

2012 ISCDA Multi-location Sweet Corn Seed Treatment Trial

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Introduction: The Seed Treatment Committee of the International Sweet Corn Development Association (ISCDA) organizes a seed treatment trial every year. Researchers at locations across the U.S. evaluate the selected set of treatments for their effect on seedling stand and vigor.

Methods: Eighteen seed treatments and a nontreated control were evaluated at multiple locations using one seed lot of the sweet corn hybrid, Super Sweet Jubilee (*sh2*), with a warm germination rate of 84%, and a cold germination rate of 70%. The seed treatments are listed in Table 1. They consisted of mixtures of conventional, experimental, and/or organic fungicide products, and many of the treatments had seed enhancements and insecticides. Seed treatments were sponsored by BASF Corporation; Nufarm Americas, Inc.; Syngenta Crop Protection, LLC; TJ Technologies, Inc.; and Valent USA Corporation. Additionally, two standard seed treatment mixtures and an organic seed treatment were selected by the committee. Treatments were applied to seeds by participating companies, or by Mike Erickson (The McGregor Co.). Sixteen sets of the treated seed were packaged and sent to cooperating researchers for planting and evaluation at locations in seven states (FL, ID, IL, MN, NY, WA, and WI). A list of locations, planting dates, and cooperating researchers is on page 3 of this report. Each set of seed was planted using a randomized complete block design. Trial set up varied at different locations; most planted 100 seeds in 4 replicate plots, while others planted 25 seeds in 16 replicate plots. Planting methods also varied from hand-planting to mechanical planters, and planting dates ranged from February to September. Stand counts and vigor ratings were recorded in each plot, usually at the 5-6 leaf stage. Some locations did not report vigor. Vigor ratings were on a subjective visual scale of 1-5 (1=extremely weak, 2=weak, 3=fair, 4=vigorous, 5=very vigorous). Data from each location were subjected to analysis of variance (ANOVA) and a pairwise comparison of treatment means using the Fisher's Protected Least Significant Difference method, LSD (0.05). Data from each of the locations were then combined in a summary across locations, and analyzed with ANOVA and a comparison of the composite treatment means.

Results: The mean % stand results for each treatment at each location, and the composite means for % stand across 16 locations are presented in Tables 2A and 2B. The nontreated control and Treatment 12 resulted in the smallest stand counts when averaged across locations, 47% and 49% respectively. Treatment 19 also resulted in significantly smaller stand counts compared to the other treatments, only 54% when averaged across locations. These two organic treatments (Treatment 12 and Treatment 19) were the lowest ranking treatments for % stand at most locations. Their performance was



Figure 1. Treatments 1, 2, and 3 (from left to right). WA-2 location, 25 DAP.

comparable to that of the nontreated control. The other seed treatments had mean stand counts ranging from 68% to 75% in the summary across locations. Overall, these treatments were comparable to the two standard seed treatments. The treatment resulting in the largest stand count in the summary across locations was Treatment 17, which had a significantly larger composite mean for % stand compared to all other treatments, except for Treatment 3 and Treatment 10. Treatments 3 and 10 resulted in significantly larger composite means for % stand compared to 10 out of the 19 entries, but were similar to Treatments 4, 5, 9, 15, 16, 17, and 18. The three top ranking treatments in the summary across locations did not have the largest stand counts at all locations, but tended to be among the best performing treatments at most locations. A closer inspection of the results at each location will provide more information about the treatments, but is not attempted in this report. The only location with no significant differences in stand for any of the treatments was ID-4, which had the largest stand counts in the trial.

