The performance of AXIAL® in the control of aryloxyphenoxy propionate resistant wild oats (*Avena* spp.) in wheat and barley

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Summary The widespread use of the Group A, acetyl-CoA-carboxylase (ACCase) inhibitor herbicides for the selective control of wild oats (*Avena* spp.) in cereals has resulted in an observed decrease in performance of the ACCase inhibitors, with resistance first identified in Australia in 1985. In particular, the aryloxyphenoxy propionate (AOPP) or 'fop' herbicides, diclofop-methyl (Hoegrass™) and more recently fenoxaprop (Wildcat™) and clodinafop (Topik®), have sometimes failed to provide acceptable levels of wild oat control.

In 2006 Syngenta Crop Protection released Axial® (100 g L^{-1} pinoxaden), a Group A cereal selective post-emergent graminicide. Pinoxaden, 8-(2,6-diethyl-4-methylphenyl)-1,2,4,5-tetrahydro-7-oxo-7*H*-pyrazolo[1,2-*d*][1,4,5]oxadiazepin-9-yl-2,2-dimethylpropanoate, represents a unique new phenylpyrazolin or 'den' class of herbicides. Recent screening of confirmed ACCase herbicide resistant wild oat biotypes has demonstrated that Axial is likely to be the most effective cereal selective graminicide for the control of AOPP herbicide resistant biotypes.

A random seed collection survey of wild oat populations across the West Australian wheatbelt was conducted in 2005 to identify the frequency and distribution of wild oat resistance to the ACCase inhibitor herbicides (Owen and Powles 2007). This survey of 150 populations found only 23% of populations to be fully susceptible to diclofop, 88% susceptible to tralkoxydim, whilst 97% of populations were susceptible to Axial.

In autumn 2007 a similar outdoor pot-study was conducted examining the performance of Axial on 25 wild oat populations previously confirmed as resistant to AOPP herbicides (Boutsalis unpublished 2007). Samples were sourced from SA, VIC, WA, NSW and QLD and were derived from seed samples that had been sent in for resistance testing from 2004–2006. The results of this study demonstrated that percentage plant survival to fenoxaprop was generally higher than for clodinafop, with both herbicides generally providing less control on wild oats than Axial. In this study, 32% of the AOPP resistant biotypes tested exhibited some degree of cross resistance to Axial, although surviving plants were heavily damaged and generally recovered only through the production of new tillers. In contrast, wild oat plants surviving treatment with clodinafop or fenoxaprop tended to show only slight symptoms of herbicide damage.

A subsequent study conducted in winter 2007 examined the frequency of ACCase resistance in 96 wild oat populations collected from a 2006 random survey of north-central and north-eastern Victoria (Boutsalis unpublished 2007). Resistance screening in pots found 8% of samples to be resistant to diclofop but expression of resistance in surviving plants ranged from no growth effects to strong suppression. Screening of the same 96 biotypes showed only 2% of wild oat populations to be resistant to Axial.

Recent surveys have confirmed herbicide resistance to be a major factor in declining field performance of the AOPP herbicides for the control of wild oats. Although resistance to the cyclohexanedione (CHD) or 'dim' herbicides and phenylpyrazolin or 'den' herbicides has been identified, these herbicides still remain an option for the control of wild oats in many cereal cropping areas. It is important to note that variability in wild oat control by different group A herbicides may be related to specific resistance mechanism/s of the target population.

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REFERENCES

Owen, M. and Powles, S.B. (2007). Frequency of herbicide resistance in wild oat (*Avena fatua*) across the Western Australian wheatbelt. Proceedings of the 2007 Agribusiness Crop Updates, ed. A. Douglas, pp. 31-4. (Department of Agriculture and Food, Western Australia).