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INTEGRATED USE OF ETHYLENE AND TEMPERATURE TO REVERSE THE EFFECT OF 1-METHYLCYCLOPROPENE (1-MCP) ON HASS AVOCADOS, UNDER MICHOACAN (MEXICO) CONDITIONS

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There are a number of studies confirming the high effectiveness of 1-MCP for specially retaining avocado color development and preventing excessive pulp softening, during transit and temporary cold storage at the distribution centers. Furthermore, there are also results indicating the benefits of 1-MCP improving general avocado appearance, minimizing weight loss, reducing the incidence of physiological disorders, delaying fruit senescence and limiting the presence of some fungi diseases. Fruit treated with 1-MCP normally requires near 8-9 days to reach the ready-to-eat stage under shelf-life conditions, in comparison to the most common 3-4 days needed for the untreated avocados.

The 1-Methylcyclopropene (1-MCP) mode of action is via a preferential attachment to the ethylene receptors, thereby, blocking the effects of ethylene from both internal and external sources. Previous results with a number of crops (including avocados) have already demonstrated the possibility to reverse the 1-MCP responses with the use of ethylene, after a period of time has elapsed. This might be at least partially due to new ethylene sites being generated.

This study was undertaken to further fine-tune the integrated use of ethylene and slightly higher temperatures to accelerate the ripening of 1-MCP treated avocados, after a simulated transit and temporary storage at the distribution center, and prior to their shipment to the retail market. The Hass avocados for this study were obtained from a leading exporter in Michoacan (Mexico), and the experiment was conducted during March-April 2003. High quality export avocados with approximately 27% dry matter and 19% oil content, were treated with 1-MCP at 200 parts per billion (ppb) during 12 hours at 12 ± 0.5ºC and 90% ± 5% R.H. A complete set of untreated fruit was kept under similar conditions to those of the avocados being treated. The respective sets of treated and untreated fruits were then held under conditions simulating a shipment to Europe or Japan (21 days at 6 ± 0.5ºC and 90 ± 5% R.H). Avocados were then continuously exposed to ethylene (100 ppm) during 24, 48 or 72 hr at 21ºC and approximately 85% R.H., immediately after concluding the simulated refrigerated shipment. All the treated and untreated avocados were promptly transferred to shelf-life conditions (22 ± 2ºC; 75 ± 10% R.H.), to daily evaluate their color development, pulp softening, number of ripening fruits, weight loss, and percent of dry matter and oil content.

The interim results from this study show an inverse correlation between the duration of the ethylene treatment (at 21ºC) and the speed for reversing the 1-MCP effect on the treated avocados. The 1-MCP treated avocados required 6 days to reach the ready-to-eat stage (at least 75% fruits) when exposed to ethylene during only 24 hours, without any adverse effect on fruit quality including ideal color and pulp firmness. This avocado ripening period was further reduced to 5 or even 3 days, when the ethylene treatment was extended to 48 or 72 hr respectively. The balanced of the avocados (less than 25% fruits) in each case were expected to possibly ripen within 1-2 additional days. A more flexible response to market demand and further improvement in avocado quality and uniformity, are key to better attend the every day increasing consumer demands and more competitive markets.