

The evaluation of novel hybrid bluegrass in northwest Oklahoma as low-input turf

Objectives:

1. Obtain second year performance data on hybrids derived from Texas x Kentucky crosses that were seeded in late September 2014 at USDA-ARS in Woodward Oklahoma.
2. Determine seed yield and viability from seeds harvested in 2015 & 16.

As water use restrictions continue to increase, there is a need for turf-grass with improved performance under hot and dry conditions. Seed producing hybrids derived from crosses between Texas and Kentucky bluegrass were selected in an effort to develop low-input turf with these traits. After establishment, turf quality ratings in the low input trial on 6-17-15 (Table 1; Fig 1) indicated hybrids #57 and #67 contained turf quality ratings 6.3 and 6.0 respectively and were not significantly different from the Kentucky or hybrid checks. From 6-17-15 to 8-25-15 weather conditions became much hotter, drier, and windier. Three consecutive days in early August (8-6 to 8-8) were particularly stressful with daily highs ranging from 100 - 104°, constant wind speeds 20 – 30 mph, and no rain. Hybrids #67, TK24 SPS, and TK43xTrenton-35:24 were not significantly different from SolarGreen (Table 1; Fig 1) (rating = 4.5). Most of the other hybrids or checks either entered dormancy or started to die during this period. By mid-November 2015, in the low input trial, many of the hybrids and Kentucky checks did not persist through the summer. Hybrid #67 continued to appear to contain greater heat/drought tolerance than most of the other hybrids and Kentucky checks. The gusty sandblasting conditions created erosion that made mowing difficult. By late May 2016, hybrid #67 contained the highest turf quality rating of all the experimental hybrids (Fig 2). In the second year as conditions became hotter and drier, pure Texas bluegrass D4 began to display the ability to remain green and productive longer than many of the other entries (Fig 2). In late June the ability to irrigate the medium trial was lost due to a technical problem. The hot, dry and windy conditions gradually caused the majority of the entries in both the low and medium input trials to turn brown and eventually die (Fig 2). Seed yield varied for harvests in 2015 and 16 (Fig 3). Some of the entries including #57 severely declined from 2015 to 2016 resulting in a reduced seed yield. Seeds from 2015&16 harvests and additional hybrids are currently being re-evaluated at Woodward in 2x2 plots that were seeded on 10-19-16 (Fig 3). Ten hybrids that germinated fair to good in two weeks are scheduled to be tested in larger plots in Stillwater OK (OSU).

Summary:

>After two years of evaluation a limited number of the hybrids appeared to have greater heat tolerance than the Kentucky checks.

>Seed production varied by hybrid and harvest year.

>Based on seed production and germination, six hybrids in the current trial and four recently identified hybrids are in the process or scheduled for further evaluation at Woodward USDA-ARS and at Stillwater (OSU).

Table 1. Characteristics and performance of hybrids and checks in the low and medium input seeded turf trial

