Winter Turf Performance Trials

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ABSTRACT

Overseeding trials were conducted to evaluate the turf-type fitness of cool season grasses for use in the desert when bermudagrass is dormant. Perennial ryegrass, fine fescues, rough stalk bluegrasses and creeping bentgrasses were tested for turfgrass quality, color, percent ground cover and uniformity under a close mowing (3/8 inch) regime. Entries varied significantly from each other once seasonal hard frosts did not recur after January. Certain entries had better turf performance under hot (late spring) conditions. Both commercially available and experimental germplasm were evaluated.

INTRODUCTION

In order to maintain turfgrass utility on a year-round basis, cool season grasses are established into bermuda and maintained for 6 to 8 months under desert conditions. The predominant species include perennial ryegrass (Lolium perenne), and to a limited extent, fine fescues (Festuca spp.) rough stalk bluegrass (Poa trivialis), and creeping bentgrass (Agrostis palustrus). These grasses must be capable of quick germination and emergence, rapid establishment, have superior mowing tolerance, and maintain acceptable appearance under large diurnal temperature extremes and high temperature conditions. These qualities are essential for good performance for the intended use in an overseeding situation.

The objectives of this experiment were to measure the performance of perennial ryegrass varieties, experimental accessions (not yet released for sale), ryegrass blends and composite mixtures (two or more species) for turf performance during the winter and spring seasons under desert conditions.

MATERIALS AND METHODS

Thirty-six entries were seeded into a 100% sand medium on October 16, 1988. There was no underlying bermudagrass. Seeding rates for the perennial ryegrasses were 30 lbs. per 1000 ft^2. Mixtures were seeded at the appropriate corresponding rates (see Appendix Table A).

Visual evaluations were made for percent ground cover from 2 November throughout 24 November as a measure of establishment capability.

Plots were fertilized with 0.4 lbs.N/1000 ft^2 from a 6-20-20 fertilizer on 14 November, and with 1.0 lb./1000 ft^2 from a 29-3-5 source on 28 November 1988. Plots were mowed on 2 and 7 November at a 5/8 inch height of cut which was then lowered to 3/8 inches and mowed twice weekly starting on November 21, 1988. Plots were fertilized every 2 weeks with 4, 10, and 20 oz per 1000 ft^2 of Ferromec, potassium sulphate, and flowable sulphur, respectively, from December through the end of March. Beginning in April 1989, plots were fertilized with 1.0 lb. N/1000 ft^2 every two weeks from a 27-8-16 source.

Plots were evaluated for color (1 - 9, 9 = dark green), quality (1 - 9, 9 = best), percent ground cover (0 - 100%), and plot uniformity (1 - 9, 9 = most uniform). Uniformity measurements were taken on 28 April, 28 May and 20 June. Uniformity served as a measure of mowing tolerance under heat stress because the entries

exhibited visual differences in elongation rates, shoot density, seed head formation, and leaf texture due to high temperature conditions. Plots were irrigated nightly at 100% of ET determined from an on-site weather station. Color, quality, and percent cover were determined on 5 Dec 1988, 28 Jan, 25 Feb, 10 Mar, 27 Mar, 28 April, 28 May, and 20 June 1989.

RESULTS AND DISCUSSION

The entries did not vary tremendously in their ability to reach 70% ground cover (Table 1). Laser/Southshore (fine fescue/bentgrass) reached 70% ground cover in 14 days, followed by ISI PR 852 (15 days) and NK P19 (16 days) perennial ryegrasses. Annual rye had 70% ground cover in 23 days (Table 1). Percent plot cover was monitored throughout the test. This became important during the April, May, and June ratings when high temperature conditions were evident.

Percent cover and color scores are listed in Tables 2 and 3. Several hard frosts occurred and cold night temperatures were realized in December, which slowed turf growth. CBS II, Saturn, Jamestown/Laser, and Marvelgreen/Laser had 75% or greater cover at that time (Table 2). Palmer/Prelude, Lindsay, Caravelle, and Caddie had less than 65% ground cover. The cold night temperatures affected color as well. Over 15 hard frosts occurred in December. Marvelgreen/Laser was the only entry to have a mean color score greater than 6.0 (Table 3), but Jamestown/Laser, Saturn and Palmer were very close to having acceptable color.

