GFP helps monitor transgenic plants

By utilizing green fluorescent protein as a marker gene, researchers at the University of North Carolina have been able to monitor the presence and expression of an important gene in transgenic plants.

GREENSBORO, N.C. — Agriculturists wishing to improve the fitness of their crops can infuse them with genes transferred from other organisms. Yet these transgenes may have the undesired effect of increasing wild plant growth within or outside the crop environment.

Researchers from the University of North Carolina have developed a method for monitoring transgenes that may be suitable for use in the field. By introducing the marker gene green fluorescent protein (GFP) into a plant and observing its fluorescence when excited with blue or ultraviolet light, they have been able to track the presence and expression of the agronomically important transgene *Bacillus thuringiensus cry1Ac* (*Bt cryl Ac*) in tobacco and canola plants.

According to assistant professor of biology C. Neal Stewart Jr., GFP is a suitable marker gene because its green fluorescence can be easily distinguished from the reddish-purple fluorescence of many wild plants. He said that the researchers transferred the gene, which was cloned from jellyfish cells, into tobacco and canola using a bacterium that naturally transfers DNA into plants.

In laboratory studies, Stewart's team used a Fluoromax-2 fluorescence spectrophotometer manufactured by Instruments SA (now Jobin Yvon/Horiba) of Edison, N.J., to excite fluorescence in both transgenic and wild plants at 385 and 490 nm, and to detect emissions at 509 and 510 nm, respectively. The researchers also observed fluorescence of the transgenic tobacco plants in the field at night over two growing seasons using a portable, handheld UV source manufactured by UVP of Upland, Calif. Their analysis of the fluorescence data confirmed that GFP is a reliable marker for *Bt cryl Ac* and that it can be introduced into a host plant with no ill effects on crop growth.

The team is developing methods to improve the technique's utility in a field environment. "We can use a UV lamp in the field to detect GFP," Stewart said, "but that is not readily quantifiable. We would like to have a small, portable fluorescence spectrophotometer for fieldwork."

Stewart believes that commercial application of the technique may follow from additional research. "We need to look at the toxicity and allergenicity of GFP before we think about it entering the food chain, and such first studies are in progress," he said. He has already cofounded a company, Transgreenix, to commercialize the technology. □

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