

Evaluation of Twenty-six Buffalograss Cultivars and Accessions for Use as Turfgrass on the High Plains of West Texas

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ABSTRACT

The development of high quality buffalograss [*Buchloe dactyloides* (Nutt.) Engelm.] is depended on the texture, density, length of growing season and overall turfgrass quality. Twenty-six buffalograss cultivars and accessions were evaluated for their potential as a high quality turfgrass at the Texas Tech University located in Lubbock, TX. The top five turfgrasses that consistently had the best turfgrass quality grown on the High Plains of West Texas were TTU-227, TTU-196, 378, TTU-12 and TTU-232.

KEYWORDS: *Buchloe dactyloides* (Nutt.) Engelm., cultivar evaluation, turfgrass quality

Buffalograss, *Buchloe dactyloides* (Nutt.) Engelm., is a stoloniferous, sod forming, perennial, warm season grass native to North America. Buffalograss is the dominant short grass in the Great Plains and is extremely tolerant to drought, disease, temperature extremes and requires minimal fertilization (Waddington et al., 1992; Wenger, 1943). These traits along with the ability to withstand moderate traffic have led to an increase in the use of buffalograss as a turfgrass (Leuthold, 1982; Riordan, 1991). Buffalograss has been increasingly evaluated for its potential as a low maintenance turfgrass (Englke and Hickey, 1983; Kneebone, 1984; Pozarnsky, 1983; Wu et al. 1984).

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Buffalograss has typically been described as dioecious, with a few isolated monoecious plants (Savage, 1934). The staminate plant of buffalograss is characterized by a flag-like inflorescence that protrudes an inch or two above the main canopy. The pistillate plants inflorescence is shorter and held in the canopy among the leaves (Beard, 1973). The staminate inflorescence is one of the reasons buffalograss has not been used extensively as a turfgrass. Some new buffalograss cultivars however are comprised of only pistillate plants or have low numbers of staminate flowers.

Buffalograss's tolerance to environmental stresses lies in its ability to go dormant (Shantz, 1911). The onset of dormancy can be induced by temperature (chilling), drought, or photoperiod. Although dormancy has ensured buffalograsses survival in harsh environments it has limited its use as a turfgrass. Buffalograsses have been evaluated that green up early in the spring and enter dormancy later to provide a longer growing season (Kenworthy, 1996, Morris, 2000).

Research has shown that buffalograss requires less irrigation and fertilization than other warm season turfgrasses (Wu et al., 1989). In arid and semiarid climates where water resources are limited buffalograss provides a turfgrass that requires less water and has the ability to withstand periods of drought. Similarly, protection of water resources from nitrate leaching is essential. Buffalograss has a low fertility requirement of 0.0 to 0.4 lbs./nitrogen (N)/month during the growing season as compared to 0.5-1.5 lbs/N/month for bermudagrass (Beard, 1973). The low irrigation, fertility and pesticide requirements of buffalograss save important natural resources and limits environmental contamination. The objective of this study is to evaluate buffalograss cultivars and accessions that produce a high quality turfgrass for use on the High Plains of West Texas.

MATERIALS AND METHODS

Twenty-six buffalograss cultivars and accessions were planted July 1996 at the Texas Tech University Erskine Research Farm in Lubbock, Texas (Table 1). The first 14 cultivars were part of the National Buffalograss Test-1996. The remaining 12 accessions were selected from 273 accessions of native buffalograss collected across the lower Great Plains (Kenworthy, 1996). The soil type was an Amarillo fine sandy soil (fine-loamy, mixed thermic, Aridic Paleustalf). Treatments were arranged as a randomized block design with three replications. Each cultivar or accession was grown in a 10 ft. x 10 ft. area with a 1 ft. border on all sides. The plots were irrigated with sprinklers during establishment and flood irrigated thereafter. Five cultivars were established from seed with the remaining 21 cultivars established vegetatively with four 2 inch plugs per plot (Table 1). Plots were fertilized at a rate of 2-3 lbs. of N/1000ft²/year, mowed at a height of 2 inches every 7 to 10 days irrigated to prevent stress weekly during the growing season.

The twelve accessions evaluated in this study from the Texas Tech University buffalograss germplasm collection had been collected at twelve extremely diverse sites across the lower Great Plains (Table 2). Two of the accessions were diploids (2N=20), three of the accessions were tetraploids (4N=40) and seven accessions were hexaploids (6N=60). These twelve accessions had been phenotypically selected for turfgrass quality during

the collection process and again in replicated plots at Lubbock, Texas during 1995 and 1996 (Kenworthy, 1996). These twelve accessions exhibited the best turfgrass quality of the 273 accessions in this collection.

Turfgrass quality was determined by evaluating leaf texture (1 = coarse to 9 = fine), density (1 = bare to 9 = maximum density) and percent living ground cover (0 to 99). Turfgrass quality ratings were taken monthly from April through August 1997, April through October, 1998, and March through October 1999 and 2000. Turfgrass quality rating are based on a scale of 1 = dormant to 9 = maximum quality turfgrass. All evaluations were based on standards use by the National Turfgrass Evaluation Program (NTEP). Data were analyzed by analysis of variance and means were separated with Fisher's Protected Least Significant Difference Test at the 0.05 level of probability using SAS (SAS, 1989).

RESULTS AND DISCUSSION

Turfgrass is a crop that is evaluated based on its aesthetic qualities over a number of years. The cultivars in this experiment were evaluated over a four-year period evaluating leaf texture, density, percent ground cover and overall turfgrass quality. Leaf texture was taken in the first year after planting in April 1997 (Table 3). There were no significant differences in leaf texture for any of the cultivars or accessions.

