Title Modified and controlled atmospheres for tropical fruits

Author Elhadi M. Yahia

Citation Stewart Postharvest Review, Volume 2, Number 5, October 2006, pp. 1-10(10)

Keyword Controlled atmospheres; modified atmospheres; tropical; fruits; vegetables; storage; transport; packaging; quarantine

Abstract

Purpose of the review: This review provides updated information on the research and application of modified and controlled atmospheres (MA and CA) for tropical crops.

Recent findings: The increase in the demand and, thus, in the export of tropical crops, have increased the need to investigate and develop technologies that can maintain the quality and postharvest life of these crops for prolonged periods. MA and CA are adequate technologies that can help to extend the postharvest life of crops. MA and CA are not used for storage of tropical crops, but are used for their marine transport. Very little research has been done on MA/CA of tropical crops as compared with temperate fruits such as apples and pears. Most of the research was done on avocado, banana, mango, papaya and pineapple, while very little has been done on cassava, custard apple, feijoa, guava, lanzone, loquat, rambutan, sapodilla and sugar apple, and no research has been reported on atemoya, birba, breadfruit, cacao, carambola, cashew, coconut, jackfruit, langsat, longan, macadamia, mammee-apple, mamey, mountain apple, tomatillo, pulsan, white sapote, soursop, tamarind and yam.

Directions for future research: 1) Potential benefits and ideal MA/CA conditions is still needed for intact and lightly-processed tropical crops, especially those for which little or no information is available. 2) Insecticidal atmospheres, especially in combination with other treatments such as heat, seem to be very promising and should be further investigated for all tropical crops. Information needed include the tolerance of different crops to these atmospheres, mortality of different species of insects, ideal gas composition, temperature, and duration of treatment. 3) The mode of action of MA/CA in alleviating some physiological disorders, especially chilling injury, is still not clearly understood. The mechanism by which some physiological disorders are initiated or augmented by MA/CA is also not yet understood. Research aimed at investigating the cause of and developing methods to control these physiological disorders will improve the application of MA/CA for tropical fruits. 4) The variable results reported for modified atmosphere packaging are due to use of variable conditions (differences in cultivars used, stages of maturity, types of films, sealing methods, sizes of packages, temperatures and relative humidity, etc). Therefore, experiments should

be controlled to distinguish effects that are due to atmosphere modification from those due to other factors. 5) The behaviour of fruit after MA/CA is still not fully understood and, therefore, the methods of handling MA/CA-treated crops are not well established. Further research is needed to investigate the metabolic changes caused by MA/CA and, thus, to implement adequate methods of handling. 6) The potential use of low pressure atmosphere (LP) for transport of exotic tropical crops, especially those that are very sensitive to ethylene and do not require the addition of other gases (such as CO_2 and CO), should be further investigated. There is a need to develop inexpensive LP technology. 7) More in-depth studies are needed to investigate the potential use of CO in combination with MA/CA, especially during transit. Treatments and methods to permit safer use should be developed. 8) Further and in-depth research on the mode of action of MA/CA are still needed in order to increase the commercial use of the technology for tropical crops. These studies should contribute further to our understanding of the mechanism by which low O_2/high CO_2 conditions control fruit ripening/senescence or cause tissue injury. Very little is known about protein turnover and gene expression in crops held in MA/CA. Thus, molecular studies are needed to identify clones for genes that are switched on or off in response to low O_2/high CO_2, in order to identify molecular markers to monitor responses of fruits to MA/CA, and to try to manipulate tissue response.