

# Effect of methyl jasmonate and salicylic acid postharvest treatment on mechanisms and activities of antioxidants in lemon fruit rind during cold storage

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## Abstract

'Eureka' lemons are chilling sensitive and develop chilling injury (CI) during cold quarantine treatment (-0.5°C). The fruit contains antioxidants that may either enhance chilling tolerance or induce defensive responses to protect fruit from damages caused by chilling. Soluble sugars (sucrose, glucose and fructose) in the rind can increase fruit chilling tolerance. Postharvest treatments with methyl jasmonate (MJ) and salicylic acid (SA) have been successfully used to reduce CI. With the aim of enhancing antioxidant activities and carbohydrate levels, fruit were treated with various combination of MJ and SA (10 µM MJ or 2 mM SA or 10 µM MJ and 2 mM SA or 1 µM MJ and 0.2 mM SA or 0.1 µM MJ and 0.02 mM SA) and thereafter, waxed and stored at -0.5°C for either 0, 7, 14, 21, 28, 35, or 42 days plus 7 days at room temperature (25°C) where after CI was evaluated. Total antioxidant scavenging capacity, ascorbic acid, total phenolics and soluble sugars in the rind were determined. Treatment with MJ and/or SA significantly ( $P \leq 0.05$ ) reduced CI. Compared with other treatments, 10 µM MJ and 2 mM SA was more effective in protecting fruit from chilling damage by delaying and reducing CI symptoms. Exposing fruit to -0.5°C for 14 days, resulted in high total antioxidant capacity presumably in response to cold stress. Total antioxidant capacity in untreated fruit decreased with extended cold storage time from 21-42 days. Treatment with MJ and SA delayed the degradation of total antioxidant capacity in lemons during cold storage. Seemingly, MJ and SA treated fruit were chilling tolerant due to high antioxidant activities. Treatments with 10 µM MJ and/or 2 mM SA were also effective in inducing other antioxidants such as total phenolics and ascorbic acid, which could have enhanced chilling tolerance. Furthermore, treatment with 10 µM MJ and/or 2 mM SA were effective in increasing rind sugar levels. This could have enhanced chilling tolerance by

increasing the pool of sugars acting as osmoprotectants presumably protecting fruit from CI. Therefore, treatment with 10  $\mu$ M MJ and/or 2 mM SA is suggested to increase chilling tolerance of lemons during quarantine treatment.