

ANNUAL REPORT

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Title: Pre-plant burndown herbicide efficacy and wheat crop safety

Personnel:

Albert Adjesiwor, University of Idaho

Jared Spackman, University of Idaho

Joan Campbell, University of Idaho

Address: Albert Adjesiwor; Kimberly Research & Extension Center; 3806 N 3600 E; Kimberly, ID 83341; Office: 208-423-6616; Email: aadjesiwor@uidaho.edu

Abstract: Herbicide-resistant weed populations are evolving rapidly and threatening the sustainability of crop production in Idaho. Field studies were established in 2021 and 2022 at two locations (the University of Idaho Kimberly Research and Extension Center, Aberdeen Research and Extension Center) to 1) assess the efficacy and crop safety of different herbicides and mixtures compared to glyphosate, and 2) evaluate the economics of using alternative pre-plant burndown herbicides and mixtures on wheat. Treatments comprised of a weedy check, *glyphosate* (Roundup PowerMax), and various mixtures of *bromoxynil* (Maestro), *carfentrazone* (Aim EC), *clethodim* (Select Max), *dicamba* (Clarity), *glufosinate* (Liberty 280), *paraquat* (Gramoxone), *pyraflufen* (Vida), *tiafenacil* (Reviton), and *topramezone* (Impact). Winter wheat was planted within 4 weeks after herbicide applications to assess any potential phytotoxicity from these herbicides. When averaged across locations, control of broadleaf weeds (common lambsquarters, kochia, and redroot pigweed), was 80% or better in most herbicide treatments except Impact applied alone. Similarly, grassy weed (barnyardgrass, green foxtail) control exceeded 80% in most herbicide treatments except Impact applied alone and Select + Clarity. No significant crop injury has been observed from the herbicide treatments and wheat yield was not affected by treatments. The estimated cost of the glyphosate treatment was \$11.17/acre and \$16.25/acre for the 22 oz/acre and 32/acre, respectively. The estimated cost of the alternative herbicide programs ranged from \$6.8/acre to 26.1/acre. The cost for most of the alternative effective herbicide programs was similar to the high rate of glyphosate, indicating that there are effective and economical alternative herbicides to glyphosate for pre-plant burndown in wheat.

Background: No-till dryland wheat 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. To protect the value of glyphosate in wheat production systems, it is important to identify effective alternative herbicides and mixtures for weed control.

Objectives: The objectives of this study were to

1. Assess the efficacy and safety of pre-plant burndown herbicides and mixtures on wheat
2. Economics of using alternative pre-plant burndown herbicides and mixtures on wheat

Results

Objective #1: efficacy and safety of pre-plant burndown herbicides and mixtures

When averaged between the two sites, nearly all herbicide treatments (except Impact applied alone) provided good control of common lambsquarters, kochia, and redroot pigweed in 2021 (Figures 1 & 2). Grassy weed (barnyardgrass and green foxtail) varied among treatments, but the majority of the treatments provided good grassy weed control (Figures 1 & 2). Impact and Reviton applied alone tended to provide less than 80% control of barnyardgrass and green foxtail. These herbicides may need to be tankmixed with other herbicides to provide good grassy weed control. The trend for weed control in 2022 was similar to what was observed in 2021, where a majority of the herbicide treatments provided good broadleaf and grassy weed control (Figures 4 & 5). Select + Clarity was included in the 2022 trial and we observed that this treatment generally provided less than 70% control of broadleaf and grassy weeds (Figures 4 & 5). In 2022, relatively poor weed control from Liberty, Roundup PowerMax, Clarity, and Select at the Aberdeen site (Figure 5) was possibly due to cool temperatures following herbicide application.

Although wheat yield varied across treatments, there were no statistical differences in wheat yield at both research sites. In addition, no visible signs of herbicide injury were observed. This is an indication that the herbicides evaluated were safe to be used for pre-plant weed control in wheat production systems.

Objective #2: Economics of using alternative pre-plant burndown herbicides and mixtures.

The estimated cost of the glyphosate treatment was \$11.17/acre and \$16.25/acre for the 22 oz/acre and 32/acre, respectively. The estimated cost of the alternative herbicide programs ranged from \$6.8/acre to 26.1/acre. This shows that although glyphosate (Roundup PowerMax) remains one of the cheapest options for broad-spectrum weed control, the cost for most of the alternative effective herbicide programs was similar to the high rate of glyphosate, indicating that there are effective and economical alternative herbicides to glyphosate for pre-plant burndown in wheat.

