



Selective Removal of Creeping Bentgrass from Cool-season Turfgrass Stands using Tenacity Herbicide

Shehbaz Singh and Derek Settle, Chicago District Golf Association, Lemont, Illinois



Introduction

Creeping bentgrass (*Agrostis stolonifera*) at low mowing heights can be a serious invader of other cool-season turfgrass species. Mesotrione is known to provide selective control of C. bentgrass in a Kentucky Bluegrass with 2 or 3 subsequential applications. However, the long-term efficacy of 2 or 3 applications in suppressing bentgrass is yet to be known. There is not enough literature on the selective control of bentgrass in different cool-season turfgrass species/cultivars and the regrowth of cool-season turfgrass with additional fertilization in mesotrione-applied turfgrass stands.

Objectives

- Evaluate creeping bentgrass removal with 2 versus 3 Tenacity applications.
- Evaluate regrowth of cool-season turfgrass
- Evaluate any phytotoxicity associated with Tenacity herbicide

Materials and Methods

- Two years of field research in 2023 and 2024 on three tee surfaces at the Bob Berry Sunshine course, Lemont, IL
 - Study 1: ‘HD Sport 2.0’ Kentucky bluegrass Tee
 - Study 2: ‘HGT’ Kentucky Bluegrass Tee
 - Study 3: ‘RTF’ Tall Fescue Tee
- Randomized Complete Block Design
 - Three treatments were replicated four times
 - Individual plot size: 10 ft x 5 ft

Table 1. Treatment list and description, Bob Berry Sunshine Course, Lemont, IL.

Treatment	Product	Rate fl oz/A	Application number	App. Dates, 2023
1	Untreated	n/a	n/a	none
2	Tenacity + NIS	5.0	2	Aug 22, Sep 6
3	Tenacity + NIS	5.0	3	Aug 22, Sep 6, Sep 19

- Spray Equipment
 - CO2 backpack sprayer operated at 40 psi; three nozzle boom with XR TEEJET 8004VS
 - Rates per 1000 sq ft adjusted to per 96 sq ft (size of each treatment plot x 4 reps)
 - Applied in water equivalent to 2 gal per 1000 sq ft
- Nitrogen Fertilization
 - 2023: Six applications of Urea (46-0-0) at the rate of 0.25 lbs. N per 1000 sq ft bi-weekly following the second application on Sep 12, 19, 26, and Oct 3, 10, and 17 in 2023.

- Data collection
 - Visual Turf Quality: 1 to 9 scale, 9 = best and 6 = minimum acceptable quality
 - Normalized Difference Vegetation Index: GreenSeeker handheld sensor, (Trimble Inc. Westminster, CO).
 - Creeping Bentgrass (%): Visual estimate of C. bentgrass (0-100%)
 - Kentucky Bluegrass Regrowth (%): Visual estimate of K. bluegrass regrowth after tenacity applications(0-100%)
 - Tall Fescue Regrowth (%): Visual estimate of Tall fescue regrowth after Tenacity applications (0-100%)
- Data Analysis:
 - Statistical analysis conducted for all data by date within each year (ARM statistical software, GDM Solutions, Inc.)
 - Area Under the Progress Curve (AUPC) used to summarize data across one year. Estimated by the trapezoidal integration method (Madden et al., 2007).

ANOVA TABLE

‘HD Sport 2.0’ K. Bluegrass Tee	2023	22-Aug	29-Aug	6-Sep	12-Sep	18-Sep	26-Sep	3-Oct	10-Oct	19-Oct	25-Oct	3-Nov	6-Nov	AUPC
	VQ	NS	NS	+	***	***	+	+	NS	NS	NS	NS	NS	NS
	NDVI	NS	NS	+	***	***	+	+	NS	NS	NS	NS	NS	NS
	C. Bentgrass	NS	NS	NS	NS	NS	NS	***	***	***	***	***	***	***
	K. Bluegrass	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
‘HGT’ K. Bluegrass Tee	2024	2-Apr	25-Jul	13-Aug	3-Sep	1-Oct	15-Oct	28-Oct	15-Nov					AUPC
	VQ	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	NDVI	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	C. Bentgrass	***	***	***	***	***	***	***	***	***	***	***	***	***
	K. Bluegrass	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
‘RTF’ K. Bluegrass Tee	2023	22-Aug	29-Aug	6-Sep	12-Sep	18-Sep	26-Sep	3-Oct	10-Oct	19-Oct	25-Oct	3-Nov	6-Nov	AUPC
	VQ	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	NDVI	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	C. Bentgrass	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	Tall Fescue	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
‘HGT’ K. Bluegrass Tee	2024	2-Apr	25-Jul	13-Aug	3-Sep	1-Oct	15-Oct	28-Oct	15-Nov					AUPC
	VQ	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	NDVI	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	C. Bentgrass	***	***	***	***	***	***	***	***	***	***	***	***	***
	Tall Fescue	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Table 2: Summary ANOVA table for evaluated parameters. NS = not statistically significant, + = significant at 0.05 level of probability (or p value of 0.05), ** = significant at p-value of 0.01, and *** = significant at p-value of 0.001. AUPC = Area Under Progress Curve. Dash = data not collected

