

Title Modelling the level of the major glucosinolates in broccoli as affected by controlled atmosphere and temperature

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Abstract

This study describes the effects of controlled atmosphere (CA) and temperature on glucosinolate (GLS) levels in broccoli. Gas exchange rates were measured in three climate rooms with twelve containers each holding 20 randomly selected broccoli (cv '1997') taken from one large batch of broccoli during a three-week period. Broccoli heads were stored at three temperatures and subjected to four levels of O₂ and three levels of CO₂. GLS were measured on individual broccoli heads using a HPLC-based protocol. Information about the GLS development over time was extracted by analysing 'replicate' broccoli containers (containers stored at the same temperature and gas conditions) that were removed periodically during the storage period. The most striking feature was the large variation in GLS concentrations at harvest with the propagation of variation over time clearly affected by CA and temperature. Decay of the four most important GLS over time was described by a sigmoid model based on the decompartmentalisation of the enzyme myrosinase that hydrolyses GLS. Gas exchange parameters were estimated using the standard gas exchange model; the parameters of the GLS decay were estimated using a batch model that describes the propagation of the GLS variation as function of O₂, CO₂, time, temperature, the average biological age and biological variation (R^2_{adj} 88%). This approach was used to study the effect of regular and modified atmosphere conditions on GLS keeping quality. Storage under regular atmosphere during chain simulation showed that the keeping quality for all four GLS is between four and seven days, while storage under 1.5 kPa O₂ and 15 kPa CO₂ showed a keeping quality of at least 14 d, indicating that to preserve the nutritional quality of broccoli, MA packaging is a viable option.