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Going underground: Benefits of phototropism in *Arabidopsis* depend on the soil environment

Phototropins are blue-light photoreceptors that control shoot and root phototropism in Arabidopsis thaliana. We investigated whether the soil environment influences the benefit of phototropism. We hypothesized that root phototropism should improve survival and growth under dry soil conditions, but not under wet conditions. We used a greenhouse experiment to test whether phototropism under dim light benefits plants in drought conditions. Seed of two non-phototropic (phot 1, nph3) mutants and wildtype A. thaliana (Columbia ecotype) were planted into a range of soil moisture regimes created by altering the sand content in the soil and varying the watering schedule. The soil water content varied from 26%-65% (w/w) mainly due to the sand content. Seedling size (rosette diameter) was measured three weeks after germination. We found several significant results. First, seedling emerged earlier in wet soil (11.5+/- 4.3 days after planting) then dry soil (15.3 +/- 5.6 d). Second, wild type plants were significantly larger than the mutant genotypes, but the magnitude of the size advantage depended on the soil environment. In sandy soil the wild type plants were 20% larger then the non-phototropic mutant plants ($P<0.0001$), and in the clay soil, the wild type plants were only 12% larger then the non-phototropic mutant plants($P<0.01$). These results agree with previous findings that the growth advantage associated with phototropism increases in dry conditions. These results led us to wonder what was happening below the soil surface. We asked do non-phototropic plants differ from wild type in their rooting profiles, due to impaired root phototropism of mutant genotypes. We tested this idea in another greenhouse experiment in which the same genotypes were grown under dry and wet soils resembling the moisture extremes of the first experiment. Seeds were planted along the sides of clear plastic window boxes to enable us to track the roots. All sides except the top of the boxes were wrapped in foil to prevent light from entering. One month later, the boxes were unwrapped and the roots traced to determine the length and distance that each had traveled through the soil. Measurements are currently in progress.