
Comments on “Water Transport Through Plant Cells and Cell Walls: Theoretical Development”

Several of the computations presented in the above paper by Molz and Ikenberry (1974) were based on the assumption that the water capacity per cell in the vacuolar pathway was 50 to 100 times larger than the water capacity per cell in the cell-wall pathway. This may still be the case. However, data brought to my attention recently (Teoh, Aylmore, and Quirk, 1967; Wiebe, 1966) suggests that the difference might be in the 1 to 10 range rather than the 50 to 100 range.

The data of Teoh et al. (1967) are in the form of a plot of cell-wall water content (g/g) of Vicia faba root as a function of cell-wall water potential (bar). The average slope of the curve is 0.1 cm³ bar⁻¹ g. Taking a bulk density of 0.3 g cm⁻³ which is typical of cellulose materials yields a storage coefficient “S” of 0.03 bar⁻¹. The water capacity of the cell-wall pathway per cell is given by 1.52αδxS, and the corresponding water capacity of the vacuolar pathway is \( V_o/(\epsilon + \pi_o) \), where \( a \) is cross-sectional area of cell-wall pathway (cm²), \( \Delta x = \) length of cell (cm), \( V_o = \) cell volume at zero turgor pressure (cm³), \( \epsilon = \) elastic modulus of cell-wall. However, water capacity ratios might still change the conclusions of Molz and Ikenberry (1974) with respect to the prediction of local equilibrium between cells and cell-walls for water transport processes in stems and roots.

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References


Comment on Kinetics of Nitrification and Biomass of Nitrifiers in a Soil Column

In a recent paper (Kirda et al., 1974), kinetic terms of a first-order biochemical reaction. Ammonium was 100 ppm N, however, and it was recognized that on the basis of published data a zero-order reaction in Eq. [1a] [sic] may partially depend upon the value of \( m \) decreasing with soil depth.” It has been shown that they have observed pseudo-first order nitrification.

By averaging their steady-state nitrifier counts in the quasi-steady states before and after a pulse, one finds a more or less exponential decline in numbers with depth, with a specific growth constant as defined by the equation

\[ m = m_o \exp(-rx) \]

Here \( m_o \) is the number at \( x = 0.5 \) cm, i.e., half way through the column. This distribution is expected behind the solution front (McLaren, 1971) and has been confirmed experimentally (Ardakani et al., 1975).

Using Eq. [8] of Kirda et al., with \( K = 8 \) ppm (Ardakani et al., 1974) we find

\[ -\frac{dS}{dt} = \epsilon S/(K + S) \approx \]

\[ \frac{dS}{dt} \approx \epsilon S \]