On 28 Jan, percent plot cover (Table 2) ranged from 85 - 95%, with 20 entries having 90% or greater mean ground cover. The overall color ratings (Table 3) improved to 6.2 for the entire test at this point, compared to 5.1 for the previous month. Caddie, ISI 832, Charger, Caravelle, PhD, and Marv/Jam/Laser had mean color ratings of 6.5 or greater. There were 14 entries which had mean color scores of 6.0 or less. Marv/Laser had a mean quality of 7.1, while Palmer/Prelude had a mean score of 5.0 on 28 January (Table 4).

By February 25, overall percent plot cover was 94% (Table 2). Color scores improved, ranging from 5.5 (annual ryegrass) to 7.4 for the PhD blend (Table 3). The overall quality mean for the test improved to 6.8, with 14 entries having mean scores of 7.0 or greater. There were two entries which had mean quality scores of less than 6.0 (Table 4).

The overall test means for color and quality increased to 6.5 and 6.8, respectively, by March 10 (Tables 3 and 4). Color scores ranged from 2.9 for annual rye to 7.4 for PE-8 (Table 3). The mixtures Marvelgreen/Jamestown/Laser, Marvelgreen/Jamestown, Jamestown/Laser, Marvelgreen/Laser, Laser/Southshore and the perennial ryegrass ISI-832 had mean scores of 7.4 or greater for quality (Table 4).

On 27 March, percent cover, color and quality had overall test means of 98%, 6.7 and 7.4, respectively. All entries except annual ryegrass had at least 97% plot cover, with nine entries having 100% cover (Table 2). The darkest colored turf was Caravelle, followed by Saturn, 2DD, Charger, 2 EM and PE-8. These entries had color scores of 7.5 or greater (Table 3). There were seven entries which had mean quality scores of 8.0 or greater (Table 4) while four entries had mean quality scores of 6.9 or less. This was the best time of the overseed season for growth and performance.

On 28 April, there were six (6) entries which had 95% or less cover (Table 2). These included the cool season mixtures which contained Laser Poa trivialis, which became faded and necrotic in small scattered patches. At this time, the annual ryegrass faded to 13% mean ground cover. The entries 2DD, Saturn, and Charger had mean color scores of 7.3 or greater (Table 3). Ten entries had mean color scores of 6.0 or less. Entries including Saturn, Marvelgreen/Jamestown, 2DD, Charger, Marvelgreen/Jamestown/Laser and SR 400 had mean quality scores of 6.8 or greater (Table 4). Temperatures were unusually high for late April. Jamestown/Laser was the most uniform in appearance (Table 5), despite the small patches which appeared in the plot (mean = 8.0). Laser/Southshore, Marvelgreen/Jamestown/Laser and Saturn had mean uniformity ratings of 7.5 or greater, maintaining plot integrity to a high degree.

During the high temperatures experienced in May, there was a slight overall reduction in percent plot cover on 28 May. There were seven entries which maintained 98% or greater ground cover including NK M9, Ovation,

ISI-832 Repell, Saturn, SR 4100 and Caliente (Table 2). Caravelle decreased to 41% ground cover, showing its low heat tolerance, which may be an advantage during transition. Again, there was no underlying bermudagrass in the test. The composite mixtures such as Marvelgreen/Jamestown/Laser, Marvelgreen/Laser, Laser/Southshore, and Jamestown/Laser had between 56 and 88% ground cover (Table 2).
Mean color scores ranged from 1.8 (annual rye) to 7.4 (Saturn perennial rye) (Table 3). Twenty-six (26) entries had mean color scores of 6.0 or greater, with three (3) entries (Charger, SR 4100 and Saturn) having mean color scores of 7.1 to 7.4 (Table 3). Turfgrass quality scores ranged from 1.6 (annual rye) to 6.9 for PE-8 and 2DD (experimental germplasm) (Table 4). A quality score of 6.5 or greater shows acceptable quality under high temperature conditions.

At this time, there was severe discoloration in circular patches in entries Marvelgreen/Jamestown/Laser, Marvelgreen/Laser, Jamestown/Laser and Laser/Southshore bentgrass. It seemed that the addition of Laser Poa trivialis had encouraged the development of a foliar disease which turned the turf bright red in circular patches symptomatic of southern turf blight, caused by Sclerotium rolfsii. Fungal colonies of Fusarium spp., Rhizoctonic spp. and Sclerotium spp. were isolated from infected tissue. The specific causal agent has yet to be positively identified.

