



Management of Herbicide Resistant Italian Ryegrass in Oklahoma

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Introduction

Italian ryegrass [*Lolium perenne* L. spp. *multiflorum* (Lam.) Husnot] populations with acetolactate synthase (ALS) herbicide resistance have been confirmed in Oklahoma, while acetyl coA carboxylase (ACCase) resistant populations are suspected. The use of preemergence herbicides in Oklahoma winter wheat may improve the control of ALS and ACCase herbicide resistant Italian ryegrass biotypes. To evaluate control, a study was conducted at the Cimarron Valley Research Station near Perkins, OK during the 2016-2017 field season to evaluate weed management systems that included pyroxasulfone, flufenacet, metribuzin, and pinoxaden applied delayed preemergence (DPRE) and/or postemergence (POST). A greenhouse study was conducted to confirm herbicide ACCase resistance within the trial population.

Materials and Methods

- The trial was arranged in a randomized complete block design with four replications.
- Applications were made delayed preemergence (DPRE), very early postemergence (VPOST), and/or mid-postemergence (MPOST).
- Treatments were applied using a CO₂-pressurized backpack sprayer calibrated to deliver 140 L ha⁻¹.
- Visual weed control and crop injury were evaluated 4, 6, 9, 13, 21, 24, and 28 weeks after planting (WAP) and at harvest.
- Italian ryegrass seed was separated from harvested wheat with a seed cleaner and weighed.
- Italian ryegrass seed was planted and sprayed with pinoxaden for a preliminary resistance screen.
- Herbicide Abbreviations:** Flu, flufenacet; Met, metribuzin; Pyr, pyroxasulfone; Pin, pinoxaden.
- Recommended rates were used for all herbicides (Table 1).
- Data sets were analyzed using PROC MIXED with pdmix 800 macro included.
- Means were separated using Fisher's Protected LSD at P = 0.05

Table 1. Herbicide use rates and timings.

Herbicide	Rate (g AI/ha)	Timings
Flufenacet + metribuzin	286.0	VPOST
Metribuzin	105.0	VPOST
Pyroxasulfone	119.0	DPRE, VPOST
Pinoxaden	60.0	VPOST, MPOST

