Effect of an Ethylene Absorbent on Quality of Tomato Slices

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ABSTRACT

Ethylene production is stimulated during the slicing of fresh cut tomato slices. Experiments were conducted to investigate whether the inclusion of ethylene absorbents in packaging affects the quality of tomato slices cv. Revolution during storage at 5°C. 'Pink' maturity stage tomatoes were cut into 7mm thick slices and vertically stacked in closed glass containers for 12 days with or without Purafil® to remove ethylene. The ethylene removal treatment resulted in reduced ethylene, less CO_2 accumulation, and firmer slices.

INTRODUCTION

Ethylene production is stimulated by various types of stress, including mechanical wounding and cutting (Yang and Hoffman, 1984). Consequently, ethylene production is increased when fruits and vegetables are sliced or cut for preparation as fresh cut products. Pangaribuan et al. (2003) showed that the rate of ethylene production and respiration from tomato slices was significantly higher than that from the intact fruit. Ethylene can induce adverse physiological responses such as softening (Watada, 1986). In this experiment we hypothesised that ethylene would reduce the quality of stored tomato slices. The objective of this study was to examine the effect of an ethylene absorbent on ethylene and CO_2 accumulation, and pericarp firmness of fresh cut tomato slices.

METHODOLOGY

Tomato cv. 'Revolution' at the 'pink' maturity with Hue angle 75–80° and firmness ca. 20 N were selected. Medium sized fruit were chosen with a mean fruit mass of 175 ± 15 g, and equatorial and longitudinal dimensions of 73 ± 2 mm and 68 ± 2 mm, respectively. Tomato fruits were dipped in 100 ppm NaOCl solution and slices were cut using a tomato slicer. Five 7-mm thick slices from the equator of tomatoes were vertically stacked in glass jars and stored at 5 °C for 12 days. All procedures were conducted under aseptic conditions. Treatments were (1) Control (no ethylene absorbent) and (2) Ethylene absorbent (10 g potassium permanganate as Purafil®) placed into the glass container prior to sealing. The jars were sealed throughout experiment.

Samples were analysed after 12 days to evaluate ethylene production and respiration rate using gas chromatography of the headspace and firmness using an Instron Food Texture Analyser by penetrating a 3 mm probe at a speed of 1 mm/s. The experimental design was based on a completely randomised design with five replications.

RESULTS AND DISCUSSION

Ethylene production by the tomato slices without the absorbent increased continually during storage. In contrast, no accumulation of ethylene was observed in containers with an ethylene absorbent throughout storage (Table 1). This ethylene accumulation could be attributed to biosynthesis of wound ethylene (Yang and Pratt, 1978). CO_2 accumulated more in containers without Purafil than with the absorbent. Average levels of CO_2 at without Purafil treatment during storage was 7.6% after 12 days storage, whereas if Purafil was present the CO_2 accumulation was 0.55%. This CO_2 accumulation was probably caused by ethylene stimulated respiration by the tomato slices. Pericarp firmness of tomato slices were affected by the ethylene absorbent. After 12 days, in the presence of Purafil © slices were slightly firmer than in the absence of Purafil© (Table 1). Abe and Watada (1991) found that an ethylene absorbent was effective in reducing the rate of softening in kiwifruit slices and banana sections.

Table 1. Effect of ethylene absorbent on ethylene, CO_2 accumulation and firmness of 'pink' tomato slices (means of 5 replicates ± SE) stored at 5 °C for 0 and 12 days.

Treatment	Time (days)	Ethylene (ppm)	CO_2 (%)	Firmness (N)
Without Purafil©	0	1.66 ± 0.21	0.76 ± 0.06	8.84 ± 0.41
	12	18.22 ± 0.60	7.60 ± 0.22	6.82 ± 0.76
With Purafil©	0	0	0.20 ± 0.02	8.94 ± 0.50
	12	0	0.55 ± 0.05	7.77 ± 0.37

CONCLUSION

Ethylene absorbent could reduce ethylene and CO_2 accumulation within glass jars containing tomato slices. An ethylene absorbent helped to slow the rate of softening of the tomato slices.

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