



Q: Last year I fertilized my corn crop with potassium according to a soil test. This year my soybean plants showed potassium deficiency symptoms. Why?

Numerous occurrences of potassium deficiency symptoms were reported for soybean and other crops this growing season. Most of these reports originated in the north and northeast regions of Missouri, but occurred in other regions, as well. Soybeans require relatively large amounts of potassium. Each bushel of grain contains 1.25 pounds of potassium and the supporting stems and leaves contain 0.75 pounds. So, an acre of soybean that yields 45 bushels will contain 90 pounds of potassium. It's alright to fertilize just the corn crop of a corn/soybean rotation as long as you remember to apply enough for both crops and any recommended build up. Assuming that your soil test levels were adequate, potassium deficiency is still a possibility, especially during the dry weather conditions that were common in spring of 2000.

One effect from dry weather is that dry soil conditions inhibit root growth. Potassium moves very slowly within soil, so roots must continually exploit additional soil volume for potassium. If root growth is inhibited by dry soil or compaction, potassium uptake is depressed and deficiency symptoms are expressed in mature leaves.

Perhaps more important is the effect of dry soil on potassium diffusion to root surfaces. Roots actively take up potassium so a potassium concentration gradient (low concentrations near the root, higher concentrations in soil solution about ½ inch from the root) develops. Potassium ion diffusion toward the root surface is stimulated by this gradient. In dry soils, the water film around the soil particles becomes much thinner than in soil at field capacity. The route of the potassium ions becomes much longer and more circuitous as water films shrink. So, not only is root growth slowed, but potassium diffusion is inhibited by dry soil.

The vast majority of the potassium present in Missouri's soil is unavailable for plant growth. Some of the potassium is "fixed" within clay mineral layers and becomes available slowly with time. Dry weather can interfere with the availability of fixed potassium because some types of clay minerals collapse (shrink) when water is removed. The collapsed layers trap the potassium ions. When the soil is wetted, the clay layers move apart and free some of the fixed potassium.

Dry weather and its effects on soil properties contributed to poor potassium uptake by plants. When rain began, new root growth was stimulated and this helped alleviate some of the potassium deficiency symptoms. If potassium deficiency symptoms occur again, you may be tempted to try a rescue treatment with knifed liquid-potassium or broadcast KCl. These applications will probably not improve yield, but research data are limited and definitive recommendations are not possible. However, there is a possibility of harming the crop by root pruning or leaf burning.

Unfortunately, some of the potassium deficiency symptoms reported this year were associated with low soil potassium tests. Some of our producers have reduced fertilizer application rates to reduce input costs and have allowed their soil tests to drop below

acceptable levels. All of our crops, including soybean, require potassium for optimum growth and yield. Even if deficiency symptoms do not appear, yield can still be reduced by inadequate potassium availability (hidden hunger). Proper soil testing and appropriate fertilizer application are essential to profitable soybean production. Soil management practices that prevent root damage such as avoiding tillage of wet soils and other causes of compaction will improve plant health and reduce nutrient uptake problems.