

Choosing the Right Kentucky Bluegrass and Seed Mixtures for Athletic Fields

John C. Stier
Department of Horticulture

INTRODUCTION

Athletic fields composed of similar proportions of Kentucky bluegrass (*Poa pratensis*) and perennial ryegrass (*Lolium perenne*) are desirable for many reasons. Perennial ryegrass (PRG) adds wear tolerance to the turf and minimizes the impact of necrotic ring spot disease (*Leptosphaeria korrae*) of Kentucky bluegrass (KBG). The rhizomes of KBG increase stability of the turf, improve traction, and allow recovery of bare areas. The presence of a significant amount of KBG can minimize the impact of crown rust disease (*Puccinia coronata*) of PRG.

A range of recommendations exists concerning the best proportions of KBG and PRG to use in seed mixes for establishing athletic fields. Some of the recommendations are based on research data, however, a review of the literature shows conflicting results. The conflicting recommendations could be due to differences in the cultivars of KBG.

The purpose of the project was to use specific groups of KBG in mixtures with PRG to determine if the type of KBG chosen affected the species composition of the turf stand. KBG groups were based on the Rutgers system of classification (Murphy et al., 1997). The information will be useful to specify seed mixtures.

MATERIALS AND METHODS

Treatments and plot maintenance.

Location: O.J. Noer Turfgrass Research Facility (Verona, WI)

Soil type: Miami silt loam, pH 6.6

Experimental design: Split-plot, randomized complete block, 3 replications

Treatment arrangement: 6 x 4 factorial (Table 1)

Plot size: Main plots = 4.9 x 1.8 m, sub-plots = 1.2 x 1.8 m each (2.2 m²)

Seeding mixtures were prepared on a w/w basis to be consistent with commercial practices.

Two seeding dates: 12 September 1998 and 9 September 1999

Seeding rate: 196 kg ha⁻¹

Fertility: 245 kg N ha⁻¹ (Table 2)

Mowing: 3.8 cm, 2-3 x weekly, reel mower, clippings returned

Irrigation: Twice weekly to replenish 70% ET

Traffic: Applied September through November with Brinkman Traffic Simulator; 30 simulated football games

Table 1. Factorial arrangement with grass mixtures as main plots and Kentucky bluegrass (KBG) types as sub-plots.

Mixtures †	Seed planted ha⁻¹
95% Kentucky bluegrass, 5% perennial ryegrass	186 kg KBG, 10 kg PRG
85% Kentucky bluegrass, 15% perennial ryegrass	166 kg KBG, 29 kg PRG
75% Kentucky bluegrass, 25% perennial ryegrass	147 kg KBG, 49 kg PRG
65% Kentucky bluegrass, 35% perennial ryegrass	127 kg KBG, 68 kg PRG
50% Kentucky bluegrass, 50% perennial ryegrass	98 kg KBG, 98 kg PRG
25% Kentucky bluegrass, 75% perennial ryegrass	49 kg KBG, 147 kg PRG
KBG types	Cultivars (33% each)
Aggressive	Limousine, Touchdown, Fairfax
BVMG	Cannon, Merit, Viva
Compact	Midnight, Indigo, Alpine
Common	Alene, Kenblue, Ronde

† The same mixture of perennial ryegrass was used in all mixtures: 1:1:1 of ‘Manhattan 3’, ‘Precision’, and ‘SR4200’.

Table 2. Fertilization schedule for seed mixture study.

				1998-99			
Date	24 Nov	2 May	1 Jun	21 Jun	4 Aug	13 Sept	25 Oct
N (kg ha ⁻¹)	37	24	37	49	37	49	49
Formulation	13-25-12	19-25-12	21-3-20	21-3-20	21-3-20	21-3-20	18-3-18
				2000			
		12 May	17 June	17 Aug	20 Sept	7 Oct	
N/1000 ft ²		24	49	49	49	24	
Formulation		18-3-18	18-3-18	18-3-18	18-3-18	21-3-12	

