

SULFOSULFURON FOR CONTROL OF ROUGHSTALK BLUEGRASS DURING KENTUCKY BLUEGRASS STAND ESTABLISHMENT

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Introduction

Kentucky bluegrass and roughstalk bluegrass (*Poa trivialis*) have both been successful seed crops in central Oregon for decades, despite the fact that most Kentucky bluegrass markets tolerate little or no seed contamination from roughstalk bluegrass. While volunteer roughstalk bluegrass is a common weed in seedling Kentucky bluegrass in the region, it has been successfully controlled with the ALS-inhibitor (Group 2) herbicide primisulfuron, formulated as Beacon and as a premix with dicamba as NorthStar. Production of primisulfuron was discontinued by the primary registrant Syngenta in 2018 and has been unavailable for several years. Registration of a replacement herbicide for primisulfuron is necessary to maintain the viability of high-value Kentucky bluegrass seed production in many fields in central Oregon and is an important need for other production regions as well. Sulfosulfuron (Outrider), also an ALS-inhibitor herbicide, was identified as a likely candidate for this use in preliminary greenhouse (Jeliazkova et al., 2019) and field (Jeliazkova et al., 2020) experiments. Field trials were established in newly seeded irrigated Kentucky bluegrass stands in Jefferson County, OR, for the 2020 crop year to replicate these findings, to test a wider range of use patterns, and to generate further data to support 24c SLN registration efforts for this use in Oregon.

Materials and Methods

Field trials were established in four commercial Kentucky bluegrass seed production fields in Jefferson County, OR, with varieties ‘Kelly’, ‘Wildhorse’, ‘Shamrock’, and ‘Rockstar’ (same order as sites in Figure 1). Stands were established with standard production practices in August 2019. After bluegrass emergence, trials were established in a randomized complete block design with four replications and individual plot size of 10 feet x 30 feet. Sites were chosen in three fields with roughstalk bluegrass populations and in a fourth known to be free from the weed. Outrider (sulfosulfuron) was applied at several rates and at three application timings: fall, spring, or split-applied in both fall and spring (Figure 1). Results were compared to the industry standard use of split-applied Beacon (primisulfuron). Applications were made with a CO₂-powered backpack sprayer delivering

15 gpa through four 110025 Greenleaf TurboDrop air induction nozzles at 32 psi. All treatments were applied with MSO at 1% v/v and liquid AMS at the equivalent of 8.5 lb AMS/100 gal.

Fall herbicide applications were made in late October to early November, when Kentucky bluegrass was at the two- to four-tiller stage and roughstalk bluegrass had three to six tillers. Spring applications were made in early April, within a week of the first irrigation of the year. All other management matched standard production practices in the rest of the field.

Crop safety and weed control were rated in late April and at Kentucky bluegrass heading in early June. Crop injury and weed control in April were rated on a percent scale from 0 to 100, with no effect at 0 and complete plant death at 100. In June, assessment of individual roughstalk bluegrass plants was extremely challenging, so ratings were made on a categorical abundance scale. At crop maturity, a 6-foot x 27-foot portion of each plot was swathed, allowed to dry in the field for 2 to 5 days, and threshed with a plot combine. Samples were further processed with experimental-scale cleaning equipment (stationary thresher, brush debarker, air screen) to clean seed yield at 22–23 lb/bu and 98–99% purity. Data were analyzed with ANOVA (yield) in base R software or via beta regression (injury and control) with the R package *betareg*. Consistency with model assumptions was confirmed via examination of residual and quantile-quantile plots. Tukey’s multiple comparison procedure was conducted with *emmeans*, and letter displays were generated with *multcomp*. Data plots were generated with *ggplot2*, and summaries were derived with *ggpubr*.

Results and Discussion

Roughstalk bluegrass control

Roughstalk bluegrass was present at three of the four sites. In late April, a fall-only application of Outrider at 0.76 oz/acre controlled roughstalk bluegrass at all three infested sites as well as the standard split application of Beacon (Figure 1, bottom). Control was comparable to Beacon with 0.38 oz/acre of fall-applied Outrider at two of these sites and more variable (resulting in lower average control) at the third. Outrider applied in the

spring did not control large, overwintered roughstalk bluegrass plants. Split applications of Outrider provided good control at all but the lowest rate, matching or exceeding the performance of Beacon.

