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NUTRIENT STRATIFICATION AND NO-TILL – IS IT A PROBLEM?

Farmers have adopted conservation tillage practices at a very high rate across the northern Great Plains, a practice we are thankful for each spring when the wind blows. However, a common question asked about no-till seeding systems is whether there is any nutrient stratification due to a lack of soil mixing, and if this stratification is a problem for crop access to soil nutrients?

Nutrient mobility in the soil plays a big role in evaluating stratification. Those nutrients that end up in a chemical form which is mobile, like nitrate and sulfate, generally are less stratified. The less mobile nutrients, like P and K, bind to soil and are primarily found in the surface 6 inches, regardless of tillage practices.

Phosphorus and K have been found to accumulate near the soil surface to a greater degree after 10 years of no-till than with conventional till. In research trials where both P and K were measured, they generally were found to be at a higher concentration in the surface 2 to 3 inches relative to conventional till. In fact, some studies found that the P and K accumulated at the same depth, which also happened to be the depth that the fertilizer had been banded – an interesting finding and confirmation about the low movement of these nutrients.

However, the next important question was this: Did stratification impact nutrient uptake? Studies in northern Alberta and central Montana both reported that when nutrients were stratified in the no-till soil, this did not impact the uptake of the nutrient by the next crop in rotation. In fact, in one instance P uptake was actually improved in the no-till plots. This is good news for those folks who are concerned about the change in soil nutrients with no-till.

Why would stratification of nutrients in no-till fields not impact crop uptake? There are a few factors we need to consider when asking this question. First of all, many research projects have reported that the surface soil moisture in no-till fields is higher than tilled fields. As a result, we would expect more roots to grow in this surface region, one which is also rich in nutrients. Secondly, many of our prairie soils are high in K, and some have residual P from years of application in the seed row. As a result, many of these soils will not show a high response to applied fertilizer P or K. In fact, many farmers are applying P at a rate which replaces what they remove on an annual basis, and rely on the residual nutrients from these bands to support crops for several years to come.

Nutrient stratification is an issue to monitor, but not one to worry about at this time. The results from these three research trials in Alberta and Montana indicate that we do have nutrient stratification occurring in our no-till fields. However, the two that measured crop uptake indicate that this is not a problem to date, but one we continue to closely monitor.

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Abbreviations in this article: P = phosphorus; K = potassium.