

# SOYBEAN SINGLE VS. DOUBLE INOCULANT CONSIDERATIONS



## Why do we Inoculate Soybeans?

Research shows that soybeans which are inoculated can provide soybean plants up to 74% of the nitrogen they require through the growing season. The following document is meant to be used to help gauge whether to consider single or double inoculating your soybeans. If two or more boxes to the right are applicable to you, please consider double or stacking inoculant to ensure your greatest yield potential.

FACTORS TO CONSIDER	WHEN TO SINGLE INOCULATE	WHEN TO DOUBLE INOCULATE
<b>A) Virgin Soil</b>	There must be adequate levels of rhizobium in the soil within close proximity of the seed. Since bradyrhizobium isn't native, the only way to establish a population is by inoculating and establishing successfully nodulated soybean crops	When planting into virgin soils the impact of nodulation can be great on overall yield. Yield drag can be seen in virgin soils and by double inoculating you can create soil reserves of bradyrhizobium quickly
<b>B) Soybean Rotation</b>	In a short rotation (1-3 Years), recent history of bradyrhizobium application leaves more highly efficient bacteria in the overall population in the soil. A single application of inoculant provides efficient clones for secure nitrogen production	In a long rotation (4-8 Years) you will want to double inoculate soybeans as the overall bacteria population in the soil becomes less efficient and less populated over time
<b>C) pH Level</b>	Rhizobia perform best in the pH range of 5.8 - 7.0, as plants can optimally communicate via exudates with the rhizobium	Soil pH of <5.8 and >7.0 can highly impact the level of inoculation. Soil which is acidic or basic creates challenges for signals to be transmitted from soybean roots to rhizobium. The use of soil amendments can impact the pH, such as the use of lime
<b>D) Moisture</b>	Moisture during the growing season can help ensure strong nodulation when inoculant is used. Inoculation can be impacted by stressful soil conditions, which can include both excessive moisture and or drought conditions	Moisture stress can impact the number of flavonoids produced by the plant. Therefore, placing large populations of fresh bradyrhizobium through inoculant can preserve nodulation under stress
<b>E) Soil Type</b>	Well drained, medium textured soils with a range of 1.5% - 3% organic matter provide the most stable environment for rhizobium to thrive in	Sandy conditions, soils with high organic matter (>3%) and compaction can cause a difference in water holding capacity and fluctuating oxygen levels. Double inoculation can help mitigate these stresses which can lead to rhizobium desiccation
<b>F) History</b>	If there's a history of certain fields with poor nodulation, it's likely to have one or more of the underlying issues already discussed. Corrective actions should be considered to help improve overall soybean health. The use of inoculant will be an important component	If there's a field history of poorly nodulated soybeans, caution should be taken going into the next cropping cycle. The impact of double inoculation can be highly profound and can greatly affect the overall benefit to the crop in these situations

# Other Considerations

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## Manure

**What to watch for:** Manure can be a great source of nitrogen for many crops, but keep in mind that in some cases it takes multiple seasons for it to breakdown into plant available forms. With the increased nitrates soybeans can become overly vegetative and can experience challenges with plant health.

**Possible Solution:** Soil tests can be utilized to ensure soil nitrogen isn't abundant and allow for the nodulation process to begin. For a preseason 6-inch nitrate test, 20-60lbs of nitrogen is optimal. Anything above this can cause issues with nodulation, timing and intensity.

## Introduction of a New Species of Rhizobium

**What to watch for:** In areas where soybeans have been planted for a multitude of years, the native rhizobium population in the area may have a level of ineffectiveness due to genetic changes overtime. The use of fresh inoculant and new highly efficient rhizobium in high populations with close proximity to the seed is highly recommended for optimal results. In soils with established populations, inoculant drives a greater proportion of active vs. inactive nodules regarding biological nitrogen fixation.

**Possible Solution:** The use of a second inoculant as a double inoculation or introduction of a new species of inoculant will allow you the best opportunity to increase diversity of species and strains. Seed placed and in furrow placed inoculant is critical to ensure maximum benefit to the early development of the crop.

## Above Average Temperatures and Rainfall

**What to watch for:** In extremes we can see the movement of rhizobium from the seedbed into deeper layers of the rhizosphere.

**Possible Solution:** It's all about location and it's critical for the placement of rhizobium to be in the furrow and around the seed at planting. Establishing fresh inoculant each spring helps ensure strong potential nodulation for your crop.

## Iron Deficiency Chlorosis

**What to watch for:** Soils with a high pH, poor drainage, salinity or a large degree of organic matter can all impact early soybean growth and iron availability. These conditions may increase the likelihood of iron deficiency chlorosis symptoms.

**Possible Solution:** Inoculant can be part of a multi-faceted approach to this problem; the use of an iron fertilizer or an inoculant capable of iron insolubility is also encouraged.

## Active vs. Inactive Nodules

**What to watch for:** Active nodules begin around V2-V3 and when sliced open have pink to red centre's which show they are producing nitrogen in the soil. Nodules which are small and white may be immature and have not started fixing nitrogen. The appearance of green, brown or mushy nodules are not fixing nitrogen. The ineffective nodules can be a result of a multitude of issues, listed throughout this document. Keep in mind soybeans will cycle through fresh nodules every few weeks, the healthy nodules will senesce, and new nodules will form along the root up until the plant reaches R5 (pod fill).

**Possible Solution:** Consult the nodulation scouting guide to learn more about the proper technique of scouting and evaluating nodules on soybeans. If healthy nodules aren't found with initial scouting come back in a week's time to reassess the nodulation. If this persists, consult your agriculture representative for next steps in rescuing the crop.

**LAL FIX PROYIELD**  
LIQUID SOYBEAN

**LAL FIX LIQUID**  
SOYBEAN

**LAL FIX SPHERICAL**

**LAL FIX PEAT**  
SOYBEAN