

# Seeded Bermudagrass Water Use, Root and Shoot Growth Under Soil Stresses

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## Goals:

- *Evapotranspiration (ET), drought resistance, rooting/water extraction patterns and shoot responses were determined under field conditions.*
- *Basic cultural programs (fertility, disease/insect, traffic tolerance) were defined.*
- *The genetic stability of these grasses with respect to environment, disease, and insect pressures was determined.*

Bermudagrasses, *Cynodon* spp., are drought resistant grasses in many areas of the southern United States. In the Piedmont region, as well as Udisol and Oxisol soils world-wide, turfgrass root growth can be inhibited by soil stresses: a) high soil strength, and b) acid soil complex, a combination of element toxicities with nutrient deficiencies. Genotypes of bermudagrass may differ in tolerance to these stresses.

This project evaluated the water use, rooting patterns, and best-suited cultural programs for eight seeded bermudagrass genotypes from the USGA-supported breeding program at Oklahoma State University versus two commercial cultivars (Arizona common and PRIMAVERA) under three traffic levels and three nitrogen fertilizer regimes. A summary of the results to date include:

1. The most rapid establishment was observed for PRIMAVERA, 91-2, 91-1, and Arizona (AZ) common, while least was for 91-14, 91-12, and 91-3.
2. AZ common and PRIMAVERA exhibited some winterkill (i.e., 5 to 10%), while no winter injury was noted on the OSU experimentals.
3. Cultivars with consistently higher visual quality and shoot density than AZ common across all N levels (2, 4, and 6 lb. N per 1000 ft<sup>2</sup> per year), and at no traffic or soil compaction were 91-3, 91-15, and 91-4.

4. Under the most severe traffic regime (soil compaction with a power roller plus pressure/tearing on shoot tissues), 91-3 and 91-4 demonstrated improved traffic tolerance, regardless of N level.

5. Evapotranspiration averaged across 39 days in 1994 and 1995 revealed that cultivar differences were present.

PRIMAVERA and 91-15 had 27 % higher ET values than Arizona common.

6. Cultivars which extracted significantly greater water from the 21 to 60 cm soil zone than Arizona common during dry-down periods were 91-1, 91-15, and PRIMAVERA.

Summary of visual quality data for 11 rating dates for all nitrogen levels and traffic treatments except for 6 lb./1000 ft<sup>2</sup> per year and "None" traffic which is based on 14 rating dates. Percent of ratings which were statistically less than (<) or greater than (>) Arizona Common (AZC) by nitrogen level and traffic treatment (None, C = Compaction with heavy roller, and WC = wear plus compaction).

Contrast		2 lb/1000ft <sup>2</sup> per yr		4 lb/1000ft <sup>2</sup> per yr		6 lb/1000ft <sup>2</sup> per yr		Across N level	
Cultivar	Traffic	<AZ com.	>AZ com.	<AZ com.	>AZ com.	<AZ com.	>AZ com.	<AZ com.	>AZ com.
		----- % -----							
PRIMAVERA	None	0	0	9	0	21	0	11	0
91-1	"	0	36	0	18	0	6	0	19
91-2	"	0	18	0	18	0	36	0	25
91-3	"	9	82	0	18	0	36	0	25
91-4	"	0	36	0	55	6	36	3	42
91-10	"	9	9	9	0	6	0	8	3
91-12	"	18	18	18	9	21	6	19	11
91-14	"	9	9	9	9	6	6	8	8
91-15	"	9	64	0	45	6	43	6	50
PRIMAVERA	C	0	0	9	0	36	0	15	0
91-1	"	0	36	0	36	0	0	0	24
91-2	"	0	27	0	73	0	9	0	36
91-3	"	0	64	0	73	9	27	3	55
91-4	"	0	36	0	73	0	27	0	45
91-10	"	0	9	0	9	9	0	3	6
91-12	"	9	9	9	18	27	0	15	12
91-14	"	9	18	9	36	27	0	15	18
91-15	"	9	55	9	55	18	27	12	45
PRIMAVERA	WC	36	0	18	0	9	0	21	0
91-1	"	0	55	0	64	0	18	0	45
91-2	"	0	36	0	55	0	18	0	36
91-3	"	9	55	0	82	0	36	3	58
91-4	"	0	55	0	73	0	36	0	55
91-10	"	0	9	0	9	0	0	0	6
91-12	"	9	18	0	18	18	0	9	12
91-14	"	9	18	0	9	18	18	9	15
91-15	"	9	45	9	9	9	36	9	30