The Effect of Blue fescue Over-seeding on Buffalograss Genotype Turfgrass Performance

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Abstract

Buffalograss [*Buchloe dactyloides* (Nutt.) Engelm.] turf is limited by its dormancy and lack of green color in early spring and late fall. This native grass has excellent stress tolerance and minimum input requirement that shouldn't be compromised by its warm-season turfgrass characteristics. Research was conducted to determine the effect of blue fescue over-seeding rates on buffalograss genotypic performance. Eight buffalograss genotypes were over-seeded with three blue fescue seeding rates, in a split plot design with three replications. Significant differences were observed between years, seeding rates, and genotypes for most traits but not for interactions. Differences between the control and the seeding rates demonstrated that over-seeding blue fescue enhanced the overall spring green-up, turfgrass color, stand density, species plant count and turfgrass quality of the mixture. The effects were more pronounced in late autumn and early spring. The 5 gm^{-2} overseeding rate resulted in significant green color retention and turfgrass quality enhancement over the control in autumn with less species competition and seed required. Legacy had the highest overall performance. Buffalograss genotype over-seeded with blue fescue determines the overall turf performance of the mixture.

Introduction

Buffalograss [*Buchloe dactyloides* (Nutt.) Engelm.] is a native warm season perennial grass predominately grown in the Great Plain of North America (Shearman, et al., 2004). It is well adapted to the different biotic, abiotic and edaphic conditions of the region. Recently buffalograss is getting great momentum for its turf quality on home lawns, sport fields, utility, gulf course fairways and greens, soil conservation and erosion control (Shearman et. al, 2004).

Buffalograss aesthetic value decreases as temperatures decline below normal for the grass. The plants turn brown and become dormant early in fall and remains dormant until late spring which are limiting factors in this turf. Buffalograss has numerous advantages (Beard and Kim, 1989; Engelke and Hickey, 1985). These attributes shouldn't be compromised by a short period of brown color and thus lower quality turf during late fall and early spring.

Overseeding cool season grasses in buffalograss was found to improve the performance of the turf. Cool season grasses actively germinate, and establish live green turf while buffalograss plants are dormant. This was commonly practiced in southern USA (Longer, 1998; Foy, 1998), though there were some difficulties in maintaining the optimum botanical composition of the species (Beard, 1973; Johnson, 2003). Severmutulu et al., (2005) by overseeding buffalograss turf with fine-leaved fescues have found the highest turfgrass quality, color and green cover ratings in experiment carried near Mead, NE. Blue fescues have a fine textured leaves, well adapted to dry situations (Hansen, et al., 1969) and are good choices for low-maintenance lawns (Roberts, 1990).

Thus the objectives of this experiment are:

1. To determine the compatibility of buffalograss genotypes with blue fescue on the overall performance of the mixture and;
2. To determine the effects of blue fescue overseeding rates in buffalograss turf on blue fescue establishment and the overall turfgrass color and quality.

Materials and methods

Eight buffalograss genotypes were established on silty-clay loam at Mead, NE in 2003/4. A randomized complete block design with split plot treatment arrangement was used. Blue fescue seeding rates were considered as main plots while buffalograss genotypes were considered as subplots. The treatments were replicated three times. Matured stands of buffalograss genotypes were mowed at 25mm height and clippings removed. Single core cultivation was done in fall of 2004. Then blue fescue cultivar 'SR 3200' seeds were broadcasted at 0, 5 and 10 g m^{-2} uniformly to the main plots. 5 g N m^{-2} (16N-11P-10K) was applied after overseeding and irrigated 3 times daily at 6 mm for three weeks. Later the plots received 12 mm water weekly during the growing season. The turf was mowed at 50 mm weekly and the clippings were returned. After establishment the turf received 25 mm of water as rain or irrigation per month and 10g m^{-2} of N half applied in June and the remaining half applied in July every season. The stand was mowed at 1.6 cm every time.

Assessments were made on spring green-up, turf color, shoot density, stand count and turf quality. Data were analyzed using PROC GLM (SAS Institute, 1999) and means were separated by Fischer's least significant differences (P<0.05). Analyses of variances for all turf traits and their mean tables were prepared.

