

## 2021 Soybean Variety Trials-Yields Summary

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### Conventional Farm Site Description and Research Methods

In 2021, a variety trial consisting of 13 certified organic soybean varieties and 2 biological seed treatments was conducted in block 11 (mapped as Osco silt loam, 2-5% slope) at the WIU Research Farm. The farm is located ~ 2 miles north of the WIU campus in central McDonough County. Prior to 2018, the trial was also replicated at the WIU Allison organic research farm but only the conventional site was planted 2018-2021.

Four-row plots were planted on 6/4 using a John Deere 7000 4x30" planter at a target rate of 160,000 seeds/a. The plots were arranged in a randomized complete block design with 4 replications. Weed control consisted of a standard non-GMO soybean herbicide program and some weeds were manually removed late in the season.

In addition to comparing 13 soybean varieties without any seed treatment, one variety (291GH) was treated with 2 liquid biological products. Seed Start 200 from SoilBiotics (<https://www.soilbiotics.com/>) was applied at a rate of 5 oz/cwt 3 days prior to planting. This product is a blend of 10.5% humic acid derived from Leonardite ore and a consortium of microorganisms. An experimental inoculant called N2bjP1pf-10L-ST from Terra Max (<https://terramaxag.com/>) was applied at a rate of 2 oz/cwt 3 days prior to planting. This product consists of 2 strains of Bradyrhizobium japonicum and a microorganism with phosphorus solubilizing properties.

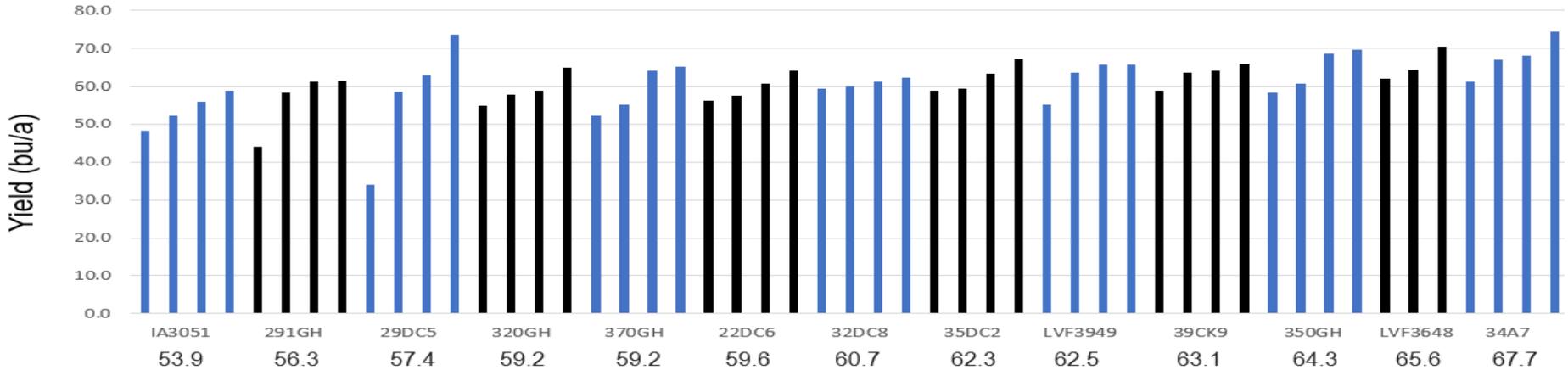
The middle 2 rows of the 4-row plots were harvested with a Gleaner Model K plot combine on 11/4/21. All plots were 36 ft in length, with the exception of 2 partially compromised plots, which were 22.5 ft and 34 ft in length at harvest.

The soybeans harvested from each sub-plot were weighed and analyzed for moisture content, and yields (bu/a) were calculated assuming 60 lbs per bushel at 13% moisture.

Note: A combine plug resulted in no data collection for LVF 3648 in rep 4, thus reducing it to only 3 reps. In addition, 2 varieties, 29DC5 and 291GH, had unusually low yields in rep 3 for unexplained reasons. Data from these plots is included in Table 1 and figure 1 but not in figure 2.