However, by crop heading in early June, some severely injured roughstalk bluegrass plants recovered and produced seed heads. This result was unexpected, and by the time it became apparent, accurate evaluation was not possible due to inability to confidently identify

individual plants in mature grass stands. From the extremely limited data that were collected, it appears that control from fall-only Outrider was probably slightly less than from Beacon, and control from split applications was slightly greater (data not shown). No treatment (including Beacon) entirely prevented roughstalk bluegrass head production at any site. It is emphasized that this observation is tentative at best and requires further confirmation before confident conclusions can be made.

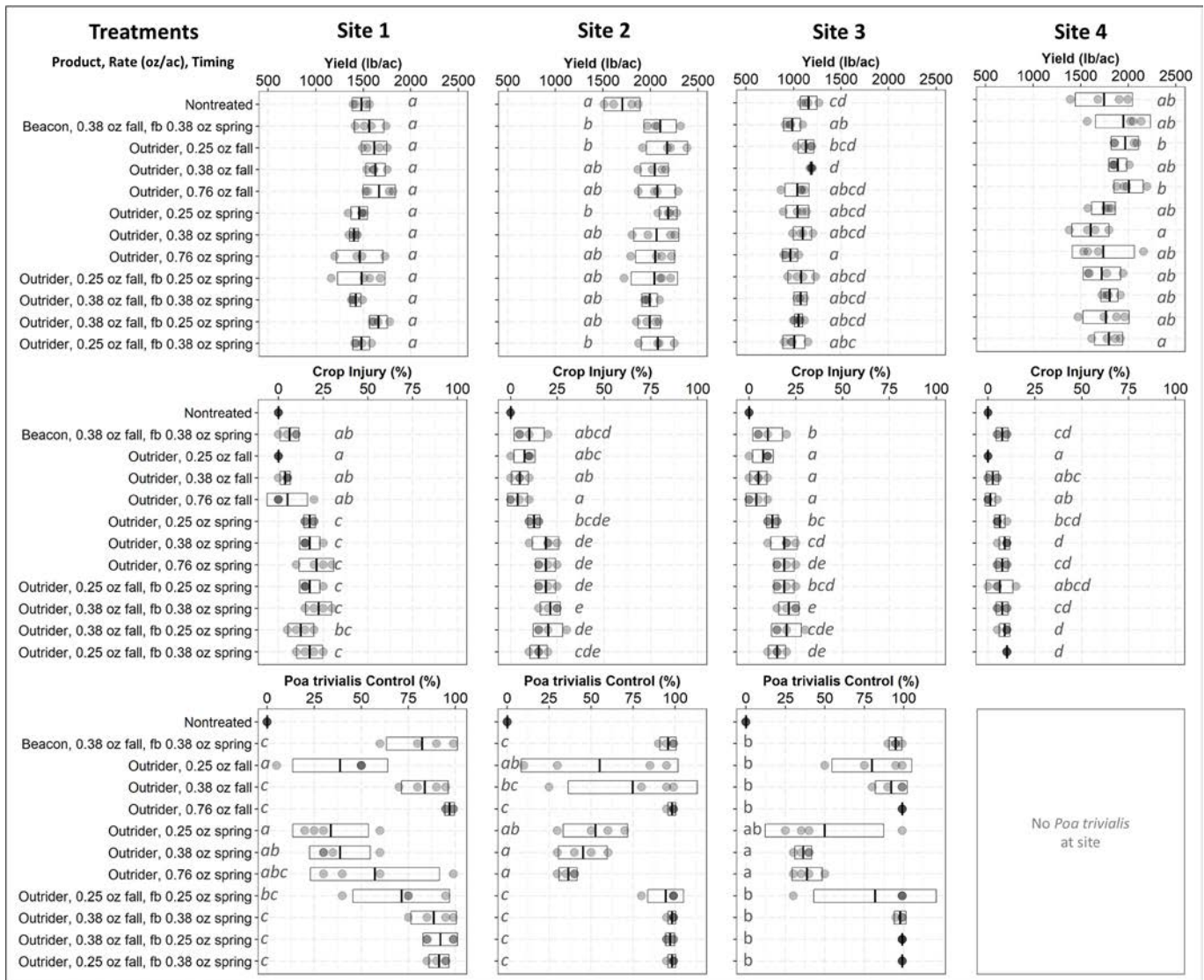


Figure 1. Experimental treatments and results for four trial sites in new stands of irrigated Kentucky bluegrass in central Oregon, 2020. Yield is in pounds clean seed per acre (approximate bushel weight 23 lb, 98–99% purity). Kentucky bluegrass crop injury and roughstalk bluegrass (*Poa trivialis*) control were evaluated in late April (crop in early boot stage) on a percent scale from 0 (no visible injury) to 100 (complete plant death). Individual observations are plotted as points; treatment mean (cross hatch) and accompanying 89% confidence intervals (box outline) are also indicated. Within a plot, treatments followed by the same number are not significantly different by Tukey’s multiple comparison procedure ($\alpha = 0.05$).

Kentucky bluegrass crop safety

In April, safety on Kentucky bluegrass was good for fall applications of Outrider at all sites and rates. Crop injury was less than injury from Beacon at two sites and equivalent at the others (Figure 1, middle). In contrast, spring applications of Outrider resulted in numerically higher levels of injury at three of the four sites, particularly at higher rates, although injury was statistically greater than that with Beacon at only one site. Split applications of Outrider had injury similar to spring applications. At three of the four sites, mean crop injury reached 20% or more from spring-only and split applications of Outrider. While injury for all treatments declined over the remainder of the growing season, relative patterns remained the same through crop heading (data not shown).

Kentucky bluegrass yield

Yield data were somewhat variable (Figure 1, top), and meaningful statistical separation was not evident between treatments. At three of the four sites, inspection of the raw data indicate yields with fall-only Outrider treatments similar to the Beacon standard. At two of these sites, yield of spring-only and split applications was numerically lower than for the Beacon/fall Outrider group of treatments; at the third it was similar. At site 3, no clear pattern is evident.

