

Weed scientist finds slight rise in herbicide chronic toxicity

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A University of Wyoming weed scientist—frustrated with the noise surrounding genetically modified organisms and glyphosate use—analyzed data to see for himself if biotech adoption has had a negative or positive effect on herbicide use.

Andrew Kniss specifically looked at chronic toxicity—interaction with the chemicals on a regular basis for many years—of herbicides used in five different crops grown in the U.S. "Long-term trends in the intensity and relative toxicity of herbicide use" was published Monday in the journal *Nature Communications*.

The study is of most relevance to applicator safety, but information also sheds light on herbicide and genetically modified organism (GMO) use.

"The most important thing to take away is that, in most cases, we haven't seen a huge increase in the toxicity of herbicides we are using," says Kniss, an associate professor in the College of Agriculture and Natural Resources.

There has either been a dramatic decrease in toxicity or, in some cases, a slight increase, he says.

"But, in the cases where we have seen a change in toxicity, either an increase or decrease, it's hard to pin that change on the adoption of biotech crops," says Kniss, in the Department of Plant Sciences.

Chronic toxicity in corn and cotton has increased not because of glyphosate, the herbicide associated with GMOs, but rather due to an increased reliance on other herbicides, he says. Nearly all of the significant decreases in toxicity were due to the EPA phasing out some of the most toxic herbicides.

As with most GMO and pesticides issues, he expects a wide range of reaction.

Although this study was funded through public sources, Kniss has had research projects funded by chemical companies, particularly related to glyphosate.

"So, I came to this project with bias just like anyone has biases," he says. "But, I really did try just to follow the data. What does the data say?"

The publicly available data he used are posted with the article. "Which means anyone who questions my conclusions can look through the data, run the analyses themselves and double-check my work," Kniss says.

The pro-GMO crowd claims GMOs and glyphosate have decreased toxic chemical use. There are others who disagree with the use of GMOs and herbicides, claiming they are bad for the earth.

Kniss says frustration with claims unsupported by evidence motivated him.

"I would hear some of my stakeholders, who I tend to agree with on those topics, making statements I didn't think were supported by evidence," he says. "And, then I'd hear an activist group making statements that were completely opposite. I wanted to rigorously check some of those claims, because there is a lot of misinformation out there. Some of it is intentional. Some is not."

Kniss found:

- Strong evidence that herbicide use has increased in GMO crops (corn, soybean, cotton). But, herbicide use has increased faster in the non-GMO crops rice and wheat, suggesting there is an overall trend for increasing herbicide use in all crops.
- The analysis suggests the contribution of glyphosate to the chronic toxicity hazard has remained relatively low, even though the amount of glyphosate being used has increased.
- Of the three GMO crops in the analysis, the chronic toxicity hazard associated with herbicide use has increased in corn and cotton, but decreased in soybeans over the last 25 years. In all three cases, Kniss says, few of the changes in herbicide use that caused [chronic toxicity](#) to change are directly attributable to GMO traits.

The study's value, he says, is that it shows there are subtle differences to GMO and herbicide use questions.

"It's not clear-cut, black or white that GMOs are good or GMOs are bad, or that [glyphosate](#) is good or bad," he says. "There's a lot of nuance in the way farming works. We are clearly using a lot more herbicides than we used to, and that's not a good trend. But, because of the changes in which [herbicides](#) are being used, that increase in herbicide use wasn't necessarily associated with greater [toxicity](#)."

More information: Andrew R. Kniss. Long-term trends in the intensity and relative toxicity of herbicide use, *Nature Communications* (2017). [DOI: 10.1038/ncomms14865](https://doi.org/10.1038/ncomms14865)

Provided by University of Wyoming

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