

Root Growth

The objective is to reveal the remarkable contribution of root growth to the overall growth of a plant.

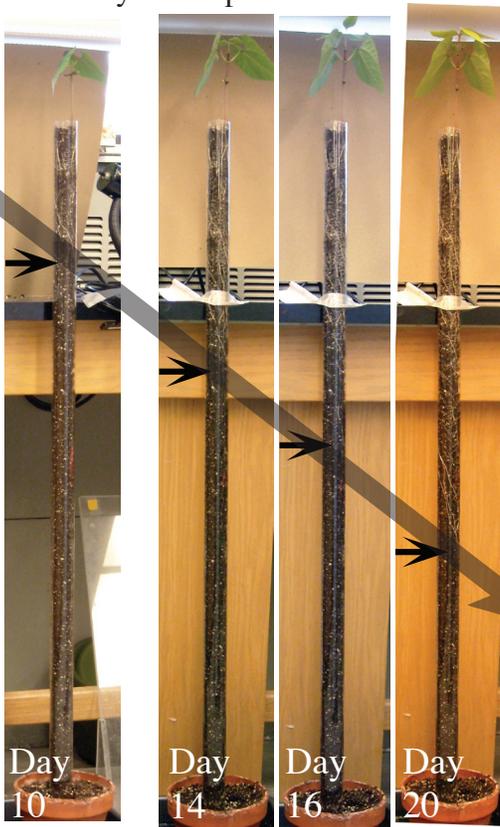
Method. Large bore glass tubes (3.5 cm or 4.75 cm inner diameter, 1.2 meters long) were filled with a standard potting soil mix (without added sand to minimize abrasion of the glass tubes). One end of the tube was covered with a cotton gauze and placed in a pot of soil. The soil was wetted, then sown with tomato or bean seeds

The glass tubes were mounted in a research lab at 25 degrees Celsius. Once the seeds had germinated, a fluorescent light was positioned close to the top of the tube (Day 4). The fluorescence tubes were standard (T8), with a colour temperature of 6500K (that is, a strong blue color to maximize plant growth). The irradiance ($50 \mu\text{mol m}^{-2} \text{sec}^{-1}$) was about 2.5% the intensity of direct sunlight.



The unseen life underground

The roots penetrate deeply into the soil (arrows) while the aboveground seedling has barely developed.



Initially, the seed provides the food and nutrients for underground growth. Only later does net photosynthesis provide the sugars required to fuel growth both underground and above ground.



Root Experiments

There are many different kinds of experiments students can do

Underground relations between species. If glass plates are used rather than tubes, students can explore how two different species interact underground. For example, tomato seedlings and bush bean seedlings, or other common vegetables (with its large seeds and fast germination, zucchini would be suitable). How do the different species share the soil? Growing them side by side in soil sandwiched between glass plates makes observations possible. The distance between the plates should be 2 to 4 cm, a depth of 30 to 50 cm and width of 40 cm will give ample space to observe root growth over 3-6 weeks.



Photo by Milissa Elliott

Growth through different kinds of soil. It's relatively easy to create variations in soil (sand, silt and clay) and its hardness (by packing the soil). How do these affect the growth of roots?



Soil nutrients and root growth. By creating layers of soil enriched in standard fertilizers, students can explore how roots grow in the presence of nutrients. The level of complexity can be increased by considering the effect of major nutrients (potassium K, phosphorus P, and nitrogen N).



Photo by
Milissa Elliott

