Herbicide resistance update – northern region

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Take home message

- Widespread glyphosate resistance has been found in awnless barnyard grass (*Echinochloa colona*) (50% of populations), feathertop Rhodes grass (*Chloris virgata*) (99%), flaxleaf fleabane (*Conyza bonariensis*) (100%) and sweet summer grass (*Brachiaria eruciformis*) (58%)
- Paraquat and paraquat + diquat resistance has been identified, for the first time as part of this industry wide survey, in feathertop Rhodes grass (8% of populations) and flaxleaf fleabane (2%)
- 2,4-D resistance was identified in common sowthistle for the first time in the northern grains region.

Background

In 2020 and 2021, field surveys were conducted across Australian grain production regions, as part of a GRDC investment, to detect herbicide resistance in key weeds of grain production. In the northern region, the survey took place in both winter and summer crops at or near harvest time and in summer fallows. In the random survey, weed seeds were collected from surviving plants and screened for susceptibility/resistance to commonly used herbicides.

The collected seeds were germinated and/or transplanted, and then treated with each herbicide at the recommended upper label rate (Table 1). Populations were assessed for survival and classified as resistant (>19% survival), developing resistance (1 – 19% survival), or susceptible (0% survival). The majority of testing has been finalised with a small number of repeats underway to confirm resistance.

Results from this study provide important information to land managers and industry on the presence and distribution of herbicide resistance. This information helps to inform weed management decisions including which herbicides are still effective and which ones are at greatest risk for resistance development.

Results

Glyphosate resistance was identified as endemic in the summer grass weeds feathertop Rhodes grass (99% of populations), awnless barnyard grass (50%), sweet summer grass (58%) and 100% of flaxleaf fleabane populations (Table 1). These results are similar to the detected glyphosate resistance in these weeds in a 2016/17 survey with an increase in the proportion of resistant populations for both awnless barnyard grass and sweet summer grass.

For sowthistle, the 2016/17 survey identified widespread resistance in sowthistle to glyphosate. However, in this 2020/21 collection, no glyphosate resistance was detected. Further work is planned to compare populations from each study to further explain differences.

Paraquat resistance has been identified in a number of feathertop Rhodes grass populations, and for flaxleaf fleabane resistance to the mixture of paraquat + diquat has been found in two populations. Populations resistant to the Group 22 herbicides (paraquat and diquat) have previously been identified independently of the national survey. However, these are the first cases identified as part of this random survey.

For 2,4-D, 9% of sowthistle populations were identified as resistant and an additional 36% were identified as developing resistance. For flaxleaf fleabane, 2,4-D is still effective on all populations. The previous survey did not identify any 2,4-D resistance to either species.

Chlorsulfuron is no longer registered to control sowthistle; however, testing is undertaken to confirm resistance is still widespread. The high proportion of sowthistle populations with resistance to chlorsulfuron is consistent with previous survey results.

Haloxyfop was effective in controlling all summer grass populations with no resistance detected. In contrast, resistance to other Group 1 herbicides was identified in wild oats where 20% of populations were resistant to clodinafop and 7% resistant to pinoxaden. In addition, 3% of wild oat populations were resistant to flamprop-M-methyl.

Table 1. Percent (%) of weed populations from the northern grain region identified as resistant (>19% survivors) to a range of commonly used herbicides.

Weed	Herbicide	Resistant (%)
Feathertop Rhodes grass (*Chloris virgata*)	Glyphosate	99
	Paraquat	8
	Haloxyfop	0
Awnless barnyard grass (*Echinochloa colona*)	Glyphosate	50
	Paraquat	0
	Haloxyfop	0
	Clethodim	0
Sweet summer grass (*Brachiaria eruciformis*)	Glyphosate	58
	Haloxyfop	0
Flaxleaf fleabane (*Conyza bonariensis*)	Glyphosate	100
	Paraquat + diquat	2
	2,4-D	0
Common sowthistle* (*Sonchus oleraceus*)	Glyphosate	0
	Chlorsulfuron	68
	2,4-D	9
Wild oat* (*Avena* spp.)	Clodinafop	20
	Clethodim	0
	Pinoxaden	7
	Flamprop-M-methyl	3
	Mesosulfuron-methyl	0

* Queensland data only

Discussion

The 2020/21 resistance survey has identified Group 22 (paraquat/diquat) resistance in both feathertop Rhodes grass and flaxleaf fleabane. This is the first detection of these resistances as part of a random survey of grain production systems. The result is likely due to selection with paraquat and paraquat+diquat applied for the double knock control of glyphosate resistant feathertop Rhodes grass and flaxleaf fleabane, respectively. Growers need to be looking at other chemical and non-chemical tactics to use in place of Group 22 herbicides.

Group 1 herbicides are an effective alternative for the knockdown control of grasses. This group of herbicides remains an effective option for summer grass weeds, but they are at high risk of resistance selection. Therefore, any survivors of Group 1 herbicides need to be controlled to stop seed set. For wild oats, Group 1 resistance is becoming more common. Alternative options are required for wild oat control which may be best facilitated by changes in crop rotation. For example, moving to a summer crop for a few years and achieving knockdown control in a winter fallow to reduce seed set and the wild oat seed bank.

Resistance to 2,4-D has been identified in common sowthistle for the first time in the northern region as part of this survey. Previous cases have been identified in farming systems of southern Australia.

Glyphosate resistance continues to be the most common resistance in the northern grains region. For the summer grasses and flaxleaf fleabane, glyphosate will rarely provide control in isolation. Alternative chemical and non-chemical tactics will be required.

The survey for resistance has highlighted an increase in resistances across the northern grain region. It is important for industry to manage weed populations with a range of diverse control tactics to minimise the spread of resistance and to preserve important and effective herbicides.

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