NEWS & VIEWS

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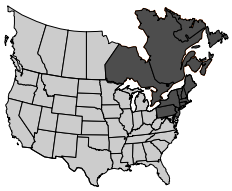

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Potassium Placement for Conservation Tillage Cropping

POTASSIUM (K) nutrition is important in conservation tillage systems. Crop producers using reduced tillage continuously have become concerned about stratification of nutrients, particularly the less mobile nutrients such as K (**Figure 1**). In soils with higher bulk density, it becomes more difficult for plant roots to proliferate, reducing the plant's ability to take up K from the soil. Deficiencies are being observed more frequently in no-till systems, not only in Ontario but in parts of the western Corn Belt as well.

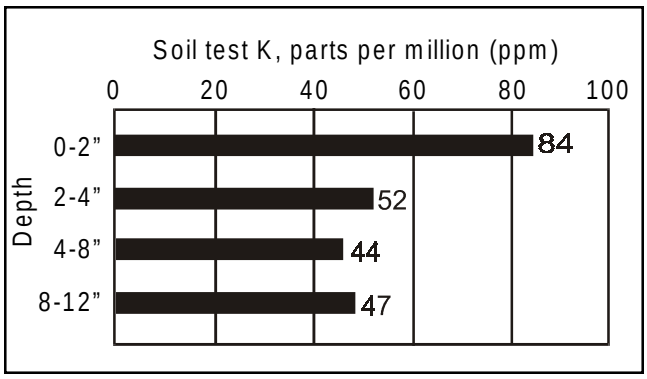

Figure 1. Stratification of soil test K, Paris, Ontario.

Recent research in Ontario, funded by the Ontario Corn Producers Association, Pioneer Hi-Bred Limited, A&L Laboratories, Grow Ontario and PPI/PPIC, has been aimed at determining the impact of reduced tillage on response to K and K placement methods. These trials are being conducted in fields that have been managed under continuous no-till for at least 10 years. So far, two years of trials have demonstrated four important facts:

1. No-till corn can respond more to K fertilization than tilled corn. Compared to corn grown with spring zone-tillage or that grown with mulch tillage (chisel plowing), no-till corn grown in sandy loam soil showed a 13 bushel yield response (**Figure 2**).

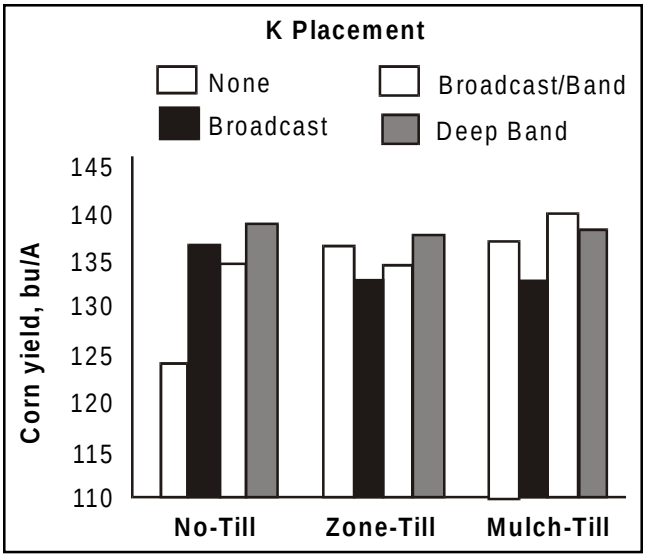

Figure 2. Corn yield response to tillage and K_2O applied at 110 lb/A, Paris, 1997.

Method of application made little difference, whether broadcast, deep banded (6"), or a combination of broadcast and banding. This was likely due to the favorable rainfall received during the 1997 growing season. Results might be very different in a dry year. It appeared that either form of tillage mixed the soil well enough to make soil K from the upper two inches available.

At the same site, five hybrids were compared in a no-till system. Again, there were no differences in placement method. Four hybrids (Pioneer 3820, MAX357, NK3030, & Dekalb 385B) responded strongly to K, but one hybrid (Pioneer 3893) yielded well without adding fertilizer.

