EFFECT OF LIGHT AND TEMPERATURE INTERACTIONS ON WEED SEED DORMANCY. Ramon G. Leon-Gonzalez* and Micheal D. K. Owen, Graduate Research Assistant and Professor, Iowa State University, Ames, IA, 50011.

Seed dormancy is one of the most important characteristics of weeds and extends the germination and emergence of weeds over time thus favoring the persistence of seeds in the seed bank. Knowledge about dormancy regulation is very important not only in understanding the biology of a plant species, but also the success of that species as a weed in an agroecosystem. In general, the regulation of dormancy level is exerted by physiological changes in the seed that are environmental dependent and independent. Temperature and light are two key environmental factors that impact the dormancy level of several species.

The effects of temperature and light and their interaction on the dormancy of common waterhemp, giant foxtail and velvetleaf seeds were studied under controlled growth chamber conditions. Seeds were either chilled (wet conditions at 4 C for 12 wk) or maintained in dry storage. Then, seeds were germinated under increasing and decreasing temperatures, and under continuous red light (R) and far-red light (FR). In addition, chilled and non-chilled seeds were germinated in the dark after being exposed to alternating R and FR flashes.

Velvetleaf seeds germinated between 12 and 36 C. The germination of this species was increased by exposure to high temperature immediately following exposure to low temperature, but light had no effect. Chilling did not affect velvetleaf dormancy. Giant foxtail showed clear interactions between light and chilling and temperature and light. Giant foxtail germination occurred between 20 and 28 C. Temperatures higher than 30 C were inhibitory. Heat shock after cold storage reduced the dormancy level of this species more than a gradual increase in temperature. Continuous exposure to FR reduced the germination of chilled giant foxtail seeds only under increasing temperatures. Thus, giant foxtail seed dormancy was, to some extent, phytochrome regulated, but high temperature exerted a more important regulation. In the case of common waterhemp, interactions between chilling, light and temperature during germination were observed. Common waterhemp seeds germinated between 16 and 36 C. Chilling reduced common waterhemp seed dormancy and increased sensitivity to light and temperature. When exposed to increasing temperatures, chilled seeds under R germinated at lower temperatures than the other treatments. R promoted germination, whereas FR inhibited germination and maintained dormancy. In addition, the effect of light was reversible. Therefore, common waterhemp dormancy was phytochrome-regulated. However, high temperatures overcame the inhibitory effect of FR and promoted the germination of chilled seeds.

The results of this work showed how the interactions between different environmental factors are important determining dormancy regulation, and how the response to those interactions differs dramatically among species.