ID	Medium	N	11-20-14	2-13-15	4-29-15	6-17-15	8-25-15	9-17-15	11-4-15	3-1-16	4-4-16	5-25-16	7-15-16	8-29-16	9-27-16	10-9-15	4-29-15	10-9-15
			Germ	TQ	TQ	TQ	TQ	TQ	TQ	TQ	TQ	TQ	TQ	TQ	Spread (cm)	Density	Texture	Color
Seeded 9-24-14																		
#125 Tkiso	3	7.0 a	7.3 a	5.0 bc	5.0 def	3.0 bcdef	4.0 bcdef	4.3 abc	4.3 abc	3.7 bcd	4.7 bcd	3.7 abcd	3.0 abcd	61.7 abcd	5.0 abcde	4.0 cde	5.3 abcd	
#21 D4-10xPoland	3	5.3 abc	6.3 abc	5.0 bc	4.0 fg	1.0 f	1.3 gh	1.7 de	2.3 de	2.0 efg	3.0 def	2.0 def	1.7 de	30.0 ef	3.0 ef	6.0 a	4.7 cd	
#50 TK43xTrenton	3	4.3 bcde	3.7 de	3.3 d	3.3 gh	1.3 ef	2.0 fgh	1.7 de	1.7 de	1.7 fg	2.3 ef	1.7 ef	1.7 de	30.0 ef	3.0 ef	3.0 efg	5.5 abcd	
#56 WL63xRussian	3	2.0 efg	2.0 e	1.7 e	2.3 h	1.0 f	1.0 h	1.0 e	1.3 e	1.3 g	2.0 f	1.0 f	0.7 e	15.0 f	1.3 f	4.0 cde	5.0 bcd	
#57 TK43xTrenton	3	2.3 defg	2.0 e	6.3 ab	6.3 abc	3.3 abcde	5.0 abcde	5.0 abc	3.3 bcd	4.3 bc	4.0 cde	2.0 def	2.0 cde	38.7 cdef	6.0 abc	4.3 bcd	4.7 cd	
#67 TK24xHuntsville	3	3.0 cdefg	4.0 cde	5.0 bc	5.3 cde	3.3 abcde	3.3 defg	3.3 bcde	2.0 de	2.0 efg	3.0 def	2.0 def	1.7 de	33.3 ef	4.0 cde	3.3 def	6.7 a	
#71 TK24xHuntsville	2	4.0 bcdef	4.5 bcde	3.0 de	3.5 gh	2.5 cdef	3.5 cdef	3.0 cde	2.5 de	3.0 cdef	4.0 cde	2.5 cdef	1.5 de	28.0 ef	4.5 bcde	4.0 cde	6.5 ab	
#87 WL63xRussian	2	1.5 fg	2.0 e	3.0 de	4.5 efg	3.5 abcd	4.0 bcdef	4.5 abc	3.0 cde	2.0 efg	4.0 cde	2.0 def	2.0 cde	35.0 ef	6.0 abc	3.5 def	6.0 abc	
(TK43xTrenton)xRussian	3	2.7 defg	2.7 e	3.0 de	4.0 fg	4.0 abcd	4.7 abcde	3.3 bcde	5.3 a	4.0 bc	4.0 cde	3.7 abcd	4.0 ab	66.7 ab	5.3 abcde	3.7 def	6.0 abc	
TK24 SPS	2	1.0 g	2.0 e	3.0 de	4.0 fg	5.0 ab	4.0 bcdef	4.0 abcd	6.0 a	4.5 bc	4.5 bcd	2.5 cdef	2.0 cde	37.5 def	7.0 a	2.5 fg	4.0 d	
TK43xTrenton WT35:24	2	2.5 defg	3.0 e	4.0 cd	4.5 efg	4.5 abc	5.5 abc	4.5 abc	4.5 abc	4.0 bc	4.5 bcd	4.5 a	4.5 a	65.0 abc	6.5 ab	3.0 efg	5.0 bcd	
Texas-D4	3	2.3 defg	2.7 e	2.7 de	3.3 gh	3.0 bcdef	4.0 bcdef	4.7 abc	6.0 a	6.7 a	5.0 abc	4.0 abc	4.3 a	66.7 ab	5.7 abc	3.3 def	4.0 d	
Absolute	3	4.3 bcde	3.7 de	5.7 ab	6.0 abcd	4.3 abc	4.3 abcde	4.7 abc	3.3 bcd	4.0 bc	5.0 abc	3.0 abcde	2.0 cde	33.3 ef	6.3 ab	5.3 ab	6.7 a	
Bandera	3	4.7 abcd	5.7 abcd	6.0 ab	5.0 def	2.0 def	3.0 efg	2.7 cde	2.0 de	2.3 defg	4.0 cde	2.0 def	1.7 de	13.3 f	3.3 def	4.0 cde	4.7 cd	
Midnight	3	6.3 ab	5.7 abcd	6.3 ab	7.0 a	4.7 ab	5.7 ab	6.3 a	5.0 ab	4.7 b	6.7 a	2.7 bcdef	2.0 cde	43.3 bcde	6.7 ab	5.3 ab	6.7 a	
SolarGreen	3	6.0 ab	6.7 ab	6.7 a	6.7 ab	5.3 a	6.3 a	5.7 ab	4.7 abc	4.7 b	6.0 ab	4.7 a	3.7 abc	70.0 a	7.0 a	2.0 g	5.0 bcd	
ThermalBlue	3	6.5 ab	5.7 abcd	6.3 ab	5.7 bcde	4.0 abcd	5.3 abcd	4.3 abc	4.3 abc	4.0 bc	5.7 abc	4.3 ab	3.7 abc	70.0 a	6.0 abc	2.7 fg	5.0 bcd	