Turfgrass density was taken in 1997-99 (Table 3). In 1997, all seeded cultivars, Bam-1000, Bison, Cody, Tatanka and Texoka, had a significantly greater turfgrass density than the vegetative cultivars. This would be attributed to the seeds being spread over the entire 10 ft. x 10 ft. area at planting whereas the vegetative cultivars were established from 4 plugs per plot and had to spread via stolons. The higher density ratings of the vegetative cultivars are an indication of cultivar vigor. All vegetative cultivars and accessions exhibited similar growth rates except Bonnie Brae, 378, TTU-227, TTU-12, TTU-232, TTU-62 and TTU-43 that had a significantly lower density. In 1998, cultivars and accessions TTU-43, 91-118, TTU-232, TTU-175B, TTU-46 and TTU-196 had the greatest density, but only accession TTU-12 and cultivars Texoka and 378 had significantly lower density than the other cultivars. In 1999, Bonnie Brae, 91-118, Stampede, TTU-175B, 86-120, 378, TTU-94B, and UCR-95 had the greatest density, but only Midget, Bam-1000, Bison and Texoka had a significantly lower density than other cultivars and accessions. For the three-year average Cody, Tatanka and Bison had the greatest density. Percent living ground cover was taken in the fall of 1997 through 1999 (Table 3). In 1997, both Bam-1000 and Bison had the highest living ground cover rating at 96%. By the fall of 1997, twelve of the cultivars and accessions had a living ground cover of less than 80%. In 1998, however all but accessions TTU-12, TTU-232, TTU-43 and TTU-62 had similar ground cover rating of greater than 90%. In 1999, all cultivars and accessions had greater than 80% living ground cover except Tatanka, Bonnie Brae and UCR-95. Over the three-year period Cody, Bam-1000, Bison, Texoka, 86-120, TTU-94B, TTU-230A, TTU-84, TTU-17, TTU-175B and TTU-227 had greater than 90% living ground cover.

Turfgrass quality ratings were collected from April through August in 1997 (Table 4). Four of the five seeded cultivars were rated the best overall quality during the first grow-

ing season. This could be attributed to the greater density of these cultivars during the first growing season. The highest rated cultivars in 1997 were Cody and Bam-1000. Four of the top five rated cultivars and accessions were seeded. Quality rating in the first year may be of minimal value as the cultivars and accessions were still being established. After the first growing season quality ratings in 1998 were taken from April through October (Table 5). The highest rated cultivars and accessions in descending order were TTU-227, TTU-196, TTU-175B, UCR-95 and 609. These cultivars and accessions had the highest overall average for the entire growing season. Many of these cultivars and accessions were still receiving high quality rates in October compared to other cultivars and accessions that were beginning to go dormant. In 1999, data were taken from March through October (Table 6). The top five rated cultivars and accessions in descending order were TTU-227, 378, TTU-12, TTU-196 and 609. The March quality rating indicates that some cultivars and accessions were beginning to green-up compared to others that were still dormant. Similarly, in October many of the top cultivars and accessions were still green when others were already dormant. In 2000, cultivars and accessions that had the highest average quality rating in descending order were TTU-196, TTU-227, 378, TTU-12 and Bison (Table 7). The cultivars and accessions that have the highest average quality ratings tended to green-up earlier in the spring and retain color later into the fall. An infestation of white grubs in the fall of 1999 may have influenced individual plot ratings in 2000. These data indicate that over a three year period from 1998 through 2000 that TTU-227, TTU-196, TTU-12 and TTU-232 had similar or better overall quality compared to the standard 378 that was the highest rated standard in this study (Table 8).

The performance of twelve accessions was comparable with the fourteen commercially developed cultivars (Table 8). It was interesting to note that four of the top five accessions were hexaploids. Hexaploids often have longer and coarser leaves but establish dense, vigorous stands. Because ploidy levels were not readily available on the commercial cultivars, direct comparison based on ploidy was not possible. The high turfgrass quality ratings of accessions such as TTU-227 and TTU-196 indicate there is still useful genetic variation for turfgrass quality in buffalograss available in native populations of this grass.

CONCLUSION

This study indicates that accessions TTU-227, TTU-196, TTU-12 and TTU-232 produced a high quality turfgrass for this geographical location as compared to the standard cultivars of Bison, Texoka, 378 and 609. These accessions provide a fine texture and dense turfgrass suited for commercial use. Similarly, these accessions had a long growing season and the highest quality turfgrass. It was interesting that in these evaluations many of the hexaploid accessions produced the highest quality turfgrasses compared to diploid and tetraploid accessions. These accessions have shown great promise grown on the High Plains of West Texas. Further research will be necessary to evaluate these cultivars grown under different environmental conditions such as the NTEP Test.

