# Catching up kochia

Investigating new strategies to tackle resistant biotypes

When it comes to herbicide-resistant kochia, Charles Geddes doesn't mince words. He's clear and concise about the tremendous challenges Prairie farmers face with kochia populations, and about promising new research that's offering new tools and approaches to combat kochia.



A Research Scientist with Agriculture and Agri-Food Canada at Lethbridge, AB, Geddes is leading a Prairiewide, five-year collaborative and practical research project to look at various cultural practices to help, growers get ahead of

kochia. The project is funded through the WGRF-led Integrated Crop Agronomy Cluster.

"If you just use chemicals to manage herbicide-resistant kochia, it's not going to work well," says Geddes. "It's safe to assume that all kochia in Western Canada is resistant to Group 2 herbicides, the majority is now glyphosate resistant (Group 9), and a portion are also showing resistance to Group 4."

# The compounded trouble with kochia

Geddes knows we're long past simple herbicide solutions for kochia. The trouble lies largely in the very biology of the weed – almost as if it was designed by nature to spread. "It's a tumbleweed that's very efficient at dispersing its seeds among multiple fields and multiple farms within the same year," he says. "And as a long season plant, kochia continues to grow throughout the season as long as conditions are favourable."

Group 2 resistant kochia was first identified in Western Canada in the late 1980s. In 2011, the first glyphosateresistant kochia was identified in southern Alberta. In the last 10+ years, glyphosate resistance has reached more than 50% of the kochia populations tested across the Prairies. "And there is no silver bullet solution," says Geddes.

That's why he's leading a team of collaborators in Alberta, Saskatchewan and Manitoba in a series of research projects over the last four years – they're searching for new approaches to manage glyphosate-resistant kochia in a range of environments across the Prairies.

# Crop rotation disrupts kochia life cycle

The first part looked at diversifying the crops in a rotation to disrupt kochia's foothold. They added winter wheat in two of the four years of several rotations, and added an alfalfa crop for hay production into another rotation.

#### 66

We know that once weeds are resistant to multiple modes of action, we have to look at the biology of the plant to find control options. It makes weed management more complex than just spraying herbicides, and it's where integrated weed management truly is necessary.

- Dr. Charles Geddes, AAFC

The strategy with winter wheat is that it is well established in the spring when kochia is trying to emerge, so the crop is more competitive from the start. "Plus, winter wheat is harvested before kochia has begun producing viable seeds so we've reduced the opportunity for kochia seeds to be released at harvest and go back in the seed bank."

Adding a forage produced a similar result because again, harvest happened before kochia was producing seeds. Both approaches are showing promise.

"Changing spring wheat for winter wheat resulted in a decrease in kochia biomass by 64% and density by 74% in year three of the study," says Geddes. "Adding in a forage decreased kochia biomass by 89% and density by 99% in year three."

## Cultural tools create more competitive crops

They also looked at altering cultural practices to improve a crop's competitiveness against kochia including using



narrow or wide row spacing, and recommended seed rates or doubled rates. Doubling seeding rates in two of the four years of the rotation saw kochia biomass decreased by 64%. And narrower rows brought a benefit in all four years with a 56% reduction in kochia biomass.

"When we combined both factors – higher seeding rates in narrow rows – we saw an overall 80% decrease in kochia biomass. That's the same as the threshold of control required by herbicide regulators to designate that a herbicide controls kochia," says Geddes.

So, optimizing the plant spatial arrangement in a field – to boost the competitiveness of crops against kochia – brings a level of control similar to adding a new herbicide mode of action against kochia.

# Harvest timing helps weed management

The final part of the project looked at how harvest dates could impact kochia seed production. "Understanding the biology of kochia, we wanted to see if it makes sense to use a pre- or post-harvest herbicide, and if harvest date has an impact on that," says Geddes.

Kochia starts producing seeds in mid- to late-August. If you cut off kochia during crop harvest when plants are still vegetative (before flowering), the plants tend to regrow.

"If you harvest before kochia is producing seed (August or earlier), a post-harvest herbicide makes sense to prevent kochia from regrowing. But if you are harvesting in September or later, you don't need post-harvest control because when you cut down kochia that is producing seed, it tends to die off and not regrow," he says.

### **Realistic recommendations**

The project is wrapping up, and Geddes has identified some clear recommendations for growers.

- Kochia responds to competitive crops by reducing its biomass and seed production, so anything you can do to promote a competitive crop is a good option, including narrow rows and higher seeding rates.
- Harvest timing is important for kochia management. Earlier harvest can decapitate kochia before it produces viable seeds, but it's important to consider a post-harvest herbicide to control regrowth.

17