Bioluminescence in Plant Biotechnology: Bananas are Glowing Light!

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Abstract

Bioluminescence refers to the production of light by living organisms. The discovery of the bioluminescence process paved the way for its use as a biotechnological tool in non-bioluminescent organisms. To be operational the bioluminescence process essentially requires two components: a substrate (called luciferin, which means 'light bearing substance') and an enzyme (not surprisingly called luciferase) that catalyzes a reaction leading to the release of photons, and thus light. The gene encoding luciferase enzyme or shortly *luc* gene can be used as a highly sensitive reporter to monitor gene expression in plants upon the application of luciferin simply by spraying. An example of the usefulness of this reporter system in banana is presented here. The establishment of banana embryogenic cell suspension allows the generation of transgenic plants with the aid of a famous soil bacterium, *Agrobacterium tumefaciens*. A modified *luc* gene from the American firefly was transferred to banana for the discovery of novel genes and promoters, i.e. regulatory DNA sequences that are responsible for switching on genes.

Banana promoters were identified by selecting banana cultures and plants showing bioluminescence under a sophisticated camera system in a light-tight box.