Texas Agricultural Extension Service
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Rhizobium Inoculation, Nodulation, and Early-Season Nodule Evaluation for Guar

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Timely evaluation of *Rhizobium* nodulation on any legume should be part of a **comprehensive crop scouting program**. Effective *Rhizobium* inoculation and nodulation for most crops, including guar, is essential to approach yield potential. However, 1999 and 2000 observations in the Texas South Plains find minimal or no *Rhizobium* nodulation. Successful nodulation for most crops in West Texas is expected, but is not guaranteed.

Why the problem with guar?

We don=t know for sure. Guar-specific products from Urbana Laboratories (both a conventional seedbox and a seedbox treatment with a sticker, RhizoStick) and LiphaTech (conventional seedbox) are available. Without a sticker, conventional seedbox inoculants are supposed to be applied to moistened seed on the turnrow, but that takes time, and most growers don=t do it. Also, conventional seedbox inoculants are not normally preferred due to lower bacteria delivered to the seed compared to a granular or liquid inoculant. RhizoStick addresses that problem to some extent, but some air planters blow the inoculum off if there is no sticker. Unfortunately, due to the limited guar acreage, inoculant companies are probably not likely to produce a granular or liquid product for guar.

Typically, 20 to 100 nodules per plant are expected for a crop like peanuts, however among numerous fields observed in the past two years I estimate that 20 to 25% of our peanut fields are undernodulated. I have seen pictures of guar roots covered with nodules, but don=t know how. Research colleagues in Australia in 2001 also report minimal to no nodulation on guar. Other reasons for poor nodulation, including how we handle and apply the product are listed below. Poor nodulation in the Texas South Plains may be somewhat correlated with caliche soils, where pH > 8.0 may curtail *Rhizobium* effectiveness. Discovering poorly nodulated fields early in the season allows time for implementing or adjusting an N fertilizer program to compensate for loss of fixed N to the peanut.

A good time to evaluate *Rhizobium* nodulation on guar fields is when most stands have been in the ground 4 to 5 weeks. In a couple areas of the field use a shovel to dig (don=t pull) plants to evaluate nodulation. If desired, swirl roots in a bucket of water to remove soil. Nodule mass is more important than number of nodules. Slice open several nodules. Active nodules are pink to dark red inside. If nodules are white inside they are not yet active so check again in another week for reddish color. (Later season, older, inactive nodules will be gray or greenish inside.) If nodulation is judged poor, little can be done to increase nodulation.

What about guar *Rhizobium* inoculation with other crop-specific inoculants?

Our industry partners making *Rhizobium* inoculants recognize that different strains of *Rhizobium* are usually specific for a particular crop or related crops, and select then market these strains accordingly. Inoculants from U.S. companies usually contain more than one strain. Some growers have asked, however, about applying *Rhizobium* inoculant products packaged for other crops, such as peanuts, to guar. I can=t recommend this practice until I see some test results, but I think it is worth looking at in a research trial setting either in a greenhouse or on-farm. Some strains of *Rhizobium* do in fact work to some extent with other crops though certainly are far from optimum if a crop-specific product works. The possible advantage, however, might be found in a liquid inoculant which has far higher numbers of *Rhizobium* delivered to the seed than in a seedbox treatment.

In general for most *Rhizobium*-inoculated legume crops, if no nodulation or poor nodulation is observed check the field again in ten days just to be sure. If poor nodulation persists, consider a modest N fertilizer program to address the crop N requirement. Also, to possibly pinpoint why that field may not have nodulated, ask yourself if any of the following may have occurred:

Common *Rhizobium* Inoculation Mistakes

(These apply to all *Rhizobium* inoculants, not just guar; comments are included for granular and liquid *Rhizobium* inoculants.)

-Inoculant exposure before planting to temperatures above 90 F. Do not store inoculant in a building where it can get hot in the afternoon. Do not keep inoculant in the pickup cab once in the field. This reduces *Rhizobium* numbers.
-If using a liquid inoculant, avoid chlorinated water which kills bacteria.
-Poor placement of in-furrow granular or liquid inoculant. Ensure that drop hoses in particular (many need to be lengthened a few inches) and nozzles direct inoculum to the seed rather than from 6" or more away. Be sure granular drop hoses are free of dirt, spider webs, etc.
-Low rates of inoculum; calibrate granular and liquid inoculants to ensure adequate rates.
-Using an inoculum not specific for peanuts; bacterial strains in Rhizobium
-Shallow planting on hot, dry soils if not irrigated quickly. If you can=t water quickly, inoculant companies suggest you consider granular rather than liquid inoculant as the granules afford some protection to the bacteria.
-Very high pH soils (>8.0)B*Rhizobium* inoculant companies suggest that growers consider granular inoculants rather than liquid in this instance.
-Incompatibility with other seed, fertilizer, or chemical treatments (if unsure, consult your inoculant=s company representative).
-Placing large amounts of N fertilizer near the seed will greatly curtail nodulation.
-Using old, expired inoculum.

Some growers routinely use a double *Rhizobium* inoculant rate. If you choose to do this and options are available, consider using two different products, like the frozen inoculant (delivered and stored in frozen form; thaw before use then apply like a liquid) along with a conventional liquid; or use both granular and a liquid.

Always keep in mind that *Rhizobium* inoculant is a live bacteria! We should do what is necessary to ensure that the integrity of the inoculant is not compromised in any way.