Scientia Horticulturae 197 (2015) 287–296

Contents lists available at ScienceDirect

Scientia Horticulturae

journal homepage: www.elsevier.com/locate/scihorti

Influence of a chitosan coating on the quality and nutraceutical traits of loquat fruit during postharvest life

Milena Petriccione*, Maria Silvia Pasquariello, Francesco Mastrobuoni, Luigi Zampella, Donatella Di Patre, Marco Scortichini

Consiglio per la Ricerca in Agricoltura e l'analisi dell'Economia agraria (CREA), Fruit Trees Unit Research, Via Torrino 3, I-81100 Caserta, Italy

ARTICLE INFO

Article history:
Received 8 June 2015
Received in revised form 23 August 2015
Accepted 29 September 2015
Available online 9 October 2015

Keywords:
Loquat
Chitosan
Bioactive compounds
Principal component analysis

ABSTRACT

Chitosan coating has been used for improving the postharvest life of fruits and vegetables. Loquat is a non-climacteric-fruit with a short postharvest life and a susceptibility to browning, chilling injury, purple spot and microbial decay. The effectiveness of a chitosan coating treatment (1%) on the quality and nutraceutical traits of three loquat cultivars and three selections stored at 7 °C for 21 days were investigated. It was found that chitosan treatment provided an effective control in reducing fruit weight loss and delaying changes in the soluble solids concentration, titratable acidity and skin colour during 21 days of cold storage in a cultivar-dependent manner. Furthermore, in chitosan-coated fruits, losses of the total polyphenol, flavonoid, carotenoid, ascorbic acid content and the antioxidant capacity were reduced. Principal component analysis was used to track the effect of different parameters on the effectiveness of the chitosan coating on loquat fruit. It showed that with the cold storage increasing time, the uncoated fruits exhibited a higher deterioration than chitosan-coated fruits.

The chitosan coating could be used commercially to extend the postharvest life, improve the storability and enhance the nutraceutical value of loquat fruits up to 21 days of cold storage.

1. Introduction

Loquat (*Eriobotrya japonica* Lindl.), which is included in the family *Rosaceae*, is a subtropical evergreen fruit tree cultivated and naturalized in several subtropical and mild-temperate regions of the world (Lin et al., 1999). Loquat has an unusual phenology compared to most temperate fruit crops; it blooms in fall and early winter and ripens during the spring. This fruit is offered in fresh markets when there is a low fleshy fruit availability to allow growers to obtain high prices, especially for the early-season harvest (Pinillos et al., 2011).

Loquat cultivars show a wide diversity of fruit colours due to the carotenoids content and distribution in fruit skin and flesh (Goulas et al., 2014). This fruit is a relatively good source of natural antioxidants, such as polyphenols, vitamin C, carotenoids and flavonoids, but the bioactive compound content and antioxidant capacity vary greatly among the cultivars (Xu and Chen 2011)

Loquat is a non-climacteric-fruit with a short postharvest life and a susceptibility to browning, chilling injury, purple spot and microbial decay (Cai et al., 2006c; Ghasemnezhad et al., 2011; Pareek et al., 2014). This fruit is consumed as fresh fruit, and it is highly perishable and often does not reach consumers at an optimal quality. Cold storage is the main postharvest treatment to reduce the rate of many metabolic processes in perishable fruits. In loquat fruit the minimum safe temperature to avoid chilling injury ranges from 0 to 10 °C; consequently, the optimal storage temperature depends on the cultivar susceptibility to chilling injury (Pareek et al., 2014). To extend the postharvest life of loquat fruit, several technologies, including low temperature conditioning, modified atmosphere packaging, hot air, methyl jasmonate, 1-methylcyclopropene (1-MCP) and coating in combination with cold storage, have been applied (Cai et al., 2006a; Cao et al., 2007; Cao et al., 2009a,b; Ding et al., 2002; Ghasemnezhad et al., 2011; Márquez et al., 2009; Rui et al., 2010). Edible coatings with semipermeable films can provide an alternative to modified atmosphere storage by reducing quality changes and quantitative losses through the modification and control of the fruit internal atmosphere (Dhall 2013).

