

Controlled atmosphere storage of mango fruit: challenges and thrusts and its implications in international mango trade

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Abstract

The highly perishable nature of mango fruit and its susceptibility to chilling injury (CI) when stored below 13°C limits its international trade. Cold storage of mango at 12-13°C is successful only for 2-3 weeks coupled with substantial losses in fruit quality. Cold storage limits the use of sea freight which is usually more economical and eco-friendly than air freight. Controlled atmosphere (CA) storage usually involves regulating the concentration of oxygen (O₂) and carbon dioxide (CO₂) using nitrogen, storage temperature, as well as relative humidity in the storage environment. CA in combination with an optimum storage temperature has been reported to prolong the storage life and maintain fruit quality including aroma volatiles in mango fruit depending upon the cultivar. Fruit quality is an important factor in influencing consumer preferences in international and domestic markets. CA storage seems to be promising in extending storage life, maintaining quality of mango fruit consequently offers opportunities to export mangoes to distant markets using sea freight. This overview paper will focus on fundamental and applied aspects of CA storage of mango fruit and its implications in facilitating international trade. Some research work has been reported on optimising CA conditions for different cultivars of mango as the CA requirements of mangoes vary among cultivars and inappropriate CA conditions adversely affect quality of ripe mango fruit. CA comprising of low O₂ concentrations (<2%) has been reported to accumulate ethanol and adversely affect fruit quality of 'Tommy Atkins' and 'Delta R2E2' cultivars of mango. My research group has been exploring the effects of CA on extending storage life, maintaining fruit quality including aroma volatiles production in mango fruit for more than a decade. CA storage comprising 3% O₂ in combination with 6% CO₂ at 13°C proved to be beneficial for extending the storage life of the Australian mango cultivars 'Kensington Pride' and 'R2E2' by up to six weeks, with good fruit quality and maintaining a high concentration of the major volatile

compounds responsible for the aroma of ripe mangoes. The applications of CA in preventing CI, postharvest diseases and insect disinfestations will also be discussed. The faster rate of expansion of mango production, its international trade, short shelf life, and higher susceptibility to CI, postharvest diseases, as well as consumer demand for superb quality are major challenges in extending storage life of mango fruit and their implications in international trade. CA storage offers a great potential in extending storage life of mango which enable to employ sea freight for wider distribution of mango fruit in the distant international markets in a very cost effective manner. A specific composition of O_2 and CO_2 in CA which extends the storage life of mango fruit is cultivar dependent and is yet inconclusive. Moreover, to minimise the negative effects of CA storage in mango such as fruit softening, poor colour development and higher titratable acidity (TA), reduced aroma and flavour are major research gaps yet to be addressed by the research in the future. CA storage offers an attractive alternative for ameliorating CI, controlling of postharvest diseases and pests in combination with preharvest technology. A holistic approach to meet market requirements considering mango production, postharvest handling including CA storage and supply chain is prerequisite for promoting international trade of mango.