Title The propagation of variation in glucosinolate levels as effected by controlled atmosphere and temperature in a broccoli batch

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Abstract

Broccoli combines high levels of vitamins, fibres and glucosinolates (GLS) with a low calorie count. GLS are precursors for the characteristic broccoli flavour and have anti-carcinogenic properties. This study describes the effect of controlled atmo¬sphere (CA) and temperature on GLS concentrations in broccoli. Data on GLS behaviour and gas exchange were gathered for broccoli heads that were stored at three temperatures and subjected to four levels of O_2 and three levels of CO_2. The GLS behaviour of three GLS (raphanin, GB and neo-GB) was examined that showed exponential decrease over time, possibly representing the GLS interaction with myrosinase. The most striking feature is the large variation in GLS concentrations at harvest. The propagation of the variation in GLS over time is clearly affected by CA and temperature. Variation in GLS concentrations over time at the same gas condi¬tions and temperature was interpreted with the moment of harvest as main cause of random variation. Assuming that this random variation is normally distributed, the exponential function over time can be transformed into a batch model that describes the changes of variation over time (Schouten et al., 2004, Hertog et al. 2004). The effect of the CA was modelled using the standard gas exchange model. This calibrated gas exchange model was then linked via the reaction rate constant to the batch model to create an integrated batch model. This integrated batch model was subsequently calibrated to describe the variation of the GLS as function of O_2, CO_2, time, tempera¬ture and the batch parameters (average biological age and standard deviation). The percentage variance accounted for was on average 85%. Considering that this modelling effort is based on destructive GLS measurements, this is a rather high value. All GLS species were retained by suitable (low O_2, high CO_2) gas conditions, but remarkably, raphanin was found to be less affected by temperature, indicating that CA storage and low temperature would both retain this GLS species to the same extent, while low temperature storage is a better option for e.g. neo-GB.