Crop gene editing needs proactive communication plan, scientist warns

Effective science and communication collaborations are critical to ensure gene editing technology does not suffer from the “perception problem” now facing genetically modified organisms (GMOs), a plant pathologist warned.

“I want to feed the world sustainably. That’s what motivates me as a scientist,” said Jim Bradeen, head of the Department of Plant Pathology at the University of Minnesota. “I will be hugely disappointed if gene editing goes the way of GMO approaches” to crop breeding.

“Technologies are neutral,” Bradeen told reporters at the recent International Federation of Agricultural Journalists (IFAJ) in Minneapolis, Minn. “They are not good; they are not bad. It’s the way we use them that matters. I would love to see the conversation focused on that. How do customers want us to use such technologies?”

Ongoing investments into gene editing research are a move in the right direction, he said. But they must be balanced with effective communication so the “application plays out in a positive way. I think scientists need to play a role; communicators need to play a role. We need to work together to make sure we are communicating openly and effectively about what these technologies are, what the potential is and what the risks are.”

Bradeen challenged scientists to take an interest in how the technology they develop reaches ordinary farmers because too many bottlenecks have made it difficult to get improved crops into the hands of those who need them. He hopes that situation will change with gene editing.

“Our institution trained Norman Borlaug,” Bradeen said. “He did his masters and PhD here. He went on to launch the Green Revolution. And I maintain that he was successful not because he was a plant breeder or pathologist, he was successful because he knew how to get things done. He was a special person in a lot of ways. And I think we need a lot more of that…”

Potential of CRISPR

Bradeen said CRISPR technology can be used to wipe out the functions of genes in living organisms that promote diseases. It can also be used to tweak the genes to look like their wild counterparts so they are better resistant to diseases.

“CRISPR and gene editing approaches have a lot of potential and promise for feeding the world sustainably,” he said. “I think this methodology is an improvement over genetic modification (GM). So GM is a sledge hammer. Gene editing is a tack hammer. It’s a much more refined strategy for improving crop plants.”

CRISPR, which stands for Clustered Regularly Interspaced Short Palindromic Repeats, refers to specialized DNA stretches in single-celled organisms with an associated enzyme, Cas9, which works like a pair of molecular scissors capable of cutting DNA strands. When introduced in multi-celled organisms,

they have the capacity to edit the genes to suit specific purposes

Bradeen, who is also the newly appointed internal communications officer of the American Phytopathological Society, hailed the contribution GMO technology has made to food production, but expressed worry that it's been embroiled in too much controversy.

"GM crops got so wrapped up with herbicide usage" that it created an impression in the minds of many individuals that GMOs are about increased use of chemicals when the opposite is actually the case, he noted. "I feel that the GM issue is obviously very polarized. It limits the approaches scientists have to improve crops. That's where I hope gene editing and new technologies don't go. We've learned. We have to have that conversation with the public to convey the power and potential of that instead of focusing on the past."

Since they were first introduced into the food chain 23 years ago, GM crops have increased yield productivity by more than 657.6 million tons. GM crops have added an estimated US$186.1 billion in economic benefits to the wealth of farmers. Yet despite the huge benefits, only about 17 million farmers in 24 countries are able to grow GM crops out of a global total of 570 million farmers in over 180 countries. This is due largely to regulatory hurdles.

The approval process for GM crops is overly expensive, limiting the ability of public researchers to get a lot of the benefits of GM crops into the hands of farmers, he explained. Typically, only big companies can afford to bring GM crops to market.

He praised the US Department of Agriculture's decision to exempt most gene-edited crops from the same regulatory process as GMOs. "This opens a whole wide array of possibilities for companies and public researchers to make materials accessible to farmers."

Food insecurity and malnutrition kill more people than any other major cause of death, so conscious efforts need to be made to ensure genetic improvement of crops to avert more fatalities, Bradeen said. He noted that while road accidents, diabetes, tuberculosis and HIV/AIDS annually kill an estimated 1.2 million, 1.26 million, 1.34 million and 1.78 million people, respectively, food insecurity kills up to 9 million people every year.

That figure could rise to 12.5 million by 2050, when the world population is expected to reach 10 billion, unless drastic actions are taken now, he warned. "The situation could be a lot worse than this. We know that climate change is impacting agricultural productivity on a global scale and the growth in population is concentrated in regions like Africa that are already facing food security challenges. So the issues of food insecurity are significant and require urgent action on the part of scientists."

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