Update on U.S. Herbicide Resistance in Row Crops

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How quickly can you lose a herbicide?

Year 1
Herbicide Resistance: Not a New Occurrence

• Resistance is not unique to glyphosate, nor is it relatively new!

2,4-D resistance

wild carrot (*Daucus carota*)
1950’s in Canada

Atrazine resistance

common groundsel (*Senecio vulgaris*)
1968 in U.S.
Unique Cases of Herbicide Resistance
Corn Acreage (35.9 million ha)

89% Herbicide Resistant
Soybean Acreage (34.5 million ha)

94% Herbicide Resistant
Cotton Acreage (3.5 million ha)

89% Herbicide Resistant
The World’s Greatest Herbicide

Glyphosate-Resistant Horseweed (*Conzya canadensis*)

Following 2 glyphosate applications

2000
The rate of resistance spread continues to increase.

By 2020, almost all U.S. row crop acreage will be infested with glyphosate-resistant weeds (66.7 million ha)
Convenience and Simplicity

Drove broad-scale adoption of glyphosate-resistant crops
Simplicity Had A Cost

Roundup Ready Corn

Roundup Ready Soybean

Roundup Ready Cotton
Convenience had a price
Glyphosate-Resistant Palmer Amaranth –
A National Agricultural Issue

2005
Glyphosate-Resistant Palmer Amaranth – A National Agricultural Issue

29 states & counting
Glyphosate-Resistant Waterhemp – A National Agricultural Issue

16 states with glyphosate resistance
ALS (G2) resistance perpetuated glyphosate resistance (G9).

Glyphosate resistance (G9) perpetuated PPO resistance (G14).

**Herbicide Resistance Treadmill!!!**

**Multiple-Resistance (Stacked Resistance):** Resistance to two or more modes of action within an individual or population.

– Ex. Resistance to ALS (G2) and Glyphosate (G9)
## Stacked Resistance

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<th>ALS (G2)</th>
<th>Microtubule (G3)</th>
<th>PSII (G5)</th>
<th>EPSPS (G9)</th>
<th>PPO (G14)</th>
<th>HPPD (G27)</th>
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<tbody>
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Liberty is the only effective postemergence option available in soybean.

Stacked resistance is a game changer!

- Palmer amaranth
- Waterhemp
Is the Solution to Resistance in a Jug?
Farmer looks forward to next weed fighting tool

FARMER CITY — Kyle Kopp is getting that warm, fuzzy feeling again. It’s like the one he got 20 years ago, when Roundup Ready soybeans first came on the market.

Kopp is one of 19 farmers in the Midwest growing Monsanto’s newest product, Roundup Ready 2 Xtend soybeans, which are resistant to glyphosate and dicamba.

“When Roundup came out, it was fabulous. It took all that labor away,” Kopp said. “It also allowed us to expand acres. . . . That changed the face of farming.”

Kopp acknowledges such concerns. But, he believes farmers have become more aware of the danger of relying on a single mode of action to control weeds.

Meanwhile, he is looking forward to clean fields again.

“(glyphosate) Having a mixture of Roundup and dicamba going over a field of resistant waterhemp is the most wonderful thing,” he said. “It’s as wonderful as Roundup was when we started up with that in the mid-’90s.”
Moving Forward

• Growers are AWARE of the problem, but need more education on the concept

• Education of the Popular Press is essential for accurate reporting!

• Consistency in the message is needed

• Some have promoted a Perception that is not Reality
What is Reality?

• There is no simple solution on the horizon - the answer to resistance management is complex

• However, U.S. weed management practices have changed slowly and reactively over the past 15 years
Moving Resistance Management

Reactive

Proactive
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