



Information

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Soybean Variety and Corn Hybrid Performance Under Organic and Conventional Systems

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A research field was established at the Lower Eastern Shore Research and Education Center – Poplar Hill Facility during 2001 that allows for side-by-side evaluations of organic and conventional management cropping systems. The organic plot areas within this field are managed so that all aspects of production comply with the National Organic Farming Standards. This field was used during 2004 to compare a number of select corn hybrids and soybean varieties for agronomic performance.

Soybean Study

The soybean plots were preceded by a winter rye cover crop that was planted into corn residue following the corn harvest during fall 2003. On the organic plots the rye cover was killed by tilling it into the soil during early May. The conventional plots also had the winter rye cover crop. These plots received a pre-emergence herbicide application that consisted of 1.5 pt A⁻¹ Dual 8E, 13 oz A⁻¹ Lorox DF, and 3 oz A⁻¹ Canopy XL. Soybean plots were planted May 21 for both the organic and conventional systems. Each plot consisted of 4-20 foot rows spaced 24 inches apart that accommodated cultivation as the weed management mechanism in the organic system. Each variety was replicated 12 times. Both organic and conventional systems were harvested November 3. Agronomic performance data was collected and is reported in Table 1.

Averaged over the seven varieties, the conventionally managed system averaged 4 bu a⁻¹ more than the organically managed system. Assuming a price of \$5.25 bu⁻¹ for conventionally produced soybeans, the gross return for the conventionally produced crop would be approximately \$204. The same gross return could be attained with organically produced soybeans at a price of \$5.86 bu⁻¹. Given that certified organic soybeans frequently receive premiums that are double the average conventionally managed soybean price, an organically managed system can prove highly profitable when the yield is only a few bushel less as was the case in this study.

The top producing variety under both cropping systems was NC+ 3F43. NC+ Seeds is an independently owned farmer cooperative that has been producing quality row crop seeds since 1958. They recently established NC+ Organics to provide certified organic seed for organic farmers. Overall, the soybeans produced in the organic systems expressed slightly more susceptibility to lodging, had a slightly higher harvest moisture content, and reached maturity (100% leaf drop) about

one day later than conventionally managed varieties. None of these slight differences in agronomic characteristics would be considered detrimental to the overall profit benefit that would be attained with only 4 bu a⁻¹ less.

Corn Study

Five (organic) and six (conventional) hybrids representing two company brands were compared in this component of the study. The organic corn plot areas were planted to a winter cover crop of hairy vetch during fall 2004. The conventional plots were planted to a winter rye cover crop. Organic plots were prepared in the spring by disking the vetch twice to incorporate it into the soil during late April. The conventional plots received herbicide applications: 1) early pre-emergent—Roundup Weathermax @ 28 oz a⁻¹, Princep 4L @ 32 oz a⁻¹, and 2,4-D Ester @ 16 oz a⁻¹ (2 weeks prior to planting) and 2) pre-emergent—Roundup Weathermax @ 24 oz a⁻¹, MicroTech @ 1.5 qt a⁻¹, and Atrazine @ 15 oz a⁻¹ (just prior to planting). Corn plots were planted on April 27 for both the organic and conventional systems. Each plot consisted of 4-100 foot rows spaced 30-inches apart that accommodated cultivation as the weed management mechanism in the organic system. Each variety was replicated 4 times. Fertility for the organic system consisted of one T a⁻¹ high calcium lime and 1.5 T a⁻¹ poultry litter that was applied prior to planting. It was assumed that the vetch cover crop supplied 90 lb a⁻¹ of nitrogen for the crop. The conventional plots received the same 1 T a⁻¹ high calcium lime. These plots received a pre-plant broadcast fertilizer application equivalent to 35-30-80-24 and a sidedress UAN application equivalent to 100 lb a⁻¹ N. It was assumed that these two different approaches to providing the crop's nutrient needs was supplying equivalent amounts of nutrients. There were noticeably more weeds present in the organically managed system throughout the growing season. The plots were harvested October 20. Yield is reported in Table 2.

