

GenoCAD designs complex genetic constructs

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Researchers at the Virginia Bioinformatics Institute at Virginia Tech and the Slovenia National Institute of Biology may have found a way to make plants do their bidding.

Using the [GenoCAD platform](#), a computer-assisted design application for synthetic biology developed at Virginia Bioinformatics Institute, the researchers developed a genetic language to program plants. Results of this collaboration were published in a recent issue of the open-access journal *PLoS One*.

Plant synthetic biologists are continually looking for ways to improve drought- and pest-resistance in crops, while others are seeking to use plants to produce novel products.

"We used GenoCAD for this project because it supports a structured workflow to capture the rules that plant expression systems need to follow," said Anna Coll, a research associate at the National Institute of Biology and the paper's lead author. "Our work will make it easier to design hundreds of constructs which some large research programs in industry desperately need."

The study describes proven strategies for designing synthetic DNA sequences to express genes in plants.

Specifically, the strategies can be used to first understand how genes are expressed in plants, identify where specific proteins are located in the cell, and finally determine how multiple proteins interact with one another in complex regulatory networks.

These networks include those that may control flower development, tolerance to drought, and other traits affecting the yield of major crops.

Researchers say the work provides plant biologists with a new avenue to design the increasingly complex DNA constructs that the agriculture biotechnology industry relies on to express proteins of interest in various plant species.

"In this paper, we have summarized our experience accumulated over the years by developing genetic constructs to support our own research projects," said Kristina Gruden, a professor at the National Institute of Biology and one of the senior authors. "We expect that it will save new students a lot of time by avoiding the repetition of mistakes made by their predecessors."

"We see GenoCAD as a platform to foster communication between experts in various biological domains and less experienced scientists who would like to benefit from their advice while designing their genetic constructs," said Jean Peccoud, a professor at the Virginia Bioinformatics Institute and chief executive officer of GenoFAB LLC. Peccoud is also the senior author of the study. "GenoCAD complements the traditional narrative format of scientific manuscripts by allowing scientists to write DNA in genetic languages specified by domain experts."

More information: "Rule-Based Design of Plant Expression Vectors Using GenoCAD." *PLoS ONE* 10(7): e0132502. [DOI: 10.1371/journal.pone.0132502](https://doi.org/10.1371/journal.pone.0132502)

Provided by Virginia Tech

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