Results and Discussion – Study 1- ‘HD Sport 2.0’ Kentucky Bluegrass Tee

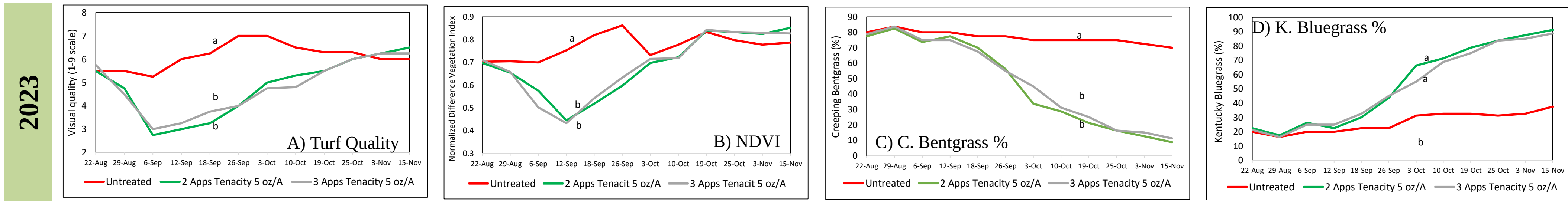


Figure 1. A) Visual Turf Quality, B) NDVI, C) Percent Creeping Bentgrass, and D) Percent Kentucky Bluegrass for three herbicide treatments in 2023. Bob Berry Sunshine Course, Lemont, IL.

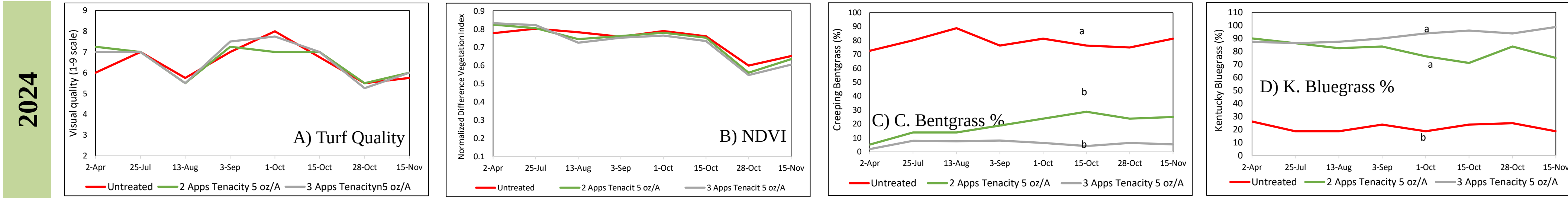


Figure 2. A) Visual Turf Quality, B) NDVI, C) Percent Creeping Bentgrass, and D) Percent Kentucky Bluegrass for three herbicide treatments in 2024. Bob Berry Sunshine Course, Lemont, IL.



Figure 3. A) Initial: A week after 1st application (Sep 14), B) Final: K. Bluegrass regrowth (Nov 2) in 2023. Bob Berry Sunshine Course, Lemont, IL.

