, high-yielding varieties could be available to farmers as early as 2011, Singh said.

"The cowpea has worldwide importance as a crop for both human and animal nutrition," said Payne of Texas AgriLife Research, assistant director for research at the Norman Borlaug Institute for International Agriculture. "Introducing improved disease- and drought-resistant and higher-yield varieties could not only have tremendous potential for Texas and U.S. agriculture, it could help provide poor and developing countries with an important alternative source of nutrition."

According to the International Institute of Tropical Agriculture in Africa, the cowpea is an important food crop in many African, Asian and South American countries, especially as an alternative source of protein where people cannot afford meat and fish. The crop typically is grown by subsistence farmers with limited agricultural resources, who use it to feed livestock or sell for additional income.

The international Food and Agriculture Organization estimates more

than 7.5 million tons of cowpeas are produced annually worldwide, with sub-Saharan Africa responsible for about 70 percent of that amount.

"We are already involved in international research projects in Africa relating to cowpeas," Payne noted. "It's exciting to think where these new activities in College Station and the research already under way in Africa may lead."

Source: Texas A&M AgriLife Communications

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