

Competitive effects of glyphosate-resistant and -susceptible Palmer amaranth plants with grapevines during vineyard establishment.

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Palmer amaranth has been ranked as one of the worst weeds in US agriculture. This species has evolved resistance to several herbicides including glyphosate. Glyphosate-resistant (GR) populations of Palmer amaranth have also been documented in California. Glyphosate is also a common herbicide in perennial cropping systems in California. In recent years, the prevalence of this species has also been noticed in vineyards. However, it is not known if these are GR or glyphosate-susceptible types. Furthermore, it is not known if these two types are different in their competitive ability in vineyards, especially newly established vines, or if the GR type has an associated fitness penalty. Therefore, a study was conducted in 2020 and 2021 to assess the difference in the competitive ability of GR and GS Palmer amaranth with young grapevines and to compare the growth and biomass of GR and GS Palmer amaranth biotypes in a wine grape vineyard in Fresno, CA. Young Grenache 1A on Freedom Uber vines was transplanted on May 12, 2020 and March 19, 2021 in two vine rows spaced 11 ft and 6 ft apart within a row. GR and GS palmer amaranth seedlings were planted about 6 in close to some of the vines or by themselves alone. There were five treatments that included grape alone, grape + one GR palmer, grape + one GS palmer, GR palmer alone, and GS palmer alone. Each treatment was replicated five times and arranged in a randomized complete block design. GR and GS Palmer amaranth seedlings of similar height and size were chosen for transplanting. The plants were allowed to grow till August 27 in 2020 and July 19 in 2021. They were then harvested. The length of the mainstem of the grape plants was recorded and the leaves were separated from the stems. The weight of the stems and leaves were taken after drying them in a forced-air oven at 60°C for 96 hours. Similarly, each palmer amaranth plant was also harvested, and the dry weight of the aboveground parts was recorded. Data on the mainstem length and dry weights were subjected to ANOVA and means were separated by Fisher's LSD test when significant at a 0.05 level of significance. There were no interactions between year and treatment for any of the variables, therefore the data for the two years was combined. In comparison to grape-alone, the mainstem length and total grape biomass was reduced by 30% and 43%, respectively by the GR plants but the GS palmer amaranth had no effect. However, the GR and GS palmer amaranth alone had similar dry biomass. Therefore, this study showed that the GR palmer amaranth plants were more competitive than the GS plants with young grapevines and showed no fitness penalty despite being glyphosate resistant.