Results and Discussion – Study 2- ‘HGT’ Kentucky Bluegrass Tee

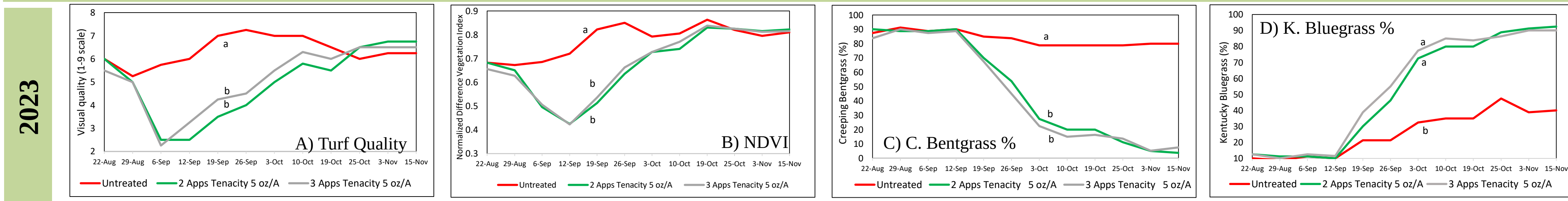


Figure 5. A) Visual Turf Quality, B) NDVI, C) Percent Creeping Bentgrass, and D) Percent Kentucky Bluegrass for three herbicide treatments in 2023. Bob Berry Sunshine Course, Lemont, IL.

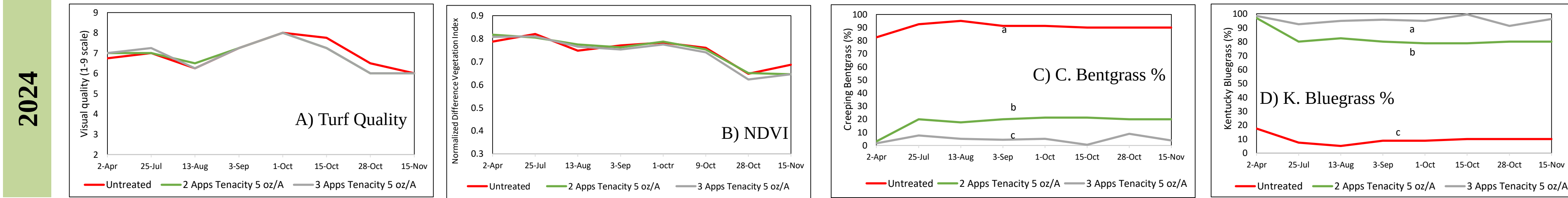


Figure 6. A) Visual Turf Quality, B) NDVI, C) Percent Creeping Bentgrass, and D) Percent Kentucky Bluegrass for three herbicide treatments in 2024. Bob Berry Sunshine Course, Lemont, IL.



Figure 7. A) Initial: A week after 1st application (Sep 14), B) Final: K. Bluegrass regrowth (Nov 2) in 2023. Bob Berry Sunshine Course, Lemont, IL.



Figure 8. Creeping bentgrass regrowth for A) 2 Tenacity Application, B) 3 Tenacity Application in 2024. Bob Berry Sunshine Course, Lemont, IL.

Results and Discussion – Study 3- ‘RTF’ Tall Fescue Tee

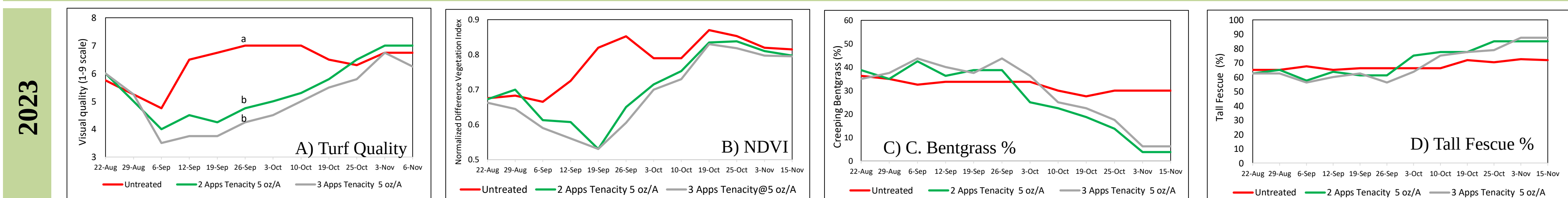


Figure 8. A) Visual Turf Quality, B) NDVI, C) Percent Creeping Bentgrass, and D) Percent Kentucky Bluegrass for three herbicide treatments in 2023. Bob Berry Sunshine Course, Lemont, IL.

