# 2012
# Soybean Management Field Days

# RESEARCH UPDATE

## 2013 DATES/LOCATIONS

- January 29 - O'Neill
- January 30 - Lexington
- January 31 - Columbus
- January 31 - David City

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## Soybean Management Field Days On-Farm Research Introduction

*Keith Glewen, UNL Extension Educator*

The 2012 growing season represented the second year replicated field research was conducted at the Soybean Management Field Day sites.

Why the need for conducting research at these sites?

Many practical questions regarding soybean production and natural resource sustainability are not being answered by current federal and industry funded crop research programs. In addition, the diversity of soybean growing environments in Nebraska, changes in climate and advancements in production technologies are causing growers to question many long-held assumptions associated with soybean production. Add to this, today's consumer are asking questions about how and where their food comes from, the increasing world demand for soybeans, and the importance natural resources such as soil and water have on meeting the demand. Subsequently, growers are increasingly challenged to grow soybeans more responsibly.

All of those representing the University of Nebraska – Lincoln greatly appreciate the financial investment you the soybean growers of Nebraska have made through your Checkoff contribution in supporting the research undertaken in this project. We would also like to thank the Nebraska Soybean Board for their part in support and management of this effort. Their input into the selection of research topics and in some cases treatments, was extremely valuable.

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| | David City | Platte Center | Lexington | O'Neill |
|---|---|---|---|---|
| Planting Date | 4/24/2012 | 4/25/2012 | 5/2/2012 | 5/4/2012 |
| Soybean Variety | Pioneer 93M11 | Pioneer 93M11 | NK S28-B4 | NK 25-R3 |
| Soil Type | Hastings silt loam | Hobbs silt loam | Rusco silt loam | O'Neill fine sandy loam |
| Previous Crop | Corn | Corn | Corn | Corn |
| Tillage | Fall Vertical | Spring Disc | Spring Vertical | Spring Vertical |
| **Soil Nutrient and Production Factors** | | | | |
| pH | 6.6 | 6.7 | 6.3 | 5.3 |
| BpH | 6.9 | - | 6.9 | 6.3 |
| Organic Matter % | 2.8 | 3.6 | 3.8 | 2.7 |
| Lbs./acre Nitrates (0-8 inches) | 36 | 51 | 55 | 39 |
| Phosphorus ppm P | 16 | 143 | 56 | 25 |
| K ppm | 386 | 744 | 623 | 180 |
| S ppm | 20 | 24 | 40 | 18 |
| Zn ppm | 3.08 | 4.23 | 4.95 | 2.59 |
| Fe ppm | 52.5 | 85.9 | 39.5 | 99.5 |
| Mn ppm | 12.7 | 16.9 | 12.6 | 24.6 |
| Cu ppm | 0.86 | 1.5 | 0.85 | 0.79 |

# Quest for the Holy Grail of Soybean Production: 100 Bushel Soybeans

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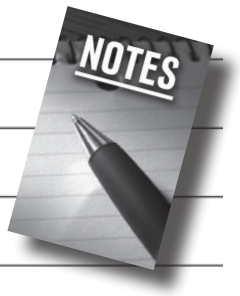
Growing 100 bushel soybeans has eluded many farmers and researchers alike. As cultivars, production practices, equipment and other production inputs continue to improve, this "holy grail" of soybean production becomes more realistic. Soybean plots in Brule, NE in research conducted by Kruger had individual plots where soybean yields reached as high as 99 bu/ac. Yield monitors often register >100 bu/ac over short distances. Several demonstrations/research projects were conducted in 2012 to examine components of soybean production that might increase yields.

**One of the research topics at the 2012 SMFD sites was to test materials designed to provide more fertility for soybeans than what might be recommended using standard recommendations.**

Our recommendations for soybean nutrition is to base applications on soil tests. Our NebGuide: Fertilizer Recommendations for Soybeans (http://www.ianrpubs.unl.edu/sendIt/g859.pdf) gives all the guidelines that are supported by our research results. We are continually conducting research to improve these recommendations, but the extent of the research is dependent on the grant resources available to us.

Research at the Soybean Management Field Days in 2011 suggested that 10 lbs N/acre starter resulted in a small, potentially profitable effect on yields, but probably not enough effect to justify the risk of fertilizer salt damage during germination and emergence. Foliar nutrient application at R2 resulted in a small, significant, but non-economical yield increase suggesting a need to determine which nutrients caused the yield increase. Soil applied N, to imitate N fertigation, at R3 did not result in much yield increase except when the N was applied as Agrotain treated urea rather than ammonium nitrate; N availability was likely delayed with the former raising the question of whether N application at R4 rather than R3 has more promise. Soybean response to manure application is commonly observed by farmers and Extension.



**METHODS**

The 2012 SMFD sites had the following treatments:

Table 1. Treatment explanations at the 2012 SMFD Soil fertility Study

1. Full Package1 – a. 25 lbs N soil applied at R4,
   b. Foliar NRAGE @ R2,
   c. SoyGrow @ R2,
   d. 5 gal 10- 34-0 starter band
2. Full Package1 minus 10-34-0 band (with a, b, and c)
3. Full Package1 minus 25 lbs N soil applied at R4 (with b, c, and d)
4. Full Package1 minus foliar NRAGE @ R2 (with a, c, and d)
5. Full Package1 minus foliar SoyGrow @ R2 (with a, b, and d)
6. Full Package1 minus foliar NRAGE and minus SoyGrow @ R2 (with a and d)
7. Minus all (conventional)
8. Dried poultry manure @ 3 t/ac
9. 100 lbs 20-0-0-24 (ammonium sulfate broadcast)
10. 150 lbs 11-52-0 (MAP broadcast)
11. 100 lbs 0-0-60 (KCl broadcast)
12. Full package Plus Extras (Every treatment except 7 (control))
13. At O'Neill site only, Minus all (conventional) plus pell lime surface applied in a ~8" band over the row at 400 lb/ac.

The manure was from Michael Foods, Inc. (Waldbaum Co) in Wakefield and contained 91 lbs total N per ton, 77 lbs phosphate ($P_2O_5$), and 60 lbs potassium ($K_2O$) per ton, in addition to other nutrients.

At each site the soil information available is reported in Table 2.

Table 2. Soil chemical properties at the 2012 SMFD sites (0-8 in, pre-season).

| Soil attribute | Platte Center | David City | Lexington | O'Neill |
|---|---|---|---|---|
| pH | 6.7 | 6.6 | 6.3 | 5.3 |
| Organic Matter(%) | 3.6 | 2.8 | 3.8 | 2.7 |
| Soluble salts | 0.48 | 0.39 | 0.51 | 0.18 |
| Nitrates (ppm) | 21.4 | 15.1 | 23.1 | 16.1 |
| Melich 3 P | 143 | 16 | 56 | 25 |
| K | 744 | 386 | 623 | 180 |
| Ca | 24 | 20 | 40 | 18 |
| Zn | 4.2 | 3.1 | 5.0 | 2.6 |
| Fe | 86 | 52 | 40 | 100 |
| Mn | 17 | 13 | 13 | 25 |
| Cu | 1.5 | 0.86 | 0.85 | 0.79 |

Based on the NebGuide cited on the previous page, the only UNL recommendations that would be made for soybeans are the following:

pH O'Neill is low and should have lime applied, a buffer pH would indicate the quantity.
P Only David City would be close to needing some P, the P recommendation would start when the soil test was 12, so this site is not deficient yet.

No other nutrients were near deficiency, so the prediction is that all the applied treatments, with the possible exception of the lime at O'Neill would have no effect. It usually takes at least 6 months to change pH, so spring applied lime at O'Neill might not be effective either.

However, there are situations that can inhibit or impede soybean roots from actually utilizing the nutrients that are in the soil, so it may be that in some fields that test high there would be a positive response to added nutrients. In these cases for the long run, the real cause of the root uptake problem needs to be fixed. Continually adding nutrients is not a long term solution.

**RESULTS**

The main data collected at these sites was yield data. However, for a few treatments foliar leaf samples were taken at flowering (Table 3 and 4). For almost all the nutrients tested, the leaf values were above the critical level (level at which deficiency is possible). The sampled treatments were from the extremes: the nontreated control and the 'kitchen sink', treatment 12 that had all the amendments. There were few differences between these two treatments, and in some cases the treated had lower values than the untreated. This indicates a phenomenon that sometimes occurs in that a fast growing plant may have low concentrates of nutrients due to dilution. That is why uptake values are usually calculated since it is the total amount of a nutrient that is also important. Sampling time may be important since as the plant takes up water, or losses it, the same actual amount of a nutrient will show different concentrations. The leaves are dried before analysis, so the difference is not actual leaf water content. However, as water moves in the plant, so do nutrients. In any event, these data do not indicate deficiencies of any nutrients.

The yield data shown in table 5 include all the mean yields for each location and the average over the four locations. The statistical analysis at the bottom helps determine which treatments may have affected yields. Two statistical techniques are shown in this table, the ANOVA is an abbreviation for Analysis of Variance. ANOVA is calculated by taking into account the differences between treatments treated alike (same treatment replicated four times) and is useful in determining what part of the yield differences are due to errors associated with the field and our experimental technique, and what are due to the treatment. The first step in the interpretation of the ANOVA is to examine the Treatment effect. Two sites, David City and Lexington have low probabilities that the differences found are due to chance alone (0.05 and 0.0001, respectively). The other two sites have a high probability that the differences found are due to chance alone. Taken together over the four sites, there is no consistent treatment effect. However, the ANOVA does indicate that there are differences at some sites, so there is a significant location by treatment interaction.

As with many field research experiments, specific plans interact with nature and unplanned events to make it difficult to interpret the studies. In 2012, the Lexington site had an early hail storm that affected plant population, and may have influenced yields. Lexington was one of the sites with significant differences, however, one of the highest yielding treatments was the control with 68 bu/ac and the lowest yielding was the 'kitchen sink' treatment (12) with all additives at 43 bu/ac. At David City, the other significant site, the irrigation system was not working correctly and the site was essentially rainfed for most of the season. At this site, the 'kitchen sink' treatment was the highest yielding treatment (68 bu/ac), and the control was a lower yielding treatment (57 bu/ac). It is this kind of difference by site, that makes for difficult interpretation of the results. The add-on treatment at O'Neill did not increase yield.

## SUMMARY AND CONCLUSIONS

The sites selected for the SMFD field days tend to be intensively managed and potential deficiencies have mostly been addressed previously. Soil samples, leaf samples and yields indicate that while some variation exists, there was no one treatment that consistently improved yields. The control treatment was high yielding relative to the other treatments, and did not have any of the costs associated with it that the other treatments would have.

