

# USGA Distichlis Report University of Arizona Summer 2003

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## **Abstract**

*The U/A twenty-one clone saltgrass accession nursery received a mowing height of 7/8" (or less) in 2003. In spring of 2003, clonal accessions C-8, A51, A53, and A138 produced the quickest green-up in early April. Accessions with good quality turf performance in spring/early summer included A138, A51, C-8, A65, A48, and A53. Starting in July, all plots were split with a rolling treatment (850 lb. roller, 2 passes, 2-3 times weekly) up until early October. The main effect of rolling caused increased positive responses for certain clonal accessions, others showed no response, while yet others showed decreased performance from the rolling treatment. Rolling increased positive turf responses among turf clones with showed good turf quality when not rolled. This occurred for nine of the twenty-one clones in this test, all when mowed 3 times weekly at 7/8". Accumulated rolling increased turf performance to enhanced and acceptable levels of quality (6.0 or greater) by the end of September. This was true for nine of the twenty-one clones as well. Accessions, which produced good quality turf (after rolling started in June) throughout the summer, included the following: A138, A65, A86, A137, A48, A51, and A40. Accessions which produced the best quality turfs when unrolled included A138. Likewise, turf density visual scores produced similar accession X rolling interactions. Eleven of the twenty-one clones produced a denser appearing turf after rolling, nine of which had mean visual density scores within the range of 6.3 – 8.7, when rolled. This enhanced response to rolling improved the overall appearance (turf quality) of select clonal accessions over their unrolled counterparts. Initial response to repeated rolling and lower mowing heights showed a favorable response among certain clonal accessions.*

## **Introduction**

The replicated accession trial planted in 1998 was evaluated in 2003 after initializing a lower mowing height of 7/8" starting in at green-up 2003. This lower mowing height should separate clones further based on growth habit (tolerance to lower mowing). In addition, starting in mid-July all plots were divided into half plots which then received rolling events 3 times weekly. Therefore, half of the plot area was rolled and mowed at 7/8", while the other half was mowed at 7/8". Mowing events were 2x – 3x weekly, depending on relative growth rates.

## Materials and Methods

### Test 1:

This test included mowing all plots at the new mowing height of 7/8" using a 22" walk behind reel mower. For this portion of the test, plots were flood irrigated and fertilized on May 1 and 23, June 13, July 3 and 25, August 15, September 5 and 26. Flooding was 3-4" after fertilizing with 1.2 lbs. -N-/ M, from a 21-7-14 fertilizer.

The plots received pre-emergence fertilizer on the dates of September 22, 2003. Turfgrass visual scores of plot composition cover (% green tissue, %bare ground and % straw stems) were assigned at green-up (April 4) and up to September 30, 2003. Visual assignment scores of color, quality, and density were assigned in May and June, before rolling treatments were conducted. Data was subjected to the analysis of variance technique using SAS software. Field design was a RCB with three replications. Bonferroni's protected LSD values were calculated as the mean separation statistic only when the F ratio for the accession main effect had P values of 0.05 or less.

### Test 2:

All plots received rolling starting on July 10, 2003. An 875-lb. Brouer roller passed over 1/3 of the plot, twice per rolling event. Rolling events occurred 2 or 3 times weekly, depending on surface moisture conditions (rain, flooding events).

Data from 28 July to 30 September were analyzed using the analysis of variance technique using SAS software. This field design was a split plot design with the rolling factor as the main plot and field accession as the sub-plot. Data was then analyzed for each rolling level (roll-yes and roll-no) for evaluating mean responses of accessions. LSD values were calculated when the appropriate sources of variation were significant at P = 0.05, or less. Interaction means are included for the mean responses of all accessions to rolling levels (roll no, and roll yes).

