# Performance Test - 1988 National Turfgrass Evaluation Program Bermudagrass Trials

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## ABSTRACT

*Bermudagrass germplasm was evaluated for turfgrass color, quality, chlorosis symptoms, leaf texture and percent plot ground cover, in order to assess turf adaptation under desert conditions. Both experimental materials and commercially available germplasm were different for these traits during 1988, which was the second year's evaluation of a 5-year-long national trial for turf-type bermudagrass.*

## INTRODUCTION

The National Turf Evaluation Program (NTEP) is sponsored by the USDA, which is headquartered in Beltsville, Maryland. The NTEP sponsors turfgrass variety trials on a national basis for determining the performance and adaptation of experimental, newly released, and established turfgrass germplasm. These tests usually last for a period of five consecutive years. The University of Arizona hosts the NTEP bermudagrass and NTEP tall fescue trials in Tucson, Arizona. This report deals with those entries included in the bermudagrass trial for the summer of 1988 period.

## MATERIALS AND METHODS

The NTEP bermudagrass trial includes 28 entries. Of these, 10 are commercially available, and 18 are being tested for potential release. Seven (7) are seeded types, while the other 21 are vegetatively propagated. (Appendix Table A).

Plots were established during May 1987 by placing prerooted sprigs within 4' x 6' plots which are 95% sand. Pre-rooted sprigs were transplanted on 1-foot centers. Each entry was replicated three times in a randomized complete block design. In accordance with USDA recommendations, seeded entries were established by transplanting mature individual seedlings on 1-foot centers (similar to the vegetative entries).

Starting in May 1988, plots were fertilized once every 2 - 3 weeks with 0.5 lb. -N- per 1000 $ft^2$ from a 27-8-17 source, mowed twice weekly at 0.75 inches and irrigated to prevent wilt. The test was evaluated on 15 June, 15 July, and 17 August 1988. Plots were evaluated for color (1 - 9, 9 = dark green), quality (1 - 9, 9 = best), percent cover (0 - 100%) and texture (1 - 9, 9 = finest). During July, extensive chlorosis developed during the monsoons, and plots were evaluated on 15 July for the degree of chlorosis (1 - none, 6 - severe) and for percent plot chlorosis (0 - 100%), regardless of intensity.

## RESULTS

For the June evaluation, the bermudagrass entries were significantly different for color, quality, percent ground cover, and texture. Both Tifway and the experimental bermudagrass MSB-30, had mean color scores greater

than 7.0. Guymon, NMS-I RS-1, NMS-4, NMS-14, Texturf 10 and Arizona common had color scores of 5.0 or less (Table 1).

Turfgrass quality estimates ranged from 7.3 (Tifway) to 3.5 (Arizona Common). Entries A-22, C7-23, Tifgreen, Tifway, MSB-20, MSB-10 and Tifway II had quality scores of 6.5 or greater. Guymon, NMS 1, 2, 4 and 14, Texturf 10 and Arizona Common had mean quality ratings of 4.8 or less, exhibiting poorer performance (Table 2).

Percent plot cover during the second summer of this test ranged from 40% (Arizona Common) to 98% for the hybrid A-22 on 15 June (Table 3). The slower establishment for the seeded bermudagrass entries is in part due to the fact that individual seedlings were established at a lower planting density (1 per square foot) according to test standards. Normally, at seeding rates of 1.0 - 1.5 lbs. 1000 $ft^2$, the population density would be much higher. Therefore, the competitiveness of the more decumbent hybrids is favored.

There is a great difference in leaf texture within the bermudagrass entries, with eight entries having mean texture ratings from 7.0 - 8.0, all of these being hybrids (Table 4). Again, the seeded bermudagrasses had mean texture scores of 4.5 - 6.0. The hybrid 'Vamont' did exhibit a coarse leaf texture (4.5 score).

At the July rating, considerable chlorosis was evident, which seriously affected color scores (Table 1). Likewise, significant differences existed for color, quality, percent cover, texture, degree of chlorosis, and percent plot chlorosis differences among the bermudagrasses.

Mean color scores ranged from 4.0 to 8.7. The entries NM507, 471, 375, 3, 72, 4 and Tifway had superior scores of 6.8 or greater. NMS-2, CT-23, Arizona Common, Midiron, E-29 and A-22 had mean color scores within the 4.5 to 4.0 range (Table 1).

The entries NM 507, 471, 3, Tifway II, MSB-10 and Tifway had superior mean quality ratings ranging from 6.8 - 8.7. Vamont, NM3-2, A-22, Midiron and Arizona Common had lower mean scores, ranging from 5.0 - 4.0 (Table 2).