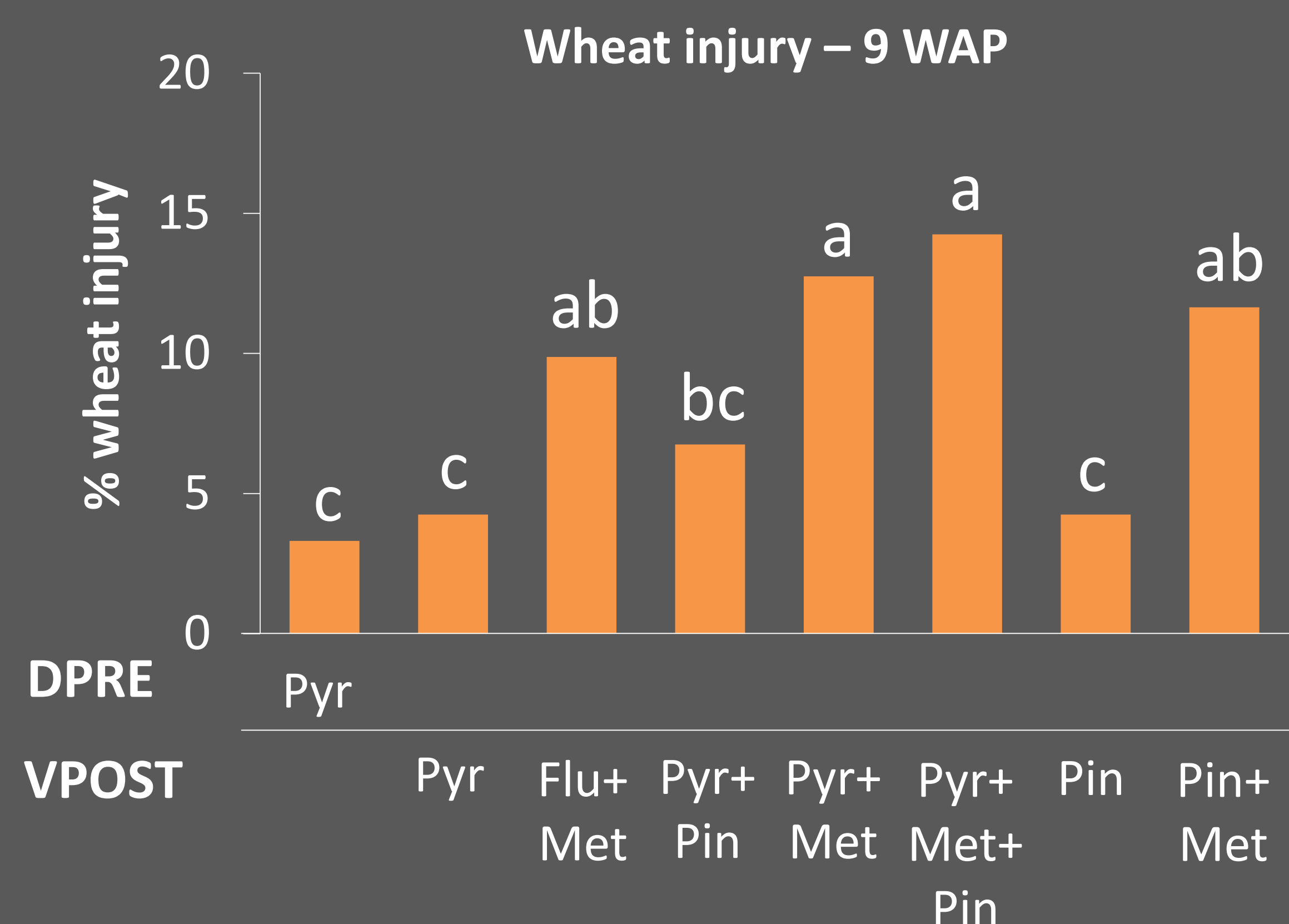


Figure 1. Wheat injury 9 weeks after planting.

