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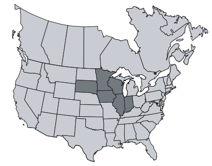

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Keep an Eye on Potassium this Season

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In much of the Corn Belt, native soil K supplies are insufficient for crop growth. In the eastern Corn Belt, a common practice is to use fertilizer to build soil test K up to a level that will not limit crop development and yield, then maintain that level with application rates that are equal to crop removal. Historically, when economic conditions worsen, some farmers have used rates less than those required to build and/or maintain soil supplies or such applications have been omitted entirely.

The regularly scheduled K applications in this fertilization system are often used as a practical approach to managing the variability in soil test K, both across the field as well as over time. When these applications are omitted, variability in soil K supplies becomes more apparent and needs to be monitored closely, to ensure levels at various places within the field do not become yield limiting.

Suggestions for Monitoring K in the Soil-Crop System

Cutting back on K for short term economic reasons reinforces the need to monitor crop K nutritional status more closely, especially given the greater variability that is expected to result. The following are some tips:

- Sample at the same time of year. This helps take out some of the seasonal variability. Switching from fall to spring sampling can introduce significant changes from one sampling period to the next.
- Ensure samples are representative and composed of enough cores. This may require some strategizing. If areas of the field have been inexplicably variable from one year to the next, increasing the number of cores going into those samples may help stabilize some of the variation over time.
- Find a quality lab and stick with it. Staying with the same lab removes the lab to lab variability from the overall year to year variation.
- Find ways to control depth of sampling to ensure consistency. Adding stops to the probe or creating marks are possibilities.
- Keep track of nutrient additions and removals to calculate nutrient budgets. When additions exceed removals, soil test levels are expected to build. When removal exceeds additions, levels are expected to decline.
- Consider setting up some monitoring areas. Places to start are on soils that have been changing in unpredictable ways. Samples of these areas should be taken every year to gain a better understanding of soil test K dynamics. Keeping additional information on these areas, such as moisture conditions at sampling and nutrient budgets, may provide some further insights into the primary causes of variability.
- Scout fields to look for visible signs of nutrient deficiency. In both corn and soybean, deficient plants will typically begin to show yellowed tissue along the edges of lower, older leaves first. If the deficiency persists, more affected leaves will appear at progressively higher positions on the plant.

Causes of Soil K Variability

Variability in soil test K has many causes. A few of the more commonly encountered ones are listed below:

- **Time of year**. Studies in the Midwest have shown that levels are typically lowest in November, rise during the winter, and peak in March. During the cropping season, K levels decline, again reaching their minimum. In some areas of the Corn Belt, crop advisers report that growers are requesting a shift to spring, rather than fall, soil sampling. This shift could cause soil test levels to increase above expectations when compared to samples from previous years' fall samples.
- **Nutrient uptake and removal by crops**. Comparing the amount of K removed to the amount applied is often used as a way to predict the direction of soil test changes in the future. If more K is applied than removed, then a positive budget exists and levels are expected to increase. If application rates are less than removal rates, then soil test levels are expected to decline. How quickly and how much soil test levels will respond to budgets depends on the mineralogical properties of the soil, environmental conditions, and the magnitude of the K budget surplus or deficit.

Abbreviations and notes for this article: K = potassium; ppm = parts per million.

Photo by Terry Wyciskalla, Nashville, Illinois.

Potassium deficiency symptoms appear in these soybeans in an Illinois field in 2008.

Photo by Dr. Carl Crozier, North Carolina State University, and David Hardy and Brenda Cleveland, North Carolina Dept. of Agriculture and Consumer Services.

Potassium deficiency in corn.

- **Release of K from crop residues**. Potassium is not tied up in organic forms in the plant. Therefore, it is easily leached from plant residue with moisture. Consequently, the timing and quantity of precipitation relative to harvest and sampling can affect the K levels measured by a soil test. Soil samples taken immediately after harvest would not detect much of the K contributions from the recently harvested crop's residue. However, later sampling after more precipitation would be expected to capture more of the leached K, leading to higher soil test readings.
- **Soil moisture**. Many advisers have noticed that soil moisture at the time of sampling can greatly affect soil test K results. The reasons behind these changes are not clear, but have been linked to the release of K from interlayer positions of certain clay minerals. This mechanism is likely largely responsible for the seasonal variations discussed earlier.
- **Nutrient stratification**. Nutrient stratification is a gradient of soil test levels with depth. In reduced tillage systems, levels of K can be several hundred ppm greater at the surface than just a few inches down. An important aspect of stratification is the shift in soil test levels not only at the soil surface but throughout the soil profile. Some studies have shown that, relative to more aggressive tillage systems such as moldboard plowing, reduced tillage systems have relatively higher levels near the surface but relatively lower levels deeper in the soil profile.
- **Depth control during soil sampling**. Controlling sampling depth becomes more important as nutrient stratification increases. If samples are taken shallower than recommended, inaccurately high soil test K levels may result. If samples are taken too deeply, the opposite may occur.
- **Number of cores in a soil sample**. A representative sample is critical for assessing soil nutrient status. Soil test K levels can be highly variable within a field. Causes of variability include differences in landscape position, erosion, and management history. Taking a small number of cores results in reduced chances that the sample represents the average fertility of the area. In addition, smaller core numbers lead to greater variability among samples taken from the same area. Consequently, taking too few cores per sample can contribute significantly to the observed year-to-year variability in soil test results, producing random increases or decreases.

Soil test K is known to be variable, both across the field and over years. For this reason, it requires more careful management and a greater attention to detail, especially when regularly scheduled K applications are reduced or omitted. Doing a good job of monitoring K soil fertility is a good investment of time and resources to ensure crops are capable of yielding their full potential. ■

IPNI Crop Nutrient Deficiency Photo Contest—2009

Once again, IPNI opens our crop nutrient deficiency photo contest as part of a continuing effort to encourage the art of field observation and increase understanding of the physical appearance of crop nutrient deficiencies and the varying conditions in which they may appear in the field.

Some specific supporting information is required for all entries, including: the entrant's name, affiliation, and contact information; the crop and growth stage, location, and date of the photo; and supporting and verification information related to plant tissue analysis, soil test, management factors, and additional details that may be related to the deficiency.

There are four categories in the competition: **Nitrogen (N), Phosphorus (P), Potassium (K), and Other**. Entrants are limited to one entry per category (one individual could have an entry in each of four categories). Cash prizes are offered in each of the four categories as follows: First place = US$150.00; Second place = US$75.00; and a Grand Prize of US$200.00 will be awarded to the entry with the best combination of photographic quality and supporting evidence across all categories.

Photos and supporting information can be submitted until December 15, 2009, and winners will be announced in January of 2010. Winners will be notified and results will be announced at the IPNI website.

Entries can only be submitted electronically as high resolution digital files to: >**www.ipni.net/photocontest**<.

Reference #09065