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TRANSCRIPTOME AND METABOLIC ANALYSIS REVEAL THE IMPACT OF STATIC AND DYNAMIC LOW OXYGEN REGIMES ON POSTHARVEST STORAGE OF 'GRANNY SMITH' APPLES

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Apples are subjected to long-term cold storage to maintain quality and ensure year-round market availability.

The most common strategy to delay ripening is low-temperature storage, which can interfere with usual fruit physiology and trigger chilling injury disorders such as superficial scald.

To prevent the appearance of this disorder, controlling the storage atmosphere by reducing oxygen concentration is an effective method and alternative to the use of the ethylene antagonist 1-MCP.

To monitor the potential effects of low oxygen regimes, an integrated survey was conducted, profiling transcriptome variations along with three categories of metabolites (phenolics, lipids, and VOCs) in samples of 'Granny Smith' apples stored under static controlled atmosphere and dynamic hypoxic conditions for 5 and 7 months, respectively.

High concentrations of chlorogenic acid and increased expression levels of Md*PAL* and Md*PPO* were detected in samples affected by superficial scald.

RNA-seq analysis revealed 8,100 differentially expressed genes categorized into three main functional groups, highlighting significant transcriptional reprogramming associated with the onset of superficial scald and storage

conditions.

Additionally, DEG-network analysis identified distinct transcriptomic hubs depending on the storage duration, shedding light on the deep effect that hypoxia can have on fruit physiology, and highlighting differences in gene regulation when comparing different storage strategies.