

The fight against Palmer amaranth, the herbicide-resistant soybean weed

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An early-season competition of Palmer amaranth with soybeans in southcentral Nebraska. Credit: Amit Jhala

For the past 25 years, many farmers across Nebraska have relied on the chemical glyphosate for weed control to have a successful crop harvest.

However, due a to a not-so-simple change in the genetic makeup of Palmer [amaranth](#), a pesky [weed](#) found in [soybean fields](#), that no longer works. In fact, six weeds in Nebraska have become resistant to glyphosate, including Palmer amaranth.

Enter Amit Jhala, member of the American Society of Agronomy, who's latest research aims to help farmers fight this weed. Jhala's research was recently highlighted in *Agronomy Journal*.

"Soybeans are the second most important crop grown in Nebraska," says Jhala. "Not only is the crop important here, but it's grown across the U.S."

Some common weeds, such as [palmer amaranth](#) and waterhemp, have become resistant to the herbicides used to manage them. This is challenging for farmers, and it can decrease crop production in their fields.

Palmer amaranth is problematic because it can outcompete most crops, leading to high yield loss.

Historically, the chemical glyphosate has been used to control the weed in glyphosate-resistant cropping systems. The [crops](#) in these systems, often corn and soybeans, are resistant to glyphosate. This means it doesn't affect crop performance, but it kills the weeds.

Since glyphosate is no longer effective in controlling resistant Palmer amaranth, farmers need alternate management practices.

Management of Palmer amaranth is challenging and cannot be controlled

by just one chemical. Herbicides work in various ways, called sites of action. The team recommends using a [herbicide](#) with a mixture of chemicals that can work in multiple sites of action.

One option farmers have is to apply pre-emergence herbicide, which is applied on soil after crop planting.

Depending on weed growth in the field after the soybeans emerge, another spraying should be done to kill the weed species.

"The main objective of our study was to determine the critical time of Palmer amaranth removal in soybeans and how it is affected by pre-emergence herbicide," says Jhala.

"The weeds compete with the crop for nutrients, moisture, space, and light. If they outcompete, there is large yield loss," he explains. "We need to know the best time to remove the weeds to avoid yield loss in soybeans."

The team conducted field experiments in 2018 and 2019 in fields infested with glyphosate-resistant Palmer amaranth. They compared weed removal in fields sprayed with pre-emergence herbicides to those with no pre-emergence herbicide applied.

For the fields sprayed with pre-emergence herbicide, the team compared two different management techniques. One treatment used a pre-emergence herbicide with one [active ingredient](#) (flumioxazin), and the other was a mix of three herbicide active ingredients (flumioxazin, metribuzin, and pyroxasulfone).

The team then compared timing of Palmer amaranth removal at different soybean growth stages to determine the best management practices.

Results indicate that using a pre-emergence herbicide with three active ingredients applied at [soybean](#) planting was the most effective.

"When Palmer amaranth is common in a field, farmers should consider using herbicide with multiple sites of action," says Jhala.

"If farmers don't use any chemical in a pre-emergent application, the field can be overrun with Palmer amaranth and they will see a high yield reduction," he explains.

More information: Jose H. S. Sanctis et al. Residual herbicides affect critical time of Palmer amaranth removal in soybean, *Agronomy Journal* (2021). [DOI: 10.1002/agj2.20615](https://doi.org/10.1002/agj2.20615)

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