DROPLET SIZE IMPACT ON ACIFLUORFEN AND LACTOFEN EFFICACY FOR PALMER AMARANTH (*AMARANTHUS PALMERI* S. WATS) CONTROL

L.X. Franca
D.M. Dodds
J. McNeal
S.S. Davis
J.J. Williams
B. Norris
Mississippi State University
Starkville, MS
G.R. Kruger
T.R. Butts
University of Nebraska
Lincoln, NE

Abstract

Widespread occurrence of glyphosate and ALS-resistant Palmer amaranth has led to increased use of protoporthyrinogen oxidase (PPO) inhibiting herbicides. Lactofen and acifluorfen are non-systemic, PPO-inhibiting herbicides used to control several annual broadleaf species in soybeans, cotton, and peanuts. Concerns exist with regard to the dissemination of Palmer amaranth populations resistant to PPO-inhibiting herbicides across the Midwestern and Southern United States. Palmer amaranth populations resistant to PPO-inhibiting herbicides have been reported in Arkansas, Tennessee, Illinois, and Mississippi. Therefore, efficacious and cost-effective means of application are needed to maximize lactofen and acifluorfen effectiveness.

Experiments were conducted in 2016, 2017, and 2018 across three locations in Mississippi and Nebraska to evaluate the influence of droplet size on lactofen and acifluorfen effectiveness for Palmer amaranth control. Lactofen (Cobra®, Valent U.S.A., Walnut Creek, CA 94596-8025) was applied at 0.21 kg ai ha^{-1} + crop oil concentrate (Agri-Dex®, Helena Chemical Company, Collierville, TN 38017) at 1% v/v and acifluorfen (Ultra Blazer®, United Phosphorus Inc., King of Prussia, PA 19406) at 0.42 kg ai ha^{-1} + crop oil concentrate (Agri-Dex®, Helena Chemical Company, Collierville, TN 38017) at 1% v/v using the following droplet sizes: 150, 300, 450, 600, 750, and 900 µm. Prior to experiment initiation, droplet size spectra for each herbicide was characterized in a low speed wind tunnel at the Pesticide Application Technology Laboratory at University of Nebraska, North Platte, NE. Treatments were POST applied to 15 cm Palmer amaranth using a tractor mounted sprayer equipped with a CAPSTAN® AG Pulse Modulated Sprayer (Capstan Ag Systems, Inc., Topeka, KS) and Wilger Precision Spray Technology Tips (Wilger Inc., Lexington, TN 38351-6538) at 4.8 km per hour using a spray volume of 140 L ha^{-1}. Visual Palmer amaranth control was evaluated at 7, 14, 21, and 28 days after application. Fifteen plants per plot were tagged prior initiation of the experiment and used for dry biomass determination at the end of the experiment. Data were subjected to analysis of variance using PROC MIXED procedure in SAS® v. 9.4 (SAS Institute Inc., Cary, NC 27513-2414) and means were separated using Fischer s Protected LSD at ±=0.05. In addition, a generalized additive modelling (GAM) analysis was conducted for optimal droplet size determination to maximize herbicide efficacy and mitigate spray drift.

Palmer amaranth control did not differ with respect to droplet size using lactofen, regardless of rating period. Acifluorfen applied using 300 µm droplets resulted in the greatest Palmer amaranth control, regardless of rating period. Lactofen applied at all droplet sizes resulted in significant dry biomass reduction. Additionally, GAM analysis suggests that the greatest control level using acifluorfen could be achieved with 250 µm droplets, and droplets ranging from 180 to 310 µm could be used to maintain 90% level of maximum weed control.