## Results and Discussion

### Test 1. Accession Response to 7/8" mowing, prior to mechanical rolling (April 4 to June 9, 2003).

The ANOVA main effect of the "clonal accession" was significant for all responses on all of the above dates. For green-up in early April, the mean percent plot canopy composition was 28% green turf, 63% straw turf and 9% bare soil respectively on 4 April 2003 (Table 1). The percent plot green, percent straw, and percent bare soil ranges (among all clones) were (7%-47%), (15%-73%), and (0%-78%), respectively. The accessions with the greater amounts of total percent plot green cover at this time were C8 (47%), A51 (45%), A53 (37%) and A138 (37%). Clones C56 and C66 had 13% or less green cover at this time (Table 1). The clones with high percent plot cover mentioned above also had the least amount of bare soil evident (0-3% maximum), which showed at maximum carry over of vegetation from the previous year. Likewise, clones with the least amount of percent green, percent plot cover also had the most amount of bare ground showing (C56-32%) and (C66-72%) (Table 1). This demonstrates poor tolerance to mowing at the previous year's height of 1.25 inches.

By 30 May, full green-up was now evident, with accessions ranging from 23% to 94% percent plot green cover. The overall test mean was 69% green cover at this time (Table 1). Accessions with 90% or more green cover at 7/8" mowing height included C8 (94%), A138 (93%), A65 (90%), A48 (88%) and A51 (87%). These accessions also produced minimal % straw and bare ground surface compositions. Just prior to the rolling program, percent plot composition scores were assigned again on 9 June. The percent plot green composition mean scores ranged from 28-96% (Table 1). The maximum green plot cover was achieved by clone A138 (96%), followed closely by C8, A65, and A48, all with 93% mean percent green plot cover. Clones with the least ground cover included C56 (28%), C66 (40%), and C92 (50%) (Table 1). Those clones had considerable bare ground percentage values, as well.

For turfgrass quality in May and June (before rolling was conducted), accessions with the greatest amounts of % green plot cover tended to exhibit the best quality turf scores as well (Table 1). Therefore, at the height of 7/8", accessions with the best performance in May and June were as follows: A138 (7.3:8.0), A51 (6.0:6.7), C8 (7.0:7.3), A65 (6.7:7.7), A48 (6.7-7.7), and A53 (6.0:6.3), respectively, Turfs with the greatest visual density on 9 June 2003 included A138 (8.0), C8 (7.3), A65 (7.3), and A48 (7.0).

### Test 2. Mowing at 7/8" [With/Without Rolling]

The ANOVA main effect of "rolling" was significant for 9 of 13 response variables for the summer of 2003. In essence, the percent plot bare ground on September 30 and visual leaf texture on 28 July and color on 29 July were not affected by rolling (Tables 3, 4). All other variables showed that the rolling factor was significant. (Table 4). The mechanical rolling of *Distichlis* did enhance certain turf variable responses. On 28 July, (10 days after initial rolling began), the percent plot green averaged 83% vs. 79% for unrolled plots. While mean color scores of the twenty-one clones did not respond in any way to rolling, overall turf quality did, as rolled plots had significant greater mean quality scores (6.2) vs. unrolled plots (5.5). This was mainly due to increased visual density estimates of the rolled plots (6.4) compared to unrolled plots (5.6) (Table 3). These responses were highly noticeable and statistically significant (Table 4).

At the close of the regular summer season, certain *Distichlis* clones (on average) exhibited improvements in turfgrass color, quality, texture and percent plot green composition over their unrolled counterparts. It has been observed on germplasm collection trips that saltgrass plants were often the only grass vegetation growing on highly compacted and trafficked motor ways such as county road banks, U.S. mail stops in rural areas, and non-paved truck stops. These locations essentially were shallow gravel packed drives, or predominated as bare soil areas only. In either case, plants were not protected in asphalt cracks. Removal and evaluation of these collections has produced low growing plants, *as well as* tall plants with unacceptably long internodes (Lincoln Logs). Therefore it is fair to assume that (1) growing points are not affected by extreme traffic/compaction, and (2) a compaction X genotype interaction exists within saltgrass.

Based on three months of rolling treatments, rolling X accession interactions were statistically significant for four turf responses. These occurred for turfgrass color, quality and % green plot cover on 30 September 2003, and for turfgrass quality on 28 July (Table 4). The interaction was caused by the fact that (in September) certain accessions had increased plot cover when they were rolled A55 (15%:37%), C66 (8%:10%); others were unchanged. A61 (63%: 63%), C92 (18%: 18%), C12 (48%: 47%), while others showed an INCREASE when rolled versus their unrolled counterparts A138 (92%:68%), A72 (55%:35%), A86 (75%:60%), A137 (83%:65%), A48 (87%:67%), A51 (85%:55%), and A53 (75%:63%) (Table 2).

