

Termination Strategies for Winter Rye and Overwintering Annual Ryegrass with Glyphosate

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Abstract

Midwest corn and soybean producers have an increasing interest in an annual ryegrass and winter rye cover crops in the North Central region due to the benefits of reducing soil erosion, scavenging nutrients, and increasing soil organic matter. Annual ryegrass may or may not survive winter in the Upper North Central region depending upon variety and winter conditions like temperature and the duration of snow cover. This study was conducted to compare glyphosate application rates for winter rye and annual ryegrass at three different timings. Annual ryegrass and winter rye plots were established at Arlington Agricultural Research Station, Arlington, WI on September 9, 2013. The winter rye variety was 'Guardian'. The annual ryegrass varieties included 'Bruiser', 'King', and 'Gulf'. In the spring of 2014, herbicides were applied at three different timings each with four different glyphosate rates. Timings included early- May, mid-May, and early-June. Glyphosate rates include 0, 0.62, 1.26, 2.52, and 5.04 kg ae ha⁻¹. Treatments were replicated four times. Fourteen days after application, the cover crop termination was assessed by collecting digital images which were analyzed for percent green cover by SigmaScan[®] Pro software utilizing the Turf Analysis 1-2 Macro and additionally by harvesting biomass from a 0.25m² quadrat and comparing the production of dry biomass. Percent green cover of annual ryegrass and winter rye decreased (P<0.0001) for all cover crops at all rates at 14 days after application. Annual ryegrass and winter rye dry biomass weight was significantly decreased (P<0.0001) at the 0.62 kg ae ha⁻¹ glyphosate rate for early May and June applications. More research will be needed to establish best management practices for farmers interested in the use of glyphosate as a primary termination method.

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Introduction

Midwest corn and soybean producers have increasing interest in annual ryegrass and winter rye cover crops in the North Central region due to the benefits of reducing soil erosion, scavenging nutrients, and increasing soil organic matter. Annual ryegrass may or may not survive winter in the Upper North Central region depending on variety and winter conditions like temperature and the duration of snow cover.

Objective

This study was conducted to compare glyphosate application rates for winter rye and annual ryegrass at three different timings.

Materials and Methods

- Annual ryegrass and winter rye plots were planted at Arlington Agricultural Research Station, Arlington, WI on September 8, 2013. Varieties include annual ryegrasses 'Bruiser,' 'Gulf,' and 'King' and 'Guardian' winter rye.
- Plot size was 2.3 m wide by 13.3 m long, and treatments were replicated four times.

