WASHINGTON STATE UNIVERSITY EXTENSION

# 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 a single 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 were 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. The 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 combined treatment means.

**Results:** The treatment means for % stand at each location, and the combined treatment means for % stand across 16 locations are shown 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. It should be noted that Treatment 12 did not include any fungicide products, but was an organic seed enhancement product. Treatment 19 also resulted in significantly smaller stand counts compared to the other seed treatments, only 54% when averaged across locations. However, Treatment 19 resulted in a

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

significantly larger stand count compared to the nontreated control in the summary across locations, and at many of the locations. The two treatments with organic products (Treatment 12 and Treatment 19) were the lowest ranking treatments for % stand at most locations. 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 stand count compared to all other treatments, except for Treatment 3 and Treatment 10. Treatments 3 and 10 resulted in significantly larger stand counts when averaged across locations 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 combined treatment means 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 means for vigor when averaged across locations 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 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

- Treatments 12 and 19 resulted in smaller stand counts and lower vigor ratings compared to the other seed treatments at most locations. Summarized across locations, Treatment 12 performed similarly to the nontreated control, but Treatment 19 resulted in a significantly larger stand count compared 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 cwohleb@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 |

| TABLE 1: 2012 ISCDA Seed Treatments | | | |
|---|---|---|---|
| **No.** | | **Treatment** | **Rate** |
| 1 | Control | No Treatment | |
| 2 | Standard 1 | Dividend Extreme (difenconazole + mefenoxam)<br>Apron XL (mefenoxam)<br>Maxim 4FS (fludioxonil)<br>Vitavax 34 (carboxin) | 2.00 oz/cwt<br>0.38 oz/cwt<br>0.08 oz/cwt<br>3.50 oz/cwt |
| 3 | Standard 2 | Captan 4 Flowable (captan)<br>Thiram 42S (thiram)<br>Dividend Extreme (difenconazole + mefenoxam)<br>Apron XL<br>Vitavax 34 | 2.50 oz/cwt<br>2.50 oz/cwt<br>5.00 oz/cwt<br>0.32 oz/cwt<br>4.00 oz/cwt |
| 4 | BASF 1 | Stamina F3 HL (pyraclostrobin + triticonazole + metalaxyl)<br>Cruiser 5FS (thiamethoxam) | 2.00 oz/cwt<br>0.30 mg ai/seed |
| 5 | BASF 2 | Dividend Extreme (difenconazole + mefenoxam)<br>Apron XL (mefenoxam)<br>Maxim 4FS (fludioxonil)<br>Vitavax 34 (carboxin)<br>Stamina (pyraclostrobin) | 2.00 oz/cwt<br>0.38 oz/cwt<br>0.08 oz/cwt<br>3.50 oz/cwt<br>0.80 oz/cwt |
| 6 | Nufarm 1 | Signet 480 FS (thiram)<br>Sativa 309 FS (tebuconazole)<br>Sebring 318 FS (metalaxyl)<br>Senator 600 FS (imidacloprid)<br>Flo Rite 1197 | 2.50 oz/cwt<br>0.74 oz/cwt<br>0.75 oz/cwt<br>6.00 oz/cwt<br>3.00 oz/cwt |
| 7 | Nufarm 2 | Spirato 480 FS (fludioxonil)<br>Sativa 309 FS (tebuconazole)<br>Sebring 318 FS (metalaxyl)<br>Senator 600 FS (imidicloprid)<br>Flo Rite 1197 | 0.08 oz/cwt<br>0.74 oz/cwt<br>0.75 oz/cwt<br>6.00 oz/cwt<br>3.00 oz/cwt |
| 8 | Syngenta 1 | Dividend Extreme (difenconazole + mefenoxam)<br>Apron XL (mefenoxam)<br>Maxim 4 FS (fludioxonil)<br>Cruiser (thiamethoxam) | 15.0 g ai/100 kg<br>4.5 g ai/100 kg<br>2.5 g ai/100 kg<br>0.3 mg ai/seed |
| 9 | Syngenta 2 | Maxim Quattro (fludioxonil + mefanoxam + azoxystrobin + thiabendazole)<br>Apron XL (mefenoxam)<br>Cruiser (thiamethoxam) | 0.064 mg ai/seed<br>2.000 g ai/100 kg<br>0.3 mg ai/seed |
| 10 | Syngenta 3 | Maxim Quattro (fludioxonil + mefanoxam + azoxystrobin + thiabendazole)<br>Apron XL (mefenoxam)<br>Avicta Duo 250 (abamectin + thiamethoxam) | 0.064 mg ai/seed<br>2.000 mg ai/seed<br>0.450 mg ai/seed |