Table 1. Entry, genotype, propagation method and sponsor of 26 buffalograss cultivars and accessions evaluated at Lubbock TX from 1996 to 2000.

| Entry | Genotype | Propagation method | Sponsor |
|-------|-------------|--------------------|-------------------------|
| 1. | Bam-1000 | Seeded | Bambert Seed Company |
| 2. | Bison | Seeded | Standard entry |
| 3. | Cody | Seeded | Native Turf Group, Inc. |
| 4. | Tatanka | Seeded | Native Turf Group, Inc. |
| 5. | Texoka | Seeded | Standard entry |
| 6. | Bonnie Brae | Vegetative | Horizon Turfgrass |
| 7. | Legacy | Vegetative | Todd Valley Farms, Inc |
| 8. | Midget | Vegetative | Horizon Turfgrass |
| 9. | Stampede | Vegetative | Turfgrass America |
| 10. | UCR-95 | Vegetative | Frontier Hybrids |
| 11. | 86-120 | Vegetative | University of Nebraska |
| 12. | 91-118 | Vegetative | University of Nebraska |
| 13. | 378 | Vegetative | Standard entry |
| 14. | 609 | Vegetative | Standard entry |
| 15. | TTU-12 | Vegetative | Texas Tech University |
| 16. | TTU-17 | Vegetative | Texas Tech University |
| 17. | TTU-43 | Vegetative | Texas Tech University |
| 18. | TTU-46 | Vegetative | Texas Tech University |
| 19. | TTU-62 | Vegetative | Texas Tech University |
| 20. | TTU-84 | Vegetative | Texas Tech University |
| 21. | TTU-94B | Vegetative | Texas Tech University |
| 22. | TTU-175B | Vegetative | Texas Tech University |
| 23. | TTU-196 | Vegetative | Texas Tech University |
| 24. | TTU-227 | Vegetative | Texas Tech University |
| 25. | TTU-230A | Vegetative | Texas Tech University |
| 26. | TTU-232 | Vegetative | Texas Tech University |

Table 2. Chromosome number, ploidy, collection site and proximity of twelve accessions of Buffalograss evaluated for turf quality at Lubbock, Texas from 1997 to 2000.

| Genotype | Chromosome | | Collection Site | | |
|----------|------------|------------|-----------------|-----------|------------------|
| | Number | Ploidy | Latitude | Longitude | Proximity |
| TTU- 12 | 60 | Hexaploid | 36°37' | 100°30' | Canadian, TX |
| TTU- 17 | 60 | Hexaploid | 38°01' | 100°21' | Cimarron, OK |
| TTU- 43 | 60 | Hexaploid | 34°04' | 102°20' | Littlefield, TX |
| TTU- 46 | 20 | Diploid | 34°56' | 102°24' | Hereford, TX |
| TTU- 62 | 40 | Tetraploid | 38°06' | 102°55' | Lamar, CO |
| TTU- 84 | 20 | Diploid | 34°34' | 103°12' | Clovis, NM |
| TTU- 94B | 40 | Tetraploid | 34°58' | 104°51' | Santa Rosa, NM |
| TTU-175B | 40 | Tetraploid | 30°30' | 101°09' | Cornstock, TX |
| TTU-196 | 60 | Hexaploid | 27°35' | 98°38' | Freer, TX |
| TTU-227 | 60 | Hexaploid | 29°59' | 97°53' | Kyle, TX |
| TTU-230A | 60 | Hexaploid | 30°26' | 98°21' | Johnson City, TX |
| TTU-232 | 60 | Hexaploid | 31°07' | 98°04' | Lampasas, TX |

Table 3. Mean leaf texture rating, density rating and percent living ground cover of 26 buffalograss cultivars and accessions evaluated at Lubbock, TX from 1997 to 1999.

| Cultivar | Texture | Density | | | | Percent living ground cover | | | |
|-----------------------------|----------|--------------------|--------|--------|--------|-----------------------------|------|-------|---------|
| | | 1997 | 1998 | 1999 | Avg. | 1997 | 1998 | 1999 | Avg. |
| | -rating- | ----- rating ----- | | | | ----- % ----- | | | |
| Cody | 7.0a | 7.0a | 8.3a-c | 7.7a-d | 7.7a | 89ab | 99a | 86a-c | 91.7a |
| Tatanka | 6.3a | 6.7a | 8.3a-c | 8.0a-c | 7.7a | 83ab | 99a | 77bc | 86.7a-d |
| Bam-1000 | 7.3a | 7.0a | 8.3a-c | 7.0cd | 7.3ab | 96a | 99a | 89a-c | 94.7a |
| Bison | 7.7a | 7.7a | 8.3a-c | 7.0cd | 7.7a | 96a | 98a | 86a-c | 93.3a |
| Texoka | 8.0a | 7.3a | 7.7c | 6.7d | 7.0a-c | 90ab | 99a | 86a-c | 92.0a |
| 91-118 | 4.7a | 4.0b-d | 9.0a | 8.7a | 7.0a-c | 23gh | 99a | 89a-c | 70.7ef |
| 86-120 | 6.0a | 4.0b-d | 8.3a-c | 8.7a | 7.0a-c | 86ab | 99a | 93ab | 92.7a |
| Legacy | 6.3a | 3.3b-e | 8.3a-c | 8.3ab | 6.7b-d | 63b-f | 98a | 99a | 86.7a-d |
| Bonnie Brae | 7.0a | 3.0c-e | 8.3a-c | 8.7a | 6.7b-d | 43d-h | 96ab | 73c | 70.7ef |
| Midget | 5.3a | 4.0b-d | 8.7ab | 7.3b-d | 6.7b-d | 43d-h | 96ab | 86a-c | 75.3de |
| Stampede | 7.0a | 3.3b-e | 8.7ab | 8.7a | 7.0a-c | 63b-f | 95ab | 96a | 84.7a-d |
| UCR-95 | 6.7a | 3.3b-e | 8.7ab | 8.7a | 6.7b-d | 13h | 99a | 73c | 62.0f |
| 609 | 5.3a | 4.7b | 8.7ab | 8.3ab | 7.3ab | 70a-e | 99a | 99a | 89.3ab |
| 378 | 6.3a | 3.0c-e | 7.7c | 8.7a | 6.3cd | 70a-e | 96ab | 99a | 88.3a-c |
| TTU-94B | 7.7a | 4.3bc | 8.3a-c | 8.7a | 7.0a-c | 90ab | 98a | 89a-c | 92.3a |
| TTU-230A | 7.7a | 4.0b-d | 8.7ab | 8.0a-c | 6.7b-d | 90ab | 94ab | 99a | 94.3a |
| TTU-84 | 7.0a | 4.0b-d | 8.3a-c | 8.0a-c | 6.7b-d | 87ab | 99a | 89a-c | 91.7a |
| TTU-17 | 7.0a | 3.7b-d | 8.3a-c | 8.3ab | 7.0a-c | 90ab | 99a | 93ab | 94.0a |
| TTU-232 | 6.7a | 2.0ef | 9.0a | 8.0a-c | 6.3cd | 83ab | 88c | 93ab | 88.0a-c |
| TTU-175B | 7.7a | 3.3b-e | 9.0a | 8.7a | 6.7b-d | 73a-d | 99a | 99a | 90.7ab |
| TTU-12 | 8.0a | 2.0ef | 8.0bc | 8.0a-c | 6.0d | 40e-h | 91bc | 99a | 76.7c-e |
| TTU-196 | 8.0a | 2.2b-d | 9.0a | 8.3ab | 7.0a-c | 40e-h | 99a | 99a | 79.0b-e |
| TTU-46 | 8.0a | 4.0b-d | 9.0a | 8.3ab | 7.0a-c | 83ab | 96ab | 83a-c | 87.3a-c |
| TTU-62 | 7.3a | 2.0ef | 8.3a-c | 8.3ab | 6.3cd | 50c-g | 72d | 90a-c | 70.3ef |
| TTU-43 | 7.7a | 1.0ef | 9.0a | 8.3ab | 6.0d | 37f-h | 87c | 89a-c | 71.0ef |
| TTU-227 | 7.3a | 2.7de | 8.3a-c | 8.0a-c | 6.3cd | 77a-c | 99a | 99a | 91.7a |
| LSD (0.05) | NS | 1.30 | 0.81 | 1.19 | 0.7 | 32.4 | 5.9 | 16.4 | 8.5 |
| Coefficient of Variation | | 20.2% | 5.9% | 8.9% | 6.6% | 29.0% | 3.8% | 11.0% | 11.8% |