The results verify UNL guidelines for management of nutrients for soybean production. Probability of response to applied nutrients is low when soil tests indicate adequate soil supply as has been confirmed by these results for N, P, K, and S. Foliar application is not likely to be beneficial when soil nutrient supply is well managed. Adequate evidence from elsewhere verifies the value of manure application for some soil situations while little response is expected for many high fertility and highly productive sites as were these sites. The results clearly demonstrate the importance of planning research, including on-farm research, in consideration of existing information, and of matching research objectives with site characteristics.

Table 3. Foliar analysis at flowering for two SMFD sites 2012 (July 11).

| | N | P | K | S | Ca | Mg | Zn | Mn | Fe | Cu |
|---|---|---|---|---|---|---|---|---|---|---|
| | ----------%---------- | | | | | | ----------ppm---------- | | | |
| **David City** | 5.5 | 0.57 | 2.41 | 0.31 | 0.93 | 0.42 | 47 | 58 | 130 | 11 |
| **Platte Center** | 5.9 | 0.68 | 2.40 | 0.34 | 1.03 | 0.43 | 50 | 74 | 157 | 10 |
| **Average** | 5.7 | 0.62 | 2.40 | 0.32 | 0.98 | 0.42 | 49 | 66 | 143 | 10 |
| **No starter, R2 treatments** | 5.7 | 0.60 | 2.36 | 0.33 | 1.02 | 0.43 | 51 | 65 | 160 | 11 |
| **NRage and starter** | 5.7 | 0.59 | 2.40 | 0.32 | 1.00 | 0.42 | 48 | 64 | 144 | 10 |
| **Starter alone** | 5.6 | 0.65 | 2.43 | 0.31 | 0.95 | 0.42 | 48 | 63 | 137 | 10 |
| **Nothing** | 5.7 | 0.67 | 2.38 | 0.32 | 0.99 | 0.43 | 48 | 63 | 144 | 10 |
| **Kitchen Sink** | 5.5 | 0.60 | 2.43 | 0.33 | 0.92 | 0.41 | 49 | 76 | 133 | 10 |
| **Average** | **5.7** | **0.62** | **2.40** | **0.32** | **0.98** | **0.42** | **49** | **66** | **143** | **10** |
| **Critical Values** | 5.0 | 0.40 | 2.00 | 0.30 | 0.35-2.0 | 0.25-1.0 | 20-50 | 21-150 | 50-350 | 10-30 |

Table 4. Foliar analysis at flowering for two SMFD sites 2012.

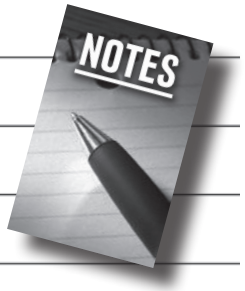
| | N | P | K | S | Ca | Mg | Zn | Mn | Fe | Cu |
|---|---|---|---|---|---|---|---|---|---|---|
| Lexington | 5.9 | 0.64 | 2.75 | 0.35 | 0.98 | 0.46 | 57 | 139 | 90 | 9.4 |
| O'Neill | 6.5 | 0.73 | 2.66 | 0.34 | 1.06 | 0.49 | 55 | 101 | 119 | 11.3 |
| **Average** | **6.2** | **0.67** | **2.72** | **0.35** | **1.01** | **0.47** | **56** | **129** | **98** | **9.9** |
| Nothing | 5.9 | 0.64 | 2.76 | 0.35 | 1.02 | 0.47 | 54 | 146 | 84 | 9.8 |
| Kitchen sink | 5.9 | 0.64 | 2.73 | 0.36 | 0.94 | 0.45 | 60 | 132 | 96 | 9.0 |
| **Average** | **5.9** | **0.64** | **2.75** | **0.35** | **0.98** | **0.46** | **57** | **139** | **90** | **9.4** |

Table 5. Effect of fertility treatments on yield at the 2012 SMFD sites. Nebraska.

| Treatments | Number | David City | Lexington | O'Neill | Platte Center | Overall Mean |
|---|---|---|---|---|---|---|
| | | bu/ac | | | | |
| Full Package (FP) | 1 | 49.5 | 62.1 | 41.5 | 53.2 | 51.6 |
| minus starter | 2 | 45.4 | **67.9**[1] | 38.2 | 48.8 | 50.1 |
| minus R4 N | 3 | 50.1 | 55.9 | 44.5 | 48.4 | 49.7 |
| minus Nrage | 4 | 55.1 | 57.5 | 44.7 | 49.0 | 51.6 |
| minus SoyGrow | 5 | 62.3 | 59.4 | 42.2 | 50.6 | 53.6 |
| minus Nrage and SoyGrow | 6 | 55.6 | 61.0 | 43.1 | 52.6 | 53.1 |
| No Additions (control) | 7 | 57.0 | **67.8** | 41.8 | 49.8 | 54.1 |
| Poultry Manure | 8 | 60.8 | 60.8 | 38.6 | **56.0** | 54.1 |
| AS | 9 | 57.1 | **69.5** | 41.1 | 51.7 | 54.8 |
| MAP | 10 | 56.0 | **65.9** | **49.6** | 51.5 | 55.8 |
| KCL | 11 | 54.7 | **65.1** | 46.5 | 50.9 | 54.3 |
| All Additions (Kitchen Sink) | 12 | **67.9** | 42.9 | 45.5 | 52.2 | 52.1 |
| Lime | 13 | - | - | 38.4 | - | - |
| **ANOVA** | | | | | | |
| Location effect (LOC) | | -- | -- | -- | -- | *** |
| Treatment (TRT) | | 0.05 | 0.0001 | NS[2] | NS | NS |
| LOC X TRT | | -- | -- | -- | -- | ** |
| LSD 0.05 | | 12 | 9.0 | 17 | 8.9 | 5.7 |
| CV (%) | | 15 | 9.5 | 24 | 12 | 15 |
| Mean (bu/ac) | | 56.0 | 61.3 | 43.1 | 51.2 | 53.0 |

[1]Bold numbers indicate higher yielding treatments within a site

[2]NS, non-significant



# The 2012 Soybean Management Field Days
# Quest For the Holy Grail of Soybean Production: 100 Bushel Soybeans

*Principal Investigators:*
Greg Kruger, Cropping Systems Specialist
Evan Sonderegger, Graduate Student
Keith Glewen, Extension Educator

**Introduction**

In 2012, the Nebraska Soybean Board and the University of Nebraska-Lincoln partnered to better understand soybean yield and yield components in an attempt to ascertain whether or not 100 bushel/acre soybean production was possible. Studies conducted in Minnesota, Wisconsin, Kentucky, Missouri, Arkansas, and other major soybean production states in recent years have concluded that soybeans are versatile but there are certainly some agronomic practices which can be implemented to maximize production. They found narrow row spacing to be the most important practice that growers can adopt to increase yields.

**Methodology**

In 2012, replicated research studies were conducted at each of the Soybean Management Field Day sites (David City, Lexington, O'Neill, and Platte Center). At each site, two studies were conducted to better understand the interaction of grower decisions based around row spacing x plant population and maturity group x plant population. For the first study, 15 inch and 30 inch row spacings were compared at 100,000, 150,000, and 200,000 seeds/acre. In the second study, a 2.4, 2.9, and 3.4 relative maturity soybean were planted at 100,000, 150,000, and 200,000 seeds/acre. Studies were planted on April 24$^{th}$, May 2$^{nd}$, May 4$^{th}$, and April 25$^{th}$ for David City, Lexington, O'Neill, and Platte Center, respectively.

Notes were taken from each study including final plant population, yield, and moisture as well as 6 ft. row per plot were hand harvested. From the hand harvested plants, the number of soybean seed/plant and seed size were determined. Additionally, at Mead and North Platte, a study was conducted looking at the same relative maturity soybeans at 50,000 and 250,000 seeds/acre beyond those in the relative maturity x plant population study. In the studies at Mead and North Platte, the plots were seeded near May 1$^{st}$ and June 1$^{st}$ for both locations so that the impact of planting date could also be determined. All yields were adjusted to 13% moisture content for reporting. Yields were reduced at Lexington due to hail and at David City due to problems with the irrigation well running dry.

In studies conducted in other states in recent years, they concluded that early planted soybean have a greater yield potential than later planted soybean. Our study seeks to confirm if this is true across a wide range of relative maturity groups in Nebraska or if planting date is less of a factor in Nebraska.

**Results**

While none of the treatments, resulted in 100 bushel/acre, valuable information was gained on production practices which could potentially increase yields for Nebraska growers. Much like the results from other states, narrow row soybeans have had greater yields and, in general, earlier planting date resulted in higher yields. Across the four locations, soybean yields were approximately 10 bushels/acre higher in 15 inch rows than in 30 inch rows. The seeding rate did not have an effect on yields, however it should be noted that the plant stands were only 60-80% of the seeding rates with the higher seeding rates having lower germination rates.

Interestingly, studies in Nebraska have shown that certain management decisions including the use of strobilurin fungicides had no impact on soybean seed size (Sonderegger unpublished). Management decisions did have an impact on the number of seeds/acre though. As we better understand relationships such as number of seeds/acre and seed size resulting from agronomic practices, we will be better suited for making recommendations to growers.

**Table 1.** Yield from the row spacing by planting population study at four locations in Nebraska.

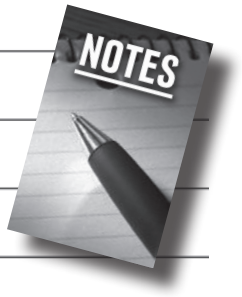
| | | Location | | | |
|---|---|---|---|---|---|
| Row spacing | Plant population | David City | Lexington | O'Neill | Platte Center |
| in | seeds/ac | | bu/ac | | |
| 15 | 100,000 | 50.3 a | 44.9 a | 42.1 a | 57.1 a |
| 15 | 150,000 | 47.7 a | 45.6 a | 36.9 ab | 58.3 a |
| 15 | 200,000 | 47.6 a | 45.3 a | 36.4 b | 56.8 a |
| 30 | 100,000 | 44.7 a | 30.5 b | 30.0 c | 41.3 b |
| 30 | 150,000 | 50.5 a | 32.8 b | 30.9 c | 46.2 b |
| 30 | 200,000 | 43.7 a | 32.4 b | 27.7 c | 42.8 b |

* Mean separations are within a column. Numbers followed by at least one similar letter are not statistically different at the α = 0.1 level.