Conclusions

Fall + spring applications of Outrider provided the best control of roughstalk bluegrass but with excessive risk for crop injury. Spring-only applications of Outrider also appear to have excessive crop injury potential, as well as poor control of roughstalk bluegrass. Given the injury observed from these treatments, it is unlikely that they will be suitable for general use.

When applied in the fall only, Outrider at 0.76 oz/acre provided roughstalk bluegrass control nearly equivalent to Beacon, and 0.38 oz/acre gave slightly lower, but still useful, control. Crop safety was good with both rates. At this time, it appears that fall applications of Outrider at 0.38–0.76 oz/acre offer a workable replacement for Beacon for control of roughstalk bluegrass in irrigated seedling Kentucky bluegrass. In fields with heavy weed pressure, split applications may represent a useful salvage treatment when expected economic loss from contamination exceeds the possible yield reduction (about 20%) from herbicide injury. Discussion is ongoing with the registrant (Valent USA) and the Oregon Department of Agriculture regarding the potential for 24c SLN labeling for this use.

References

- Jeliazkova E., R. Affeldt, J. Carroll, and C. Tollefson. 2019. Greenhouse screenings of selected herbicides for replacement of Beacon in Kentucky bluegrass grown for seed. *2018 Annual Report*. Central Oregon Agricultural Research and Extension Center.
- Jeliazkova, E., R. Affeldt, and J. Spring. 2020. Replacing Beacon for control of roughstalk bluegrass during Kentucky bluegrass stand establishment. *2019 Annual Report*. Central Oregon Agricultural Research and Extension Center.

Acknowledgments

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Note: The rights to primisulfuron and associated products were purchased by Gowan USA in late 2020, but it is unclear when—or even if—24c Special Local Needs labels will be renewed for use of new primisulfuron products in Kentucky bluegrass in Oregon. The original SLN labels were approved prior to the EPA requirement for established federal feeding tolerances for all products labeled in grass seed crops. Primisulfuron does not have established feeding tolerances, which could prevent, or substantially delay, the return of primisulfuron to the Kentucky bluegrass market. As sulfosulfuron already has established feeding tolerances, it could quite feasibly receive 24c labeling prior to renewal of primisulfuron labels and serve at the very least as a valuable interim substitute, if not an outright replacement. Continued development and registration efforts for Outrider remain pertinent at the time of writing and are ongoing.