Soil
FACTSHEET

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Soil Acidity and Liming Facts

INTRODUCTION

Low pH soils (i.e. acidic soils) require liming to improve crop production. The following points provide a reference to managing low pH soils.

1. Soil pH is reported as measured in water (H_2O) or in a 0.01M $CaCl_2$ (calcium chloride) solution. These measurements indicate how acid or alkaline the soil is. Either measurement can be used to determine whether a soil needs liming or acidification.
2. A soil pH measured in water is about 0.5 unit higher than when determined in 0.01M $CaCl_2$.
3. The equivalent water pH can be calculated from the calcium chloride pH value by multiplying the latter by 1.1.
4. Measurements made in calcium chloride are more precise than in water. That is, there is less variation among repeated measurements on a soil sample with $CaCl_2$ compared to water.
5. Soil pH values vary during the growing season by 0.25 unit easily. The variation is usually greater on soils with a pH above 6.5 than on more acid soils.
6. The buffering capacity of a soil is its capacity to resist a change in pH.
7. High buffering capacity soils need more lime to raise their pH levels by a given amount.
8. Generally, soils with high clay/organic matter levels have higher buffering capacities.
9. Soil pH is used to determine if a soil needs liming: a buffer-pH like the 'SMP Buffer pH' is used to determine the lime requirement of a soil.
10. The lime requirement of a soil is the amount of good quality limestone that should be added and worked in the top 20 cm (8-10 inches) to reach the target pH.
11. Lime requirement(s) depend on the desired pH, which depends partly on the crop growing or to be grown.
12. If the soil organic matter is 30% or higher, the soil layer is considered "organic" and should not be limed above pH 5.4.
13. Hydrated lime or calcium hydroxide [$Ca(OH)_2$] can be substituted for limestone but the liming recommendations should be reduced by 25%.
14. One of the principal reasons why hydrated lime neutralizes soil acidity more rapidly than limestone is because it is more finely pulverized.
15. All liming materials have to be incorporated thoroughly into the plow layer to effect a rapid neutralization of the soil acidity.
16. If the limestone cannot be incorporated into the plow layer, the recommended rate may have to be reduced.
17. If the liming recommendation is above about 7 tonnes per hectare (about 3 tonnes per acre); 2 or more applications should be made.
18. Dolomitic limestone contains magnesium (the content varies) and may be used to increase the levels of plant available magnesium on acid soils.
19. Finer limestone particles have greater surface areas exposed to chemical reaction and will neutralize soil acidity faster than coarse limestone particles.
20. Calcium is an important plant nutrient. Levels are adequate for plant growth by liming the soil to its desired pH.
21. Liming to raise the soil pH will increase the levels of plant available calcium in soils and generally also increase the concentration of calcium in crops.
22. Liming may improve the soil structure of fine textured clay soils.
23. Increasing the soil pH with liming will promote the decomposition (mineralization) of soil organic matter. Consequently, an increase in yield associated with the liberation of plant nutrients in the organic matter may increase yields. Such increases in yields may be more economically obtained by adequate fertilization.
24. Soil pH (acidity), aluminum toxicity, or manganese toxicity will not be a problem for most crops by liming to pH 5.5.
25. If liming costs are a serious burden, then lime to pH 5.5 to precipitate or bind toxic levels of aluminum and/or manganese in soil and select appropriate crops.

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