Means within column not followed by the same letter differ at the 0.05 level of probability by Fisher's Least Significant Difference Test.

Texture rating = 1= coarse to 9= fine texture.

Density rating = 1= bare to 9= maximum density.

Table 4. Turfgrass quality ratings of 26 cultivars and accessions of buffalograss evaluated at Lubbock, TX in 1997.

| Cultivar | Turfgrass quality rating | | | | | |
|--------------------------|--------------------------|--------|--------|--------|--------|--------|
| | Apr. | May | Jun. | Jul. | Aug. | Avg. |
| | ----- rating ----- | | | | | |
| Texoka | 7.0ab | 8.3a | 9.0a | 8.0ab | 9.7a | 8.4a |
| Bam-1000 | 7.3a | 8.0ab | 9.0a | 8.0ab | 9.7a | 8.4a |
| Cody | 6.7a-c | 8.0ab | 9.0a | 8.0ab | 9.7a | 8.3ab |
| Bison | 7.3a | 7.3bc | 9.0a | 8.0ab | 9.3ab | 8.2a-c |
| TTU-230A | 6.7a-c | 7.3bc | 9.0a | 8.3a | 9.0a-c | 8.1a-c |
| TTU-46 | 6.7a-c | 7.3bc | 9.0a | 8.0ab | 9.0a-c | 8.0a-c |
| TTU-84 | 7.0ab | 7.0cd | 8.3a-c | 8.0ab | 9.0a-c | 7.9a-d |
| Tatanka | 5.3a-e | 8.0ab | 9.0a | 8.0ab | 9.0a-c | 7.9a-d |
| TTU-175B | 6.0a-d | 6.7c-e | 8.3a-c | 8.0ab | 9.3ab | 7.7a-e |
| TTU-94B | 5.3a-e | 7.0cd | 8.7ab | 8.3a | 9.0a-c | 7.7a-e |
| TTU-17 | 6.7a-c | 6.7c-e | 7.7b-d | 7.7a-c | 8.3b-d | 7.4b-f |
| TTU-227 | 5.0a-e | 6.7c-e | 7.7b-d | 8.0ab | 9.0a-c | 7.3c-g |
| Midget | 4.3b-f | 6.7c-e | 7.7b-d | 7.7a-c | 8.7a-d | 7.0d-h |
| 86-120 | 5.7a-d | 6.3d-f | 7.3c-e | 8.0ab | 7.3ef | 6.9d-i |
| 378 | 5.0a-e | 6.3d-f | 7.0d-f | 7.3b-d | 8.7a-d | 6.7e-j |
| Legacy | 4.7a-f | 6.0e-g | 7.3c-e | 7.7a-c | 8.0c-f | 6.7e-j |
| 91-118 | 3.7d-f | 6.3d-f | 7.7b-d | 7.7a-c | 8.3b-d | 6.7e-j |
| TTU-196 | 2.7ef | 6.0e-g | 7.0d-f | 8.0ab | 9.0a-c | 6.5g-k |
| 609 | 5.0a-e | 4.7h | 6.7d-f | 7.7a-c | 8.7a-d | 6.5g-k |
| Bonnie Brae | 4.0c-f | 5.7fg | 7.0d-f | 7.0cd | 8.0c-f | 6.3g-k |
| TTU-232 | 4.0c-f | 6.0e-g | 6.0f | 7.0cd | 8.0c-f | 6.2h-k |
| TTU-12 | 4.0c-f | 5.7fg | 6.3ef | 7.0cd | 7.7d-f | 6.1h-k |
| Stampede | 4.3b-f | 6.0e-g | 6.0f | 6.7d | 7.7d-f | 6.1h-k |
| TTU-62 | 3.3d-f | 5.7fg | 6.7d-f | 7.3b-d | 7.0f | 6.0i-k |
| UCR-95 | 2.0f | 5.3gh | 6.3ef | 7.3b-d | 8.7a-d | 5.9jk |
| TTU-43 | 2.7ef | 5.7fg | 6.0f | 6.7d | 7.0f | 5.6k |
| LSD(0.05) | 2.67 | 0.99 | 1.08 | 0.79 | 1.01 | 0.95 |
| Coefficient of Variation | 32% | 9.3% | 8.6% | 6.3% | 7.2% | 8.2% |