The mean vigor ratings for each treatment at each location, and the composite mean for vigor at 14 locations are presented in Tables 3A and 3B. The nontreated control had the lowest vigor rating in the summary across locations (2.92), followed by Treatment 12 (3.01), and then Treatment 19 (3.13). These all had significantly lower composite means for vigor compared to the other treatments. The other treatments had vigor ratings ranging from 3.58 to 3.87 in the summary across locations. The treatment with the highest vigor rating in the summary was Treatment 15, which had a composite mean vigor rating that was significantly better than 10 out of the 19 entries, but similar to Treatments 3, 4, 9, 10, 11, 14, 16, 17, and 18. Two locations, FL-3 and WI-2, showed no significant differences in vigor among treatments.

Summary

- Two organic seed treatments (Treatments 12 and 19) resulted in smaller stand counts and lower vigor ratings compared to the other seed treatments at most locations. These treatments performed comparably to the nontreated control.
- The performance of all other seed treatments in the trial was comparable to that of the two standard seed treatments. Of the two standard treatments, Treatment 3 tended to have slightly better stand counts and vigor ratings compared to Treatment 2.
- Summarized across locations, the treatment resulting in the best overall stand count was Treatment 17, followed by Treatment 3, and Treatment 10.
- This trial includes a number of seed treatments that either substituted products, added products, and/or increased rates of products in the mixtures. These were not discussed in this report, but the data is presented in the tables. A close inspection of the results should provide significant information to seed treatment formulators and other sweet corn industry personnel.

2012 ISCDA Seed Treatment Committee

Mike Erickson, Co-Chair, The McGregor Company, Filer, ID

Ron Baker, Co-Chair, Harris Moran Seed Company, Nampa, ID

Carrie Wohleb, Coordinator, Washington State University Extension, Ephrata, WA

For more information about this report, the 2012 ISCDA Seed Treatment Trial, or participation in future trials contact Carrie Wohleb at cwohle@wsu.edu or (509) 754-2011 x.413.



Figure 2. Sweet corn plots showing a range in seedling vigor with different seed treatments. WA-2 location, 25 DAP.

Trial Locations, Planting Dates, and Participating Researchers

FL-1	Naples, FL	Feb. 24, 2012	Justin Minor, Syngenta Seeds Inc., Nampa, ID
FL-2	Belle Glade, FL	Feb. 29, 2012	Robert Beiriger, University of Florida, Belle Glade, FL
FL-3	Belle Glade, FL	Sep. 25, 2012	Robert Beiriger, University of Florida, Belle Glade, FL
ID-1	Nampa, ID	Apr. 11, 2012	Justin Minor, Syngenta Seeds Inc., Nampa, ID
ID-2	Huston, ID	Apr. 13, 2012	Don Ogawa, Crookham Company, Caldwell, ID
ID-3	Nampa, ID	May 22, 2012	Ron Baker, Harris Moran Seed Company, Nampa,
ID-4	Nampa, ID	Jun. 12, 2012	Justin Minor, Syngenta Seeds Inc., Nampa, ID
IL-1	Mendota, IL	May 11, 2012	Steve Otto, Del Monte Foods, Rochelle, IL
MN-1	Stanton, MN	Apr. 24, 2012	Justin Minor, Syngenta Seeds Inc., Nampa, ID
MN-2	Stanton, MN	Jun. 1, 2012	Justin Minor, Syngenta Seeds Inc., Nampa, ID
NY-1	Geneva, NY	May 24, 2012	Stephen Reiners, Cornell University, Geneva, NY & James Ballerstein, Cornell University, Geneva, NY
NY-2	Aurora, NY	Jun. 8, 2012	Margaret Smith, Cornell University, Ithaca, NY & Sherrie Norman, Cornell University, Aurora, NY
WA-1	George, WA	Apr. 9, 2012	Carrie Wohleb, Washington State University, Ephrata, WA
WA-2	Ephrata, WA	Jul. 2, 2012	Carrie Wohleb, Washington State University, Ephrata, WA
WI-1	Plainfield, WI	May 1, 2012	Justin Minor, Syngenta Seeds Inc., Nampa, ID
WI-2	DeForest, WI	May 15, 2012	Tim Gustafson, Monsanto Vegetable Seeds, DeForest, WI

Disclaimers: Application of a pesticide to a crop or site that is not on the label is a violation of pesticide law and may subject the applicator to civil penalties up to \$7,500. In addition, such an application may also result in illegal residues that could subject the crop to seizure or embargo action by Washington State Department of Agriculture and/or the U.S. Food and Drug Administration. It is your responsibility to check the label before using the product to ensure lawful use and obtain all necessary permits in advance.

