

Reducing Soil Acidity Caused by Aluminum

Introduction:

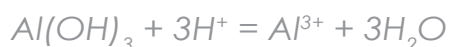
Soil acidity is among the most important environmental factors which can influence soil properties and productivity, nutrient uptake and efficiency and crop production.

Causes of Soil Acidity:

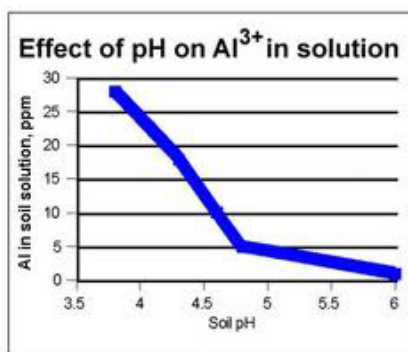
Research shows that hydrogen (H⁺) and aluminum (Al³⁺) ions are the predominant forms of acidity in soils; the higher the H⁺ and Al³⁺ concentration the lower the pH, increasing soil acidity. Each type of soil has a certain level of acidity depending upon its composition, agricultural practices and rainfall amounts, however, various factors over time cause changes in soil pH and acidity; fertilizer practices, leaching, erosion, crop uptake of basic cations (calcium, Ca²⁺; magnesium, Mg²⁺; potassium, K⁺), decay of plant residues, microbial activity and plant root exudates are all means by which the soil acidity is increased.

Soil Acidity/Aluminum Toxicity Connection:

Under acid soil conditions, aluminum dissolves to a limited extent, releasing aluminum into the soil solution, where it may be hydrolyzed and contribute to soil acidity. The overall reaction is:



There is, however, a major problem with the process: the aluminum hydroxide



is in a solid form, and when hydrogen ions are added it goes into the solution phase. Aluminum in the solid phase is a normal part of every soil and is benign or even beneficial, but in the solution phase it can become toxic to plants. The primary response to aluminum stress occurs in the roots. Aluminum-injured roots are stubby and brittle. Root tips and lateral roots thicken and turn brown. The root system as a whole is affected, with many stubby lateral roots and no fine branching. Such roots are inefficient in absorbing nutrients and water. The main symptom of aluminum toxicity is rapid reduction in root growth and plant production.



Damage to small grain roots caused by excess Al

Progyp Properties can Correct Subsoil Acidity and Toxicity Caused by Aluminum:

- 200X more soluble than limestone and has ability to rapidly penetrate into subsoil.
- Effects of toxic soluble aluminum in the subsoil can be decreased.
- Leaching of soluble aluminum in soils can reduce subsoil acidity.
- Sulfate may form a complex (Aluminum Sulfate) with aluminum which renders the aluminum non-toxic and allows the aluminum to migrate deeper into the subsoil.
- Sulfate ions may react with iron hydroxides to release hydroxyl ions, which give a neutralizing effect to reduce subsoil acidity.
- Calcium ions move into the subsoil rapidly, displacing aluminum ions which are a major source of subsoil acidity.