

FRUIT RIPENING

Anne White and Allan Woolf

HortResearch, Auckland, New Zealand

Ethylene ripening

In the past three seasons, a major focus of postharvest research in New Zealand has been the development and refinement of ethylene ripening (or “pre-ripening”) as a technique for providing ripe-to-eat product to the New Zealand and Australian markets.

There are a large number of factors, which can influence the response of fruit to ethylene ripening. These include fruit maturity/time in the season, delay from harvest until treatment (temperature/duration), the ethylene treatment itself (concentration, duration, temperature, CO₂ levels), how long the fruit is held at ambient after treatment and the storage temperature/duration after treatment. Some of these variables were held constant so the influence of other variables could be determined.

We have examined the use of ethylene treatment at 17C for ripening avocados both before and after storage. On the basis of our results recommendations were made to the industry on the optimum duration of treatment at different times in the season, and influence of storage before and after ethylene treatment on fruit quality and response to treatment.

For example, the duration of ethylene treatment required to obtain the fastest rate of ripening and minimum amount of fruit-to-fruit variability in non-stored fruit was 24 to 36 hours for early season fruit (October), reducing to 12 hours by late season (March). Also, for fruit harvested over the main part of the commercial season (October to March) there was no benefit found in ethylene treating fruit after 21 days of storage at 5.5C.

Measuring fruit firmness

Firmness is an important characteristic of avocado fruit as it is the most reliable method of determining if the fruit is ripe to eat. The firmness at which a fruit is consumed is very important, as rots and other internal disorders develop rapidly during the latter stages of fruit ripening.

The most common method of measuring avocado firmness used by consumers, industry personnel and researchers is gentle hand squeezing of the fruit. However, this method is very subjective. Research groups around the world have used a range of methods to objectively measure firmness; compression of the whole fruit with the Firmometer (South Africa) or with a rounded probe (WFC, Australia), puncture with an Effegi probe (USA) or puncture with a pointed probe (the Chatillon, Israel). The Firmometer has been modified in NZ (precision engineering and digitalization) and is increasingly being used by the NZ avocado industry and retail distributors in NZ and Australia.

We have recently been comparing these various methods to determine which is best able to provide a rapid non-subjective means of measuring avocado firmness and hence ripeness. As squeezing the fruit by hand is the most common method of measuring avocado firmness, all the test methods were compared to this.

The Firmometer had the closest relationship with hand firmness across the entire firmness range (from harvest to ripe). The other three test methods had a curvilinear relationship with hand firmness; they were able to measure differences between very hard fruit that hand assessment was unable to perceive, but hand assessment was able to measure differences between soft fruit that the instrumental measurements were unable to perceive (Fig. 1).

Having assessed four objective methods of measuring avocado firmness, the Firmometer appears to be the most accurate, practical method and, with slight modifications, is able to discriminate between fruit over the entire firmness spectrum.

Figure 1. The relationship between the firmness of the same individual avocado measured by hand (0=hard, 5=fully ripe) and by various mechanical devices. R² was calculated about the smoothed curve.