TABLE 1: 2012 ISDA Seed Treatments

No.	Treatment	Rate
1	Control	No Treatment
2	Standard 1	Dividend Extreme 2.00 oz/cwt Apron XL 0.38 oz/cwt Maxim 4FS 0.08 oz/cwt Vitavax 34 3.50 oz/cwt
3	Standard 2	Captan 4 Flowable 2.50 oz/cwt Thiram 42S 2.50 oz/cwt Dividend Extreme 5.00 oz/cwt Apron XL 0.32 oz/cwt Vitavax 34 4.00 oz/cwt
4	BASF 1	Stamina F3 HL 2.00 oz/cwt Cruiser 5FS 0.30 mg ai/seed
5	BASF 2	Dividend Extreme 2.00 oz/cwt Apron XL 0.38 oz/cwt Maxim 4FS 0.08 oz/cwt Vitavax 34 3.50 oz/cwt Stamina 0.80 oz/cwt
6	Nufarm 1	Signet 480 FS 2.50 oz/cwt Sativa 309 FS 0.74 oz/cwt Sebring 318 FS 0.75 oz/cwt Senator 600 FS 6.00 oz/cwt Flo Rite 1197 3.00 oz/cwt
7	Nufarm 2	Spirato 480 FS 0.08 oz/cwt Sativa 309 FS 0.74 oz/cwt Sebring 318 FS 0.75 oz/cwt Senator 600 FS 6.00 oz/cwt Flo Rite 1197 3.00 oz/cwt
8	Syngenta 1	Dividend Extreme 15.0 g ai/100 kg Apron XL 4.5 g ai/100 kg Maxim 4 FS 2.5 g ai/100 kg Cruiser 0.3 mg ai/seed
9	Syngenta 2	Maxim Quattro 0.064 mg ai/seed Apron XL 2.000 g ai/100 kg Cruiser 0.3 mg ai/seed
10	Syngenta 3	Maxim Quattro 0.064 mg ai/seed Apron XL 2.000 mg ai/seed Avicta Duo 250 0.450 mg ai/seed

TABLE 1: 2012 ISCDA Seed Treatments

No.		Treatment	Rate
11	TJ Technologies 1	Dividend Extreme Apron XL Maxim 4FS Vitavax 34 Quick Roots	2.00 oz/cwt 0.38 oz/cwt 0.08 oz/cwt 3.50 oz/cwt 32.00 g/cwt
12	TJ Technologies 2	Organic Quick Roots	
13	TJ Technologies 3	Dividend Extreme Apron XL Maxim 4FS Vitavax 34 Quick Roots TJ EXP A3AP TJ EXP HB2T	2.00 oz/cwt 0.38 oz/cwt 0.08 oz/cwt 3.50 oz/cwt 32.00 g/cwt
14	Valent 1	Metlock Sebring 318 Rizolex Nipsit Inside	0.052 oz/cwt 0.750 oz/cwt 0.300 oz/cwt 0.25 mg ai/seed
15	Valent 2	Metlock Sebring 318 Rizolex Signet 480 Nipsit Inside	0.052 oz/cwt 0.750 oz/cwt 0.300 oz/cwt 2.500 oz/cwt 0.25 mg ai/seed
16	Valent 3	Metlock Sebring 318 Rizolex Signet 480 Captan Nipsit Inside	0.052 oz/cwt 0.750 oz/cwt 0.300 oz/cwt 2.500 oz/cwt 2.500 oz/cwt 0.25 mg ai/seed
17	Valent 4	Metlock Sebring 318 V10208 Rizolex Signet 480 Captan Nipsit Inside	0.052 oz/cwt 0.375 oz/cwt 0.300 oz/cwt 0.300 oz/cwt 2.500 oz/cwt 2.500 oz/cwt 0.25 mg ai/seed
18	Valent 5	Metlock Sebring 318 Rizolex Signet 480 Captan V10355 Nipsit Inside	0.052 oz/cwt 0.750 oz/cwt 0.300 oz/cwt 2.500 oz/cwt 2.500 oz/cwt 0.400 oz/cwt 0.25 mg ai/seed
19	Organic Treatment	Champ Formula 2 MI 2012 Organic seed coat	0.330 oz/cwt

