

Title Controlled atmosphere storage at high CO₂ and low O₂ levels affects stomatal conductance and influence root formation in kalanchoe cuttings

Author N.B. Bredmose and K.L. Nielsen

Citation Scientia Horticulturae, Volume 122, Issue 1, 1 September 2009, Pages 91-95

Keywords Controlled atmosphere storage; Cutting; Raised carbon dioxide level; Reduced oxygen level; Stomata conductance; *Kalanchoë blossfeldiana* Poelln.

Abstract

Since the response of cuttings to raised CO₂ concentration is not documented, controlled atmosphere (CA) storage of kalanchoe cuttings at combinations of high carbon dioxide and low oxygen levels was investigated to study the feasibility of using CA to sustain quality of cuttings prior to planting. During storage, stomata opening and plant fresh weight (FW) were measured, and root formation (RF) was recorded post storage. Storage atmosphere composition (10/2, 15/2, or 15/5; kPa CO₂/kPa O₂), storage duration (9 or 19 days), and cutting type (rooted or un-rooted) affected stomata conductance (G_s), and influenced FW and subsequent RF in cuttings of kalanchoe 'Yellow Josefine'. In CA stored plants, G_s was high, 60–160 mmol m⁻² s⁻¹, indicating open stomata, whereas in control plants G_s was low, 5–14 mmol m⁻² s⁻¹, indicating closed stomata. Generally G_s values were higher for un-rooted than for rooted cuttings. Overall, cutting FW was reduced by CA storage with no significant differences in FW reduction between the CA treatments. RF of un-rooted CA stored cuttings was comparable to that of controls, whereas for rooted cuttings controls grew better than CA stored cuttings. CA at 10 kPa CO₂ and 2 kPa O₂ for 2–3 weeks could sustain un-rooted cuttings, in a pests-free state whilst retaining the ability of the cuttings RF. The results showed that stomata aperture may be altered by high CO₂ concentration combined with low O₂, and results indicated that this effect was not only caused by high CO₂ but also by low O₂ concentration. In addition, the results indicated that CA storage, stomata conductance, and water stress of kalanchoe cuttings may be correlated. Monitoring G_s of leaves of cuttings could be used as a non-destructive indicator of storability and quality status. Based on the novel positive preliminary results reported here, a protocol that focuses on minimising water loss should be developed and optimised for kalanchoe.