**Table 2.** Yield from the maturity group by planting population study at six locations in Nebraska (first planting only for Mead and North Platte).

| | | Location | | | | | |
|---|---|---|---|---|---|---|---|
| Maturity group | Plant population | David City | Lexington | Mead | North Platte | O'Neill | Platte Center |
| | seeds/ac | | | bu/ac | | | |
| 2.4 | 50,000 | —— | —— | 34.4 | 39.9 | —— | —— |
| 2.4 | 100,000 | 34.6 | 66.3 | 32.3 | 38.9 | 30.8 | 55.3 |
| 2.4 | 150,000 | 35.9 | 61.4 | 37.4 | 51.1 | 25.2 | 57.7 |
| 2.4 | 200,000 | 35.3 | 53.8 | 36.7 | 37.5 | 24.9 | 50.1 |
| 2.4 | 250,000 | —— | —— | 36.1 | 59.5 | —— | —— |
| 2.9 | 50,000 | —— | —— | 36.9 | 40.4 | —— | —— |
| 2.9 | 100,000 | 43.8 | 69.9 | 36.3 | 51.6 | 24.5 | 53.9 |
| 2.9 | 150,000 | 36.9 | 73.6 | 39.2 | 45.2 | 23.6 | 52.2 |
| 2.9 | 200,000 | 34.8 | 60.4 | 43.6 | 34.5 | 23.7 | 48.4 |
| 2.9 | 250,000 | —— | —— | 38.5 | 37.5 | —— | —— |
| 3.4 | 50,000 | —— | —— | 44.2 | 47.3 | —— | —— |
| 3.4 | 100,000 | 37.2 | 63.8 | 45.0 | 46.5 | 27.4 | 53.4 |
| 3.4 | 150,000 | 42.4 | 63.4 | 44.6 | 60.0 | 29.6 | 52.9 |
| 3.4 | 200,000 | 37.8 | 64.6 | 46.2 | 48.6 | 30.9 | 51.5 |
| 3.4 | 250,000 | —— | —— | 41.7 | 49.0 | —— | —— |

* No statistically different yields were observed at the α = 0.1 level within location.



SOYBEAN (*Glycine max* L.)
Septoria brown spot (*Septoria glycines*)

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# Effect of foliar fungicides and insecticides on soybean disease severity and yield in Nebraska, 2012.

Foliar fungicide/insecticide trials were conducted at four locations in Nebraska to determine the effects on disease control and yield. The four sites were David City, Lexington, O'Neill, and Platte Center. All treatments were arranged in a randomized complete block design. Asgrow 3131 was the seed variety used for these trials and was planted at all sites with a population density of 140,000 seeds/A. All plots were 4 rows wide (10 feet) by 20 feet long. Fungicide/insecticide treatment applications were applied with a $CO_2$ pressurized backpack sprayer. The sprayer had a 10 ft wide boom with Teejet XR11002 nozzles spaced 20 in. apart. Treatments were sprayed at 40 psi and fifteen gallons per acre with the appropriate ratio of chemical to water. The backpack sprayer apparatus provided adequate canopy penetration and coverage of soybean leaves. All applications were made at the R3 (beginning pod development) growth stage. Disease was assessed at approximately 11 - 22 days after treatment and again later on in the growing season. Leaf retention was assessed shortly before harvest when <50% leaves were remaining in non-treated control plots. Prior to harvest, the ends of each plot were cut to minimize edge effects in yield data. All yields were adjusted to 13% moisture content.

Septoria brown spot was reduced when compared to the untreated check in plots treated with fungicide only and fungicide/insecticide combinations at all sites. Statistical differences were observed at all sites in the amount of insect feeding damage in plots that were treated with insecticide in combination with a fungicide and insecticide alone. Lexington and Platte Center had the highest yields of the four locations. Yield differences were not consistently observed due to treatment in these trials and only the Platte Center location had similar trends to those observed in 2011 (insecticide and fungicide combinations having the highest yields).

**Table 1: Overall site management for each trail location.**

| | Detailed Site Information 2012 | | | |
|---|---|---|---|---|
| | **David City** | **Lexington** | **O'Neill** | **Platte Center** |
| **Planting Date** | 24-Apr | 2-May | 4-May | 25-Apr |
| **Treatment Application Date** | 10-Jul | 25-Jul | 22-Jul | 11-Jul |
| **14-21 DAT[z]** | 24-Jul | 14-Aug | 15-Aug | 24-Jul |
| **28-35 DAT[z]** | 17-Aug | 28-Aug | 29-Aug | 16-Aug |
| **42-49 DAT[z]** | 31-Aug | 11-Sep | 12-Sep | 30-Aug |
| **56 DAT[z]** | 14-Sep | 25-Sep | 26-Sep | 13-Sep |
| **Harvest Date** | 25-Sep | 4-Oct | 1-Oct | 26-Sep |
| **Irrigation Method** | Center Pivot | Center Pivot | Center Pivot | Center Pivot |
| **Abiotic Stress** | Drought (Dry Well) | Early Hail | None | None |
| **Herbacide Application Date** | | | | |
| OptillPro & Roundup | 30-Apr | | | 30-Apr |
| Outlook & Verdict & Roundup | | | 7-May | |
| Roundup & Xtreme | 20-Jun | 3-Jun | 13-Jun | 20-Jun |

[z] DAT = Days After Treatment (Rating)

**Table 2. Effects of fungicide and insecticide applications on disease severity and insect injury at David City, NE. All evaluations were done on a linear percentage scale (0-100%) of injury or damage.**

| | % Brown Spot Severity | | % Insect Feeding | | % Spider Mite Damage |
|---|---|---|---|---|---|
| **Treatment and Rate/A** | **14 DAT[z]** | **38 DAT[z]** | **14 DAT[z]** | **38 DAT[z]** | **38 DAT[z]** |
| Non-treated | 12.5 | 15.0 | 2.8 | 7.5 | 7.5 |
| Headline 6 fl oz/A | 11.3 | 7.5 | 4.3 | 10.0 | 1.5 |
| Headline 6 fl oz/A + Respect 3 fl oz/A | 11.3 | 11.3 | 0.9 | 2.5 | 7.5 |
| Priaxor 4 fl oz/A | 10.0 | 12.5 | 5.0 | 11.3 | 4.3 |
| Priaxor 4 fl oz/A + Respect 3 fl oz/A | 10.0 | 10.0 | 0.7 | 2.5 | 7.5 |
| Quilt Xcel 10.5 fl oz/A | 8.8 | 8.8 | 3.5 | 10.0 | 3.5 |
| Quilt Xcel 10.5 fl oz/A + Warrior II 1 fl oz/A | 10.0 | 12.5 | 0.7 | 1.8 | 2.3 |
| Stratego YLD 4 fl oz/A | 10.0 | 8.8 | 3.5 | 8.8 | 4.5 |
| Stratego YLD 4 fl oz/A + Leverage 360 2.8 fl oz/A | 10.0 | 12.5 | 0.8 | 1.3 | 10.3 |
| Topguard 7 fl oz/A | 11.3 | 12.5 | 5.0 | 7.5 | 5.5 |
| Topguard 7 fl oz/A + Declare 1 fl oz/A | 11.3 | 10.0 | 1.0 | 1.5 | 13.8 |
| Evito 2 fl oz/A | 11.3 | 8.8 | 4.3 | 8.8 | 2.5 |
| Evito 2 fl oz/A + Hero 5 fl oz/A | 7.5 | 10.0 | 0.4 | 1.0 | 6.8 |
| Hero 5 fl oz/A | 6.3 | 11.3 | 0.4 | 1.0 | 8.0 |
| LSD (α=0.1) | 4.3 | 4.7 | 1.2 | 4.2 | 4.8 |

[z] DAT = Days After Treatment

**Table 3. Effects of fungicide and insecticide applications on disease severity and insect injury at Lexington, NE. All evaluations were done on a linear percentage scale (0-100%) of injury or damage.**

| | % Brown Spot Severity | | % Insect Feeding | |
|---|---|---|---|---|
| **Treatment and Rate/A** | **20 DAT[z]** | **35 DAT[z]** | **20 DAT[z]** | **35 DAT[z]** |
| Non-treated | 0.2 | 3.5 | 0.2 | 0.1 |
| Headline 6 fl oz/A | 0.1 | 1.3 | 0.1 | 0.2 |
| Headline 6 fl oz/A + Respect 3 fl oz/A | 0.3 | 1.4 | 0.1 | 0.1 |
| Priaxor 4 fl oz/A | 0.2 | 1.5 | 0.0 | 0.1 |
| Priaxor 4 fl oz/A + Respect 3 fl oz/A | 0.2 | 1.1 | 0.0 | 0.1 |
| Quilt Xcel 10.5 fl oz/A | 0.1 | 1.8 | 0.0 | 0.1 |
| Quilt Xcel 10.5 fl oz/A + Warrior II 1 fl oz/A | 0.1 | 1.3 | 0.0 | 0.1 |
| Stratego YLD 4 fl oz/A | 0.2 | 2.0 | 0.1 | 0.2 |
| Stratego YLD 4 fl oz/A + Leverage 360 2.8 fl oz/A | 0.1 | 1.3 | 0.0 | 0.1 |
| Topguard 7 fl oz/A | 0.1 | 1.3 | 0.0 | 0.1 |
| Topguard 7 fl oz/A + Declare 1 fl oz/A | 0.0 | 0.9 | 0.1 | 0.2 |
| Evito 2 fl oz/A | 0.3 | 1.4 | 0.1 | 0.1 |
| Evito 2 fl oz/A + Hero 5 fl oz/A | 0.2 | 1.5 | 0.0 | 0.1 |
| Hero 5 fl oz/A | 0.4 | 3.5 | 0.0 | 0.1 |
| LSD (α=0.1) | 0.2 | 1.1 | 0.1 | 0.1 |