By July of the second year, 14 entries had achieved 96% or greater ground cover (Table 3). Tifway II, Tifgreen, NM43, MSB-20 and Tifway and others exhibited most acceptable texture scores during the hot weather, accompanied by natural rainfall (Table 4). At this time, chlorosis developed throughout the test. Midiron, A-22, NMS-1, 2, 14 and Arizona Common had mean chlorosis ratings within the range of 3.3 - 4.3 which was considerable. MSB-20, NMS-3, 507, 72 and 471 had minimal or no chlorosis (Table 5).

Generally, the degree of chlorosis was related to the extent of chlorosis on a plot percentage basis ($r = 0.82$). Midiron, E-29, Arizona Common, had between 55 - 70% chlorotic turf. MSB-20, NM 43, 3, 4, 375, 507, 72 and 471 had only trace amounts of chlorosis. These data clearly show that there are true differences in bermudagrass germplasm for iron uptake and/or metabolism.

On 17 August, once again, there were significant differences among bermudagrasses for color, quality, percent cover and texture. Entries with color ratings of 6.5 or greater included NM507, 471, 375, 43, NMS 3, 4, MSB 10 Tifway and Tifway II. Arizona Common, Midiron and E 29 had the poorest color ratings which were below 5.0 (Table 1).

Visual estimates for turfgrass quality included NM507, 471, NM3, Tifway II, and Tifway bermudagrass as having scores between 6.8 - 8.7. Midiron, NMS 14, E-29 and Arizona Common had quality scores of 4.5 or less (Table 2).

There were 12 entries which had at least 98% ground cover by August 1988. Included in this was one seeded entry, NMS-4 (Table 3). Generally, the seeded entries were less aggressive in establishing ground cover. Once again, this is perhaps an artifact of the establishment process mentioned earlier.

Table 1. Mean[1] Color Response[2] of 28 NTEP Bermudagrass Entries, Summer 1988, University of Arizona.

| Entry | 15 June | 15 July | 17 Aug. | Avg. |
|---|---|---|---|---|
| MSB-30 | 7.2 | 6.2 | 6.2 | 6.5 |
| Tifway | 7.0 | 7.0 | 7.2 | 7.0 |
| MSB-10 | 6.8 | 6.2 | 6.5 | 6.5 |
| Tifway II | 6.8 | 6.2 | 6.5 | 6.5 |
| NM-43 | 6.5 | 6.2 | 6.5 | 6.4 |
| A-22 | 6.3 | 4.0 | 4.7 | 5.0 |
| E-29 | 6.3 | 3.5 | 3.8 | 4.5 |
| CT-23 | 6.2 | 4.5 | 5.0 | 5.2 |
| A-29 | 6.2 | 5.3 | 5.7 | 5.7 |
| NM 471 | 6.0 | 7.8 | 7.8 | 7.2 |
| Tifgreen | 6.0 | 5.5 | 6.2 | 5.9 |
| NM-507 | 6.0 | 8.6 | 8.7 | 7.7 |
| MSB-20 | 6.0 | 6.2 | 6.3 | 6.2 |
| Vamont | 5.8 | 5.2 | 5.3 | 5.4 |
| FB-119 | 5.7 | 5.3 | 5.3 | 5.4 |
| Tufcote | 5.7 | 5.3 | 5.5 | 5.5 |
| NMS-3 | 5.7 | 6.8 | 7.0 | 6.5 |
| NM-375 | 5.5 | 7.0 | 6.8 | 6.4 |
| NMS-2 | 5.3 | 4.5 | 4.7 | 4.8 |
| Midiron | 5.3 | 4.0 | 4.3 | 4.5 |
| NM-72 | 5.2 | 6.8 | 6.8 | 6.3 |
| Guymon | 5.0 | 5.3 | 5.7 | 5.3 |
| NMS-1 | 4.8 | 5.2 | 5.2 | 5.1 |
| RS-1 | 4.7 | 5.3 | 5.3 | 5.1 |
| NMS-4 | 4.5 | 6.8 | 6.8 | 6.0 |
| NMS-14 | 4.5 | 4.7 | 5.2 | 4.8 |
| Texturf-10 | 4.3 | 5.7 | 6.0 | 5.3 |
| AZ-Common | 4.3 | 4.3 | 4.5 | 4.4 |
| LSD[3] | 1.0 | 1.0 | 1.0 | 1.0 |

1/ Mean of 3 replications.
2/ Color ratings 1 - 9, 1 = dead; 9 = dark green.
3/ LSD = least significant difference value (0.05). To determine statistical difference among entries, subtract one entry's mean from another entry's mean. Statistical differences occur when this value is larger than the corresponding LSD value.