Tsunami	2	4.5 abcde	4.0 cde	6.5 a	6.5 abc	4.0 abcd	4.5 abcde	5.0 abc	3.0 cde	3.5 bcde	6.0 ab	3.0 abcde	2.5 bcd	50.0 abcde	6.0 abc	5.0 abc	6.5 ab	
Low																		
Seeded 9-25-14																		
#125 Tkiso	3	9.0 a	8.7 a	5.7 abcd	4.0 cd	1.7 ef	2.0 cde	1.3 cde	2.7 de	2.7 defg	3.3 efg	2.7 def	2.0 de	36.7 cde	2.7 def	6.0 bc	4.3 de	
#21 D4-10xPoland	3	6.3 cde	7.3 abc	4.7 cdef	3.7 d	1.3 f	1.0 e	1.0 de	1.0 f	1.3 fg	2.3 fg	1.7 efg	1.0 efg	20.0 efg	1.3 f	7.3 a	5.0 bcde	
#50 TK43xTrenton	3	6.7 bcde	6.3 abcd	3.0 g	4.0 cd	1.0 f	1.0 e	0.7 e	0.7 f	1.0 g	2.0 g	0.7 g	0.0 g	10.0 fg	1.0 f	3.7 fgh	4.7 cde	
#56 WL63xRussian	2	5.5 def	6.5 abcd	3.5 fg	4.0 cd	1.5 ef	2.0 cde	1.0 de	1.0 f	2.0 efg	3.0 efg	2.0 defg	1.5 def	27.5 def	2.0 ef	3.0 hi	5.0 bcde	
#57 TK43xTrenton	3	3.7 fg	4.7 defg	6.0 abc	6.3 a	1.0 f	1.0 e	1.0 de	0.7 f	1.0 g	2.3 fg	1.0 g	1.3 def	16.7 fg	1.0 f	5.0 cde	4.0 e	
#67 TK24xHuntsville	3	7.7 abc	7.3 abc	6.3 ab	6.0 a	4.0 abc	3.7 abc	2.3 abcd	3.7 cd	4.3 bcd	5.3 abcd	3.0 de	2.3 cd	46.7 bcd	4.3 bcd	4.3 efg	6.7 a	
#71 TK24xHuntsville	2	5.5 def	6.0 bcde	4.5 def	4.0 cd	2.0 def	2.5 cde	1.5 cde	2.0 ef	2.0 efg	3.5 defg	2.5 def	2.0 de	28.5 def	3.0 cdef	3.5 gh	6.0 abc	
#87 WL63xRussian	2	2.0 g	2.5 gh	3.0 g	3.5 d	2.0 def	2.0 cde	1.0 de	0.5 f	1.0 g	2.0 g	1.5 fg	1.0 efg	15.0 efg	3.0 cdef	3.5 gh	4.5 cde	
(TK43xTrenton)xRussian	3	5.0 ef	5.0 cdef	5.0 bcde	4.3 cd	3.7 abc	4.3 ab	3.3 ab	5.0 abc	3.3 cde	4.3 bcde	3.3 cd	3.7 b	55.0 abc	5.3 ab	4.0 efg	5.7 abcd	
TK24 SPS	3	1.7 g	2.0 h	4.3 defg	4.7 bc	4.7 a	5.0 a	2.7 abc	4.3 bc	5.0 abc	4.3 bcde	1.7 efg	2.0 de	30.0 def	6.7 a	2.3 i	6.3 ab	
TK43xTrenton WT35:24	2	2.0 g	3.0 fgh	3.5 fg	4.0 cd	4.0 abc	5.0 a	2.5 abc	5.5 ab	4.0 bcd	4.0 cdef	4.5 bc	4.5 b	62.5 ab	5.0 abc	4.0 efg	6.0 abc	
Texas-D4	3	3.7 fg	3.7 efg	4.0 efg	4.0 cd	3.3 abcd	5.3 a	3.7 a	6.0 a	6.3 a	6.0 ab	5.0 b	6.0 a	71.7 a	5.7 ab	3.3 ghi	5.3 abcde	
Absolute	3	8.0 abc	8.3 ab	7.0 a	5.7 a	1.0 f	1.3 de	1.0 de	1.3 ef	2.7 defg	3.3 efg	1.7 efg	0.3 fg	13.3 fg	1.3 f	4.7 def	5.0 bcde	
Bandera	3	7.3 abcd	6.3 abcd	6.7 a	6.0 a	1.0 f	1.0 e	1.0 de	1.0 f	1.0 g	2.7 efg	1.0 g	0.3 fg	0.0 g	1.0 f	3.7 fgh	4.3 de	
Midnight	3	7.0 abcde	5.0 cdef	6.3 ab	6.0 a	1.3 f	1.0 e	0.7 e	0.7 f	2.0 efg	2.7 efg	1.3 fg	0.0 g	13.3 fg	1.0 f	5.5 bcd	5.0 bcde	
SolarGreen	2	8.5 ab	8.5 a	7.0 a	6.0 a	4.5 ab	5.0 a	3.5 a	5.5 ab	5.5 ab	7.0 a	6.5 a	3.5 bc	65.0 ab	5.5 abc	3.0 hi	5.0 bcde	
ThermalBlue	3	8.7 ab	7.0 abcd	7.0 a	6.0 a	3.0 bcde	3.0 bcd	2.0 bcde	4.0 bcd	4.3 bcd	5.7 abc	5.0 b	4.7 b	60.0 ab	4.0 bcde	3.7 fgh	5.0 bcde	
Tsunami	2	7.0 abcde	6.5 abcd	6.0 abc	5.5 ab	2.5 cdef	2.0 cde	1.5 cde	2.0 ef	3.0 def	5.5 abc	2.5 def	1.5 def	32.5 cdef	3.0 cdef	6.5 ab	5.5 abcd	

