

Herbicide Resistance Screening of Wild Oat (*Avena fatua* L.) Collected from Small Grain Production Systems

Sushmita Sharma Koirala, Chandra Montgomery, Traci Rauch, Joan Campbell, Albert Adjesiwor
Department of Plant Sciences, University of Idaho

INTRODUCTION

Wild oat (*Avena fatua*) is one of the most problematic weeds in small grains (Figure 1). Widespread herbicide resistance in wild oat threatens small grain production (Sharpe et al., 2024). Understanding herbicide resistance distribution is critical for effective management strategies.

Objective

Estimate wild oat survival frequency to pre- and post-emergence herbicides commonly used in small grains production systems.

Hypothesis: Wild oat populations will survive commonly used pre- and post-emergence herbicides.

Figure 1. Severe wild oat infestation in a spring wheat field in Idaho.



METHODOLOGY

Wild oat collection (88 fields) (Figure 2)

Seed cleaned and soaked in 2% KNO₃

Grown in the greenhouse (Figure 2)

Two pre- and 8 post-emergence (Table 1)

herbicides, completely randomized, 4 replicates

Pre-emergence: ethalfluralin (1120 g/ha), triallate (560 g/ha)

Table 1. Rates of the 8 post-emergence herbicides. Herbicides were sprayed at the 3-leaf stage of wild oat

quizalofop-p-ethyl (92 g/ha)	fenoxaprop-ethyl (92 g/ha)	pinoxaden (60 g/ha)	clethodim (280 g/ha)
fluroxypyr + pyroxsulam (114 g/ha)	mesosulfuron-methyl (15 g/ha)	imazamox (26 g/ha)	glyphosate (1262 g/ha)

Herbicides applied with Generation 4 Research Track Sprayer (DeVries Manufacturing, MN), calibrated to deliver 187 L per ha⁻¹.

Data Collection and analysis: Visual injury was assessed on a 0–100% scale 14 and 28 days after herbicide application, where 0% = no visible injury and 100% = complete plant death. Survival frequencies were calculated in the R statistical language v 4.4.2.



Figure 2. Wild oat sampling in the field (A) and greenhouse experiments at the University of Idaho, Kimberly (B)

RESULTS AND DISCUSSION

Table 2. Percent survival frequency of wild oat populations after application of herbicides at labeled field rates. n = 88

Herbicide	% survival
ethalfluralin	9.1
triallate	14.8
fluroxypyr + pyroxsulam	100
imazamox	44.3
mesosulfuron-methyl	59.1
quizalofop p-ethyl	72.7
fenoxaprop-p-ethyl	56.8
pinoxaden	55.7
clethodim	0
glyphosate	0

High survival was observed for Acetyl-CoA carboxylase (ACCase) and acetolactate synthase (ALS) inhibiting herbicides (Table 2)

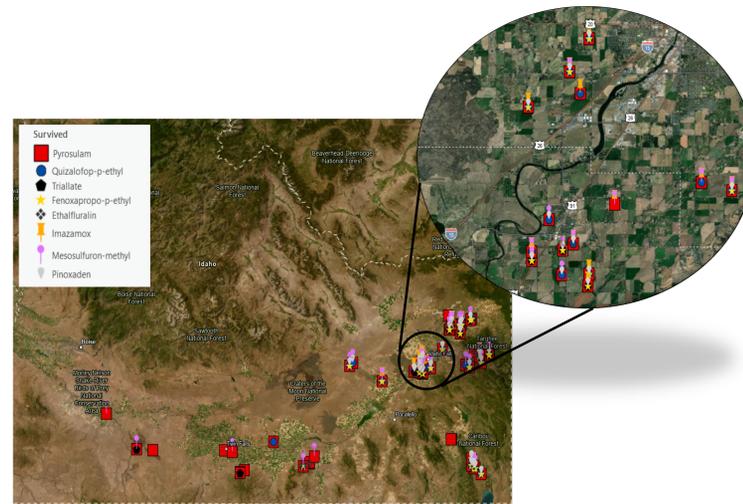


Figure 3. Distribution of surviving wild oat populations across Idaho

- Lower survival to soil-applied herbicides suggests these pre-emergence options may still provide partial control (Table 2).
- High survival frequencies to multiple ALS inhibitors (pyroxsulam, mesosulfuron-methyl, and imazamox) and ACCase (fenoxaprop, pinoxaden, and quizalofop) likely due to repeated use of these herbicide in small grain production systems of Idaho.
- The 0% survival to clethodim shows that there was no cross-resistance between other ACCase herbicides and clethodim.
- Wild oat collected from Bonneville and Madison Counties showed the highest survival frequencies (Figure 3).

CONCLUSION

Reduced efficacy of several post and pre-emergence herbicides highlights the impact of repeated selection pressure in small grain systems. There is the need for diversified weed control programs.

FUTURE RESEARCH

- Dose–response analysis to characterize the level of resistance in the wild oat populations.
- The cost of managing herbicide-resistant wild oat in small grains.



References
Sharpe, S. M., Tidemann, B. D., & Geddes, C. M. (2024). Wild oat (*Avena fatua*): Crop mimicry and herbicide resistance. *Plant Health*

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