



Summer 1997, No. 3

### **CAN HIGH POTASSIUM SOILS RESPOND TO POTASH?**

**Potassium deficiency is not widespread in the northern Great Plains.** In fact, more than 70 percent of soils in the region test high in available potassium. Despite this, high potassium soils often respond to potassium fertilization. Potassium movement in soil, natural variability and potassium fertilizer source help explain how this can happen.

**Potassium is considered immobile in the soil. When it moves to plant roots, it does so by diffusion—but soil tests tell us little about this process.** Diffusion is slow, short-ranged, 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 potassium will diffuse, the slower plant roots grow, and the slower potassium will be taken up by roots. Diffusion and rate of potassium uptake limit potassium availability, even though the soil tests high in available potassium. Applying potassium under these conditions helps increase the soil solution potassium, providing a ready source for plant roots.

**Soil nutrients are not uniformly distributed throughout fields.** Grid sampling has shown that soil fertility levels of many fields are more variable than once thought—potassium is no exception. This high variability can lead to incorrect recommendations for potassium, and other nutrients. 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 any potassium fertilizer, yet the grid sampling revealed that 30 percent of the field needed potassium and another 33 percent may need extra potassium. It doesn't take many 300 parts per million samples to inflate the average, leading to an erroneous fertilizer recommendation.

**Response to potash on high potassium soil may be due to the chloride in the potash.** Muriate of potash ...with analysis of 0-0-60 or 0-0-62...is a common potassium fertilizer which also contains 47 percent chloride. Chloride is a plant nutrient that is often low in Great Plains soils. On-going research from Texas to the Canadian Prairies is demonstrating the importance of chloride fertilization in small grain production. And, like potassium, chloride can be highly variable in the soil.

A recent Saskatchewan study reported a 17-bushel yield increase in the footslope area of a wheat field that had been fertilized with muriate of potash. No response occurred in the upper slopes. The soil had almost 400 pounds per acre of available potassium, but chloride levels were low in the footslopes. Unlike potassium, chloride is very mobile in the soil and easily leached, especially in low-lying areas that accumulate water.

**Should potassium be applied to high potassium soils?** Don't ignore the soil test...if it is high, a response to potassium fertilizer is unlikely. But if your yields are lower than you expect, and you routinely seed in cool soils, or you suspect soil potassium levels are variable or that chloride may be limiting, apply some muriate of potash...the results might surprise you.

—TLR—

For more information, contact Dr. Terry L. Roberts, Western Canada Director, PPI, Suite 704, CN Tower, Midtown Plaza, Saskatoon, Saskatchewan, Canada S7K 1J5. Phone (306) 652-3535. E-mail: [troberts@ppi-far.com](mailto:troberts@ppi-far.com).