Likewise, turfgrass quality scores were affected by rolling, with several accessions exhibiting improved overall turf quality scores in response to rolling. For example on 28 July, C8 (7.0:6.0), A138 (8.7:8.3), A65 (7.3:7.0), C11 (6.7:4.7), A119 (7.0:6.7), A137 (6.3:6.0), A48 (7.7:7.3), A51 (7.3:6.7), A40 (6.7:6.7) and A86 (7.7:6.0) all had good turf quality scores when rolled or unrolled, noting that A51, A86, and A130 had improved quality in response to rolling on 28 July (Table 5). C11 produced a poor quality turf when unrolled (4.7), but was fully acceptable when rolled (6.7) on 28 July. By the beginning of fall on 30 September all the aforementioned clones did have greater mean quality scores when rolled (versus when not rolled), but on average, scores were lower than in mid-summer (Table 5).

The only accession with good to excellent quality scores on 30 September when rolled/unrolled was A138 (8.0:6.3). The following clones had improved and acceptable quality after three months of rolling, but were of lesser overall quality when not rolled at the end of September; A65 (7.7:5.7), A86 (7.0:5.0), A137 (6.3:5.3), A41 (6.3:4.7), A48 (6.3:5.0), A51 (6.7:5.0), and A40 (6.3:5.0). Therefore, accumulated rolling events increased the turf performance of seven accessions to 6.0 or greater, when their unmowed counterparts were less than 6.0 for turf quality. One accession, A53, had better turf quality in September than in July. This clone also benefited from accumulated rolling with mean quality scores of (6.7rolled : 6.0 n o-roll) on 30 September. The significant accession X rolling interaction on 30 September was caused by the accompanying decreased performance due to rolling for most of the remaining clones and by no response to rolling at all (A55, C56, A77, and C66) (Table 4,5)

Accessions which produced good quality turfs mowed at 7/8" and when rolled throughout the summer (both quality dates) included A138 (8.7:8.0), A65 (7.3:7.7), A86 (7.7:7.0), A137 (6.3:6.3), A48 (7.7:6.3), A51 (7.3:6.7), and A40 (6.7:6.3) respectively (Table 5). These are noteworthy and positive responses, since traffic/compaction response has not been tested in mowed saltgrass turfs, noting that certain accessions tolerated this level of traffic. Plans are to repeat these treatments again in 2004.

## Conclusions

1. At a lower mowing height of 7/8 inch, saltgrass clones produced significant responses between clones for turfgrass color, quality, density, and percent plot composition.
2. In spring of 2003, clonal accessions C-8, A51, A53, and A138 produced the quickest green-up in early April. Accessions with good quality turf performance in spring/early summer included A138, A51, C-8, A65, A48, and A53.
3. The Accession which produced the best quality turfs when unrolled was that of clone A138.
4. After mechanical rolling with a 875 lb. machine, the main effect of rolling caused increased positive responses for certain clonal accessions, others showed no response, while yet others showed decreased performance from the rolling treatment.
5. Accessions, which produced good quality turf (after rolling started in June) throughout the summer, included the following: A138, A65, A86, A137, A48, A51, and A40.

**Table 1. Mean composition cover of 21 saltgrass accessions before rolling treatments. University of Arizona. 2003. Values are the mean of three replications. Turf mowed 3x weekly at 7/8 inch.**

