Bradyrhizobium japonicum Inoculants Have Little Effect in Kentucky’s Soybean-Corn Rotation

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Soybean (Glycine max [L.] Merrill) is an important row crop in Kentucky. In recent years intensive agronomic management has increased, specifically the use of *Bradyrhizobium japonicum* soybean inoculant at planting (University of Kentucky Cooperative Extension Service, 2017). *B. japonicum* is a bacteria that has a symbiotic relationship with the soybean root to fix nitrogen (N) from the atmosphere for plant use, which is essential for producing high yielding soybean (Bhuvaneswari et al., 1980). Typically, *B. japonicum* seed inoculants are an inexpensive input ($3 to 4/acre) that producers use to guarantee adequate N availability and uptake and yield potential. However, claims that twice or three times the labeled rate produce greater root nodulation and N uptake have increased the interest and cost of soybean inoculants. The objective of this study was to determine the effect of different rates of commercially available *B. japonicum* inoculants on full season and double crop soybeans for seed yield, number of root nodules, and N concentration of soybean leaves.

Field trials were conducted at the University of Kentucky Research and Education Center in Princeton, KY (37°6′ N, 87°52′ W) and Spindletop Research Farm in Lexington, KY (38°7′ N, 84°29′ W) in 2016. A full season and double crop trial were evaluated on three soil types: a well-drained Crider silt loam (Typic Paledalf) and moderately well-drained Zanesville silt loam (Oxyaquic Fragudalf) at Princeton and a well-drained Maury silt loam (Typic Paleudalf) at Lexington. Both trials examined five treatments: America’s Best Inoculant at the recommended (1×; 12.5 fl oz/cwt) and twice the recommended rate (2×; 25 fl oz/cwt); Optimize XC at the recommended (1×; 2.8 fl oz/cwt) and twice the recommended rate (2×; 5.6 fl oz/cwt); and a non-inoculated control. Treatments were arranged as a randomized complete block design with four replications. *B. japonicum* inoculants were applied directly to untreated soybean seed (DuPont Pioneer [Johnston, IA] 94PY23) according to the labels. Soybean seeds were planted on 15-inch row spacing at 140,000 seeds per acre. The previous crop for the full season trial was no-till corn (*Zea mays* L.), while the double crop trials were planted into no-till winter wheat (*Triticum aestivum* L.) stubble, which was preceded by corn. At Princeton, two seven-row plots were planted for each treatment to provide one yield plot and one plot for destructive sampling of root nodules number and leaf tissue analysis. The Lexington location had one six-row plot per treatment; the middle