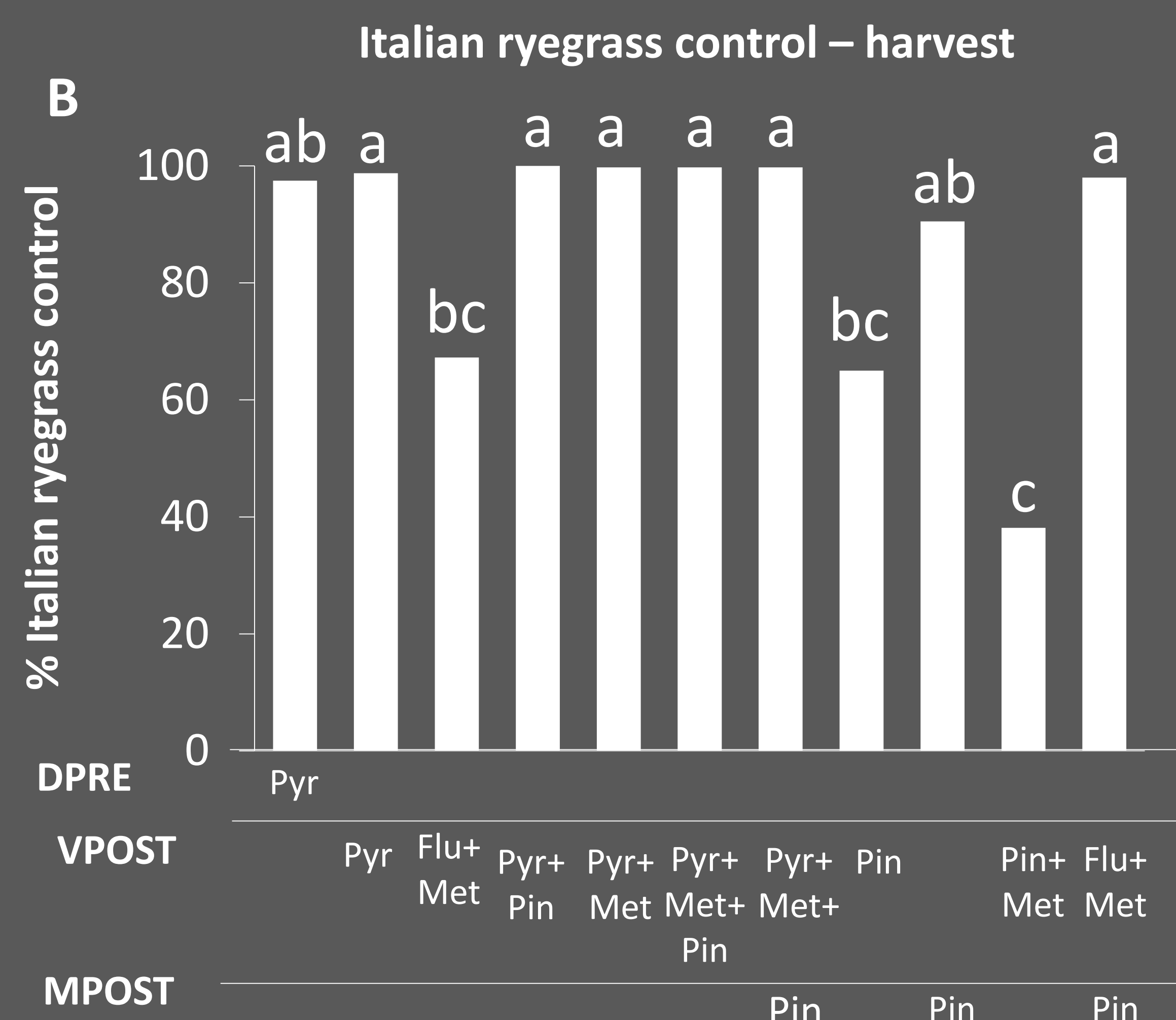