Accession Number	%Plot green 4-Apr	%Plot straw 4-Apr	%Plot bare 4-Apr	%Plot green 30-May	%Plot straw 30-May	%Plot bare 30-May	%Plot green 9-Jun	%Plot straw 9-Jun	%Plot bare 9-Jun	TURF COLOR 30-May	TURF COLOR 9-Jun	TURF QUALITY 30-May	TURF QUALITY 9-Jun	TURF DENSITY 9-Jun
<b>A61</b>	<b>23</b>	<b>73</b>	<b>3</b>	<b>70</b>	<b>3</b>	<b>27</b>	<b>75</b>	<b>3</b>	<b>22</b>	<b>6.0</b>	<b>5.3</b>	<b>5.3</b>	<b>5.3</b>	<b>5.3</b>
A55	38	57	5	73	3	24	75	5	20	6.3	6.3	5.0	5.7	5.7
<b>C8</b>	<b>47</b>	<b>52</b>	<b>2</b>	<b>94</b>	<b>1</b>	<b>5</b>	<b>93</b>	<b>4</b>	<b>3</b>	<b>6.7</b>	<b>7.0</b>	<b>7.0</b>	<b>7.3</b>	<b>7.3</b>
C92	30	50	20	52	0	48	50	8	42	6.0	6.0	4.0	4.0	4.0
<b>A138</b>	<b>37</b>	<b>63</b>	<b>0</b>	<b>93</b>	<b>0</b>	<b>7</b>	<b>96</b>	<b>3</b>	<b>1</b>	<b>8.0</b>	<b>8.0</b>	<b>7.3</b>	<b>8.0</b>	<b>8.0</b>
A65	23	73	4	90	0	10	93	4	4	6.3	6.3	6.7	7.7	7.3
<b>C56</b>	<b>12</b>	<b>57</b>	<b>32</b>	<b>23</b>	<b>0</b>	<b>77</b>	<b>28</b>	<b>3</b>	<b>68</b>	<b>5.7</b>	<b>5.7</b>	<b>3.0</b>	<b>2.7</b>	<b>3.3</b>
C11	25	65	10	72	4	24	60	9	31	6.0	5.7	4.7	4.7	4.7
<b>A72</b>	<b>20</b>	<b>73</b>	<b>7</b>	<b>63</b>	<b>3</b>	<b>33</b>	<b>72</b>	<b>5</b>	<b>23</b>	<b>6.3</b>	<b>6.3</b>	<b>5.3</b>	<b>5.0</b>	<b>5.0</b>
A119	28	68	3	77	4	19	85	4	11	5.7	7.0	5.7	6.7	6.3
<b>A86</b>	<b>28</b>	<b>72</b>	<b>0</b>	<b>78</b>	<b>0</b>	<b>22</b>	<b>90</b>	<b>3</b>	<b>7</b>	<b>7.0</b>	<b>7.3</b>	<b>5.3</b>	<b>6.3</b>	<b>5.7</b>
A77	32	62	7	48	3	48	52	3	45	5.7	5.3	3.3	4.7	3.7
<b>A137</b>	<b>22</b>	<b>78</b>	<b>0</b>	<b>63</b>	<b>3</b>	<b>33</b>	<b>67</b>	<b>6</b>	<b>27</b>	<b>5.0</b>	<b>5.0</b>	<b>4.7</b>	<b>5.3</b>	<b>4.7</b>
A41	33	63	3	73	5	22	70	7	23	5.7	6.0	5.0	5.3	5.0
<b>C66</b>	<b>7</b>	<b>15</b>	<b>78</b>	<b>26</b>	<b>0</b>	<b>74</b>	<b>40</b>	<b>7</b>	<b>53</b>	<b>4.3</b>	<b>3.3</b>	<b>2.3</b>	<b>2.3</b>	<b>2.0</b>
A48	33	65	2	88	1	11	93	3	5	6.3	7.3	6.7	7.7	7.0
<b>A51</b>	<b>45</b>	<b>55</b>	<b>0</b>	<b>87</b>	<b>3</b>	<b>10</b>	<b>88</b>	<b>4</b>	<b>8</b>	<b>6.3</b>	<b>7.7</b>	<b>6.0</b>	<b>6.7</b>	<b>6.3</b>
C12	27	62	12	60	0	40	63	2	35	7.3	7.7	4.7	4.7	4.3
<b>C10</b>	<b>25</b>	<b>67</b>	<b>8</b>	<b>70</b>	<b>3</b>	<b>27</b>	<b>60</b>	<b>7</b>	<b>33</b>	<b>6.0</b>	<b>6.0</b>	<b>5.0</b>	<b>5.3</b>	<b>5.0</b>
A40	17	83	0	62	2	36	72	2	26	6.7	7.0	4.3	5.0	4.7
<b>A53</b>	<b>37</b>	<b>60</b>	<b>3</b>	<b>77</b>	<b>1</b>	<b>22</b>	<b>80</b>	<b>3</b>	<b>17</b>	<b>7.0</b>	<b>7.3</b>	<b>6.0</b>	<b>6.3</b>	<b>6.3</b>
<b>MEAN</b>	<b>28</b>	<b>63</b>	<b>9</b>	<b>69</b>	<b>2</b>	<b>30</b>	<b>72</b>	<b>5</b>	<b>24</b>	<b>6.2</b>	<b>6.4</b>	<b>5.1</b>	<b>5.6</b>	<b>5.3</b>
<b>LSD Value</b>	<b>20</b>	<b>20</b>	<b>6</b>	<b>22</b>	<b>3</b>	<b>23</b>	<b>23</b>	<b>4</b>	<b>23</b>	<b>1</b>	<b>0.9</b>	<b>1.6</b>	<b>1.4</b>	<b>1.3</b>