Plot uniformity ratings on 28 May ranged from 2.0 (annual ryegrass) to 7.3 for 2DD perennial ryegrass (Table 5). Entries which had mean scores of 6.0 or greater exhibited acceptable uniformity during heat stress. These plots were devoid of seed heads, and generally had a uniform elongation rate and uniform texture (leaf width).

On June 20, percent cover was 4% for annual ryegrass, followed by 47 and 57% ground cover for Caravelle perennial ryegrass and Laser/Southshore, respectively (Table 2). Most entries maintained acceptable ground cover, with 23 entries having at least 97% ground cover.

Mean color scores ranged from 2.0 to 7.4 on 6 June (Table 3). Caravelle annual rye had the lowest mean color score (3.1). This Caravelle had an attractive rich dark green color during the cooler season, and decline noticeably under prolonged periods of heat stress. The entries SR 4100, Charger, SR 4000 and 2DD had good color under heat stress at this time (Table 3).

Mean quality scores ranged from 1.8 to 7.1 on 6 June (Table 4). The entries Charger, Saturn, SR 4100, 2DD and Accolade had mean quality scores of 7.0 or greater, showing good quality after a final fertilization on 13 July.

Overall seasonal averages for color and quality are given in Tables 3 and 4, respectively. Overall seasonal color ratings of 6.5 or greater were achieved by 8 entries (Saturn = 6.9, Charger = 6.8, 2-DD = 6.7, SR4000 = 6.6, PE8 = 6.6, Palmer = 6.5, PHD = 6.5, and SR 4100 = 6.5). These entries had acceptable color through conditions ranging from successive heavy frosts to temperatures well over 100° F for sustained periods.

Overall seasonal quality means of 6.8 or greater were achieved by 10 entries (Marvelgreen/Jamestown = 7.1, Saturn = 7.1, Charger = 7.0, Prelude = 6.9, Accolade = 6.9, PE 8 = 6.9, SR 4000 = 6.8, ISI 832 = 6.8, Caliente = 6.8, and Ovation = 6.8). These entries tended to have good quality appearance at most times throughout the test.

It was apparent that turfgrass color and quality are not specifically related and therefore quality components are not entirely dependent on color attraction alone. This test included mixtures containing creeping red fescue (Jamestown), Poa trivalis) and bentgrass (Southshore). The fine leaf texture, color and close mowing tolerance of these mixtures varied under desert conditions, as did that of ryegrass. Most of these mixtures had excellent color and quality ratings until the beginning of May, when a foliar blight (causal agent yet to be determined) severely damaged those mixtures containing Poa trivialis. It is evident that improvements in germplasm are being made by turfgrass breeders, as the turf performance of newly released and experimental germplasm is equal to or greater than that of some established varieties or blends. Since cool season grasses are used from 6 to 7 months in desert turfs, year round turf performance is important and may be affected largely by the choice of cool season turfs.

Appendix Table A. Germplasm roster for 1988-89 winter turf trials, University of Arizona.

Entry		Composition %	Seed rate lbs. 1000 ft^2	Originator
1.	Marvelgreen per. rye Jamestown red fescue Laser Poa trivialis	(60) (25) (15)	25	Lofts Seed
2.	Marvelgreen per. rye Jamestown red fescue	(75) (25)	30	Lofts Seed
3.	Palmer per. rye Prelude per. rye	(60) (40)	30	Lofts Seed
4.	Palmer per. rye Prelude per. rye Yorktown per. rye	(50) (30) (20)	30	Lofts Seed
5.	Marvelgreen per. rye Laser Poa trivialis	(85) (15)	25	Lofts Seed
6.	Palmer per. rye	(100)	30	Lofts Seed
7.	Cowboy per. rye	(100)	30	Lofts Seed
8.	Prelude per. rye	(100)	30	Lofts Seed
9.	Laser Poa trivialis Southshore creeping bent	(80) (20)	7	Lofts Seed
10.	Jamestown red fescue Laser Poa trivialis	(60) (40)	18	Lofts Seed
11.	Repell per. rye	(100)	30	Willamette Seed
12.	Caliente per. rye	(100)	30	Willamette Seed
13.	Ranger per. rye	(100)	30	Willamette Seed
14.	PE-8	(100)	30	Willamette Seed
15.	SR-4000	(100)	30	Seed Research
16.	SR-4100	(100)	30	Seed Research
17.	Ovation	(100)	30	O. M. Scotts
18.	Accolade	(100)	30	O. M. Scotts
19.	Caravelle	(100)	30	O. M. Scotts
20.	Lindsay	(100)	30	Int'l Seeds

