EFFECT OF FLOODING PERIOD AND SEED BURIAL DEPTH ON PALMER AMARANTH SEED GERMINATION

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Abstract

Palmer amaranth (*Amaranhus palmeri* S. Wats.) is an extremely prolific seed producer with one single female plant being capable of producing up to 600,000 seeds per plant under favorable conditions. Palmer amaranth seed production of 312,000 and 500,000 seeds per plant have been reported when plants were competing with soybeans and cotton, respectively. Seed germination and viability is dependent on factors such as, soil moisture, oxygen availability and quality, temperature, light exposure, microbial activity, and burial depth. Flooding conditions create an unfavorable environment for most weed species, typically resulting on reduction of seed germination and emergence. Flooding is a common practice in most of rice (*Oryza sativa* L.) fields in the Lower Mississippi Alluvial Valley, where fall-winter flooding is an effective practice for rice stray decomposition and waterfowl habitat. Nevertheless limited research is available regarding the effects of fall-winter flooding and burial depth on Palmer amaranth seed germination in Mississippi.

Experiments were conducted in 2016 at the R. R. Foil Plant Research Center in Starkville, MS to evaluate the effects of flooding period and seed burial depth on Palmer amaranth seed germination. Flood simulation was conducted with 26.5 L buckets containing 30 cm of soil plus 15 cm of water. 500 micron pore opening mesh bags measuring 64 cm^2 containing 20 grams of soil were used to store 100 viable Palmer amaranth seeds throughout experiment duration. Three soil textures were used, a leeper silty clay loam, a Dundee silty loam, and a Brooksville silty clay. Mesh bags were buried at 0 and 15.2 cm depth and subjected to six flooding periods, no-flooding, 1 month (October), 2 months (October-November), 3 months (October-December), 4 months (October-January), and 5 months (October-February). Following each flooding period seeds were removed from experimental area, enumerated under a microscope, and characterized as normal or damaged. Following characterization, seeds were germinated in a growth chamber under 35-30C day-night temperatures with 14-10 hours day-night period. Seeds were considered germinated when radicle was equal or longer than 1 mm. Data were subjected to analysis of variance using PROC GLM procedure in SAS® Software v. 9.4 and means were separated using Fisher's Protected LSD at α=0.05.

Flooding periods of 4 and 5 months resulted in the greatest amount of damaged Palmer amaranth seeds. Moreover, only 1.6 and 0.3% of damaged seeds germinated in no-flooding and flooding period treatments, respectively. Flooding significantly reduced Palmer amaranth seed germination, regardless of flooding period ($P \leq 0.0001$). In addition, Palmer amaranth seed germination was reduced by 30% in flooded treatments. No significant differences were observed on Palmer amaranth seed germination when buried in silty clay loam, silty loam, and silty clay soils ($P = 0.6760$). Palmer amaranth seed viability was significantly greater when buried at 15.2 cm compared to 0 cm when no flood was applied ($P \leq 0.0001$). However, seed burial did not affect Palmer amaranth germination under flooded conditions.