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ORIGINAL ARTICLE

The Effects of Postharvest Treatments of Salicylic Acid and Cinnamon Oil on The Storage Of Peach

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ABSTRACT
In order to determine the effects of salicylic acid (SA) and cinnamon essential oil on postharvest life and quality of peach fruits, three different concentrations (0.5, 1 and 2 mmol L^{-1} SA) and three different concentrations 250, 500 and 750 ppm cinnamon essential oil for 5 min at 25ºC were applied to peach fruits cv. 'Elberta'. Result indicated that significant differences were observed in quality parameters among treated fruits and control. Data showed that treatment with 2 mM and control had the highest of TSS content (12.30 and 12.71 °Brix) also, treated fruits with 2 mM SA had the lowest the percentage of weight loss (1.89 %). Result indicated that treatment with 1 mM had the highest of TA (64.48 %) and pH (64.48%) content. The results of present study conclusively showed that 2mM salicylic acid had significant effect on quality parameters of peach fruits cv. 'Elberta' during of storage period.
Key words: *Peach, Salicylic acid, Cinnamon essential oil, Postharvest quality.*

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INTRODUCTION

During postharvest storage, due to internal and external factors, chemical and physical changes occur in fruits and vegetables, which result in losses in nutritional quality. Postharvest quality of peach fruits is greatly affected by several pre-and postharvest factors. Peach is a climacteric fruit which undergoes rapid ripening. This is responsible for its short shelf-life and represents a serious constraint for its efficient handling and transportation [1]. It is therefore very important to optimize the postharvest care of fruits to obtain satisfactory quality. Salicylic acid (SA) is a plant hormone inhibiting ethylene biosynthesis and delaying the senescence [2]. SA being an endogenous growth regulator from phenolic group [3] has been extensively used for quality improvement in a number of crops [4]. Salicylic acid has been documented to enhance flesh firmness of harvested peaches during storage and persimmon [5, 6]. Essential oils are volatile, natural, complex compounds characterized by a strong odor and are formed by aromatic plants as secondary metabolites. Essential oils play an important role in the protection of the plants as antibacterial, antifungal, insecticides and also against herbivores by reducing their appetite for such plants [7]. Tripathi *et al.* [8] reported the effective control of the gray mould fungi using essential oils derived from *Ocimum sanctum*, *Prunus persica* and *Zingiber officinale*. Keeping in view the perishable nature of peach fruits and effectiveness of postharvest salicylic acid and cinnamon essential oil application, an experiment was designed to evaluate the effects of salicylic acid and cinnamon essential oil applications on postharvest quality parameters such as weight loss, TA, pH, TSS and TSS/TA evaluation.

MATERIALS AND METHODS

The present investigation was conducted in the Department of Horticultural Science, Faculty of Agricultural Science and Natural Resources, Science and Research Branch, Islamic Azad University, Tehran, Iran. Peach fruits (*Prunns persica* L.) Cultivar 'Elberta' was hand-harvested at physiologically mature stage from a commercial orchard in Damavand, Iran (2012-2013). The fruit was packed in corrugated boxes and transported to laboratory immediately. The fruit were screened based on

uniformity of shape, size and peel color, and any defaced fruits were discarded. The fruits were divided into three groups and were treated by dipping in the solution of 0 (as control), 0.5, 1 and 2 mM SA and 250, 500 and 750 ppm cinnamon essential oil for 5 min at 25ºC. The experiment was conducted in a complete randomized factorial design with three replications consisting of 15 fruits for each repeat. Data were analyzed using SAS version 9.1. (SAS Institute, Cary, NC, USA), and means were compared by Duncan's multiple range test at 5% level of confidence.

Quality Parameters

Titratable acidity (TA), Total soluble solids (TSS) and pH

The pH value of fruit was measured with a pH meter at 20°C. Titratable acidity (TA) was determined by titration with 0.1 N NaOH until pH 8.2 was reached and reported g/100 g^{-1} of malic acid fresh weight using malic acid as a control. Total soluble solids (TSS) was determined at 20°Cwith a digital Refractometer (model Atago, Iapan) and reported as °Brix. The maturity index was calculated by using the TA/TSS ratio.

Fruit weight loss:

Fresh weight of peach fruits was recorded in before and end storage. Fruit weight loss (%) was recorded at each sampling and computed by following formula: Weight loss (%) = [(A−B)/A] x 100

