# COTTON (*GOSSYPIUM HIRSUTUM*) DEFOLIATION AS AFFECTED BY DROPLET SIZE AND CARRIER VOLUME

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## Abstract

From 2018 - 2020, a field experiment was conducted to evaluate the effect of carrier volume and spray droplet size on the efficacy of cotton (*Gossypium hirsutum*) defoliation programs. This experiment was conducted at the R.R. Foil Plant Science and Research Center in Starkville, Mississippi and at the Black Belt Branch and Experiment Station in Brooksville, Mississippi. Eight-row (7.7m x 12.1m) plots were planted to DP 1646 B2XF. Initial harvest aid applications were made at 60% open boll, and secondary applications to select plots occurred 12 days later.

Applications were made with a Capstan® Pinpoint Pulse-Width Modulation (PWM) sprayer on a high-clearance Bowman Mudmaster at a speed of 14.5 km hour$^{-1}$. This experiment utilized two carrier volumes: 47 and 187 L ha$^{-1}$, and three droplet sizes: 200 µm, 500 µm, and 800 µm. Defoliation materials included: thidiazuron (TakeDown® SC) applied at 0.15 kg ha$^{-1}$, ethephon (BollBuster®) applied at 1.5 kg ha$^{-1}$, tribufos (Folex® 6EC) applied at 0.37 kg ha$^{-1}$, and pyraflufen-ethyl (ET®) applied at 0.105 kg ha$^{-1}$. Defoliation programs included: [1A] thidiazuron + ethephon and [1B] thidiazuron + ethephon + tribufos, [2A] 1A + pyraflufen-ethyl + ethephon, and [2B] 1B + pyraflufen-ethyl + ethephon.

Visual ratings were taken at 3, 7, and 10 days after application (DAT) for both A and B applications, and included open bolls, green leaves, defoliation, desiccation, and terminal regrowth and basal regrowth. All ratings were normalized to the non-treated control. The center two rows were mechanically using a spindle picker modified for plot research, and seed cotton samples for each plot (4.5 kg) were sent to the University of Tennessee in Jackson, TN for ginning. Fiber quality was determined by the USA classing office in Memphis, TN.

The experimental design was a factorial arrangement of treatments within a randomized complete block and included four replications, each with a non-treated control. Data were analyzed in SAS v. 9.4 using PROC MIXED. Means were separated using Fisher's Protected LSD at an alpha level of 0.05. Results did not vary across year or location and were therefore pooled across these factors.

No affect was observed on seedcotton yield or fiber quality, and, therefore, our conclusions are based solely on defoliation efficacy. We conclude that cotton defoliation efficacy to be positively and negatively correlated with carrier volume and spray droplet size, respectively. Additionally, independent of all other factors evaluated in this study, we observed a secondary application of pyraflufen-ethyl + ethephon + crop oil to significantly improve defoliation efficacy over single applications alone. Finally, correlation analyses revealed that maximum defoliation efficacy occurred from secondary applications to plots with apparently sub-optimal defoliation following the first application.

As such, we conclude that maximum defoliation efficacy is achieved from cotton defoliation programs consisting of two-applications, each consisting of high carrier volumes and fine spray droplet sizes. However, for maximum profitability and ROI, we conclude that lower carrier volumes have utility in cotton defoliation programs to substantially reduce all input costs associated with defoliation applications, thereby maximizing efficiency, profitability, and economic ROI.