

COMPARATIVE ANALYSIS OF 'GRANNY SMITH' AND 'LADINA' APPLE CULTIVARS IN RELATION TO THE ONSET OF THE POSTHARVEST DISORDER SUPERFICIAL SCALD.

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To slow down the general metabolism preventing the fruit decay in apple, after harvest fruit are stored at low temperature with modified atmosphere. These strategies efficiently control the progression of ripening through a reduction in the ethylene production and response. Low temperature condition can however trigger the onset of chilling injuries, such as the superficial scald disorder. Specific apple varieties, such as 'Delicious', 'Fuji' and 'Granny Smith', are in fact susceptible to a typical postharvest disorder known as superficial scald, manifesting the development of dark areas interesting the first outer layers of hypodermal cells, which makes the fruit aesthetically unacceptable, and hereby promoting fruit waste.

In this study three different storage conditions were applied in 'Granny Smith' and 'Ladina' cultivars. The first one is the common variety used to explore the superficial scald onset, while the second is a new apple cultivar selected for its resistance to scab. Nevertheless, 'Ladina' apples present a low storability, being prone to develop superficial scald and less responsive to the preventing treatment normally applied to contr4ol

this disorder. To investigate the physiological mechanism underlying the control of superficial scald in these two cultivars, fruit after harvest, from both cultivars, were stored following different strategies: 1) for 4 months at 1°C with 92% of relative humidity in regular atmosphere; 2) fruit treated with 1-MCP (1-methylcyclopropene) overnight and stored at regular atmosphere for 7 months at 1°C; 3) apple stored at 1°C in controlled atmosphere, with low oxygen concentration (0.8-1%O₂). The last two conditions generally prevented the onset of superficial scald. After storage samples were collected and a comprehensive transcriptomic and metabolite survey investigated the effect of two preventing strategies in the two cultivars.

The results evidence how the interference at the level of ethylene receptors induced a metabolic reorganization of specific secondary metabolites, such as polyphenolic compounds (catechin, epicatechin and procyanidin) and unsaturated types of fatty acids (oleic acid, linoleic acid and linolenic acid) in 'Granny Smith'. Whereas in 'Ladina' an increase levels of chlorogenic acid and a different class of lipids, such as the very long saturated fatty acid (behenic, arachidonic and lignoceric acids) were observed.

The KEGG pathway and GO enrichment analysis showed as the treatment with 1-MCP actively promoted a reinforcement in the inner cellular membrane through an increased production of fatty acids, while the low oxygen level promoted the shift of the central carbon metabolism. The global RNA-Seq pattern also elucidated a specific transcriptomic signature, showing specific genes, such as *Mal d 1-like* and *DMR6-like* more constitutively expressed in 'Ladina' than in 'Granny Smith', validating the effect of the genetic background on the susceptibility to this disorder.