21.	PHD Regal Derby Gator	 (40) (40) (20)	30	Int'l Seeds
22.	ISI 832 per rye	(100)	30	Int'l Seeds
23.	ISI PR 861 per rye	(100)	30	Int'l Seeds
24.	ISI PR 852 per rye	(100)	30	Int'l Seeds
25.	2DD per rye	(100)	30	Int'l Seeds
26.	Charger per rye	(100)	30	Turf Seed
27.	Saturn per rye	(100)	30	Turf Seed
28.	2 EM PR per rye	(100)	30	Turf Seed
29.	246 PR per rye	(100)	30	Turf Seed
30.	CBS II per rye Omega Citation Birdie	 (33) (33) (33)	30	Turf Seed
31.	NK P 19 per rye	(100)	30	Northrup King
32.	M9 per rye	(100)	30	Northrup King
33.	Caddie per rye	(100)	30	Northrup King
34.	Medalist 7 per rye	(100)	30	Northrup King
35.	Annual rye	(100)	30	Cheapseed Co.
36.	Palmer per rye Pinnacle per rye	(50) (50)	30	AZ Nursery Supply

Table 1. Mean[1] number of days from planting to reach 70% ground cover. Plots planted on October 16, 1989, Tucson, Arizona.

Entry	No. of Days
Annual rye	23
Caravelle	23
ISI 832	22
Palmer/Prelude	21
Cowboy	21
CBS II	21
2 EM PR	21
Palmer	21
2 DD	21
PE 8	20
Marvelgreen/Laser	20
NK M9	20
Marvelgreen/Jamestown/Laser	20
ISI PR 861	20
Caddie	20
Lindsay	20
Caliente	20
Accolade	19
PHD	19
Repell	19
Charger	19
Ranger	18
SR 4100	18
SR 4000	18
Palmer/Prelude/Yorktown	18
Marvelgreen/Laser	18
Palmer/Pinnacle	18
Ovation	17
Medalist 7	17
Saturn	17
Prelude	16
246 PR	16
Jamestown/Laser	16
NK P 19	16
ISI PR 852	15
Laser/Southshore	14
Test mean	18
LSD_2	6

1/ Mean of 4 replications
2/ LSD value = least significant difference value (0.05). To determine statistical difference among entries, subtract one entry's mean from another entry's mean. A statistical difference occurs when this value is larger than the corresponding LSD value.

Table 2. Percent cover[1] of 36 entries on select dates, Fall 1988, Spring 1989, University of Arizona.

Entry	Percent ground cover (0 - 100%)						
	12/05/88	01/28/89	02/25/89	03/27/89	04/28/89	05/28/89	06/20/89
Marvelgreen/Laser	80	95	98	100	92	83	90
Jamestown/Laser	79	95	98	100	92	76	88
Saturn	78	95	98	100	98	99	99
CBS II	75	89	94	98	96	96	98
Charger	74	89	94	98	98	96	99
Annual rye	74	88	94	76	13	15	4
Laser/Southshore	74	91	93	100	95	56	57
Repell	74	93	95	99	99	99	99
NK-P-19	73	90	97	99	96	92	98
Palmer/Prelude/Yorktown	73	91	93	98	96	95	93
PHD	73	89	94	98	97	95	97
Cowboy	73	91	96	98	96	95	98
PE-8	72	88	92	98	96	96	98
ISI-PR-852	72	89	93	99	100	71	96
Marvelgreen/Jamestown	72	89	95	99	100	95	98
SR-4000	72	90	94	98	98	97	98
Accolade	70	91	96	99	100	94	98
ISI-PR-861	69	91	91	99	96	92	94
2-DD	69	88	93	97	96	93	98
Marvelgreen/Jamestown/Laser	69	90	95	100	95	88	89
2-EM-PR	69	93	98	98	96	97	99
Prelude	68	92	94	100	99	96	98
ISI-832	68	90	95	100	100	99	98
Caliente	68	92	97	100	100	99	99
NK-M9	68	90	92	98	98	99	98
246-PR	68	90	93	97	98	92	99
SR-4100	68	91	94	98	98	99	99

