

Department of Biological Sciences

Aqsa Shakoor

Professor Hilary Callahan

Relating Root Growth Plasticity to Reproductive Plasticity in Drought-Stressed *A. thaliana*

We investigated the effects of drought on the above and below ground phenotype and survival ability of *A. thaliana*. We exposed plants to five treatments: mortality, control, drought/rescue, root control, and root drought in which we measured survivorship and fecundity in a replicated experiment with 20 recombinant genotypes derived from Bayreuth and Shahdara parental genotypes, native to contrasting habitats. For each genotype we studied the mortality rate, root growth plasticity, and reproductive plasticity. The mortality treatment was planted a week earlier than the rest of the treatments in order to allow us to calibrate drought severity. Root plasticity was measured by comparing the root control and root drought treatments for root weight and total plant weight. Reproduction plasticity was measured in the control and drought/ rescue treatments in which we measured the number of fruits produced by the plants. We observed significant genotype to genotype variation in mortality rate estimated as mean days to death. We observed that the plants died at an average of ten days after imposing drought, however, the trend was found that the larger plants had a more rapid mortality than the smaller plants. This may be because the larger plants require more water than the smaller plants due to a higher evapo-transpiration. Although genotypes in the drought treatment generally varied in size and root weight, the drought treatment did not induce root plasticity. Some difference was found between the drought/rescue and control treatment in reproductive plasticity. The control treatment on average had a higher fruit production due to a few small genotypes whose higher than average fruit production was compromised by drought.

In a follow up to this experiment we conducted a mini-experiment with other genotypes derived from Bayreuth and Shahdara parents in which we observed the mortality rates of drought- stressed seedlings. The genotypes with the two longest roots and two shortest roots were selected using previously published data. The seedlings began drought stress 10 days after planting and were monitored until death. For each genotype we recorded size and mortality rate. We observed genotype to genotype variation for seedling size but not for mortality. Future work will include similar mini-experiments at different temperatures.