Optimum temperatures for two biotypes of horseweed (*Conyza canadensis*) and hairy fleabane (*C. bonariensis*) germination

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Horseweed (*Conyza canadensis*) and hairy fleabane (*Conyza bonariensis*) are two common weeds found in orchards, vineyards, and roadsides in the San Joaquin Valley (SJV). In recent years, these two species have become a more widespread problem in the SJV due to the evolution of glyphosate resistance and paraquat resistance (in hairy fleabane only). Therefore, alternate control approaches are required for the herbicide-resistant horseweed and hairy fleabane. An approach would be to develop an integrated weed management (IWM) system for these species. Weed biology is an integral part of IWM and it includes aspects of seed germination and seedling emergence. A major environmental factor driving seed germination and seedling emergence is temperature. In recent years, these species have been noticed to germinate and emerge year-round in the SJV. Hence, the optimal temperature for germination of these species needs to be determined. Studies in the SJV have found differences in the growth and development of glyphosate-resistant (GR) and glyphosate-susceptible (GS) biotypes of these species. However, differences in optimum temperature for germination and emergence of these two biotypes are unknown. Therefore, the objective of this experiment was to determine the optimum temperature for germination and seedling emergence from seeds of known GR and GS horseweed and hairy fleabane collected from the SJV. A growth chamber experiment was conducted at California State University, Fresno in 2010. Pots were filled with media and 30 seeds of each species and biotype were planted on the surface of the media. The experiment was arranged as a split-split plot and replicated four times with temperature as the main effect, species as the sub plot, and biotype as the sub-sub plot. Growth chamber temperatures were set at 5/0, 10/5, 15/10, 20/15, 25/20, and 30/25 C (day/night) temperature, respectively. Seedling emergence counts were recorded every day and an emerged seedling was removed as soon as it was counted. Seedling emergence was monitored for about 6 weeks. Results showed that optimum temperature for germination of both species was 25/20 C. Some germination was observed at temperatures as low as 10/5 C. Germination, in general, was greater for horseweed than for hairy fleabane. This may be because of the differences in maturity of the seeds at the time of collection or other factors. Significant differences were seen in germination of the GR and GS horseweed seeds at the lower and higher temperatures but not at the optimum temperature. The germination of seeds from GS horseweed plants was always greater than those from GR plants at the sub-optimum temperatures. However, the differences were opposite for hairy fleabane because the germination of seeds from GR hairy fleabane plants was greater than those from GS plants at almost all temperature regimes, except at 5/0 and 30/25 C. These findings may be interesting as the study showed that germination of the biotypes at different temperature ranges was different although the seeds were collected from areas within a 50 mile radius. The differences between biotypes could be a result of environmental rather than genetic factors, but this needs to be ascertained. In conclusion, the experiment determined the optimum temperature of both species as 25/20 C and found differences between biotypes in germination and seedling emergence. The experiment is being repeated.