

**PHYSIOLOGICAL BASIS FOR COTTON TOLERANCE TO  
VALOR APPLIED POSTEMERGENCE-DIRECTED**

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**Abstract**

Previous research has shown that Valor, a herbicide being developed as a postemergence-directed spray (PDS) treatment in cotton, has the potential to injure cotton that is less than 30 cm tall if it contacts green stem material due to rain splash or misapplication of a PDS treatment. In response to this concern, the influence of plant growth stage and harvest time on the absorption, translocation, and metabolism of  $^{14}\text{C}$ -Valor in cotton was investigated. To evaluate whether growth stage influenced absorption, translocation, and metabolism, cotton plants at 4, 8 or 12-leaf growth stages were treated with  $^{14}\text{C}$ -Valor on a 5-cm<sup>2</sup> section of stem simulating a postemergence-directed spray (PDS) application. Plants were harvested 4, 24, 48, and 72 hours after treatment (HAT) and divided into the treated stem, mature leaves, immature leaves and buds, remainder of the untreated stem, roots, fruiting branches (including the leaves on the fruiting branch), squares, and bolls. Total  $^{14}\text{C}$  absorbed at 72 HAT was 77, 76, and 95% of applied at 4, 8, and 12-leaf growth stages, respectively. Cotton at the 12-leaf stage absorbed more  $^{14}\text{C}$  within 48 HAT than was absorbed by 4 or 8-leaf cotton at 72 HAT. A majority (31-57%) of applied  $^{14}\text{C}$  remained in the treated stem for all growth stages and harvest times. Treated cotton stems at all growth stages and harvest times contained higher concentrations (Bq/gram tissue dry wt.) of  $^{14}\text{C}$  than any other tissue except at the 12-leaf stage 4 HAT which had less. Valor metabolites made up less than 0.05% of the applied radioactivity and less than 5% of the radioactivity found in the treated stem. These data suggest that differential absorption and translocation at various growth stages is the basis for differential tolerances by cotton to Valor applied PDS. In cases where injury is observed on chlorophyllous green stem cotton after Valor is applied as a PDS, the most likely cause is high local concentrations of Valor on the treated stem area due to lower absorption into the stem and lower redistribution throughout the plant compared to older cotton. In older cotton plants with a bark layer on the lower stem, less injury may be observed in part due to more rapid translocation out of the treated stem area. Also, lower concentrations found in the treated stem due to the increased mass of an older cotton plant, and continued absorption of applied Valor into the stem from the surface may dilute Valor concentration which reduces injury potential.