Non-transgenic generation of herbicide resistance in soybean using CRISPR base editing

Funding: $94,901

Principal Investigator

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Overview of project objectives

This project strives to address the challenges posed by weeds in North Central soybean fields, which are becoming harder to control, primarily due to spreading of weeds resistant to herbicides that are usable on soybeans. By equipping soybeans with new tolerance traits against herbicides not currently used on soybeans, more choices of herbicides with diverse modes of action will be made possible. Using CRISPR-based gene editing, we hope to create new herbicide tolerance traits by introducing precise changes to a select set of soybean genes. Modifying three soybean genes would enable tolerance to corresponding herbicides Imazapyr, fluridone, and mesotrione.

Key results

Progress is being made, even though the COVID-19 pandemic forced the closure of the research labs for more than 10 weeks and much of the tissues and materials were lost. Because of this, new protocols are under development, which, if successful, will be simpler, technically less demanding and shorten the time needed for producing transgenic materials. The research team has incorporated a new base editor, the latest version of base editing Cas9. They are in the process of engineering herbicide tolerance in soybeans using alternative approaches including trying to adopt a rice herbicide tolerance gene in soybean.

Benefit to farmers

The successful outcomes of this project will be soybean seed stocks equipped with three new herbicide tolerance traits, which could be separate or combined into the same seed. Soybean growers would be able to use three novel classes of herbicides that are not currently used on soybeans, thus broadening herbicide choices and flexibility for farmers. This will, in turn, lead to higher soybean yields and productivity.

Links

Non-transgenic generation of herbicide resistance in soybean using CRISPR base editing *USB National Soybean Checkoff Research Database*