



Harvest Maturity is Critical for Pink Lady Fruit Quality.

By Jenny Jobling*

This project aimed to determine if Pink Lady apples susceptible to rapid ripening as a result of the stimulation of ethylene production during cold storage. The results showed that Pink Lady apples were not susceptible to this disorder. Instead the project highlighted the critical importance of fruit maturity at harvest for storage quality.

This worked compared the storage life of two harvests of fruit. One suited to CA storage, the other suited for direct sale onto the fresh market. Harvest 1 (20th April 2001) was ideally suited for controlled atmosphere storage as ethylene production did not begin until

after day 4 (Fig 1). The average starch index of fruit harvested at this time was 1.5 which is the recommended score for fruit being placed into long term CA storage (Little and Holmes, 2001).

Harvest 2 was well suited to the fresh market as ethylene production and ripening had begun at harvest and the starch index was also high at 3.5. The sweetness and flavour of fruit harvested at this maturity would be developing during transport and marketing. This would mean that the final consumer would receive a tasty, quality apple.

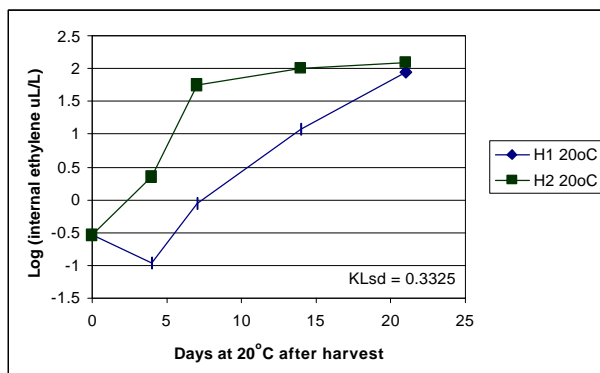


Fig 1. Changes in internal ethylene levels of Pink Lady apples after harvest in 2001.

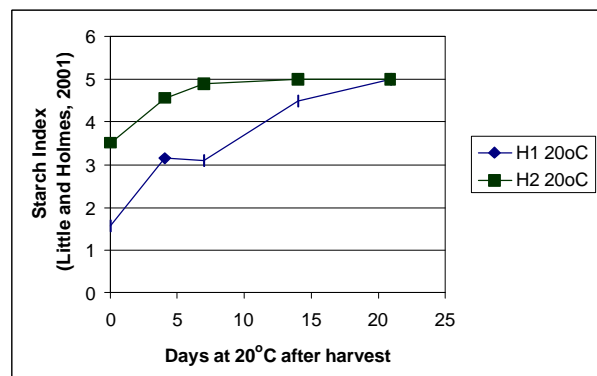


Fig. 2. Changes in the starch index of Pink Lady apples after harvest in 2001.

It is important to note that there is a good correlation between the starch index and the level of internal ethylene. This means that the starch index is a very useful maturity parameter for this variety.

Fruit from the two harvests were placed in cool rooms in air at 0, 3 or 10°C in order to determine if they were prone to rapid ripening. The level of internal ethylene of fruit from both

harvests at all temperatures was quite high on removal from storage (Fig. 3). Although fruit stored at 0°C were significantly lower than the other temperatures.

This shows that storage at low temperature in air does not induce rapid ripening or inhibit ripening, although 0°C does slow the process. The data for both harvests shows that

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the warmer the storage temperature the higher the level of ethylene production.

This result also has practical consequences. The results for the changes in flesh firmness show that fruit from harvest 2 soften more than fruit from harvest 1 as they were more mature when placed in storage (Fig. 4).

The results also show that fruit stored at 0°C were firmer than fruit stored at the warmer temperatures.

These results show that Pink Lady apples are not susceptible to rapid ripening. However maturity at harvest is a key factor in determining storage life and quality.

