

## Managing Glyphosate (Group-9) and ALS (Group-2) Resistant Common Waterhemp with Different Systems and Herbicide Rates in LibertyLink Soybean in SE Minnesota in 2016.

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The objective of this trial was to evaluate systems for controlling glyphosate (Group-9) and ALS (Group-2) resistant waterhemp in southeastern Minnesota. The research site was a Lawler loam series with pH of 6.1, O.M. 2.4 % and soil test P and K levels of 41 ppm and 137 ppm, respectively. In the spring the field was disked and field cultivated once prior to planting. The previous crop was alfalfa/fallow/soybean. The soybean variety was Stine 23LF32 (LibertyLink) and was planted on May 4, 2016 at a depth of 1.5 inches in 30 inch rows at a rate of 165,000 seeds per acre. A randomized complete block design was used with three replications. Preemergence (PRE) treatments and postemergence (POST) for systemic herbicides were applied with a tractor mounted sprayer delivering 15 gpa at 30 psi using TTI 11002 spray tips. POST applications for contact herbicides were made using TTI J60 11002 spray tips delivering 15 gpa at 30 psi. Evaluations were taken May 24 and 31, June 10, 17, 21, and 27, July 8 and September 19. The center two rows of each plot were machine harvested on October 13, 2016. Application dates, environmental conditions, and weed stages can be found in Table 1. Performance ratings for common waterhemp, common lambsquarters, and grass control and crop injury can be found in Tables 2 through 5, respectively.

### Discussion

All of the PRE/POST systems in this trial provided very good to excellent (89 to 99%) control of common waterhemp, September 19 rating date. Two total POST systems were evaluated, Liberty at 29 fl oz/a + Prefix at 2 pt/a / Liberty at 29 fl oz/a + Warrant at 3 pt/a, and Liberty at 29 fl oz/a + Outlook at 10 fl oz/a / Liberty at 29 fl oz/a + Warrant at 3 pt/a. The first post application was made on June 2 (V2 soybean and 1-3 inch weeds), which was 6 days earlier than the first POST treatments that included a PRE. Both systems provided 96-99% waterhemp control by the final rating, September 19. However, soybean response to the POST I applications of Liberty + Prefix was 60% injury compared to the Liberty + Outlook at 27% injury, Figures 1 and 2. Even though soybeans recovered, injury resulting from the POST I Liberty + Prefix appeared to impact final yield, Liberty + Prefix, 50.9 bu/a compared to Liberty + Outlook, 56.8 bu/a, Table 1.

As herbicide resistant waterhemp populations become more widespread, there is a need and an interest to include non-chemical control options such as in-season cultivation to control waterhemp. In 2016, a comparison of Boundary at 1.95 pts/a followed by either Liberty at 29 fl oz/a or a mechanical cultivation was evaluated. Final waterhemp control achieved by the Boundary/cultivation was significantly better, 98%, compared to the Boundary/Liberty program at 89%, Table 2. Interesting to note, the soybean canopy closed sooner where cultivation occurred and any waterhemp that germinated under the canopy in July did not survive, Table 2., July 8 and Sept 19 rating dates. In addition, soybean yield of each treatment was similar and equal to the top yielding treatment in this trial. The Boundary / cultivation treatment was evaluated in 2015 with similar results for weed control, canopy closure and final yield. (University of Minnesota Extension Regional Office, Rochester.)

**Table 1. Application timing, plant stage, environmental conditions.**

| Date                                   | 5/4        | 6/2           | 6/8            | 6/17            | 6/21           | 6/24          |
|--|------------|---------------|----------------|-----------------|----------------|---------------|
| Treatment                              | PRE<br>(A) | POST I<br>(B) | POST II<br>(C) | POST III<br>(D) | POST IV<br>(E) | POST V<br>(F) |
| Temperature (F)                        |            |               |                |                 |                |               |
| Air                                    | 59         | 69            | 70             | 72              | 71             | 64            |
| Soil                                   | 56.0       | 69.5          | 73.9           | 68.5            | 69.2           | 65.3          |
| Relative Humidity (%)                  | 40         | 46            | 40             | 78              | 47             | 90            |
| Wind (mph)                             | 12         | 7             | 3              | 10              | 10             | 7             |
| Soil Moisture                          | Normal     | Normal        | Normal         | Normal          | Normal         | Normal        |
| Soybean                                |            |               |                |                 |                |               |
| Stage                                  |            | V2            | V2-V3          | V5              | V6             | V6-V7         |
| Height (inch)                          |            | 4.9           | 5.8            | 11.1            | 14.0           | 14.6          |
| Common Lambsquarter                    |            |               |                |                 |                |               |
| Weed Density (ft <sup>2</sup> )        |            |               |                | 5.5             |                |               |
| Height (inch)                          |            | 2.5           | 2.4            | 6.3             | 9.3            | 7.3           |
| Common Waterhemp                       |            |               |                |                 |                |               |
| Weed Density (ft <sup>2</sup> )        |            |               |                | 40.5            |                |               |
| Height (inch)                          |            | 1.5           | 2.9            | 5.5             | 8.0            | 3.4           |
| Grass                                  |            |               |                |                 |                |               |
| Weed Density (ft <sup>2</sup> )        |            |               |                | 75.5            |                |               |
| Height (inch)                          |            | 2.6           | 2.7            | 6.3             | 8.8            | 5.6           |
| Rainfall after each application (inch) |            |               |                |                 |                |               |
| Week 1                                 | 0.87       | 0.9           | 2.66           | 0.41            | 0.71           | 0.65          |
| Week 2                                 | 0.58       | 3.75          | 1.39           | 0.65            | 0.1            | 1.66          |
| Week 3                                 | 0.21       | 0.3           | 0.71           | 1.66            | 2.07           | 0.78          |