Table 2. Mean[1] Turfgrass Quality Scores[2] of 28 NTEP Bermudagrass Entries, Summer 1988, University of Arizona, Tucson.

| Entry | 15 June | 15 July | 17 Aug. | Avg. |
|---|---|---|---|---|
| Tifway II | 7.3 | 7.6 | 7.7 | 7.5 |
| MSB-10 | 7.0 | 7.3 | 7.5 | 7.3 |
| MSB-20 | 6.8 | 6.3 | 6.5 | 6.5 |
| Tifway | 6.8 | 7.2 | 7.3 | 7.1 |
| Tifgreen | 6.7 | 6.0 | 6.3 | 6.3 |
| CT-23 | 6.7 | 5.0 | 5.2 | 5.6 |
| A-22 | 6.5 | 4.5 | 4.8 | 5.3 |
| NM-43 | 6.3 | 6.3 | 6.5 | 6.4 |
| A-29 | 6.3 | 6.5 | 6.8 | 6.5 |
| E-29 | 6.0 | 3.7 | 4.2 | 4.6 |
| NM 471 | 6.0 | 8.2 | 8.3 | 7.5 |
| Midiron | 6.0 | 4.2 | 4.5 | 4.9 |
| FB-119 | 5.8 | 5.8 | 5.8 | 5.8 |
| Tufcote | 5.8 | 5.5 | 5.5 | 5.6 |
| NMS-3 | 5.7 | 6.8 | 6.8 | 6.4 |
| MSB-30 | 5.7 | 6.3 | 6.2 | 6.1 |
| RS-1 | 5.5 | 5.0 | 5.2 | 5.2 |
| NM 507 | 5.5 | 8.7 | 8.7 | 7.6 |
| NM 72 | 5.5 | 6.2 | 6.3 | 6.0 |
| Vamont | 5.3 | 5.0 | 5.3 | 5.2 |
| NM-375 | 5.2 | 6.3 | 6.3 | 5.9 |
| Guymon | 4.8 | 5.5 | 5.5 | 5.3 |
| NMS-1 | 4.7 | 3.3 | 5.3 | 4.4 |
| NMS-2 | 4.7 | 4.5 | 4.7 | 4.6 |
| NMS-4 | 4.3 | 6.0 | 6.3 | 5.5 |
| Texturf-10 | 4.3 | 5.0 | 5.3 | 4.9 |
| NMS-14 | 4.2 | 4.0 | 4.3 | 4.2 |
| AZ-Common | 3.5 | 4.0 | 4.2 | 3.9 |
| LSD[3] | 1.1 | 1.1 | 0.9 | 1.0 |

1/ Mean of 3 replications.
2/ Quality ratings (1 - 9), 1 = dead turf; 9 = best.
3/ LSD = least significant difference value (0.05). To determine statistical difference among entries, subtract one entry's mean from another entry's mean. Statistical differences occur when this value is larger than the corresponding LSD values.

Table 3. Mean[1] Percent Plot Cover[2] of 28 NTEP Bermudagrass Entries, Summer 1988, University of Arizona.

| Entry | 15 June | 15 July | 17 Aug. |
|---|---|---|---|
| A-22 | 98 | 98 | 98 |
| A-29 | 98 | 98 | 98 |
| MSB-20 | 98 | 98 | 98 |
| Tifway II | 98 | 100 | 100 |
| MSB-10 | 95 | 99 | 100 |
| Tufcote | 93 | 91 | 93 |
| Midiron | 93 | 80 | 81 |
| E-29 | 91 | 85 | 85 |
| Vamont | 91 | 93 | 92 |
| FB-119 | 90 | 97 | 93 |
| NM-72 | 90 | 96 | 98 |
| CT-23 | 88 | 94 | 94 |
| Tifgreen | 88 | 98 | 98 |
| NM-471 | 86 | 99 | 100 |
| NM-43 | 86 | 98 | 98 |
| RS-1 | 85 | 88 | 88 |
| NMS-3 | 85 | 96 | 97 |
| MSB-30 | 85 | 89 | 91 |
| Tifway | 82 | 98 | 99 |
| NM-507 | 80 | 100 | 100 |
| Guymon | 78 | 85 | 85 |
| NMS-14 | 75 | 53 | 80 |
| NMS-4 | 75 | 97 | 98 |
| NMS-2 | 73 | 61 | 67 |
| NM-375 | 71 | 91 | 92 |
| NMS-1 | 70 | 63 | 65 |
| Texturf 10 | 67 | 87 | 88 |
| AZ-Common | 40 | 70 | 80 |
| LSD[3] | 17 | 16 | 14 |

1/ Mean of 3 replications.
2/ Plot cover = (0 - 100%).
3/ LSD = least significant difference value (0.05). To determine statistical difference among entries, subtract one entry's mean from another entry's mean. Statistical differences occur when this value is larger than the corresponding LSD values.