Table 2. Percent plot cover composition of 21 saltgrass clones subjected to 7/8" mowing and mechanical rolling. University of Arizona, summer 2003. Values are the mean of three replications.

Accession	roll yes			roll no			roll yes			roll no		
	% green	% bare	% straw	% green	% bare	% straw	% green	% bare	% straw	% green	% bare	% straw
	28-Jul	28-Jul	28-Jul	28-Jul	28-Jul	28-Jul	30-Sep	30-Sep	30-Sep	30-Sep	30-Sep	30-Sep
A61	87	7	7	83	12	5	70	8	22	63	12	25
A55	70	10	20	73	7	20	15	58	27	37	40	23
C8	91	4	5	87	7	7	63	20	17	53	20	27
C92	72	23	5	58	30	12	18	70	12	18	70	12
A138	98	1	1	96	1	2	92	3	5	68	5	27
A65	95	0	5	93	2	6	75	5	20	60	7	33
C56	58	37	5	70	23	7	10	83	7	13	85	2
C11	87	7	7	65	30	5	60	35	5	45	45	10
A72	92	6	2	77	18	5	55	27	18	35	37	28
A119	95	2	2	90	7	3	57	22	20	40	32	28
A86	93	5	2	80	10	10	75	10	15	60	18	22
A77	77	18	5	70	22	8	27	68	5	22	75	3
A137	85	13	2	88	10	2	83	5	12	65	13	22
A41	73	20	7	70	23	7	67	15	18	52	23	25
C66	37	53	10	35	53	12	8	90	2	10	88	2
A48	93	4	3	93	4	3	87	5	8	67	7	27
A51	94	5	1	88	8	3	85	4	11	55	12	33
C12	87	12	2	88	8	3	48	37	15	47	35	18
C10	87	7	7	78	10	12	18	75	7	22	70	8
A40	87	10	3	89	7	4	43	32	25	35	35	30
A53	77	7	15	87	7	5	75	10	15	63	20	17
mean	83	12	6	79	14	7	54	33	14	44	36	20
LSD	16	15	NS	13	17	17	17	17	16	20	21	17

**Table 3. Mean Response of 21 *Distichlis* clones to Rolling when mowed 3x week at 7/8". Summer of 2003. University of Arizona. Values are the mean of 63 observations.**

<b>Response</b>	<b>Date</b>	<b>Roll Yes</b>	<b>Roll N0</b>	<b>LSD Value</b>
<b>Color</b>	<b>28-Jul</b>	<b>6.3</b>	<b>6</b>	<b>NS</b>
<b>Quality</b>	<b>28-Jul</b>	<b>6.2</b>	<b>5.5</b>	<b>0.1</b>
<b>Texture</b>	<b>28-Jul</b>	<b>6.4</b>	<b>6.7</b>	<b>NS</b>
<b>%plot green cove</b>	<b>28-Jul</b>	<b>83</b>	<b>79</b>	<b>3.3</b>
<b>% plot straw</b>	<b>28-Jul</b>	<b>6</b>	<b>7</b>	<b>NS</b>
<b>%bare soil</b>	<b>28-Jul</b>	<b>12</b>	<b>15</b>	<b>0.3</b>
<b>Density</b>	<b>28-Jul</b>	<b>6.4</b>	<b>5.6</b>	<b>0.5</b>
<b>Color</b>	<b>30-Sep</b>	<b>5.4</b>	<b>4.7</b>	<b>0.6</b>
<b>Quality</b>	<b>30-Sep</b>	<b>5.3</b>	<b>4.3</b>	<b>1</b>
<b>Texture</b>	<b>30-Sep</b>	<b>6</b>	<b>5.3</b>	<b>0.3</b>
<b>%plot green cove</b>	<b>30-Sep</b>	<b>54</b>	<b>44</b>	<b>3</b>
<b>% plot straw</b>	<b>30-Sep</b>	<b>14</b>	<b>20</b>	<b>4.1</b>
<b>%bare soil</b>	<b>30-Sep</b>	<b>32</b>	<b>36</b>	<b>NS</b>

