Title Simultaneous measurement of neon diffusivity and skin resistance of 'Braeburn' and 'Jonica' apples

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Abstract

resistance to transport of metabolic gases simultaneously from the results of tracer gas efflux experiments. It is based on curvefitting the gas concentrations calculated from a finite element gas transport model to measured data. The latter were obtained by impregnating apples with the inert tracer gas neon and transferring them to a neon-free jar, where they release the absorbed neon; the neon concentration in the second jar was monitored. Two models were tested, one where neon is absorbed into the gas phase (pores) only and one where it was also absorbed into the cells. The test involved two cultivars, 'Braeburn' and 'Jonica' (a Jonagold color mutant), each stored for one, 17 and 33 weeks under controlled atmosphere, with 30 replicates in each batch. For the outer cortex region the average diffusivity (based on the concentration gradient in the fruit) was 7.59×10^{-8} m^2 s^{-1} for 'Braeburn' and 14.4×10^{-8} m^2 s^{-1} for 'Jonica'. Average skin resistances were 4.28×10^5 for 'Braeburn' and 4.54×10^5 for 'Jonica'. Using a co-diffusion model the diffusivities of O_2 and CO_2 were also estimated from the results for neon. The diffusivity results imply that the response time of the fruit to a change in atmosphere is of the order of 5–10 h. The lower diffusivity and hence lack of uniformity in the internal atmosphere of 'Braeburn' apples might explain why they are more susceptible to core damage than 'Jonica'. The main limitation of the present tests is that only the first few minutes of the efflux period was monitored, hence the property values obtained relate only to the outer layers of tissue (about 3 mm).