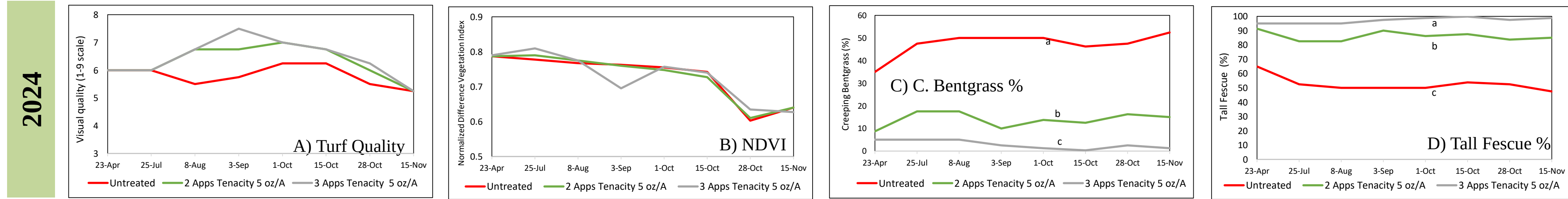


Figure 9. A) Visual Turf Quality, B) NDVI, C) Percent Creeping Bentgrass, and D) Percent Kentucky Bluegrass for three herbicide treatments in 2024. Bob Berry Sunshine Course, Lemont, IL.



Figure 10. A) Initial: A week after 1st application (Sep 12) B) Final: K. Bluegrass regrowth (Nov 2) in 2023. Bob Berry Sunshine Course, Lemont, IL.



Figure 11. Creeping bentgrass regrowth for A) 2 Tenacity Application, B) 3 Tenacity Application in 2024. Bob Berry Sunshine Course, Lemont, IL.

Conclusion

Two years of field study showed that Mesotrione can effectively control creeping bentgrass contamination in cool-season turfgrass stands. However, the number of applications can be a critical factor. Three applications instead of two applications provide long-term creeping bentgrass suppression. Additional nitrogen fertilization during herbicide application would help cool-season turfgrass to fill in the space where bentgrass has been killed by herbicidal activity.

We sincerely appreciate the following colleagues for their contribution of materials and/or technical advice: Matt Geise, Technical Service-Midwest, Syngenta.

2023

- Creeping Bentgrass contamination reduced from 80 to 8.7% for 2 apps while for 3 apps, 80 to 11.7%. Fig. 1-C
- Kentucky Bluegrass regrown to about 90% from initial 20%. Fig. 1-D
- Following 1st application, visual quality and NDVI differ significantly for untreated versus Tenacity treatments due to brownish color of dying creeping bentgrass. Fig. 1-D.

2024

- Regrowth of C. Bentgrass in Tenacity applied was first observed in April 2024, almost 8 months after the first application in 2023. Fig. 2-C
- Regrowth of bentgrass was more for 2 Tenacity Applications than 3 Tenacity Applications.
- On Nov 15, C. bentgrass was 5.2% for 3 Apps Tenacity while was 25 % for 2 Apps Tenacity treatment. Fig 2-C

2023

- Creeping Bentgrass contamination reduced from 85 to 3.7% for 2 apps while for 3 apps, 80 to 7.5%. Fig. 5-C
- Kentucky Bluegrass regrown to about 92% for 2 apps and 90% for 3 apps from initial 20%. Fig. 5-D
- ‘HGT’ K. Bluegrass showed more regrowth than ‘HD sport 2.0’ which shows cultivar effect within same turfgrass species.

2024

- On ‘HGT’ K. Bluegrass tee, 20 % C. bentgrass regrowth for 2 Tenacity Apps and 3.75% for was recorded for 3 Tenacity Apps treatment. Fig. 6-C
- K. Bluegrass was 80 % in 2 Tenacity Apps treatment and 96.25 % in 3 Tenacity Apps treatment. Fig. 6-D
- No significant differences among treatments was observed for visual quality and NDVI on any date in 2024. Table 2 and Fig. 6-A&B.

2023

- C. Bentgrass contamination reduced from 37.5 to 3.7% for 2 apps while for 3 apps, 37.5 to 6.2%. Fig. 9-C
- Tall fescue had less bentgrass contamination comparatively to K. Bluegrass tees which suggest allelopathy effects tall fescue can have on creeping bentgrass.
- Whitish leave tips were observed for tall fescue after Tenacity applications suggesting some kind of mesotrione phytotoxicity on this turfgrass species

2024

- No significant differences among treatments were observed for visual quality and NDVI on any date in 2024. Table 2 and Fig. 9-A&B.
- On the ‘RTF’ Tall fescue tee, 15 % C. bentgrass growth was observed for 2 Apps Tenacity and 1.25% for 3 Apps Tenacity treatment. Fig. 9-C