Means within column not followed by the same letter differ at the 0.05 level of probability by Fisher's Least Significant Difference Test.

Turfgrass rating = 1=dead or dormant to 9=maximum turfgrass quality

Table 5. Turfgrass quality ratings of 26 cultivars and accessions of buffalograss evaluated at Lubbock, TX in 1998.

| Cultivar | Turfgrass quality ratings | | | | | | | |
|-----------------------------|---------------------------|-------|--------|--------|--------|--------|--------|--------|
| | Apr. | May | Jun. | Jul. | Aug. | Sep. | Oct. | Avg. |
| | -----rating----- | | | | | | | |
| TTU-227 | 8.7a | 8.7a | 9.0a | 8.7ab | 9.0A | 8.7a | 3.7a-c | 8.0a |
| TTU-196 | 7.3c-e | 8.0ab | 9.0a | 8.7ab | 8.0bc | 8.7a | 5.0a | 7.8ab |
| TTU-175B | 7.7b-d | 8.3ab | 9.0a | 9.0a | 8.0bc | 7.7a-c | 3.0b-d | 7.6a-c |
| UCR-95 | 6.7ef | 7.7bc | 8.7ab | 9.0a | 8.0bc | 8.0ab | 5.0a | 7.5a-d |
| 609 | 8.3ab | 8.0ab | 8.0b-d | 7.3de | 8.0bc | 8.0ab | 4.3ab | 7.4b-e |
| Bison | 7.3c-e | 7.7bc | 8.7ab | 8.3a-c | 7.7b-d | 7.3b-d | 5.0a | 7.4b-e |
| TTU-94B | 7.7b-d | 8.0ab | 8.7ab | 8.3a-c | 7.7b-d | 7.3b-d | 3.0b-d | 7.3b-d |
| Texoka | 7.7b-d | 7.7bc | 8.7ab | 8.3a-c | 7.7b-d | 7.0b-d | 4.3ab | 7.2c-f |
| TTU-46 | 8.3ab | 8.3ab | 8.3a-c | 8.0b-d | 7.3c-e | 7.0b-e | 2.3c-e | 7.2c-g |
| TTU-12 | 8.0a-c | 8.0ab | 8.7ab | 8.3a-c | 7.7b-d | 6.3de | 3.0b-d | 7.2c-g |
| TTU-232 | 7.7b-d | 8.0ab | 8.3a-c | 7.7c-e | 8.3ab | 7.3b-d | 3.0b-d | 7.1c-h |
| Midge | 7.3c-e | 8.0ab | 8.3a-c | 8.3a-c | 7.0de | 7.3b-d | 3.7a-c | 7.1c-h |
| Bam-1000 | 8.0a-c | 8.0ab | 8.7ab | 8.0b-d | 8.0bc | 6.7c-e | 3.0b-d | 7.1d-i |
| TTU-84 | 8.3ab | 8.0ab | 8.3a-c | 8.3a-c | 7.3c-e | 6.7c-e | 2.3c-e | 7.0d-h |
| Cody | 8.0a-c | 8.0ab | 8.7ab | 8.3a-c | 7.7b-d | 6.3de | 2.3c-e | 7.0d-h |
| Tatanka | 8.3ab | 8.0ab | 8.3a-c | 8.3a-c | 7.7b-d | 6.3de | 1.7de | 6.9d-j |
| 378 | 7.7b-d | 7.7bc | 8.0b-d | 7.7c-e | 7.7b-d | 6.7c-e | 2.3c-e | 6.8f-k |
| Legacy | 7.3c-e | 7.7bc | 8.0b-d | 7.7c-e | 7.3c-e | 6.7c-e | 3.0b-d | 6.8f-k |
| TTU-17 | 7.0de | 8.0ab | 8.0b-d | 8.0b-d | 7.7b-d | 6.0e | 3.0b-d | 6.8f-k |
| TTU-230A | 7.0de | 7.7bc | 8.0b-d | 8.3a-c | 7.3c-e | 6.7c-e | 1.7de | 6.7g-k |
| Stampede | 7.3c-e | 7.7bc | 7.7cd | 7.3de | 7.3c-e | 6.7c-e | 2.3c-e | 6.7g-k |
| Bonnie Brae | 6.7ef | 8.0ab | 8.0b-d | 7.7c-e | 7.7b-d | 6.7c-e | 2.3c-e | 6.6h-k |
| 91-118 | 8.0a-c | 7.7bc | 7.7cd | 8.0b-d | 7.7b-d | 6.0e | 1.7de | 6.6i-k |
| TTU-62 | 7.0de | 7.0c | 7.7cd | 7.3de | 7.0de | 6.3de | 3.0b-d | 6.5j-l |
| 86-120 | 7.7b-d | 7.7bc | 7.7cd | 7.3de | 7.3c-e | 6.0e | 1.0e | 6.4kl |
| TTU-43 | 6.0f | 7.0c | 7.3d | 7.0e | 6.7e | 6.0e | 2.3c-e | 6.0l |
| LSD(0.05) | 0.98 | 0.80 | 0.85 | 0.88 | 0.79 | 1.03 | 1.65 | 0.42 |
| Coefficient of variation | 7.9% | 6.2% | 6.2% | 6.7% | 6.3% | 9.0% | 33.8% | 4.6% |

Means within column not followed by the same letter differ at the 0.05 level of probability by Fisher's Least Significant Difference Test.

