



Evaluating the Suitability of Bermudagrass and Zoysiagrass for Golf Tee Use in the Chicago Area

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Introduction

Bermudagrass (*Cynodon* sp.) is native to Europe, Africa, Australia and much of Asia. Zoysiagrass (*Zoysia* sp.) is native to the coastal grasslands of southeast Asia and Indonesia. Both are warm season (C4) turfgrass species that spread by both stolons and rhizomes. Both are increasingly utilized in the Midwestern United States. C4 turfgrasses are more drought tolerant and display better recuperative potential than most cool season turfgrasses. Slow divot recovery is common issue for creeping bentgrass (*Agrostis stolonifera*) in summer when peak heat combines with dry conditions. Research is warranted to investigate newer bermudagrass hybrids and *Zoysia japonica* for possible use as tee surfaces in Chicago.

Objectives

- Evaluate the establishment rate of select bermudagrass and zoysiagrass
- Monitor characteristics of quality, color, green up and dormant color
- Validate bermudagrass and zoysiagrass cold tolerance of newer varieties

Materials and Methods – 2024

- C4 Variety Trial at the Bob Berry Sunshine Course in Lemont, IL**
 - Randomized Complete Block Design (RCBD) with 5 replications
 - Eight C4 entries (4 bermudagrass and 4 zoysiagrass varieties)
 - Individual plot size (5 ft x 5 ft)

Vegetative Establishment

- Establishment used 4-inch diameter plugs
- May 22: Two bermudagrass plugs were planted in each plot.
- May 29: Four zoysiagrass plugs were planted in each plot.

Tee Mowing Height

- Jun-Oct: Tee height maintained at 0.5 inch 3X per week by a John Deere triplex mower (Cog Hill Golf & Country Club, Lemont, IL).

Fertilizer Inputs

- Jul-Oct: Forever Green Natural 4-3-0 fertilizer (0.5 lbs. N/1000 sq ft) was applied monthly beginning July 9.

Herbicide Inputs

- Postemergent herbicides were necessary to address a broadleaf (dandelion) and a grassy weed (*Poa annua*) and maintain plots.
- Applications: July 3, Switchblade 4 pints/A (PBI Gordan, Kansas City, MO); July 25, Revolver 0.4 fl oz/1000 sq ft (Envu, Carey, NC); A hand edger tool or Oct 3, glyphosate by Ranger Pro 2 fl oz/1000 sq ft (Lesco, Cleveland, OH) to keep 1 ft plot boundaries.

Table 1. Cold tolerant warm-season variety trial, Bob Berry Sunshine Course, Lemont IL.

Entry	Cultivar or Experimental No.	C4 Species	Source
1	Tahoma 31	Cynodon	Oklahoma State University
2	OKC3920	Cynodon	OSU
3	OSU15x9	Cynodon	OSU
4	OSU1629	Cynodon	OSU
5	Meyer	Zoysia	Kansas State University/Texas A&M
6	Innovation	Zoysia	KSU/Texas A&M
7	DALZ1701	Zoysia	KSU/Texas A&M
8	DALZ1808	Zoysia	KSU/Texas A&M

Data

- Visual Quality: (1–9 scale, 6 = minimum acceptable and 9 = best)
- Lateral Spread: (in.) Maximum stolon length from plug center
- Persistence/Winter Survival: Visual cover (% per plot)
- Fall Color Retention: (1–9 scale, 9 = dark green)
- Normalized Difference Vegetation Index (NDVI): GreenSeeker (Trimble Inc., Westminster, CO)

Data Analysis

- Statistical analysis conducted for all data by date within each year (ARM, GDM Solutions, Inc., Brookings, SD).
- Area Under the Progress Curve (AUPC) summarized data by year. Estimated by trapezoidal integration method (Madden et al., 2007).

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.

