

Water Relations and Mechanical Properties of Growing Cells

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Rapidly growing plant cells double their cell volume (length) each 10 h and reach a length (volume) which can be more than 50 x of that of the meristematic cell. The large growth requires mechanical extension of the cell walls, uptake of water, and maintenance of solute concentration.

In principle cell enlargement could be controlled by three factors:

- (1) the mechanical (elastic and plastic) extensibility of the cell wall
- (2) the rate of water inflow into the growing cell
- and (3) either the rate uptake of osmotic solutes or its production from polymer storage products such as starch.

Growth hormones (auxins) may act at all three levels. Water relation parameters and mechanical properties of growing cells in the epicotyl of pea seedling (*Pisum sativum*) have been determined using the pressure probe technique. The results show that the half-time of water exchange is of the order of 10 to 30 s and the elastic coefficient of the cells is 5 to 50 bar.

The data are discussed in relation to a possible limitation of growth by water transport.