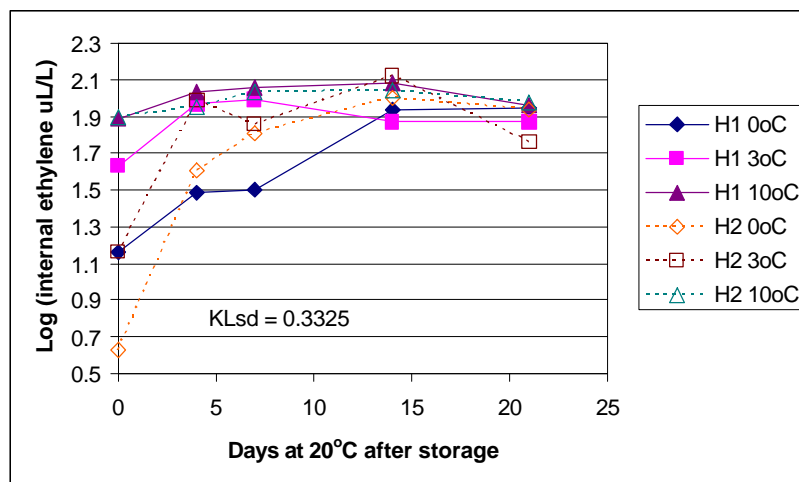


Fig 3. Changes in internal ethylene levels of Pink Lady apples after 1 month storage in air at different temperatures.

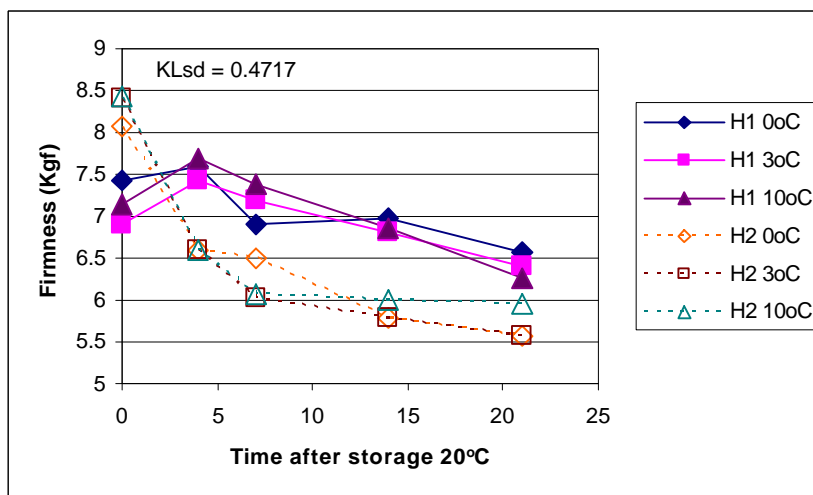


Fig 4. Changes in firmness of Pink Lady apples after 1 month storage in air at different temperatures.

Practical Implications

The message for apple growers and cool room operators is that maturity

and temperature management are critical for ensuring storage life and quality of Pink Lady apples. The fruit may appear in good condition on

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removal from storage but that quality is quickly lost as the fruit warm to room temperature. Ideally air stored fruit should be transported and kept at 0°C throughout marketing and retail display to ensure there is some remaining shelf life for the consumer. This data also puts in doubt the practice of exporting Pink Lady in refrigerated containers, as the shelf life on arrival at the destination will be short, particularly if the fruit are harvested late.

Another important factor is cool room temperature management. Variations in temperature of only a few degrees can cause a significant reduction in shelf life of Pink Lady apples.

CA storage trial for Pink Lady apples

Pink Lady apples were also stored in CA storage (2% O₂ and <1% CO₂). The fruit were removed after 3 and 6 months in storage and assessed after 0, 4, 7 and 14 days at 20°C to determine the fruits shelf life.

Figure 5 illustrates the results for the loss of firmness. Fruit from harvest 2 stored at both 0 or 3°C were softer and lost firmness more quickly than fruit from harvest 1.

This effect of fruit maturity is well known but is sometimes overlooked, as growers try and leave the fruit on the tree as long as possible in an effort to gain maximum pink blush for this variety. This result shows that fruit aimed for export by sea freight in air must be harvested at the correct maturity if fruit quality is to be maintained during transport. Consumers prefer crisp apples and so fruit harvested pre-climacteric, before ethylene production has begun, are more likely to have an acceptable shelf life on arrival compared to fruit harvested later.