**Figure 1.** Liberty 280 @ 29 fl oz/a + Prefix @2 pt/a  
POST on June 2, 2016  
60% Injury  
50.9 bu/a



**Figure 2.** Liberty 280 @ 29 fl oz/a + Outlook @10 fl oz/a  
POST on June 2, 2016  
27% Injury  
56.8 bu/a

**Table 2. Common waterhemp control with herbicide systems in Liberty Link soybean at Rochester, MN in 2016.**

| Pest Code   | AMATA            |        |                     |         |         |         |        |         |        |       |  | YIELD       |      |      |  |
|---|------------------|--------|---------------------|---------|---------|---------|--------|---------|--------|-------|--|-------------|------|------|--|
|   | Common Waterhemp |        |                     |         |         |         |        |         |        |       |  | Oct-13-2016 |      |      |  |
| Pest Name   |                  |        |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| Rating Date   | May-24           | May-31 | June-10             | June-17 | June-21 | June-27 | July-8 | Sept-19 |        |       |  |             |      |      |  |
| No. Treatment   | Rate             | Appl   | Percent Control (%) |         |         |         |        |         |        |       |  |             |      | BU/A |  |
| 16 UNTREATED CHECK  |                  |        | 0 d                 | 0 e     | 0 f     | 0 i     | 0 e    | 0 e     | 0 g    | 0 f   |  |             | 28.5 | d    |  |
| <b>A/C = PRE 5/4/16 / POST II 6-8-16 (MIDPOWE 1-3 inch weeds)</b>                                       |                  |        |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| 9 SOA 14, 15 / 10   |                  |        | 99 a                | 97 b    | 96 ab   | 99 a    | 98 ab  | 86 d    | 85 f   | 92 de |  |             | 59.9 | a    |  |
| VERDICT   | 5 fl oz/a        | A      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| OUTLOOK   | 10 fl oz/a       | A      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| LIBERTY 280   | 29 fl oz/a       | C      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| AMS   | 8.5 lb/100 gal   | C      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| 10 SOA 14, 15 / 10, 15  |                  |        | 95 c                | 95 d    | 91 de   | 99 ab   | 97 bc  | 97 abc  | 95 cd  | 95 bc |  |             | 57.1 | ab   |  |
| VERDICT   | 5 fl oz/a        | A      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| LIBERTY 280   | 29 fl oz/a       | C      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| OUTLOOK   | 8 fl oz/a        | C      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| AMS   | 8.5 lb/100 gal   | C      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| 11 SOA 14, 15 / 10, 15  |                  |        | 97 b                | 95 d    | 92 cde  | 98 ab   | 97 abc | 94 bc   | 93 d   | 93 cd |  |             | 52.9 | bc   |  |
| VERDICT   | 5 fl oz/a        | A      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| LIBERTY 280   | 32 fl oz/a       | C      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| OUTLOOK   | 8 fl oz/a        | C      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| AMS   | 8.5 lb/100 gal   | C      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| 12 SOA 5,15 / 10  |                  |        | 99 a                | 98 ab   | 99 a    | 99 ab   | 97 ab  | 94 c    | 89 e   | 89 e  |  |             | 57.3 | ab   |  |
| BOUNDARY  | 1.95 pt/a        | A      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| LIBERTY 280   | 29 fl oz/a       | C      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| AMS   | 8.5 lb/100 gal   | C      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| <b>A/D = PRE 5/4/16 / POST III 6-17-16 (MIDPOWE 1-3 inch weeds)</b>                                     |                  |        |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| 1 SOA 2, 14 / 10  |                  |        | 99 a                | 97 b    | 94 bcd  | 94 f    | 98 ab  | 99 a    | 99 ab  | 98 a  |  |             | 57.7 | ab   |  |
| AUTHORITY FIRST   | 4 oz/a           | A      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| LIBERTY 280   | 29 fl oz/a       | D      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| AMS   | 8.5 lb/100 gal   | D      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| 4 SOA 2, 14 / 14, 15, 10  |                  |        | 99 a                | 96 c    | 89 e    | 90 g    | 97 ab  | 99 a    | 99 ab  | 98 a  |  |             | 59.3 | a    |  |
| AUTHORITY FIRST   | 4 oz/a           | A      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| ANTHEM MAX  | 2.5 fl oz/a      | D      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| LIBERTY 280   | 29 fl oz/a       | D      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| AMS   | 8.5 lb/100 gal   | D      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| 5 SOA 14, 15 / 10   |                  |        | 99 a                | 98 ab   | 96 ab   | 97 bcd  | 99 ab  | 99 a    | 99 a   | 99 a  |  |             | 61.0 | a    |  |
