

Fumigation of Avocado Fruit with Methyl Bromide¹

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Abstract. Avocado (*Persea americana* Mill.) fumigated with methyl bromide exhibited varying degrees of tolerance to fumigation as indicated by the extent of skin damage, but fruits of all cultivars were affected. Fumigation damage during ripening was masked on dark-skinned purple to black fruit. The majority of the green-skinned types showed obvious fumigation damage.

One of the 2 treatments approved by the U. S. Department of Agriculture for fruit fly (*Dacus dorsalis* Hendel, *Dacus cucurbitae* Coquillett and *Ceratitis capitata* Wiedemann) disinfestation of avocado fruit to be shipped from Hawaii to the mainland United States is the use of 32g/m³ of methyl bromide in an airtight chamber for 4 hr (3). This has been the standard procedure for treating fresh avocados shipped to Canada and the United States with the exception of Alaska.

Previous studies have shown that certain avocado cultivars can tolerate methyl bromide treatment (1). Thirteen cultivars are described in Yee's circular (4) and several of these cultivars have been recommended for fumigation treatment. The majority of these, however, are considered home garden cultivars not suited for commercial orchards or export to the U. S. mainland. This study was initiated in order to secure data on acceptability of other cultivars grown in Hawaii and their potential for export and also to determine their tolerance to the approved methyl bromide fumigation treatment.

Avocado fruit of 31 cultivars were harvested in the Kona and Puna areas of the island of Hawaii as they reached maturity. Samples were collected and treated for 2 consecutive years.

Twenty fruit were harvested from each tree at monthly intervals and divided into 2 equal lots. One lot was treated with methyl bromide in perforated open wooden boxes in a sealed fumigation chamber and the other control lot kept in an adjacent room. Temperatures in the chamber and the adjacent room ranged from 22-25°C with relative humidity ranging from 75-100%. Fruit were removed from the chamber after fumigation for 4 hr followed by airing of the fumigation chamber for one hour and then kept in the

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same room with control fruit until ripe.

Immediately after treatment all fruit were inspected for external damage. Fruit were individually rated by 2 individuals as they ripened for external and internal appearances and other possible fumigation effects, such as the incidence of anthracnose and stem-end fruit rot. A rating scale of 1 (no effect) to 10 (very severe effect) was used. A rating of 5 is considered to be commercially acceptable based on the standard for Hawaii grown avocados (2). Grade A was rated 2 or 3, grade B rated 4 to 6 and culls rated 6 or higher.

Fruits treated with methyl bromide always exhibited some external damage, ripening 2 to 4 days earlier than the unfumigated controls. Pitting and other visual damage caused by fumigation was masked in the case of cultivars with purple or black fruit when the fruit became ripe and dark colored. The cultivars with least damage are those with purple or black skin such as 'Mal R2T1', 'Rodrigues' and 'Masami' (Table 1), 'Hal R27T8', 'Sharwil' and 'Wahiawa' show promise for the green — skinned cultivars. Several others had ratings higher than 4.0. Cultivars with thick skins were just as susceptible to damage as those with thin skins. 'Itzamna' rated fairly high in tolerance to fumigation but it is considered of inferior quality with very large seeds and little or no potential for export.

Table 1. Effect of methyl bromide fumigation on the external appearance of avocado fruits.²

Very slight (Grade A)	Slight (Grade B)	Moderate (off grade)	Severe
Hal R27T8 (G)	Wahiawa (G)	Coban (G)	Chong (G)
Mal R2T1 (P)	Reinecke (G)	Hal R1T45 (G)	Nishikawa (G)
Rodrigues (P)	N-112 (G)	Ashikawa (LP)	N-119 (G)
Masami (P)	Semil-34 (G)	Kashlan (G)	Fuerte (G)
Itzamna (G)	Hashimoto (G)	Gripina-12 (G)	Ilialu (G)
Ohata (P)	Murashige (G)	Fujikawa (G)	Tanaka (G)
Sharwil (G)	Al Boyce (G)		Hal R1T43 (G)
	CRC4-25 (LP)		
	CRC151-2 (G)		
	Kampong (G)		
	Kahaluu (G)		

²Based on Standards for Hawaii-grown avocados, Table 5.2, 1. Classification of defects (2).

³Rind color: G = green, P = purple, LP = light purple.

Methyl bromide fumigation did not affect the flesh as much as the skin. Flesh color and flavor were acceptable in most cultivars and the former was equal to that of the controls in appearance. Fumigated fruit showed more internal browning in certain cultivars with visibly affected vascular fibers throughout the flesh.

A significant positive correlation (r^2) of 0.62 existed between the external and internal effect caused by methyl bromide. There was a rather high degree of variability among cultivars with different skin colors, especially since methyl bromide fumigation mainly appears to affect the epidermal layer of the fruit.

Fruit rots, particularly anthracnose, were especially serious on 'Fuerte' and 'Nishikawa'. Fumigation did not increase the incidence of fruit rots but the latter developed faster after the methyl bromide treatment since the ripening process was accelerated by 2-4 days.

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