J. Plant Biochem. Biotechnol. (July–September 2015) 24(3):292–297
DOI 10.1007/s13562-014-0271-9

ORIGINAL ARTICLE

Nitric oxide inhibits activities of PAL and PME enzymes and reduces chilling injury in 'Santa Rosa' Japanese plum (*Prunus salicina* Lindell)

Swati Sharma · R. R. Sharma

Received: 13 December 2013 / Accepted: 28 April 2014 / Published online: 11 May 2014

Abstract Studies were carried out to observe the effect of sodium nitroprusside (SNP) treatment (source of nitric oxide) on chilling injury, electrolyte leakage, malondialdehyde (MDA) content, phenylalanine ammonia lyase (PAL) and pectin methyl esterase (PME) activities during low temperature storage of Japanese plums cv. 'Santa Rosa'. All SNP treatments significantly alleviated CI symptoms during entire period of cold storage. Among different treatments, fruits treated with SNP (0.5 mM) showed 71 % lower incidence of CI than control. Minimum electrolyte leakage (49 %), PAL (53.6μmoles of cinnamic acid produced min^{-1} g^{-1}FW) and PME activity (0.36 μmol min^{-1} g^{-1}FW) were observed in 0.5 mM SNP treated plums and the maximum in control. The maximum retention of ascorbic acid (25.6 mg/100 g pulp) and antioxidant capacity (14.7 μmol Trolox g^{-1}) was also exhibited by 0.5 mM SNP treated plums. Lowest MDA content (8.17 nmol g^{-1} FW) and anthocyanin content (592.7 mg/kg FW) were also found in the fruits treated with 0.5 mM SNP. Thus, it can be concluded that SNP is an easy method for application of nitric oxide to maintain fruit quality and extending shelf life by inhibiting fruit softening through interfering with PAL and PME activities during cold storage of 'Santa Rosa' plums.

Keywords Plum · Chilling injury · Electrolyte Leakage · Phenylalanine ammonia lyase · Pectin methyl esterase · Malondialdehyde

S. Sharma · R. R. Sharma (✉)
Division of Food Science & Postharvest Technology, Indian Agricultural Research Institute, New Delhi 110 012, India
e-mail: rrs_fht@rediffmail.com

Abbreviations

CI	Chilling Injury
EL	Electrolyte Leakage
PAL	Phenyl alanine lyase
PME	Pectinmethyl esterase
MDA	Malondialdehyde
NO	Nitric oxide
SNP	Sodium nitroprusside

Introduction

Plum is the 2nd important temperate fruit in area and production after peach in India. Among different species of plum, Japanese plum (*Prunus salicina* Lindell) is most widely grown in India and its variety, 'Santa Rosa' is most accepted because of its prolific bearing habit, better taste and quality than other varieties. Plums contain appreciable quantity of phytochemicals and are considered a good source of natural antioxidants in our daily diet. Plums have higher total antioxidant capacity (TAA) than several other fruits. Phenolic compounds, especially flavonoids, phenolic acids and anthocyanins are most important components responsible for high TAA. These are considered as potent group of antioxidants and have lately emerged as the guardian of health. However, it is a climacteric fruit with high metabolic and respiration rates, which makes it a very perishable fruit. There are huge post harvest losses of about 25–30 % during transportation (Sharma et al. 2012c). Thus, this highly prized fruit needs new approaches to enhance its postharvest life while maintaining quality.

Low temperature storage is an effective and commercially practiced technology for prolonging shelf-life of fresh fruits, due to slowing down of respiration and other metabolic processes which lead to ripening and senescence. So, in order to