

Screening the San Joaquin Valley for Glyphosate-resistant Palmer amaranth in Perennial and Annual Cropping Systems.

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Glyphosate has been a popular herbicide for weed management in agriculture cropping systems and non-crop areas for more than a decade. Heavy reliance on a single mode of action can increase the risk of weed species evolving resistance to the herbicide. Glyphosate-resistant (GR) populations of Palmer amaranth have been confirmed throughout the southeast United States since 2005. Since 2012, growers in California's San Joaquin Valley (SJV) have observed poor control of Palmer amaranth in glyphosate-tolerant corn (*Zea mays L.*) and cotton (*Gossypium hirsutum L.*). Palmer Amaranth (*Amaranthus palmeri*) is one of the most difficult weeds to control because of its competitive ability, C4 photosynthesis, high water use efficiency and drought tolerance, rapid growth rate, and prolific seed production. However, it is not known if these are cases of GR populations or application of glyphosate at more tolerant stages of the weed. Palmer amaranth seeds from 6 annual and biannual cropping systems from different locations of the SJV were collected for evaluation of glyphosate resistance. The SJV Palmer amaranth populations have been evaluated against a known GR and a glyphosate-susceptible (GS) population from New Mexico. The experimental design was a 4 by 9 factorial randomized complete block with four replications. The 4 populations and the 9 herbicide doses were the factors. Glyphosate treatments were administered at the 5- to 8- leaf stage at 0.5x, 1x, 1.5x, 2x, 2.5x, 3x, 3.5x, and 4x rates with a control, where 1x= 840 g ae ha⁻¹ (labeled rate). The study was repeated. All the SJV populations had 100% mortality at the 840 g ae ha⁻¹ rate of glyphosate in both studies and therefore deemed to be GS. However there was a significant difference (P< 0.05) between the two studies in the biomass. Collectively, these studies will provide information on whether the reported lack of control in the SJV Palmer amaranth populations are cases of GR populations or due to tolerance to glyphosate at later growth stages.