| AUTHORITY ELITE   | 32 fl oz/a       | A      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| LIBERTY 280   | 29 fl oz/a       | D      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| AMS   | 8.5 lb/100 gal   | D      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| 6 SOA 14, 15 / 10   |                  |        | 99 a                | 98 ab   | 95 abc  | 94 ef   | 99 a   | 99 a    | 98 abc | 99 a  |  |             | 60.8 | a    |  |
| AUTHORITY ELITE   | 24 fl oz/a       | A      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| LIBERTY 280   | 29 fl oz/a       | D      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| AMS   | 8.5 lb/100 gal   | D      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| 7 SOA 14, 15 / 10   |                  |        | 99 a                | 99 a    | 99 a    | 99 a    | 99 a   | 99 a    | 99 ab  | 99 a  |  |             | 60.4 | a    |  |
| FIERCE  | 3.5 oz/a         | A      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| LIBERTY 280   | 29 fl oz/a       | D      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| AMS   | 8.5 lb/100 gal   | D      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| 8 SOA 2, 14, 15 / 10  |                  |        | 99 a                | 97 b    | 97 ab   | 96 cde  | 99 ab  | 97 ab   | 95 bcd | 95 bc |  |             | 58.2 | a    |  |
| OPTILL PRO  |                  |        |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| OPTILL  | 2 oz/a           | A      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| OUTLOOK   | 10 fl oz/a       | A      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| LIBERTY 280   | 29 fl oz/a       | D      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| AMS   | 8.5 lb/100 gal   | D      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| <b>A/E = PRE 5/4/16 / POST IV 6-21-16 (LAPOWE, Before R1, 1-3 inch weeds)</b>                           |                  |        |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| 13 SOA 5,15   |                  |        | 99 a                | 98 ab   | 97 ab   | 99 ab   | 99 a   | 99 a    | 95 bcd | 98 a  |  |             | 58.1 | a    |  |
| BOUNDARY  | 1.95 pt/a        | A      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| CULTIVATION   |                  | E      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| <b>A/F = PRE 5/4/16 / POST V 6-24-16 (LAPOWE, Before R1, 1-3 inch weeds)</b>                            |                  |        |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| 2 SOA 2, 14 / 10  |                  |        | 99 a                | 97 b    | 94 bcd  | 95 def  | 95 c   | 99 a    | 99 ab  | 99 a  |  |             | 60.4 | a    |  |
| AUTHORITY FIRST   | 6.5 oz/a         | A      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| LIBERTY 280   | 29 fl oz/a       | F      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| AMS   | 8.5 lb/100 gal   | F      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| 3 SOA 2, 14 / 10  |                  |        | 99 a                | 98 ab   | 97 ab   | 97 abc  | 97 abc | 99 a    | 99 ab  | 99 a  |  |             | 56.9 | ab   |  |
| AUTHORITY FIRST   | 8 oz/a           | A      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| LIBERTY 280   | 29 fl oz/a       | F      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| AMS   | 8.5 lb/100 gal   | F      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| <b>B/F = POST I 6-2-16 (EAPOWE 1-3 inch weeds) / POST V 6/24/16 (LAPOWE, Before R1, 1-3 inch weeds)</b> |                  |        |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| 14 SOA 10, 14, 15 / 10, 15  |                  |        | 0 d                 | 0 e     | 99 a    | 99 a    | 97 ab  | 99 a    | 99 ab  | 99 a  |  |             | 50.9 | c    |  |
| LIBERTY 280   | 29 fl oz/a       | B      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| PREFIX  | 2 pt/a           | B      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| AMS   | 8.5 lb/100 gal   | B      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| LIBERTY 280   | 29 fl oz/a       | F      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| WARRANT   | 3 pt/a           | F      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| AMS   | 8.5 lb/100 gal   | F      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| 15 SOA 10, 15 / 10, 15  |                  |        | 0 d                 | 0 e     | 88 e    | 80 h    | 76 d   | 98 a    | 96 a-d | 96 b  |  |             | 56.8 | ab   |  |
| LIBERTY 280   | 29 fl oz/a       | B      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| OUTLOOK   | 10 fl oz/a       | B      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| AMS   | 8.5 lb/100 gal   | B      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| LIBERTY 280   | 29 fl oz/a       | F      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| WARRANT   | 3 pt/a           | F      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| AMS   | 8.5 lb/100 gal   | F      |                     |         |         |         |        |         |        |       |  |             |      |      |  |
| LSD P=.10   |                  |        | 1                   | 1       | 4       | 2       | 2      | 3       | 3      | 3     |  |             | 4.8  |      |  |

