



# Mississippi Corn Promotion Board 2020 Progress Report

**Title:** Investigation of Palmer Amaranth Resistance to Glufosinate in Mississippi

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## Project Summary

One of the most critical issues for weed scientists today is the management of herbicide-resistant weeds. Herbicide-resistant Palmer amaranth (pigweed) is the greatest pest problem for corn, cotton, and soybean producers. A greenhouse research was conducted at the Delta Research and Extension Center in 2020, to investigate (to detect) possible Palmer amaranth resistance to glufosinate and its distribution in Mississippi. The data obtained will facilitate the solution of current weed problems and will help preserve the existing and new technologies for as long as possible. Results will be communicated to stakeholders. Palmer amaranth populations from various counties of Mississippi were sampled in 2017. Seedheads from about 50 plants were processed to obtain clean seed. In 2019, Seeds were planted on September 12 in a tray and emerged on September 15. Seedlings were thinned to about 100 plants per population and sprayed at 2- to 4-leaf stage (September 27) with the field use rate of glufosinate (32 fl oz/A). Palmer injury/control was scored visually on a scale of 0-100% (0 = no injury or control and 100 = dead), using the corresponding nontreated check for each population as reference. The percentage of Palmer amaranth that survived the glufosinate application was calculated based on the number of plants sprayed. The survivors were transplanted to bigger pots to produce enough seeds for verification if these were truly resistant (for future research).



## Project Results/Outcomes

In 2019 screening (step one of this project), some Palmer amaranth populations out of 52 tested had survivors (ranging from 2 to 20 survivors) from 1X rate of glufosinate application. Palmer amaranth plants survived from 1X (32 fl oz/A as recommended rate) glufosinate application (suspected glufosinate-resistant Palmer amaranth) in 2019, were transplanted to a bigger pot and grown for seed production in 2020. Bolivar-3 (9% survivor), Coahoma-1 (11% survivor), Holmes-3 (11% survivor), Issaquena-2 (13% survivor), Tunica-4 (17% survivor), and Yazoo-3 county (20% survivor) were selected for does response test in August 2020.

In 2020, few of those transplanted survived Palmer plants, were female. The seed's heads were harvested and cleaned in summer of 2020. limited number of seeds were obtained and stored for does response testing. The progeny (F1) of suspected glufosinate-resistant Palmer amaranth seed were planted in a tray on August 29, 2020 and emerged on August 31. Palmer seedlings were sprayed at 2- to 4-leaf stage with 1/2 X, 1X, 2X, and 4X rates of glufosinate on September 15. The visual rating for Palmer injury/control was made based on the non-treated control tray. The survived Palmer amaranth populations from various glufosinate applications determined. At this point, the level (1/2 X, 1X, 2X, 4X) of Palmer amaranth (2019 survivor's progeny – F1) resistant to glufosinate identified (does responses). Only one Palmer amaranth plant (F1 progeny) from Holmes-3 and Tunica-4 survived from 32 fl oz/A of glufosinate. There was no survivor palmer from 2 or 4 X rates. At this point, we cannot say with certainty that these survivors are resistant because past screenings from other States also had survivors, but which produced susceptible offspring.

# Project Results/Outcomes

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We can say that fields with survivors have difficult-to-control populations. These fields are identified, and growers will be advised to manage these fields intensively to control Palmer amaranth escaping herbicide applications.

2021 Palmer amaranth screening against glufosinate:

In August 2020, around 20 Palmer amaranth populations (sample) from suspected glufosinate-resistant area (based on 2019 screening results) and 10 sample from Washington county area were collected for further investigation since previous samples were collected in 2017. In 2021, those suspected Palmer amaranth populations (from 2017 collection in our 2019 screening) and the new Palmer amaranth sample collected in August 2020 (from suspected area) will be tested for glufosinate resistance (around +/- 40 Palmer populations) to verify with certainty if these survivors are resistant. More research (including physiological and molecular studies) need to be done to confirm if the offspring of survivors are indeed resistant. An efficient weed management program should focus on eliminating crop-weed interference and sustain this result for as long as possible by preventing/delaying the occurrence of herbicide-resistant weeds.

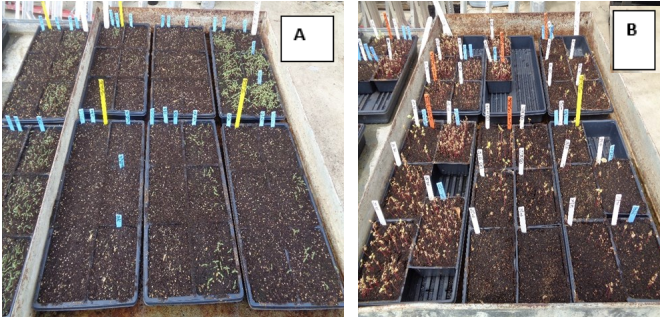
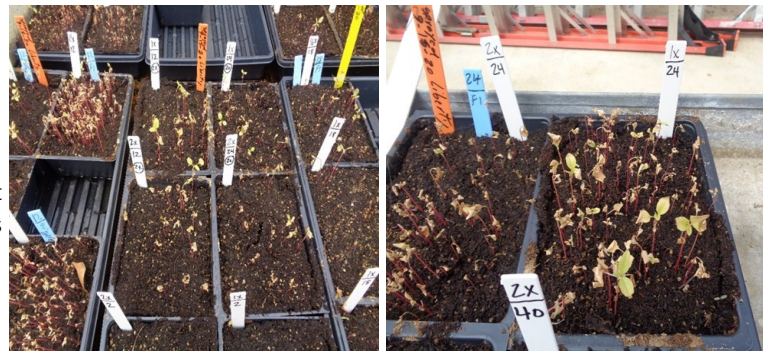


Figure 1. Suspected glufosinate-resistant Palmer amaranth progeny (F1) populations planted on August 29, 2020 and emerged on August 31 (A); and Palmer amaranth progeny (F1) response to glufosinate application (B).

Figure 2. Response of Suspected glufosinate-resistant Palmer amaranth progeny populations (F1) to different rates of glufosinate (does response).



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# Project Impacts/Benefits

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The results of this experiment will help to combat the suspected glufosinate-resistant Palmer amaranth in order to facilitate the solution of current weed problems and to communicate the results to stakeholders, but also to preserve the existing and new technologies for as long as possible.

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# Project Deliverables

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