TABLE 2A. 2012 ISCDA Seed Treatment Trial - % STAND.*Planting date in italics.* Means of 4 replications. Numbers in columns followed by the same letter are not significantly different.

TREATMENT NO.	FL-1 <i>Feb-24-12</i>	FL-2 <i>Feb-29-12</i>	FL-3 <i>Sep-25-12</i>	ID-1 <i>Apr-11-12</i>	ID-2 <i>Apr-13-12</i>	ID-3 <i>May-22-12</i>	ID-4 <i>Jun-12-12</i>	IL-1 <i>May-11-12</i>	MN-1 <i>Apr-24-12</i>
1	61.5 efg	37.3 d	51.8 g	38.5 c	38.8 g	22.5 h	82.3	65.5 d	21.8 f
2	75.0 ab	87.8 a	64.5 def	78.0 ab	66.5 de	74.0 abc	86.8	82.0 ab	57.5 a-e
3	73.5 abc	85.5 a	65.5 c-f	82.0 a	69.8 a-d	73.8 abc	85.0	86.3 a	63.3 a-d
4	72.3 a-d	87.3 a	74.0 abc	73.8 ab	70.0 a-d	63.8 ef	85.0	82.0 ab	51.3 e
5	79.3 a	85.8 a	63.3 ef	77.3 ab	73.3 abc	77.8 a	89.3	79.8 bc	62.8 a-d
6	65.0 c-g	86.5 a	71.0 a-e	76.5 ab	72.8 abc	63.3 f	88.3	75.0 c	55.8 cde
7	70.8 a-e	89.5 a	67.0 a-f	69.5 ab	68.0 b-e	67.0 c-f	87.5	81.5 ab	59.5 a-e
8	68.3 b-f	76.0 b	66.3 b-f	78.5 ab	72.8 abc	71.0 a-e	87.0	83.3 ab	63.8 abc
9	74.5 abc	89.5 a	76.0 a	68.0 b	64.5 de	71.3 a-e	84.0	83.3 ab	66.3 a
10	74.3 abc	87.0 a	63.3 ef	75.3 ab	64.0 de	69.0 b-f	86.8	85.3 ab	60.5 a-e
11	79.3 a	88.0 a	66.0 c-f	74.0 ab	67.3 b-e	73.8 abc	75.5	79.8 bc	56.0 b-e
12	57.8 g	55.8 c	50.8 g	46.3 c	39.8 g	32.8 g	78.8	66.5 d	22.5 f
13	63.8 d-g	90.3 a	73.5 a-d	77.3 ab	67.3 b-e	67.5 c-f	84.0	81.8 ab	56.0 b-e
14	72.0 a-d	87.0 a	72.3 a-e	71.8 ab	62.3 e	65.5 def	85.3	79.3 bc	53.8 de
15	68.8 b-e	86.3 a	75.8 a	68.0 b	66.8 cde	72.3 a-d	87.3	85.0 ab	51.0 e
16	70.3 a-e	85.3 a	68.5 a-e	75.5 ab	67.8 b-e	72.3 a-d	83.0	80.3 abc	56.0 b-e
17	67.3 b-g	85.8 a	75.8 a	75.3 ab	67.0 cde	76.3 ab	86.3	81.8 ab	65.8 ab
18	69.8 a-e	85.5 a	75.3 ab	66.8 b	75.3 a	77.3 a	87.8	82.0 ab	51.0 e
19	53.4 g	58.8 c	58.5 fg	43.5 c	48.0 f	37.5 g	81.5	66.3 d	29.0 f
GRAND MEAN	69.6	80.8	67.3	69.3	64.3	64.6	84.9	79.3	52.8
<i>LSD (P=0.05)</i>	9.69	9.09	9.09	12.69	6.19	7.59	8.38	6.08	9.91
CV	9.85	7.96	9.55	12.95	6.81	8.3	6.98	5.42	13.27

