Soybean [Glycine max (L.) Merr] is one of the world’s most important crops, supplying approximately half of the global demand for vegetable oil and protein (Oerke, 2006). In 2013, Ohio had a record high soybean yield of 3.29 Mg ha⁻¹ (Mass, 2014). However, further yield increases are critical to meet the growing food and bio-based product demand. Yield increases occur due to a combination of genetic and agronomic factors. Improvements on agronomic management practices increase soybean grain yield by 0.060 to 0.015 Mg ha⁻¹ yr⁻¹ (Specht et al., 1999). Agronomic inputs may be applied alone or in combination with other practices to attain increased yields.

Objectives: Therefore, the objective of this study was to evaluate five common agronomic inputs (Rhizobia inoculant, fungicide, insecticide, Mn foliar fertilizer, and gypsum) on soybean yield and determine whether:
1. Inputs decrease yield when omitted from an enhanced soybean production system.
2. Inputs increase yield when added to a traditional production system.

Materials and Methods

- Field study conducted in 2013 in nine Ohio counties:
  - Clark, Clinton, Delaware, Erie, Henry, Mercer, Preble, Wood, and Wayne
- Omission trial, randomized complete block design with four replications (Table 1)
- ASGROW 3231 seed, 3.2 maturity group
- Metalaxyl, pyraclostrobin, pyflumetofen, and imidacloprid seed treatment (Acceleron™)
- Planted at 358,000 seeds ha⁻¹ in 38 cm rows
- Plots 8.5 to 9.1 m long (depending on site)
- Application of inputs:
  - Rhizobia inoculant (0.06 ml kg⁻¹ of seed) at planting
  - Pelletized gypsum (4.47 Mg ha⁻¹) at VC
  - Pyraclostrobin fungicide (439 ml ha⁻¹) at R3
  - Lambda-cyhalothrin insecticide (117 ml ha⁻¹) at R3
  - Mn foliar fertilizer (4.67 L ha⁻¹) at R3
- Protein and oil content analyzed with ASGROW 3231 seed, 3.2 maturity group,
- Planted at 358,000 seeds ha⁻¹

Conclusions

- When fungicide was omitted from the enhanced production system, soybean yield decreased at 3 of 9 locations. When fungicide was added to the traditional production system, no significant yield effects were observed. No beneficial yield responses were observed for the inoculant, fungicide, insecticide, and manganese foliar fertilizer inputs (Table 2).

- Protein Content: When fungicide was omitted from the enhanced production system, protein content was increased in two of nine locations and protein content was decreased in one of nine locations. When fungicide was added to the traditional production system, protein content was decreased in two of nine locations. When insecticide was added to the traditional production system, protein content was decreased in one of nine locations. The insecticide, manganese foliar fertilizer, and gypsum inputs had no significant effects on soybean protein content (Table 3).

- Omission of pyraclostrobin fungicide from an enhanced production system reduced yield in three out of nine locations by 0.21 to 0.79 Mg ha⁻¹, but addition of the fungicide to a traditional system did not result in a yield increase. It is possible tank mixing with lambda-cyhalothrin insecticide resulted in synergistic effects. During 2013, with established corn/soybean rotations, no sulfur or manganese deficiencies, and limited insect pressure, there was no beneficial effect of inoculant, fungicide, insecticide, and manganese foliar fertilizer on grain yield. Regular scouting is useful to identify inputs that will increase soybean yield.

- Although statistically significant differences were observed for protein and oil content, these differences varied only by 0.4 and 0.8% for protein and 0.1 to 0.4% for oil. These differences may not be biologically significant.

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