

Influence of Lime on the Bacterial Life of the Soil.

The humus or semi-decayed organic matter in the soil is the main source and storehouse of nitrogen, the dominant and most costly element of plant food. Before this humus-nitrogen can be utilized by growing crops it must be oxidized and converted into nitrates. This process, known as nitrification, is the life work of certain vegetable micro-organisms or bacteria within the soil. In soils deficient in carbonate of lime, and especially in ill-drained, water-logged soils, the decay of the organic matter is accompanied by the development of certain organic acids, and thus the soil becomes sour. This acid condition of the soil is distinctly unfavourable to the life and development of the useful nitrifying organisms, for these can flourish only in a neutral, or rather slightly alkaline soil. Lime and carbonate of lime neutralize these acids, making the soil a suitable medium for the growth of these bacteria and, further, furnish a base or alkali to combine with the nitric acid produced by them. The nitrate of lime so formed is, no doubt, the immediate source of the nitrogen supply of our field crops.

Comparative Values of Lime Compounds.

All forms of lime used in agriculture are not of equal value, especially for the correction of acidity. In acid-correcting power and in furnishing available lime, and considering the various forms on a basis of equal purity, 56 pounds of quicklime is the equivalent of 74 pounds of freshly-slaked lime and of 100 pounds of carbonate of lime whether it be as marl or ground limestone. Air-slaked lime, for reasons already noted, may be partly hydrate and partly carbonate; its value will, therefore, be intermediate between that of freshly-slaked lime and the carbonate; that is, 56 pounds of quicklime will be equal to a weight of air-slaked lime between 74 and 100 pounds. Presenting these facts in tabular form we have:—

900 lbs. quicklime = 3,571 lbs. ground limestone and marl.
2, 0 lbs. quicklime = 2,643 lbs. freshly-slaked lime.

If quicklime were worth \$5 per ton, ground limestone, equally free from impurities, would be worth \$2.80 per ton, and freshly-slaked lime, \$3.86 per ton. While the above comparison, as to equivalent weights and values, may serve in a general way, an analysis is necessary when the exact lime value of any particular sample or samples is desired.

Is Lime or Carbonate of Lime Preferable?

In settling this question the character of the soil and the desired rapidity of action should be considered.

On account of their influence in hastening the decomposition of the humus, quicklime and slaked lime are not so desirable or safe to use on light sandy and gravelly loams as are ground limestone and marl. If lime be applied to these soils it should be in small dressings (not more than 1,000 pounds per acre) and at long intervals. Carbonate of lime (limestone and marl) is much milder in its action and an excess can do little or no harm.

For heavy clays or soils rich in organic matter, mucks and peaty loams, lime or slaked lime is to be preferred and may be applied in fairly large amounts—say 13 to 3 tons per acre. These compounds are gradually converted into carbonate of lime within the soil, but being more vigorous and active from the outset and being in finer powder than ground limestone they pass more readily into solution, thus allowing a more uniform distribution throughout the soil. As a result their influence in flocculating the clay particles and improving tilth will be more rapid. For the same reason the chemical action also of these forms is more vigorous than that of ground limestone and marl.