

# Pre-storage nitric oxide treatment enhances chilling tolerance of zucchini fruit (*Cucurbita pepo* L.) by S-nitrosylation of proteins and modulation of the antioxidant response

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Postharvest Biology and Technology, Volume 171, January 2021, 111345

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## Abstract

Nitric oxide (NO), a major signalling molecule with various physiological functions in plants, participates in many responses to abiotic disorders such as cold stress. Chilling injury (CI) is the most costly postharvest problem in zucchini fruit (*Cucurbita pepo* L.), since it diminishes market acceptability and shelf life. This study investigates the effect of NO treatment on zucchini fruit during postharvest cold storage. Fruit were dipped in an aqueous solution of sodium nitroprusside (SNP; 25, 100, and 500  $\mu\text{M}$ ) as a NO donor and in potassium ferricyanide (a structural analogue of SNP) and distilled water, both used as controls and responding the same during postharvest cold storage. The results showed that the application of 25  $\mu\text{M}$  SNP treatment reduced weight loss and CI in zucchini fruit during cold storage. S-nitrosylated proteins detected in the exocarp of NO-treated fruit were more abundant than in non-treated fruit. The application of SNP improved the quality of zucchini fruit stored at 4 °C, with a reduction of weight loss, electrolyte leakage, content of malondialdehyde and  $\text{H}_2\text{O}_2$ , and delayed loss of firmness during cold storage. NO-treated fruit showed a higher activity of superoxide dismutase, ascorbate peroxidase, glutathione reductase, and phenylalanine ammonia lyase during the first days of cold storage. Total antioxidant capacity was higher in the NO-treated fruit during the first days of cold storage, supported also by higher concentrations of phenols. NO appeared to play a regulatory role in the antioxidant balance in zucchini fruit, maintaining the cellular redox homeostasis and thus modulating ROS toxicity, thereby improving fruit quality during cold conservation.