Data collection

Turf quality (1 to 9 scale; 9 = ideal, 5 = lowest acceptable): Rated monthly

Percent turf cover: Rated monthly

Plant counts, optical point quadrat method: Spring, summer, autumn

RESULTS AND DISCUSSION

All seed mixtures initially resulted in a stand composed of more than 50% perennial ryegrass. When seeded to 15% or more ryegrass by weight, the stand contained more than 85% perennial ryegrass the following spring. Both mixtures and KBG type had significant effects on the percentage of KBG present in the turf stand for all dates (Table 3). The aggressive, BVMG, and common types of Kentucky bluegrass resulted in a higher proportion of Kentucky bluegrass than did the common types. Interactions between mixtures and KBG type developed as stands matured. The amount of KBG in the stand increased proportionally to KBG seed mix composition except with the Common types. Common types produced equivalently low proportions of KBG in the swards except at the 95% KBG seed mixture, which still produced a significantly lower proportion of KBG compared to the Aggressive, BVMG or Compact types (Table 4).

Seed mixtures significantly affected turf quality only in May and June of the year following seeding for both studies (Table 5). Mixes which contained at least 75% Kentucky bluegrass of the aggressive, BVMG, or compact types usually provided the highest quality turf during summer and autumn, though the differences were no longer present by the end of the traffic period. The type of Kentucky bluegrass significantly affected turf quality as the turf matured in the 1998 seeding trial; data for the 1999 trial have not yet been collected. Common types usually provided the worst quality turf, while Compact types either provided the best cover or were similar to Aggressive and BVMG types (Fig. A). Interactions occurred sporadically for plots seeded in 1998. No interactions have been observed yet for the 1999 seeding.

As expected the establishment rate was directly proportional to the amount of perennial ryegrass in the seed mixtures (Fig. B). By spring of the year following planting all seed mixtures provided over 90% turf cover except the mixes containing 95% Kentucky bluegrass which yielded slightly less cover (data not shown). The KBG:PRG seed mixture regularly affected turf cover throughout the study (Table 6). During the first nine months after seeding, plots seeded to 50% or more PRG had the best cover, 96-98% (data not shown). Eleven months after seeding plots seeded to 85% or more KBG provided the best cover, 99-100%. By thirteen months after seeding, plots seeded to 65% or more KBG had the best turf cover.

The type of Kentucky bluegrass significantly affected turf cover as the stand matured, particularly in the second year after establishment. Compact types typically yielded the highest turf cover followed by or equivalent to Aggressive and BVMG types (Fig C). These data correlated with the increase in Kentucky bluegrass composition of the turf stand for these types of KBG. The proportion of Kentucky bluegrass in the sward increased over time for aggressive, compact, and BVMG types but not for common types (Table 4).

Weed infestation depended on the seed mixture planted and age of the stand (Fig. D). Weed infestation was most severe in plots seeded to the 95% KBG mixes in turf less than 12 months age; by the second season weed infestation was least in plots seeded to 95% KBG as Kentucky bluegrass plants increased in size and number.

CONCLUSIONS

Aggressive, BVMG, and Compact KBG types resulted in similar proportions of Kentucky bluegrass 12 months and later following establishment

Aggressive, BVMG, and Compact types increased as a proportion of the turf stand during the first 12 months of establishment, after which a stasis was achieved.

Only the Common types of Kentucky bluegrass failed to compete with perennial ryegrass

The effects of KBG type on turf quality and cover became apparent only as the stand aged.

Over time (> 12 months) the best quality was obtained with Compact types, followed by Aggressive, followed and often equalled by BVMG.

Worst turf quality and cover was obtained when Common types were in the seed mix.

The minor differences among Aggressive, BVMG, and Compact KBG types suggest any type(s) other than Common can be mixed with perennial ryegrass to produce a turf composed of approximately 50% of either species within two years of establishment given: 1) no overseeding, and 2) The seed mixture contains at least 65% KBG by weight.

LITERATURE CITED

Murphy, J.A., S. Bonos, P. Perdomo. 1997. Classification of *Poa pratensis* genotypes. Int. Turfgrass Soc. Res. J. 8(2):1176-1183.

Table 4. The effect of Kentucky bluegrass:perennial ryegrass (KBG:PRG) seed mixtures on the amount of KBG in a sward depends on the type of KBG cultivar (Verona, WI).