Turfgrass rating = 1=dead or dormant to 9=maximum turfgrass quality

Table 6. Turfgrass quality ratings of 26 cultivars and accessions of buffalograss evaluated at Lubbock, TX in 1999.

| Cultivar | Turfgrass quality ratings | | | | | | | | |
|--------------------------|---------------------------|--------|--------|-------|-------|--------|--------|-------|--------|
| | Mar. | Apr. | May | Jun. | Jul. | Aug. | Sep. | Oct. | Avg. |
| | -----rating----- | | | | | | | | |
| TTU-227 | 2.0ab | 5.0c | 6.3de | 8.0a | 9.0a | 7.7ab | 4.7a | 2.3a | 5.6a |
| 378 | 2.0ab | 6.3a | 7.7ab | 7.7ab | 8.3bc | 8.0a | 2.3b-d | 1.0b | 5.4ab |
| TTU-12 | 2.0ab | 6.0ab | 7.7ab | 8.0a | 9.0a | 7.7ab | 1.3de | 1.0b | 5.4a-c |
| TTU-196 | 2.0ab | 5.0c | 6.0e | 7.7ab | 9.0a | 8.0a | 3.3b | 2.3a | 5.4ab |
| 609 | 2.0ab | 5.0c | 6.0e | 8.0a | 8.3bc | 7.0a-c | 3.3b | 2.3a | 5.3a-d |
| TTU-232 | 2.0ab | 5.7a-c | 7.0b-d | 7.7ab | 8.0c | 7.3ab | 2.7bc | 1.0b | 5.2a-e |
| Legacy | 2.0ab | 6.0ab | 7.7ab | 7.3bc | 8.0c | 7.3ab | 1.0e | 1.0b | 5.1a-f |
| TTU-17 | 1.7bc | 6.0ab | 7.3a-c | 7.7ab | 8.0c | 7.0a-c | 1.7c-e | 1.0b | 5.1a-f |
| 86-120 | 2.0ab | 6.0ab | 8.0a | 7.0c | 8.0c | 6.7a-d | 1.0e | 1.0b | 5.0b-f |
| Bonnie Brae | 2.0ab | 6.0ab | 8.0a | 8.0a | 8.3bc | 5.0a-e | 1.3de | 1.0b | 5.0b-f |
| TTU-84 | 2.0ab | 5.7a-c | 7.0b-d | 7.7ab | 8.3bc | 6.3a-d | 1.7c-e | 1.3b | 5.0b-f |
| TTU-175 B | 1.0d | 5.7a-c | 7.0b-d | 7.7ab | 9.0a | 6.7a-d | 1.7c-e | 1.0b | 5.0b-f |
| Cody | 2.0ab | 5.7a-c | 7.0b-d | 8.0a | 9.0a | 5.0a-e | 1.7c-e | 1.0b | 4.9b-f |
| Texoka | 2.0ab | 5.7a-c | 7.0b-d | 8.0a | 8.7ab | 5.0a-e | 1.3de | 1.0b | 4.9b-g |
| 91-118 | 1.0d | 5.7a-c | 7.0b-d | 8.0a | 8.0c | 6.0a-d | 2.3b-d | 1.0b | 4.9b-g |
| TTU-230A | 1.0d | 5.0c | 6.3de | 8.0a | 8.0c | 7.7ab | 2.0c-e | 1.3b | 4.9b-g |
| TTU-62 | 2.3a | 5.a-c7 | 6.7c-e | 8.0a | 8.0c | 5.3a-d | 2.3b-d | 1.0b | 4.9b-g |
| Tatanka | 2.0ab | 6.0ab | 7.7ab | 8.0a | 8.3bc | 4.0c-e | 1.0e | 1.0b | 4.8d-g |
| Bam-1000 | 2.0ab | 6.0ab | 7.0b-d | 7.7ab | 8.7ab | 5.0a-e | 1.3de | 1.0b | 4.8c-g |
| TTU-46 | 2.0ab | 6.0ab | 7.0b-d | 7.3bc | 8.7ab | 3.7de | 1.3de | 1.0b | 4.7e-g |
| Bison | 2.0ab | 5.0c | 6.3de | 8.0a | 8.3bc | 5.0a-e | 2.0c-e | 1.0b | 4.7d-g |
| Stampede | 1.7bc | 5.3bc | 6.7c-e | 8.0a | 8.3bc | 4.7b-e | 2.0c-e | 1.0b | 4.7d-g |
| TTU-94B | 1.0d | 6.0ab | 7.0b-d | 7.7ab | 8.3bc | 5.3a-d | 1.3de | 1.0b | 4.7d-g |
| TTU-43 | 1.3cd | 6.0ab | 7.3a-c | 8.0a | 8.0c | 3.7de | 1.0e | 1.0b | 4.5f-h |
| UCR-95 | 1.0d | 4.0d | 6.0e | 7.3bc | 8.3bc | 5.7a-d | 1.3de | 1.0b | 4.3gh |
| Midget | 2.0ab | 5.0c | 6.0e | 7.3bc | 8.0c | 2.0e | 1.0e | 1.0b | 4.0h |
| LSD(0.05) | 0.37 | 0.83 | 0.83 | 0.61 | 0.59 | 3.04 | 1.11 | 0.41 | 0.60 |
| Coefficient of variation | 12.8% | 9.0% | 7.3% | 4.8% | 4.3% | 31.6% | 36.7% | 21.5% | 7.4% |

Means within column not followed by the same letter differ at the 0.05 level of probability by Fisher's Least Significant Difference Test.

