



CHAPTER 3

Background information and research

1. Why is post-harvest physiology important?

In a competitive market environment, in which there is presently an over-supply of some products, the producer must handle his product in such a manner that optimal quality is achieved.

Fruit is a living product and, as such, has certain requirements with regards to temperature, humidity, atmospheric composition and physical handling. After harvest the product continues with all its anabolic and catabolic processes and the manner in which stress is dealt with, which accompany post-harvest, eventually determine the product quality. (PPECB post-harvest module of the pack house course.)

2. Basic concepts

Fruit reserves are stored in the form of starch in pome fruit and sugar and organic acids in stone fruit. These reserves are then used to provide energy that keeps the fruit 'alive'. Because the reserves are limited and decrease over time, a decrease in quality and senescence result. Heat due to respiration is also continuously produced by the product.

All stone fruit (except cherries) is climacteric fruit, with the result that this product shows an increase in respiration rate during the maturation phase, and hence heat production also increases. This fruit can be harvested at a physiologically mature stage, but when it is still in the immature/unripe (not eating-ripe) state. This fruit has, however, the capacity to mature normally after harvest.

It is also important to note that in the case of stone fruit soluble solids (sugars) **do not increase after the fruit has been harvested.**

Green colour, acid and firmness decrease, while the yellow background colour, taste and aroma increase. As the acids decrease, the ratio of sugars to acids increases, with the result that the consumer is better able to detect the taste and sweetness of the fruit. (See Figure 8.)

A. HARVEST THE FRUIT IN THE COOLER TIME OF DAY AND LIMIT ANY FORM OF TEMPERATURE INCREASE, BEFORE AND AFTER PRE-COOLING AND FORCED AIR-COOLING.

Plant products contain 85–95% water. Water moves out of the product as a result of certain driving forces: temperature and humidity. Loss of moisture causes various negative effects (see PPECB post-harvest course material). Even a 1% loss in moisture causes accelerated carbon dioxide and ethylene production and hence faster maturation.

There are several methods by which moisture loss can be minimised and the effect is ascribed to the minimising of the Water Vapour Pressure Shortage (WVPS). The care taken with and the speed of harvesting, packing and cooling are the primary factors. Rough handling and a delay in cooling will lead to higher WVPSs. A good cooling design should ensure that high humidity is retained, good insulation is assured, enough air can circulate over the coil and unnecessary high air speeds are avoided. The period before cooling must be kept short (Figure 1) as any delay in cooling leads to poorer quality.

The advantage related to cooling has to do with respiration, ethylene production and action, moisture loss and pathogenic decay. The great temperature differential between the product and cooling medium initially leads to rapid cooling at no great cost. The significant effect on respiration and metabolism supports the principal of cooling. It is however important to remember that the cooling period forms only a small part of the fruit's post-harvest chain and it makes sense to ensure that the rest of the chain is also well in place. **Always remember that: cooling causes drying out, hence the period of cooling must be as short as possible and the air speed as low as possible** (high air speeds are necessary during initial

cooling, but as the target temperature of the product is approached, the air speed must be reduced). **Relative humidity is less important than temperature, depending on how long the product must be kept inside during precooling. Packaging interferes with cooling so do try to start with a cooler product temperature. Product temperature must be maintained during transport (PPECB).**