Projections: This is being replicated in spring 2023 at Moscow, ID to target Italian ryegrass and other weeds common in northern Idaho. This report will be updated with results from northern Idaho and results will be made available to the Idaho Wheat Commission and Idaho wheat growers. Results from this study will be presented at the 2023 Weed Tour at Kimberly and the 2023 Western Society of Weed Science Conference. An extension publication will be developed from the results.

Publication/ Outreach: This study was showcased at the 2022 Kimberly Field Day and results were presented at the 2022 Western Society of Weed Science Conference.

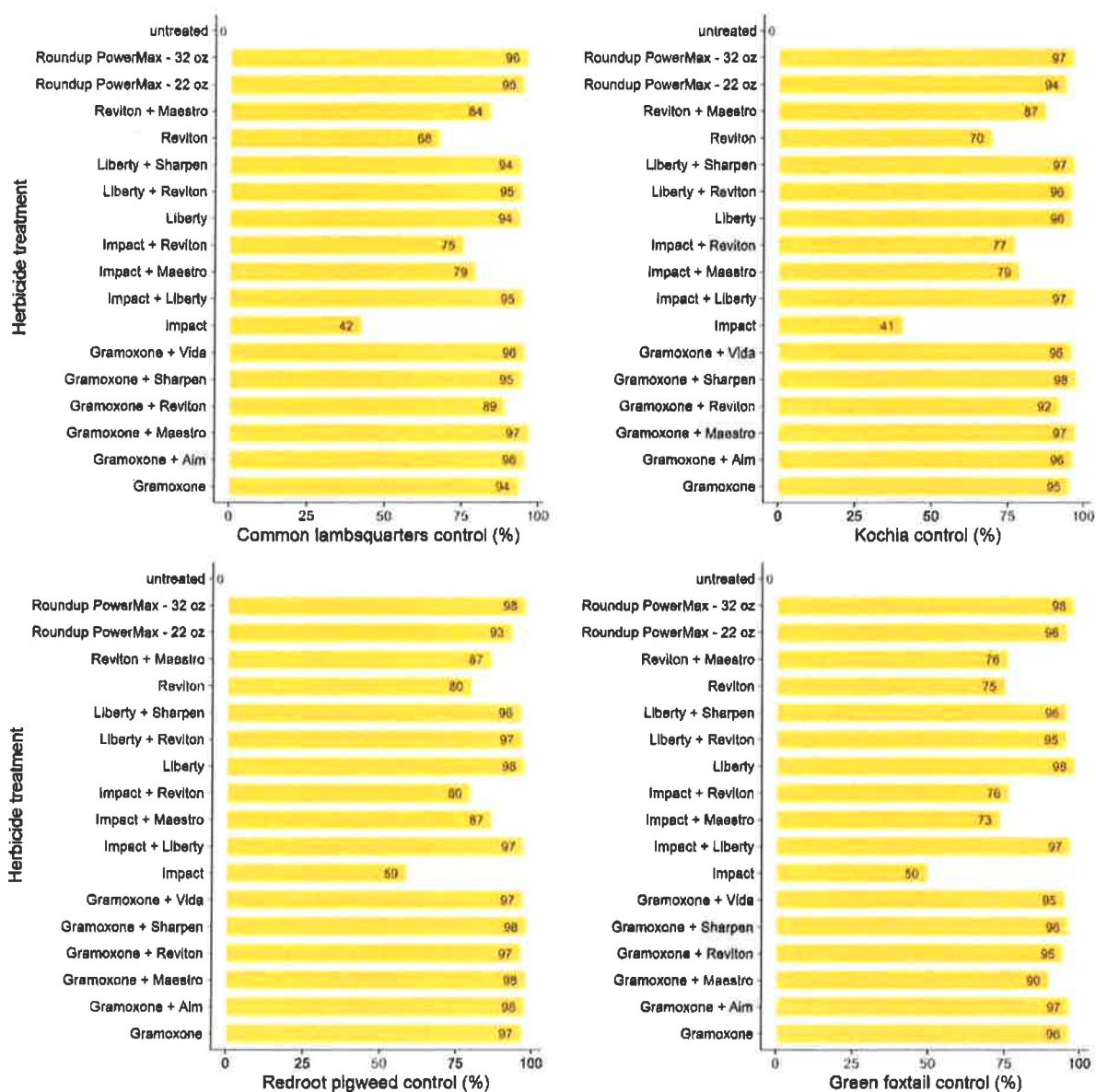


Figure 1. The efficacy of herbicide programs on broadleaf and grassy weeds at Kimberly, ID in 2021. Herbicide rates are provided in Table 1.

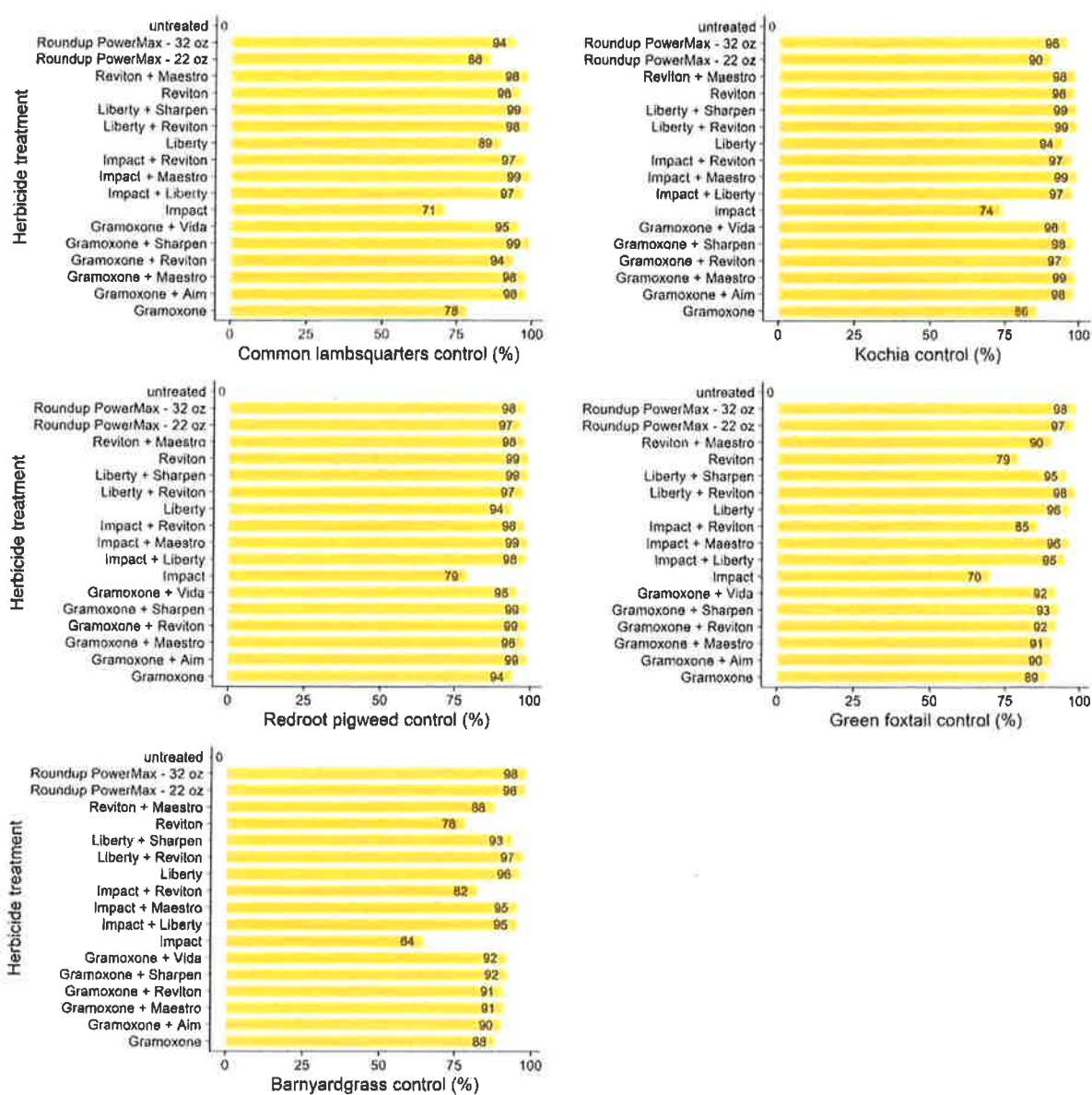


Figure 2. The efficacy of herbicide programs on broadleaf and grassy weeds at Aberdeen, ID in 2021. Herbicide rates are provided in Table 1.