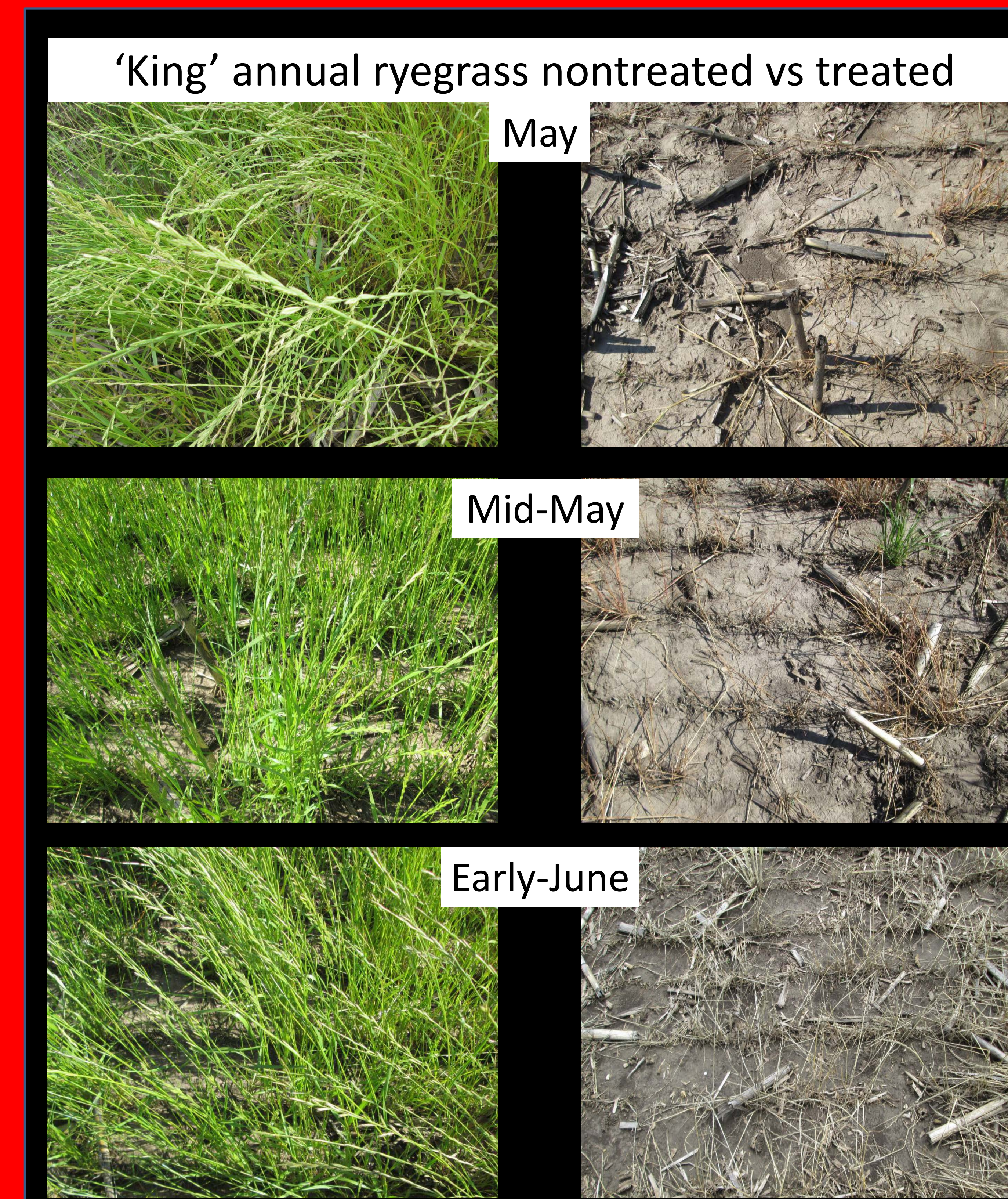
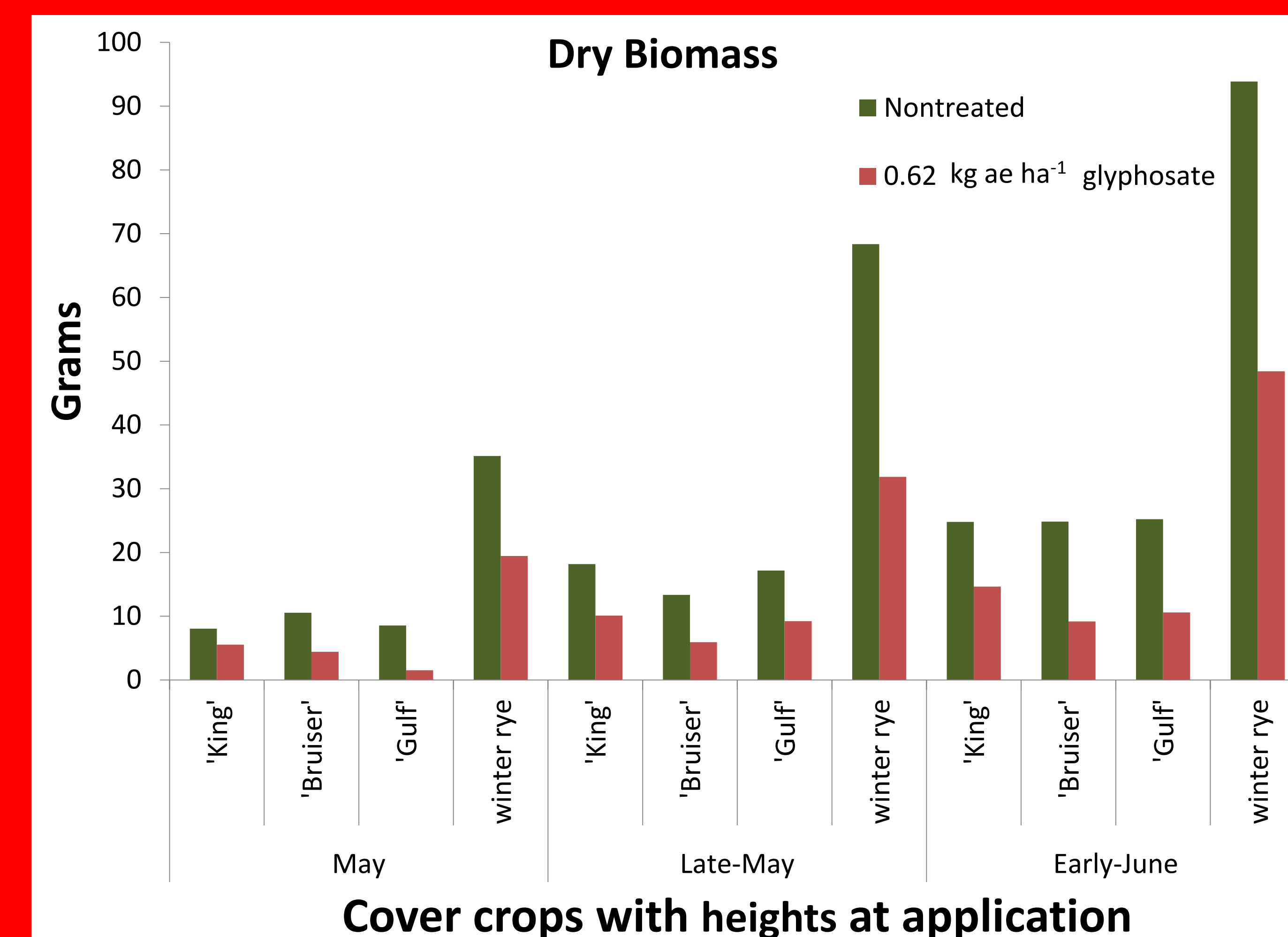
