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COTTON NUTRITION AND FERTILIZATION

A major factor affecting both cotton yield and quality is the availability of adequate and balanced nutrition. Soil nutrients are taken up by cotton in direct proportion to growth and temperature, with total nutrient uptake for nitrogen (N), phosphorus (P) and potassium (K) tracking cumulative heat units.

Nitrogen is essential for the development shoots, buds, leaves, roots, and bolls. Cotton takes up about 60 lb of N for each 480 lb bale produced, although it should be noted that N uptake figures can vary considerably. Uptake is limited early in the season prior to squaring, with the majority of N taken up after first bloom. A good N management scheme consists of three fundamental segments: 1) supply about 10 to 20% of the total seasonal N fertilizer need before bloom, 2) supply the remaining needed N during the 60 to 75 day boll development period, and 3) deplete soil N for an abrupt N deficiency to help mature the crop for harvest (*Hake et al., 1991. Cotton Physiology Today, Vol.2, No. 3*). Since cotton is an indeterminate perennial, too much N late in the season may cause excessive vegetative growth and should be avoided. When planning N fertilization other sources of N such as residual soil N and N in irrigation water should be accounted for.

Phosphorus is important in early root development, photosynthesis, cell division, energy transfer, early boll development, and hastening of maturity. About 25 to 30 lb of P_2O_5 is taken up per bale of cotton produced. Placement of P fertilizer is not as important as in the production of some other crops; however, banding P can be advantageous in some situations such as in reduced or no-till production or under compacted soil conditions. Insufficient P results in dwarfed plants, delayed fruiting and maturity, and reduced yield.

Potassium is an especially important nutrient in cotton production. It reduces the incidence and severity of wilt diseases, increases water use efficiency, and affects fiber properties like micronaire, length and strength. It is important in maintaining sufficient water pressure within the boll for fiber elongation, and for this reason bolls are a major sink for K. Cotton takes up about 60 lb of K_2O per bale. The need for K increases dramatically during early boll set, and about 70 percent of uptake occurs after first bloom. Potassium deficiency may be expressed as a full season deficiency, or it may not appear until late season since this is the period of greatest demand. A shortage of K compromises fiber quality and results in plants that are more susceptible to drought stress and diseases. Preplant applications of K fertilizer, and in some cases mid-season foliar applications, are effective in correcting deficiencies.

Recent work in Central and Gulf Coast areas of Texas has demonstrated the importance of cotton K nutrition (*Spiegelhauer et al., 2014. Great Plains Soil Fertility Conference, Vol. 15: 212-216*). In this work multiple rates of preplant banded (4 in. to side of row and 6 in. deep) and broadcast incorporated applications of K are being compared. Potassium application has had a considerable impact on both lint yield and quality in this study. For example, after considering yield and loan price (quality) from the 2013 season the average (two sites) return on investment from the banded 40 lb K_2O/A rate was US$148.

Secondary elements and micronutrients may also be critical to profitable cotton production. For example, cotton responds to trace elements like zinc and boron where these nutrients are deficient.

Good nutrient management can result in higher cotton yields, improved fiber quality, greater water and nutrient use efficiency, and more profit. Soil and plant analyses, field history, and experience should all be considered when planning fertility programs.

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