Herbicide Programs for Pre-plant Weed Control in Wheat and Barley

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Background and objectives

No-till dryland wheat and barley growers in Idaho are becoming increasingly reliant on glyphosate for pre-plant and post-harvest weed control. The repeated use of glyphosate as the main weed management tool could result in widespread glyphosate-resistant weed populations[1]. To protect the value of glyphosate in wheat and barley production systems, it is important to identify effective alternative herbicides and mixtures for weed control.

Objective:
Assess the efficacy and safety of pre-plant burndown herbicides and mixtures on wheat and barley.

Methodology

- **Study locations:** University of Idaho Kimberly Research and Extension Center, Kimberly, ID & Aberdeen Research and Extension Center, Aberdeen, ID.
- **Study design**: There were 18 treatments (Figure 1 and Table 1) arranged in randomized complete block, with four replications.
- **Plot size:** 3 by 9.1 m.
- **Herbicide application***:* CO_2-pressurized bicycle sprayer, 115 L/ha at 207 kPa with TeeJet 11002DG nozzles.
- **Planting:** Winter wheat ("Brundage") and winter barley ("Charles") were planted at 112 kg/ha in September/October 2021, within 21 to 28 days after herbicide application.
- **Data collection**: Weed control (by each weed species) was visually assessed within, 7 to 21 days after treatment on a scale of 0 to 100%, where 0% = no control and 100% = complete control.
- **Data analysis:** Linear mixed-effects ANOVA in R Software[2,3]. Herbicide treatments considered fixed, location, crop and block considered random. Mean separation was conducted using Tukey's HSD at alpha = 0.05

Table 1. Herbicides and rates used in the study

Herbicide[1]	Rate used (g ai or ae ha^{-1})	Product name
bromoxynil	420	Maestro 2 EC
carfentrazone-ethyl	35	Aim EC
glufosinate-ammonium	594	Liberty 280 SL
glyphosate	870 & 1260	Roundup PowerMax
paraquat	560	Gramoxone SL 2.0
pyraflufen-ethyl	3.64	Vida
saflufenacil	50	Sharpen
tiafenacil	49.6	Reviton
topramezone	24.5	Impact

[1]Label recommended adjuvants were added to each herbicide treatment

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References

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[2]R Core Team (2021). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R-project.org
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Results and discussion

- Nearly all herbicide treatments (except topramezone applied alone) provided good control of common lambsquarters, kochia, redroot pigweed, and hairy nightshade (Figure 1).
- Grassy weed (barnyardgrass and green foxtail) varied among treatments, but majority of the treatments provided good grassy weed control (Figure 1).
- Tiafenacil and topramezone applied alone provided less than 80% control of barnyardgrass and green foxtail.
- Tiafenacil and topramezone may need to be tankmixed with other herbicides to provide good grassy weed control.
- Bromoxynil improved topramezone efficacy on grassy weeds, suggesting a possible synergistic interaction (Figure 1)
- No visible herbicide injury was observed at the time of crop emergence at any of the study sites.
- Crop injury will be visually assessed in the spring of 2022 and biomass will be collected to assess phytotoxicity.
- Economic analysis of the herbicide programs will also be conducted.

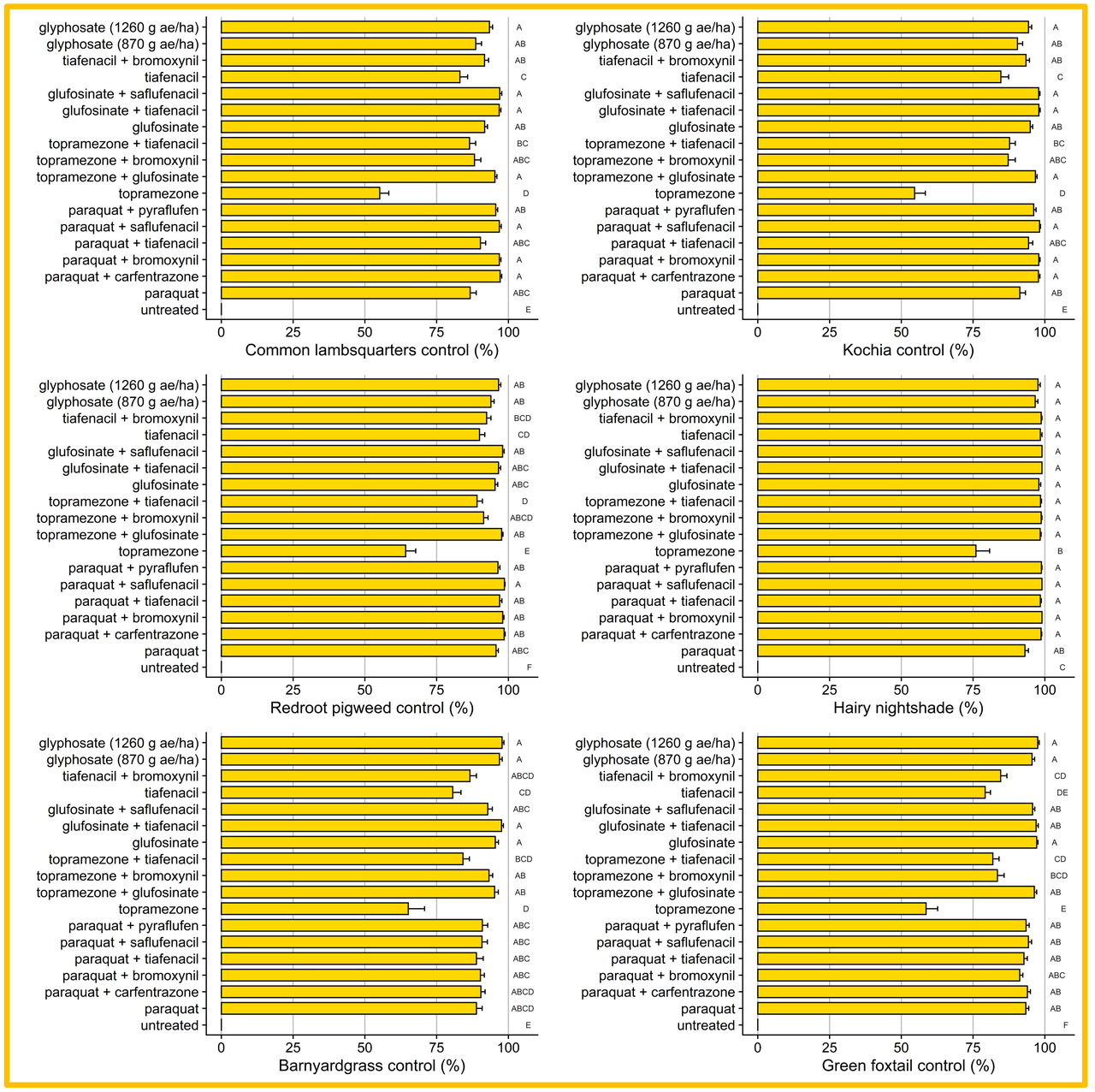

Figure 1. The efficacy of herbicide programs on broadleaf and grassy weeds at Kimberly and Aberdeen study sites. For each weed species, bars followed by the same letters are not statistically different according to Tukey's HSD at the 0.05 probability level