Title Respiration rate of pomegranate arils as affected by O_2 and CO_2 and Design of modified atmosphere packaging

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Abstract

Pomegranate (*Punica granatum*) fruit has a high antioxidant activity and phenolic content. It is consumed in different forms including juice, sauces and fresh consumption of arils. Pomegranate arils can be consumed as fresh directly or in different desserts, but it is difficult to separate it from the fruit. Fresh pomegranate arils can be separated and packaged in modified atmosphere packages (MAP) for convenience with extended shelf life. Effect of $C0_2$ and 0_2 on respiration rate of arils need to be investigated for designing MAP.

Respiration rate of arils from a local pomagranate cultivar, 'Hicaz', was determined at different O_2 (2, 10, 21 %) and CO_2 (0, 10, 20%) concentrations at 4°C in a closed system. Main effects of O_2 and CO_2 and their interactions were tested by ANOVA procedure. Oxygen consumption and CO_2 production rate of the arils were modelled by enzyme kinectics based models. Inhibitory effect of CO_2 on respiration rate was evaluated by four types of inhibition models (competitive, uncompetitive, combination of competitive and uncompetitive, non-competitive types). MAP desing was conducted for different package sizes to determine the characteristic of required packaging materials for fresh pomegranate arils. Respiration rate of the arils was significantly affected by O_2 and CO_2 concentrations. As O_2 concentration decreased respiration rate decreased. Respiration rate decreased by 10 and 20% $C0_2$ levels. No difference between the effect of 10 and 20% CO_2 concentration was detected. Michealis-Menten type model, competitive and uncompetitice models were generally fit the respiration data well. Since the CO_2 significantly inhibited respiration rate one these inhibition model should be used as respiration rate model in package design. MAP design analysis indicated that available packaging materials were not suitable for pomegranate arils. Required packaging material's permabilities were determined for several package sizes from 250 g to 2 kg. The results of these case studies will be presented in detail.