Title Prediction of ascorbic acid content in broccoli using a model equation of respiration

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Abstract

The relationship between ascorbic acid (AA) and respiration of stored broccoli was investigated in an experiment involving various temperature conditions (5, 10, 20 and 30 °C), O_2 concentrations (21%, 10% and 5% O_2), cultivars (cv. 'Pixcel', 'Morimidori' and 'Subaru') and produce types (intact and cut). The relative AA (AA_{rel}) in percent, which was normalized from the initial AA value, was plotted against the accumulated amount of CO_2 production (AR_{CO2}). AA_{rel} decreased with increasing AR_{CO2} in each experiment. The relationship between AA_{rel} and AR_{CO2} of broccoli can be expressed by a single equation with a common parameter (β), regardless of storage and produce variations, suggesting that decreasing AA content could be deduced from respiratory activity. Subsequently, the feasibility of applying the published respiration data to this equation to predict AA change during actual distribution processes was investigated. Cut broccoli was stored under fluctuating temperature conditions and modified atmosphere packaging (MAP). We calculated the change in AA values under these conditions using our proposed equation substituted in the Arrhenius and Michaelis–Menten models. Predicted values had good agreement with measured values. This finding suggests a new application of the respiration model for quality prediction. Our proposed model might also be able to predict quality for other commodities, by applying knowledge of respiration data that has been reported previously.