[z] DAT = Days After Treatment

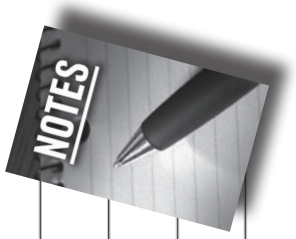


**Table 4. Effects of fungicide and insecticide applications on disease severity and insect injury at O'Neill, NE. All evaluations were done on a linear percentage scale (0-100%) of injury or damage.**

| Treatment and Rate/A | % Brown Spot Severity 24 DAT[z] | % Insect Feeding 24 DAT[z] |
|---|---|---|
| Non-treated | 2.0 | 0.0 |
| Headline 6 fl oz/A | 2.1 | 0.1 |
| Headline 6 fl oz/A + Respect 3 fl oz/A | 1.2 | 0.0 |
| Priaxor 4 fl oz/A | 1.1 | 0.1 |
| Priaxor 4 fl oz/A + Respect 3 fl oz/A | 1.6 | 0.0 |
| Quilt Xcel 10.5 fl oz/A | 0.9 | 0.0 |
| Quilt Xcel 10.5 fl oz/A + Warrior II 1 fl oz/A | 0.6 | 0.0 |
| Stratego YLD 4 fl oz/A | 0.8 | 0.1 |
| Stratego YLD 4 fl oz/A + Leverage 360 2.8 fl oz/A | 0.4 | 0.0 |
| Topguard 7 fl oz/A | 2.8 | 0.1 |
| Topguard 7 fl oz/A + Declare 1 fl oz/A | 1.0 | 0.0 |
| Evito 2 fl oz/A | 1.0 | 0.0 |
| Evito 2 fl oz/A + Hero 5 fl oz/A | 0.7 | 0.0 |
| Hero 5 fl oz/A | 3.1 | 0.0 |
| LSD (α=0.1) | 1.8 | 0.0 |

[z] DAT = Days After Treatment

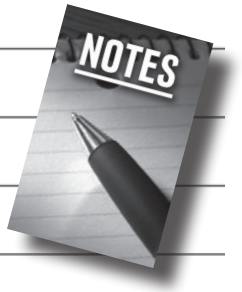


**Table 5. Effects of fungicide and insecticide applications on disease severity and insect injury at Platte Center, NE. All evaluations were done on a linear percentage scale (0-100%) of injury or damage.**

| | % Brown Spot Severity | | | % Insect Feeding | | | % Spider Mite Damage | |
|---|---|---|---|---|---|---|---|---|
| **Treatment and Rate/A** | **14 DAT[z]** | **36 DAT[z]** | **48 DAT[z]** | **14 DAT[z]** | **36 DAT[z]** | **48 DAT[z]** | **36 DAT[z]** | **48 DAT[z]** |
| Non-treated | 0.3 | 1.5 | 4.3 | 0.1 | 0.6 | 2.8 | 10.0 | 5.0 |
| Headline 6 fl oz/A | 0.1 | 0.4 | 2.3 | 0.1 | 0.5 | 2.3 | 7.5 | 12.8 |
| Headline 6 fl oz/A + Respect 3 fl oz/A | 0.0 | 1.3 | 2.3 | 0.0 | 0.1 | 1.6 | 14.5 | 7.8 |
| Priaxor 4 fl oz/A | 0.1 | 1.0 | 1.8 | 0.1 | 0.6 | 2.3 | 9.0 | 5.5 |
| Priaxor 4 fl oz/A + Respect 3 fl oz/A | 0.1 | 0.6 | 2.8 | 0.0 | 0.1 | 1.5 | 15.0 | 13.8 |
| Quilt Xcel 10.5 fl oz/A | 0.1 | 0.4 | 1.5 | 0.2 | 0.1 | 1.0 | 11.3 | 4.3 |
| Quilt Xcel 10.5 fl oz/A + Warrior II 1 fl oz/A | 0.1 | 0.9 | 2.8 | 0.0 | 0.1 | 0.3 | 10.0 | 7.5 |
| Stratego YLD 4 fl oz/A | 0.1 | 0.4 | 1.3 | 0.1 | 0.6 | 1.5 | 6.3 | 2.3 |
| Stratego YLD 4 fl oz/A + Leverage 360 2.8 fl oz/A | 0.0 | 0.2 | 2.3 | 0.0 | 0.0 | 0.1 | 15.5 | 14.3 |
| Topguard 7 fl oz/A | 0.1 | 0.4 | 3.5 | 0.2 | 0.8 | 3.5 | 6.3 | 2.8 |
| Topguard 7 fl oz/A + Declare 1 fl oz/A | 0.0 | 0.5 | 3.3 | 0.0 | 0.3 | 0.9 | 8.8 | 12.5 |
| Evito 2 fl oz/A | 0.0 | 0.9 | 2.3 | 0.1 | 0.6 | 2.5 | 11.3 | 3.5 |
| Evito 2 fl oz/A + Hero 5 fl oz/A | 0.1 | 0.8 | 1.3 | 0.0 | 0.0 | 0.2 | 5.3 | 3.5 |
| Hero 5 fl oz/A | 0.0 | 1.6 | 3.5 | 0.0 | 0.1 | 0.4 | 13.0 | 16.5 |
| LSD (α=0.1) | 0.2 | 1.0 | 1.9 | 0.1 | 0.4 | 1.3 | NS | 13.5 |

[z] DAT = Days After Treatment

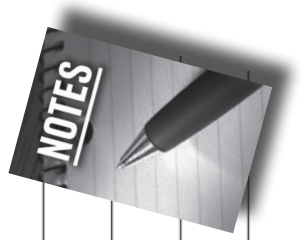
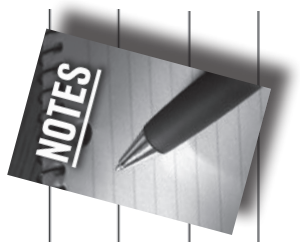


**Table 6: Seed oil and protein content at each location and averaged across all sites.**

| | % Oil and Protein Content | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | David City | | Lexington | | O'Neill | | Platte Center | | Average | |
| Treatment and Rate/A | Oil Content % | Protein Content % | Oil Content % | Protein Content % | Oil Content % | Protein Content % | Oil Content % | Protein Content % | Oil Content % | Protein Content % |
| Non-treated | 20.5 | 34.4 | 19.0 | 33.2 | 18.4 | 35.4 | 21.1 | 33.0 | 19.8 | 34.0 |
| Headline 6 fl oz/A | 20.6 | 34.0 | 18.5 | 33.5 | 18.2 | 35.4 | 21.1 | 33.0 | 19.6 | 34.0 |
| Headline 6 fl oz/A + Respect 3 fl oz/A | 20.2 | 34.5 | 18.7 | 33.4 | 18.3 | 35.4 | 21.0 | 33.0 | 19.5 | 34.1 |
| Priaxor 4 fl oz/A | 20.3 | 34.3 | 18.7 | 33.3 | 18.5 | 35.6 | 21.2 | 32.5 | 19.7 | 33.9 |
| Priaxor 4 fl oz/A + Respect 3 fl oz/A | 21.0 | 34.2 | 19.0 | 33.0 | 18.6 | 35.2 | 21.2 | 32.5 | 20.0 | 33.7 |
| Quilt Xcel 10.5 fl oz/A | 20.2 | 34.5 | 18.5 | 33.3 | 18.3 | 36.0 | 21.0 | 33.0 | 19.5 | 34.2 |
| Quilt Xcel 10.5 fl oz/A + Warrior II 1 fl oz/A | 20.2 | 35.0 | 18.5 | 34.0 | 18.4 | 35.4 | 21.3 | 33.0 | 19.6 | 34.4 |
| Stratego YLD 4 fl oz/A | 20.6 | 34.0 | 19.0 | 33.4 | 18.4 | 35.4 | 21.2 | 33.0 | 19.8 | 34.0 |
| Stratego YLD 4 fl oz/A + Leverage 360 2.8 fl oz/A | 20.5 | 34.1 | 18.5 | 33.3 | 18.2 | 35.6 | 21.3 | 33.0 | 19.6 | 34.0 |
| Topguard 7 fl oz/A | 20.3 | 34.4 | 18.5 | 34.0 | 18.4 | 35.5 | 21.3 | 32.3 | 19.6 | 34.1 |
| Topguard 7 fl oz/A + Declare 1 fl oz/A | 20.2 | 34.5 | 18.6 | 33.4 | 18.4 | 35.4 | 21.2 | 33.0 | 19.6 | 34.1 |
| Evito 2 fl oz/A | 20.5 | 34.2 | 18.5 | 33.6 | 18.3 | 35.2 | 21.3 | 32.4 | 19.6 | 33.8 |
| Evito 2 fl oz/A + Hero 5 fl oz/A | 20.7 | 34.0 | 18.7 | 33.3 | 18.4 | 35.4 | 21.0 | 33.0 | 19.7 | 33.9 |
| Hero 5 fl oz/A | 20.1 | 34.5 | 19.0 | 33.3 | 18.8 | 35.2 | 21.2 | 33.0 | 19.8 | 34.0 |
| LSD (α=0.1) | 0.5 | 0.7 | 0.3 | 0.6 | 0.3 | 0.3 | 0.2 | 0.4 | 0.2 | 0.3 |
| LSD (α=0.25) | 0.3 | 0.5 | 0.2 | 0.4 | 0.2 | 0.2 | 0.1 | 0.3 | 0.1 | 0.2 |
| **Average of Fungicide Treatments (2,4,6,8,10,12) Oil** | | | | | | | | | | 19.6 |
| **Average of Fungicide + Insecticide Treatments (3,5,7,9,11,13) Oil** | | | | | | | | | | 19.7 |
| **Average of Fungicide Treatments (2,4,6,8,10,12) Protein** | | | | | | | | | | 34.0 |
| **Average of Fungicide + Insecticide Treatments (3,5,7,9,11,13) Protein** | | | | | | | | | | 34.0 |

**Table 7: Yield data (bu/A) for each trail location and averaged across all sites.**

| | (Yield bu/A) | | | | |
|---|---|---|---|---|---|
| **Treatment and Rate/A** | **David City** | **Lexington** | **O'Neill** | **Platte Center** | **Average** |
| Non-treated | 17.2 | 71.7 | 34.7 | 45.6 | 42.3 |
| Headline 6 fl oz/A | 15.6 | 67.4 | 29.7 | 48.0 | 40.1 |
| Headline 6 fl oz/A + Respect 3 fl oz/A | 17.5 | 71.3 | 30.7 | 49.9 | 42.3 |
| Priaxor 4 fl oz/A | 17.4 | 67.1 | 32.8 | 49.3 | 41.7 |
| Priaxor 4 fl oz/A + Respect 3 fl oz/A | 16.4 | 63.3 | 33.9 | 50.0 | 40.9 |
| Quilt Xcel 10.5 fl oz/A | 21.4 | 72.0 | 32.1 | 47.5 | 43.3 |
| Quilt Xcel 10.5 fl oz/A + Warrior II 1 fl oz/A | 19.7 | 64.4 | 32.3 | 49.3 | 41.4 |
| Stratego YLD 4 fl oz/A | 20.8 | 68.0 | 32.8 | 46.0 | 41.9 |
| Stratego YLD 4 fl oz/A + Leverage 360 2.8 fl oz/A | 18.0 | 64.9 | 34.0 | 48.1 | 41.2 |
| Topguard 7 fl oz/A | 21.0 | 75.3 | 33.0 | 51.7 | 45.3 |
| Topguard 7 fl oz/A + Declare 1 fl oz/A | 17.6 | 76.6 | 32.3 | 47.8 | 43.6 |
| Evito 2 fl oz/A | 18.6 | 78.4 | 34.0 | 51.0 | 45.5 |
| Evito 2 fl oz/A + Hero 5 fl oz/A | 19.4 | 66.9 | 29.9 | 51.2 | 41.8 |
| Hero 5 fl oz/A | 17.8 | 68.6 | 31.8 | 47.9 | 41.5 |
| LSD (α=0.1) | NS | 10.4 | 4.1 | 5.3 | 3.3 |
| LSD (α=0.25) | 4.5 | 7.2 | 2.8 | 3.7 | 2.3 |
| **Average of Fungicide Treatments (2,4,6,8,10,12)** | | | | | 42.95 |
| **Average of Fungicide + Insecticide Treatments (3,5,7,9,11,13)** | | | | | 41.88 |



SOYBEAN (*Glycine max* L.)
Seedling disease

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Lincoln, NE 68583-0722.