Means followed by same letter or symbol do not significantly differ (P=.10, LSD)

**Table 3. Common lambsquarters control with herbicide systems in liberty Link soybeans at Rochester, MN in 2016.**

| Pest Code   | CHEAL                |        |                     |         |         |         |        |         |       |       |     | YIELD       |     |      |    |
|---|----------------------|--------|---------------------|---------|---------|---------|--------|---------|-------|-------|-----|-------------|-----|------|----|
|   | Common Lambsquarters |        |                     |         |         |         |        |         |       |       |     | Oct-13-2016 |     |      |    |
| Pest Name   |                      |        |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| Rating Date   | May-24               | May-31 | June-10             | June-17 | June-21 | June-27 | July-8 | Sept-19 |       |       |     |             |     |      |    |
| No. Treatment   | Rate                 | Appl   | Percent Control (%) |         |         |         |        |         |       |       |     |             |     | BU/A |    |
| 16 UNTREATED CHECK  |                      |        | 0 d                 | 0 d     | 0 f     | 0 d     | 0 f    | 0 e     | 0 f   | 0 e   | 0 e | 0 f         | 0 e | 28.5 | d  |
| <b>A/C = PRE 5/4/16 / POST II 6-8-16 (MIDPOWE 1-3 inch weeds)</b>                                       |                      |        |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| 9 SOA 14, 15 / 10   |                      |        | 91 c                | 85 c    | 94 a-d  | 93 ab   | 90 e   | 87 d    | 86 de | 90 c  |     |             |     | 59.9 | a  |
| VERDICT   | 5 fl oz/a            | A      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| OUTLOOK   | 10 fl oz/a           | A      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| LIBERTY 280   | 29 fl oz/a           | C      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| AMS   | 8.5 lb/100 gal       | C      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| 10 SOA 14, 15 / 10, 15  |                      |        | 88 c                | 86 c    | 92 cde  | 96 ab   | 90 e   | 89.7 cd | 88 cd | 91 bc |     |             |     | 57.1 | ab |
| VERDICT   | 5 fl oz/a            | A      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| LIBERTY 280   | 29 fl oz/a           | C      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| OUTLOOK   | 8 fl oz/a            | C      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| AMS   | 8.5 lb/100 gal       | C      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| 11 SOA 14, 15 / 10, 15  |                      |        | 88 c                | 86 c    | 93 a-d  | 98 a    | 92 de  | 93 bc   | 90 bc | 90 bc |     |             |     | 52.9 | bc |
| VERDICT   | 5 fl oz/a            | A      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| LIBERTY 280   | 32 fl oz/a           | C      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| OUTLOOK   | 8 fl oz/a            | C      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| AMS   | 8.5 lb/100 gal       | C      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| 12 SOA 5,15 / 10  |                      |        | 95 b                | 90 bc   | 94 a-d  | 94 ab   | 93 cde | 88 d    | 83 e  | 83 d  |     |             |     | 57.3 | ab |
| BOUNDARY  | 1.95 pt/a            | A      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| LIBERTY 280   | 29 fl oz/a           | C      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| AMS   | 8.5 lb/100 gal       | C      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| <b>A/D = PRE 5/4/16 / POST III 6-17-16 (MIDPOWE 1-3 inch weeds)</b>                                     |                      |        |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| 1 SOA 2, 14 / 10  |                      |        | 97 ab               | 98 a    | 97 ab   | 96 a    | 98 a   | 99 a    | 99 a  | 99 a  |     |             |     | 57.7 | ab |
| AUTHORITY FIRST   | 4 oz/a               | A      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| LIBERTY 280   | 29 fl oz/a           | D      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| AMS   | 8.5 lb/100 gal       | D      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| 4 SOA 2, 14 / 14, 15, 10  |                      |        | 97 ab               | 97 a    | 93 a-d  | 94 ab   | 99 a   | 99 a    | 99 a  | 99 a  |     |             |     | 59.3 | a  |
| AUTHORITY FIRST   | 4 oz/a               | A      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| ANTHEM MAX  | 2.5 fl oz/a          | D      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| LIBERTY 280   | 29 fl oz/a           | D      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| AMS   | 8.5 lb/100 gal       | D      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| 5 SOA 14, 15 / 10   |                      |        | 98 a                | 98 a    | 96 abc  | 96 a    | 99 a   | 99 a    | 99 a  | 99 a  |     |             |     | 61.0 | a  |
| AUTHORITY ELITE   | 32 fl oz/a           | A      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| LIBERTY 280   | 29 fl oz/a           | D      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| AMS   | 8.5 lb/100 gal       | D      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| 6 SOA 14, 15 / 10   |                      |        | 97 ab               | 97 a    | 95 abc  | 94 ab   | 98 ab  | 99 a    | 99 a  | 99 a  |     |             |     | 60.8 | a  |
| AUTHORITY ELITE   | 24 fl oz/a           | A      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| LIBERTY 280   | 29 fl oz/a           | D      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| AMS   | 8.5 lb/100 gal       | D      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| 7 SOA 14, 15 / 10   |                      |        | 96 ab               | 94 ab   | 92 b-e  | 90 bc   | 97 ab  | 98 a    | 97 a  | 98 a  |     |             |     | 60.4 | a  |
| FIERCE  | 3.5 oz/a             | A      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| LIBERTY 280   | 29 fl oz/a           | D      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| AMS   | 8.5 lb/100 gal       | D      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| 8 SOA 2, 14, 15 / 10  |                      |        | 98 ab               | 96 a    | 88 e    | 88 c    | 97 abc | 98 a    | 98 a  | 98 a  |     |             |     | 58.2 | a  |
| OPTILL PRO  |                      |        |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| OPTILL  | 2 oz/a               | A      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| OUTLOOK   | 10 fl oz/a           | A      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| LIBERTY 280   | 29 fl oz/a           | D      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| AMS   | 8.5 lb/100 gal       | D      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| <b>A/E = PRE 5/4/16 / POST IV 6-21-16 (LAPOWE, Before R1, 1-3 inch weeds)</b>                           |                      |        |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| 13 SOA 5,15   |                      |        | 97 ab               | 95 ab   | 90 de   | 87 c    | 96 a-d | 93 b    | 93 b  | 93 b  |     |             |     | 58.1 | a  |
| BOUNDARY  | 1.95 pt/a            | A      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| CULTIVATION   |                      | E      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| <b>A/F = PRE 5/4/16 / POST V 6-24-16 (LAPOWE, Before R1, 1-3 inch weeds)</b>                            |                      |        |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| 2 SOA 2, 14 / 10  |                      |        | 98 ab               | 97 a    | 97 ab   | 95 ab   | 97 abc | 99 a    | 99 a  | 99 a  |     |             |     | 60.4 | a  |
| AUTHORITY FIRST   | 6.5 oz/a             | A      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| LIBERTY 280   | 29 fl oz/a           | F      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| AMS   | 8.5 lb/100 gal       | F      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| 3 SOA 2, 14 / 10  |                      |        | 98 ab               | 98 a    | 96 abc  | 97 a    | 97 ab  | 98 a    | 98 a  | 99 a  |     |             |     | 56.9 | ab |
| AUTHORITY FIRST   | 8 oz/a               | A      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| LIBERTY 280   | 29 fl oz/a           | F      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| AMS   | 8.5 lb/100 gal       | F      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| <b>B/F = POST I 6-2-16 (EAPOWE 1-3 inch weeds) / POST V 6/24/16 (LAPOWE, Before R1, 1-3 inch weeds)</b> |                      |        |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| 14 SOA 10, 14, 15 / 10, 15  |                      |        | 0 d                 | 0 d     | 97 a    | 96 a    | 94 b-e | 99 a    | 99 a  | 98 a  |     |             |     | 50.9 | c  |
| LIBERTY 280   | 29 fl oz/a           | B      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| PREFIX  | 2 pt/a               | B      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| AMS   | 8.5 lb/100 gal       | B      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| LIBERTY 280   | 29 fl oz/a           | F      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| WARRANT   | 3 pt/a               | F      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| AMS   | 8.5 lb/100 gal       | F      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| 15 SOA 10, 15 / 10, 15  |                      |        | 0 d                 | 0 d     | 96 abc  | 97 a    | 90 e   | 99 a    | 97 a  | 97 a  |     |             |     | 56.8 | ab |
| LIBERTY 280   | 29 fl oz/a           | B      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| OUTLOOK   | 10 fl oz/a           | B      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| AMS   | 8.5 lb/100 gal       | B      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| LIBERTY 280   | 29 fl oz/a           | F      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| WARRANT   | 3 pt/a               | F      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| AMS   | 8.5 lb/100 gal       | F      |                     |         |         |         |        |         |       |       |     |             |     |      |    |
| LSD P=.10   |                      |        | 3                   | 6       | 5       | 5       | 4      | 3       | 3     | 3     |     |             |     | 4.8  |    |