Table 4. Mean[1] Turfgrass Texture Scores[2] of 28 NTEP Bermudagrass Entries, Summer 1988, University of Arizona, Tucson.

| Entry | 15 June | 15 July | 17 Aug. | Avg. |
|---|---|---|---|---|
| MSB-20 | 8.0 | 8.2 | 8.2 | 8.1 |
| MSB-10 | 7.7 | 7.8 | 7.8 | 7.8 |
| CT-23 | 7.5 | 7.5 | 7.5 | 7.5 |
| Tifgreen | 7.5 | 8.3 | 8.5 | 8.1 |
| Tifway II | 7.5 | 8.5 | 8.5 | 8.1 |
| NM-43 | 7.3 | 8.3 | 8.0 | 7.9 |
| Tifway | 7.0 | 8.0 | 8.2 | 7.7 |
| NM-471 | 6.5 | 7.7 | 7.8 | 7.1 |
| NM-507 | 6.5 | 8.0 | 8.0 | 7.5 |
| A-22 | 6.5 | 7.0 | 7.0 | 6.8 |
| Tufcote | 6.2 | 6.7 | 6.8 | 6.6 |
| A-29 | 6.2 | 6.8 | 6.8 | 6.6 |
| Texturf 10 | 6.2 | 6.2 | 6.2 | 6.2 |
| Midiron | 6.2 | 6.3 | 6.2 | 6.2 |
| NMS-4 | 6.0 | 6.7 | 6.8 | 6.5 |
| E-29 | 6.0 | 5.8 | 5.7 | 5.8 |
| NMS-3 | 5.8 | 6.3 | 6.3 | 6.1 |
| NM-72 | 5.8 | 7.2 | 7.3 | 6.8 |
| MSB-30 | 5.7 | 6.5 | 6.7 | 6.3 |
| FB-119 | 5.7 | 6.3 | 6.3 | 6.1 |
| NM-375 | 5.5 | 6.5 | 6.5 | 6.2 |
| NMS-2 | 5.3 | 5.5 | 5.5 | 5.4 |
| RS-1 | 5.3 | 5.8 | 5.8 | 5.6 |
| NMS-14 | 5.2 | 4.8 | 4.8 | 4.9 |
| NMS-1 | 5.2 | 5.7 | 5.8 | 5.6 |
| Guymon | 4.7 | 4.8 | 4.8 | 4.8 |
| AZ-Common | 4.5 | 5.0 | 5.0 | 4.8 |
| Vamont | 4.5 | 5.5 | 5.5 | 5.2 |
| LSD[3] | 0.6 | 0.7 | 0.6 | 0.6 |

1/ Mean of 3 replications.
2/ Texture = (1 - 9), 9 = finest.
3/ LSD = least significant difference value (0.05). To determine statistical difference among entries, subtract one entry's mean from another entry's mean. Statistical differences occur when this value is larger than the corresponding LSD values.

Table 5. Mean[1] Response of 28 NTEP Bermudagrass Entries for Degree[2] and Percent Plot Chlorosis[3], 15 July 1988, University of Arizona, Tucson.

| Entry | Degree of chlorosis | Percent plot chlorosis |
|---|---|---|
| E-29 | 5.9 | 68 |
| Midiron | 4.3 | 73 |
| A-22 | 4.3 | 86 |
| NMS-1 | 4.0 | 50 |
| NMS-2 | 4.0 | 42 |
| NMS-14 | 4.0 | 31 |
| RS-1 | 3.7 | 37 |
| AZ-common | 3.3 | 55 |
| Vamont | 3.3 | 22 |
| Tufcote | 3.3 | 30 |
| CT-23 | 3.3 | 43 |
| Guymon | 2.7 | 33 |
| Tifgreen | 2.3 | 13 |
| NM-375 | 2.3 | 3 |
| FB-119 | 2.3 | 16 |
| Tifway | 2.0 | 22 |
| MSB-10 | 2.0 | 22 |
| MSB-30 | 2.0 | 30 |
| Texturf-10 | 2.0 | 20 |
| NMS-4 | 1.7 | 3 |
| NM-43 | 1.7 | 6 |
| A-29 | 1.7 | 28 |
| Tifway II | 1.7 | 10 |
| MSB-20 | 1.7 | 6 |
| NMS-3 | 1.7 | 3 |
| NM-507 | 1.0 | 0 |
| NM-72 | 1.0 | |
| NM-471 | 1.0 | 0 |
| LSD[4] | 1.6 | 31 |

1/ Mean of 3 replications.
2/ Degree of chlorosis. (1 - 6). 1 = none, 6 = severe chlorosis.
3/ Percent plot area exhibiting chlorosis. (0 - 100%).
4/ LSD = least significant difference value (0.05). To determine statistical difference among entries, subtract one entry's mean from another entry's mean. Statistical differences occur when this value is larger than the corresponding LSD values.