Table 2. (continued)

Palmer	66	86	92	99	98	95	97
Ranger	65	93	95	98	95	86	87
Ovation	65	85	94	100	100	98	99
Palmer/Pinnacle	65	88	89	98	98	96	98
Medalist 7	65	89	94	98	97	96	98
Palmer/Prelude	63	88	91	99	96	93	96
Lindsay	62	88	93	98	97	96	95
Caravelle	61	88	95	99	97	41	47
Caddie	59	85	89	97	98	95	87
Date mean	70	90	94	98	94	88	91
LSD value[2]	13	8	7	3	5	15	10

1/ Mean of 4 replications. Percent cover = (0 - 100%).
2/ LSD value = least significant difference value (0.05). To determine statistical difference among entries, subtract one entry's mean from another entry's mean. Statistical difference occurs when this value is larger than the corresponding LSD value.

Table 3. Mean[1] color[2] scores of 36 entries, Fall 1988, Spring 1989, University of Arizona.

Entry	Color 12/05 1988	01/28 1989	02/25 1989	03/10 1989	03/27 1989	04/28 1989	05/28 1989	06/20 1989	Overall Average
Marvelgreen/Laser	6.4	6.3	6.4	6.6	6.3	6.9	5.6	5.7	6.2
Jamestown/Laser	5.9	6.3	6.6	6.6	6.0	6.4	4.9	5.5	6.0
Saturn	5.8	6.4	6.9	7.1	7.6	7.4	7.4	6.8	6.9
Palmer	5.8	6.3	6.8	6.6	6.8	6.3	6.6	6.4	6.5
Lindsay	5.6	5.9	6.6	6.8	7.3	6.3	6.3	5.9	6.3
Laser/Southshore	5.5	6.3	6.8	6.6	6.0	6.8	6.3	4.3	6.1
Repell	5.5	6.3	6.4	6.4	6.6	6.0	3.7	5.8	5.8
2-DD	5.4	5.8	6.4	6.9	7.6	7.5	6.9	7.4	6.7
SR-4000	5.4	6.3	6.6	6.5	7.1	6.8	6.9	7.3	6.6
Caddie	5.4	7.0	7.2	6.5	6.6	6.0	6.5	5.8	6.4
Accolade	5.4	5.9	6.4	6.8	7.1	6.6	6.5	6.7	6.4
Prelude	5.4	6.4	6.8	6.4	6.6	6.0	6.5	6.3	6.3
Caravelle	5.4	6.5	6.8	7.1	8.4	7.1	3.4	3.1	6.0
Marvelgreen/Jamestown	5.3	6.0	6.9	6.8	6.5	6.6	6.2	6.0	6.3
PHD	5.3	6.5	7.4	6.4	7.0	6.7	6.6	6.3	6.5
PE-8	5.3	6.2	6.6	7.4	7.5	7.1	6.5	6.1	6.6
ISI-832	5.3	6.8	6.6	6.6	7.0	6.5	6.6	6.1	6.4
Palmer/Prelude/Yorktown	5.3	6.4	6.5	6.5	6.5	6.4	6.5	6.1	6.3
Charger	5.3	6.6	6.5	6.8	7.6	7.3	7.1	7.1	6.8
SR-4100	5.1	6.3	6.5	6.9	6.9	6.5	7.1	7.0	6.5
Caliente	5.0	6.4	7.0	6.5	6.6	6.1	6.3	5.9	6.2
NK-M9	5.0	6.0	6.9	6.6	6.6	5.7	6.6	5.8	6.2
Marvelgreen/Jamestown/Laser	4.9	6.5	6.3	6.6	6.1	6.4	6.3	6.3	6.2
CBS II	4.9	6.4	7.0	6.9	6.8	6.1	5.6	6.4	6.3
Palmer/Pinnacle	4.9	5.4	6.0	5.9	6.9	6.3	6.6	6.3	6.0

