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Arable Extra

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Have wild oats in Canterbury become resistant to herbicides?

Introduction

Wild oats are a problem weed for many New Zealand seed producers where the identification of wild oats during Seed Certification inspection leads to either rejection from the scheme e.g. tetraploid ryegrass crops, or a down-grading of the crop. Wild oats are also a problem in their own right where competition decreases grain yields in cereals (see FAR Cereal Update No. 74)

Overseas, wild oat (*Avena fatua*) is known to have developed resistance to fenoxaprop-P-ethyl and occasionally to haloxyfop and flamprop-M-isopropyl. Anecdotal reports of resistance existing in Canterbury led to a project aimed at determining if herbicide resistance does exist in New Zealand populations of wild oats.

Key points

- Resistance to both fenoxaprop-P-ethyl and haloxyfop has been found in one wild oat population in Canterbury.
- Resistance management strategies need to be developed to stop the problem increasing.
- Some wild oat infestations probably survive spraying due to insufficient crop competition or spraying plants too late in the development stage of the wild oat.

Materials and methods

- Seeds of wild oat were collected from eight arable farms between Lincoln and Waimate, where possible resistance had been reported.
- Seeds were also obtained from two properties where no resistance was thought to exist.
- Seeds from these populations were sent to Massey University where they underwent dormancy-breaking techniques (overnight in GA3 then 5°C for four days), and were then germinated at 20°C and established individually in pots within a glasshouse in October 2013.
- When seedlings were four weeks old (15 November 2013), they were sprayed with the recommended rate of fenoxaprop-P-ethyl (750 ml/ha as Foxtrot® + 1 L/ha Uptake Spray Oil), haloxyfop (500 ml/ha as Ignite™) or flamprop-M-isopropyl (4 L/ha as Stratos™).
- One treatment also involved germinating seeds of one population two weeks earlier than the others, thus they were sprayed as six-week-old seedlings with fenoxaprop-P-ethyl (Fig 1).
- Plants were kept in a glasshouse and irrigated regularly; the maximum and minimum daily temperatures in the two weeks following application averaged 24.2°C and 16.0°C respectively.
- All populations had untreated controls. Fresh weights of all above-ground parts of plants were measured five weeks after treatment, then calculated as percentage of untreated plant weight.
- A separate randomised block design with six replicates was used for each herbicide, and an analysis of variance detected significant differences in fresh weight data between populations.

Figure 1. Size of 4-week-old plants (purple tags) and 6-week-old plants (orange tags) at time of spraying.

Results and discussion

- One of the 14 populations was poorly controlled by all three herbicides, suggesting it has developed resistance (Figs 2 and 3).
- The remaining populations were adequately controlled by fenoxaprop-P-ethyl and haloxyfop when treated at four weeks of age.
- However, seedlings of one of these susceptible populations (Pop K) were poorly controlled by fenoxaprop-P-ethyl when treated as six-week-old seedlings, showing the importance of applying this herbicide early, while seedlings are still susceptible (Figs 2 and 4).
- None of the populations were controlled well by flamprop-M-isopropyl. This was because insufficient competition was exerted on the seedlings following application, (as recommended to make this herbicide work well) and so the application rate was too low to compensate. Variability in tolerance did exist however (Fig 2c) within the populations tested. The testing methods for flamprop-M-isopropyl require further validation.
- Fenoxaprop-P-ethyl and haloxyfop both belong to the ACCase inhibitor family of herbicides (commonly referred to as 'fops and dims'), thus cross resistance is not surprising. Wild oats with resistance to ACCase inhibitors should be controlled by chemistry with a different mode of action assuming resistance has not already developed e.g. ALS inhibitors.