Source	4-Jun	25-Jun	9-Jul	23-Jul	8-Aug	22-Aug	12-Sep	1-Oct	15-Oct	28-Oct	15-Nov	AUPC
VQ	***	***	***	**	***	***	***	NS	NS	NS	***	***
NDVI	***	NS	NS	NS	NS	*	***	NS	***	NS	NS	NS
Spread	***	***	***	***	***	***	***	***	***	***	***	***
Cover					***	***	***	***	***	***	***	***
Color	***	***	***	*	NS	NS	NS	NS	**	NS	***	***

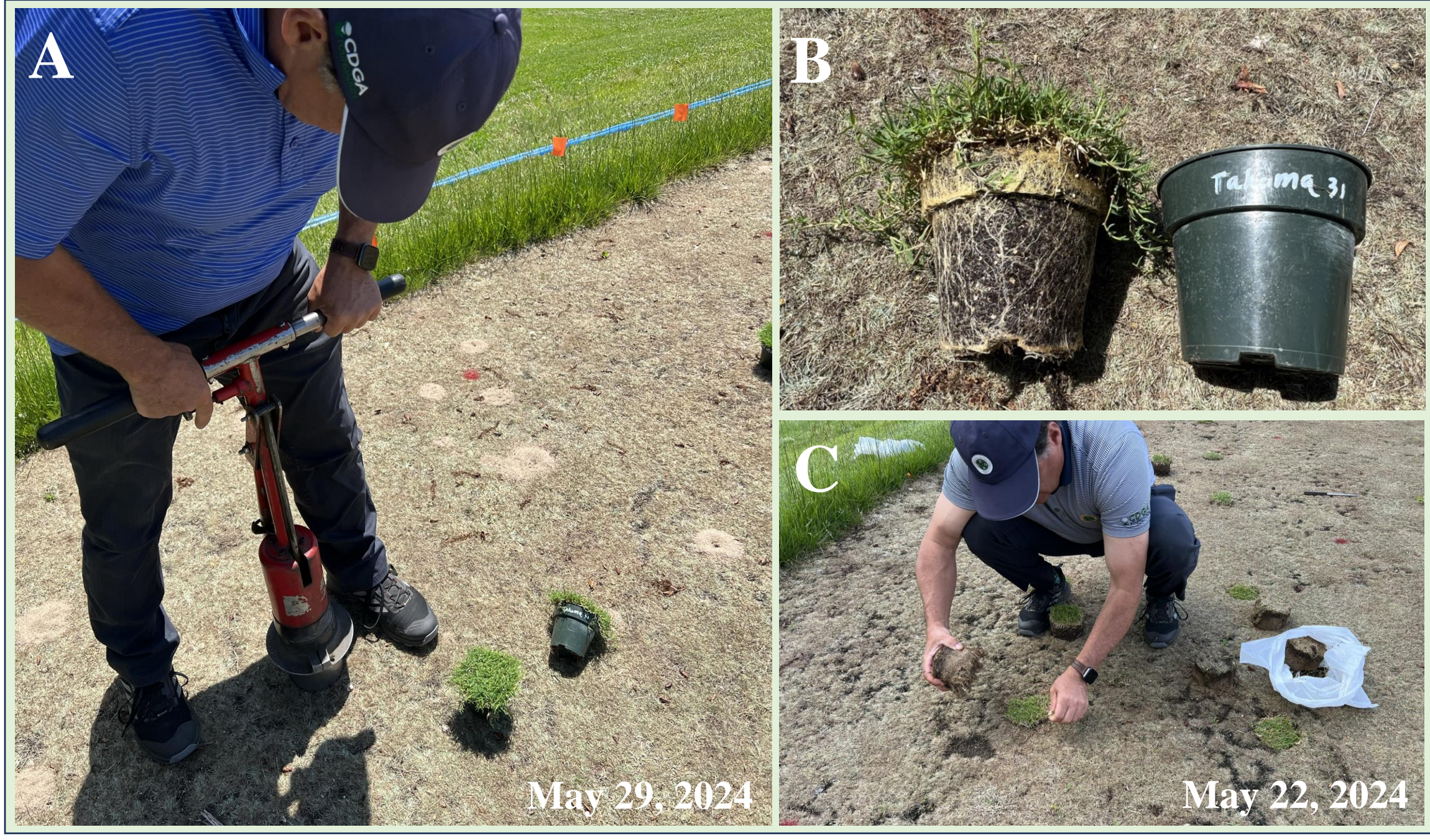


Figure 1. (A) A 4-inch cup-cutter used to (B) transplant bermudagrass and (C) zoysiagrass plugs into tee.

Results and Discussion

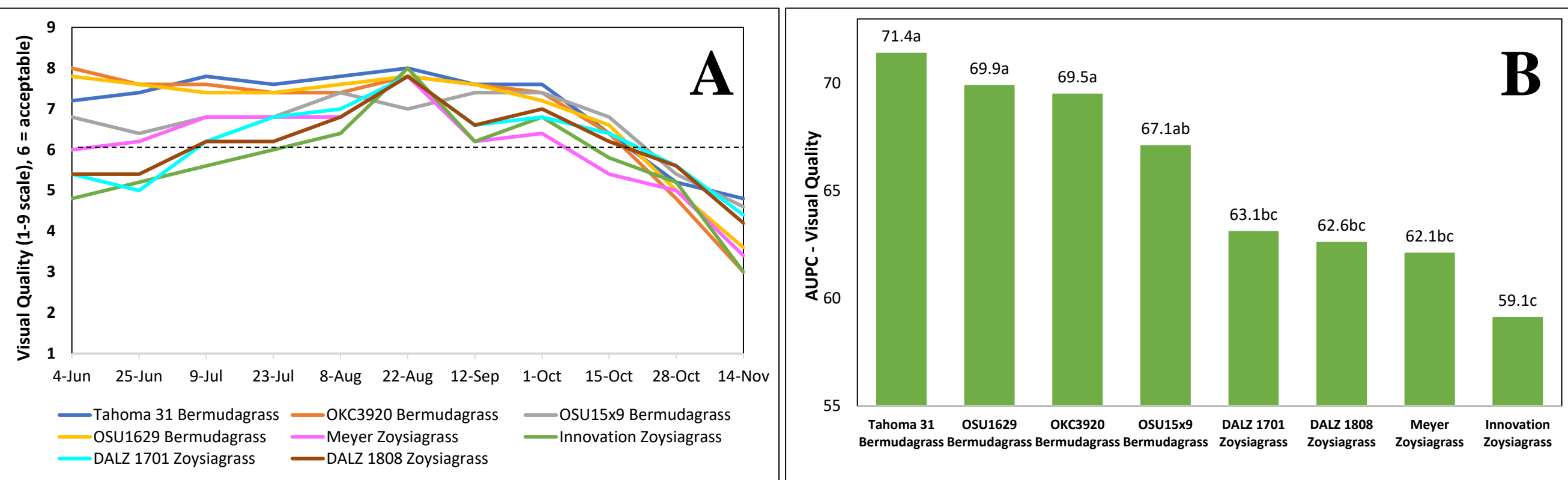


Figure 2. A) Weekly visual quality for C4 turfgrasses and B) entire year summary by Area Under the Progress Curve for visual quality in 2024.