# Effect of fungicide and insecticide seed treatments on soybean stand and yield in Nebraska, 2012.

Seed treatment fungicide/insecticide/nematicide trials were conducted at four locations in Nebraska to determine the effects on disease control and yield. The four sites were David City, Lexington, O'Neill, and Platte Center. All treatments were arranged in a randomized complete block design. Asgrow 3131 was the seed variety used for these trials and was planted at all sites with a population density of 140,000 seeds/A. All plots were 4 rows wide (10 feet) by 20 feet long. Fungicide/insecticide/nematicide seed treatment applications were applied to the seed prior to planting. Stand counts were conducted at VE-V1, V4-V6, and at maturity. Prior to harvest, the ends of each plot were cut to minimize edge effects in yield data. All yields were adjusted to 13% moisture content.

Statistical differences were observed within plant population density at Davis City, Lexington, and Platte Center. Plots that had combined fungicide, insecticide, and nematicide seed treatments had higher stand counts at relatively all rating times. Cruiser Maxx Plus + N-hibit exhibited the highest population for the early season counts at David City and Lexington. Avicta Complete Beans + Cruiser Maxx Plus showed to have the highest population at the end of the season at David City and Platte Center. Statistically significant differences in yield also observed at David City and Platte Center. No differences in yield were observed when all sites were averaged. This data set is representative of variability commonly observed with seed treatments and how fields will vary in response to product use.

**Table 1: Overall site management for each trail location.**

| | Detailed Site Information 2012 | | | |
|---|---|---|---|---|
| | **David City** | **Lexington** | **O'Neill** | **Platte Center** |
| **Planting Date** | 24-Apr | 2-May | 4-May | 25-Apr |
| **Harvest Date** | 25-Sep | 4-Oct | 1-Oct | 26-Sep |
| **Irrigation Method** | Center Pivot | Center Pivot | Center Pivot | Center Pivot |
| **Abiotic Stress** | Drought (Dry Well) | Hail 30-May | None | None |
| **Herbacide Application Date** | | | | |
| OptillPro & Roundup | 30-Apr | | | 30-Apr |
| Outlook & Verdict & Roundup | | | 7-May | |
| Roundup & Xtreme | 20-Jun | 3-Jun | 13-Jun | 20-Jun |

**Table 2: Yield data (bu/A) for each trail location and averaged across all sites.**

| | | (Yield bu/A) | | | | |
|---|---|---|---|---|---|---|
| | **Treatment and Rate/A** | **David City** | **Lexington** | **O'Neill** | **Platte Center** | **Average** |
| 1 | Non-Treated Check | 37.0 | 86.2 | 41.9 | 45.7 | 52.3 |
| 2 | CruiserMaxx Plus 3.2 fl oz/cwt | 40.2 | 74.5 | 39.5 | 51.1 | 51.7 |
| 3 | ApronMaxx RTA 5 fl oz/cwt | 36.0 | 74.0 | 40.6 | 50.9 | 50.6 |
| 4 | Avicta Complete Beans 0.15 mg ai/seed + CruiserMaxx Plus 3.2 fl oz/cwt | 42.7 | 65.5 | 38.0 | 49.6 | 49.6 |
| 5 | Acceleron FI Company Treated | 36.3 | 85.6 | 43.0 | 53.3 | 54.2 |
| 6 | Acceleron FI + Poncho Votivo Company Treated | 38.5 | 76.3 | 38.1 | 49.8 | 50.7 |
| 7 | Inovate 4.74 fl oz/cwt | 36.6 | 73.4 | 33.6 | 51.0 | 48.7 |
| 8 | EverGol Energy 0.019 mg ai/seed | 39.2 | 82.8 | 33.2 | 45.5 | 49.4 |
| 9 | EverGol Energy 0.019 mg ai/seed + Poncho Votivo 0.013 mg ai/seed | 36.6 | 78.4 | 36.1 | 48.3 | 49.7 |
| 10 | CruiserMaxx Plus 3.2 fl oz/cwt + N-Hibit 0.25 oz wt/cwt | 38.8 | 84.5 | 41.3 | 47.4 | 53.0 |
| LSD (α=0.1) | | 5.3 | 22.1 | 8.3 | 7.3 | 5.1 |
| LSD (α=0.25) | | 3.6 | 16.2 | 5.8 | 5.0 | 3.5 |
| **Average of Fungicide Treatments (3,5,8)** | | | | | | 51.7 |
| **Average of Fungicide + Insecticide Treatments (2,7)** | | | | | | 50.0 |
| **Average of Fungicide + Insecticide + Nematicide Treatments (4,6,9,10)** | | | | | | 50.6 |



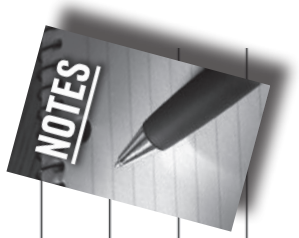
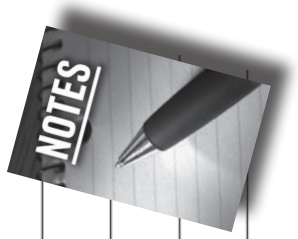


**Table 3: Effects of fungicide and insecticide seed treatments on soybean population density.**

| | Population Density (Plants/Acre) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | David City | | | Lexington | | | O'Neill | | | Platte Center | | | Average | | |
| | DAP[z] | | | DAP | | | DAP | | | DAP | | | DAP | | |
| Treatment and Rate/A | 20 | 35 | 143 | 16 | 30 | 148 | 17 | 33 | 150 | 19 | 34 | 145 | 16-20 | 30-35 | 143-150 |
| 1 Non-Treated Check | 81,675 | 97,356 | 76,230 | 74,923 | 46,609 | 38,115 | 67,736 | 76,012 | 62,726 | 68,607 | 76,012 | 54,232 | 73,235 | 73,997 | 57,826 |
| 2 CruiserMaxx Plus 3.2 fl oz/cwt | 73,616 | 94,961 | 75,141 | 65,340 | 39,422 | 31,363 | 76,448 | 83,417 | 74,705 | 85,595 | 95,614 | 76,012 | 75,250 | 78,354 | 64,305 |
| 3 ApronMaxx RTA 5 fl oz/cwt | 62,291 | 70,132 | 55,975 | 87,556 | 50,530 | 40,511 | 68,389 | 78,408 | 72,745 | 63,598 | 73,399 | 57,717 | 70,458 | 68,117 | 56,737 |
| 4 Avicta Complete Beans 0.15 mg ai/seed + CruiserMaxx Plus 3.2 fl oz/cwt | 92,783 | 104,108 | 79,933 | 77,537 | 46,827 | 34,195 | 74,488 | 80,586 | 71,874 | 97,139 | 111,296 | 86,031 | 85,487 | 85,704 | 68,008 |
| 5 Acceleron FI Company Treated | 55,539 | 69,478 | 59,459 | 60,984 | 26,789 | 21,127 | 80,150 | 86,684 | 70,349 | 73,616 | 84,724 | 72,527 | 67,572 | 66,919 | 55,866 |
| 6 Acceleron FI Company Treated + Poncho Votivo | 72,092 | 84,071 | 68,389 | 90,169 | 50,094 | 44,867 | 65,993 | 74,052 | 63,162 | 77,537 | 87,338 | 65,122 | 76,448 | 73,889 | 60,385 |
| 7 Inovate 4.74 fl oz/cwt | 55,975 | 71,003 | 63,380 | 84,071 | 44,213 | 38,768 | 73,181 | 79,279 | 65,558 | 98,881 | 104,980 | 71,656 | 78,027 | 74,869 | 59,841 |
| 8 EverGol Energy 0.019 mg ai/seed | 57,935 | 63,598 | 49,658 | 49,223 | 24,176 | 21,127 | 81,893 | 86,902 | 70,567 | 61,420 | 67,300 | 59,242 | 62,618 | 60,494 | 50,148 |
| 9 EverGol Energy 0.019 mg ai/seed + Poncho Votivo 0.013 mg ai/seed | 63,815 | 80,804 | 64,469 | 66,211 | 31,363 | 24,829 | 74,923 | 86,684 | 71,003 | 85,378 | 92,347 | 80,586 | 72,582 | 72,800 | 60,222 |
| 10 CruiserMaxx Plus 3.2 fl oz/cwt + N-Hibit 0.25 oz wt/cwt | 119,572 | 148,975 | 75,794 | 102,366 | 59,677 | 44,649 | 76,883 | 84,942 | 73,616 | 81,457 | 88,427 | 71,221 | 95,070 | 95,505 | 66,320 |
| LSD (α=0.1) | 29,032 | 43,893 | 20,446 | 34,891 | 19,928 | 15,810 | NS | NS | NS | 24,358 | 26,614 | 15,376 | 51,641 | 55,568 | 33,368 |
| LSD (α=0.25) | 20,038 | 30,296 | 14,112 | 24,083 | 13,755 | 10,912 | 13,209 | NS | NS | 16,812 | 18,369 | 10,613 | 19,746 | 21,248 | 12,759 |
| **Average of Fungicide Treatments (3,5,8)** | | | | | | | | | | | | | | | 62,103 |
| **Average of Fungicide + Insecticide Treatments (2,7)** | | | | | | | | | | | | | | | 71,774 |
| **Average of Fungicide + Insecticide + Nematicide Treatments (4,6,9,10)** | | | | | | | | | | | | | | | 76,035 |

[z] DAP = Days After Planting (Stand Counts)



# BioStimulant Seed Treatment and Foliar Product Effects on Soybean Yields and Seed Quality, 2012

*Principal Investigator, M.D. Rethwisch*

**Introduction**

A number of products which claim to effectively increase plant growth and subsequent yields have recently become commercially available. Limited Nebraska data from replicated experimentation are available for multiple product comparisons involving treated seed, with many providing some increases in seed, however inconsistency is noted.

