Differential Response of Strains of *Lotus* Nodule Bacteria to Soil Treatment Practices

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Much information is available demonstrating the favorable effects of inoculation and fertilizer treatments upon the quality and yields of leguminous crops. A relatively large portion of these effects has been interpreted by numerous investigators solely as a crop response. It has been shown also that strains of nodule bacteria, in association with their host plants, differ in nitrogen-fixing efficiency. Whether these strains respond differently to varying levels of mineral nutrient supply has not been determined. Since the full benefit of soil treatment can be realized only when both partners of the symbiotic process—plant and nodule bacteria—operate in an environment that allows both of them to express fully their inherent capacities, it seemed desirable to design an experiment to determine whether full advantage of the nitrogen-fixing efficiency of the best strains of nodule bacteria is secured on many of our soils and to ascertain to what extent various strains respond to increased soil fertility levels.

Roberts and Olson (5) concluded from work done with *Rhizobium* *trifolii* strains and the *Trifolium pratense* host plant that some strains of *trifolii* were able to fix more nitrogen at lower levels of potassium fertility than were others. They concluded that phosphorus had little effect on the efficiency of the strains studied. Albrecht, Klemme, and Mierke (1) found that the addition of potash fertilizers increased the nitrogen fixed by sweet clover (*Melilotus* alba), but this work was confined to several strains of nodule bacteria may differ in their efficiency thus strain differences could not be measured.

PROCEDURE

Birdsfoot trefoil (*Lotus corniculatus*) was selected for this investigation because its nodule bacteria are absent from most Illinois soils and it is not nodulated by the legumes found in these soils. Thus there is little contamination from outside sources. Furthermore, it has been shown that while birdsfoot trefoil will grow on soils of low fertility, it responds to soil treatment practices.

In an earlier paper (4) a number of *Lotus* nodule bacteria were evaluated in respect to nitrogen-fixing efficiency under greenhouse and field conditions. Five of these strains were chosen as test organisms for the experimental work reported in this paper. These strains are designated here as A, B, C, D, and E.

Two soils which differed greatly in their capacity to produce nitrogen were used in this experiment. One soil was a composite from untreated check plots on three Illinois soil experiment fields where Cisne silt loam predominates. This composite is designated as soil 1. The other soil was obtained from a farmer's field near Urbana, Ill., and designated soil 2. Soil 1 had a pH of 4.7, and gave a potash test of 116 pounds and a phosphate test of 23 pounds per acre.