User: Not logged in
Login
Signup

Spectrum Analytic Inc
1087 Jamison Rd NW
Washington Court House, OH 43160
(800) 321-1562

Agronomic Library

Soil Aluminum and Soil Test Interpretation

Title
Soil Aluminum and Test Interpretation

By
Spectrum Analytic Inc

Synopsis
This paper will discuss the aspects of soil Al and using soil Al test results.

Keywords
Al
Al+++
aluminum
aluminum toxicity
available
available aluminum
gypsum
interpretation
Mehlich 3
Mehlich 3 Al
pH
plant
roots
soil
soil pH
soil test
soluble
soluble aluminum
test
testing
toxicity

Aluminum is not an essential element for either plants or animals. Most plant producers have heard that too much aluminum (Al) can be harmful to plants. However, many may not be aware that there are multiple forms of Al in the soil and most of them are not directly harmful to plants. There are also multiple methods of testing the soil for these various forms of Al and several different ways to use these soil test results. This paper will discuss these aspects of soil Al and using soil Al test results.

Aluminum is the most abundant metal in the earth's crust. It makes up about 7% of the mass (essentially the weight) of the earths crust. If you apply this number to an acre of soil 6 2/3 inches deep (2 million pounds of soil), that 7% "Total Al" would equal about 140,000 lb Al/acre or 70,000 ppm. Those of us involved in producing plants, whether those plants are agricultural, turf, or ornamental, should understand how Al can affect these plants.

Forms of Aluminum in Testing

As mentioned earlier, there are multiple forms of Al in the soil and multiple tests that have been used to identify these different forms. Only two of the tests are useful for growers.

1. **Available Al:** This test determines the amount of the "available" or easily soluble Al (Al^{+++}). Growers can use this result to evaluate the potential of Al toxicity to their crop. This is not a routine test and must be specifically requested.

2. **Mehlich 3-Al:** Mehlich 3-Al (M3-Al) is extracted with the same chemical solution that is used in determining many plant nutrients. Mehlich 3 is a stronger extracting solution than used for available Al, so the results are much larger values. **The M3-Al result has no relationship to "available" Al.** It is used by several north eastern states when converting the Mehlich 3-P result to the equivalent Morgan-P test result. We automatically run the M3-Al test on all soil samples that are received from those states in which the University lab runs the Morgan-P test, so that they are able to make this conversion if they want.

Aluminum Toxicity

Excess soluble/available aluminum (Al^{+++}) is toxic to plants and causes multiple other problems. Some of the more important problems include...

- Direct toxicity, primarily seen as stunted roots
- Reduces the availability of phosphorus (P), through the formation of Al-P compounds
- Reduces the availability of sulfur (S), through the formation of Al-S compounds
- Reduces the availability of other nutrient cations through competitive interaction

The primary damage caused by excess Al^{+++} is in damage to plant roots, as seen in these wheat seedlings. Diagnosing this type of damage requires that growers inspect the root systems of their crops or other plants. Of course, when plants have damaged root systems, many other above-ground symptoms are likely. One of the most