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POTASH RESPONSE ON SOILS TESTING HIGH IN POTASSIUM

Potassium deficiencies are not common on northern Great Plains soils. More than 70% of the soils in this region test high or very high in plant-available potassium. However, growers have reported that high potassium soils often respond to potassium fertilization. The limited mobility of potassium in soil, soil variability, and potassium fertilizer sources can explain these responses.

Potassium is considered immobile in the soil, moving by diffusion from the soil to roots. Diffusion is a slow, short-range process which depends on soil moisture, and to a lesser extent on soil temperature. Prairie soils are frequently cool early in the spring at planting. The colder the soil, the slower the potassium will diffuse, the slower plant roots grow, and the slower potassium will be taken up by roots. Diffusion and the rate of potassium uptake by plants will limit availability, even though the soil tests high in available potassium. Applying low rates of starter potassium (15 to 20 pounds per acre) under these conditions helps increase the soil solution potassium, providing a ready supply for early season plant root access.

Soil nutrients are not uniformly distributed throughout fields, especially with variable topography. Past research using grid soil sampling has shown that fertility levels of many fields are more variable than once thought. This high variability can lead to a soil with a mean potassium level which is considered sufficient, while large areas of the field are in the deficient range. For example, a grid sampling study in Alberta found soil test potassium in a typical field to vary from 59 to 310 parts per million, with a mean of 135 parts per million. Based on this average value, the field did not require potassium fertilizer, yet the grid sampling revealed that 30% of the field needed potassium and another 33% may have need for extra potassium. When collecting a composite sample, it does not take many 300 parts per million samples to inflate the average, leading to an erroneous fertilizer recommendation.

Response on high potassium soil may also be due to the chloride in potash fertilizer. Muriate of potash has an analysis of 0-0-60 or 0-0-62, and contains 50% potassium and 47% chloride. Chloride is a plant nutrient that is often low in Great Plains soils. On-going research on the Canadian Prairies is demonstrating the importance of Cl fertilization in cereal grains, especially for some cultivars. A study on the northern Great Plains showed a response to potassium in only one portion of the landscape. The authors reported a 17 bushel per acre wheat yield increase in the footslope area that had been fertilized with muriate of potash, while no response was recorded in the upper slope position. While the soil had almost 400 pounds per acre of available potassium, the chloride levels were low in the footslope position. Unlike potassium, chloride is very mobile in the soil and easily leached, especially in low-lying areas that accumulate water. This creates variability across the landscape, making the prediction of chloride response difficult.

So the question remains, should potassium be applied to high testing soils? Well, the answer is really a response to your soil test results. If you have high soil test potassium, a response to potassium fertilizer is unlikely. However, if your yields are lower than you expect, you routinely seed into cool soils, and your landscape is variable, you may have the potential for a potassium response. Also, do not forget to ask for a chloride analysis with your soil sample...low soil chloride levels can often explain the response to potash.

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