

1-Methylcyclopropene inhibits ethylene perception and biosynthesis: A theoretical and experimental study on cape gooseberry (*Physalis peruviana* L.) fruits

Helber Enrique Balaguera-López, Mauricio Espinal-Ruiz, Jeimmy Marcela Rodríguez-Nieto, Aníbal Herrera-Arévalo and Lorenzo Zacarías

Postharvest Biology and Technology, Volume 174, April 2021, 111467

Abstract

Theoretical and experimental studies were conducted to determine the role of 1-MCP in the biosynthesis of ethylene in cape gooseberry fruits (*Physalis peruviana* L.), ecotype Colombia. A completely randomized experimental design was used with 3 treatments: ethylene (1000 μL ethephon L^{-1}), 1-MCP (1 μL L^{-1}), and a control with no applications. At 1, 6 and 11 days after treatment, volatile compounds, firmness and color were measured. The enzymatic activities of ACC oxidase (E.C. 1.14.17.4) and histidine kinase (HK, E.C. 2.7.13.3) were also determined *in vitro*. Subsequently, molecular docking studies with the enzymes, their respective substrates and 1-MCP were carried out. It was found that 1-MCP decreased the emission of volatile esters, color index, loss of firmness, and ACC oxidase and histidine kinase activities. Results indicated 1-MCP acted as a competitive inhibitor of ACC oxidase and as a noncompetitive inhibitor of HK. The coupling free energy was higher for 1-MCP in both the ACC oxidase (8.31) and the HK (4.22), compared to their respective substrates. The results also suggested that 1-MCP was able to decrease both the biosynthesis and activity of ethylene in cape gooseberry fruits.