

Herbicide resistance forces farmers to weed by hand

After years of very heavy use of the herbicide glyphosate on 'Roundup Ready' GE (genetically-engineered) crops in the US, weeds are developing resistance to the chemical. The rapidly-spreading problem shows how reliance on genetically-engineered herbicide-resistance is a short-sighted strategy that is resulting in more difficult-to-control weeds.

"I think this threatens our way of farming more than anything I've seen in the 30-plus years I've worked in agriculture."

Ken Smith, University of Arkansas weed scientist, 2009

'The most problematic weed in all of cotton'

Palmer pigweed (*Amaranthus palmeri*) is a troublesome weed that has recently acquired glyphosate resistance and is rapidly spreading in the US South and Midwest, infesting fields of Roundup Ready cotton, soya, and maize. Weed scientists are alarmed, and warn of ruin for many farmers. No effective control exists for resistant Palmer pigweed except large increases in the use of persistent herbicides, hand-weeding of crops, and increased tillage (ploughing), resulting in topsoil loss.

Glyphosate-resistant Palmer pigweed was first confirmed in the state of Georgia in 2005 (Culpepper, 2006). The pigweed is wind-pollinated, and the resistance trait is spreading far and fast via the plant's highly mobile pollen (Sosnoski, 2007). Carried on the wind, resistant populations of the weed are moving so quickly that no reliable national estimates of affected acreage exist. In 2009, in the states of Arkansas and Tennessee alone, it is believed to have infested more than 500,000 farm hectares (Charlier, 2009).

"We're now seeing [Palmer pigweed] that is resistant to glyphosate... That's going to be a major problem. We can go back to ploughing and controlling what we can that way, but so far, there's no chemical that will take care of it."

Ronnie Qualls, Arkansas cotton farmer, 2009.

Stanley Culpepper of the University of Georgia is the weed scientist who first confirmed the resistant pigweed. He now calls it 'surely the most problematic weed in all of cotton'. To control it, Culpepper recommends use of additional herbicides and hand-weeding cotton with hoes – a labour-intensive anachronism in America's landscape of large and highly mechanised farms.

A return to hand-weeding and garden hoes

With glyphosate ineffective against the weed, agricultural supply stores in the Mississippi Delta region have reported that common garden hoes have returned from obscurity to become one of the fastest-selling items (Charlier, 2009). "We haven't chopped [weeded] cotton in a long time," says an Arkansas cotton grower. Hand-weeding on heavily-infested plantings is costing Georgia cotton farmers as much as \$240 US dollars per hectare (Hollis, 2009). Farmers who don't hand weed or apply additional herbicides are risking disaster, say weed scientists.

"I continue to see growers who are just spraying Roundup in Roundup Ready cotton. If you continue to do that, you will not survive. Even if you've survived this far, you will not survive in the future."

Stanley Culpepper, University of Georgia weed scientist, 2009.

Strengthening resistance

The glyphosate resistance appears not only to be physically spreading; but also to be growing stronger: "In the past, when you applied 22 ounces of Roundup WeatherMax to a resistant pigweed, it'd at least cause symptoms," says University of Tennessee weed specialist Larry Steckel. "Now, in some cases, we can spray 152 ounces and not see any symptoms. It's hard to believe how quickly and strong the resistance has become and spread." (Bennett, 2008b).

Weed scientists are telling farmers to use 'residual herbicides' that rely on different chemistries in order to compensate for the failure of the Roundup Ready system to control pigweed in maize, soya, and cotton. Residual herbicides are applied early in the season and are designed to persist in the soil, killing newly-sprouted weeds for weeks after application.

As the Palmer pigweed problem continues to spread, farmers and scientists are scrambling to come up with solutions. As a result of heavy reliance on glyphosate, there are no good control options available. Those that do exist are labour and chemical intensive, raising costs for farmers and the environment. The short-term gains that attracted US farmers to Roundup Ready crops are rapidly being undermined by nature's predictable response to overuse of a single herbicide.

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