Means followed by same letter or symbol do not significantly differ (P=.10, LSD)

**Table 4. Grass control with herbicide systems in LibertyLink soybeans at Rochester, MN in 2016.**

| Pest Code  | Rating Date             | GRASS species |            |                     |          |          |          |            |             | YIELD    |          |            |    |    |    |    |   |      |    |
|--|-------------------------|---------------|------------|---------------------|----------|----------|----------|------------|-------------|----------|----------|------------|----|----|----|----|---|------|----|
|  |                         | May-31        | June-10    | June-17             | June-21  | June-27  | July 8   | Sept-19    | Oct-13-2016 | BU/A     |          |            |    |    |    |    |   |      |    |
| No.  | Treatment               | Rate          | Appl       | Percent Control (%) |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
| 16   | UNTREATED CHECK         |               |            | 0                   | d        | 0        | e        | 0          | f           | 0        | e        | 0          | c  | 0  | f  | 0  | c | 28.5 | d  |
| <b>A/C = PRE 5/4/16 / POST II 6-8-16 (MIDPOWE 1-3 inch weeds)</b>  |                         |               |            |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
| 9  | SOA 14, 15 / 10         |               |            | 99                  | a        | 97       | abc      | 99         | a           | 99       | a        | 99         | a  | 99 | a  | 99 | a | 59.9 | a  |
|  | VERDICT                 | 5             | fl oz/a    |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
|  | OUTLOOK                 | 10            | fl oz/a    |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
|  | LIBERTY 280             | 29            | fl oz/a    |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
|  | AMS                     | 8.5           | lb/100 gal |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
| 10   | SOA 14, 15 / 10, 15     |               |            | 97                  | c        | 93       | d        | 98         | ab          | 98       | ab       | 98         | b  | 97 | e  | 97 | b | 57.1 | ab |
|  | VERDICT                 | 5             | fl oz/a    |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
|  | LIBERTY 280             | 29            | fl oz/a    |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
|  | OUTLOOK                 | 8             | fl oz/a    |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
|  | AMS                     | 8.5           | lb/100 gal |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
| 11   | SOA 14, 15 / 10, 15     |               |            | 98                  | b        | 94       | cd       | 99         | ab          | 99       | ab       | 99         | ab | 98 | cd | 98 | a | 52.9 | bc |
|  | VERDICT                 | 5             | fl oz/a    |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
|  | LIBERTY 280             | 32            | fl oz/a    |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
|  | OUTLOOK                 | 8             | fl oz/a    |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
|  | AMS                     | 8.5           | lb/100 gal |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
| 12   | SOA 5,15 / 10           |               |            | 99                  | a        | 99       | a        | 99         | a           | 99       | a        | 99         | a  | 99 | a  | 99 | a | 57.3 | ab |
|  | BOUNDARY                | 1.95          | pt/a       |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
|  | LIBERTY 280             | 29            | fl oz/a    |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
|  | AMS                     | 8.5           | lb/100 gal |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
| <b>A/D = PRE 5/4/16 / POST III 6-17-16 (MIDPOWE 1-3 inch weeds)</b>                                      |                         |               |            |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
| 1  | SOA 2, 14 / 10          |               |            | 97                  | c        | 94       | cd       | 91.3       | e           | 98       | ab       | 99         | a  | 99 | a  | 99 | a | 57.7 | ab |
|  | AUTHORITY FIRST         | 4             | oz/a       |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
|  | LIBERTY 280             | 29            | fl oz/a    |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
|  | AMS                     | 8.5           | lb/100 gal |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
| 4  | SOA 2, 14 / 14, 15, 10  |               |            | 97                  | c        | 96       | bc       | 90         | e           | 98       | ab       | 99         | a  | 97 | d  | 98 | a | 59.3 | a  |
|  | AUTHORITY FIRST         | 4             | oz/a       |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
|  | ANTHEM MAX              | 2.5           | fl oz/a    |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
|  | LIBERTY 280             | 29            | fl oz/a    |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
|  | AMS                     | 8.5           | lb/100 gal |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
| 5  | SOA 14, 15 / 10         |               |            | 99                  | a        | 99       | ab       | 99         | a           | 99       | a        | 99         | a  | 99 | a  | 99 | a | 61.0 | a  |
|  | AUTHORITY ELITE         | 32            | fl oz/a    |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
|  | LIBERTY 280             | 29            | fl oz/a    |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
|  | AMS                     | 8.5           | lb/100 gal |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
| 6  | SOA 14, 15 / 10         |               |            | 99                  | a        | 99       | a        | 99         | ab          | 99       | a        | 99         | a  | 99 | a  | 99 | a | 60.8 | a  |
