PALMER AMARANTH (*AMARANTHUS PALMERI*) AND THRIPS (*THRIPS SP.*) CONTROL WITH VARIOUS DICAMBA + INSECTICIDE TANK-MIXES IN COTTON (*GOSSYPIUM HIRSUTUM*)

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Abstract

In 2018 and 2019, a field experiment was conducted to evaluate the effect of carrier volume and spray droplet size on the efficacy of dicamba + insecticide tank mixtures to control both Palmer amaranth (*Amaranthus palmeri*) and thrips (*Thrips sp.*) in cotton (*Gossypium hirsutum*). This experiment consisted of two field locations: the Delta Research and Extension Center in Stoneville, Mississippi, and Hood Farms in Dundee, Mississippi. Four row plots were planted with a single cotton variety: DP 1646 B2XF, and plot dimensions were 3.9m x 14.2m (Stoneville, MS) and 3.8m x 9.1m (Dundee, MS). Applications were initiated when cotton reached the 4-leaf growth stage.

Applications were made with a Capstan Pinpoint Pulse-Width Modulation (PWM) sprayer on a high-clearance Bowman Mudmaster at a ground speed of 14.5 km hour^{-1}. A single formulation of dicamba: (XtendiMAX® with VaporGrip) applied at 1.5 kg ha^{-1}, and two insecticides: acephate (Acephate 97UP) applied at 0.2 kg ha^{-1}, and dimethoate (Dimethoate 4EC) applied at 0.4 kg ha^{-1} were chosen. This experiment utilized two carrier volumes: 140 and 280 L ha^{-1} and two droplet sizes: 200µm and 800µm.

Pesticide - Carrier Volume - Droplet Size treatment combinations included [1] dicamba-141 L ha^{-1}-800 µm, [2] dicamba + acephate-141 L ha^{-1}-800 µm, [3] dicamba + dimethoate-141 L ha^{-1}-800 µm, [4] dicamba + acephate-280 L ha^{-1}-800 µm, [5] dicamba + acephate-280 L ha^{-1}-800 µm, [6] acephate-141 L ha^{-1}-200 µm, [7] acephate-141 L ha^{-1}-800 µm, [8] dimethoate-141 L ha^{-1}-200 µm, [9] dimethoate-141 L ha^{-1}-800 µm. Each replication contained both a weed/pest free check in addition to an untreated control.

Visual thrips damage ratings (1-5) and thrips counts (adults and nymphs) were taken at 1, 3, and 7 days after treatment (DAT). Visual Palmer amaranth control (0-100) was evaluated at 7, 14, 21, and 28 DAT, and visual cotton injury (0-100) was rated at 7, 14, and 21 DAT. Seed cotton yield was collected using a spindle picker modified for plot research. Additionally, 25 boll -samples were collected prior to mechanical harvest and ginned on a laboratory micro-gin to determine lint turnout.

The experimental design was a randomized complete block and data were analyzed using PROC MIXED in SAS v. 9.4. Means were separated using Fisher's Protected LSD at an alpha level of 0.05. In 2018 and 2019, Palmer amaranth was not present at the Stoneville location. Conversely, due to poor seed germination no thrips data were obtained in Dundee for 2019. Palmer amaranth control varied due to year, and Thrips control varied due to both year and location. Therefore, these data were ran as site year and are presented as such.

For Dundee, Mississippi in 2018, immature thrips counts 7 days after treatment (DAT) varied due to treatment ($p = 0.001$). All treatments reduced immature thrips at least 62% relative to the non-treated control. Additionally, all treatments resulted in the same level of control as the pest free control. For Stoneville, MS in 2018, immature thrips varied due to treatment ($p = < 0.0001$). All treatments reduced immature thrips at least 90% relative to the non-treated control. Additionally, all treatments resulted in the same level of control as the pest free control.

For Dundee, Mississippi in 2018, visual Palmer amaranth control varied due to treatment ($p = <.0001$). All treatments resulted in greater Palmer amaranth control than the non-treated control. Dicamba + acephate or dimethoate applied at 280 L ha-1 provided 14% greater Palmer amaranth control than dicamba + dimethoate at 140 L ha-1. For Dundee, Mississippi in 2019, visual Palmer amaranth control varied due to treatment ($p = <.0001$). All treatments resulted in greater Palmer amaranth control than the non-treated control. Additionally, each dicamba + insecticide tank-mix resulted similar levels of Palmer amaranth control as dicamba applied alone.

For Thrips treatments, seed cotton yield varied due to site year ($p = \leq 0.0001$) and was at least 72$ (3068 kg ha^{-1}) higher in Stoneville than Dundee. Seed cotton yield for Dundee was not obtained in 2019 due to wet conditions at harvest. For Palmer amaranth treatments, seed cotton yield varied due to treatment ($p = 0.0003$). All treatments resulted in higher yields than the non-treated control. Additionally, all treatments resulted in similar yield to the weed-free control.

These indicate that Thrips control did not vary due to tank mix, droplet size, or carrier volume. Additionally, these data indicate that dicamba + insecticide tank-mix and carrier volume had no effect on Palmer amaranth control. However, our results show no single treatment resulted in control of Palmer amaranth or Thrips similar to the Pest or Weed Free controls, respectively. As such, while pesticide efficacy was not negatively impacted due to the parameters in this study, these data indicate that Palmer amaranth and Thrips control are likely not achieved with a single application.