Timely Topic: Soil testing for phosphorus and pH

April 2020. Provided by Clain Jones, Montana State University Extension Soil Fertility Specialist

Several tests have been developed over the past century to assess phosphorus (P) availability, including Olsen, Bray, Mehlich-3, and Haney–Haney–Hossner–Arnold (H3A). Montana State University fertilizer guidelines are based on Olsen P, which has proven to be reliable in soils with pH greater than 7 (alkaline) that contain calcium carbonate (limestone). However, different laboratories often use one of the other three, especially labs in the Midwest. The question is whether there is a reliable conversion between Olsen and any of these three OR whether Mehlich-3, Bray, and H3A are simply not reliable in high pH soils.

A recent article in *Crops & Soils,* September 2019*,* published by the American Society of Agronomy, reported on an Idaho study that found a strong correlation between Mehlich-3 and Olsen P (Olsen P = (Mehlich/2.05) – 14). Using this conversion, the MSU P fertilizer guidelines can be used with caution to calculate approximate P fertilizer rates.

Both the Bray and H3A tests were designed for neutral to acidic soils (pH less than 7). The Idaho study did not find a correlation between either the Bray or the H3A tests and Olsen P test results in soils containing calcium carbonate. In a number of soils, the Bray P test did not detect any P, even though Olsen P levels were relatively high.

When sending soil to a lab, ask the lab to use the Olsen test. If the lab doesn't use Olsen, but does use Mehlich-3, make sure to convert from Mehlich-3 to Olsen. If the lab only uses Bray or H3A, consider switching labs, or make sure that the pH is less than 7. The Bray test may be a reliable indicator of available P, however, you will need to use the lab's P recommendation rather than MSU's, which may not be ideal for Montana soils. The H3A test is not reliable for Montana soils.

While you are in the field soil sampling, look for or ask about areas that may have had unexplained poor production, unusual response to herbicide or herbicide residual, increased Cephalosporium stripe or fusarium crown rot, or nitrogen deficient legumes (poor legume nodulation). These are all indicators of possible soil acidification.

Farmers in several Montana counties are experiencing nearly complete yield loss in portions of their fields due to soil acidity (pH below 5.5). Soil acidification is best caught early in order to modify agronomic practices and minimize further crop loss.

In areas that are suspect, test the top 0-3 inches of soil using a field soil pH probe at about 1.5 inches (or sending off for lab analysis). Soil at the edge of poor growth areas should also be analyzed to determine if the pH is close to toxic, but crops do not yet exhibit symptoms. The potential is there for problem areas to grow in size. Areas where pH is 5 to 6 should be managed differently to prevent further acidification.

For additional information on this emerging issue, go to http://landresources.montana.edu/soilfertility/acidif/index.html. Please contact Clain Jones, (clainj@montana.edu, 994-6076) with questions.