|  | AUTHORITY ELITE         | 24            | fl oz/a    |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
|  | LIBERTY 280             | 29            | fl oz/a    |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
|  | AMS                     | 8.5           | lb/100 gal |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
| 7  | SOA 14, 15 / 10         |               |            | 99                  | a        | 98       | ab       | 97         | ab          | 99       | ab       | 99         | a  | 99 | a  | 99 | a | 60.4 | a  |
|  | FIERCE                  | 3.5           | oz/a       |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
|  | LIBERTY 280             | 29            | fl oz/a    |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
|  | AMS                     | 8.5           | lb/100 gal |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
| 8  | SOA 2, 14, 15 / 10      |               |            | 99                  | a        | 99       | a        | 99         | ab          | 99       | a        | 99         | a  | 99 | ab | 99 | a | 58.2 | a  |
|  | OPTILL PRO              |               |            |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
|  | OPTILL                  | 2             | oz/a       |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
|  | OUTLOOK                 | 10            | fl oz/a    |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
|  | LIBERTY 280             | 29            | fl oz/a    |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
|  | AMS                     | 8.5           | lb/100 gal |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
| <b>A/E = PRE 5/4/16 / POST IV 6-21-16 (LAPOWE, Before R1, 1-3 inch weeds)</b>                            |                         |               |            |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
| 13   | SOA 5,15                |               |            | 99                  | a        | 99       | a        | 99         | a           | 99       | a        | 99         | a  | 99 | a  | 99 | a | 58.1 | a  |
|  | BOUNDARY                | 1.95          | pt/a       |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
|  | CULTIVATION             |               |            |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
| <b>A/F = PRE 5/4/16 / POST V 6-24-16 (LAPOWE, Before R1, 1-3 inch weeds)</b>                             |                         |               |            |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
| 2  | SOA 2, 14 / 10          |               |            | 97                  | bc       | 97       | ab       | 95         | c           | 95       | c        | 99         | a  | 99 | a  | 99 | a | 60.4 | a  |
|  | AUTHORITY FIRST         | 6.5           | oz/a       |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
|  | LIBERTY 280             | 29            | fl oz/a    |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
|  | AMS                     | 8.5           | lb/100 gal |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
| 3  | SOA 2, 14 / 10          |               |            | 98                  | b        | 96       | abc      | 93         | d           | 92.3     | d        | 99         | a  | 99 | a  | 99 | a | 56.9 | ab |
|  | AUTHORITY FIRST         | 8             | oz/a       |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
|  | LIBERTY 280             | 29            | fl oz/a    |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
|  | AMS                     | 8.5           | lb/100 gal |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
| <b>B/F = POST I 6-2-16 (EAPOWE, 1-3 inch weeds) / POST V 6/24/16 (LAPOWE, Before R1, 1-3 inch weeds)</b> |                         |               |            |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
| 14   | SOA 10, 14, 15 / 10, 15 |               |            | 0                   | d        | 98       | ab       | 97         | b           | 96       | c        | 99         | a  | 98 | bc | 98 | a | 50.9 | c  |
|  | LIBERTY 280             | 29            | fl oz/a    |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
|  | PREFIX                  | 2             | pt/a       |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
|  | AMS                     | 8.5           | lb/100 gal |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
|  | LIBERTY 280             | 29            | fl oz/a    |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
|  | WARRANT                 | 3             | pt/a       |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
|  | AMS                     | 8.5           | lb/100 gal |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
| 15   | SOA 10, 15 / 10, 15     |               |            | 0                   | d        | 97       | abc      | 99         | a           | 97       | bc       | 99         | a  | 99 | ab | 99 | a | 56.8 | ab |
|  | LIBERTY 280             | 29            | fl oz/a    |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
|  | OUTLOOK                 | 10            | fl oz/a    |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
|  | AMS                     | 8.5           | lb/100 gal |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
|  | LIBERTY 280             | 29            | fl oz/a    |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
|  | WARRANT                 | 3             | pt/a       |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
|  | AMS                     | 8.5           | lb/100 gal |                     |          |          |          |            |             |          |          |            |    |    |    |    |   |      |    |
| <b>LSD P=.10</b>   |                         |               |            | <b>1</b>            | <b>3</b> | <b>2</b> | <b>2</b> | <b>0.5</b> | <b>1</b>    | <b>1</b> | <b>1</b> | <b>4.8</b> |    |    |    |    |   |      |    |

Means followed by same letter or symbol do not significantly differ (P=.10, LSD)

**Table 5. Crop response to herbicide systems to control SOA 9- and SOA 2- resistant common waterhemp in LibertyLink soybeans at Rochester, MN in 2016.**