RESULTS AND DISCUSSION

The effect of cinnamon essential oil and SA on TSS content fruit showed in Fig 1. Result indicated that significant differences were observed in TSS content among treated fruits and control. Data showed that treatment with 2 mM and control had the highest of TSS content (12.30 and 12.71 °Brix) (Fig. 1). SA treatment effectively decreased ethylene production in fruit and noticeable decrease in metabolic activity which delays fruit senescence process [9]. Asghari *et al.* [10] reported that TSS and TA of strawberries infected with *B. cinerea* increased with the application of cumin oil. There was significant difference in TA content of treated fruits with control fruits. (Fig. 2). Data showed that treatment with 1 mM had the highest of TA content (64.48 %). It is matter of fact that fruit taste is mainly made up of sugars and acids combination. It has been suggested that TA decreases in fruits in result of breakup of acids to sugars during respiration [11]. Han and Li [12] have also reported that apple fruits treated with SA had increased TA content at the end of storage. Also, salicylic acid had a significant effect on apple titratable acids and total soluble solids [13]. Data showed that control had the highest of TSS/TA content (25.17%). Among essential oils, cinnamon essential oil at 500 and 750 ppm was the best treatment, but there was no significant difference in TSS/TA content among 0.5 and 2 mM SA and 250 ppm cinnamon essential oil treatment (Fig 3). There was significant difference in pH value, among treatments with control (Fig 4). Treated fruits with the cinnamon essential oil in concentration 750 ppm had the lowest pH value with 51.44%, while treated fruits with the 1 mM SA had the highest pH value concentrations (64.48%). As mentioned for TA percentage, similar result on TSS/TA ratio has been reported by Nikos and Tzortzakis [14]. Ranasinghe *et al.* [15] resulted the effectiveness of essential oil on quality parameters of banana fruits and found that cinnamon and clove oils had no effect on TSS, pH and TA of oil-treated fruits. The percentage of weight loss was very low for fruit treated by 2 mM SA and had significant difference comparison to control ($p< 0.01$). Among samples, treated fruits with 2 mM SA had the lowest the percentage of weight loss (1.89 %), while control (3.42%), followed by 750 ppm of cinnamon essential oil (3.24%) had the highest the percentage of weight loss (Fig 5). Weight loss is mainly regulated by respiration, transpiration and metabolic activities in fruits. SA has been reported to close stomata which results in suppressed respiration rate and minimized weight loss of fruits [16]. Similarly, peach fruits cv. 'Delicia' treated with SA exhibited less weight loss than control [17]. Thus, the results of this study suggest that SA might have reduced respiration and transpiration which concomitantly delayed senescence. Data recorded by Wolucka *et al.* [18] are in line with previous results. They reported that fruits which received SA in their nutrient solution had smaller weight loss than fruits without SA in their nutrient solution, weight loss are due to metabolic activity, respiration and transpiration. Previous experiments using natural anti-fungal compounds reduced weight loss percentage in cherry and grape [19, 20].

