Effect of 1-MCP on Fresh-Cut Fruits

Eduardo V. Vilas-Boas and Adel A. Kader
Department of Pomology, UC Davis

Quality of fresh-cut fruit products depends upon quality of the intact fruit and its maintenance between harvest and preparation of the fresh-cut products, method of preparation, and subsequent handling conditions (temperature, relative humidity, time, proper sanitation). Only good quality and partially-ripe intact fruits should be used to assure good quality fresh-cut products to the consumer. The greatest hurdles to the commercial marketing of fresh-cut fruit products are relatively short post-cutting life due to excessive tissue softening and cut surface browning (caused by the action of polyphenol oxidase on phenolic compounds released during cutting). Fruit tissue softening during ripening and senescence is triggered by ethylene. Both softening and browning can be delayed by effective cooling and maintenance of the cold chain throughout the preparation and subsequent handling steps of fresh-cut fruit products. Chemical dips (such as ascorbic acid, calcium chloride, and cysteine) have been shown to be effective in retarding browning and softening of fruit slices. Packaging fresh-cut fruit products in polymeric films that help in creating a modified atmosphere of about 2 to 4 % oxygen and 10 to 12 % carbon dioxide can also be an effective supplement to proper temperature management in maintaining their quality. In some cases, ethylene scrubbing can be a useful supplemental procedure to add another day or two to the post-cutting life of fresh-cut fruit products. Thus, we tested the efficacy of 1-methylcyclopropene (1-MCP) in delaying softening and browning of fresh-cut fruit products.

Based on preliminary studies, we selected a 6-hour exposure at 10ºC (50°F) to 1000 ppb 1-MCP as the standard treatment for testing on several fresh-cut fruits that were kept at 5ºC (41°F) following the 1-MCP treatment until the end of their marketable-life. In each case, the MCP treatment was applied to either the intact, partially-ripe fruits before cutting or to the fresh-cut products (slices or wedges) immediately after cutting. Quality evaluations included color and firmness (penetration force) of the fruit slices or wedges at intervals during storage at 5ºC (41°F). Also, the rates of respiration and ethylene production were measured. A brief summary of our results so far, follows.

Bananas: Exposure of color 4 bananas to 1-MCP before cutting stimulated more ethylene production and did not influence softening or browning rates of banana slices. In contrast, exposure of banana slices to 1-MCP had no effect on their ethylene production and browning rates, but reduced their softening rate and extended their post-cutting life by 1 to 2 days at 10ºC (50°F), especially when exposed to 2 ppm ethylene in air.

Kiwifruits: Softening of kiwifruit slices was delayed by 1 to 2 days at 5ºC (41°F) in response to 1-MCP treatment of either whole fruits before cutting or the slices after cutting. Concurrently, ethylene production rate was decreased by the 1-MCP treatment.

Mangoes: Exposure of partially-ripe 'Keitt' mangoes to 1-MCP was not effective in slowing the softening rate of fresh-cut mango cubes beyond the first 3 days at 5°C (41°F) after cutting. Treating the fresh-cut mango cubes with 1-MCP was effective in delaying their softening by 1 to 2 days during storage at 5ºC (41°F).

Persimmons: Treating intact 'Fuyu' persimmons with 1-MCP was more effective than treating the fresh-cut wedges in delaying their softening, but it increased their ethylene production rate during storage at 5ºC (41°F). A 3- to 4-day extension of post-cutting life at 5ºC (41°F) was observed.

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