Results and Discussion

Seed Rate:

Significant differences were observed among the seed rates and genotypes for most traits (Tables 1 and 2) but not for most interactions. Average spring green-up increased from 3.4 for the control to 4.3 and 5.5 ratings for the 5 and 10 gm^{-2} seeding rates respectively (Table 3). Turf color improved from 110% to 115 % over the control by 5 and 10 gm^{-2} seeding rates respectively. The 5 gm^{-2} blue fescue over-seeding rate improved all trait performance over the control (Table 3). Thus the 5 g m^{-2} blue fescue over-seeding rate is considered near optimum for significant performance under uniform distribution and germination of seeds. Similarly, Watschke and Schmidt (1992) in their review article reported that establishment conditions influence seeding rate recommendations.

Table 1. ANOVA for spring green-up, color, density and species plant count of buffalograss genotypes overseeded with blue fescue, grown at Mead, NE in 2005 and 2006.

		Mean Squares				
		Green-up	Color	Density	Species Count	
Source	df				Buffalograss	Blue fescue
Rep	2	0.8	0.5	2.9	397.1	2257.4
Year (Y)	1	0.3NS	36.0*	87.1*	5954.7NS	13708.5NS
Error a	2	6.9	0.9	3.9	1912.0	15441.8
Seed Rate (SR)	2	53.2**	6.9**	4.9**	79325.3**	541199.3**
Y x SR	2	0.5NS	9.3**	1.9NS	1964.2NS	3439.6NS
Error b	8	1.2	0.8	0.5	597.3	4399.5
Genotypes (C)	7	6.4**	2.6**	3.6**	1118.1*	1510.1NS
Y x C	7	0.8NS	1.5**	3.2**	478.1NS	2501.3NS
SR x C	14	0.4NS	0.3NS	0.3NS	1018.1*	2405.2*
Y x SR x C	14	0.3NS	0.6NS	0.1NS	207.4NS	1314.3NS
Error c	84	0.5	0.5	0.4	435.1	1262.8
R^2		82	80	83	85	92
C.V. (%)		16.0	10.0	10.3	21.2	29.0

Stand Density and Composition:

Blue fescue over-seeding rates have significant effect on stand density and composition. Average species plant counts have shown 173 to 183 % increase in number of plants per unit area as compared to buffalograss monostand (Table 3). The mixture consisted of 71% blue fescue and 29% buffalograss plants per unit area. Severmutulu et. al. (2005) and Johnson (2003) reported that botanical composition of the mixtures over-seeded in fall reached 75 - 80 % fine fescue and 20-25% buffalograss. The number of buffalograss plants per m^2 decreased significantly by over-seeding blue fescue while the number of blue fescue plants per m^2 didn't increase significantly by doubling the seed rate from 5 to 10g m^{-2}. The reduction in number of buffalograss plants per unit area when over-seeded with blue fescue might be due to competition between the species.

Table 2. ANOVA for quality of buffalograss genotypes over-seeded with blue fescue, grown at Mead, NE. in 2005 and 2006.

Source	df	Quality Mean Squares				
		June	July	August	September	October
Rep	2	6.0	13.4	11.3	13.6	21.3
Year (Y)	1	6.7NS	4.0NS	1.2NS	9.0NS	14.1NS
Error a	2	2.2	3.6	3.3	1.9	14.1
Seed Rate (SR)	2	1.6NS	15.4**	24.1**	59.4**	95.1**
Y x SR	2	5.7**	5.2NS	0.9NS	10.4NS	40.2**
Error b	8	0.4	1.3	1.3	2.4	4.0
Genotypes (C)	7	11.0**	3.8**	2.0**	3.7**	4.3**
Y x C	7	0.9NS	0.6NS	1.1NS	1.6NS	3.2**
SR x C	14	0.4NS	0.4NS	0.9NS	0.7NS	1.4NS
Y x SR x C	14	0.3NS	0.4NS	0.5NS	0.4NS	0.5NS
Error c	84	0.5	0.5	0.6	0.8	1.3
R^2		77	78	74	80	81
C.V. (%)		12.6	11.9	13.7	18.9	33.2

An overall average of 127 to 136 % quality improvement was obtained over the control across years and months (Table 3). Over-seeding blue fescue on buffalograss increased turf quality by improving spring green-up, stand density, ground cover, and turf color as well as green color retention of the turf. These improvements are more pronounced during the late fall and early spring when buffalograss plants are brown and dormant. In Utah, Johnson (2003) reported buffalograss-blue fescue mixture provided the best overall quality and uniformity compared to the other fine fescue–buffalograss mixtures. Severmutlu et. al. (2005) also found buffalograss-blue fescue performance maintained acceptable quality ratings of the mixture during summer stress. By over-seeding buffalograss with blue fescue, it is possible to improve the overall spring green-up, turf color, plant population per unit area and quality of the turf.