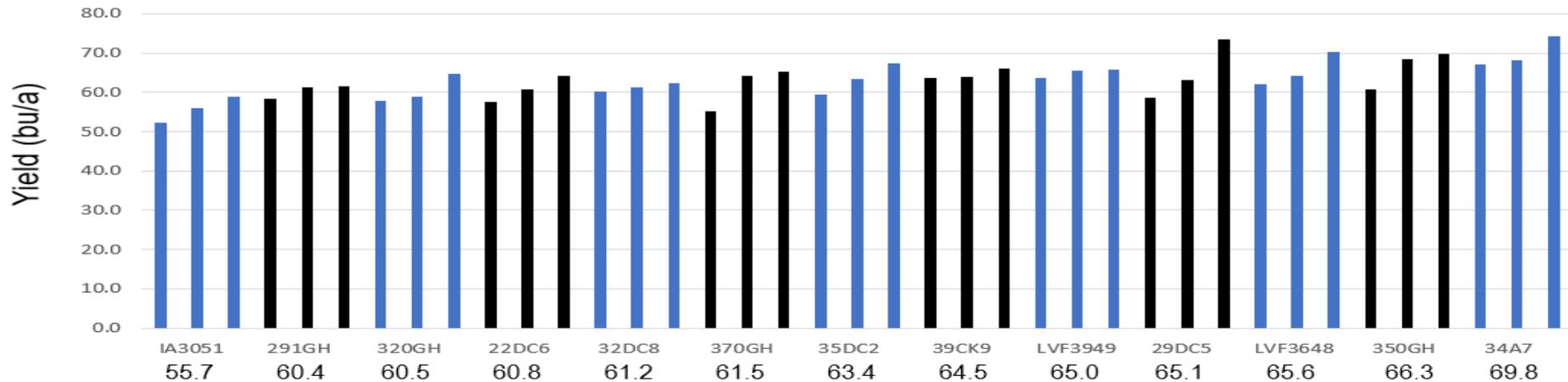
**Figure 1**

**Variation in soybean yield by plot and variety – all plots included**  
*(arranged from left to right by mean yield for each variety)*



**Figure 2**

**Variation in soybean yield by plot and variety – top 3 plots per variety**  
*(arranged from left to right by mean yield for each variety)*



**Table 1: Performance of 13 soybean varieties and 2 seed treatments**

Variety	Group	Company/ Source	Traits	Conventional WIU Farm Planted 6/4  Yield (bu/a)	Significance Groupings	R a n k
34A7	3.4	Blue River Organic Seed	Feed-grade	67.7	a	1
LVF 3648	3.6	Lakeview Farms	Food-grade	65.6	ab	2
350GH	3.5	Great Harvest Organics	Feed-grade	64.3	ab	3
39CK9	3.9	Blue River Organic Seed	Feed-grade	63.1	abc	4
LVF 3949	3.9	Lakeview Farms	Feed-grade	62.5	abc	5
35DC2	3.5	Blue River Organic Seed	Feed-grade	62.3	abc	6
32DC8	3.2	Blue River Organic Seed	Feed-grade	60.7	abc	7
291GH w/Seed Start 200	2.9	Great Harvest Organics	Food-grade	60.5	abc	8
22D6	2.2	Blue River Organic Seed	Feed-grade	59.6	abc	9
370GH	3.7	Great Harvest Organics	Feed-grade	59.2	abc	10
320GH	3.2	Great Harvest Organics	Feed-grade	59.2	abc	11
29DC5	2.9	Blue River Organic Seed	Feed-grade	57.4	bc	12
291GH w/ TerraMax ST*	2.9	Great Harvest Organics	Food-grade	57.3	bc	13
291GH	2.9	Great Harvest Organics	Food-grade	56.3	bc	14
IA3051	3.0	Clarkson Grain	Food-grade	53.9	c	15
					( $\alpha = 0.05$ )	

\*TerraMax ST = N2bjP1pf-10L-ST

Significance groups were identified with  $\alpha = 0.05$ . This means that soybean varieties with no shared letters in the significance group columns are the most likely (95% confidence) to have real, non-random differences in yield.

