

Woods, S., S. Archer, and S. Schwinning. 2011. Early taproot development of a xeric shrub (*Larrea tridentata*) is optimized within a narrow range of soil moisture. *Plant Ecology* **212**:507-517.

Effects of watering amount and frequency on root biomass accumulation and taproot elongation were examined 16 to 17 days post-germination in seedlings of *Larrea tridentata*, a dominant shrub in North American hot deserts. Two experimental variables manipulated in a full factorial design greenhouse study were (i) number of “triggering” days: consecutive days (2, 3, 4 or 5) at the start of the experiment on which seedlings received 10 mm of water per day; and (ii) “post-trigger” watering frequency: 5 mm of water either daily or every other day.

We hypothesized that taproot elongation would increase with greater numbers of triggering days, whereas higher post-trigger watering frequency would enhance root biomass development. Increasing the number of triggering days from 2 to 4 promoted taproot extension without affecting root biomass, and higher watering frequency in the post-trigger phase generally increased root biomass, as expected. Contrary to expectations, root biomass and taproot length were significantly reduced when daily watering followed 5 consecutive triggering days. Taproot length correlated with root biomass, but irrigation regime also had a biomass-independent effect: with either 2 or 5 triggering days, taproots were shorter than expected based on root biomass. Thus, both too little and too much water stymied taproot extension. In natural settings, the adverse response of taproots to too little or too much water could reduce seedling survivorship and restrict establishment to a narrow range of environmental conditions.

Keywords

Recruitment – threshold – xerophyte – Sonoran Desert – episodic establishment – creosote bush