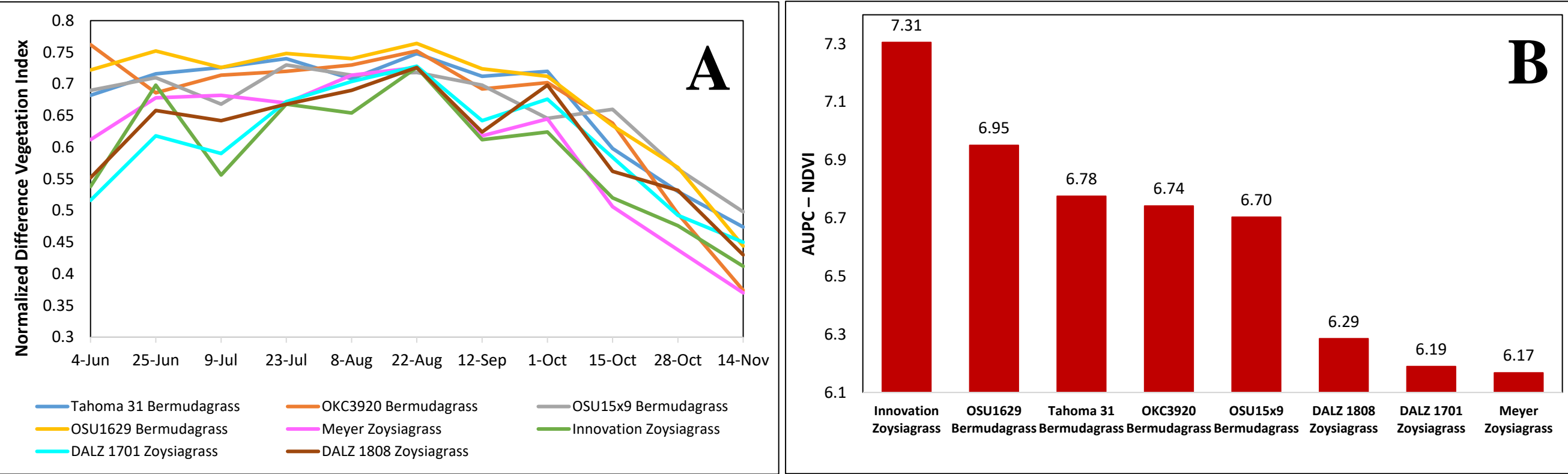


Figure 3. A) Weekly NDVI for C4 turfgrasses and B) entire year summary by Area Under the Progress Curve for NDVI in 2024.