Color/Quality/Texture = 1-9. 1=dead, 6= fully acceptable 9=best possible.

Table 4. Significance Levels for Main and Interactive Effects of Rolling on 21 *Distichlis* Accessions, mowed at 7/8", summer 2003, University of Arizona.

		SOURCE OF VARIATION		
		Accession [A]	Rolling [R]	[A] x [R]
Color	28-Jul	XXX	NS	NS
Quality	28-Jul	XXX	XXX	X
Texture	28-Jul	XXX	NS	NS
%plot green cover	28-Jul	XXX	XXX	NS
% plot straw	28-Jul			
%bare soil	28-Jul	XXX	XXX	NS
Density	28-Jul	XXX	XXX	NS
Color	30-Sep	XXX	XXX	XXX
Quality	30-Sep	XXX	XXX	XXX
Texture	30-Sep	XXX	XXX	NS
%plot green cover	30-Sep	XXX	XXX	XXX
% plot straw	30-Sep	XXX	XXX	NS
%bare soil	30-Sep	XXX	NS	NS

NS= non significant.

X, XX, XXX = significant at P= 0.05, 0.01 and 0.001, respectively.

Accessions= 21 *distichlis* clones, 4 x6 plots.

Rolling = plots rolled 2 passes @2-3X week,875 Lb. Brouer roller.



Table 5. Mean Color, quality Texture and density scores of 21 saltgrass clones subjected to 7/8" mowing, with and without rolling treatments. University of Arizona, summer 2003.