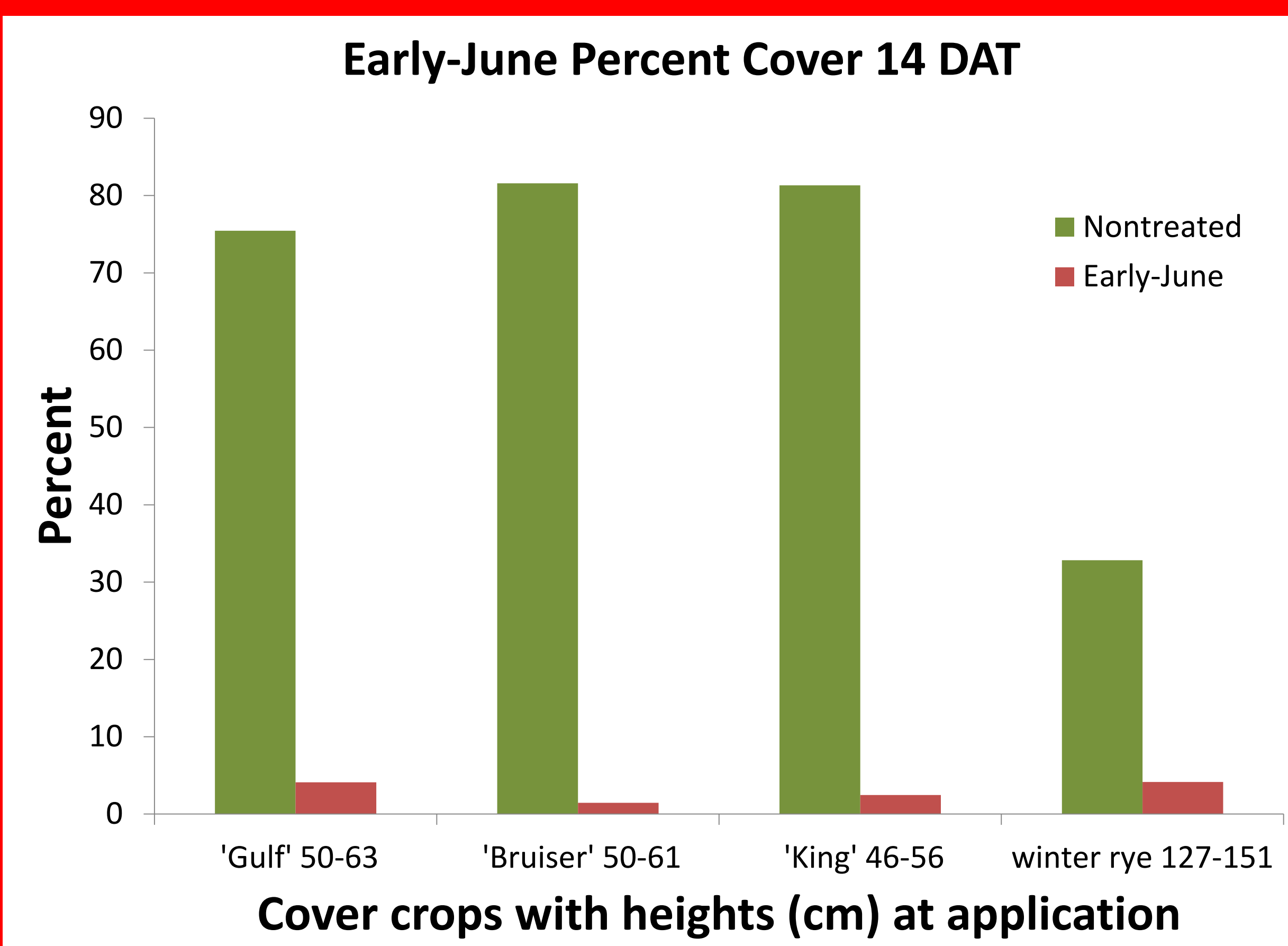