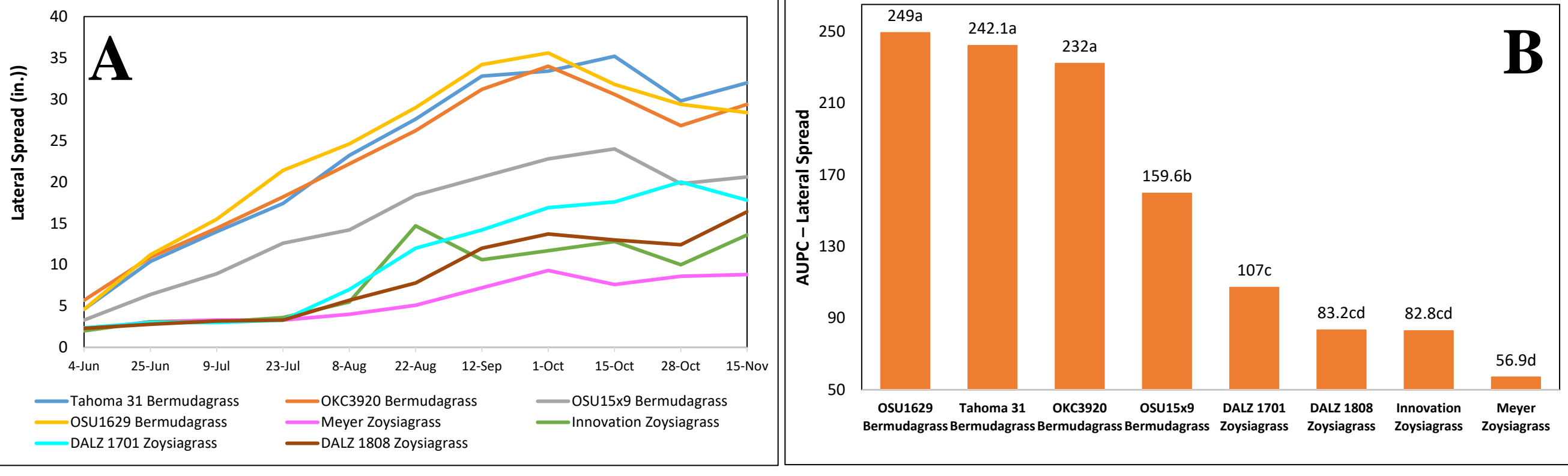


Figure 4. A) Weekly lateral spread for C4 turfgrasses and B) entire year summary by Area Under the Progress Curve for lateral spread in 2024.

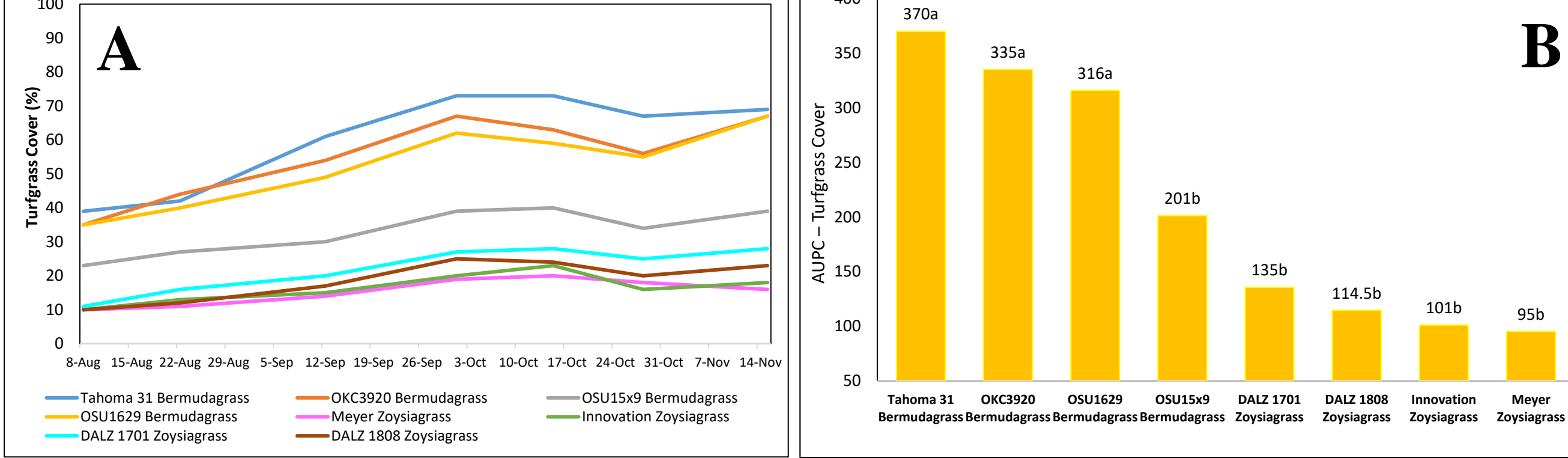


Figure 5. A) Weekly turfgrass cover for C4 turfgrasses and B) entire year summary by Area Under the Progress Curve for turfgrass cover in 2024.

