

Abstract:

Ethylene affects the metabolism of fruits on different levels. The definition of a closed packaging system for fruits includes the determination of the required O₂-permeability, CO₂-permeability and ethylene permeability/ethylene adsorption rate of the packaging film. Consequently, to package a certain type of fruit in a specific package configuration, the relation between the ethylene production rate (at the optimal ripeness stage for packaging) and the respiration rate, with changing O₂ concentration, has to be established. For this purpose the Michaelis-Menten type model, describing the influence of O₂ on the respiration rate, was extended with an extra equation for the ethylene production rate. Experimental data on gas exchange were analysed using WEST (Hemmis N.V., Kortrijk, Belgium) modelling and simulation software. A clear linear relation was found between the ethylene production rate and the respiration rate (R² ranging from 0.8 to 1). It is, in our knowledge, the first time that such a relation was described. Moreover, analysis from the data revealed that for most investigated ethylene producing fruits, the ethylene production rate reached zero before aerobic respiration was stopped. The proposed model was made for commercially mature avocado, banana, mango, kiwi, nectarine, strawberry, raspberry, white grape and red currant fruit and illustrated with data of banana, nectarine, raspberry, avocado and kiwi fruit.