TRT	Color		Color		Quality		Quality		Texture		Texture		Density	
	roll yes	roll no	roll yes	roll no	roll yes	roll no	roll yes	roll no	roll yes	roll no	roll yes	roll no	roll yes	roll no
	28-Jul	28-Jul	30-Sep	30-Sep	28-Jul	28-Jul	30-Sep	30-Sep	28-Jul	28-Jul	30-Sep	30-Sep	28-Jul	28-Jul
<b>A61</b>	<b>5.7</b>	<b>5.3</b>	<b>6.3</b>	<b>5.3</b>	<b>5.0</b>	<b>5.0</b>	<b>6.7</b>	<b>5.7</b>	<b>7.3</b>	<b>7.0</b>	<b>7.3</b>	<b>6.0</b>	<b>7.0</b>	<b>5.7</b>
A55	6.7	5.7	4.3	5.3	5.7	5.0	4.0	4.0	6.7	7.0	6.0	5.7	6.0	5.3
<b>C8</b>	<b>5.7</b>	<b>6.0</b>	<b>5.7</b>	<b>6.3</b>	<b>7.0</b>	<b>6.0</b>	<b>5.3</b>	<b>4.7</b>	<b>7.0</b>	<b>7.3</b>	<b>6.7</b>	<b>6.0</b>	<b>7.0</b>	<b>6.7</b>
C92	5.3	4.7	3.3	3.0	5.0	3.7	2.3	3.0	4.3	4.3	3.3	3.3	5.0	4.0
<b>A138</b>	<b>8.0</b>	<b>8.0</b>	<b>7.7</b>	<b>5.7</b>	<b>8.7</b>	<b>8.3</b>	<b>8.0</b>	<b>6.3</b>	<b>7.0</b>	<b>7.3</b>	<b>7.7</b>	<b>6.7</b>	<b>8.7</b>	<b>8.3</b>
A65	5.7	5.7	6.7	5.0	7.3	7.0	7.7	5.7	7.3	8.0	7.3	6.0	8.3	7.3
<b>C56</b>	<b>5.7</b>	<b>6.3</b>	<b>2.7</b>	<b>3.3</b>	<b>4.0</b>	<b>4.7</b>	<b>2.0</b>	<b>2.7</b>	<b>6.7</b>	<b>6.0</b>	<b>4.3</b>	<b>4.3</b>	<b>3.7</b>	<b>4.7</b>
C11	5.7	4.7	5.3	4.0	6.7	4.7	5.0	3.3	6.0	6.3	4.7	4.3	5.7	4.3
<b>A72</b>	<b>6.7</b>	<b>6.0</b>	<b>4.7</b>	<b>3.7</b>	<b>6.0</b>	<b>5.0</b>	<b>4.7</b>	<b>3.0</b>	<b>6.3</b>	<b>6.7</b>	<b>5.7</b>	<b>6.0</b>	<b>6.3</b>	<b>5.0</b>
A119	6.7	6.7	5.0	4.0	7.0	6.7	5.0	3.3	6.3	7.0	6.3	5.3	7.3	6.3
<b>A86</b>	<b>7.0</b>	<b>7.3</b>	<b>6.7</b>	<b>4.7</b>	<b>7.7</b>	<b>6.0</b>	<b>7.0</b>	<b>5.3</b>	<b>6.7</b>	<b>6.7</b>	<b>7.3</b>	<b>5.3</b>	<b>7.3</b>	<b>6.0</b>
A77	6.0	5.3	5.0	5.0	5.3	4.3	3.7	3.7	5.7	5.7	5.3	4.7	5.0	4.3
<b>A137</b>	<b>6.7</b>	<b>6.3</b>	<b>6.3</b>	<b>6.0</b>	<b>6.3</b>	<b>6.0</b>	<b>6.3</b>	<b>5.3</b>	<b>7.0</b>	<b>7.0</b>	<b>7.0</b>	<b>6.0</b>	<b>7.3</b>	<b>6.0</b>
A41	5.7	5.3	7.0	6.0	5.7	5.0	6.3	4.7	6.0	6.7	7.0	5.7	5.7	5.0
<b>C66</b>	<b>3.7</b>	<b>3.7</b>	<b>2.0</b>	<b>2.0</b>	<b>2.7</b>	<b>3.0</b>	<b>2.0</b>	<b>2.0</b>	<b>4.0</b>	<b>4.0</b>	<b>3.7</b>	<b>3.7</b>	<b>3.3</b>	<b>3.0</b>
A48	7.0	6.7	6.7	5.7	7.7	7.3	6.3	5.0	7.3	7.7	7.3	6.3	8.0	7.7
<b>A51</b>	<b>7.3</b>	<b>7.3</b>	<b>6.3</b>	<b>4.7</b>	<b>7.3</b>	<b>6.7</b>	<b>6.7</b>	<b>5.0</b>	<b>7.7</b>	<b>7.7</b>	<b>6.7</b>	<b>6.0</b>	<b>7.7</b>	<b>6.7</b>
C12	7.7	7.7	5.3	5.3	6.3	5.7	5.7	5.0	6.3	7.3	5.7	5.3	6.0	6.7
<b>C10</b>	<b>7.0</b>	<b>5.7</b>	<b>3.0</b>	<b>3.7</b>	<b>5.7</b>	<b>4.3</b>	<b>2.7</b>	<b>3.3</b>	<b>6.3</b>	<b>6.0</b>	<b>4.0</b>	<b>4.0</b>	<b>6.3</b>	<b>4.7</b>
A40	7.3	7.0	6.0	5.0	6.7	6.7	6.3	5.0	6.7	6.7	6.0	5.0	6.7	5.7
<b>A53</b>	<b>5.3</b>	<b>5.3</b>	<b>7.0</b>	<b>6.0</b>	<b>5.0</b>	<b>5.3</b>	<b>6.7</b>	<b>6.0</b>	<b>7.3</b>	<b>8.0</b>	<b>7.0</b>	<b>6.0</b>	<b>6.0</b>	<b>6.0</b>
mean	6.3	6.0	5.4	4.7	6.1	5.5	5.2	4.4	6.5	6.7	6.0	5.3	6.3	5.7
Lsd value	1.0	0.9	1.2	1.1	1.2	NS	1.1	0.8	1.2	1.1	1.2	1.2	1.3	1