1-MCP Inhibition of Ripening in D'Anjou Pears:
Biochemical characterization and Ripening Solutions

To reduce postharvest spoilage and extend storage life of fresh market pears (*Pyrus communis* L.), many packing houses treat fruit with the ethylene receptor antagonist 1-methylcyclopropene (1-MCP). In commercially important winter pears such as D'Anjou, however, 1-MCP treatment suspends development of color, aroma, sweetness, and flesh softening indefinitely. Thus, continued use of 1-MCP in winter pears warrants a more comprehensive understanding of its pleiotropic ripening inhibition. Comprehensive metabolic characterization in 1-MCP treated fruit revealed up to two-fold suppression of the alternative oxidase coinciding with reduced respiration of on average 150 µg CO_2 mL^{-1} hr^{-1} under control fruit at 4°C. Despite the presence of abundant protein, amylase activity remains suppressed in 1-MCP treated fruit, and total soluble solids remain low. Glyoxylic acid (GLA) may overcome some of the limitations of 1-MCP treatment by partially restoring ripening-associated organoleptic traits, however the mechanism remains undefined. Post-1-MCP GLA reduces flesh firmness on average by 8.9 N when compared to MCP only fruit and is effective at initiating aromatic compound synthesis and increasing peak ethylene evolution nearly 2-fold. Post MCP GLA treated fruit experience increased respiration on average 450 µg CO_2 mL^{-1} hr^{-1} over 1-MCP treated fruit, yet soluble sugars still do not increase. Together, these results advance our understanding of 1-MCP's effect in D'Anjou fruits at both the protein and biochemical levels and highlight the complexity of starch conversion in climacteric fruits. Furthermore, these studies suggest possible effective GLA treatment mechanisms for greater consumer acceptance of 1-MCP treated winter pears.