

**Title** Modeling the diffusion–adsorption kinetics of 1-methylcyclopropene (1-MCP) in apple fruit and non-target materials in storage rooms

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### **Abstract**

The purpose of this research was to model the kinetics of adsorption of 1-methylcyclopropene (1-MCP) in apple fruit and non-target solid materials found in apple storage rooms. The process was described by Fick's second law of diffusion of the gas through the pores of the material coupled with adsorption kinetics of the gas on the material's binding sites. A finite element formulation of the model, describing the diffusion and adsorption mechanisms separately, was first developed. The values of the relevant parameters were estimated based on headspace measurements of the decrease of 1-MCP in jars containing the different materials. The headspace concentration of 1-MCP was measured using gas chromatography. Apple fruit (Golden Delicious and Jonagold) and the following bin construction materials were investigated: high density polyethylene (HDPE), oak, poplar wood and card lining. The range in the magnitude of the diffusion coefficient, adsorption coefficient, and concentration of active sites in the various solids was 10,000-, 8-, and 30-fold, respectively.