Inoculating CRP Ground

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Abstract
The Prospective Plantings Report by the National Agricultural Statistics Service (NASS), Agricultural Statistics Board, U.S. Department of Agriculture was released on March 31, 2008. Iowa corn acreage in 2008 is expected to be 1 million acres less than in 2007 and it appears that this, along with other ground (CRP, hay and small grains), is being directly switched over to soybean (increase of 1.25 million). With the increase in soybean acres do we need to inoculate our soybean seed when planted on some of the “new” soybean acres? It depends.

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Inoculating CRP Ground

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By Palle Pedersen, Department of Agronomy

The Prospective Plantings Report by the National Agricultural Statistics Service (NASS), Agricultural Statistics Board, U.S. Department of Agriculture was released on March 31, 2008. Iowa corn acreage in 2008 is expected to be 1 million acres less than in 2007 and it appears that this, along with other ground (CRP, hay and small grains), is being directly switched over to soybean (increase of 1.25 million). With the increase in soybean acres do we need to inoculate our soybean seed when planted on some of the “new” soybean acres? It depends.

Nitrogen fixation is the process of converting atmospheric nitrogen into a usable form for the plant and is critical for producing higher yields in soybean. For nitrogen-fixation to occur, the nitrogen-fixing bacteria known as Bradyrhizobia japonicum need to be readily available in the soil or must be applied to the seed to form nodules on the soybean root.
When the seed germinates, the bacteria invade the root hairs of the seedling and begin to multiply. Nodules, which house the bacteria, form on the roots. Under field conditions, nodule formation can be seen shortly after emergence but active nitrogen fixation does not begin until about the V2 to V3 stage. After this, the number of nodules formed and the amount of nitrogen fixed increase with time until about R5.5 (midway between R5 and R6), when they decrease sharply.

There is a mutual benefit in the relationship between the *Bradyrhizobium* bacteria and the soybean plant. For nitrogen fixation to occur, *Bradyrhizobium* bacteria need to be present in the soil. The plant, in turn, provides the bacteria's carbohydrate supply. A relationship such as this, where both bacteria and plant profit from the other, is called a symbiotic relationship.

Nitrogen (N) fertilization of soybean is not a common practice because it generally does not increase grain yields. The total number of root nodules that form decreases proportionately with increasing amounts of applied N. In addition, N fertilizer applied to a soybean plant with active nodules will render the nodules inactive or inefficient, proportionately to the amount of N applied. Thus, although the soybean plant can use both fixed N from bacteria and soil N (both mineralized and fertilizer N), but soil N is used in preference to fixed N if available in large amounts.

Although soybean does not respond with increased yield to the addition of N, plants remove a significant amount of it from the soil. In Iowa soils, which have appreciable residual N levels, up to 50 percent of the total plant N has been attributed to N2 fixation. Increasing nitrogen supply by adding fertilizer, animal manure, sludge, or a green manure crop simply substitutes nitrogen from these sources for nitrogen that would otherwise be fixed by the bacteria in nodules on the roots.

I have conducted multiple inoculant experiments across Iowa every year since 2004. Our recommendation in Iowa, based on our data, is very similar to other states in the Midwest. It is recommended to inoculate the seed if nodulated soybean has not been grown in a field in the past 3 to 5 years (like CRP), if soil pH has not been maintained above 6.0, if fields have sandy soils and are irrigated, and then if fields get flooded frequently.

For the common soybean grower in Iowa with a corn-soybean rotation or a corn-corn soybean rotation we do often not see an advantage (or disadvantage) of using an inoculant. The major reason is the high frequency of growing soybean in rotations and the widespread soybean production both of which keep the inoculant level adequate in most fields due to soybean growth and dust movement. In addition, Iowa soils are fertile and have a great soil supply of plant available N that decreases the chance for severe N shortage in Iowa. However, it is recommended that if you put CRP ground into production in 2008, it would be a wise investment to inoculate your seed just to be sure that you do not have a shortage of N. More information about inoculants can be found on
www.soybeanmanagement.info with other information about inoculant and the data from our inoculant evaluation trials in Iowa in 2007.

Palle Pedersen is an assistant professor of agronomy with research and extension responsibilities in soybean production.

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Crop:  Corn

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