



Legume Inoculation

(A Team Demonstration)

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Material needed: Inoculated and non-inoculated live or pickled legume root specimens; legume seed; can of legume inoculant; water and container for mixing legume seed and inoculant.

Tom: My name is Tom and this is my teammate, Mary. We are from the _____ 4-H Club. We've been hearing a lot about legume inoculation and growing legumes to build up our soil. So today we would like to demonstrate what we mean by inoculating legumes and why inoculation is so important in any soil building program.

Mary: That's right, Tom. We hope we can impress everyone just how important it is to inoculate legume seed with the right kind of bacteria. We have known for a long time that when legumes don't have root nodules they don't make the soil richer. Now, Tom, you tell us what the difference is between legumes and other plants.

Tom: All right, Mary. There are three big differences between legumes and other plants. The legumes are: (1) richer in nitrogen; (2) they usually have nodules on the roots and (3) they are able to increase the nitrogen in the soil through the action of bacteria in root nodules.

Mary: That brings us to what we mean by inoculation and the formation of nodules. Inoculation means applying cultures of nitrogen-fixing bacteria to legume seed before planting the seed. In other words, we get the bacteria in contact with the seed. And soon after the legumes begin to grow, the legume bacteria invade the tiny root hairs and multiply in large numbers. Nodules are then formed on the roots and this is where the bacteria live and do their work. The bacteria build the root nodules and the legume is believed to supply food to the bacteria. In return, the bacteria furnish nitrogen to the legume plant.

Tom: Let's look at some legume roots that were grown from inoculated seed and some that were grown from seed without inoculation. (Show roots that were grown from inoculated seed and point out nodules on roots. Then show roots that were grown from seed without inoculation and point out the fact that there are no nodules present on these roots.)

Mary: (Holding root of specimen not inoculated.) This _____ plant that grew from seed without inoculation got raw materials for its growth just as would cotton or corn. The nitrogen as well as phosphorus, potassium, calcium, magnesium, iron, sulphur, manganese and traces of many other elements came from the soil.

Tom: (Holding root of specimen that was inoculated.) The plant nutrient requirements of this _____ plant were about the same as that _____ Mary just told you about. But the big difference is that the _____ seed was inoculated and the _____ plant got most of its nitrogen from the air. That is why we want nitrogen-fixation in the nodules. In fact that's the big reason for planting legumes. The air we breathe is about 80 percent nitrogen. Over every acre of land there are about 35,000 tons of this free nitrogen. So when we grow a good legume crop we "capture" some of this nitrogen from the air. This "captured" nitrogen is added to the soil when the legume is plowed under as green manure crop. There also are many other benefits to the soil from growing legumes, but time does not permit our discussing them now.

Mary: Here is one point I'd like to emphasize. The plant nutrient requirements of legumes and the bacteria that live and grow in legume nodules are similar to other plants except that the legume gets most of its nitrogen from the air; therefore, fertilizers often are needed and acid soils should be limed for successful nodulation and growth of legumes.

Tom: Now we come to another important point and that is whether or not it is always necessary to inoculate legume seed before planting. This may not always be necessary but inoculation is cheap and is excellent insurance against failure if the job is done right. In cases where a specific legume has been grown recently with success in a field, inoculation is cheap insurance!

Remember, there are at least two good reasons for inoculating legume seed every time they are planted. First, the soil may not contain a large enough number of bacteria; second, the bacteria left in the soil by a preceding crop may have lost their beneficial properties. The bacteria in the soil sometimes lose their ability to fix nitrogen from the air, and in such cases they do not help the legume plant at all.

Mary: Another thing we need to keep in mind about inoculants is that the same kind of bacteria will not inoculate all legumes. But the same kind of bacteria will inoculate a group of legumes. For example, it takes a different kind for alfalfa and hairy vetch. But alfalfa and sweetclover can be inoculated with the same group, and hairy vetch and Austrian winter peas can be inoculated with the same group of bacteria. Garden peas are in the same group as Austrian winter peas and hairy vetch. Garden beans need the bean group of bacteria.

The different legumes that a certain group of bacteria will inoculate usually are listed on the container. Be sure that the date on the container has not expired. Now we want to give you a demonstration on how to inoculate legume seed. (Tom and Mary follow directions on can of inoculant and inoculate seed. They mix thoroughly, getting a coating of the inoculant on all seed.)

Tom: After the seeds are inoculated they should be kept in shade and planted as soon as possible. For best results plant inoculated legume seed in moist soil. Exposure to direct sunlight and excessive dryness is harmful to the bacteria and may even kill them.

Mary: Are there any questions? If not, we thank you for your attention.

TEXAS AGRICULTURAL EXTENSION SERVICE

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