# 2023 Soybean Value-Added Product Impact on Yield

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Objectives were to demonstrate yield impact of value-added products in soybean, display value-added product portfolios from seven industry collaborators, and provide an unbiased evaluation of entries to allow growers to benchmark competitive performance of value-added products on the market. Growers should use the data set as a guide to visit with their crop consultants or local suppliers to determine a value-added product, if any, that may provide the greatest return on investment based on local supplier pricing and availability of products.

## MATERIALS AND METHODS

Experiments were conducted on a fine-textured webster-clay loam soil with 6.0% organic matter and a 7.2 soil pH near Renville, Minnesota, in 2023. The study area has been a corn-soybean rotation for decades. Spring tillage was a field cultivator at 3" depth. Becks 1630E soybean was seeded 1.25 inches deep on 30-inch row spacings at 130,000 seeds per acre on May 27, emerging June 3. Study was kept weed free with a preemergent application of Verdict + Zidua SC at 5 and 3.25 fl oz, respectively, on May 27 followed by a postemergence application of Liberty and Class Act NG at 32 fl oz and 2.5%v/v, respectively, on June 21. Treatments were applied to soybean in-furrow, at R1, and at R3 soybean growth stages (Table 1). In-furrow treatments were applied with a planter in a 7 GPA spray solution through #30-flat disk orifice pressurized with $CO_2$ at 30 psi to all four rows 50-foot in length directly overtop the seed, but prior to furrow closure. Foliar treatments applied with bicycle sprayer in 15 GPA spray solution through AIXR11002 air-induction flat fan nozzles pressurized with $CO_2$ at 25 psi to the center two rows of four row plots 50 foot in length.

Yield data were collected on October 3 utilizing a Hege 160 two-row small plot research combine equipped with a HarvestMaster large plot weigh hopper. The middle two rows of the four-row plot were harvested and samples were taken with moisture and test weights recorded using a Perten 5200-A moisture tester. Experimental design was randomized complete block with 6 replications. Data were analyzed with GLM procedure of SAS (Statistical Analysis Software 2023, version 9.4M8, SAS Institute, Inc.) at alpha=0.10 and differences are determined with 90% confidence; meaning, if the study was repeated 100 times, that 90 times out of 100 we would expect treatments that are statistically similar (within one LSD value of each other) to continue to be similar.

**Table 1. Application information for Renville giant ragweed control trials in 2023**

| Description | In-Furrow | R1 Growth Stage | R3 Growth Stage |
|---|---|---|---|
| Application Code | A | B | C |
| Date | May 27 | July 6 | July 18 |
| Time of Day | 11:00 AM | 8:00 AM | 8:00 AM |
| Air Temperature (F) | 80 | 48 | 68 |
| Relative Humidity (%) | 44 | 93 | 66 |
| Wind Velocity (mph) | 4 | 1 | 3 |
| Wind Direction | SW | NW | NE |
| Soil Temp. (F at 6") | 60 | 65 | 66 |
| Soil Moisture | Good | Fair | Dry |
| Cloud Cover (%) | 5 | 30 | 5 |
| Crop Growth Stage (avg) | - | R1 | R3 |

## RESULTS AND DISCUSSION

Soybean yield was evaluated across six replications with each treatment randomized within each of the six replications to mitigate impact of field location and environment on the data set. From plant date on May 27 until August 10, the study received a cumulative rainfall of 2.2 inches the first 75 days of soybean growth with no single event exceeding 0.4 inches of rain. Despite the good quality water holding capacity of this soil, this study was conducted under severe drought stress. Results likely reflect products that assist in maintaining a "Yield Floor" under abiotic stresses rather than elevating a "Yield Ceiling" under ideal conditions. Data table has been displayed in order of greatest yielding treatment, to least yielding treatment (Table 2) and industry partners entries fell throughout the

spectrum with no specific company out performing, or underperforming, its competitors. Each company had at least one entry that yielded statistically similar to the top yield. Fourteen of the 26 treatments were statistically similar, at 90% confidence, to the top yielding treatment. In-furrow applications of fungicide tended to be more effective than in-furrow applications of fertilizers, biologicals, or micro-nutrients. Soybean R3 growth stage applications tended to be more effective than soybean R1 growth stage applications. The addition of multiple value-added products or multiple application timings in a treatment did not appear to have a synergistic advantage on final yield.