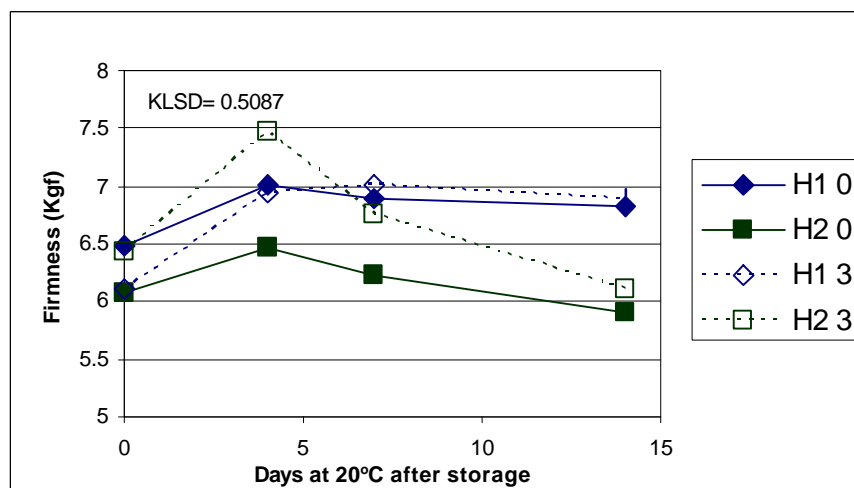


Figure 5. Changes in flesh firmness of Pink Lady apples after removal from 3 months CA storage and 14 days at 20°C.

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Another important quality parameter is the change in background colour from green to yellow. Consumers regard fruit with a greener background colour as fresher than one that has yellowed. Figure 6 shows that fruit from Harvest 1 maintained a greener background colour longer than fruit from harvest 2. Fruit from harvest 2 stored at 3°C were yellow after 7 days at 20°C. This would indicate that late harvested fruit

stored at a higher temperature do not have enough shelf life on removal from storage to reach the point of sale in good condition. These fruit would yellow quickly at the point of retail sale.

This result shows just how important maturity and storage temperature is for maintaining the quality of Pink Lady apples.

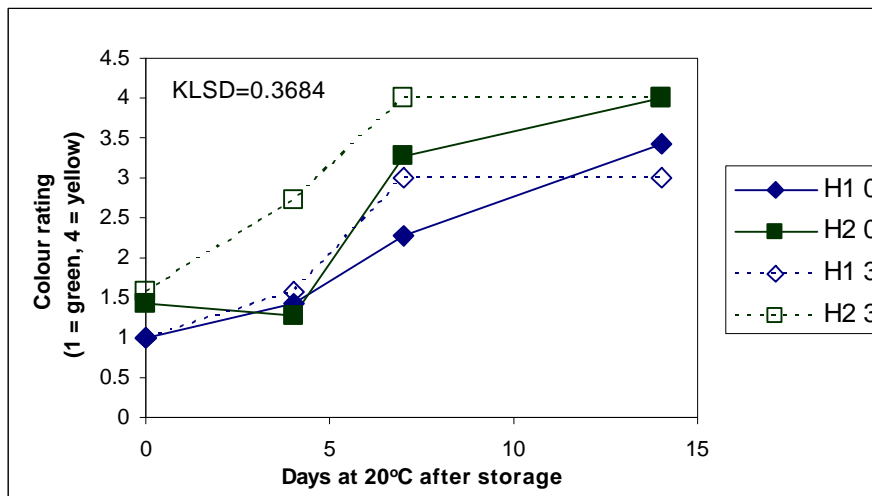


Figure 6. Changes in the background colour of Pink Lady apples after removal from 3 months CA storage and 14 days at 20°C.

The results for the 6 month removal from storage tell a similar story. The changes in internal ethylene show that all the fruit had begun to ripen in storage as the ethylene levels straight after removal from storage were high (more than 10 ppm, data not shown). This results support the industry feeling that Pink Lady apples should not be stored as long as November.