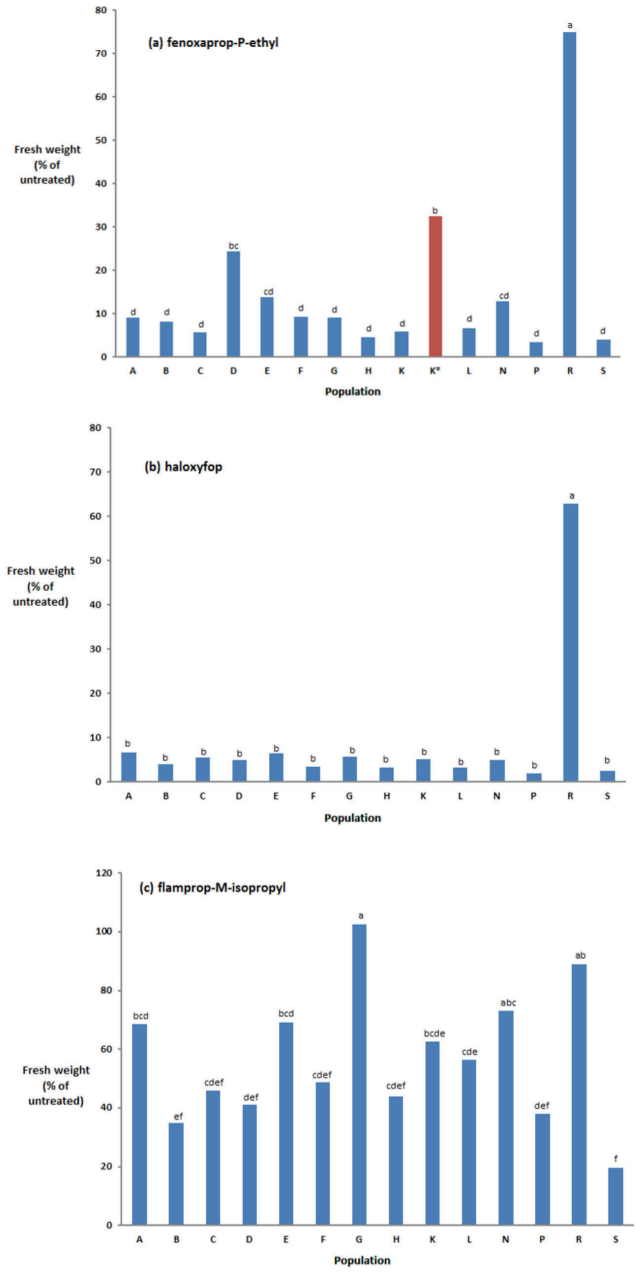

Figure 2. The effect on fresh weight of wild oat plants (expressed as percentage of untreated control) from 14 different Canterbury populations (A to S) 5 weeks after treatment with (a) fenoxaprop-P-ethyl, (b) haloxyfop or (c) flamprop-M-isopropyl applied to 4-week-old seedlings (red bar (K*) was to 6-week-old plants).

(a) fenoxaprop-P-ethyl

(b) haloxyfop

Figure 3. Wild oat plants from Population R (left) and Population C (right) 5 weeks after being treated with (a) fenoxaprop-P-ethyl or (b) haloxyfop.

Figure 4. Population K wild oat plants 5 weeks after being treated with fenoxaprop-P-ethyl as 4-week-old plants (on the right) or 6-week-old plants (left).

Conclusions

- Resistance to both fenoxaprop-P-ethyl and haloxyfop has been found in one wild oat population in Canterbury, so resistance management strategies need to be developed and used to stop the problem increasing.
- Some wild oat infestations probably survive spraying due to insufficient crop competition or spraying plants too late in the development stage of the wild oat.

Trade names

The New Zealand Novachem Agrichemical Manual (on-line version) lists the following products as containing the active ingredients referred to in this Update. Despite containing the same active ingredient, some of these products contain different safeners, which may impact on efficacy.

fenoxaprop-P-ethyl	haloxyfop		flamprop-M-isopropyl
Coronet®	AGPRO Haloxyfop 520	Hurricane®	Crusader™
Foxtrot®	Crest™ 520	Ignite™	Stratos™
Panther S	Fopp 100	Scorp® EC	
Puma® S	Gallant™ Ultra	Valiant® 520	

Acknowledgments

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