Title Postharvest nitric oxide fumigation delays fruit ripening and alleviates chilling injury during cold storage of Japanese plums (*Prunus salicina* Lindell)

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Abstract

We investigated the effects of nitric oxide (NO) fumigation on fruit ripening, chilling injury, and quality of Japanese plums cv. 'Amber Jewel'. Commercially mature fruit were fumigated with 0, 5, 10, and 20 μL L^{-1} NO gas at 20 °C for 2 h. Post-fumigation, fruit were either allowed to ripen at 21 ± 1 °C or were stored at 0 °C for 5, 6, and 7 weeks followed by ripening for 5 d at 21 ± 1 °C. NO-fumigation, irrespective of concentration applied, significantly ($P \leq 0.5$) suppressed respiration and ethylene production rates during ripening at 21 ± 1 °C. At 21 ± 1 °C, the delay in ripening caused by NO-fumigation was evident from the restricted skin colour changes and retarded softening in fumigated fruit. NO treatments (10 and 20 μL L^{-1}) delayed the decrease in titratable acidity (TA) without a significant ($P \leq 0.5$) effect on soluble solids concentration (SSC) during ripening. During 5, 6, and 7 weeks of storage at 0 °C, NO-fumigation was effective towards restricting changes in the ripening related parameters, skin colour, firmness, and TA. The individual sugar (fructose, glucose, sucrose, and sorbitol) profiles of NO-fumigated fruit were significantly different from those of non-fumigated fruit after cold storage and ripening at 21 ± 1 °C. CI symptoms, manifest in the form of flesh browning and translucency, were significantly lower in NO-fumigated fruit than in non-fumigated fruit after 5, 6, and 7 weeks storage followed by ripening for 5 d at 21 ± 1 °C. NO-fumigation was effective in reducing decay incidence in plums during ripening without storage and after cold storage at 0 °C for 5, 6, and 7 weeks. In conclusion, the postharvest exposure of 'Amber Jewel' plums to NO gas (10 μL L^{-1}) delayed ripening by 3–4 d at 21 ± 1 °C, and also alleviated chilling injury symptoms during cold storage at 0 °C for 6 weeks.