GEORGIA

Potassium Deficiency in Cotton Linked to Leafspot Disease

By Glen Harris

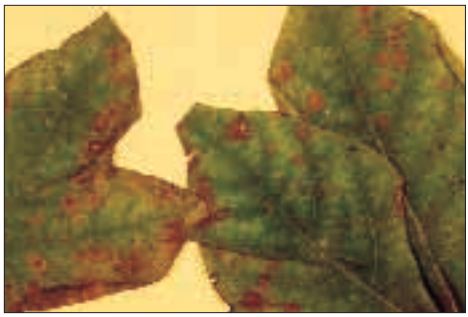
Late-season K deficiency and associated leafspot are not new to Georgia cotton. However, over the past few years, this problem has occurred more frequently, more severely and much earlier in the growing season. In some worst cases, cotton was totally defoliated soon after the fourth week of bloom.

The first indication of this problem was actually the discovery of a new leafspot for Georgia – *Stemphylium*. It is estimated that 2,000 acres of Georgia cotton were infected with this new disease in 1995 and up to 20,000 acres in 1996. The symptoms of leafspot are small brown lesions caused by the fungal organisms *Cercospora* and *Alternaria* in addition to *Stemphylium*. Upon further investigation, it was discovered that the leafspot was actually secondary to the primary problem – K deficiency. It is well known that K adds strength to plant leaf cells and the lack of K in leaf cells makes them weak and susceptible to secondary fungal infection.

Cotton is sensitive to potassium (K) deficiency. Almost every case of leafspot investigated in recent Georgia studies involved low soil K, low petiole K, and/or low plant tissue K.

In almost every case where leafspot was investigated, low soil K, low plant tissue K and/or low petiole K was discovered. Low petiole K appeared to be the best indicator. In some cases the problem was traced back to inadequate K fertilization. Some cases were under dryland conditions where low soil moisture was suspected of reducing uptake of K. Some cases occurred on short-season varieties where intense demand for K in a short period of time was suspected as the main problem. A few cases occurred with high soil magnesium (Mg) levels which were thought to have caused competition for K uptake and subsequent K deficiency. The majority of cases, however, were discovered on full season varieties under irrigation around the fourth week of bloom with heavy fruit set. This timing and situation correspond with a heavy demand for K. The roots of the cotton plant also start to decline at this

Leaf cells of K-deficient cotton are weak and susceptible to secondary fungal infections. Nearly every case of leafspot disease reported in Georgia during the past two years was found to be due to low plant K. Disease symptoms are shown here on K-deficient cotton leaves.



These cotton leaves show symptoms of *Stemphylium* leafspot and K deficiency.

time due to competition for carbohydrates by developing bolls. This adds to the challenge of taking up soil K at this time. Even with irrigation, adequate water may not have been provided during a critical dry period, or with adequate water, may have contributed to higher yield conditions and K demand.

Once K deficiency sets in and leafspot appears, fungicide sprays do not alleviate the condition since the primary problem is K deficiency. If K deficiency is detected around the fourth week of bloom and is not severe, foliar K sprays may lessen yield effects. Petiole testing could also help avoid this problem, since it is designed to predict nutrient deficiencies up to two weeks in advance, especially as the crop moves toward peak bloom. Unfortunately, if severe K deficiency occurs late (sixth week of bloom) foliar K sprays will likely not correct the problem. Also, K deficiency and leafspot are fairly common once cotton "cuts-out". No corrective treatment is recommended at this time.

Best Management Practices to Avoid Potassium Deficiency

- **Soil Testing** – The first and best line of defense for avoiding K-deficient cotton is soil testing. Maintaining soil test K levels in the medium to high range for cotton is recommended. Also keeping a good balance of other nutrients such as calcium (Ca) and Mg will help.
- **Split K Applications** – Since K is relatively mobile in sandy soils, split applications are recommended on soils with no clay subsoil in the top 16 inches. Apply half the K at planting and the remainder at side-dressing, sometime around the first square. This helps supply K at a time when demand increases rapidly and may even be helpful on "stiffer" soils.
- **Foliar Fertilization and Petiole Testing** – In most cases where soil K levels are maintained at medium to high levels, preplant soil applications of K fertilizer should provide enough K so that foliar applications will not be necessary. There are a number of cases, however, where a yield response to foliar applications may occur: deep sands, low-soil K at planting, high yield irrigated conditions, and during periods of limited soil moisture. The best way to determine the need for foliar K is by petiole testing. A complete petiole testing program is designed to predict nutrient deficiencies up to two weeks in advance, before any yield reductions due to deficiencies occur.

Excessive fertilizer rates should not be used as a strategy to avoid K deficiency. Other problems can result from nutrient imbalance. Getting back to the basics of soil testing, proper fertilization, and petiole testing should help eliminate K deficiency as a cause of yield reduction for cotton in the future. BC

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