From a quality perspective the loss of flesh firmness was greatest for fruit from the later harvest (Fig. 7). This

result highlights the importance of fruit maturity for ensuring maximum storage life and quality after storage. Fruit from harvest 1 maintained a higher level of firmness at both 0 and 3°C. However the firmest fruit were those stored at 0°C.

Fruit from the first harvest stored at 0°C also maintained a greener background colour than fruit from later harvests or at warmer temperatures (Fig. 8).

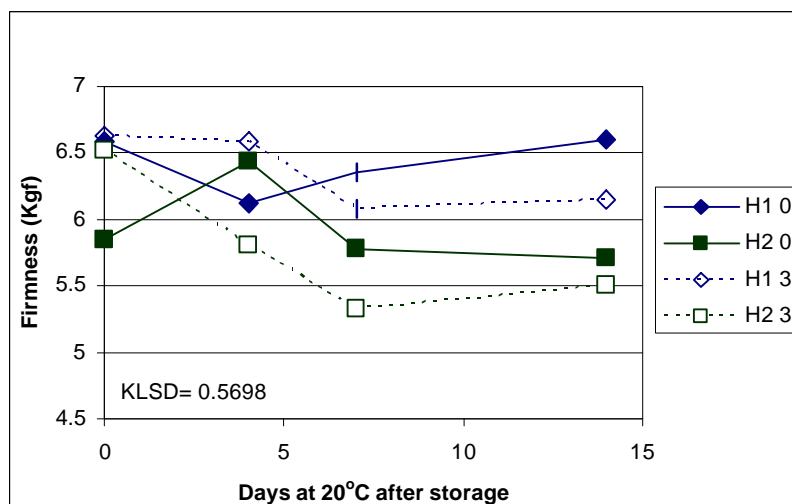


Fig 7. Changes in the flesh firmness of Pink Lady apples after removal from 6 months CA storage and 14 days at 20°C.

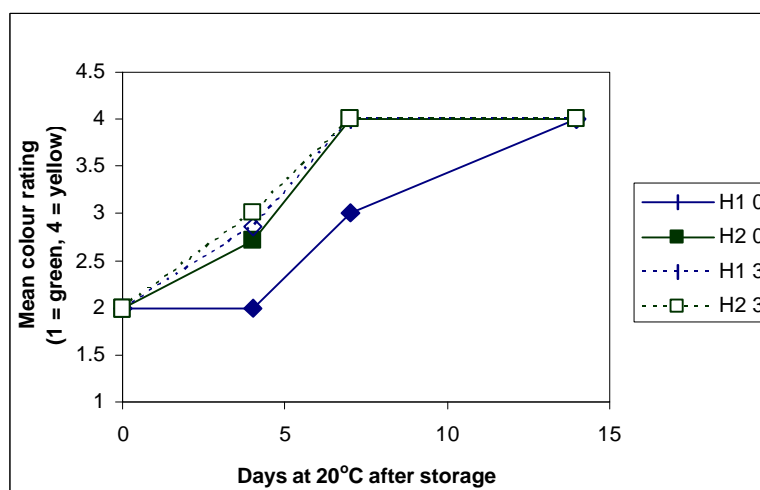


Fig 8. Changes in the background colour of Pink Lady apples after removal from 6 months CA storage and 14 days at 20°C.

Practical Outcomes for Pink Lady Apple Growers

These results highlight the importance of temperature management in cool stores and fruit maturity at harvest. These two factors have been shown to

have a direct effect on fruit quality. The importance of temperature management and fruit maturity is often overlooked as a result of commercial management pressures, however this experiment has shown it is at the direct expense of fruit quality on out turn.

Acknowledgment

This project was funded by Horticulture Australia Limited (HAL) and the AAPGA. The project was AA0055 and the Final Report for this work has been accepted and is available through (HAL).

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This article appeared in Pome Fruit Australia, August 2002

**Jenny Jobling is Research Manager at Sydney Postharvest Laboratory. Sydney Postharvest Laboratory provides independent, expert postharvest horticultural research and advice. The laboratory is located at Food Science Australia, North Ryde, NSW Australia. Their web site has a lot of postharvest information and links to other useful horticultural sites. www.postharvest.com.au*