SOIL CONDITIONS WHICH PROMOTE NITROGEN FIXATION

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INTRODUCTION

In many of the older cultivated soils of the United States, nitrogen is the limiting element in crop production and must be supplied before other fertilizer materials give profitable returns. Results of investigations of soil fertility indicate that the proper use of clovers and other legumes in rotation and the systematic use of liming materials is a more economical method of solving a large part of the nitrogen problem for general field crops than to depend solely on commercial forms of nitrogen.

The assimilation of free nitrogen by soil organisms working independently of leguminous plants, is often not considered in calculating the nitrogen balance in the soil; but it is the opinion of some investigators that this form of bacterial activity plays a large part in keeping up soil productivity.

REVIEW OF LITERATURE

In 1885, Berthelot (4) demonstrated that soil organisms assimilate gaseous nitrogen. He exposed sterilized and unsterilized soils poor in nitrogen to air in large closed flasks for several months. The unsterilized soils gained in nitrogen, but the sterilized soils did not. In 1893, Winogradski (34) started a search for the actual organism and finally isolated an anaerobic form which he called Clostridium pasteurianum. In 1901, Beijerinck (3) isolated two aerobic forms to which he gave the generic name of Azotobacter, and up to the present time the Azotobacter group seems to be the most important of all the nitrogen fixers. In 1903-04, Lipman (21) described three more species of Azotobacter. Many soil organisms, including bacteria, yeasts, molds, and fungi, have been credited with nitrogen fixing power (22) (9). Although the Azotobacter group is considered to be the most important, nitrogen assimilation is faster in the presence of other forms than with pure culture (20). Kossowitsch (19) found that certain algae and Azotobacter can work together symbiotically.