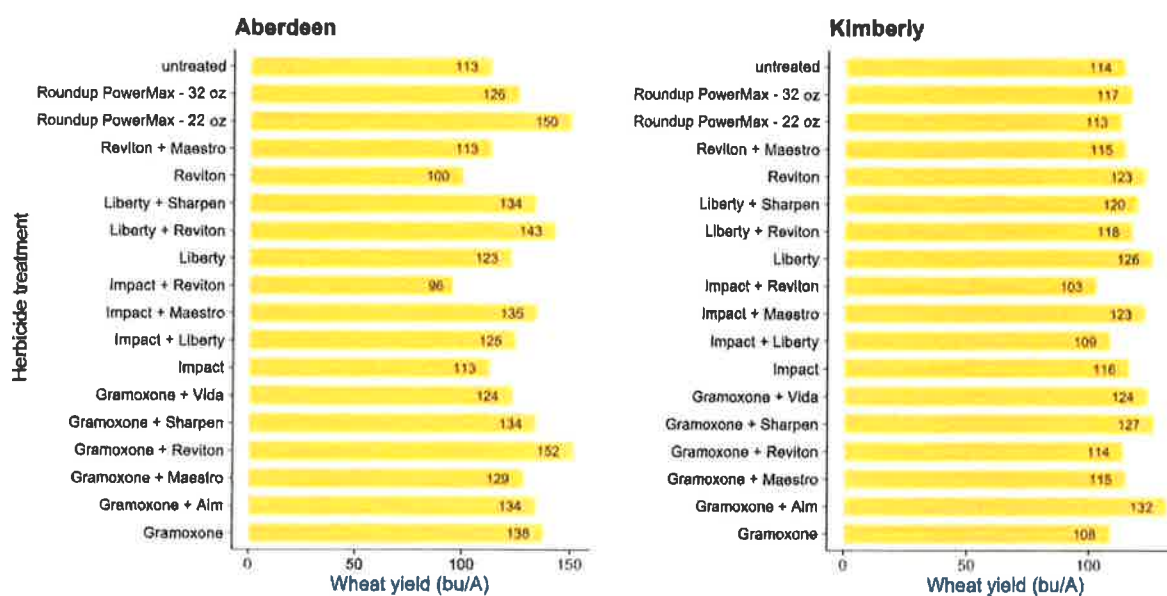


Figure 3. Wheat yield as influenced by pre-plant burndown herbicides in Aberdeen and Kimberly in 2022. Herbicide rates are provided in Table 1.

