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From Scientific Staff of the
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POTASSIUM NUTRITION FOR COTTON

Grower interest in K fertility of cotton is very high heading into the 2008 growing season. This interest was evident at the recent Beltwide Cotton Conference, when a special session on K fertility was standing-room-only. The increased concern is likely because growers are reporting K deficiency showing up in fields where it had never been a problem before. Higher-yielding varieties, earlier-maturing varieties, and recent weather patterns have been cited as possible explanations for the increased frequency of K deficiency in cotton.

A 2-bale cotton crop will take up approximately 140 lb K_2O/A (70 lb/bale), 40 lb (20 lb/bale) of which will be removed at harvest. As yields have increased across the region due to new varieties and better management, growers that have typically applied 30 to 50 lb K_2O/A annually may be surprised to find their soil test levels dropping. Heavier boll loads have increased the demand for K even more, with uptake rates being as high as 3 lb K_2O/A/day during fruiting. Research in Tennessee demonstrated that the recommended rate of 60 lb K_2O/A was adequate for late-maturing varieties, but lint yield was reduced in an early-maturing variety. Increasing the K rate to 120 lb K_2O/A increased the yield of the early variety to that obtained using the later-maturing variety. The lint yield of the later-maturing variety was not affected by increasing the K rate. These results suggest that yield of early-maturing cotton varieties may not be maximized at recommended K rates and that increased K fertilization may be necessary for optimal yield response.

Although K is bound to soil surfaces, it can be lost through leaching. This potential for loss has led many states growing cotton on coarse-textured soils to investigate splitting K applications. Work in Virginia on a sandy Coastal Plain soil demonstrated a 138-lb lint/A yield increase when K was split between planting and early square. Recommendations from Mississippi also suggest that there are situations where splitting K applications might be beneficial; however, research in Georgia resulted in a yield decrease when K was split. The Georgia researchers did note that deep sands (no subsoil clay within the top 20 in.) might be more responsive to split applications. The consensus recommendation appears to be to apply the recommended K rate at planting on low to medium K-testing soils then follow with a petiole or leaf analysis later in the season.

Responses to foliar K applications throughout the cotton belt have been variable. Researchers agree that foliar applications should be used as a supplement to…not a replacement for…a good soil-based fertilization program. The most common conditions where a yield response to foliar K applications is likely to occur include deep, sandy, low organic matter soils, low soil K at planting, high-yield, irrigated conditions, and during periods of limited soil moisture. Work in Tennessee indicates that responses may also differ among tillage systems.

By the time K deficiency symptoms appear in the leaves, all other plant parts have been affected. Potassium affects lint quality (micronaire, length, and strength), water use efficiency, enzyme functions, and reduces the incidence and severity of wilt diseases. Petiole or leaf analysis can identify K deficiencies up to two weeks in advance of any yield reductions and can also be used to determine the need for sidedress or foliar K applications. The best defense against K deficiency in cotton is a combination of soil testing, tissue testing, and proper fertilization.

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Abbreviations: K = potassium.