INTRASPECIFIC GENETIC VARIATION IN COMMON WATERHEMP (*AMARANTHUS TUBERCULATUS*) SEED DORMANCY REGULATION. Ramon G. Leon and Micheal D. K. Owen, Graduate Research Assistant and Professor, Department of Agronomy, Iowa State University, Ames, IA 50011.

Seed dormancy is one of the most important adaptive traits for the success of many weeds. Changes in seed dormancy level dramatically affect seed bank dynamics and consequently seedling emergence patterns (in time and space) thus having a direct impact on weed management. Common waterhemp (*Amaranthus tubeculatus* (Moq.) J.D. Sauer.) is a problematic weed in corn and soybeans because apart from the evolved resistance to herbicides, it has variable emergence patterns. There is contradictory information describing the emergence patterns of common waterhemp, and it is not clear if it is a late, early or just variable emerging species. In previous studies for a population collected near Ames, IA, we showed how environmental signals such as light exposure, chilling, and temperature fluctuation changed the dormancy level of common waterhemp seeds. This environmental seed dormancy regulation allows great plasticity for the occurrence of different emergence patterns depending on the environmental conditions. Because common waterhemp is a dioecious species (obligate outcrosser), it has a great potential genetic variability among populations. Therefore, it is reasonable to think that the different emergence patterns observed in the field could be also explained by the existence of different seed dormancy regulatory mechanisms among populations. We tested this hypothesis by comparing changes in seed dormancy levels in three common waterhemp populations. Two populations were collected in crop fields near Ames, IA, and near Everly, IA. The other population was collected from a pristine area in Highland County, OH. In order to minimize the environmental effect on seed dormancy, seeds from the three populations were stratified and planted in pots. The pots were placed in growth chambers under the same conditions to produce new seeds. The seeds produced were collected and used in the experiments. Seeds were incubated at 4 and 25 C in dry and wet conditions for 3 wk. Then, germination tests were conducted to determine differences in seed dormancy levels. The Ames population showed seed dormancy reductions after incubation in wet conditions, and the germination was around 50%. The germination of seeds incubated in dry conditions was between 10 and 25%. The Everly populations only reduced the seed dormancy level after incubation at 25 C and wet conditions showing germination close to 60%, which was almost twice the germination shown by the other treatments. In the case of the Ohio population, no differences between treatments were observed and the germination was above 85%. Because there was an interaction between wet conditions and temperature, we conducted another experiment to analyze in more detail the effect of those factors on seed dormancy. The seeds of the three populations were incubated at 4 and 25 C in wet conditions from 0 to 8 wk. The dormancy level of the Ames population decreased proportionally to the incubation period at the two temperatures. The Everly population only reduced the dormancy level when incubated at 25 C. The Ohio population did not respond to the incubation treatments and showed more than 85% germination for all treatments. The results of this study clearly showed that there is intraspecific genetic variation in common waterhemp seed dormancy regulation. These results highlight the problems that models based on studies conducted on only one population could have for accurately predicting weed emergence of other populations for species with high genetic variability. In addition, it is likely that several weed populations have seed dormancy traits that make them more difficult to manage than others. This raises the question about how agricultural practices such as tillage and herbicide use could be affecting the evolution of complex seed dormancy traits that are undesirable in sustainable agroecosystems.

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