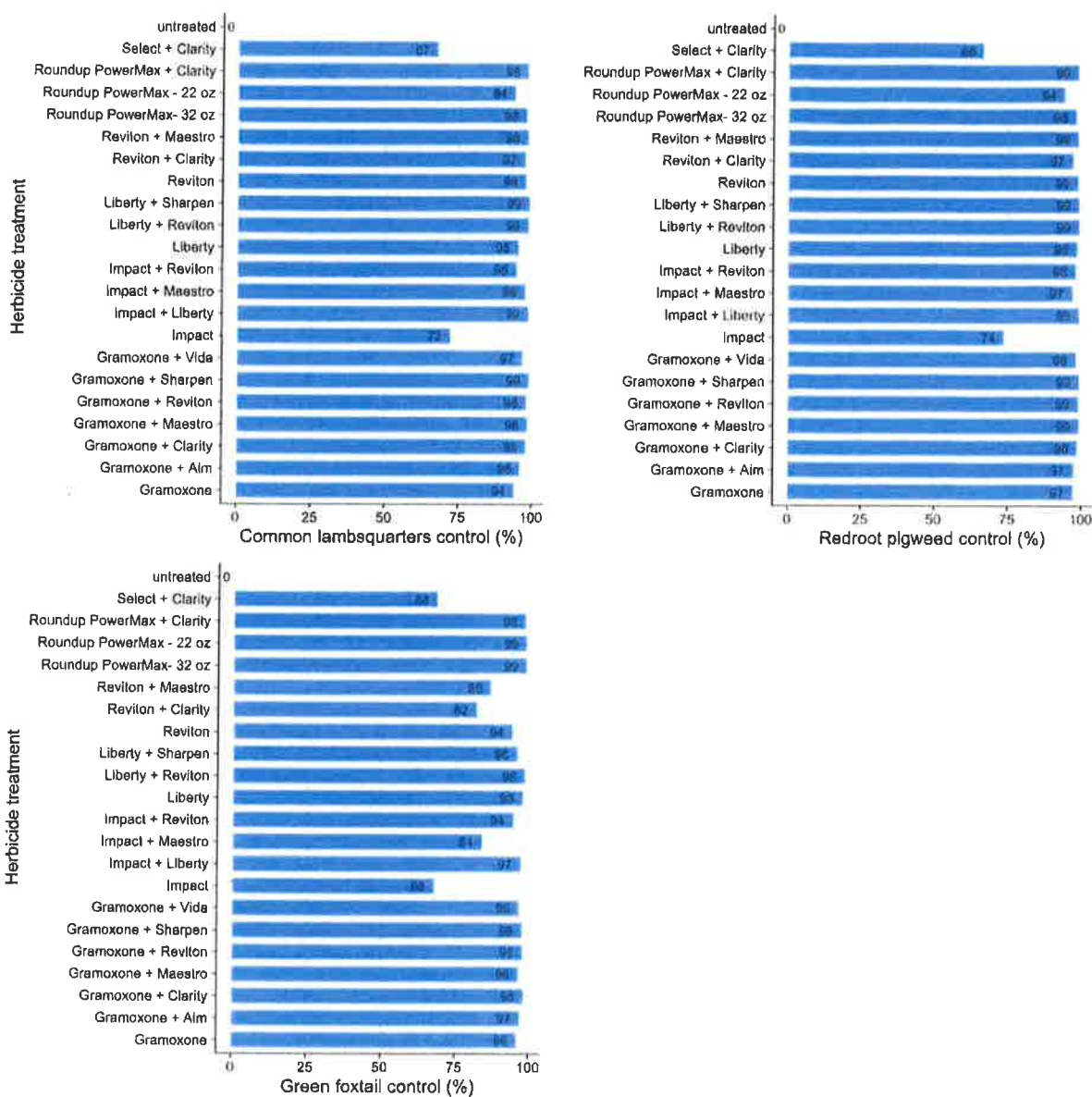


Figure 4. The efficacy of herbicide programs on broadleaf and grassy weeds at Kimberly, ID in 2022. Herbicide rates are provided in Table 1.