Table 3--(continued)

Medalist 7	4.9	5.9	6.2	6.1	6.5	5.8	6.2	5.9	5.9
Ovation	4.9	5.9	6.9	6.4	6.3	5.8	6.0	5.9	6.0
Palmer/Prelude	4.8	6.0	6.3	6.4	6.8	6.3	6.5	6.3	6.2
Ranger	4.8	6.4	6.5	6.1	6.2	5.4	5.6	5.6	5.8
Cowboy	4.6	5.5	6.8	5.8	6.4	5.4	6.9	6.9	6.0
ISI-PR-852	4.6	5.6	6.3	6.4	7.1	6.5	6.6	6.4	6.2
ISI-PR-861	4.6	6.3	6.1	6.6	7.4	7.1	6.3	5.9	6.3
Annual rye	4.4	5.5	5.0	2.9	2.4	1.5	1.8	2.0	3.2
2 EM PR	4.4	6.0	6.5	6.9	7.5	6.6	6.6	6.1	6.3
NK P 19	4.4	5.8	6.3	6.1	7.0	6.0	5.8	5.9	5.9
246 PR	4.3	6.3	6.8	6.9	7.4	7.0	6.0	5.8	6.3
Date mean	5.1	6.2	6.6	6.5	6.7	6.7	6.1	6.0	6.2
LSD Value[3]	1.3	1.1	1.2	1.0	0.6	1.1	0.9	0.9	1.0

1/ Mean of 4 replicates.
2/ Color score 1 - 9, 1 = straw, 9 = dark green
3/ LSD value = least significant difference value (0.05). To determine statistical difference among entries, subtract one entry's mean from another entry's mean. Statistical difference occurs when this value is larger than the corresponding LSD value.

Table 4. Mean[1] quality scores[2] of 36 entries, Fall 1988, Spring 1989, University of Arizona.

Entry	Quality 12/05 1988	01/25 1989	03/10 1989	03/27 1989	04/28 1989	05/28 1989	06/20 1989	Overall Average
Marvelgreen/Laser	7.1	7.1	7.8	8.3	6.4	4.9	5.6	6.7
Charger	6.9	7.5	7.0	7.6	6.8	6.5	7.0	7.0
Jamestown/Laser	6.9	6.9	7.9	8.5	5.9	4.4	4.6	6.4
SR 4000	6.6	7.0	7.0	7.4	6.8	6.4	6.6	6.8
Marvelgreen/Jamestown/Laser	6.6	6.6	8.0	8.1	6.9	5.6	5.5	6.6
CBS II	6.6	6.9	6.5	7.5	5.5	6.1	6.1	6.5
Saturn	6.6	7.3	7.0	8.1	7.5	6.4	7.0	7.1
Repell	6.6	7.6	6.5	7.4	5.9	6.5	6.4	6.7
Prelude	6.6	6.9	7.1	8.0	6.5	6.5	6.6	6.9
246 PR	6.5	7.4	6.6	7.1	6.3	5.8	5.8	6.5
ISI 832	6.5	6.9	7.4	7.8	6.6	6.8	5.8	6.8
Palmer/Prelude/Yorktown	6.5	7.3	6.6	7.4	6.1	6.0	5.8	6.5
Caliente	6.5	7.3	7.2	7.8	6.3	6.4	6.1	6.8
Laser/Southshore	6.5	7.0	7.8	8.6	6.5	4.4	3.6	6.3
Marvelgreen/Jamestown	6.4	7.5	7.9	8.0	7.4	5.8	6.8	7.1
Accolade	6.4	6.9	7.1	7.8	6.5	6.2	7.1	6.9
PE-8	6.3	6.8	7.3	7.8	6.6	6.9	6.4	6.9
ISI PR 861	6.3	6.9	6.9	7.4	6.5	6.2	5.4	6.5
SR 4100	6.1	6.8	7.1	7.3	6.1	6.6	7.0	6.7
PHD	6.1	7.0	6.4	7.0	5.3	5.8	5.8	6.2
Caddie	6.1	6.6	6.4	6.8	5.8	6.4	4.9	6.1
2 EM PR	6.1	6.8	7.1	7.4	6.5	6.5	6.3	6.7
Ovation	6.1	6.9	7.3	7.6	6.3	6.8	6.4	6.8
ISI PR 852	6.0	6.6	6.5	7.9	6.5	6.2	6.1	6.5
Cowboy	6.0	7.0	5.8	6.6	5.4	6.0	6.1	6.1
Palmer	6.0	6.6	7.0	7.3	6.3	6.0	6.5	6.5

