



Talking rot: Postharvest disease control.

By Jenny Jobling

A lot of effort is invested in growing a good quality crop of fresh, fruit, vegetables or flowers. So it is of concern that most losses of fresh produce occur between leaving the farm and reaching the consumer. Losses during this period have been estimated to be about 20% of the total crop. These losses may be caused by complete wastage of the product or by lower prices due to a reduction in quality. The cost of these losses is also important as the value of the product increases several fold from the farm gate to the final consumer, so in dollar terms postharvest losses are even more significant.

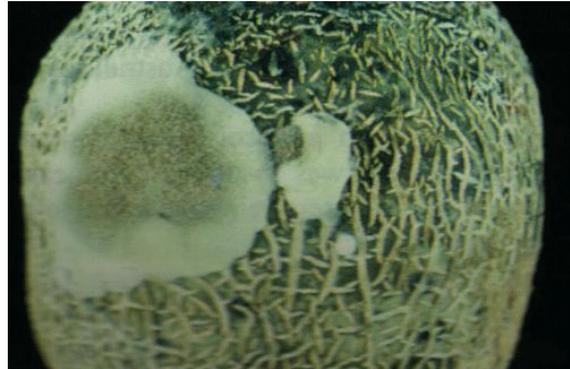
There are generally three main causes of postharvest losses.

1. Disease caused by fungi and/or bacteria
2. Physical injuries due to insects, mechanical force, chemicals, heat or freezing
3. Non-disease disorders resulting from storage conditions that upset normal metabolism

It is quite common for losses of fresh produce to result from a combination of these three factors. Another important point is that diseases caused by fungi and bacteria always have an incubation period between the time the microorganism enters the produce and the appearance of symptoms. This delay can vary from a few hours to a fortnight or more depending on the product and the surrounding conditions. So infected produce may not be obvious at the time of packing and transport for market. This often is a surprise or dispute

when the product is rejected further down the marketing chain.

Other factors such as cultivar, weather and crop management also influence the development of disease. Some cultivars are more susceptible to diseases than others and wet weather can promote the development of disease and hamper efforts to control outbreaks.



Botrytis rot on rock melons

Field and packing house hygiene

There are many spores on the surface of fruit and vegetables at harvest simply because the fruit have been outside and exposed to the elements for some time. Under certain conditions the level of these spores or bacteria can be very high. For example after very rainy periods. These spores many take time to germinate and cause disease symptoms. Chlorinated washing water helps to reduce the load of these pathogens on the surface of the product. However, care must be taken to keep

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the pH of the wash water at 7.5 and the level of chlorine must be frequently checked to ensure it the dip remains effective.

Good hygiene in the pack house is also very important. Having a clean packing shed, which is regularly washed out and scrubbed down, will go a long way towards preventing disease problems in fruit and vegetables. Old rotting fruit is the perfect incubator for disease causing organisms and over time can result in diseases building up resistance to control chemicals.

Postharvest dipping treatments, where available, should be given to all perishable produce, especially where weather conditions are likely to promote rots and where the produce is not sold immediately, ie. export or long distance transport and storage. It is important to only use chemicals which are registered for that product at the rates recommended on the label and to observe the recommended with holding period after spraying. Registration information is found on labels or through the National Registration Authority (NRA).

Postharvest dips must of course be used with care. The intensive use of chemicals can lead to the development of resistant strains of fungi. It is therefore recommended that a range of chemically unrelated compounds are used at different stages of production. The same chemical should not be used in the field and as a postharvest dip. This will help to prevent the selection of chemically insensitive strains of pathogens. Where two or more chemicals are registered for the control of a disease it is a good practise to vary the chemical used regularly. This will also help reduce the chance of chemical resistant strains developing.

It is also important to remember that all foods sold in Australia must comply with the requirements of the Australia New Zealand

Food Authority (ANZFA) Food Standards Code. The code contains 'maximum residue limits' (MRL's) for pesticides permitted on specific foods. State Departments of Agriculture do random 'basket surveys' of a range of fruit and vegetables to test for the level of pesticide residues. The Western Australian Food Monitoring Program has recently published the results from it's most recent survey (Food Watch, November 1999). The results of the survey show that 3% of the fruits and 5% of the vegetables sampled failed the test. Some products had traces of an unregistered chemical, others had residues above the MRL. One sample leafy chinese cabbage, contained 36 times the permitted amount of permethrin, which is currently not permitted on that food. The samples that did not comply were traced back to the growers and appropriate action taken to remedy the identified problems.

The current emphasis on quality assurance and HACCP means that growers will soon have to have a food safety program involving keeping accurate records and taking care to calibrate sprayers and dip tanks to prevent any problems occurring.

Packaging and handling

Damage during harvest and packaging must be avoided. Often sharp edges or large drops on a packing line cause high levels of damage. Packaging is also important. One of the main purposes of packaging is to protect the product from physical damage. Without adequate packaging even hard-skinned products such as pumpkins can be bruised and damaged. Injuries provide entry points for disease and can also promote disorders such as wilting. Minimising the amount of physical damage to a product during harvest and handling is a key factor in minimising disease outbreaks.

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Micro-organism can multiply faster on cut produce than on whole produce.

Packaging is always a compromise of many factors, such as water loss, strength, price and appearance. For many products wilting is a serious quality problem. For these products plastic packaging is an important method for minimising water loss and maintain quality. However, plastic packaging is a compromise as it can also encourage the development of postharvest diseases. The surface of plastic packages can become wet with condensation due to changes in temperature. This free water will run down the sides and wet the surface of the product. The moist surface provides the perfect conditions for the development of postharvest diseases. This problem cannot be avoided but it can be minimised by keeping the product at a constant temperature rather than allowing it to warm and cool repeatedly.

Temperature management

Cooling of fresh produce is critical for maintaining quality and it is also an important control of postharvest disease development. High temperatures accelerate the rate of deterioration of the product as well as increasing the rate at which the organism will grow. Soft fruits such as berries are very susceptible to decay and storage at low temperature is the key factor in extending the shelf life by slowing the rate of development of

disease. The growth of many organisms is inhibited or at least slowed by storage at low temperatures. However careful attention must be paid to the correct storage temperature for a particular product, since chilling injury can be the precursor to disease infection. Products like sweet potatoes and beans stored below the recommended temperatures will result in much higher losses as a result of chilling injury and decay.



Temperature management is the key to minimising disease of berry fruit.

Temperature management is critical for semi processed products. Microorganisms multiply faster on cut produce than on whole produce due to the greater availability of nutrients. The rate of multiplication depends on several factors such as the presence of sufficient water, appropriate temperature and time. These products are washed in chlorinated water but refrigeration is the principle microbial control method used (Roberts *et al*, 1998; Richardson and George, 2000). Good temperature management is the key factor for effective postharvest handling of all fresh produce.

It is important to emphasise that growers have a major influence on minimising the level of

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postharvest losses that occur during marketing. Attention to field and packing house hygiene, fungicide treatment and temperature management all have a significant effect on minimising the level of crop wastage.

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