C4 Lateral Spread

- Average lateral spread reached 27.6 in. for bermudagrass versus 14.1 in. for zoysiagrass on the final Nov rating date. Fig. 3A
- For the year, best lateral spread was by the bermudagrass entries OSU1629, OKC3920, and Tahoma 31. Fig. 3B

C4 Turfgrass Cover

- Average lateral spread was 60% for bermudagrass versus 21.1% in. for zoysiagrass on final Nov rating date. Fig. 5A
- For the year, best turfgrass cover was by bermudagrass entries OSU1629, OKC3920, and Tahoma 31; all had more than 60% turfgrass cover. Fig. 5B

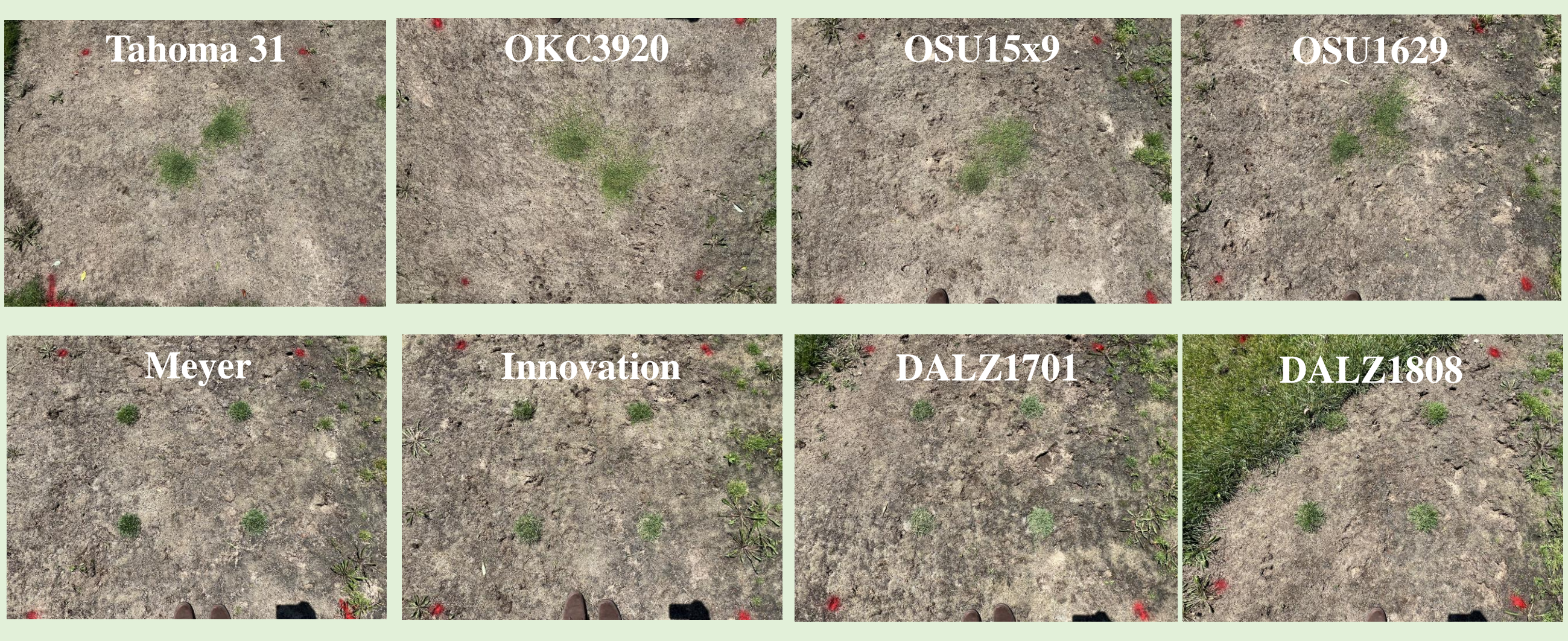


Figure 5. C4 turfgrass entries (bermudagrass upper and zoysiagrass lower) after 2 months establishment in a tee variety trial on Jul 25, 2024.

