Hitting back at 'wiretapping' parasite

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Dodder vines are parasitic plants that suck water, nutrients and information from other plants as they spread over them. Plant biologists at the University of California, Davis, have now shown that they can make plants resistant to dodder by attacking the junctions where the parasite taps into the host.

"We think that this will translate into other parasitic plants," said Neelima Sinha, professor of plant biology at UC Davis, who led the project. The work was published online July 20 by the journal *Plant Cell*.

Sinha's lab uses dodder as a model for more serious parasites such as Striga, which attacks the roots of maize, sorghum and other African crops.

In earlier work, Sinha and colleagues found that when dodder taps into a host plant, it takes up RNA molecules that can act as chemical messengers in the host along with water, sugars and other nutrients. These circulating RNA molecules act as messengers inside plants, for example coordinating growth and flowering.

The researchers wondered if they could exploit this to attack the parasite. It is possible to switch off a gene with a short piece of RNA with which it pairs. This technique is called RNA interference or RNA silencing, and it won the Nobel Prize in medicine in 2006.

To use RNA interference against dodder, the team looked for genes that could affect the parasite but not the host.

"The answer turned out to be genes I've worked on all my career," Sinha said, describing a group of genes that control the activity of other genes involved in shoot and root growth.

These genes are active in both the host plant meristem (an area of active growth in roots and shoots) and in the haustoria, the junctions where the parasite penetrates the host, Sinha said. So the researchers identified regions that were unique to the parasite, and used them to make a short DNA construct. Tobacco plants carrying this construct make short pieces of RNA that match the genes of the parasite, but not the host.

Dodder did not grow as well on the engineered plants as on control plants, Sinha said. At the same time, the dodder showed high levels of stress signals and flowered early -- a reaction to stress.

The work was initiated by Steven Runo and spearheaded by Amos Alakonya, two African graduate students who have now returned to Kenyatta University in Kenya, Sinha said. They hope to develop the technique to control Striga in African maize crops.

"This is the proof of concept, and now we can take it into the field," she said.

Provided by UC Davis