

**Title** Chlorophyll fluorescence and gas exchanges in 'Abbé Fétel' and 'Conference' pears stored in atmosphere dynamically controlled with the aid of fluorescence sensors

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### Abstract

A new technology for monitoring the physiological status of fruit during storage (HarvestWatch™ system with FIRM™ sensors, Satlantic, Canada) was used to detect anaerobic stress in pears by the increase in fluorescence response ( $F_{\alpha}$ ). Two pear cultivars were studied: 'Conference', a long-term storage cultivar, and 'Abbé Fétel', which cannot be stored longer than 4 months in air. The fruit were stored in air at -0.5°C after harvest until 18 November 2002, then in 4 gastight containers (2 per cultivar). In each container there was a fluorescence sensor in a box with 6–7 fruits. One container per cultivar was kept with a standard CA (2 kPa O<sub>2</sub>; 0.7 kPa CO<sub>2</sub>); in the other, after 3 weeks with standard CA, the oxygen concentration was decreased. On 10 February ten fruits per container were sampled, and gas exchange was measured at -0.5°C on single fruit in known gas mixtures (100 kPa N<sub>2</sub>, O<sub>2</sub> at 0.1, 0.5, 2 and 21 kPa, with 0 and 5 kPa CO<sub>2</sub>). 'Abbé Fétel' fruit had higher gas exchange rates and were more sensitive to low O<sub>2</sub>, experiencing an increase in fluorescence response at higher O<sub>2</sub> level than 'Conference' fruits. The sensitivity to low oxygen levels was confirmed by respiratory quotient, which increased at O<sub>2</sub> levels similar to those which stimulated the change in fluorescence response. Therefore it seems that  $F_{\alpha}$  measures a response to the low O<sub>2</sub> stress which induces anaerobic respiration. The fluorescence monitoring system may have potential to detect physiological limits for aerobic respiration. A CA system with excellent tightness, analytical accuracy and control is needed to implement the HarvestWatch system. However, even under optimal atmospheric control, the small number of fruit that can be monitored may present challenges to successful implementation if sample fruit are not representative of the bulk of fruit in storage.