TARNISHED PLANT BUG INFESTATIONS INFLUENCED BY PALMER AMARANTH IMPACT COTTON GROWTH AND YIELD

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Abstract

Palmer amaranth (*Amaranthus palmeri*) has continued to challenge cotton production for over a decade, making it the most impactful weedy pest in the history of Georgia agriculture. Biological characteristics including rapid growth, massive seed production, and great genetic diversity, paired with herbicide resistance, contribute to the complex task of managing this pest. An increased occurrence of damaged and aborted terminals within cotton planted in weed management trials was observed at an on-farm research site during 2015 and 2016, with a higher presence near large populations of Palmer amaranth. Significant research has documented the impact of thrips feeding on seedling cotton, with resulting injury similar to that observed at the on-farm location. Due to varying thrips pressure across years, further research is needed investigating the influence of Palmer amaranth on the population levels of tarnished plant bugs (*Lygus lineolaris*) and their subsequent impact on the development of damaged cotton terminals during the seedling stage. Two field studies and one laboratory bioassay were conducted from 2017 to 2019 to investigate the influence of Palmer amaranth on early-season insect pressure and damaged cotton terminals. For the first field study (conducted twice during 2017 and 2018) the experimental design was a split-split-plot design with weed management system (plots maintained weedy or weed-free for the first 30 DAP) as the whole-plot, at-plant insecticide seed treatment (imidacloprid and thiodicarb at 0.375 mg ai seed^{-1} or no seed treatment) as the split-plot, and supplemental foliar insecticide (foliar acephate at 200 g ai ha^{-1} or no acephate) as the split-split-plot. Maximum immature thrips pressure, sampled 21 DAP, was effectively controlled with at-plant insecticide seed treatments, and no relationship was present between populations and Palmer amaranth, damaged cotton terminals, or subsequent yield loss. Palmer amaranth however, increased tarnished plant bug populations 10-fold (24 DAP), and increased the occurrence of damaged cotton terminals 14 to 24% compared to plots maintained weed-free. Cotton yield was negatively influenced by damaged terminals during one of two years. The occurrence of damaged cotton terminals and their proximity to a Palmer amaranth source were assessed during a second field study in 2018 and 2019. Palmer amaranth was allowed to naturally establish (~58 plants m^{-1}) along the east edge of a field of weed-free cotton. Beginning next to the weedy area, maximum damaged terminals of 51% were observed on the cotton row planted directly next to the Palmer amaranth (0 m), with the furthest cotton (44 m) row noting only 8% terminal damage. Cotton yield decreased as the distance between terminal damage and Palmer amaranth decreased. A laboratory bioassay evaluated the influence of an at-plant insecticide seed treatment (imidacloprid and thiodicarb at 0.375 mg ai seed^{-1} or no seed treatment) on tarnished plant bug feeding on seedling cotton during 2017 and 2018. With at-plant seed treatments, tarnished plant bug mortality was 97%, compared to 37% with no seed treatment, combined across years. The presence of Palmer amaranth, in and around cotton fields, increased tarnished plant bug infestations, leading to an increase in damaged cotton terminals and yields reductions.