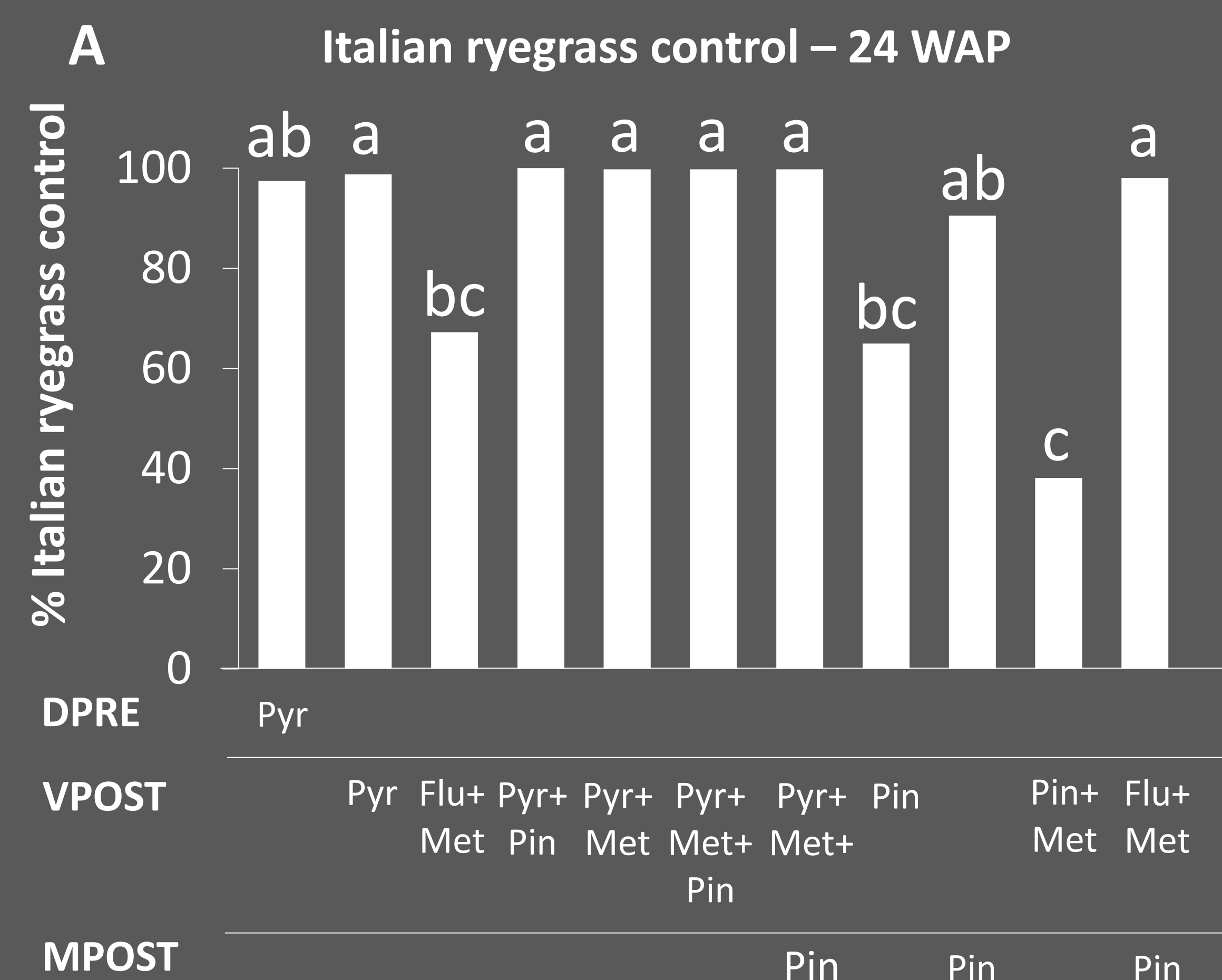


