Corn leaf potassium deficiency symptoms

Potassium (K) leaf deficiency symptoms have recently appeared in some cornfields. Early-season symptoms typically show when corn begins rapid growth, calf to knee-high (V6-V8 growth stages), and the K uptake rate accelerates as plant demand responds to this rapid growth. Because K is maintained in the plant in the K+ ion form, it is readily moved from older tissue to the growth regions, hence deficiency symptoms appear on the older leaves. On corn, symptoms show as yellowing to necrosis of the leaf margins on older leaves. Symptoms begin at the leaf tip and progress down the margin toward the leaf base. Do not confuse this with nitrogen deficiency symptoms, which also appear on older leaves (but move down the leaf midrib from the leaf tip toward the leaf base). Several factors can lead to expression of leaf K deficiency symptoms.

Deficiency of plant-available K in the soil

Soil testing, including testing soil from affected and nonaffected areas, can identify plant-available K deficiency. With the wide variation in soil K test levels often found within fields, it is possible to have deficient soil areas in fields that overall test adequate. Soil testing and K fertilization can help avoid deficiencies in the future. Also, on-farm research trials being conducted by Antonio Mallarino and his research group have often shown yield increase to K application on deficient soils without expression of K deficiency symptoms.

Potassium deficiency symptoms on lower corn leaves.

Enlarge [1]

Tillage-induced potassium deficiency in corn.

Enlarge [2]

Tillage-induced potassium deficiency in corn.

Enlarge [3]

Soil conditions other than K deficiency

Many other factors can influence plant K uptake and hence expression of K deficiency. These factors typically affect root growth, root mass, or root/plant health. In essence, they reduce root activity. Unfortunately, the symptoms (like K deficiency or stunted plants) often only become visible some time after initial occurrence of the problem. Potassium uptake by plants is an active process and thus requires an active root system with roots that can explore soil and intercept plant-available K. Therefore, things that impede uptake can result in a deficient K supply within the growing plant, K relocation, and expression of K leaf symptoms. Although probably not a reason for deficiencies this year, dry surface soil conditions have induced K deficiencies in other years (see June 26, 2000, ICM newsletter article [4]). In the past, reports of K deficiency symptoms have been common in ridge-tillage and no-tillage corn. Localized compaction, dry-hard soils, seed furrow side-wall compaction, and shallow seed planting depth all can result in stunted root systems and expression of K deficiency.

Plant pathogens

Plant pathogens have affected corn plants in some fields this year (see June 24, 2002, ICM newsletter article [5]). Reports by Gary Munkvold (Department of Plant Pathology), Antonio Mallarino and his graduate students, several ISU Extension field specialists-crops, and industry agronomists have indicated seedling, root, and crown diseases have stunted plants, severely reduced effective rooting, and induced leaf K deficiency symptoms. In these plants, deficiency is showing regardless of soil K test; however, deficient soil K can aggravate the expression of deficiency.

What to do?

Broadcasting K after observation of deficiency symptoms is unlikely to help corn recover or offset potential yield loss, especially when plant/root diseases or soil conditions are the main issue. Foliar fertilizing K is not likely to either provide adequate K to the plant or be an economical treatment. Soil testing in affected and nonaffected areas can help determine future K fertilization needs or whether a change in K application method may be needed (for example, deep banding K in ridge-tillage and no-tillage; see August 18, 2000, ICM newsletter article [6]). Managing soils using methods to promote good rooting and use of planting techniques to ensure rapid seedling growth, including seed treatments, should be helpful.

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Links:
[1] http://www.ent.iastate.edu/imagegal/plantpath/corn/kdeficiency/sawyer1mc-007.html
[2] http://www.ent.iastate.edu/imagegal/plantpath/corn/kdeficiency/sawyer1ae-309.html
[3] http://www.ent.iastate.edu/imagegal/plantpath/corn/kdeficiency/sawyer1ae-311.html
[4] http://www.ipm.iastate.edu/ipm/icm/2000/6-26-2000/kdef.html
[5] http://www.ipm.iastate.edu/ipm/icm/2002/6-24-2002/cornseedling.html
[6] http://www.ipm.iastate.edu/ipm/icm/2000/9-18-2000/deepband.html

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