Soybean experimental data from 2011 indicate that growth and yield responses appear to differ by variety, with differing interactions also noted existing for varietal response to mid-season herbicide application.

This project was initiated to evaluate the effects and interactions of two biostimulant seed treatments with mid-season applied foliar herbicide and several growth enhancement products on soybean growth, development and yields.

**Methods and Materials**

Four locations were used (Table A), with three soybean varieties differing in maturity. Pioneer 93M11, a variety with a maturity rated as 3.1, was planted at both the David City and Platte Center locations, while NK-28B4 (maturity = 2.8) was planted at the Lexington and NK-S25R3 (maturity 2.5) was planted at O'Neill. All seed was treated with CruiserMaxx which served as the base treatment, with 2 oz./100 lbs. of seed of BioForge ST (2-0-3 fertilizer and proprietory ingredients; Stoller USA) or 4 oz./100 lbs. seed of Optimize (a combination of a lipo-chitooligosacharride and *Bradyrhyzobia japonium*; Novozymes) added to create three seed treatments.

Each treatment had four replications at each location, using a randomized complete block design. Plots were 50 feet long by 4 rows wide, and were planted with a tractor mounted four row planter with 30" row spacing calibrated to plant approximately 150,000 seeds/acre. A four row border was also planted on each side of the experimental block.

Four foliar treatments were applied in June (Table A) using a back-pack sprayer with a boom equipped with TurboTeeJet TT110015 nozzles calibrated to deliver 15 gallons/acre in a flat fan configuration to assure thorough coverage. All foliar treatments included RoundUp PowerMax (active ingredient = glyphosate; Monsanto) at the rate of 22 oz./acre. The other three treatments were additives to this treatment, consisting of either ammonium sulfate (21-0-0-24), 4 oz./acre of Ratchet™, or a combination of 4 oz./acre of GreenSol™ 48 + 2.5 lbs./acre of ProSol™ Bean-Kicker. Ammonium sulfate was used at a rate of 17 lbs./100 gallons of solution, equivalent to 2.55 lbs. of applied product/acre, or 0.54 lbs./acre nitrogen and 0.61 lbs./acre of sulfur.

**Table A. Plot, planting, and treatment information for 2012 locations.**

| | David City | Platte Center | Lexington | O'Neill |
|---|---|---|---|---|
| **Planting date** | April 24 | April 25 | May 2 | May 4 |
| **Soybean Variety** | Pioneer 93M11 | Pioneer 93M11 | NK S28-B4 | NK S25-R3 |
| **Foliar Treatment date & Crop Stage** | June 21<br>R-2 | June 21<br>R-2 | June 5<br>V-4 | June 20<br>R-2 |

Ratchet™ (Novozymes) is a product that contains a lipo-chitooligosacharride molecule designed for foliar application rather than seed/soil placement. It is in the same class of chemistry as the lipo-chitooligosacharride contained in Optimize.

GreenSol™ 48 (FRIT Industries, Ozark, AL) contains the plant hormones kinetin and gibberellic acid in an 8-20-20 water-soluble fertilizer base (from which the number 48 is arrived). This product is designed to promote plant vigor, early maturity, higher yields and improved crop quality. This product is marketed to create faster transition from the vegetative to reproductive stage of plant development resulting in heavy bloom and fruit set for some crops. GreenSol™ 48 is typically used early in the plant growth cycle between first true leaf and bloom development. The product is referenced hereafter as GS-48 in this report.

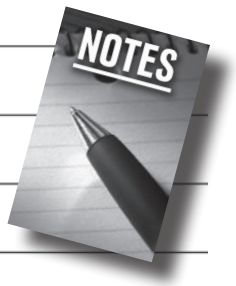
ProSol™ Bean-Kicker (FRIT Industries, Ozark, AL) is a water soluble fertilizer consisting of 5% magnesium, 10% sulfur, 10% manganese, and 2.5% boron.

Harvest

Plots were harvested in October using a 2 row mechanical harvester. Thirty+ feet of the middle two rows of each plot were harvested, measured, weighed and recorded along with moisture levels of harvested soybeans. Sub-samples were collected for protein, oil and fiber content analyses conducted by the University of Nebraska-Lincoln Department of Agronomy and Horticulture.

Data Analyses

Data were analyzed and treatment means statistically separated using the Tukey-Kramer Honestly Significant Difference (HSD) test (JMP 10.0.0, SAS Institute Incorporated, Cary, NC).



**Results and Discussion**

Notes about locations

The four sites were all center pivot irrigated, however, the David City location encountered low water pressures and less than needed water during the summer due to the excessive heat/related drought and increased pressures on local irrigation water availability. Soybeans at the Lexington site were hit with a fairly severe hail storm shortly after emergence, resulting in a stand of approximately 75,000 plants/acre. Soybeans were not replanted at this site. Soybeans at O'Neill were irrigated very frequently throughout the summer.

Yields

Large variances for yields were noted across the replicates at both David City and Platte Center, resulting in abnormal yield distributions and thus not allowing data analyses to be conducted. It is thought that spider mite infestations may have been a major factor for the variances noted, as yields increased from the edges of the experimental plots, even with the four row border area that was present.

No statistical differences were noted for yields at either the Lexington or O'Neill location (Tables 1-2). Trends were noted at both these locations however, with biostimulant treated soybeans having greater numeric yields than CruiserMaxx only treated seed, and foliar additions to glyphosate also resulting in higher numeric yield than the glyphosate only application (Table 1).

The greatest numeric yield increase due to seed treatments was noted at Lexington. It is thought that the biostimulant treatments resulted in larger root masses early in the season, thereby lessening the effect of hail at this site. The highest yields among all treatment combinations at Lexington were noted from seed biostimulant treatments followed by Bean-Kicker + GS-48, perhaps due to the extra nutrition available from the foliar treatment.

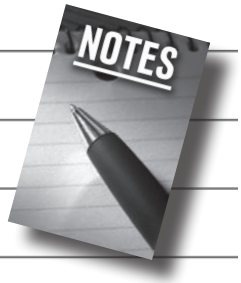


**Table 1. Mean Yields (bushels/acre at 13% moisture) of Soybeans Resulting from Seed or Foliar Treatments, 2012 University of Nebraska-Lincoln Soybean Management Field Days**

| | Soybean Variety and Location | | | |
|---|---|---|---|---|
| Treatments and rate/acre | NK S28-B4 | NK S25-R3 | | Pioneer 93M11 |
| Seed* | Lexington | O'Neil | **AVERAGE** | David City, Platte Center |
| Base | 78.4a | 38.6a | **58.5** | DATA |
| BioForge | 83.4a | 39.5a | **61.5** | NOT |
| Optimize | 81.0a | 40.0a | **60.5** | DISTRIBUTED |
| | | | | NORMALLY, |
| *P Value* | *0.22* | *0.45* | | STATISTICAL |
| | | | | ANALYSES |
| Foliar** | | | | UNABLE |
| Glyphosate only | 76.3a | 38.0a | **57.2** | TO BE |
| Glyphosate + AMS | 79.3a | 38.8a | **59.1** | COMPLETED. |
| Glyphosate + Ratchet 4 oz. | 79.1a | 40.3a | **59.7** | LARGE |
| Glyphosate + GS-48 4 oz | 84.5a | 39.2a | **61.9** | GRADATION |
| + BeanKicker 2.5 lbs | | | | IN YIELDS |
| *P Value* | *0.24* | *0.59* | | ACROSS PLOTS. |

*Means in sub-columns followed by the same letter are not statistically different at the P<0.05 level (Tukey's HSD, JMP 10.0.0)*

*All seed treatments included the base treatment of a fungicide/insecticide combination of Cruiser Maxx

** All foliar treatments included a base herbicide (active ingredient glyphosate) and were applied as a combination treatment, not separate applications.

**Table 2. Mean Yields (bushels/acre at 13% moisture) of Soybeans Resulting from Seed and Foliar Treatments, 2012 University of Nebraska-Lincoln Soybean Management Field Days.**

| | | Soybean Variety and Location | | | |
|---|---|---|---|---|---|
| Treatments and rates/acre | | NK S28-B4 | NK S25-R3 | Pioneer 93M11 | |
| Seed* | Foliar** | Lexington | O'Neil | David City | Platte Center |
| Base | Glyphosate only | 76.3a (8) | 38.0a (10) | YIELD DATA | |
| Base | Ammonium Sulfate | 76.0a (9) | 38.5a (7) | NOT | |
| Base | BeanKicker 2.5 lbs. | 79.8a (5) | 38.4a (8) | DISTRIBUTED | |
| | + GS-48 4 oz. | | | NORMALLY, | |
| Base | Ratchet 4 oz. | 81.4a (4) | 39.4a (4) | STATISTICAL | |
| BioForge | Ammonium Sulfate | 79.2a (6) | 39.9a (3) | ANALYSES | |
| BioForge | BeanKicker 2.5 lbs. | 90.8a (1) | 40.0a (2) | UNABLE | |
| | + GS-48 4 oz. | | | TO BE | |
| BioForge | Ratchet 4 oz. | 79.1a (7) | 38.7a (6) | COMPLETED. | |
| Optimize | Ammonium Sulfate | 82.7a (3) | 38.0a (9) | EXTREMELY | |
| Optimize | BeanKicker 2.5 lbs. | 82.8a (2) | 39.3a (5) | LARGE | |
| | + GS-48 4 oz. | | | GRADATION | |
| Optimize | Ratchet 4 oz. | 74.2a (10) | 42.6a (1) | ACROSS PLOTS. | |
| *Replicate P Value* | | 0.87 | 0.04 | | |

*Means in columns followed by the same letter are not statistically different at the P<0.05 level (Tukey's HSD, JMP 10.0.0)*

*All seed treatments included the base treatment of a fungicide/insecticide combination of Cruiser Maxx.

** All foliar treatments included the base herbicide (active ingredient glyphosate) and were applied as a combination treatment, not separate applications.

