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13 Abstract

14 Humidity control is one of the biggest challenges in modified atmosphere and humidity packaging (MAHP) of
15 fresh horticultural products, especially those of high transpiration rate. Humidity absorbing trays containing
16 active moisture absorber substance in the structure have been recently emerged as a potential solution in this
17 area. Here packaging of strawberries using two different humidity absorbing trays of different moisture
18 absorption capacity named T0 and T12, under fluctuating ambient conditions was simulated using an
19 integrated mathematical modeling approach and validated experimentally. The model considered transpiration
20 and respiration behavior of fresh produce, moisture absorption by packaging tray, gas and water vapor
21 permeation through the perforated packaging film to predict changes in relative humidity of packaging
22 headspace as well as moisture condensation within the package. Based on RMSE values, there was a good
23 agreement between predicted and measured data of humidity, moisture loss, absorption and condensation
24 inside the package. The RMSE values for prediction of the headspace humidity were 1.28, 2.38 and 4.34 and
25 corresponding R^2 values were 0.71, 0.86 and 0.87 for control, T0 and T12 packages, respectively. Further
26 simulations were made to design MAHP for strawberry using T12 tray and appropriate number of perforations
27 in packaging film under different conditions of fruit mass and ambient temperature. For example, using 1
28 perforation of 0.8 mm diameter for 6 days storage of a 400 g strawberry package under 15°C ambient
29 temperature, resulted in desired gas composition of O₂ (7.0%) and CO₂ (12.6%), while preventing humidity
30 saturation and consequent moisture condensation by keeping in-package equilibrium humidity at 97.6% and
31 maintaining fruit mass loss less than 0.3%.

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