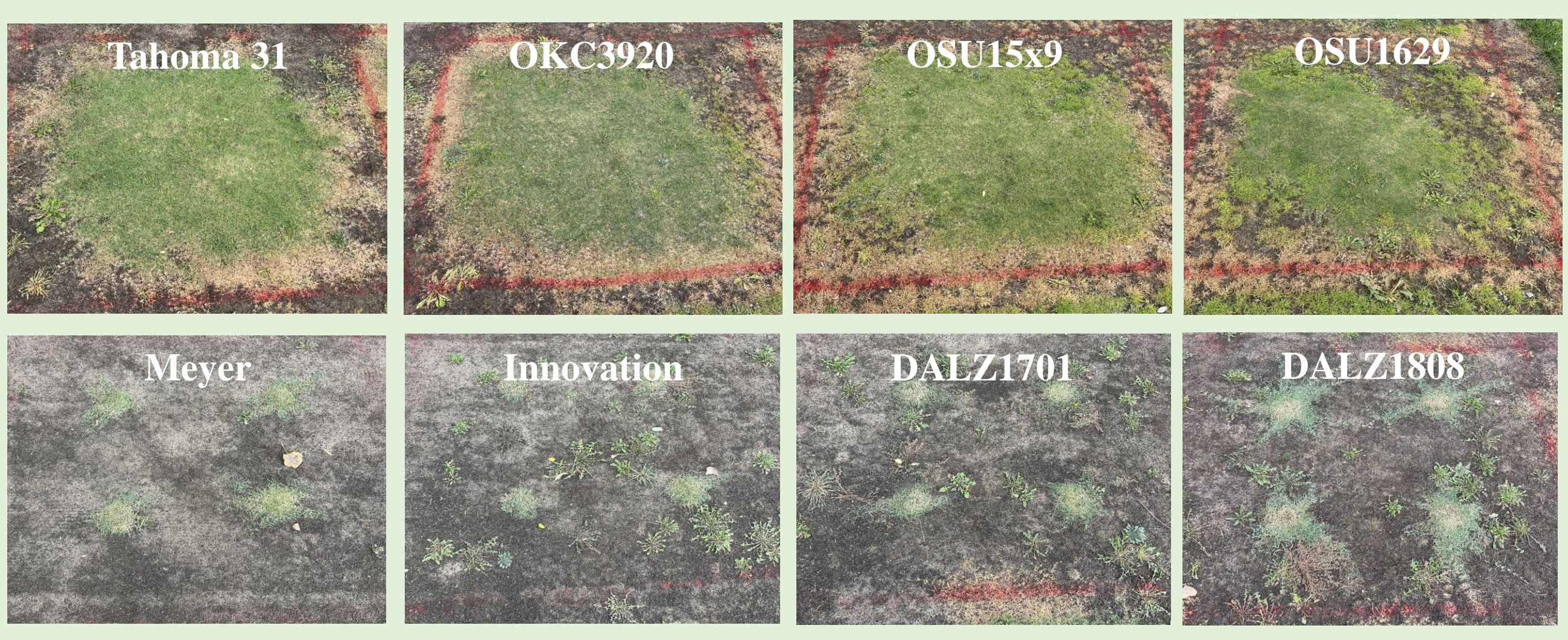


Figure 6. C4 turfgrass entries (bermudagrass upper and zoysiagrass lower) in a tee variety trial on Oct 10, 2024.