Protein percentage

Although yield data were unable to be properly statistically analyzed for the David City and Platte Center locations, samples from these locations were analyzed for quality traits (Tables 3-4). No statistical differences were noted for protein at any location however, although some trends were observed in relationship to yields at Lexington (lower protein was associated with higher yield).

**Table 3. Mean Percent Protein of Soybeans Resulting from Seed or Foliar Treatments, 2012 University of Nebraska-Lincoln Soybean Management Field Days**

| | Soybean Variety and Location | | | | |
|---|---|---|---|---|---|
| Treatments and rate/acre | NK S28-B4 | NK S25-R3 | Pioneer 93M11 | | Overall |
| Seed* | Lexington | O'Neil | David City | Platte Center | Average |
| Base | 33.62a | 35.54a | 34.40a | 34.17a | **34.43** |
| Base + BioForge | 33.23a | 35.65a | 34.34a | 34.33a | **34.39** |
| Base + Optimize | 33.29a | 35.49a | 34.48a | 34.01a | **34.32** |
| *P Value* | *0.26* | *0.20* | *0.89* | *0.46* | |
| Foliar** | | | | | |
| Glyphosate only | 33.68a | 35.58a | 34.98a | 34.00a | **34.56** |
| Glyphosate + AMS | 33.48a | 35.60a | 34.39a | 34.15a | **34.41** |
| Glyphosate + Ratchet 4 oz. | 33.29a | 35.54a | 34.18a | 34.31a | **34.33** |
| Glyphosate + GS-48 4 oz + BeanKicker 2.5 lbs. | 33.36a | 35.53a | 34.45a | 34.11a | **34.36** |
| *P Value* | *0.74* | *0.86* | *0.21* | *0.86* | |

*Means in sub-columns followed by the same letter are not statistically different at the P<0.05 level (Tukey's HSD, JMP 10.0.0)*

*All seed treatments included the base treatment of a fungicide/insecticide combination of Cruiser Maxx.

** All foliar treatments included the base herbicide (active ingredient glyphosate) and were applied as a combination treatment, not separate applications.

**Table 4. Mean Percent Protein of Soybeans Resulting from Seed and Foliar Treatments, 2012 University of Nebraska-Lincoln Soybean Management Field Days**

| | | Soybean Variety and Location | | | |
|---|---|---|---|---|---|
| Treatments and rates/acre | | NK S28-B4 | NK S25-R3 | Pioneer 93M11 | |
| Seed* | Foliar** | Lexington | O'Neil | David City | Platte Center |
| Base | Glyphosate only | 33.7a | 35.6a (4) | 34.98a (1) | 34.0a |
| Base | Ammonium Sulfate | 33.5a | 35.6a (2) | 34.30a (8) | 34.0a |
| Base | Ratchet 4 oz. | 34.0a | 35.5a (8) | 33.88a (10) | 34.23a |
| Base | GS48 4 oz. + BeanKicker 2.5 lbs. | 33.3a | 35.5a (7) | 34.47a (4) | 34.45a |
| BioForge | Ammonium Sulfate | 33.3a | 35.8a (1) | 34.43a (7) | 34.48a |
| BioForge | Ratchet 4 oz. | 32.8a | 35.6a (4) | 34.18a (9) | 34.38a |
| BioForge | GS48 4 oz. + BeanKicker 2.5 lbs. | 33.6a | 35.6a (2) | 34.43a (6) | 34.15a |
| Optimize | Ammonium Sulfate | 33.7a | 35.4a (10) | 34.47a (5) | 33.98a |
| Optimize | BeanKicker 2.5 lbs + GS48 4 oz. | 33.2a | 35.8a (8) | 34.48a (3) | 33.73a |
| Optimize | Ratchet 4 oz./acre | 33.0a | 35.6a (4) | 34.50a (2) | 34.33a |
| *Replicate P Value* | | 0.13 | 0.53 | 0.18 | <0.0001 |

*Means in columns followed by the same letter are not statistically different at the P<0.05 level (Tukey's HSD, JMP 10.0.0)*

*All seed treatments included the base treatment of a fungicide/insecticide combination of Cruiser Maxx.

** All foliar treatments included a base herbicide (active ingredient glyphosate) and were applied as a combination treatment, not separate applications.

Oil percentage

No statistical differences exist at any single location for oil content (Tables 5-6). Oil levels were somewhat numerically lower as protein levels of soybeans increased in this study, similar to that observed in previous studies. The O'Neill site had a very highly significant difference in replicates for oil content (Table 6). The cause for this is unknown.

**Table 5. Mean Oil Content Percentage of Soybeans Resulting from Seed or Foliar Treatments, 2012 University of Nebraska-Lincoln Soybean Management Field Days**

| | Soybean Variety and Location | | | | |
|---|---|---|---|---|---|
| Treatments and rate/acre | NK S28-B4 | NK S25-R3 | Pioneer 93M11 | | Overall |
| Seed* | Lexington | O'Neil | David City | Platte Center | Average |
| Base | 18.58a | 18.35a | 20.38a | 20.22a | **19.38** |
| Base + BioForge | 18.71a | 18.27a | 20.44a | 20.21a | **19.41** |
| Base + Optimize | 18.67a | 18.43a | 20.29a | 20.33a | **19.43** |
| *P value* | *0.45* | *0.20* | *0.65* | *0.72* | |
| Foliar** | | | | | |
| Glyphosate only | 18.38a | 18.43a | 20.03a | 20.25a | **19.27** |
| Glyphosate + AMS | 18.64a | 18.36a | 20.39a | 20.26a | **19.41** |
| Glyphosate + Ratchet 4 oz. | 18.71a | 18.35a | 20.53a | 20.15a | **19.44** |
| Glyphosate + GS-48 4 oz + BeanKicker 2.5 lbs. | 18.67a | 18.31a | 20.31a | 20.33a | **19.41** |
| *P value* | *0.18* | *0.82* | *0.12* | *0.71* | |

*Means in sub-columns followed by the same letter are not statistically different at the P<0.05 level (Tukey's HSD, JMP 10.0.0)*

*All seed treatments included the base treatment of a fungicide/insecticide combination of Cruiser Maxx.

** All foliar treatments included a base herbicide (active ingredient glyphosate) and were applied as a combination treatment, not separate applications.

**Table 6. Mean Oil Content Percentage of Soybeans Resulting from Seed and Foliar Treatments, 2012 University of Nebraska-Lincoln Soybean Management Field Days**

| | | Soybean Variety and Location | | | |
|---|---|---|---|---|---|
| Treatments and rates/acre | | NK S28-B4 | NK S25-R3 | Pioneer 93M11 | |
| Seed* | Foliar** | Lexington | O'Neil | David City | Platte Center |
| Base | Glyphosate only | 18.4a (10) | 18.4a (3) | 20.0a (10) | 20.3a (3) |
| Base | Ammonium Sulfate | 18.8a (3) | 18.3a (6) | 20.5a (3) | 20.3a (3) |
| Base | GS48 4 oz. + BeanKicker 2.5 lbs. | 18.7a (4) | 18.3a (6) | 20.3a (8) | 20.8a (8) |
| Base | Ratchet 4 oz. | 18.5a (9) | 18.4a (4) | 20.7a (1) | 20.2a (6) |
| BioForge | Ammonium Sulfate | 18.7a (6) | 18.2a (10) | 20.5a (3) | 20.2a (6) |
| BioForge | GS48 4 oz. + BeanKicker 2.5 lbs. | 18.6a (7) | 18.4a (4) | 20.4a (5) | 20.3a (3) |
| BioForge | Ratchet 4 oz. | 18.9a (1) | 18.2a (9) | 20.5a (2) | 20.2a (8) |
| Optimize | Ammonium Sulfate | 18.5a (8) | 18.6a (1) | 20.3a (7) | 20.3a (2) |
| Optimize | GS48 4 oz. + BeanKicker 2.5 lbs. | 18.7a (4) | 18.6a (8) | 20.3a (8) | 20.6a (1) |
| Optimize | Ratchet 4 oz. | 18.8a (2) | 18.5a (2) | 20.4a (6) | 20.1a (10) |
| *Replicate P Value* | | 0.12 | 0.09 | 0.13 | <0.0001 |

*Means in columns followed by the same letter are not statistically different at the P<0.05 level (Tukey's HSD, JMP 10.0.0)*

*All seed treatments included the base treatment of a fungicide/insecticide combination of Cruiser Maxx.

** All foliar treatments included the base herbicide (active ingredient glyphosate) and were applied as a combination treatment., not separate applications.

Percent Fiber

Significant differences for fiber content was noted only from the Lexington location due to seed treatment (Table 7), with the addition of Optimize to CruiserMaxx treated soybeans having a higher fiber content (4.91%) than CruiserMaxx only treated soybeans (4.87%). Differences were not noted in fiber content due to foliar applications (Table 7).

A significant difference among combination treatments was also noted between the extremes (CruiserMaxx + Optimize + Ratchet: 4.93%; CruiserMaxx + Ratchet 4.83%). No statistical differences were noted from the other locations (Table 8). Exact cause for these differences is unknown, but may be associated with high yields noted at the Lexington location.

**Table 7. Mean Percent Fiber Content of Soybeans Resulting from Seed or Foliar Treatments, 2012 University of Nebraska-Lincoln Soybean Management Field Days**

| | Soybean Variety and Location | | | |
|---|---|---|---|---|
| Treatments and rate/acre | NK S28-B4 | NK S25-R3 | Pioneer 93M11 | |
| Seed* | Lexington | O'Neil | David City | Platte Center |
| Base | 4.87 b | 4.72a | 4.61a | 4.64a |
| BioForge | 4.89ab | 4.71a | 4.60a | 4.63a |
| Optimize | 4.91a | 4.72a | 4.60a | 4.63a |
| *P value* | *0.02* | *0.81* | *0.67* | *0.78* |
| Foliar** | | | | |
| Glyphosate only | 4.88a | 4.70a | 4.58a | 4.68a |
| Glyphosate + AMS | 4.89a | 4.71a | 4.60a | 4.62a |
| Glyphosate + Ratchet 4 oz. | 4.88a | 4.73a | 4.61a | 4.63a |
| Glyphosate + GS-48 4 oz. | 4.89a | 4.72a | 4.62a | 4.63a |
| + BeanKicker 2.5 lbs | | | | |
| *P Value* | *0.90* | *0.75* | *0.26* | *0.15* |

*Means in sub-columns followed by the same letter are not statistically different at the P<0.05 level (Tukey's HSD, JMP 10.0.0)*

*All seed treatments included the base treatment of a fungicide/insecticide combination of Cruiser Maxx.

