

# ROOT

Roots are primarily involved in anchorage, absorption of water and minerals, storage, and conduction to the stem via the vascular system. The first land plants lacked roots, although the underground portion of the stem served some of the same functions. As vascular tissue developed further, the lower part of the stem became more specialized anatomically and differentiated roots evolved. This specialization permitted widespread colonization of land by plants. For the first time the soil was stabilized against erosion, due to plant roots..

Roots act as 'miners' of the earth's crust, absorbing minerals that may be present at low concentrations and translocating them throughout the plant where they are needed in metabolism. Roots are more extensive than we often realize: a 16 week old rye plant has 13 million root axes and lateral roots. An average tree can have 10 km of root length.

The function of roots is often altered by association with **mycorrhizal fungi**. These fungi may either coat the surface of the root or they may invade its cells in a symbiotic manner. These mycorrhizae greatly aid in the uptake of at least some of the elements.

Of course, the plant cannot use minerals that aren't there. Mineral deficiencies are common and often restrict plant growth. Nitrogen is commonly at suboptimal levels in soils and so is often added, along with phosphorus and potassium as 'fertilizer'. The cost of this, especially in underdeveloped countries, is high. A lot of attention has been given to the symbiosis of legumes and the bacterium *Rhizobium*, an association that leads to assimilation of atmospheric nitrogen!

Most of the water absorption in young roots is done by the epidermis, and this function is greatly facilitated by the presence of root hairs. **Root hairs** are tubular extensions of epidermal cells, which greatly increase the absorptive surface. Root hairs are short-lived, and they are found in the zone of maturation in the root.