

# **ABSORPTION, TRANSLOCATION AND METABOLISM OF ORTHENE® IN COTTON**

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## **Abstract**

It has been previously reported that acephate (Orthene®) is systemically active and is metabolically converted to methamidophos in cotton plants. The current study seeks to quantitatively determine the extent of absorption, translocation and metabolic conversion of acephate in cotton following several standard methods of application. Cotton plants, cv Delta Pine 655BR, were grown from seed in a greenhouse and treated at the 4<sup>th</sup> fully-expanded leaf stage with both technical acephate and <sup>14</sup>C-labelled acephate. Application methods included a directed spray to the stem, overhead (foliar) spray to the leaves or soil-drench at the base of the plants. Plants were harvested 24, 48 or 72 hours after treatment. Three replicate plants from each treatment were harvested and quick-frozen. From these the <sup>14</sup>C-acephate species were extracted and analyzed by thin layer chromatography followed by liquid scintillation chromatography. Four replicate plants from each treatment were pressed and dried for autoradiography, then ground and oxidized in a biological oxidizer and analyzed using liquid scintillation chromatography.

Autoradiographs showed that acephate was rapidly absorbed and rapidly translocated in cotton, with the greatest level of translocation from directed-spray or soil-drench treatments. Both absorption and translocation were slower following foliar application. These results were quantitatively confirmed following partition and oxidation of the same plants. <sup>14</sup>C-acephate was found to be very evenly distributed in the plants after 48 hours in the plants treated by directed spray. Similarly, uptake and thorough translocation occurred rapidly following treatment by soil-drench. Both absorption and translocation out of the treated leaf were slower following foliar application, though absorption was nearly complete after 72 hours.

TLC-separation of acephate species showed that in cotton a much higher percent of acephate is converted to methamidophos than was previously reported. Following directed-spray application about 40% of the <sup>14</sup>C labeled material in leaves was shown to be methamidophos after 24 hours. Following foliar application more than 90% of the acephate in leaves was converted to methamidophos while less methamidophos was found in other plant parts. Following soil-drench application most of the acephate in leaves and meristem tissue was found to be methamidophos. From soil drench and directed application data, it appears that acephate is readily translocated in the xylem tissues and converted to methamidophos in leaf and meristematic tissues. Conversely, there was limited movement out of treated tissues from foliar applications and this movement appears to be restricted to methamidophos.