

THE COTTON LEAF CUTICLE AND ABSORPTION OF FOLIAR-APPLIED CHEMICALS

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Abstract

The leaf cuticle constitutes the main barrier against adverse environmental stresses and to chemical penetration of foliar-applied agrochemicals. However, inadequate information exists about this vital barrier and the role it plays in the efficient penetration of agrochemicals. The field studies summarized here were designed to characterize the cotton leaf surface, the effects of water-deficit stress, and the absorption of foliar-applied fertilizers, defoliant and plant growth regulators. The cuticle constitutes a continuous waxy covering over the underlying epidermis, interspersed with numerous stomates and trichomes. The epicuticular layer of predominantly lipid material is superimposed above the cuticle. Water-deficit stress changed the composition to more long-chain, high molecular weight waxes resulting in a more hydrophobic cuticle and reduced fertilizer and defoliant penetration. For example, there was a 34 percent decrease in penetration of a labeled defoliant. These studies show the dynamic nature of the leaf cuticle and the need for this to be taken into consideration for efficient use of foliar-applied chemicals. Foliar-application of chemicals, including fertilizers, is a common practice in crop production. However, the performance of some of these foliar-applied chemicals, in cotton for example, has often been disappointing with inconsistent results experienced. The reasons for this have been associated with environmental conditions, crop conditions and the nature of the chemical applied. However, little attention has been given to the dynamic nature of the leaf surface and how this affects the uptake of foliar fertilizers.