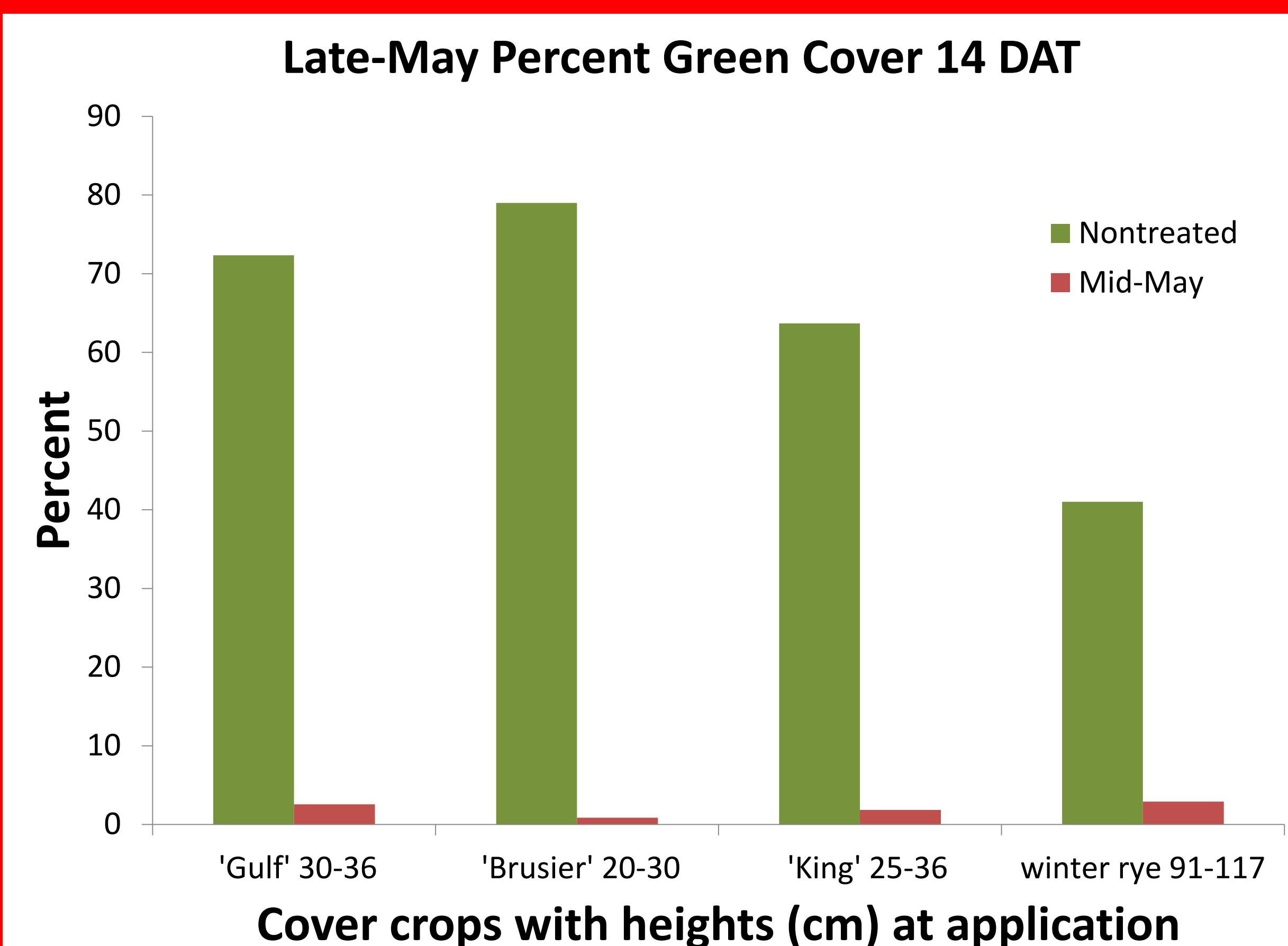
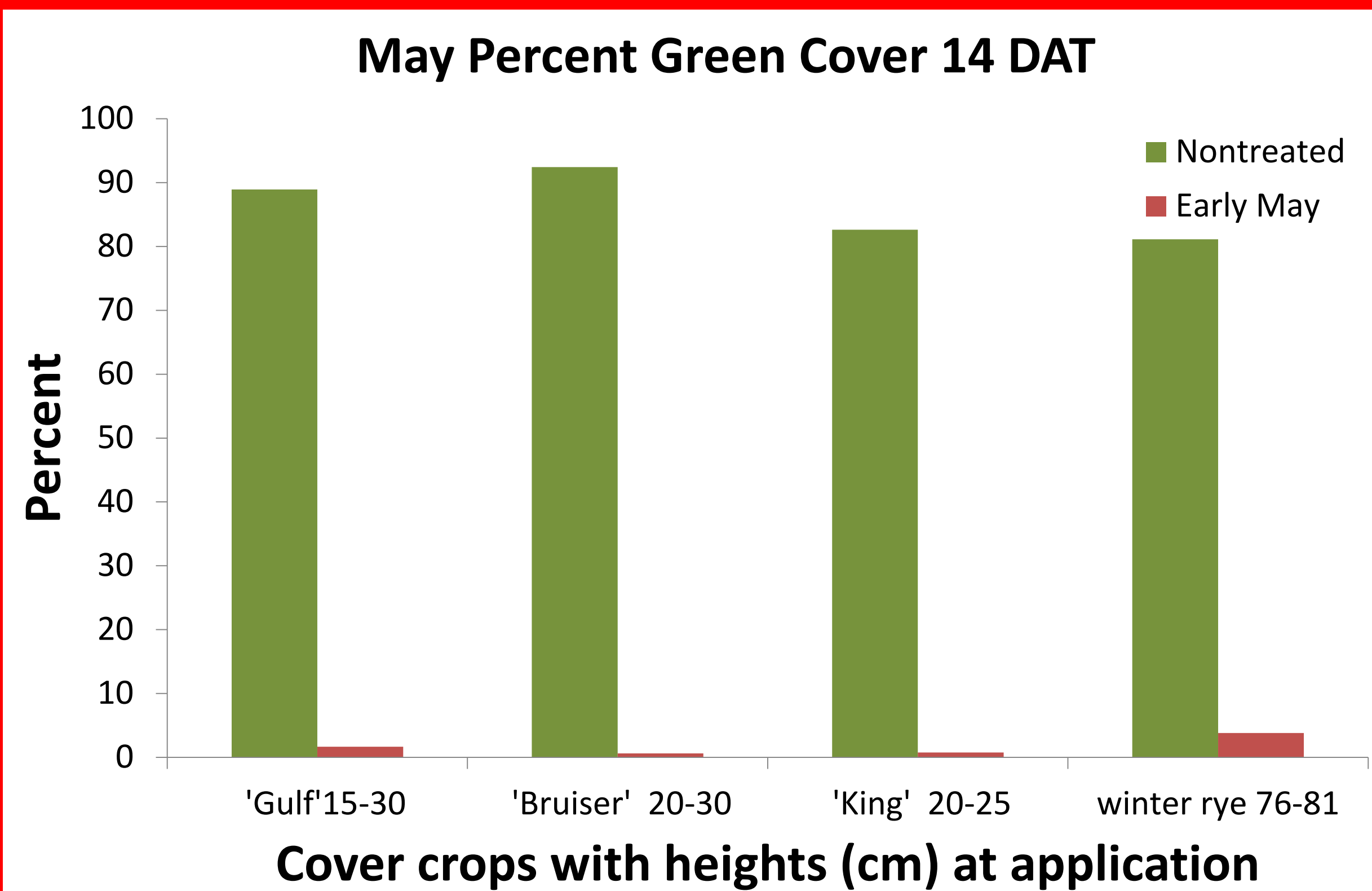
Planting depth and seeding rate of cover crops

