The Decision to Apply Lime

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Fertilizer

WHY APPLY LIME?

Controlling the pH of soil is essential to obtain superior levels of fertility , the measure of sustainable, profitable farming.

Everyone knows that, at the ideal pH, all of the nutrients that crops require are more readily available. All nitrogen fertilizers, whether organic or chemical, are absorbed more easily. The micro-organisms needed to build and mineralize stable humus are much more active, ensuring better organic matter performance. A high calcium level ensures less soil compaction through the formation of more stable aggregates.

IS LIME NEEDED OR NOT?

There are two pHs: the pH of the soil solution (SpH) and the buffer pH (BpH). The SpH is the level of active acidity in the soil solution in the immediate environment of the plant roots. This acidity directly affects root growth and the availability of nutrients in the short term. The BpH is the reading of total soil acidity, that of the solution but especially that in reserve adsorbed (attached) on clay particles and organic matter (argillo-humic complex). The argillo-humic complex determines the capacity of the soil to retain and exchange certain elements with the soil solution, notably the exchangeable bases and acidity. It is the cation-exchange capacity (CEC) of the soil, the calculation of the weight of the soil's reserve.

At an appropriate pH, the soil's acidity has been replaced by the nutrients required by the plants and they make up a large portion of the soil's food reserve, particularly for potassium (K), magnesium (Mg) and calcium (Ca). These three elements are what are known as the exchangeable bases. A decrease in the exchangeable bases in the soil's reserves automatically raises acidity and thus lowers pH.

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Soils with a BpH below 6.9 require the addition of lime. The need for lime increases as BpH decreases and CEC is high. A BpH of 6.9 (thus lime does not need to be added to the soil) corresponds to a SpH between 6.0 and 7.0 and to base saturations between 75% and 90% depending on the soil types or CECs.

The sandier the soil (and thus with low CEC), the more the SpH is below a BpH of 6.9 as compared to a clay soil with high CEC. Base saturation at a BpH of 6.9 is also weaker in light soils than in heavy soils.

It is increasingly evident that SpH is not a reliable indicator for determining the need to apply lime. The SpH is much too variable in a given year and year over year for the same season depending on certain conditions, particularly the moisture rate and organic activity of the soil during sampling.

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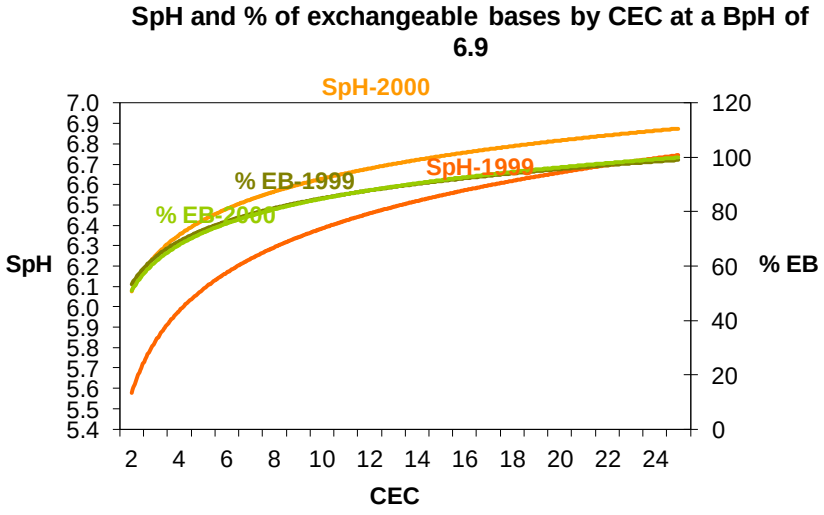
A review of the data collected from analysis of thousands of soil samples collected in 1999 and 200 clearly shows the stability during the two years of the BpH and the percentage of base saturation at a BpH of 6.9, regardless of the CEC. However, there is a significant difference in the SpHs of the two years. In 1999, a damper and hotter year, the SpHs were all lower compared to those during the colder, dryer conditions in 2000.



BpH and base saturation are the most reliable indicators for determining whether or not lime should be added and the amount if it is required.

Proper liming involves striving to achieve the following objectives as quickly and as safely as possible: a BpH of 6.9 and an ideal base saturation depending on the CEC.

THE PROPER LIME RATE

The application of too much lime, especially on light soils, can be damaging in the short or long term depending on just how much too much lime was applied. However, contrary to the widely-held belief, applying too little lime is not economically or agronomically justifiable, even though there are no negative effects on soil chemistry or biology..

An inadequate application of lime will not achieve the high yields and quality desired and often leaves the farmer with the mistaken impression that his pH problem has been resolved when that is not the case. The application of lime at a rate below the real level of need involves several passages of heavy equipment, often after harvesting when damp soil conditions favour compacting. The more often only a portion of the real need for lime is met, the greater this total need becomes and the less effective low rates of lime become. In contrast, when lime applications are neglected, the requirement for lime can become so great that generally two applications will be needed at two-year intervals . A single massive application of lime can create a chemical imbalance in the soil and promote the loss of certain nutrients, especially potassium.

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