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2. Corn responds to both fall-applied and starter K. On a site with clay loam soil, in Kirkton, Ontario, no-till corn responded to K whether broadcast in the fall or supplied in a starter band (**Figure 3**). The same pattern of responses was observed two years in a row, on sites with soil test K showing similar stratification as the Paris site, but at slightly higher levels (all in the medium range). The amount supplied in the starter band was 45 to 54 lb/A of K_2O. Deep placement (6") of K using fall zone tillage did not appear to boost yields. This was unexpected, because fall banding has been found to be the most effective and consistent method of preventing K deficiencies in western Corn Belt conservation tillage systems. When this soil was moldboard plowed, however, responses to both fall and spring applied K were strong. It appeared that the tillage operation in this long-term no-till soil raised the corn yield potential, and the increased growth demanded more K.

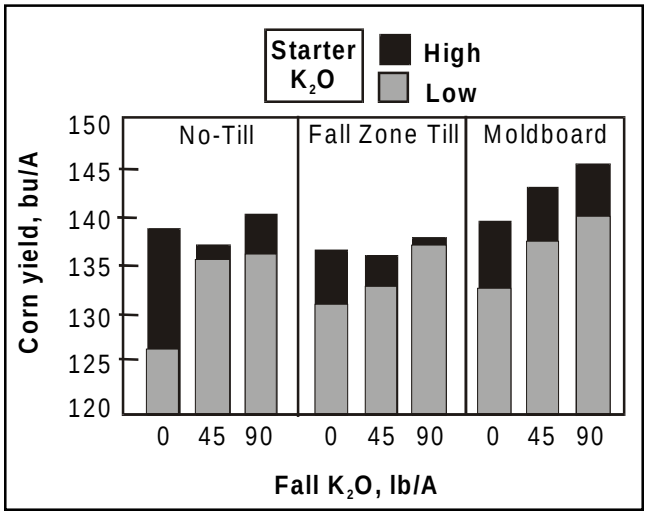

Figure 3. Corn response to tillage and K application, Kirkton, 1996-97.

3. Soybeans respond to residual fertility following corn. In the year following the first of the corn trials at Kirkton, no-till soybeans were planted without any K fertilizer. Yields responded strongly to the K treatments that had been applied to the corn (**Figure 4**), especially where the soil had been plowed prior to corn. On average, soybeans yielded 5 percent more following corn that had received the high level of K starter. Following corn which had been planted into moldboard plowed soil, no-till soybeans yielded 8 percent more in the treatments receiving fall-applied K before the corn. While soybeans are often considered less responsive to K than corn, they remove almost twice as much from the soil as corn grown for grain.

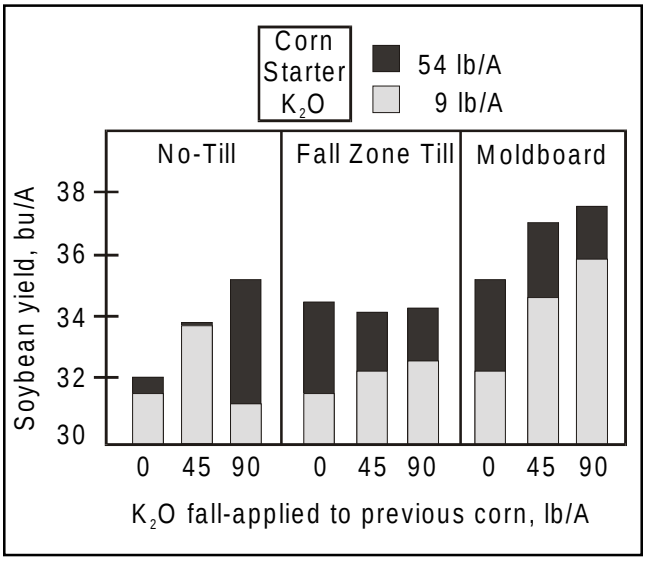

Figure 4. Soybean yield response to K and tillage applied to previous corn, Kirkton, 1997.

4. Results may differ in other conditions. At another location with soils testing high to very high in the top four inches, there were good corn and soybean yields but no responses to the same treatments applied at Kirkton. Also, soil moisture conditions at all sites in 1996 and 1997 were favorable for crop growth. In a drier year, we expect that responses to placement methods would differ substantially.

Summary

Not all soils need revised K management under conservation tillage, but many do. However, insome soils and environments, K nutritional requirements for corn and soybeans grown under no-till systems differ considerably compared to systems with regular tillage. It is clear that soil test levels, tillage methods and hybrid selection all impact optimum K management for most economic yields. ■