Project Title:
Determine the CO$_2$ sensitivity of the four main plum cultivars.

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Objectives and Rationale

The effect of carbon dioxide (CO$_2$) on quality after cold storage on four plum cultivars was tested. The aim was to determine if elevated levels of CO$_2$, in the range of 2%, 4% and 6% would have a negative effect on plum quality. This information is vital if the current vent setting procedure for plums, by opening the vents in shipping containers if threshold CO$_2$ levels are reached, is considered. The effect of this procedure on relative humidity (RH) in containers is unknown and will have to be determined at some stage. The ultimate aim is to utilise knowledge generated to increase RH in shipping containers and in this way reduce shrivel on plums.

Methods

‘Fortune’, ‘Laetitia’, ‘Songold’ and ‘September Yummy’ plums were cold stored at modified atmospheres (MA) of 2%, 4% and 6% CO$_2$. O$_2$ levels were 19%, 17%, and 15% respectively. ‘Songold’ plums were treated with the commercial concentration of 1-MCP (SmartFresh$^\text{SM}$) before cold storage. The plums were stored at MA for 20 days to simulate the shipping period to the EU. ‘Fortune’, ‘Laetitia’ and ‘September Yummy’ were stored at single temperature while a dual-temperature regime was used for ‘Songold’. Overall quality was evaluated after cold storage of 42 days and after shelf life.

Key Results

The MA regimes tested had no negative effect on ‘Fortune’, ‘Songold’ and ‘September Yummy’ plums. Positive effects with elevated CO$_2$ occurred in terms of flesh firmness (‘Fortune’) and reduced internal disorders (‘Songold’ and ‘September Yummy’). The MA regimes tested had a negative effect on flesh firmness and internal disorders with ‘Laetitia’ plums. No off tastes were noted in any of the cultivars. It therefore appears as if a blanket recommendation regarding the effect of the particular MA regimes on plum quality will not be possible. No conclusive trends could be identified for CO$_2$ level effects on shrivel development. This will require testing in shipping containers.

Conclusion and Discussion

CO$_2$ levels of up to 6% and the balance of O$_2$ (to a total of 21%) had varying effects on plum quality dependent on cultivar. A blanket recommendation for plums regarding venting of shipping containers based on CO$_2$ build-up in the containers is therefore not possible. However, the results indicated that there could be positive effects of elevated CO$_2$ levels in combination with relatively high O$_2$ levels and this could be explored to improve fruit quality of selected cultivars.