Averaged over the five hybrids that were included in both the organic and conventional systems, the conventionally managed corn produced nearly 25 bu a⁻¹ more corn. There were no hybrids that produced more under the organically managed system than they did using conventional management. The top two producing conventionally managed hybrids were both NC+ brands (Table 2) excluding NC+ 69R36 that had Poncho seed treatment. The same two hybrids were the best yielding within the organically managed system. Profitability for both organically and conventionally produced corn is dependent upon market price for the commodity and input costs. Assuming a market price for conventional corn of \$2.30 bu⁻¹, the gross return for corn produced under that system would be approximately \$260 acre⁻¹. In order to attain the same gross return, organically produced corn would have to receive a premium price of at least \$2.94 bu⁻¹. The other variable that was measured in this study was the amount of damage caused by European corn borer (ECB). Averaged over the hybrids, there was significantly more ECB damage observed in the organically managed plots (Table 2).

Acknowledgments:

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Table 1. Performance of soybean varieties grown under organic and conventional management at Lower Eastern Shore Research & Education Center - Poplar Hill during 2004.

| Variety | Yield Bu a ⁻¹ | | | Plant Height In. | Lodging | | Moisture % | | Maturity | | Oil % ² | Protein % ³ |
|----------------------|-----------------------------|--------|---------|------------------------|---------|-------|------------|------|----------|--------|-----------------------|---------------------------|
| | Avg. | Conv. | Organic | | Conv. | Org. | Conv. | Org. | Conv. | Org. | | |
| Schillinger 444F.HPC | 33.4 c ¹ | 35.3 | 31.5 | 29 | 0 | 0.75 | 15.2 | 15.2 | 9-Oct | 9-Oct | 18.3 | 47 |
| NC+ 34YP5 | 28.7 c | 29.3 | 28.0 | 28 | 0 | 1.5 | 15.7 | 16.7 | 1-Oct | 2-Oct | 19.6 | 42 |
| NC+ 41YP5 | 39.8 ab | 41.4 | 38.1 | 28 | 0.25 | 0 | 15.3 | 15.8 | 10-Oct | 12-Oct | 19.9 | 42.2 |
| NC+ 3A44 | 36.8 b | 39.9 | 33.8 | 28 | 0.25 | 0.75 | 15.1 | 16.4 | 1-Oct | 2-Oct | 20.3 | 42.6 |
| NC+ 33YP5 | 37.8 b | 40.6 | 34.9 | 38 | 1.0 | 1.25 | 14.3 | 14.5 | 8-Oct | 9-Oct | 19.8 | 43.0 |
| NC+ 37YP5 | 38.7 b | 41.1 | 36.2 | 35 | 3.0 | 3.0 | 14.5 | 14.9 | 8-Oct | 9-Oct | 20.2 | 41.8 |
| NC+ 3F43 | 42.4 a | 43.9 | 41.0 | 32 | 0.33 | 0.67 | 14.2 | 14.4 | 30-Sep | 1-Oct | 19.7 | 42.4 |
| Average | | 38.8 a | 34.8 b | 31 | 0.7 b | 1.1 a | 14.9 | 15.4 | 5-Oct | 6-Oct | 19.7 | 43.0 |
| LSD _{0.10} | 3.0 | | 2.7 | | 0.25 | | 0.53 | | | | | |

¹Varieties that have yields followed by the same letter are not significantly different at p< or =0.10.

^{2 & 3}Oil and protein data are from the organically managed treatments only.

Table 2. Yield of corn hybrids grown under organic and conventional management at Lower Eastern Shore Research & Education Center - Poplar Hill during 2004.

| Hybrid | Avg. Yield Bu a ⁻¹ | Conventional Yield Bu a ⁻¹ | Organic Yield Bu a ⁻¹ | ECB ¹ Damage % | |
|---------------------------------------|----------------------------------|--|-------------------------------------|---------------------------------|------|
| | | | | Conv. | Org. |
| Doeblers brand N509 | 88.3 b | 105.1 | 71.4 | 20 | 23 |
| NC+ brand 69R36 ¹ | Only conventional | 133.2 | No data | 10 | N/A |
| NC+ brand 62N37 | 109.0 a | 121.0 | 96.9 | 10 | 20 |
| NC+ brand 68F32 | 102.8 a | 112.0 | 93.6 | 8 | 13 |
| NC+ brand 60N37 | 109.7 a | 120.2 | 99.1 | 10 | 10 |
| Doeblers brand N640 | 95.3 b | 108.9 | 81.6 | 2 | 32 |
| Average for 5 hybrids in both systems | | 113.4 a | 88.5 b | 10 | 19.6 |
| LSD _{0.10} | 7.0 | | 17.6 | | |

¹European corn borer damage was measured by randomly selecting 20 plants from each plot and counting how many expressed visible signs of corn borer damage.

²This hybrid was only evaluated under conventional management since it had Poncho treated seed and could not be planted in the organic plots.