

'Rocha' pear ripening under the 1-MCP evergreen effect: the impact of the auxin 1-naphthaleneacetic acid treatment

'Rocha' pear (*Pyrus communis* L. cv. Rocha), is a DOP cultivar from the West region of Portugal that is appreciated worldwide. Combined with controlled atmosphere storage, 1-methylcyclopropene (1-MCP) application, an antagonist of ethylene action, has been one of the most applied techniques to extend the storage of 'Rocha' pear. However, fruit industry is facing a problem resulting from 1-MCP application: it prevents the normal ripening of the fruit and affects the final quality at the consumer level.

In this study, we exposed 1-MCP treated fruits to an auxin 1-naphthaleneacetic acid (1-NAA) solution (2 mM) and analyzed the efficacy in restoring the ripening of 'Rocha' pear. First, during the first 24 h, we determined the primary impact of 1-NAA on the expression of genes encoding ethylene receptors (*PcETRs*) and ethylene biosynthesis enzymes (*PcACS* and *PcACO*), combined with lipid peroxidation and reactive oxygen species. We also studied the effect of 1-NAA on **ethylene production, respiration**, and other ripening markers (**firmness and sugars**) across *shelf life*.

Herein, the expression of ***PcACS1*** and ***PcACS4*** increased in 1-MCP fruit treated with 1-NAA compared to pear treated only with 1-MCP. Additionally, the expression of ***PcETR2*** and ***PcETR5*** was enhanced, revealing the potential of the 1-NAA treatment in inducing the production of new ethylene receptors.

Time course physicochemical analysis revealed that fruit ripening was accelerated by 1-NAA treatment, as judged by ethylene evolution and respiration associated with softening. The 1-NAA treatment increased firmness loss (ca. 60%) and internal ethylene production (ca. 50%). Also, exogenous 1-NAA treatment increased **1-aminocyclopropane carboxylic acid (ca. 28%)** and **ACC oxidase activity (ca. 15%)** corroborating the increased in gene expression.

Our findings reveal that 1-NAA treatment may circumvent 1-MCP effect providing valuable information for ripening studies in pear.