Medium-input = 2.5" mowing height; 2 lb N/1000 ft² Spring and Fall; irrigation to prevent stress or dormancy.

Low-input = 3.5" mowing height; 0.75 lb N/1000 ft² / Spring & Fall; no irrigation after establishment.

Germ 1-9 (9 best); TQ=Turf-Quality 0-9 (9 best, 0 dead); Density 1-9 (9 most dense); Texture 1-9 (9 fine); Color 1-9 (9 dark). Means within the same column within a treatment (low or med) containing the same letter are not significantly different ($\alpha = 0.05$).

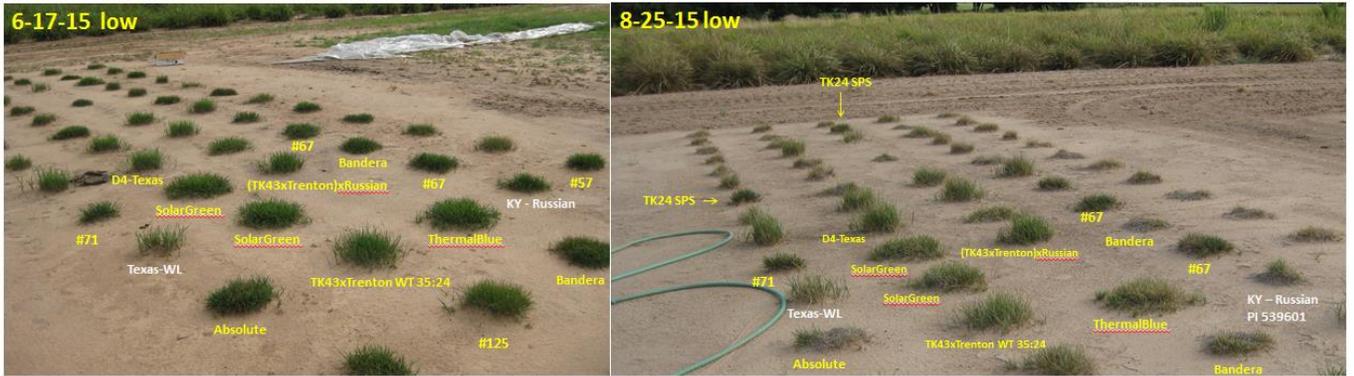


Figure 1. The low input trial photographed on 6-17-15 and in late August when many of the entries started to decline in quality.