| Pest Code   | Rating Date             | Crop Response  |        |                    |          |          |          |          |                    |          | YIELD<br>Oct-13<br>BU/A |  |      |
|---|-------------------------|----------------|--------|--------------------|----------|----------|----------|----------|--------------------|----------|-------------------------|--|------|
|   |                         | May-24         | May-31 | June-10            | June-17  | June-21  | June-27  | July-8   | Percent Injury (%) |          |                         |  |      |
| No.   | Treatment               | Rate           | Appl   | Percent Injury (%) |          |          |          |          |                    |          |                         |  | BU/A |
| 16  | UNTREATED CHECK         |                |        | 3 e                | 0 -      | 0 d      | 0 b      | 0 d      | 0 c                | 0 -      | 28.5 d                  |  |      |
| <b>A/C = PRE 5/4/16 / POST II 6-8-16 (MIDPOWE 1-3 inch weeds)</b>                                       |                         |                |        |                    |          |          |          |          |                    |          |                         |  |      |
| 9   | SOA 14, 15 / 10         |                |        | 13 ab              | 0 -      | 20 c     | 0 b      | 0 d      | 0 c                | 0 -      | 59.9 a                  |  |      |
|   | VERDICT                 | 5 fl oz/a      | A      |                    |          |          |          |          |                    |          |                         |  |      |
|   | OUTLOOK                 | 10 fl oz/a     | A      |                    |          |          |          |          |                    |          |                         |  |      |
|   | LIBERTY 280             | 29 fl oz/a     | C      |                    |          |          |          |          |                    |          |                         |  |      |
|   | AMS                     | 8.5 lb/100 gal | C      |                    |          |          |          |          |                    |          |                         |  |      |
| 10  | SOA 14, 15 / 10, 15     |                |        | 12 abc             | 0 -      | 22 c     | 0 b      | 0 d      | 0 c                | 0 -      | 57.1 ab                 |  |      |
|   | VERDICT                 | 5 fl oz/a      | A      |                    |          |          |          |          |                    |          |                         |  |      |
|   | LIBERTY 280             | 29 fl oz/a     | C      |                    |          |          |          |          |                    |          |                         |  |      |
|   | OUTLOOK                 | 8 fl oz/a      | C      |                    |          |          |          |          |                    |          |                         |  |      |
|   | AMS                     | 8.5 lb/100 gal | C      |                    |          |          |          |          |                    |          |                         |  |      |
| 11  | SOA 14, 15 / 10, 15     |                |        | 13 ab              | 0 -      | 20 c     | 0 b      | 0 d      | 0 c                | 0 -      | 52.9 bc                 |  |      |
|   | VERDICT                 | 5 fl oz/a      | A      |                    |          |          |          |          |                    |          |                         |  |      |
|   | LIBERTY 280             | 32 fl oz/a     | C      |                    |          |          |          |          |                    |          |                         |  |      |
|   | OUTLOOK                 | 8 fl oz/a      | C      |                    |          |          |          |          |                    |          |                         |  |      |
|   | AMS                     | 8.5 lb/100 gal | C      |                    |          |          |          |          |                    |          |                         |  |      |
| 12  | SOA 5,15 / 10           |                |        | 15 a               | 0 -      | 20 c     | 0 b      | 0 d      | 0 c                | 0 -      | 57.3 ab                 |  |      |
|   | BOUNDARY                | 1.95 pt/a      | A      |                    |          |          |          |          |                    |          |                         |  |      |
|   | LIBERTY 280             | 29 fl oz/a     | C      |                    |          |          |          |          |                    |          |                         |  |      |
|   | AMS                     | 8.5 lb/100 gal | C      |                    |          |          |          |          |                    |          |                         |  |      |
| <b>A/D = PRE 5/4/16 / POST III 6-17-16 (MIDPOWE 1-3 inch weeds)</b>                                     |                         |                |        |                    |          |          |          |          |                    |          |                         |  |      |
| 1   | SOA 2, 14 / 10          |                |        | 8 b-e              | 0 -      | 0 d      | 0 b      | 15 b     | 0 c                | 0 -      | 57.7 ab                 |  |      |
|   | AUTHORITY FIRST         | 4 oz/a         | A      |                    |          |          |          |          |                    |          |                         |  |      |
|   | LIBERTY 280             | 29 fl oz/a     | D      |                    |          |          |          |          |                    |          |                         |  |      |
|   | AMS                     | 8.5 lb/100 gal | D      |                    |          |          |          |          |                    |          |                         |  |      |
| 4   | SOA 2, 14 / 14, 15, 10  |                |        | 7 cde              | 0 -      | 0 d      | 0 b      | 30 a     | 15 b               | 2 -      | 59.3 a                  |  |      |
|   | AUTHORITY FIRST         | 4 oz/a         | A      |                    |          |          |          |          |                    |          |                         |  |      |
|   | ANTHEM MAX              | 2.5 fl oz/a    | D      |                    |          |          |          |          |                    |          |                         |  |      |
|   | LIBERTY 280             | 29 fl oz/a     | D      |                    |          |          |          |          |                    |          |                         |  |      |
|   | AMS                     | 8.5 lb/100 gal | D      |                    |          |          |          |          |                    |          |                         |  |      |
| 5   | SOA 14, 15 / 10         |                |        | 15 a               | 0 -      | 0 d      | 0 b      | 15 b     | 0 c                | 0 -      | 61.0 a                  |  |      |
|   | AUTHORITY ELITE         | 32 fl oz/a     | A      |                    |          |          |          |          |                    |          |                         |  |      |
|   | LIBERTY 280             | 29 fl oz/a     | D      |                    |          |          |          |          |                    |          |                         |  |      |
|   | AMS                     | 8.5 lb/100 gal | D      |                    |          |          |          |          |                    |          |                         |  |      |
| 6   | SOA 14, 15 / 10         |                |        | 13 ab              | 0 -      | 0 d      | 0 b      | 15 b     | 0 c                | 0 -      | 60.8 a                  |  |      |
|   | AUTHORITY ELITE         | 24 fl oz/a     | A      |                    |          |          |          |          |                    |          |                         |  |      |