Crop	Seeding Rate(kg ha ⁻¹)	Planting Depth(cm)
Annual Ryegrass	37	0.6
Winter Rye	134	2.5

- In spring of 2014, herbicides were applied at three different timings each with four different glyphosate rates.
- Timings included May 23rd (May), May 29th (late-May), and June 4th (early- June)
- Glyphosate rates include 0, 0.62, 1.26, 2.52, and 5.04 kg ae ha⁻¹
- Plots were sprayed with glyphosate plus ammonium sulfate at 7.7 kg per 378.5 L of water.
- Applications were sprayed at 140.2 L per ha⁻¹ using XR11002 flat fan nozzles pressurized at 124.1 kPa with boom height of 0.5 m above canopy.
- All applications were sprayed in mid to late afternoon under partly to full sun conditions. Temperatures ranged from 22° to 30°C with relative humidity ranging from 27 to 50% with wind speeds of 1.6 to 8 km/h.
- Fourteen days after treatment (DAT), the cover crops termination was assessed by collecting digital images and total dried biomass collected from a 0.25m² quadrat per plot.
- Digital images were taken at 91.4 cm above each cover crop in every plot. The camera (Canon PowerShot A1400) was mounted at a 70 degree angle on a 2.5 cm by 114 cm board, set to auto mode with zoom set to 0. This board created a stand for the camera to capture consistent photos of all subplots.
- Percent cover was calculated using SigmaScan Pro 5[®] and Turf Analysis 1-2 Macro

Results

Percent green cover of annual ryegrass and winter rye decreased ($P < 0.0001$) for all cover crops at all rates at 14 days after application. Annual ryegrass and winter rye dry biomass weight was significantly decreased ($P < 0.0001$) at the 0.62 kg ae ha⁻¹ glyphosate rate for early May and June applications.



Conclusions

Our preliminary results indicate that winter rye and annual ryegrass can be effectively terminated using a glyphosate rate of 0.62 kg ae ha⁻¹ if targeted under good weather conditions. All three annual ryegrasses had similar growth and good winter survival in 2014. More termination research is needed to establish best management practices based on rates, crop heights and to better define where glyphosate performance may be reduced due to weather conditions.

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