**Table 2. Value-added impact on soybean yield and moisture in 2023.**

| | | App. | Harvest | | |
|---|---|---|---|---|---|
| **Treatment[a]** | **Rate** | **Code[b]** | **Yield** | **Moisture** | **Company** |
| | oz/A* or fl oz/A | | Bu/A[c] | % | |
| AZteroid FC 3.3 | 4.18 | A | 47.7 a | 11.2 | Vive |
| Delaro Complete+Masterlock | 8+6.4 | C | 46.4 ab | 10.8 | Bayer |
| Delaro+Masterlock | 8+6.4 | C | 45.9 ab | 10.7 | Bayer |
| eXceed NBS+pH-Max+Masterlock | 8+2.5+6.4 | C | 45.6 a-c | 10.9 | Max Sys. |
| Nano-Zyme 2.0+pH-Max | 16+2 | A | 45.5 a-c | 11.0 | Max Sys. |
| AZterknot | 8.71 | A | 45.4 a-c | 11.1 | Vive |
| Miravis Neo+Masterlock / Miravis Neo+Masterlock | 13.7+6.4 / 13.7+6.4 | B / C | 45.4 a-c | 10.9 | Syngenta |
| Miravis Neo+Masterlock | 13.7+6.4 | C | 45.4 a-c | 10.8 | Syngenta |
| Priaxor+Masterlock | 4+6.4 | C | 45.4 a-c | 10.9 | BASF |
| eXceed NBS+pH-Max | 16+2 | A | 45.2 a-d | 11.0 | Max Sys. |
| AZterknot+Proline+Masterlock | 8+3+6.4 | C | 45.0 a-d | 10.8 | Vive |
| Accomplish Max / Terramar+Masterlock | 32 / 32+6.4 | A / B | 44.5 a-d | 10.5 | Nutrien |
| AZterknot+Tilt+Masterlock | 8+3+6.4 | C | 44.2 a-d | 10.8 | Vive |
| Yield On+Masterlock | 24+6.4 | B | 44.1 a-d | 11.0 | Winfield |
| Miravis Neo+Masterlock | 20+6.4 | B | 44.0 b-d | 11.1 | Syngenta |
| Voyagro 4-0-16+Masterlock | 16+6.4 | B | 44.0 b-d | 10.9 | Winfield |
| Humika / eXceed NBS+pH-Max+Masterlock | 16 / 8+2.5+6.4 | A / B | 43.9 b-d | 11.0 | Max Sys. |
| Untreated Check | - | - | 43.3 b-e | 10.9 | |
| Ascend SL+Masterlock | 3.4+6.4 | B | 43.2 b-e | 10.9 | Winfield |
| Veltyma+Masterlock | 7+6.4 | C | 43.1 b-e | 10.9 | BASF |
| Yield On+Delaro Complete+Masterlock | 24+8+6.4 | B | 42.8 b-e | 11.0 | Winfield |
| eXceed NBS | 16 | A | 42.7 c-e | 11.0 | Max Sys. |
| Accomplish Max | 32 | A | 42.3 c-e | 11.0 | Nutrien |
| Gainer 20-20-20 (dry)+Masterlock | 80*+6.4 | B | 41.7 c-e | 11.1 | Winfield |
| Terramar+Masterlock | 32+6.4 | B | 40.2 e | 11.0 | Nutrien |
| **LSD (0.1)** | | | **3.6** | **0.2** | |

[a]PRE treatment applications contained no additional adjuvants.
[b]Application codes refer to the information in Table 1.
[c]Bu/A=Soybean yield is corrected to a moisture of 13.5%. Same letters next to values are statistically similar values at alpha=0.1.

## CONCLUSION

The addition of multiple value-added products or multiple application timings in a treatment did not appear to have a synergistic advantage on final yield. This would suggest a grower should consider the addition of at least one value-added product to their program. However, in a year of significant abiotic stress, like a drought, the addition of a second value-added product may not be cost effective. This data set was conducted at one location that experienced only one soil type and environment. If repeated in 2024, potentially in a more "ideal" growing environment, with less abiotic stress impact synergistic advantages to tank mixing multiple value-added products may be more prevalent when the objective targeted at raising the "Yield Ceiling" of a healthy crop, rather than maintaining the "Yield Floor" of a stressed crop.

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