

Eissenstat, D. M. 1997. Trade-offs in root form and function. In: L.E. Jackson (ed.) Ecology in Agriculture. Academic Press, San Diego. pp. 173-199.

Summary

Root construction represents a series of trade-offs. On the one hand, roots can be constructed for maximizing short-term water and nutrient absorption. This may lead to rapid growing roots of small diameter and low tissue density (high water content), high specific rates of absorption of water and nutrients and high capacity to proliferate in favorable soil patches but high maintenance respiration rate and short lifespan. These traits may be typical of roots in annual crops. On the other hand, roots can be constructed to be well defended from belowground herbivores, pathogens and soil desiccation, but at the costs of slower growth rates, higher carbon investment per unit length, lower specific absorption rates, and less ability to proliferate in favorable soil patches. Coarse roots may also invest more heavily in the mycorrhizal symbiosis, which also can represent an appreciable cost. The potential importance of root diameter, tissue density and SRL as an indicator of a fundamental strategy of root deployment should be further investigated. It may provide a useful measure for investigators trying to screen numerous genotypes for a suite of specific root traits. The notion that optimal root design represents a compromise of competing root functions needs to be more formally included in studies of root form and function.