## Results & Discussion

Plot yields ranged from 34.0 to 74.4 bu/a (low yield for 29DC5 and high yield for 34A7 in figure 1) and mean yields for each variety (including data from all harvested plots) ranged from 53.9 to 67.7 bu/a (IA3051 and 34A7 in figure 1 and table 1). When the lowest yielding plot was excluded for all varieties, the mean yields for each variety ranged from 55.7 to 69.8 bu/a (figure 2).

As shown in figure 1, some of the varieties had widely ranging plot yields (e.g., 29DC5 that both the lowest plot yield – 34 bu/a and the 2<sup>nd</sup> highest plot yield - 73.6 bu/a) whereas others had very consistent yields (e.g., 32DC8 with plot yields only ranging from 59.3 to 62 bu/a). **Variation in plot yield within a variety reduces confidence that differences in mean yield indicate real differences between varieties.** **The significance groups in table 1 (letters a-c) show the varieties/treatments most likely to be similar or different in yield.**

The top yielding feed-grade soybean variety was 34A7 from Blue River Organic Seed (BROS), which yielded 67.7 bu/a (all 4 reps) and 69.8 bu/a (top 3 reps). **Note that the top 11 varieties are all in significance group a (table 1), indicating that the yields of these varieties can not be differentiated with 95% confidence.** 34A7 has been one of the top 3 yielding varieties in WIU test plots 12 out of the last 16 years. Additionally, 34A7 is a tall leafy variety that competes well with weeds and has performed well in our organic no-till trials most years since 2009. The BROS website indicates that 34A7 has excellent heat and drought stress tolerance, which likely contributes to its strong performance in organic no-till systems where the preceding cover crop sometimes has significantly depleted the soil profile. **One weakness of 34A7 is its susceptibility to soybean cyst nematodes, which we observed 1 time in the last 16 years.** Fields known to have high levels of soybean cyst nematodes or limited rotation out of soybean are not well suited for this variety.

The #2 field feed-grade variety was 350GH from Great Harvest Organics, which yielded 64.3 bu/a (all 4 reps) and 66.3 bu/a (top 3 reps). This variety has been a consistent top performer in recent WIU trials: 2017 (56.1 bu/a; ranked #1), 2019 (60.1 bu/a; ranked #3) and 2020 (63.2 bu/a; ranked #1). According to Great Harvest Organics, 350GH has excellent yield potential, a very good disease package and is versatile, allowing for flexible placement across soil types.

