

## BENEFICIAL BACTERIA ARE NOT CONFINED TO LEGUMINOUS PLANTS

By P. H. Laucks

Many people think that the only important forms of bacteria that are beneficial to the soil are those that are found in the nodules of the legume plants, but the modern scientific farmer knows that when his manure and straw piles, as well as the stalks left in the field, are under going decomposition that millions of microorganisms are bringing about these changes which play such an important part in the fertility of the soil.

Bacteria are practically responsible for all charges that soil, especially its humus content, undergo in the process of soil decomposition. Besides the valuable physical structure that bacteria establishes in the soil during these changes there are unavailable plant foods made available to the plant. As organic matter is the chief source of humus, humus the chief source of nitrogen when legumes are not grown, and fixed nitrogen one of the chief sources of plant food coming from the soil, we can easily see why bacteria brings about, and is responsible for, these changes which are so important to the agricultural industry.

Beneficial bacteria lack chlorophyll (the green coloring matter of leaves) thus they are commonly unable to make use of the energy of the sunlight, but must like animals depend upon organic food as a source of life's energy. Bacteria are referred to as saprophytes (living plants that thrive on dead organic matter such as manure, and dead plants or animals) and parasites (microorganisms that thrive upon other living plants or animals). However, there are some forms of bacteria that subsist entirely upon mineral foods. Practically all the available sulphates, phosphates, and the silicates of iron utilized by plants are brought about by the mineral bacteria.

So much for the various bacteria, now let us confine the topic strictly to beneficial bacteria, the saprophytes, which bring about the economic changes in the soil. Fixed nitrates are brought about in the soil in the two following ways: first, by a class of bacteria that rot or decompose the organic matter to the proper degree so that the plant can make use of it, and, second, by a class of bacteria such as are found in the nodules of the legume plant which are capable of transforming the nitrogen of the air into a desirable form for the plant's use. Now if the farmer keeps his

soil well aeriated, drained, and the moisture content as near 20 per cent as possible, he will be approaching a condition for the growing plant that will obtain a maximum yield with a minimum loss of soil fertility, as well as obtaining a soil condition that will practically eliminate other forms of bacteria that have just the opposite effect from the above mentioned forms.

If we add one ton of manure to a soil we not only add 12 pounds each of nitrogen and potassium, and two or three pounds of phosphates, which bring about physical and chemical changes in the soil that have the properties of increasing the granulation within the clayey soils and binding the particles together in the sandy soils, thus increasing the water holding capacity and the capillarity of the soils, but we are adding many forms of bacteria whose reactions may have a far more reaching effect than either the physical or chemical reactions produced. This is the explanation for the large benefits often derived from small applications of manure on certain plots of land. Many of these bacteria placed in the soil with the manure will not be adapted to growth under new conditions; however, some will continue to multiply and in so doing will continue to decompose the contents of the manure as well as greatly altering and making available for the plant's use other forms of organic matter.

Nitrates once formed in the soil, by microorganisms, are very desirable and essential for the growth of the plant, hence we must conserve them as much as possible. Sources of losses of nitrates are: First, nitrates are decompose into nitrites by action of bacteria that thrive in excessively wet soils or in the soils that remain wet over a long period after the maximum amount of fixed nitrates have been obtained; Second, Nitrates may be lost through percolation of water in the soil or leaching by excessive rains. The best way to conserve the fixed nitrates after they once have been formed is to let the soil become dry until the time of cropping, and to employ good farm practices in seeing that the soil involved is well drained.

It is well to note that if a proper rotation of cropping is followed, and good farm practices are put into operation, such as returning organic matter to the soil in the proper proportion to the amount taken off by the

crops removed along with the proper drainage, that the bacteriological problems will be well taken care of by nature.

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