Table 3. The overall mean performance of buffalograss traits and plant counts scored by over-seeding blue fescue, Mead, NE. in 2005 and 2006.

Trait	Seed rate (g m^{-2})			
	0	5	10	LSD
Spring Green-up	3.4	4.5	5.5	0.3
Color	5.5	6.1	6.3	0.4
Density	6.0	6.1	6.6	0.3
Quality June	5.5	5.4	5.7	0.3
Quality July	5.0	6.1	6.0	0.5
Quality August	4.7	5.8	6.0	0.5
Quality September	3.4	4.9	5.6	0.7
Quality October	1.9	3.9	4.6	0.9
Buffalograss count	145.2	73.4	76.4	8.5

Buffalograss genotypes:

Significant differences exist among buffalograss genotypes tested for spring green-up, stand density and quality, and species plant counts. Legacy, and Texoka greened-up early while Prestige, and Cody greened-up late. The number of buffalograss plants per unit area were significant among the genotypes. Buffalograss genotypes with more number of blue fescues have better overall performance than that of buffalograss genotypes with less number of blue fescue plants. Legacy maintained good turf color across the seeding rates, while FW-3 and 378 maintained the least. Cody turf color has improved from among the least for control to among the best for the highest seed rate mixture. Legacy is the only cultivar with constant superior performance for all traits across the seeding rates. Established buffalograss cultivar to be overseeded with blue fescue determines the overall turf performance of the mixture. Hence careful selection of the right buffalograss cultivar that possesses better adaptation and compatibility with blue fescue need be used.

Table 4. The overall mean quality performance of buffalograss by over-seeding blue fescue, grown at Mead, NE in 2005 and 2006.

Genotype	Quality traits					
	June	July	August	September	October	Mean
Legacy	6.8	6.6	6.0	5.3	4.1	6.1
378	4.9	5.8	5.7	4.4	3.4	5.1
Cody	5.0	5.4	5.8	5.1	3.9	5.3
NTG7	5.1	5.1	5.2	4.2	3.2	4.9
86-120	6.7	5.9	5.2	4.1	2.7	5.4
Texoka	5.2	5.3	5.5	4.8	3.9	5.2
Prestige	5.1	5.9	5.5	4.8	3.2	5.3
FW-3	5.3	5.5	5.1	4.2	3.1	5.0
Mean	5.5	5.7	5.5	4.6	3.5	5.3
LSD	0.5	0.4	0.5	0.6	0.8	

Summary and Conclusion

Significant differences were observed among seeding rates and genotypes for most traits but not for most interactions. Over-seeding blue fescue on buffalograss enhanced spring green-up, turf color, stand density and the overall quality of the mixture. Improvement of 126 to 161% for spring green-up, 114-115% for turf color, 102-110 % for stand density and 127-136 % for quality were observed for 5 and 10 gm^{-2} rates over the control respectively. Most of the differences were between the control and 5 gm^{-2} seeding rate. Thus, the 5 g m^{-2} blue fescue overseeding rate on buffalograss is recommended since it resulted in more significant spring green-up, turf color, stand density and quality enhancement over the control. Uniform distribution and germination of blue fescues seeds were important in determining improvement rate over the control. An established buffalograss turf thus need to be complemented with an actively growing blue fescue turf cover during an extended period of low temperature in late fall and/or early spring. Species or cultivar of specie that best fits the site needs should be determined. Mix of blue fescue-buffalograss creates a more attractive texture with better green color than pure buffalograss monostand in Nebraska. Legacy with blue fescue mixture produced the best overall turf quality and darkest green color while NTG7 and FW-3 the least. Thus selecting the right blue fescue genotypes, with optimum overseeding rates, and optimum planting time insure maximum growth and best overall performance of the turf.

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