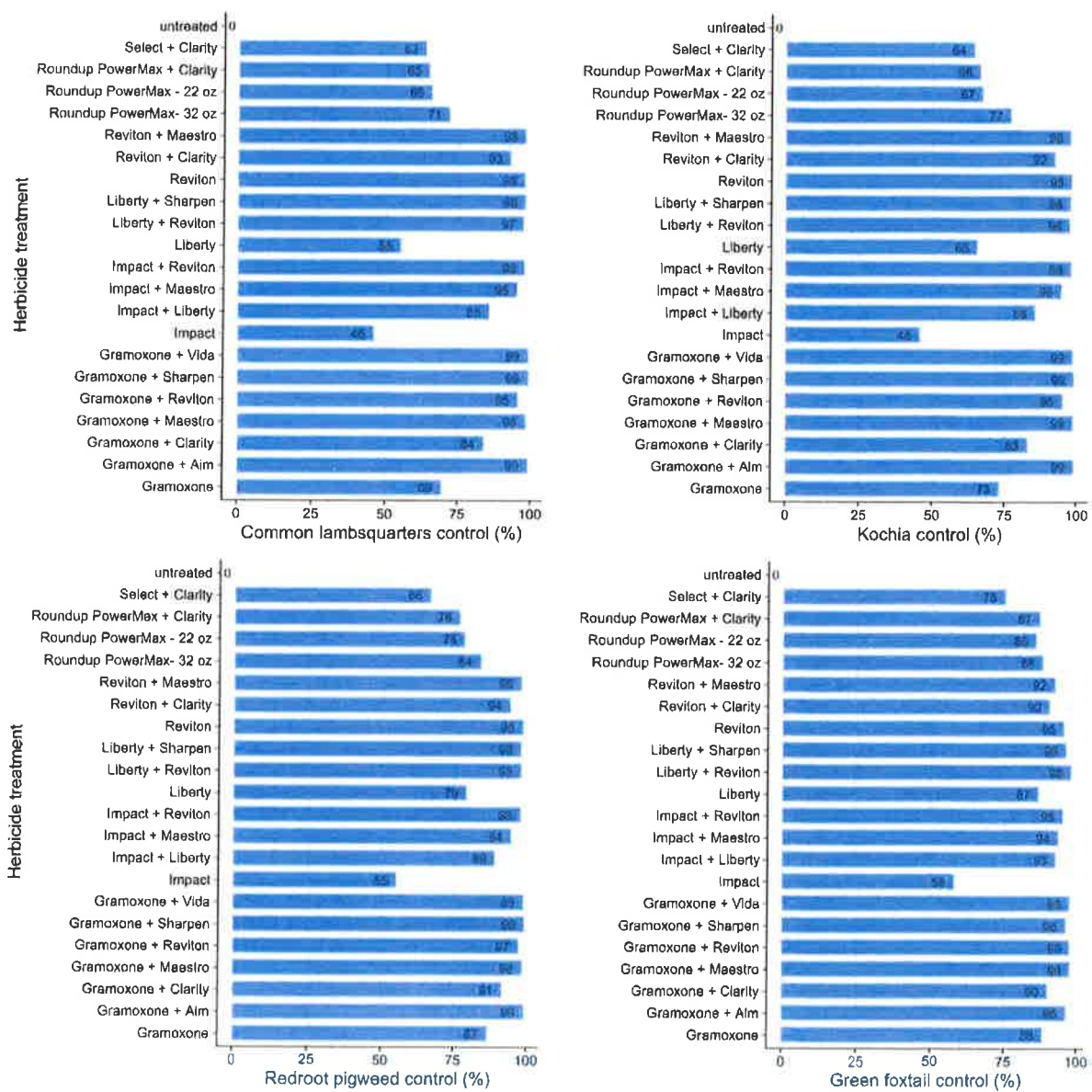


Figure 5. The efficacy of herbicide programs on broadleaf and grassy weeds at Aberdeen, ID in 2022. Herbicide rates are provided in Table 1.

Table 1. The estimated cost of herbicide programs

Herbicide	Rate used (oz/acre)	Unit price (\$)	Cost (\$/acre)
Impact	1	15/oz	15
Impact	1	15/oz	26.1
Reviton	2	5.55/oz	
Gramoxone	32	27/gal	6.8
Reviton	2	5.55/oz	11.1
Liberty 280	29	53/gal	12
Gramoxone	32	27/gal	19.5
Aim	2	6.35/oz	
Gramoxone	32	27/gal	24.3
Sharpen	2	6.15/oz	
Gramoxone	32	27/gal	15.8
Vida	2	4.52/oz	
Gramoxone	32	27/gal	17.9
Reviton	2	5.55/oz	
Gramoxone	32	27/gal	16.5
Maestro 2EC	24	52/gal	
Reviton	2	5.55/oz	20.9
Maestro 2EC	24	52/gal	
Liberty 280	29	53/gal	24.3
Sharpen	2	6.15/oz	
Liberty 280	29	53/gal	23.1
Reviton	2	5.55/oz	
Impact	1	15/oz	27
Liberty 280	29	53/gal	
Impact	1	15/oz	24.8
Maestro 2EC	24	52/gal	
Gramoxone	32	27/gal	13
Clarity	8	99/gal	
Reviton	2	5.55/oz	17.3
Clarity	8	99/gal	
Select Max	16	130/gal	22.45
Clarity	8	99/gal	
Roundup PowerMax	22	65/gal	17.37
Clarity	8	99/gal	
Roundup PowerMax	22	65/gal	11.17
Roundup PowerMax	32	65/gal	16.25