A Few Notes on pH of Soils

The acidity of the soil influences the growth of plants in many ways. These influences are not just simple reactions. What is the favorable pH range in the soil for growth of most plants? A pH range of from 6 to 7 is considered optimum for most plants. This is a sort of middle range that is slightly acid. It is best because of many complex processes that are constantly going on in the soil.

The pH affects solubility of nutrients and toxic substances, thereby affecting the ease with which nutrients are leached from the soil. The pH affects the functioning of beneficial soil organisms and the physical structure of the soil.

How does soil get out of the optimum pH range? The original soil may have been acid and extremely low in basic elements such as calcium, magnesium and potassium. We bring a soil such as this into the greenhouse and begin watering it with two acre inches of water or more each week and applying mostly acid forming fertilizers. True, we add calcium in the form of limestone, and potash. On the average, however, our soils become more acid each year even with the additions of more and more limestone.

/1 The assistance of Robert L. Borland in the determination of the organism is acknowledged.

In a few instances extreme acidity develops and cannot be raised appreciably by liming. Often in these instances several accompanying conditions arise. The soil becomes tighter in structure. It is more difficult to keep up the nutrient levels, especially calcium and nitrates. Possibly the wintertime chlorosis of carnations sometimes found in Colorado is in some way connected with extreme acidity and reduced microbiological activity during cold weather.

What can we do with such problem soils? When extreme acidity and accompanying symptoms occur, it is next to impossible to correct that acidity by liming. The pH scale used for measuring acidity or alkalinity is a scale running from 1 to 14. 7 is neutral, below 7 is acid and above is alkaline. The divisions are not equal however. The distance between 5 and 6 is ten times that between 6 and 7 and so on. Ten times as much lime is required to raise the pH of a soil from 4 to 5 as that needed to raise the pH from 5 to 6, and 100 times as much lime is required to raise the pH from 4 to 5 as that required to raise from 6 to 7.

Not many years ago we changed soil if troubles arose. I doubt that we need to change soils completely that have become too acid. Perhaps a better bet than bringing in a new soil that is poorly buffered and low in basic elements would be to take out a portion of the old soil and replace it with local alkaline soil selected for its friability. This alkaline soil when mixed thoroughly with the acid bench soil should correct it much more easily than liming and should supply other basic nutrients as well.

What steps can we take to prevent our soils from becoming too acid? Additions of organic matter are good and many growers are using peat liberally. Most peats are acid although native peats are less acid than Canadian or Michigan peat. The addition of organic matter to a soil tends to buffer the soil, making it a better storehouse for nutrients as well as making it resistant to change. Rotted or half-rotted leaves are also fine, especially for soils in which the pH is already nearing the danger point. Local mixed leaves are highly alkaline and rich in all nutrients.

Dr. O. W. Davidson presented in the N.J. Plant and Flower Growers bulletin for September, 1952 the following table which should be valuable for any grower's files.

Relative acidifying or alkalizing power of various fertilizing, liming, or acidifying materials in terms of commercial limestone (calcium carbonate) as 1.0

Material	Acidifying	Alkalizing
Dolomitic limestone	.....	1.1
Hydrated lime (calcite)	.....	1.4
Hydrated lime (dolomitic)	.....	1.7
Sodium nitrate	.....	0.3
Calcium nitrate	.....	0.2
Potassium nitrate	.....	0.2
Ammonium nitrate	0.6	.....
Ammonium sulfate	1.1	.....
Mono-ammonium phosphate	1.6	.....
Di-ammonium phosphate	1.1	.....
Urea	0.8	.....
Sulfur	3.1	.....
Ferrous sulfate	0.4	.....
Aluminium sulfate	0.5	.....

One pound of ammonium nitrate requires 0.6 pound of limestone to neutralize its acidity while one pound of ammonium sulfate will neutralize 1.1 pounds of limestone.

Your editor,

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