TABLE 2B. 2012 ISCDA Seed Treatment Trial - % STAND.*Planting date in italics.* Means of 4 replications. Numbers in columns followed by the same letter are not significantly different.

TREATMENT NO.	MN-2 <i>Jun-1-12</i>	NY-1 <i>May-24-12</i>	NY-2 <i>Jun-8-12</i>	WA-1 <i>Apr-9-12</i>	WA-2 <i>Jul-2-12</i>	WI-1 <i>May-1-12</i>	WI-2 <i>May-15-12</i>	COMPOSITE MEAN FOR 16 LOCATIONS
1	64.8 e	38.8 fg	45.3 f	22.0 e	57.3 f	51.0 cd	53.5 gh	47.1 i
2	74.8 bcd	49.5 def	63.0 a-d	51.0 a-d	72.8 cde	61.5 abc	52.8 h	68.6 efg
3	77.5 abc	60.0 a-d	67.8 ab	52.3 a-d	80.8 abc	68.5 ab	66.8 a-e	72.5 ab
4	83.5 a	67.8 ab	66.5 abc	51.8 a-d	76.3 b-e	62.3 abc	68.0 a-d	71.0 b-f
5	73.8 cd	54.5 cde	57.0 cde	53.5 a-d	69.0 e	66.0 ab	59.3 d-f	70.1 b-g
6	73.0 cd	53.3 cde	62.0 a-d	43.3 cde	76.0 b-e	59.0 bc	70.8 abc	68.2 g
7	79.8 abc	50.0 def	66.5 abc	45.0 b-e	72.8 cde	65.3 ab	64.8 b-f	69.0 d-g
8	84.8 a	56.8 b-e	59.0 bcd	39.3 de	79.0 abc	68.5 ab	56.8 fgh	69.4 c-g
9	72.8 cd	65.3 abc	59.0 bcd	60.5 a-d	75.8 b-e	66.0 ab	72.3 ab	71.8 bc
10	78.0 abc	62.8 abc	63.8 a-d	69.0 a	76.5 a-e	72.8 a	66.5 a-f	72.2 ab
11	82.3 ab	45.3 efg	54.3 def	57.5 a-d	74.5 a-d	65.0 ab	57.8 e-h	68.5 efg
12	69.0 de	35.3 g	33.3 g	42.0 cde	59.3 f	47.3 d	41.8 i	48.9 i
13	77.5 abc	45.5 efg	58.0 bcd	64.3 abc	69.5 de	60.0 bc	57.0 e-h	68.3 fg
14	78.5 abc	61.3 a-d	68.0 ab	59.3 a-d	82.0 ab	52.0 cd	61.3 c-h	69.5 c-g
15	81.5 ab	59.8 a-d	64.3 a-d	65.0 abc	78.0 a-d	68.3 ab	70.3 abc	71.8 bc
16	79.0 abc	58.0 a-d	67.5 ab	65.3 abc	80.3 abc	66.5 ab	62.3 c-h	71.1 b-e
17	82.8 a	68.8 a	69.8 a	68.0 a	85.3 a	62.0 abc	76.0 a	74.6 a
18	79.3 abc	59.3 a-d	66.5 abc	68.8 a	82.5 ab	53.0 cd	63.0 b-g	71.4 bcd
19	69.3 de	41.0 fg	47.0 ef	47.5 a-d	69.0 e	46.0 d	58.0 e-h	53.7 h
GRAND MEAN	76.9	54.4	60.0	54.0	74.5	61.1	62.0	64.4
<i>LSD (P=0.05)</i>	7.64	11.76	10.19	23.68	8.94	11.40	9.93	2.7
CV	7.02	15.3	12.03	31.04	8.48	13.2	11.32	11.43

