Dry weather can affect soil sampling and test results

Jim Camberato (765-496-9338, jcambera@purdue.edu) and Brad Joern (bjoern@purdue.edu), Agronomy Department, Purdue University, West Lafayette, IN

The accurate analysis of representative soil samples to determine lime and fertilizer needs is fundamental to crop production. Unfortunately persistent dry weather resulting in prolonged periods of low soil moisture can affect soil sampling depth and potassium (K) soil test levels.

**Sampling depth**

The recommended sampling depth for row crop fields is 8-inches deep. When soils are dry achieving the proper sampling depth becomes difficult. Nutrients and pH levels in soil are stratified with all tillage methods except moldboard plowing. Nutrients tend to be higher at the soil surface due to surface application or shallow placement of fertilizers and the crop recycling of nutrient-releasing residues to the soil surface. Shallow soil sampling typically results in higher than expected nutrient levels.

Soil pH stratification is a function of nitrogen (N) placement and tillage. Lower soil pH arises from N in fertilizer and manure, and from N fixation by soybean. Lime application increases pH and the location of its effects depends on the extent of incorporation. Shallow sampling can over- or under-estimate soil pH depending on the combination of N and lime placement and incorporation.

**Potassium**

Typically soil test K levels are lower than expected in a dry fall. One factor that contributes to low soil test K is that most of the K taken up by the crop during the growing season remains in the residue and has not been returned to the soil by rainfall. This is a larger issue with corn than soybean because corn stover contains much more K than soybean straw. Stover from a 200 bushel per acre corn crop contains 220 pounds of K₂O.
per acre whereas straw from 55 bushel per acre soybeans only contain 35 pounds of K\(_2\)O per acre. For every 100 pounds of K\(_2\)O per acre retained in the stover soil test K in a typical 8-inch deep soil sample would be lowered about 8 to 25 parts per million (ppm) dependent on soil type, texture, and other soil factors.

The amount of K extracted by soil testing methods is altered by dry soil conditions. At low soil test K levels, K extraction overestimates availability. The opposite occurs at high soil test K levels, K availability is underestimated. In essence soil test extraction levels move to the middle with dry conditions. The extent to which this occurs is dependent on a number of soil factors, but first and foremost is the type and amount of clay. In Indiana soils the increases and decreases in soil test level with soil drying generally do not exceed 20 to 30% of the soil test level of moist samples.

Bottom line: Continue soil sampling if a full-depth sample can be attained. Be aware that soil test K levels may differ from what is expected due to the absence of residue K in the soil and changes in soil K extractability arising from dry soils. Utilize previous soil tests, actual K fertilization rates, and yield-based crop removal of K (0.27 lb K\(_2\)O per bushel of corn and 1.4 lb K\(_2\)O per bushel of soybean) to determine if soil K will likely be adequate for the next crop or if fertilization is needed.