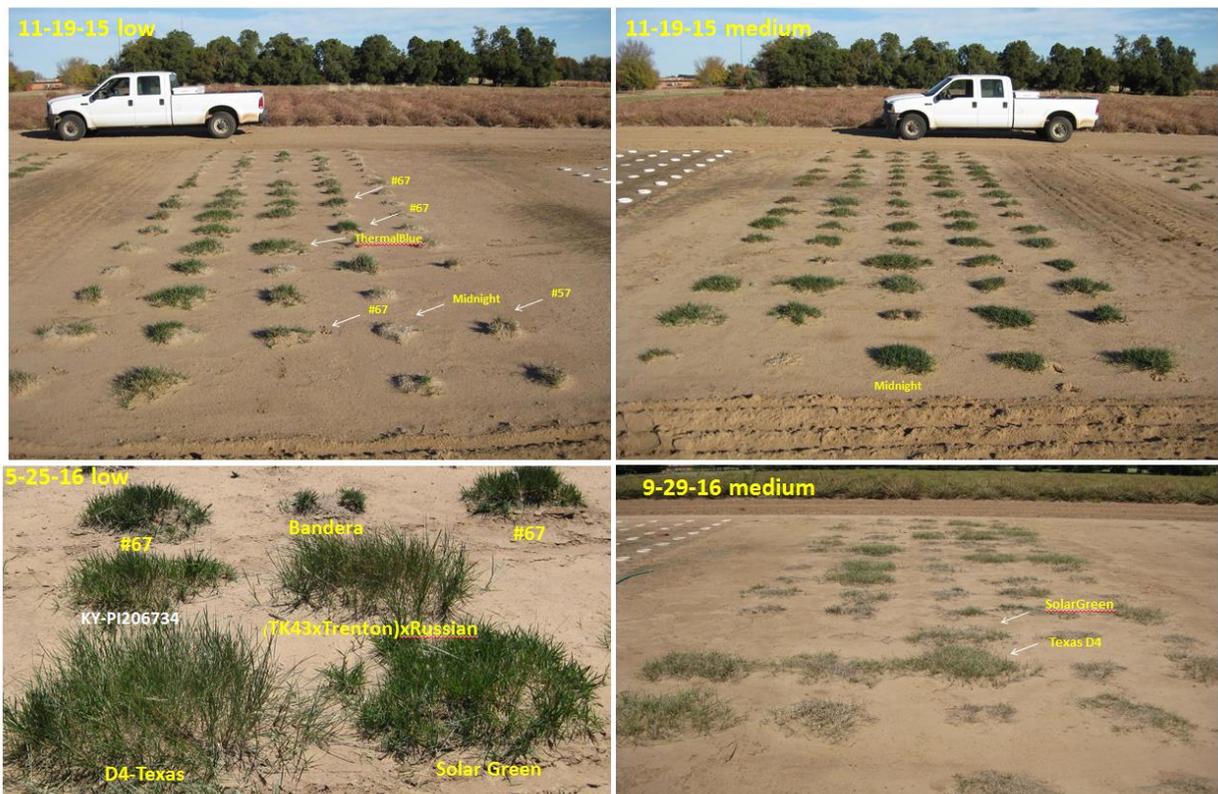


Figure 2. By mid-November 2015, in the low input trial, many of the hybrids and Kentucky checks did not persist through the summer (Top left). In the medium input trial, the addition of irrigation enabled many of the Kentucky checks and hybrids to persist as seen with the difference between Kentucky check Midnight (Top right).



Figure 3. A portion of the seed increase nursery and seed yields obtained in 2015 & 16 and a newly seeded (10-19-16) trial (2 x 2) plots at Woodward ARS.