Figure 2. Italian ryegrass control 24 WAP (A) and at harvest (B).

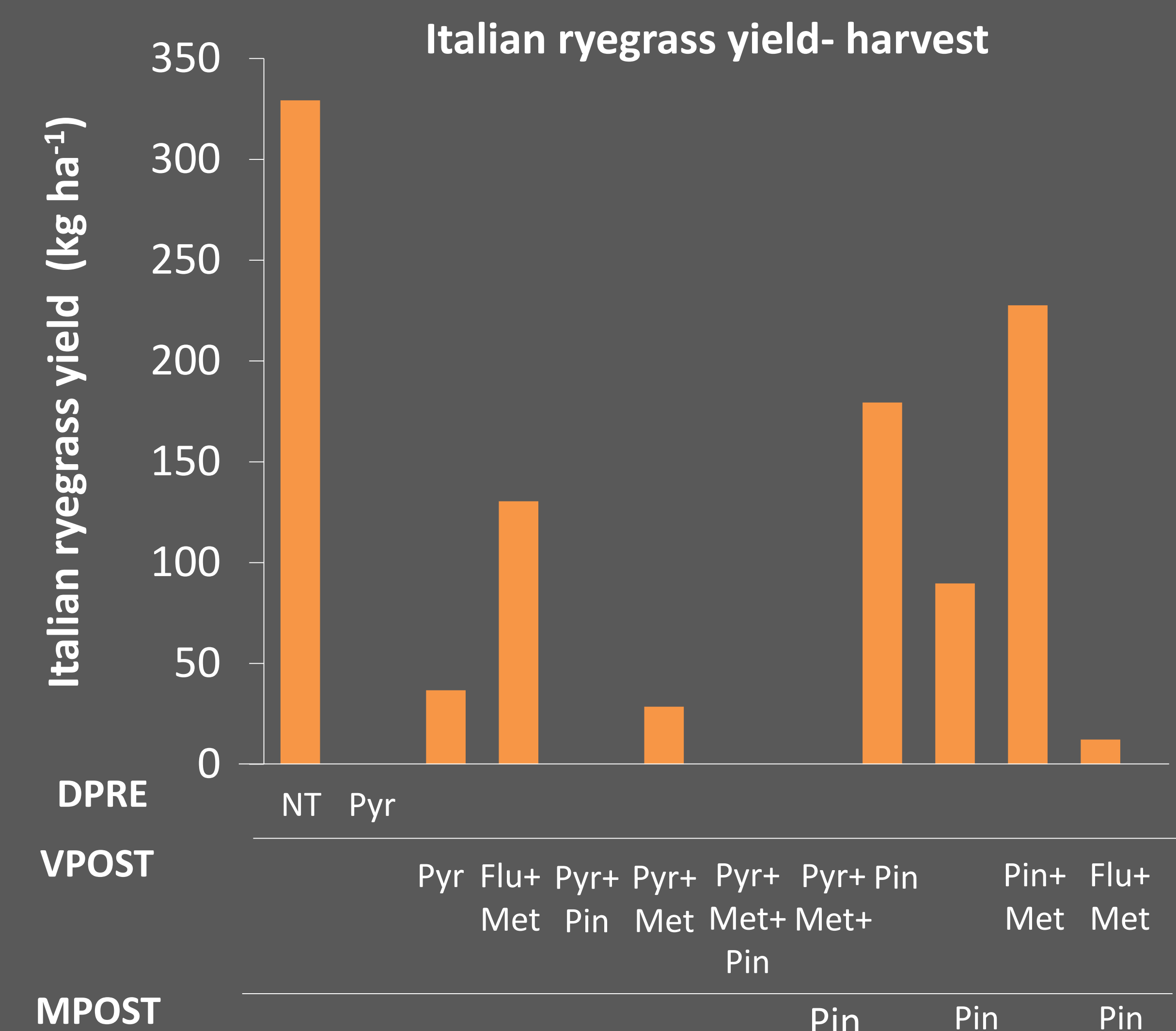


Figure 3. Italian ryegrass yield at harvest.

Results & Discussion

- VPOST treatments that included metribuzin or pinoxaden had the highest levels of injury (7 to 14%) 9 WAP (Fig. 1/data not shown).
- Italian ryegrass control 9 WAP was at least 98% for all treatments with the exception of pinoxaden + metribuzin applied VPOST (data not shown).
- Twenty four WAP and at harvest, all treatments that included pyroxasulfone and flufenacet + metribuzin (VPOST) followed by pinoxaden (MPOST) controlled Italian ryegrass 97 to 100% (Fig 2).
- All pyroxasulfone treatments produced less than 37 kg ha⁻¹ of Italian ryegrass seed compared to the nontreated control, which produced 329 kg ha⁻¹ (Fig 3). This is a significant reduction in weed seed returning to the field seed bank.
- A preliminary greenhouse study identified pinoxaden resistant biotypes in the trial population (data not shown).
- Overall, several successful systems were identified using pyroxasulfone. Wheat response to these products is influenced by planting depth, application timing, herbicide rate, soil type, and rainfall following application. Proper planting depth and timely rains aided in the success of these trials.
- This study is currently being replicated for the 2017-2018 field season to continue to evaluate herbicide systems for the management of herbicide resistant Italian ryegrass.
- Further greenhouse studies will focus on confirming ACCase resistant biotypes within the field and the state of Oklahoma.