|   | LIBERTY 280             | 29 fl oz/a     | D      |                    |          |          |          |          |                    |          |                         |  |      |
|   | AMS                     | 8.5 lb/100 gal | D      |                    |          |          |          |          |                    |          |                         |  |      |
| 7   | SOA 14, 15 / 10         |                |        | 10 a-d             | 0 -      | 0 d      | 0 b      | 15 b     | 0 c                | 0 -      | 60.4 a                  |  |      |
|   | FIERCE                  | 3.5 oz/a       | A      |                    |          |          |          |          |                    |          |                         |  |      |
|   | LIBERTY 280             | 29 fl oz/a     | D      |                    |          |          |          |          |                    |          |                         |  |      |
|   | AMS                     | 8.5 lb/100 gal | D      |                    |          |          |          |          |                    |          |                         |  |      |
| 8   | SOA 2, 14, 15 / 10      |                |        | 12 abc             | 0 -      | 0 d      | 0 b      | 15 b     | 0 c                | 0 -      | 58.2 a                  |  |      |
|   | OPTILL PRO              |                |        |                    |          |          |          |          |                    |          |                         |  |      |
|   | OPTILL                  | 2 oz/a         | A      |                    |          |          |          |          |                    |          |                         |  |      |
|   | OUTLOOK                 | 10 fl oz/a     | A      |                    |          |          |          |          |                    |          |                         |  |      |
|   | LIBERTY 280             | 29 fl oz/a     | D      |                    |          |          |          |          |                    |          |                         |  |      |
|   | AMS                     | 8.5 lb/100 gal | D      |                    |          |          |          |          |                    |          |                         |  |      |
| <b>A/E = PRE 5/4/16 / POST IV 6-21-16 (LAPOWE, Before R1, 1-3 inch weeds)</b>                           |                         |                |        |                    |          |          |          |          |                    |          |                         |  |      |
| 13  | SOA 5,15                |                |        | 12 abc             | 0 -      | 0 d      | 0 b      | 2 c      | 0 c                | 0 -      | 58.1 a                  |  |      |
|   | BOUNDARY                | 1.95 pt/a      | A      |                    |          |          |          |          |                    |          |                         |  |      |
|   | CULTIVATION             |                | E      |                    |          |          |          |          |                    |          |                         |  |      |
| <b>A/F = PRE 5/4/16 / POST V 6-24-16 (LAPOWE, Before R1, 1-3 inch weeds)</b>                            |                         |                |        |                    |          |          |          |          |                    |          |                         |  |      |
| 2   | SOA 2, 14 / 10          |                |        | 9 bcd              | 0 -      | 0 d      | 0 b      | 0 d      | 15 b               | 0 -      | 60.4 a                  |  |      |
|   | AUTHORITY FIRST         | 6.5 oz/a       | A      |                    |          |          |          |          |                    |          |                         |  |      |
|   | LIBERTY 280             | 29 fl oz/a     | F      |                    |          |          |          |          |                    |          |                         |  |      |
|   | AMS                     | 8.5 lb/100 gal | F      |                    |          |          |          |          |                    |          |                         |  |      |
| 3   | SOA 2, 14 / 10          |                |        | 8 b-e              | 0 -      | 0 d      | 0 b      | 0 d      | 15 b               | 0 -      | 56.9 ab                 |  |      |
|   | AUTHORITY FIRST         | 8 oz/a         | A      |                    |          |          |          |          |                    |          |                         |  |      |
|   | LIBERTY 280             | 29 fl oz/a     | F      |                    |          |          |          |          |                    |          |                         |  |      |
|   | AMS                     | 8.5 lb/100 gal | F      |                    |          |          |          |          |                    |          |                         |  |      |
| <b>B/F = POST I 6-2-16 (EAPOWE 1-3 inch weeds) / POST V 6/24/16 (LAPOWE, Before R1, 1-3 inch weeds)</b> |                         |                |        |                    |          |          |          |          |                    |          |                         |  |      |
| 14  | SOA 10, 14, 15 / 10, 15 |                |        | 5 de               | 0 -      | 60 a     | 20 a     | 0 d      | 20 a               | 0 -      | 50.9 c                  |  |      |
|   | LIBERTY 280             | 29 fl oz/a     | B      |                    |          |          |          |          |                    |          |                         |  |      |
|   | PREFIX                  | 2 pt/a         | B      |                    |          |          |          |          |                    |          |                         |  |      |
|   | AMS                     | 8.5 lb/100 gal | B      |                    |          |          |          |          |                    |          |                         |  |      |
|   | LIBERTY 280             | 29 fl oz/a     | F      |                    |          |          |          |          |                    |          |                         |  |      |
|   | WARRANT                 | 3 pt/a         | F      |                    |          |          |          |          |                    |          |                         |  |      |
|   | AMS                     | 8.5 lb/100 gal | F      |                    |          |          |          |          |                    |          |                         |  |      |
| 15  | SOA 10, 15 / 10, 15     |                |        | 3 e                | 0 -      | 27 b     | 0 b      | 0 d      | 20 a               | 0 -      | 56.8 ab                 |  |      |
|   | LIBERTY 280             | 29 fl oz/a     | B      |                    |          |          |          |          |                    |          |                         |  |      |
|   | OUTLOOK                 | 10 fl oz/a     | B      |                    |          |          |          |          |                    |          |                         |  |      |
|   | AMS                     | 8.5 lb/100 gal | B      |                    |          |          |          |          |                    |          |                         |  |      |
|   | LIBERTY 280             | 29 fl oz/a     | F      |                    |          |          |          |          |                    |          |                         |  |      |
|   | WARRANT                 | 3 pt/a         | F      |                    |          |          |          |          |                    |          |                         |  |      |
|   | AMS                     | 8.5 lb/100 gal | F      |                    |          |          |          |          |                    |          |                         |  |      |
| <b>LSD P=.10</b>  |                         |                |        | <b>6</b>           | <b>.</b> | <b>2</b> | <b>.</b> | <b>1</b> | <b>.</b>           | <b>1</b> | <b>4.8</b>              |  |      |

Means followed by same letter or symbol do not significantly differ (P=.10, LSD)