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Hydraulic Conductivity and Aquaporins of Cortical Cells in Gravitropically Bending Roots of *Pisum sativum* L.

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Abstract: We examined the differential elongation of gravitropically bending roots of *Pisum sativum* L. in terms of cell enlargement and water uptake by cells in the growing tissue. Hydraulic conductivity between the elongating and mature tissues (Lp) was estimated from the equation $G = A \times Lp \times \Delta\Psi$, where G is the water-uptake rate, A is the surface area of a single cell and $\Delta\Psi$ is the driving force. The rate of entry of water into a cell was estimated from the rate of increase in the volumes of cells in the outer cortex, which were calculated from longitudinal sections at given times. Gravitropic bending occurred 1 h after the application of gravi-stimulation and the curvature increased rapidly for the next 3 h. The biggest difference in the partial elongation rate between opposite sides of a root was found in the region 3 to 4 mm from the root tip at the start of stimulation. Cell enlargement rate was 2.8 to 3.8 times greater on the upper side of the root than on the lower side. The water potential and the osmotic potential, in both the elongating and mature tissues, were the same on both sides of the root. Therefore, there was no difference in the driving force for water flow. Hydraulic conductivity was 2.3 to 4.2 times greater on the upper side of the root than on the lower side. There was no difference between the upper and lower sides of the root in the amounts of 19-kD and 24-kD proteins in membrane fractions, which we assumed to be aquaporins (putative aquaporins), as estimated with two preparations of polyclonal antibodies. The differential elongation that occurred during root gravitropism was caused by a difference in Lp. However, the difference in Lp did not appear to be regulated by the

concentration in cell membranes of the putative aquaporins.

Keywords: Aquaporin, Cell elongation, Gravitropism, Hydraulic conductivity, *Pisum sativum* L., Water uptake

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