Multiple-resistant biotypes of hairy fleabane (*Conyza bonariensis*) documented in the San Joaquin Valley

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Glyphosate-resistant populations of hairy fleabane (*Conyza bonariensis*) were documented in the San Joaquin Valley (SJV) in 2007. However, poor control of these populations is also being observed with paraquat, another common contact herbicide used in the SJV. Therefore, we hypothesized that hairy fleabane had developed multiple resistance to glyphosate and paraquat. A greenhouse study was conducted in 2009 to test the effects of various rates of glyphosate and paraquat on nine populations of hairy fleabane collected from different areas of the SJV. The potted plants were sprayed at the 5-8 leaf stage with 0.5, 1, 2, 4, 8, and 16 fold the recommended label rate of glyphosate or paraquat separately (0.98 lb ae/ac and 0.45 lbs ai/ac respectively). A non-treated control treatment was also included. The herbicide applications were made with a CO_2 backpack sprayer equipped with a Teejet 8002 VS flat fan nozzle at an output of 19 gal/ac during the morning hours. The plants were kept for at least 24h outdoors before and after spraying. The experiment was a completely randomized design with five replications and was repeated. In the second round a mineral surfactant was added to the paraquat treatments at 1%V/V. The plants were evaluated 1, 3, 7, 14 and 21 days after treatment for mortality. On the 21st day, the plants were clipped and oven-dried for 72 hours and the dry weight recorded. Of the nine populations tested, four were selected and coded for easy of data presentation as follow: BH10051, BH10054, BH10055 and susceptible. The populations BH10051 and BH10055 showed the highest survival rate for paraquat. All the plants of these two populations survived even the highest rate of paraquat. For glyphosate, the population BH10055 had a survival rate of 100% and 58% at the 8- and 16-fold the label rate, respectively. However, the survival of population BH10051 plants was 58% at the 4-fold rate and did not survive higher rates. About 91% of the plants of the BH10054 biotype survived the 16-fold rate of glyphosate but only 8% of the plants survived the 4-fold rate of paraquat. Most of the susceptible plants did not survive any application rates beyond 2-fold for both glyphosate and paraquat. Therefore, this study showed that some populations of hairy fleabane in the SJV have evolved multiple resistance to glyphosate and paraquat and some populations to glyphosate or paraquat only. The level of resistance for both herbicides varied according to the biotype.