Why Is Potash Being Used in Soil with High Potassium Levels?

Application of small amounts (10 to 25 lb K\textsubscript{2}O/A) of potassium chloride (KCl) in the seed-row is becoming an increasingly common practice in the western Canada prairies. This practice has been adopted in response to reported benefits from the Cl portion of the fertilizer. Yield responses to Cl have been attributed to disease suppression, especially in winter wheat. Sometimes, however, a yield increase due to Cl application is observed without any connection to disease suppression. Other potential benefits of placing small amounts of K with the seed include responses to K due to proximity of seedling roots to readily available K in cool springs, reduction in lodging, and promotion of early maturity.

What is the Frequency of Crop Responses to Potash on High Potassium Soils in Western Canada?

During a 10-year period (1989-1998) more than 200 experiments with seed-placed K fertilizer on high testing soils were conducted in the three Prairie provinces (Alberta, Manitoba and Saskatchewan). Table 1 contrasts the frequency and amount of response to a seed-placed application of 13 or 25 lb K\textsubscript{2}O/A in the western Canadian prairies for spring cereals, 50 lb K\textsubscript{2}O/A broadcast on winter wheat, and a
broadcast application rate of 25 lb K₂O/A on all cereal crops in Montana.

Results indicate that barley had the highest probability of giving a yield response to added K in western Canada, with 15 percent of trials showing a 5 to 10 bu/A yield response, and 40 percent of trials having at least a 2 to 5 bu/A response. The frequency of response for spring wheat was lower, with 20 percent of trials having a 2 to 5 bu/A yield increase. The results from Montana indicate that the frequency of response with winter wheat is even higher than spring cereals. This reflects in part the role of Cl in reducing the incidence of physiological leaf spot, a non-disease leaf spotting symptom associated with certain winter wheat varieties. The trials measured kernel plumpness of barley and days-to-maturity and protein of both barley and wheat. However, none of these variables showed any response to the K application.

### Why the Benefits from Seed-Row K Application on Soils with High Potassium Levels?

Our work and the work of other scientists have not fully explained this behavior. We tried to relate apparent yield increases to disease suppression by the Cl portion of the fertilizer, soil type, previous crop, and climatic or regional conditions, but could not come up with either a consistent trend or sometimes any trend at all. However, we could establish a very strong relationship between frequency of response to KCl and barley variety. This provided us with an indirect link between response and disease resistance. Varieties with lower disease resistance, such as Harrington, showed a 2 to 5 bu/A yield increase 50 percent of the time and a 5 to 10 bu/A increase 20 percent of the time. However, varieties with superior disease resistance, such as Leduc, Stander or Manley, did not respond as frequently.

### Conclusion

Certain barley varieties grown on western Canadian prairie soils containing high available K levels do respond to seed-row applied KCl every two to three years out of five. We were unable to associate this response with soil Cl levels, root rot infection, climatic conditions, soil type, or previous crop. This type of response was less likely with hard red spring wheat (less than two out of five years). We are also unable to establish a benefit of seed-row KCl placement on decreasing days to maturity and grain protein or increasing plumpness of malting type barley. However, from both agronomic and economic perspectives and because we still cannot fully explain this behavior, K applications on soils containing high levels of available K are strongly recommended only with barley varieties that appear to be susceptible to disease.

---

**Dr. Karamanos is Manager, Research & Market Development, and Mr. Flore is Manager, ACES Program, Westco Fertilizers Ltd., Calgary, Alberta.**