Chitosan, a deacetylated derivate of chitin, is a high molecular weight cationic linear polysaccharide composed of D-glucosamine and, to a lesser extent, *N*-acetyl-D-glucosamine with a β-1,4-linkage. Chitosan is normally extracted from an abundant source of

* Corresponding author. Fax: +39 0823493381.
E-mail address: milena.petriccione@entecra.it (M. Petriccione).

http://dx.doi.org/10.1016/j.scienta.2015.09.051
0304-4238/

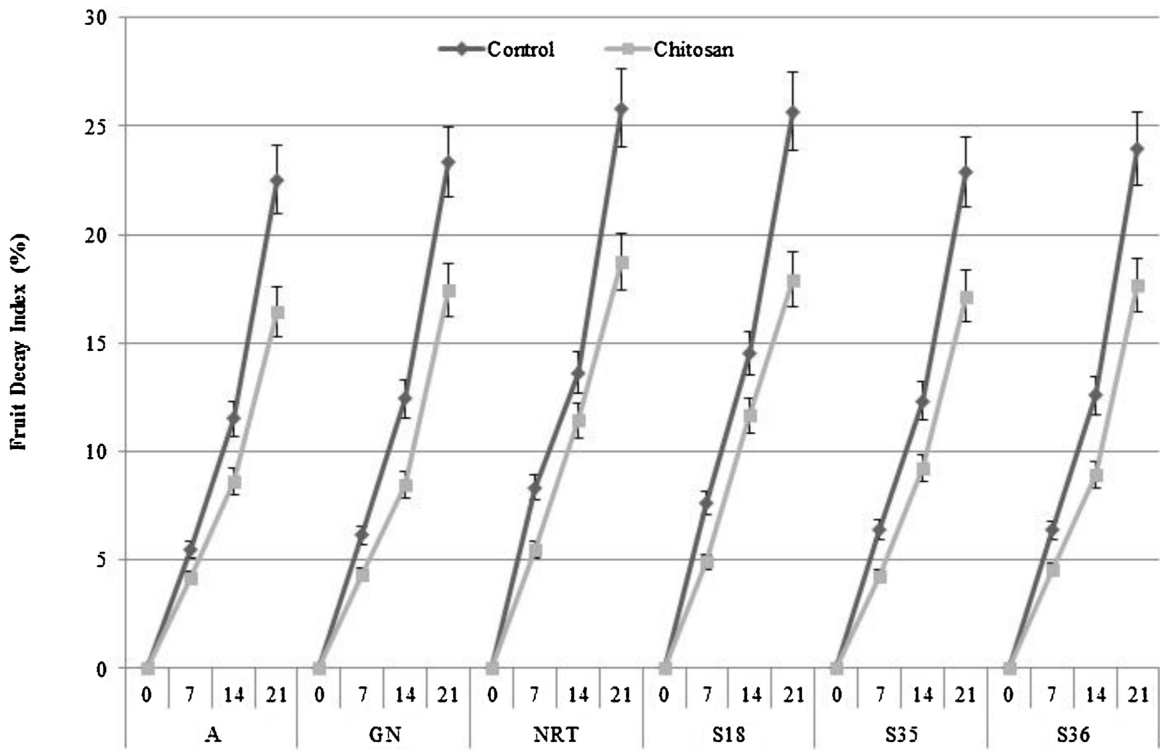

Fig. 1. Evolution of the loquat cultivars (Algerie (A); Golden Nugget (GN) and Nespolone Rosso di Trabia (NRT)) and advanced selections (CRAFRC-S18 (S18); CRAFRC-S35 (S35); CRAFRC-S36 (S36)) fruit decay index during cold storage in chitosan-coated (Chitosan) and uncoated fruits (Control). Error bars indicate the standard deviation.