** All foliar treatments included the base herbicide (active ingredient glyphosate) and were applied as a combination treatment, not separate applications.

**Table 8. Mean Percent Fiber Content of Soybeans Resulting from Seed and Foliar Treatments, 2012 University of Nebraska-Lincoln Soybean Management Field Days**

| | | Soybean Variety and Location | | | |
|---|---|---|---|---|---|
| Treatments and rate/acre | | NK S28-B4 | NK S25-R3 | Pioneer 93M11 | |
| Seed* | Foliar** | Lexington | O'Neil | David City | Platte Center |
| Base | Glyphosate only | 4.88ab | 4.70a | 4.58a | 4.68a |
| Base | Ammonium Sulfate | 4.88ab | 4.73a | 4.60a | 4.63a |
| Base | GS48 4 oz. + BeanKicker 2.5 lbs. | 4.90ab | 4.73a | 4.67a | 4.60a |
| Base | Ratchet 4 oz. | 4.83 b | 4.73a | 4.63a | 4.65a |
| BioForge | Ammonium Sulfate | 4.90ab | 4.70a | 4.60a | 4.60a |
| BioForge | GS48 4 oz. + BeanKicker 2.5 lbs. | 4.88ab | 4.70a | 4.60a | 4.65a |
| BioForge | Ratchet 4 oz. | 4.90ab | 4.73a | 4.60a | 4.63a |
| Optimize | Ammonium Sulfate | 4.90ab | 4.70a | 4.60a | 4.63a |
| Optimize | GS48 4 oz./acre + BeanKicker 2.5 lbs. | 4.90ab | 4.73a | 4.60a | 4.65a |
| Optimize | Ratchet 4 oz. | 4.93a | 4.73a | 4.60a | 4.63a |

*Means in columns followed by the same letter are not statistically different at the P<0.05 level (Tukey's HSD, JMP 10.0.0)*

*All seed treatments included the base treatment of a fungicide/insecticide combination of Cruiser Maxx.

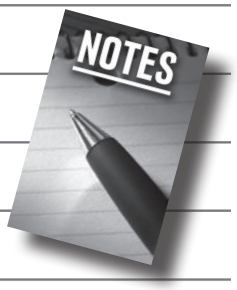
** All foliar treatments included the base herbicide (active ingredient glyphosate) and were applied as a combination treatment, not separate applications.

**Summary**

No significant differences were noted for any measured factor (yield, quality) from multiple locations, however, trends for higher yields (range of 0.9-5.0; average of 1.5 bushels/acre) were noted from the inclusion of biostimulant seed treatments and as well as for additions to glyphosate in foliar treatments (range of 0.8-8.2; average of 3.0 bushels/acre). The trend for increased yields was noted at both Lexington and O'Neill.

**Acknowledgements**

This project was funded by the Nebraska Soybean Board. The author thanks Steve Spicka, Keith Glewen and Jeremy Wagnitz (University of Nebraska-Lincoln) for their assistance and involvement with this project (planting, spraying, harvesting, etc.).



# Impact of Carrier Rate on Herbicide Performance

*Principal Investigators:*
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**Introduction**

Glyphosate-resistant weeds are becoming more prevalent due to increasing selection pressure from the continual increase in agricultural acres of glyphosate-tolerant crops which has forced many growers to use other herbicides. Herbicide programs that relied primarily on glyphosate for weed control often used rates at low as 7.5 gallons per acre (GPA). These alternative herbicides often require a higher carrier volume when compared to glyphosate which can be burdensome to the applicator. Additionally, there is growing concern about off-target movement of pesticides and what can be done to mitigate pesticide drift.

**Objective**

The objective of this study was to measure the influence of carrier volume on droplet size and weed control using four different postemergence herbicides commonly used for weed control in soybeans that use different herbicide modes-of-action. Field studies were set up at the Soybean Management Field Day sites in 2012 to demonstrate the effect of carrier rate.

**Methodology**

RoundUp PowerMax (glyphosate at 32 oz/ac), Liberty (glufosinate at 22 oz/ac), Cobra (lactofen at 12.5 oz/ac), and Weedone (2,4-D at 32 oz/ac) were applied at different carrier volumes. The four herbicides are an EPSP synthase inhibitor, glutamine synthase inhibitor, PPO inhibitor, and synthetic auxin, respectively. The four herbicides were each sprayed with appropriate adjuvants and were each applied at five carrier volumes (5, 7.5, 10, 15, and 20 GPA). Droplet size of each treatment was evaluated at the wind tunnel facility in North Platte, NE, using a diffraction laser. Weed control ratings

were recorded at three field sites located across Nebraska (Lexington, O'Neill, Platte Center) at 14 and 28 days after treatment. The sprayed plots were 5ft wide and 15ft long. Planted across each plot were rows of non-herbicide resistant corn and soybean, velvetleaf, quinoa, grain-type amaranth, and flax. Treatments were replicated four times at each site.

**Results**

Generally, the performance of systemic herbicides (glyphosate and 2,4-D) on weed control was not influenced by different carrier volumes. The abnormal behavior of the 10 GPA treatment on amaranth was likely because of the droplet size (and should be noted that it was not statistically different despite the 20% difference in efficacy). That treatment was applied with an XR11001 nozzle at 40 PSI which would produce a high amount of fine droplets when compared to the other treatments. These small droplets are more prone to drift and would potentially evaporate quicker limiting absorption by the plant. It is also partially understandable because of variability of glyphosate activity in general on the amaranth population. An interaction between the effect of carrier volume and the contact herbicides glufosinate and lactofen was observed. Herbicide efficacy in controlling velvetleaf increased from 52 and 37%, respectively, for these two contact herbicides, to 83 and 85% as carrier volume increased from 5 to 20 GPA. Control of the amaranth by glufosinate and lactofen increased from 56 and 81% to 80 and 100%, respectively. This is not too surprising since the Cobra and Liberty labels recommend 15 and 20 GPA, respectively. As applicators starting using products other than glyphosate for weed control, it will be important to understand the products that are being applied and what can be done to maximize the efficacy of those products.

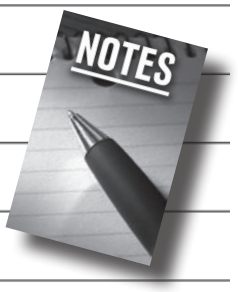


Figure 1. Visual ratings of 2,4-D, Cobra, Liberty and Roundup PowerMax injury on a grain type amaranth at 5, 7.5, 10, 15, and 20 GPA.

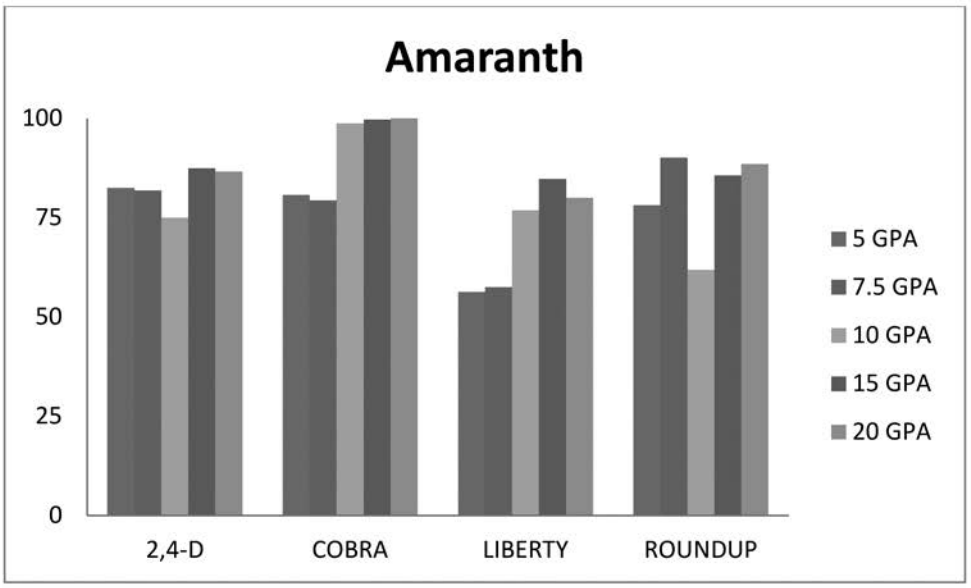
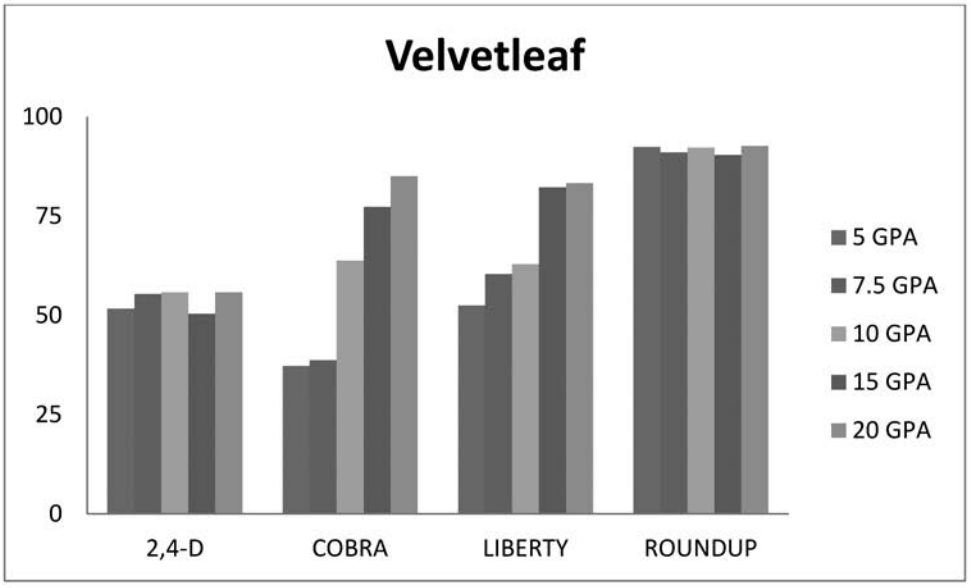



Figure 2. Visual ratings of 2,4-D, Cobra, Liberty and Roundup PowerMax injury on a velvetleaf at 5, 7.5, 10, 15, and 20 GPA.



# Soybean Management Field Days

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Soybean Management Field Days

# RESEARCH UPDATE

## Planting at 2012 SMFD sites

## Harvesting at 2012 SMFD sites

For more information, contact the Nebraska Soybean Board at (800)852-BEAN, University of Nebraska-Lincoln Extension at (800)529-8030.