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Plant Nutrition TODAY
Better Crops, Better Environment...through Science

From Scientific Staff of the
International Plant Nutrition Institute (IPNI)
3500 Parkway Lane, Suite 550
Norcross, Georgia 30092-2806 USA
Phone: 770-447-0335 Fax: 770-448-0439
E-mail: info@ipni.net Website: www.ipni.net

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WHAT DEPTH SHOULD SOIL BE SAMPLED?

The most common soil sampling depth taken is usually the topsoil or the cultivated layer. This is done for a number of reasons. First, the majority of soil biological activity occurs within the topsoil, or at least the cultivated layer of the soil being farmed. Secondly, this is the easiest layer to sample – considering time, effort, and type of soil sampling equipment required. The depth sampled varies, but is usually the top 6 to 12 in. (0.15 to 0.3 m) of the soil. Lastly, this sampling depth gives a reasonable estimate of the availability of most plant nutrients.

Deeper and multiple layer sampling is used to better estimate residual nutrients under specific crop, soil, and climatic conditions. Deeper sampling depths are usually collected separately by a few depths. For example, when sampling down to 24 in., it can be done in two or three separate samples, specifically 0 to12 and 12 to 24, or 0 to 6, 6 to 12 and 12 to 24 in. This is done primarily to determine the availability of nutrients that are more mobile in the soil, especially N, but can also include S. Specific forms of these soil-mobile nutrients move readily downward with soil water. This is especially important on coarse textured or sandy soils that are irrigated or normally receive ample precipitation.

It can be most important to know the extent of residual N as it can greatly affect crop growth and quality. For example, a shallow soil sample (e.g. 6 in.) may contain low levels of plant-available N, but considerable residual N may be lower in the soil within rooting depth of the crop grown. In crops where excess N can adversely affect crop quality, a shallow soil test may lead to a fertilizer recommendation supplying more N than required for crop yield and quality parameters. An example of a crop adversely affected by excess N is sugar beet, where excess N results in more protein and less sugar in the roots thus resulting in less extractable sugar. Another important reason is to avoid leaching of NO_3-N into groundwater, which can adversely affect drinking water quality from shallow wells used as water sources for livestock and humans. Lastly, residual N can be used by the crop, allowing a farmer to apply less N fertilizer and reduce input costs for the crop being grown.

Knowing the field history can be very useful when deciding how deep to take soil samples. One example I remember was a field near Calgary, Alberta, planted to forage oats to be used for livestock hay. The landowner had recently purchased the field during the winter. Soil sampling was done a few weeks before planting, in early May, to a 6 in. depth. Plant-available N was estimated as deficient, i.e. approximately 10 lb N/A (12 kg/ha), as indicated in the soil test results. An average 4 ton/A oat green-feed hay crop for the area removes about 130 lb N/A, so an additional 120 lb N/A was applied as 240 lb/A of urea (46-0-0) fertilizer before final seedbed tillage and planting. Later in the summer, the oat hay from the field was sampled and submitted to a feed testing laboratory for feed quality analysis. The test results showed that there was an excess level of NO_3-N in the hay and recommended it not be fed to cattle unless mixed sufficiently with low NO_3-containing hay. It was determined that the field had previously been in alfalfa that was plowed down 2 years before the oat crop and fallowed the year previous to planting. Above normal precipitation during the fallow year had leached residual N down below 12 in. This residual N was not accounted for in the 6-in. soil depth sample, but the oat crop roots effectively removed N down to about 36 in. If the person formulating the fertilizer recommendation had known that the field had been plowed down from alfalfa and fallowed for a year, a deeper soil sampling to at least 24 in. could have been done and much of the residual N from decomposing alfalfa roots and stems would have been detected.

There are conditions when deeper sampling can dramatically increase your ability to make an improved fertilizer recommendation. It is useful to check with your local soil test laboratory, a certified crop adviser, or state or provincial extension staff to determine if deeper and multi-layer soil sampling will better help you assess plant available nutrients for specific crop, soil and moisture conditions.

—TLJ—

For more information, contact Dr. Thomas L. Jensen, Northern Great Plains Director, IPNI, 102-411 Downey Road, Saskatoon, SK S7N 4L8. Phone: (306) 652-3535. E-mail: tjensen@ipni.net.

Abbreviations in this article: N = nitrogen; NO_3^- = nitrate; S = sulfur.

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