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### THE HIGHS AND LOWS OF SOIL TEST POTASSIUM VARIABILITY

**Ever get a soil test result for potassium that looked a little odd?** You're not alone. Soil test potassium levels tend to have some noticeable, and at times dramatic, variability over time. In the Midwest, studies have shown that soil test potassium levels change through the season, peaking in the spring and bottoming out in the fall. Why? Well, there are a number of possibilities. Let's highlight a few.

**Crop removal.** During the season, as crops take up potassium from the soil, levels may decline noticeably. Over time, if less potassium is applied than removed, levels may steadily drop.

**Soil moisture.** How soil moisture affects soil test potassium levels is complicated and is still being researched, but a few studies have hit on an interesting interaction. Many researchers have observed that when soils are dried, soils low in potassium show increases while soils high in potassium exhibit decreases. Seeing this effect is thought to depend not only on soil test potassium level, but also on the types of minerals present.

**Freezing and thawing.** Freeze cycles produce effects akin to wetting-drying cycles. In northern soils, some of the observed increases in potassium levels in the spring may be attributable to this factor.

**Microbial activity.** Some microbes in soils are capable of reducing the positive charge in the iron present in some clay minerals during wet, warm periods. This causes the layers of some minerals to collapse, trapping potassium inside. Microbial activity may be partly responsible for the decreases in soil test levels through the cropping season.

**Nutrient stratification.** This gradient from higher surface potassium levels to lower subsurface levels is prevalent in reduced tillage systems. Rather large gradients can occur over very shallow depths. Ensuring a constant, reproducible probe depth during sampling is essential for reducing year-to-year soil test variability.

**Number of cores in a sample.** Like it or not, a guiding statistical principle is that when the thing you want to sample is more variable, you need a greater number of samples to capture the average level. In our business, that means more cores per sample. For potassium, many would agree it is better to take fewer samples with more cores than more samples with fewer cores.

**Laboratory to laboratory variability.** A single sample sent to multiple laboratories will give you scattered results. In a recent study, variability in ammonium acetate-extractable potassium from lab to lab ranged from 6 to 22% across a range of soils used as standards. Variability across labs is about 40% higher than variability within a lab. The bottom line: Find a reputable lab with good quality control and stick with it.

**Variability is natural, but it is also influenced by what we do along the way.** Do your best to minimize the adverse effects you may have on variability: plan for sampling the same time every year, stay with a quality laboratory, control probe depth, and take plenty of cores per sample. It takes extra time, but the results will be much more meaningful.

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