TABLE 3A. 2012 ISCDA Seed Treatment Trial – VIGOR RATINGS (1 weakest, 5=most vigorous).*Planting date in italics.* Means of 4 replications. Numbers in columns followed by the same letter are not significantly different.

TREATMENT NO.	FL-1 <i>Feb-24-12</i>	FL-2 <i>Feb-29-12</i>	FL-3 <i>Sep-25-12</i>	ID-1 <i>Apr-11-12</i>	ID-2 <i>Apr-13-12</i>	ID-3 <i>May-22-12</i>	ID-4 <i>Jun-12-12</i>	IL-1 <i>May-11-12</i>	MN-1 <i>Apr-24-12</i>
1	3.50 a-d	1.00 c	2.50 a	2.93 e	2.88 e	3.10 abc	4.85 de	3.00 c	2.75 d
2	3.88 abc	3.75 ab	3.25 a	4.03 a	3.31 bcd	3.23 a	4.95 abc	3.50 abc	3.90 a
3	4.13 a	3.25 b	3.25 a	4.03 a	3.56 ab	3.00 a-d	4.95 abc	4.00 a	3.90 a
4	3.88 abc	3.75 ab	3.75 a	4.00 ab	3.38 a-d	3.10 abc	4.88 cde	3.50 abc	3.75 ab
5	3.88 abc	3.25 b	2.50 a	4.00 ab	3.63 a	3.13 abc	4.98 ab	3.00 c	3.85 ab
6	3.38 bcd	4.00 ab	2.75 a	3.95 ab	3.31 bcd	2.85 a-d	4.88 cde	3.00 c	3.78 ab
7	4.13 a	4.00 ab	2.75 a	4.00 ab	3.25 cd	2.83 a-d	4.98 ab	3.50 abc	3.68 ab
8	3.25 cd	3.25 b	2.50 a	4.00 ab	3.50 abc	2.65 de	4.93 a-d	3.25 bc	3.78 ab
9	4.00 ab	3.50 ab	3.50 a	4.03 a	3.19 d	2.78 bcd	4.98 ab	3.50 abc	3.90 a
10	3.88 abc	4.00 ab	3.00 a	3.90 ab	3.13 de	2.68 de	4.98 ab	4.00 a	3.85 ab
11	4.00 ab	3.50 ab	2.25 a	4.00 ab	3.25 cd	3.15 ab	4.93 a-d	3.25 bc	3.65 b
12	3.13 d	1.25 c	2.00 a	3.60 c	2.88 e	2.33 e	4.90 bcd	3.00 c	3.00 c
13	3.75 a-d	3.75 ab	3.00 a	4.00 ab	3.50 abc	2.93 a-d	5.00 a	3.50 abc	3.75 ab
14	3.88 abc	3.75 ab	3.50 a	3.88 ab	3.13 de	2.80 bcd	4.90 bcd	3.25 bc	3.65 b
15	3.63 a-d	4.00 ab	3.25 a	3.83 abc	3.31 bcd	2.88 a-d	4.98 ab	3.75 ab	3.78 ab
16	3.88 abc	3.75 ab	3.00 a	3.88 ab	3.19 d	2.85 a-d	4.93 a-d	3.50 abc	3.73 ab
17	3.63 a-d	4.25 a	3.00 a	4.00 ab	3.25 cd	2.93 a-d	4.88 cde	3.25 bc	3.80 ab
18	3.75 a-d	4.00 ab	3.25 a	3.75 bc	3.38 a-d	2.73 cde	4.95 abc	3.50 abc	3.75 ab
19	3.13 d	1.50 c	2.25 a	3.28 d	2.88 e	2.63 de	4.80 e	3.00 c	2.95 cd
GRAND MEAN	3.72	3.34	2.91	3.84	3.26	2.87	4.93	3.38	3.64
<i>LSD (P=0.05)</i>	<i>0.646</i>	<i>0.810</i>	<i>1.050</i>	<i>0.266</i>	<i>0.302</i>	<i>0.40</i>	<i>0.079</i>	<i>0.630</i>	<i>0.236</i>