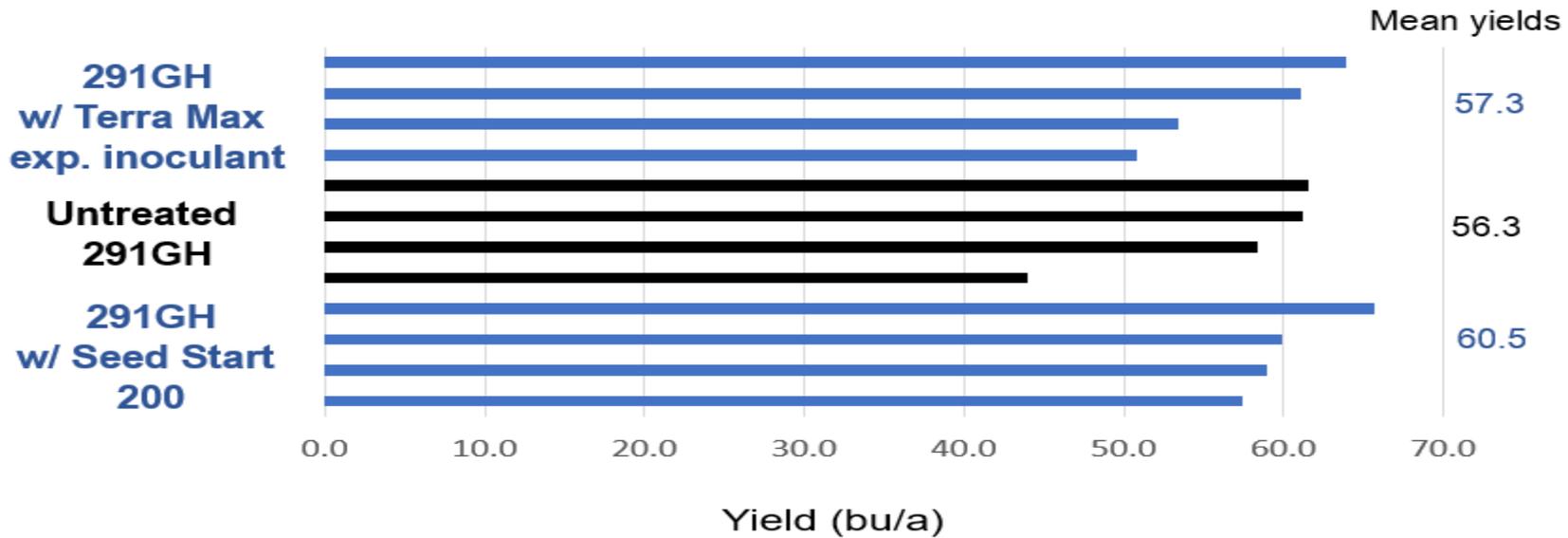
It is common for food-grade varieties to be among the lowest yielding varieties in our soybean variety trials. 291GH and IA3051 fit this pattern as food-grade varieties with relatively low maturities that yielded 56.3 bu/a and 53.9 bu/a, respectively (table 1). In contrast, food-grade variety LVF 3648 with a relatively long maturity (3.6), yielded 65.6 bu/a, 11.7 bu/a higher than the lowest yielding food-grade variety and only 2.1 bu/a lower than the highest yielding variety in the trial (table 1). It is also worth noting that biological seed treatments have the potential to add more value to food-grade soybean production. As shown in table 1 and figure 3, the mean yield for 291GH was 4.2 bu/a higher when treated with Seed Start 200 from SoilBiotics and 1.0 bu/a higher when treated with N2bjP1pf-10L-ST from TerraMax as compared to untreated 291GH. While these yield differences are not statistically significant with 95% confidence, the treatments cost much less than the value of 1 bushel, increasing the likelihood of added profit. In addition, while protein content was not measured in this trial, some studies have shown that inoculation with rhizobia can increase soybean protein content and thus improve the quality of food-grade soybeans.

When deciding whether to grow feed-grade vs food-grade soybean varieties, it is important to understand that food-grade varieties typically come with additional risks, such as strict quality requirements in addition to lower yields. To compensate for those risks, prices offered for food-grade varieties should be significantly higher than prices offered for feed-grade varieties. For example, if you grow a feed-grade variety that yields 60 bu/a and sells for \$30/bu, your gross revenue is \$1,800/a; whereas if you grow a food-grade variety that yields 50 bu/a and sells for \$33/bu, your gross revenue is only \$1,650/ac. In this example, choosing the higher yielding feed-grade variety would be the more profitable option by ~ \$150/a. However, based on yield data for the top yielding feed-grade and food-grade varieties in our 2021 variety trial, the outcome may be different. Assuming 67.7 bu/a and a feed-grade market price of \$30/bu, gross revenue for 34A7 is \$2,031/a. Assuming 65.6 bu/a and a food-grade market price of \$33/bu, gross revenue for LVF 3648 is \$2,234/a. In this example, growing a relatively high yielding food-grade soybean and receiving a \$3

premium results in ~\$203/a of additional profit, assuming no significant elevator dockages or significant additional costs incurred when producing the food-grade variety.

**Figure 3**

### Impact of 2 biological seed treatments on soybean yield



### Conclusion

This trial of 13 organic soybean varieties and 2 seed treatments, compared under conventional management, demonstrates that the genetics currently offered by 4 organic seed companies in the Midwest region include many varieties with good yield potential (among the highest yields recorded at the WIU research farm in 2021).

It should be noted that the ranking of these 13 varieties might differ when grown in an organic production system, where reliance on mechanical methods and plant competition for weed control rather than a herbicide program might give more advantage to tall leafy varieties. For this reason, some soybeans are more suited for organic production than others.