

Title: On-Farm Evaluation of Inoculation Strategies in Soybeans

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Summary: *Bradyrhizobium japonicum*, the rhizobia responsible for nitrogen fixation in soybeans, is not native to Manitoba soils and must be introduced to first-time soybean fields. Now that we have much more soybean history in our fields, have we built up populations of *B. japonicum* in our soils enough to reduce the amount of inoculant we use?

MPSG's On-Farm Network has explored different soybean inoculation strategies since 2013. Double inoculation (two formulations or placements) vs. single inoculation strategies (seed-applied inoculant alone) have been compared at 55 on-farm trials (2013-2023) and single inoculation vs. no inoculant applied has been compared at 42 trials (2016-2023).

Over the past ten growing seasons in Manitoba (2013 to 2023), there have been a total of 56 on-farm trials evaluating double (granular or peat in-furrow + liquid on-seed) vs. single (liquid on-seed) inoculation strategies. To participate, fields must have had at least two previous soybean crops and one in the last four years. 95% of the time, an additional in-furrow inoculant did not improve yield over a single inoculant alone, resulting in a loss per acre of approximately \$10/acre. At three trials (5%) there was a significant yield advantage of the double over the single inoculation and the yield increase more than paid for the cost of the inoculant. The recommendation from this research is based on field history. Consider a single inoculation strategy when planting on a field with sufficient soybean field history of at least two previous well-nodulated crops and the last crop within the last 4 years. The field should have not had a recent history of flooding or drought as this impacts rhizobia survivability in the field.

From 2016 – 2023 there were 42 trials that compared no inoculation to a single inoculation strategy (peat or liquid on-seed). For this type of trial, the minimum history of three soybean crops and one in the last four years was followed. In all cases, there was no yield advantage of using a single inoculant vs. no inoculant suggesting that naturalized populations of *Bradyrhizobium japonicum* were sufficient to support nodulation and effective N fixation in those fields. The cost of a single inoculant was an additional \$3/acre. Despite the lack of yield response, however, the additional \$3/acre cost of a liquid inoculant is an inexpensive insurance to avoid a potentially costly nodulation failure.