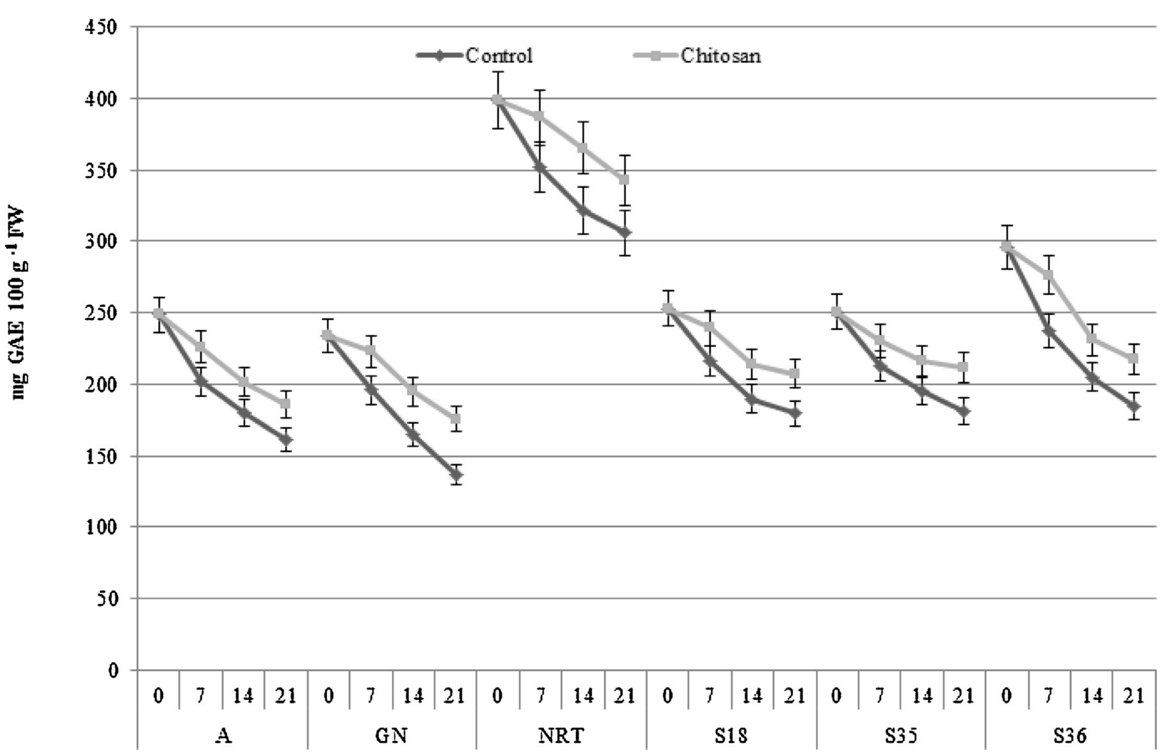

Fig. 2. Total polyphenols content of the loquat cultivars (Algerie (A); Golden Nugget (GN) and Nespolone Rosso di Trabia (NRT)) and advanced selections (CRAFRC-S18 (S18); CRAFRC-S35 (S35); CRAFRC-S36 (S36)) during cold storage in chitosan-coated (Chitosan) and uncoated fruits (Control). Error bars indicate the standard deviation.

shellfish exoskeletons or the cell wall of some microorganisms and fungi. Chitosan-based coatings are considered the best edible and biologically safe preservative coatings for different types of food due to their lack of toxicity, biodegradability, film-forming properties and antimicrobial action (No et al., 2007). Chitosan-based coatings have been used to improve the storage and to extend the shelf life of several fruits (Ali et al., 2011; Hong et al., 2012; Lin et al., 2011; Petriccione et al., 2015; Romanazzi et al., 2012; Wang and Gao 2013). In loquat, the effectiveness of edible coatings based on chitosan and sucrose ester fatty acids have been tested