Turfgrass rating = 1=dead or dormant to 9=maximum turfgrass quality

Table 7. Turfgrass quality ratings of 26 cultivars and accessions lines of buffalograss evaluated at Lubbock, TX in 2000.

| Cultivar | Turfgrass quality ratings | | | | | | | | |
|--------------------------|---------------------------|--------|--------|--------|--------|--------|--------|--------|--------|
| | Mar. | Apr. | May | Jun. | Jul. | Aug. | Sep. | Oct. | Avg. |
| | -----rating----- | | | | | | | | |
| TTU-196 | 2.0a | 3.0a-c | 6.3ab | 6.7ab | 6.7ab | 7.0a | 6.3a | 5.3a | 5.4a |
| TTU-227 | 2.0a | 3.3ab | 6.3ab | 6.7ab | 7.0a | 6.3ab | 6.0ab | 5.0ab | 5.4a |
| 378 | 1.7ab | 3.7a | 6.7a | 7.0a | 6.3a-c | 5.7a-d | 5.0a-e | 4.0b-d | 5.0ab |
| TTU-12 | 1.0b | 3.0a-c | 5.7a-d | 6.3a-c | 6.7ab | 6.0a-c | 5.7a-c | 5.0ab | 4.9ab |
| Bison | 1.7ab | 2.7a-d | 4.3b-g | 5.0a-e | 6.3a-c | 6.3ab | 5.7a-c | 4.3a-c | 4.6a-c |
| TTU-232 | 2.0a | 3.7a | 6.0a-c | 6.0a-d | 5.7b-e | 5.3b-d | 4.7b-e | 3.7cd | 4.6a-c |
| Texoka | 1.3ab | 2.3b-e | 5.0a-f | 5.3a-e | 6.7ab | 6.3ab | 5.0a-e | 4.0b-d | 4.5a-c |
| Cody | 1.3ab | 2.7a-d | 4.7a-g | 5.3a-e | 6.3a-c | 5.7a-d | 5.0a-e | 4.0b-d | 4.4b-d |
| TTU-175 B | 1.3ab | 2.3b-e | 4.7a-g | 5.3a-e | 6.3a-c | 5.7a-d | 5.3a-d | 4.3a-c | 4.4b-d |
| TTU-17 | 1.7ab | 3.0a-c | 5.3a-e | 6.0a-d | 5.3c-f | 4.7cd | 4.3c-e | 3.7cd | 4.3b-d |
| TTU-230A | 1.3ab | 2.7a | 5.0a-f | 5.0a-e | 5.3c-f | 5.3b-d | 4.3c-e | 4.3a-c | 4.2b-d |
| TTU-46 | 1.0b | 2.0c-e | 4.3b-g | 5.0a-e | 6.3a-c | 5.7a-d | 5.3a-d | 4.3a-c | 4.2b-d |
| Bam-1000 | 1.0b | 2.0c-e | 3.7d-g | 4.3c-f | 6.0a-d | 6.3ab | 5.3a-d | 4.0b-d | 4.1b-d |
| 91-118 | 1.0b | 3.3ab | 5.7a-d | 6.0a-d | 5.7b-e | 4.3d | 3.7e | 3.3cd | 4.1b-d |
| Stampede | 1.7ab | 2.7a-d | 4.3b-g | 4.7b-f | 5.0d-f | 5.3b-d | 5.0a-e | 4.0b-d | 4.1b-d |
| 609 | 2.0a | 3.0a-c | 5.3a-e | 5.7a-d | 5.7b-e | 4.7cd | 3.7e | 3.0d | 4.1b-d |
| Tatanka | 1.7ab | 2.3b-e | 4.3b-g | 4.7b-f | 5.7b-e | 5.0b-d | 4.3c-e | 3.7cd | 4.0c-e |
| 86-120 | 1.0b | 2.7a-d | 5.0a-f | 5.3a-e | 5.3c-f | 4.7cd | 4.3c-e | 3.7cd | 4.0c-e |
| TTU-84 | 1.3ab | 2.3b-e | 4.7a-g | 4.7b-f | 5.3c-f | 5.0b-d | 4.7b-e | 4.0b-d | 4.0c-e |
| Legacy | 1.0b | 2.3b-e | 4.7a-g | 5.3a-e | 5.3c-f | 4.3d | 4.3c-e | 3.7cd | 3.9c-e |
| Midget | 1.0b | 2.0c-e | 3.3e-g | 4.0d-f | 5.3c-f | 5.7a-d | 5.0a-e | 4.3a-c | 3.8c-f |
| TTU-62 | 2.0a | 2.3b-e | 4.3b-g | 4.3c-f | 5.0d-f | 4.3d | 4.3c-e | 3.3cd | 3.8c-f |
| TTU-94B | 1.0b | 2.3b-e | 4.0c-g | 4.3c-f | 5.0d-f | 4.3d | 4.0ed | 3.3cd | 3.5d-f |
| TTU-43 | 1.3ab | 1.7de | 3.3e-g | 4.0d-f | 4.7e-g | 5.0b-d | 4.3c-e | 3.7cd | 3.5d-f |
| UCR-95 | 1.0b | 1.3e | 3.0fg | 3.3ef | 4.3fg | 4.7cd | 4.0ed | 3.0d | 3.1ef |
| Bonnie Brae | 1.0b | 1.3e | 2.7g | 2.7f | 3.7g | 5.0b-d | 4.0ed | 3.0d | 2.9f |
| LSD(0.05) | 0.77 | 1.22 | 2.1 | 2.1 | 1.1 | 1.5 | 1.5 | 1.2 | 0.91 |
| Coefficient of variation | 33.4% | 29.4% | 26.9% | 25.0% | 12.2% | 16.8% | 18.9% | 19.3% | 11.6% |

