**Title** Response of post-storage carbohydrate levels in *Pelargonium* cuttings to reduced air temperature during rooting and the relationship with leaf senescence and adventitious root formation

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**Abstract**

Rooting of dark-stored pelargonium (*Pelargonium* × *hortorum*) cuttings can be restricted by carbohydrate shortage resulting from the interplay between depleted carbohydrate reserves and weak photosynthesis under the low light conditions of winter in Central Europe. The hypothesis was tested, that considerably reduced air temperature during rooting increases current availability of carbohydrates, thereby improving survival and root formation. Dark-stored cuttings (4 days, 10 °C) of storage-tolerant and -sensitive pelargonium cultivars, 'Isabell' and 'Telemann', respectively, were rooted in climate chambers (PPFD: 100 μmol $m^{-2}$ $s^{-1}$ per 10 h day-length) at reduced air temperature (10 °C, root zone temperature: 20 °C) and compared with those grown at 20 °C (air and root zone). Carbohydrate levels in different cutting tissues were analysed during the rooting period and related to leaf performance and root formation. In addition, net photosynthetic $CO_2$ gas exchange at ambient temperatures (10 °C versus 20 °C, PPFD: 100 μmol $m^{-2}$ $s^{-1}$) and leaf chlorophyll fluorescence (CF) parameters at 20 °C of oldest leaves were determined. With both cultivars, lower air temperature significantly increased tissue carbohydrate levels, particularly sugars. This was associated with higher net photosynthetic rates in the light and increased accumulation of shoot dry matter. 'Telemann' cuttings showed a lower optimum quantum yield of PSII ($F_v/F_m$) during the early rooting period when compared to 'Isabell', and thereafter responded to the low air temperature with an increase in non-photochemical quenching ($q_N$). Higher sugar levels during rooting, mediated by low air temperature were positively correlated with reduced leaf senescence, higher survival rate and higher number of roots. Strongest correlations were found with sucrose, particularly for the cultivar 'Telemann'. It is concluded that increased sugar levels were causally involved in repressed leaf senescence and contributed to improved root formation in basal stems exposed to high temperature. The results provide new prospects for the control of air temperature during rooting of cuttings that exhibit low current photosynthesis.