

Well-aerated soil is productive soil, also due to the presence of microorganisms. They convert nutrient chemicals into forms available to higher plants.

Not all the soil microorganisms are bacteria, but a good number of them are. Bacteria are single cell plant organisms which contain no chlorophyll. When conditions are favorable they reproduce very rapidly by simply splitting into two parts, each of which grows into a complete organism.

### Effect of Decaying Matter

The decay of organic matter, the conversion of its nitrogen into simple ammonia compounds, and the further transformation of these compounds into nitrites and nitrates is probably one of the best examples of the known work of the soil microorganisms. The names of the microorganisms, which after all were merely pinned on them by man, are unimportant. It is the processes by which they maintain soil sanitation and fertility essential to the higher forms of plant life that are of interest to us.

It is not to be inferred that all microbial activity in the soil is of a beneficial nature. Although soil microorganisms cause decay and nitrification, soil microorganisms also cause putrefaction and denitrification. Both beneficial and detrimental organisms require warm temperatures and derive food from organic matter or simple inorganic compounds. The rate of aeration is the chief factor determining whether desirable or undesirable microorganisms will function in the soil.

### Importance of Air

To understand why air is so important it is necessary to consider the nature of the chemical activities which take place. Decay is the chemical process called oxidation (which simply means combining elements or compounds with oxygen). Simple ammonia compounds are transformed into nitrites by oxidation. And it is the oxidation of nitrites that yields nitrates. Oxygen from air is essential for these oxidation processes brought about by soil microorganisms. Clay and even loam soils tend to become too compact for nitrification to take place as rapidly as is desirable, unless the soil is mechanically loosened from time to time. Nitrification is especially slow in soil covered by sod.

In the absence of adequate aeration, putrefaction, or decomposition of organic matter takes place. In this process decomposition is incomplete and certain offensive smelling compounds which are resistant to further decomposition are formed. None of these compounds can be utilized by higher plants, and many are actually poisonous.

A limited supply of oxygen encourages denitrification. When oxygen is deficient, anaerobic microorganisms compete with the higher plants for available nitrates. These microorganisms reduce nitrates to nitrites, and then to ammonia and gaseous nitrogen, which is lost into the air. Poor aeration can cause the denitrification of fertilizer.

The oxidation of simple sulfur compounds into sulfates which are available to higher plants is brought about by soil microorganisms. The process is similar to the nitrification cycle.

The assimilation of nitrogen from the atmosphere is usually associated with the bacteria that attach themselves to the roots of legumes. However, there are unattached nitrogen fixers at work in the soil. Attached and unattached nitrogen fixers are aerobic and are found in soil and sewage.

Soil microorganisms also produce organic acids and carbon dioxide which have a solvent action on soil minerals. Some organisms increase the solubility of phosphates. Others make minute quantities of certain nutrient elements available for higher plants. The fact that applied chemicals don't tend to be retained or accumulate to an extent where they might be poisonous to plants is believed partly due to the activities of microorganisms.

Excessive acidity or a low content of organic matter, as well as poor aeration, will reduce the number and activity of soil organisms. However, even under unfavorable conditions, microorganisms don't disappear from the soil altogether; they just go on a sit-down strike. They are in the soil and ready to resume work as soon as good working conditions are provided, therefore the need to be ever alert to the requirements of the soil and cognizant of the benefits that can be derived from proper aeration.

### Greenkeepers Annual Tourney; Medinah, Chicago, Oct. 4-5

National Greenkeeping Supts. Assn. will hold their annual golf tournament at Medinah (Ill.) CC, Oct. 4 and 5. The greenkeepers expect a large field for their annual championship and the numerous sub-championship flights. They'll play the Medinah course on which the 1949 National Open will be played for the first time the top event of golf has been in the Chicago district since 1933 when Johnny Goodman nosed out Ralph Guldahl at North Shore CC.

Ray Gerber, 865 Hillside ave., Glen Ellyn, Ill., is chmn., championship committee. Entry blanks may be secured from him.