Means within column not followed by the same letter differ at the 0.05 level of probability by Fisher's Least Significant Difference Test.

Turfgrass rating = 1=dead or dormant to 9=maximum turfgrass quality

Table 8. Turfgrass quality ratings of 26 cultivars and accessions of buffalograss evaluated at Lubbock, TX from 1997 to 2000.

| Cultivar | Turfgrass quality ratings | | | | | |
|--------------------------|---------------------------|--------|--------|--------|--------------|--------------|
| | 1997 | 1998 | 1999 | 2000 | 1997 to 2000 | 1998 to 2000 |
| | ----- rating ----- | | | | | |
| TTU-227 | 7.3c-g | 8.05a | 5.6a | 5.4a | 6.2a | 5.8a |
| TTU-196 | 6.5g-k | 7.8ab | 5.4ab | 5.4a | 5.9ab | 5.7ab |
| 378 | 6.8e-j | 6.8f-k | 5.4ab | 5.0ab | 5.7b-d | 5.3bc |
| TTU-12 | 6.1h-k | 7.2c-g | 5.4a-c | 4.9ab | 5.5b-g | 5.3bc |
| TTU-232 | 6.2h-k | 7.1c-h | 5.2a-e | 4.6a-c | 5.5c-g | 5.2cd |
| TTU-175B | 7.7a-e | 7.6a-c | 5.0b-f | 4.4b-d | 5.8a-d | 5.2c-e |
| Bison | 8.2a-c | 7.4b-e | 4.7d-g | 4.6a-c | 5.9ab | 5.1c-g |
| Texoka | 8.4a | 7.2c-f | 4.9b-g | 4.5a-c | 5.9ab | 5.1c-g |
| 609 | 6.5g-k | 7.4b-e | 5.3a-d | 4.1b-d | 5.5c-g | 5.1c-f |
| Cody | 8.3ab | 7.0d-h | 4.9b-f | 4.4b-d | 5.8a-c | 5.0c-h |
| TTU-17 | 7.4b-f | 6.8f-k | 5.1a-f | 4.3b-d | 5.6b-f | 5.0c-h |
| Bam-1000 | 8.4a | 7.1d-i | 4.8c-g | 4.1b-d | 5.8a-d | 4.9d-i |
| TTU-84 | 7.9a-d | 7.0d-h | 5.0b-f | 4.0c-e | 5.7b-e | 4.9c-i |
| TTU-46 | 8.0a-c | 7.2c-g | 4.7e-g | 4.2b-d | 5.7b-e | 4.9d-i |
| Tatanka | 7.9a-d | 6.9d-j | 4.8d-g | 4.0c-e | 5.6b-f | 4.8e-j |
| 91-118 | 6.7e-j | 6.6i-k | 4.9b-g | 4.1b-d | 5.3e-i | 4.8d-i |
| Legacy | 6.7e-j | 6.8f-k | 5.1a-f | 3.9c-e | 5.3f-h | 4.8d-j |
| TTU-230A | 8.1a-c | 6.7g-k | 4.9b-g | 4.2b-d | 5.6b-f | 4.8d-j |
| 86-120 | 6.9d-i | 6.4kl | 5.0b-f | 4.0c-e | 5.3f-j | 4.7f-k |
| Stampede | 6.1h-k | 6.7g-k | 4.7d-g | 4.1b-d | 5.1h-j | 4.7g-k |
| TTU-94B | 7.7a-e | 7.3b-d | 4.7d-g | 3.5d-f | 5.4d-h | 4.7f-k |
| TTU-62 | 6.0i-k | 6.5j-l | 4.9b-g | 3.8c-f | 5.0i-k | 4.7h-k |
| Midget | 7.0d-h | 7.1c-h | 4.0h | 3.8c-f | 5.2g-j | 4.6h-k |
| Bonnie Brae | 6.3g-k | 6.6h-k | 5.0b-f | 2.9f | 4.9i-k | 4.5jk |
| UCR-95 | 5.9jk | 7.5a-d | 4.3gh | 3.1ef | 4.9jk | 4.5h-k |
| TTU-43 | 5.6k | 6.0l | 4.5f-h | 3.5d-f | 4.6k | 4.3k |
| LSD(0.05) | 0.95 | 0.42 | 0.60 | 0.91 | 0.37 | 0.40 |
| Coefficient of variation | 8.2% | 4.4% | 7.4% | 11.6% | 4.1% | 5.0% |

Means within column not followed by the same letter differ at the 0.05 level of probability by Fisher's Least Significant Difference Test.

Turfgrass rating = 1=dead or dormant to 9=maximum turfgrass quality

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