

# SafePod: a respiration chamber to characterise apple fruit response to storage atmospheres

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## Abstract

During long-term storage of apples, detection of low O<sub>2</sub> stress is used to optimise low O<sub>2</sub> storage regimes for dynamic controlled atmosphere (DCA) storage. Monitoring respiratory characteristics, specifically the respiratory quotient (RQ), provides a tool to achieve this. The objectives of this study were to evaluate protocols to monitor response of apple consignments to low O<sub>2</sub> using a respiration chamber, the SafePod, designed for use in commercial stores and research laboratories, and to compare the RQ response to changes in chlorophyll fluorescence (CF) yield from the fruit skin as used in DCA-CF.

Protocols to identify the lowest oxygen limit (LOL), the O<sub>2</sub> concentration below which RQ rises, were tested using 'Braeburn' (sensitive to low O<sub>2</sub>) and 'Gala' (less sensitive to low O<sub>2</sub>). A protocol that allows fruit to acclimatise at each O<sub>2</sub> concentration takes several weeks and is therefore not practical for commercial use. A rapid profile without fruit acclimatisation can be completed in 2–3 days. Although this underestimates RQ values, and results in an increase in RQ at a higher O<sub>2</sub> concentration than observed for acclimatised fruit, the rapid RQ protocol provides a practical method to compare response of apple consignments between cultivars, orchards and seasons. By the rapid protocol, the LOL of 'Braeburn' consignments was near 0.6 kPa and of 'Gala' consignments was near 0.2 kPa, consistent with detection of alcoholic taints below the LOL in each case. The RQ response using the SafePod was consistent with increase in CF yield using HarvestWatch™.

Fruit respiration rates change through the storage season, including a substantial decrease over the first 2 months after harvest. As RQ response is affected by respiration rate, accurate comparison of consignments depends on profiles being measured at the same stage in the storage season. It is more difficult to determine the LOL by RQ profiling later in the season when respiration rates are lower.