TABLE 3B. 2012 ISCDA Seed Treatment Trial – VIGOR RATINGS (1 weakest, 5=most vigorous).*Planting date in italics.* Means of 4 replications. Numbers in columns followed by the same letter are not significantly different.

TREATMENT NO.	MN-2 <i>Jun-1-12</i>	NY-1 <i>May-24-12</i>	NY-2 <i>Jun-8-12</i>	WA-1 <i>Apr-9-12</i>	WA-2 <i>Jul-2-12</i>	WI-1 <i>May-1-12</i>	WI-2 <i>May-15-12</i>	COMPOSITE MEAN FOR 14 LOCATIONS
1		2.50 d		3.00 e	2.25 d	3.55 e	2.88 a	2.92 i
2		3.00 bcd		4.00 bcd	3.50 c	4.08 ab	3.00 a	3.69 b-g
3		3.00 bcd		4.00 bcd	4.50 ab	4.13 a	2.62 a	3.76 a-f
4		3.00 bcd		4.00 bcd	4.50 ab	3.93 bcd	3.25 a	3.79 a-e
5		2.75 cd		4.75 ab	3.50 c	3.98 a-d	4.00 a	3.69 c-g
6		4.00 a		3.50 de	4.25 abc	3.98 a-d	2.75 a	3.58 g
7		2.75 cd		4.00 bcd	4.25 abc	4.05 abc	2.88 a	3.68 d-g
8		3.50 abc		4.25 a-d	4.50 ab	4.05 abc	2.88 a	3.59 fg
9		3.50 abc		4.75 ab	4.75 ab	4.03 a-d	3.50 a	3.86 ab
10		4.00 a		4.75 ab	4.00 bc	4.10 ab	3.63 a	3.84 a-d
11		2.25 d		4.75 ab	3.50 c	4.13 a	3.63 a	3.64 efg
12		2.50 d		4.00 bcd	2.25 d	3.63 e	3.13 a	3.01 hi
13		2.75 cd		4.50 abc	3.50 c	4.05 abc	3.25 a	3.69 b-g
14		3.50 abc		4.25 a-d	4.00 bc	3.88 cd	3.63 a	3.72 a-g
15		2.75 cd		5.00 a	4.75 ab	4.00 a-d	3.75 a	3.87 a
16		3.50 abc		4.50 abc	4.75 ab	3.95 a-d	4.00 a	3.83 a-d
17		3.50 abc		4.50 abc	5.00 a	3.95 a-d	3.00 a	3.79 a-e
18		3.75 ab		4.75 ab	4.50 ab	3.85 d	4.00 a	3.85 abc
19		3.00 bcd		3.75 cde	3.50 c	3.55 e	3.50 a	3.13 h
GRAND MEAN		3.13		4.26	4.00	3.94	4.32	3.63
<i>LSD (P=0.05)</i>		<i>0.945</i>		<i>0.820</i>	<i>0.920</i>	<i>0.183</i>	<i>0.973</i>	<i>0.173</i>