	1998 planting			
	November 1999			
KBG:PRG mixture (w/w)	Aggressive	BVMG	Compact	Common
95:5	71.7	67.3	65.0	44.3
85:15	45.3	43.0	45.3	12.3
75:25	39.3	28.7	30.3	11.0
65:35	30.3	35.0	22.7	10.0
50:50	17.3	20.0	10.3	4.7
25:75	8.7	10.3	7.3	1.3
LSD _{.05} w/in mixture	9.3			
LSD _{.05} between mixes & types	8.5			
	May 2000			
KBG:PRG mixture (w/w)	Aggressive	BVMG	Compact	Common
95:5	77.3	64.7	63.0	37.3
85:15	67.7	32.3	38.0	11.7
75:25	47.3	37.3	36.0	9.3
65:35	44.3	36.0	28.3	6.3
50:50	27.0	20.0	17.7	3.3
25:75	18.7	17.0	12.3	4.3
LSD _{.05} w/in mixture	11.5			
LSD _{.05} between mixes & types	11.5			
	Aug 2000			
KBG:PRG mixture (w/w)	Aggressive	BVMG	Compact	Common
95:5	80.7	72.0	66.3	33.0
85:15	68.0	54.0	55.0	9.7
75:25	58.0	49.3	44.7	9.0
65:35	52.0	38.7	41.7	7.7
50:50	42.7	35.3	28.3	6.7
25:75	26.7	19.0	19.0	2.3
LSD _{.05} w/in mixture	11.1			
LSD _{.05} between mixes & types	10.8			
	1999 planting			
	Aug 2000			
KBG:PRG mixture (w/w)	Aggressive	BVMG	Compact	Common
95:5	43.7	45.0	37.0	19.7
85:15	24.0	19.7	15.3	5.7
75:25	19.7	17.7	6.0	3.7
65:35	13.3	10.7	4.7	3.0
50:50	8.3	11.3	3.0	2.0
25:75	2.0	6.3	1.0	2.0
LSD _{.05} w/in mixture	7.3			
LSD _{.05} between mixes & types	7.7			

Table 3. Analysis of variance for percent Kentucky bluegrass (KBG) in turf stand following establishment.

Source	1998 seeding					1999 seeding		
	% KBG							
	May 99	Aug 99	Nov 99	May 00	Aug 00		May 00	Aug 00
Replication	ns	**	ns	ns	ns		ns	ns
Mixture (M)	**	**	**	**	**		**	**
KBG type	**	**	**	**	**		*	**
M x KBG	ns	ns	**	*	*		ns	**

Table 5. Analysis of variance for quality ratings of seed mixture study.

Treatment	1998 seeding										
	1999							2000			
	May	Jun	July	Aug	Sept	Oct	Nov	May	June	July	Aug
Replication	ns	ns	ns	---	ns	ns	ns	ns	ns	ns	ns
Mixture (M)	**	**	ns	---	ns	ns	ns	ns	ns	ns	ns
KBG type	*	ns	**	---	*	*	ns	**	**	**	**
M x KBG	*	ns	*	---	ns	.0535	ns	ns	**	*	ns
	1999 seeding										
	2000										
	May	Jun	July	Aug	Sept	Oct	Nov				
Replication	ns	ns	ns	ns	NA†	NA	NA				
Mixture (M)	**	**	ns	ns	NA	NA	NA				
KBG type	ns	ns	ns	ns	NA	NA	NA				
M x KBG	*	ns	ns	ns	NA	NA	NA				

† NA = data not available.

Table 6. Analysis of variance for percent cover of Kentucky bluegrass:perennial ryegrass (KBG:PRG) seed mixtures.

Source	1998 seeding												
	1998	Year 1 (1999)							Year 2 (2000)				
	Oct	May	Jun	July	Aug	Sept	Oct	Nov		May	June	July	Aug
Replication	ns	ns	ns	ns	---	*	*	ns		ns	*	ns	ns
Mixture	**	**	**	*	---	*	ns	*		ns	**	*	ns
KBG type	ns	ns	ns	**	---	ns	*	ns		**	**	**	**
M x KBG	ns	ns	*	.0553	---	ns	ns	ns		*	**	ns	ns
	1999 seeding												
	1999	Year 1 (2000)											
	Oct	May	Jun	July	Aug	Sept	Oct	Nov					
Replication	*	ns	ns	ns	ns	NA†	NA	NA					
Mixture	**	**	**	ns	ns	NA	NA	NA					
KBG type	ns	ns	ns	ns	ns	NA	NA	NA					
M x KBG	ns	ns	ns	ns	ns	NA	NA	NA					

† NA = data not available.