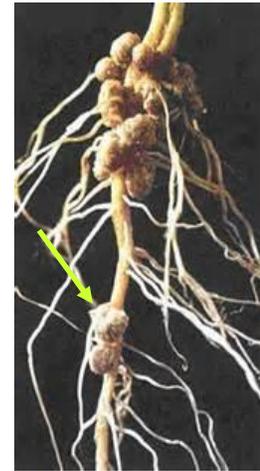


Legume Nitrogen Fixation and Inoculants

Legumes, aka plants in the bean family (Fabaceae), form a symbiotic association with species of bacteria (*Rhizobium* spp., *Bradyrhizobium* spp., and others). These bacteria take nitrogen from the air and fix it into a form that is usable by the legume plant. This fixation takes place in specialized structures on the plant's roots called nodules (arrow, right). After the roots of legume plants die and the nodules decompose, nitrogen that the bacteria fixed will be released and can become available for use by subsequent crops. The anticipated amount of nitrogen that can be fixed is dependent on many factors including the species of legume, plant stand, growing conditions, and management of the stand. The range of nitrogen fixation rates for common legumes grown in the Southeast are shown in Table 5 on Page 16 of this publication: http://extension.uga.edu/publications/files/pdf/B%201347_3.PDF. Compared to the cost of applying commercial nitrogen fertilizers, legumes can act as a cheaper, and natural, source of nitrogen in producer's cropping systems.



Only specific strains of these bacteria will interact with the various types of legumes that producers may be growing. Unless a legume crop has been grown in a field for a period of several consecutive years, the correct strain of bacteria will most likely not be present and will need to be introduced into the soil when the legume is planted. This is done by applying an inoculant that contains the correct strain of bacteria to the seed or inoculants can be added to the planter box for distribution in the furrow at planting. The most commonly used commercial inoculants are powders designed to treat seed. The inoculant is applied to moistened seeds, with a sticking agent added to help the powder adhere to the seed surface. Commercial sticking agents are available or ten percent solutions in water of powdered milk, corn syrup, molasses, or sugar can be used. Inoculants are also often added to seed coatings of pelletized seed.

With the growing interest in using legumes as a nitrogen source in crop production systems, producers may not be aware of the correct type of inoculant to use for species that they have not previously grown. To determine which inoculant to use for legumes that are commonly grown in Florida, refer to Table 1 on Page 3 of this publication: <https://edis.ifas.ufl.edu/aa126>. Some manufacturers are also offering mixes that contain several strains of bacteria in one package; the efficacy of these compared to single-strain inoculants has not been fully documented.

Effective nodulation can be confirmed by carefully excavating a few young plants and checking the roots for the presence of nodules. Active nodules will be firm and, when cut open, will be pink- to red-colored on the inside. If a nodule is mushy or the color on the inside is green or white, nitrogen fixation is not occurring.

Inoculant Considerations

- Make sure that the type of legume being planted is listed on the bag of inoculant. If there are any questions, contact the distributor or consult the manufacturer's web site for confirmation.

- Bacteria are living organisms. In order to remain effective (i.e., alive), the inoculum needs to be protected, from **heat** (do not leave a bag of inoculant or inoculated seeds sitting in the sun), **acids** (do not use soda pop as a “sticking agent”), other **caustic chemicals** (do not mix inoculated seed with lime or fertilizers unless labeled for this use), and **pesticides** (some may be toxic to the bacteria, so again, be sure check the pesticide label).
- Packages of inoculant are fairly cheap, generally costing about \$6 to \$8 for enough inoculant to treat 100 pounds of seed. Purchasing fresh inoculant each year is recommended. However, when storing a package for use during the next growing season, it is best to keep it refrigerated.
- Inoculated seed should be planted within 4 to 24 hours of treatment or the seeds will need to be re-inoculated prior to planting.
- Although most pelleted legume seed has the correct strain of bacteria included in the seed coating, adding additional inoculant before planting can be extra insurance to guarantee that viable bacteria are available for optimum nodulation, especially for older lots of seed.
- Prior to planting, a soil test should be taken and the soil pH and nutrients should be adjusted to levels recommended for the legume crop that is being grown. Planting when there is ample soil moisture and temperatures are favorable to ensure quick seed germination will generally result in successful nodulation.