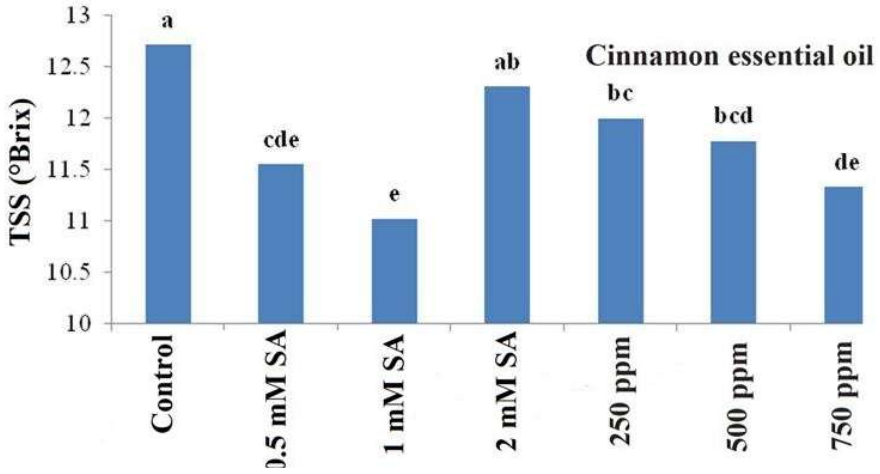

Fig. 1. TSS of peach treated cinnamon essential oil and SA during storage

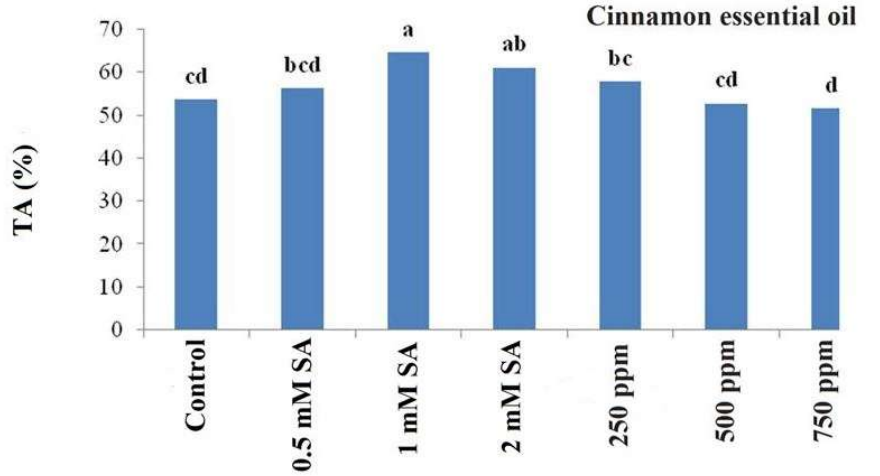

Fig. 2. TA of peach treated cinnamon essential oil and SA during storage

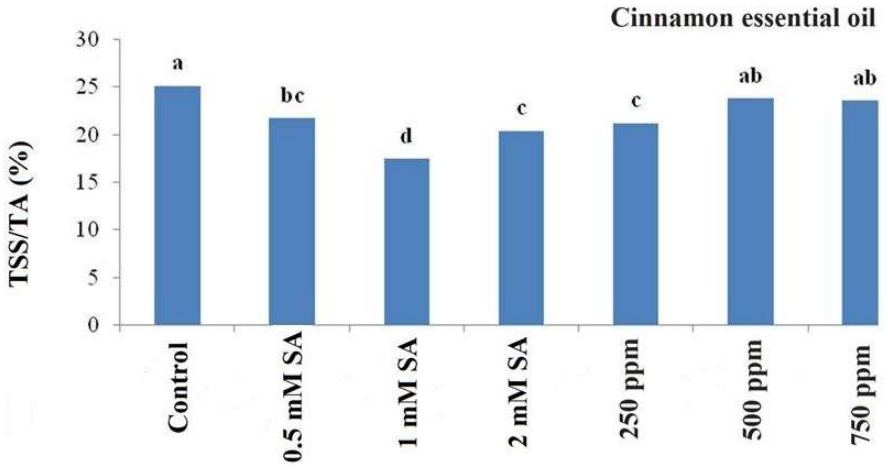

Fig. 3. TSS/TA of peach treated cinnamon essential oil and SA during storage

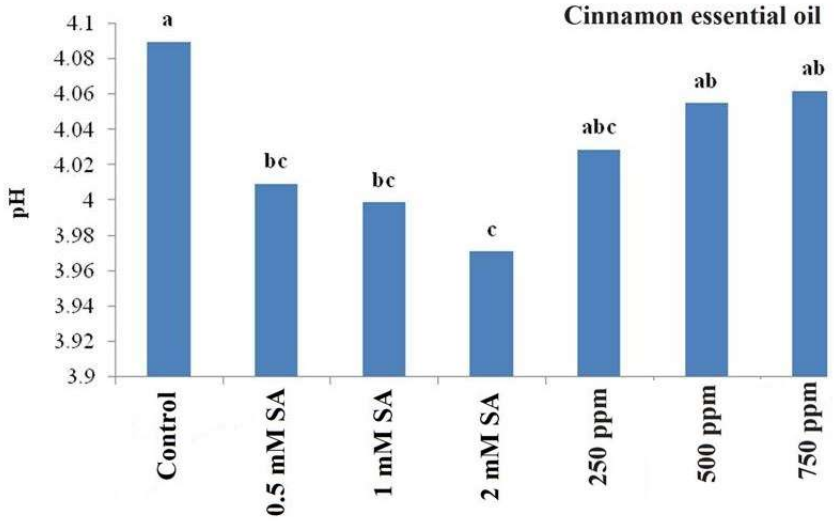

Fig. 4. pH of peach treated cinnamon essential oil and SA during storage

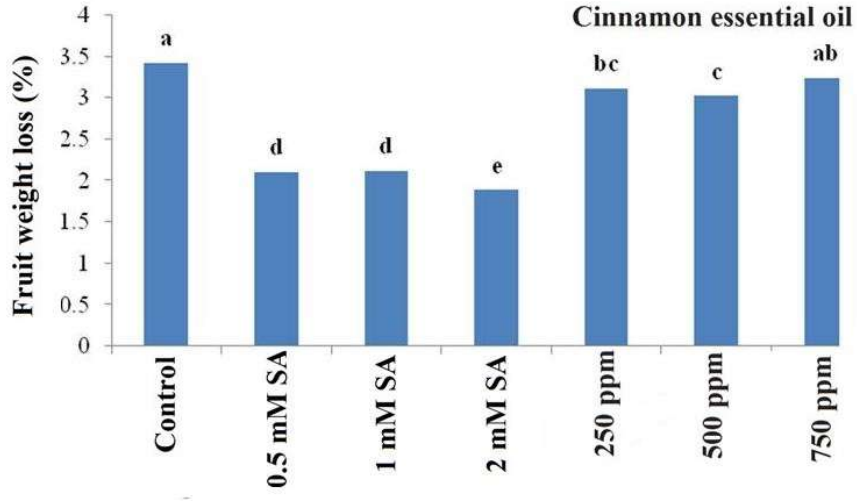

Fig. 5. Fruit weight loss (%) of peach treated cinnamon essential oil and SA during storage

CONCLUSION

The results of present study conclusively showed that 1 and 2 mM salicylic acid had significant effect on quality parameters of peach fruits cv. 'Elberta' during of storage period. While, lower SA and cinnamon essential oil concentrations did not affect significantly and performed nearly to that of control fruits.

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