| TABLE 1: 2012 ISCDA Seed Treatments | | | |
|---|---|---|---|
| **No.** | | **Treatment** | **Rate** |
| 11 | TJ Technologies 1 | Dividend Extreme (difenconazole + mefenoxam)<br>Apron XL (mefenoxam)<br>Maxim 4FS (fludioxonil)<br>Vitavax 34 (carboxin)<br>Quick Roots | 2.00 oz/cwt<br>0.38 oz/cwt<br>0.08 oz/cwt<br>3.50 oz/cwt<br>32.00 g/cwt |
| 12 | TJ Technologies 2 | Organic<br>Quick Roots | |
| 13 | TJ Technologies 3 | Dividend Extreme (difenconazole + mefenoxam)<br>Apron XL (mefenoxam)<br>Maxim 4FS (fludioxonil)<br>Vitavax 34 (carboxin)<br>Quick Roots<br>TJ EXP A3AP<br>TJ EXP HB2T | 2.00 oz/cwt<br>0.38 oz/cwt<br>0.08 oz/cwt<br>3.50 oz/cwt<br>32.00 g/cwt |
| 14 | Valent 1 | Metlock (metconazole)<br>Sebring 318 (metalaxyl)<br>Rizolex (tolclofos-methyl)<br>Nipsit Inside (clothianidin) | 0.052 oz/cwt<br>0.750 oz/cwt<br>0.300 oz/cwt<br>0.25 mg ai/seed |
| 15 | Valent 2 | Metlock (metconazole)<br>Sebring 318 (metalaxyl)<br>Rizolex (tolclofos-methyl)<br>Signet 480<br>Nipsit Inside (clothianidin) | 0.052 oz/cwt<br>0.750 oz/cwt<br>0.300 oz/cwt<br>2.500 oz/cwt<br>0.25 mg ai/seed |
| 16 | Valent 3 | Metlock (metconazole)<br>Sebring 318 (metalaxyl)<br>Rizolex (tolclofos-methyl)<br>Signet 480 (thiram)<br>Captan (captan)<br>Nipsit Inside (clothianidin) | 0.052 oz/cwt<br>0.750 oz/cwt<br>0.300 oz/cwt<br>2.500 oz/cwt<br>2.500 oz/cwt<br>0.25 mg ai/seed |
| 17 | Valent 4 | Metlock (metconazole)<br>Sebring 318 (metalaxyl)<br>V10208<br>Rizolex (tolclofos-methyl)<br>Signet 480 (thiram)<br>Captan (captan)<br>Nipsit Inside (clothianidin) | 0.052 oz/cwt<br>0.375 oz/cwt<br>0.300 oz/cwt<br>0.300 oz/cwt<br>2.500 oz/cwt<br>2.500 oz/cwt<br>0.25 mg ai/seed |
| 18 | Valent 5 | Metlock (metconazole)<br>Sebring 318 (metalaxyl)<br>Rizolex (tolclofos-methyl)<br>Signet 480 (thiram)<br>Captan (captan)<br>V10355<br>Nipsit Inside (clothianidin) | 0.052 oz/cwt<br>0.750 oz/cwt<br>0.300 oz/cwt<br>2.500 oz/cwt<br>2.500 oz/cwt<br>0.400 oz/cwt<br>0.25 mg ai/seed |
| 19 | Organic Treatment | Champ Formula 2<br>MI 2012<br>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 *Feb-24-12* | FL-2 *Feb-29-12* | FL-3 *Sep-25-12* | ID-1 *Apr-11-12* | ID-2 *Apr-13-12* | ID-3 *May-22-12* | ID-4 *Jun-12-12* | IL-1 *May-11-12* | MN-1 *Apr-24-12* |
|---|---|---|---|---|---|---|---|---|---|
| 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** |
| *LSD (P=0.05)* | *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 *Jun-1-12* | NY-1 *May-24-12* | NY-2 *Jun-8-12* | WA-1 *Apr-9-12* | WA-2 *Jul-2-12* | WI-1 *May-1-12* | WI-2 *May-15-12* | COMBINED MEANS 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** |
| *LSD (P=0.05)* | *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 *Feb-24-12* | FL-2 *Feb-29-12* | FL-3 *Sep-25-12* | ID-1 *Apr-11-12* | ID-2 *Apr-13-12* | ID-3 *May-22-12* | ID-4 *Jun-12-12* | IL-1 *May-11-12* | MN-1 *Apr-24-12* |
|---|---|---|---|---|---|---|---|---|---|
| 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** |
| *LSD (P=0.05)* | *0.646* | *0.810* | *1.050* | *0.266* | *0.302* | *0.40* | *0.079* | *0.630* | *0.236* |

**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 *Jun-1-12* | NY-1 *May-24-12* | NY-2 *Jun-8-12* | WA-1 *Apr-9-12* | WA-2 *Jul-2-12* | WI-1 *May-1-12* | WI-2 *May-15-12* | COMBINED MEANS 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** |
| *LSD (P=0.05)* | | *0.945* | | *0.820* | *0.920* | *0.183* | *0.973* | *0.173* |