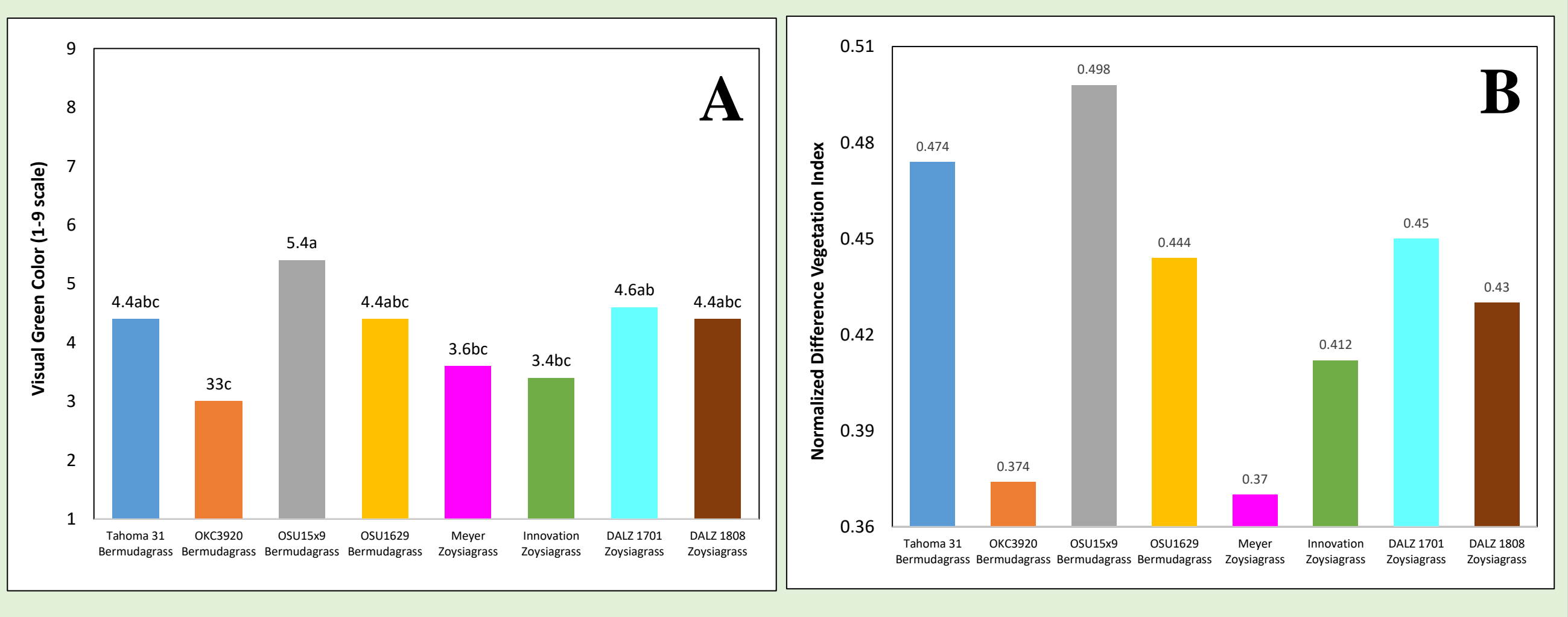


Figure 7. A) Visual green color and B) NDVI used to estimate fall green color retention for C4 turfgrass entries on final rating date of Nov 15, 2024

C4 Visual Quality

- For the year, best visual quality was by bermudagrass entries of OSU1629, OKC3920, and Tahoma. Fig. 2B

C4 Color Retention

- Differences in visual green color were observed on Nov 14, 2024. Table 2, Fig 6.
- Best color retention was associated with both bermudagrass (Tahoma 31, OSU15x9, OSU1629) and zoysiagrass (DALZ1701, DALZ1808). Fig 6.
- After Nov 14, 2024 all C4 turfgrasses were straw color an indication of dormancy (data not shown).

Conclusions

Bermudagrass entries displayed the fastest establishment rate based on average turfgrass cover (60%) versus zoysiagrass (21.1%). Best visual quality, as well as trends of higher NDVI were again associated with all four bermudagrass entries. ‘Meyer’ zoysiagrass, which is the C4 turfgrass standard of cold tolerance, was among the slowest for lateral spread and turfgrass cover. Desirable green color retention in November was observed in both bermudagrass and zoysiagrass entries. Additional data on persistence/winter survival will occur following winter 2024-25. It is not known if cold tolerant hybrid bermudagrasses or newer Zoysia japonica selections are adapted to environmental conditions and maintenance practices of golf courses in the upper Midwest. In the Chicago area, only ‘Meyer’ zoysiagrass is currently in use as lawns.