Table 4--(continued)

NK P 19	6.0	6.4	6.1	7.0	5.3	6.0	5.8	6.1
Ranger	6.0	6.6	7.1	7.2	5.6	5.4	5.0	6.1
NK M9	6.0	7.5	7.1	7.3	6.1	6.8	6.1	6.7
Annual rye	5.9	6.1	2.9	3.5	1.3	1.6	1.8	3.3
Lindsay	5.8	6.5	6.8	7.5	5.9	6.1	6.3	6.4
2 DD	5.8	6.3	6.5	7.4	7.0	6.9	7.1	6.7
Medalist 7	5.8	6.4	6.3	6.9	5.4	6.0	5.9	6.1
Palmer/Pinnacle	5.8	5.8	6.0	7.3	5.9	6.3	6.4	6.2
Caravelle	5.6	5.9	7.0	7.0	5.8	2.3	2.7	5.2
Palmer/Prelude	5.0	5.9	7.0	7.1	5.5	5.8	6.0	6.0
Date mean	6.2	6.8	6.8	7.4	6.1	5.9	5.8	6.4
LSD value[3]	1.2	1.3	1.1	1.0	1.1	1.1	1.1	1.1

1/ mean of 44 replicates
2/ Quality 1 - 9, 9 = best
3/ LSD value = least significant difference value (0.05). To determine statistical difference among entries, subtract one entry's mean from another entry's mean. Statistical difference occurs when this value is larger than the corresponding LSD value.

Table 5. Mean[1] uniformity[2] scores for 36 entries, Spring 1989, University of Arizona.

Entry	Uniformity		
	28 April 1989	28 May 1989	20 June 1989
Jamestown/Laser	8.0	5.1	7.3
Laser/Southshore	7.9	4.1	4.8
Marvelgreen/Jamestown/Laser	7.5	6.3	7.5
Saturn	7.5	5.8	6.5
Marvelgreen/Jamestown	7.4	6.9	7.8
SR 4000	6.9	5.5	6.1
Marvelgreen/Laser	6.9	6.1	7.3
2 DD	6.8	7.3	7.0
NK M9	6.8	5.9	6.5
2 EM PR	6.5	6.0	6.1
Prelude	6.5	5.6	6.0
Accolade	6.5	5.8	6.5
ISI PR 852	6.4	4.1	6.6
Repell	6.4	5.6	6.4
PE 8	6.4	6.0	5.9
Caliente	6.3	5.3	5.9
Lindsay	6.3	5.8	5.8
ISI PR 861	6.3	6.3	6.5
246 PR	6.3	5.8	6.3
ISI 832	6.1	5.5	6.0
Palmer	6.1	5.1	5.9
Charger	6.1	6.0	6.1
CBS II	6.0	5.8	5.3
Palmer/Prelude/Yorktown	5.9	6.1	6.0
Ovation	5.8	5.6	6.4
Cowboy	5.6	6.5	5.9
Caddie	5.5	5.4	5.4
SR 4100	5.5	5.9	6.1
Ranger	5.5	4.8	5.5
Palmer/Pinnacle	5.4	6.5	6.6
Palmer/Prelude	5.4	5.0	5.0
Medalist 7	5.0	5.3	5.6
NK P 19	4.9	4.3	4.5
PHD	4.8	5.6	4.8
Caravelle	4.6	3.3	3.5
Annual rye	1.8	2.0	2.5
Date mean	6.1	5.5	5.9
LSD value[3]	1.3	1.4	1.2

1/ Mean of 4 replications. 2/ Uniformity scores 1 - 9, 9 = most uniform. 3/ LSD value = least significant difference value (0.05). To determine statistical difference among entries, subtract one entry's mean from another entry's mean. Statistical difference occurs when this value is larger than the correponding LSD value.