

## POST HARVEST APPLE PRACTISES IN SOUTH AFRICA

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South Africa currently has over 22,500 hectares under apple production. The main apple growing areas are in the Western Cape with some recent plantings of Royal Gala in the Orange Free State. Over 18 million cartons of apples are exported from South Africa each year to the United Kingdom (39%) Central Europe (23%), Middle and Far East (24%), Africa (11%) and the Americas (3%). Apples constitute 30% of the total deciduous crop in South Africa.

Apples have been grown in South Africa since 1652, when Jan van Riebeeck established the first plantings. Good post harvest practices have arisen from the need to continually improve quality to meet more and more stringent market requirements. It is imperative to maintain these high standards from the time the fruit is harvested until it is sold.

### ***Post harvest practices from the orchard to the pack house***

Fruit are harvested from early morning and throughout the day. Bruise prone fruit, however, such as Golden Delicious and Pink Lady® brand apples are picked from late morning when the dew has disappeared from the fruit. All fruit is harvested by hand into picking bags that are emptied into wooden bins lined with plastic to prevent rubbing and abrasions. These bins are transported by tractor or truck to the cold store within 24 hours where, depending on the cultivar, they may be subjected to post harvest chemical drenches as required.

### ***Post harvest drenches and chemical treatments***

Many pack houses drench incoming fruit with a 50 to 100 ppm chlorine drench as a phytosanitary measure to reduce decay potential during storage. Golden Delicious or Braeburn apples which are susceptible to bitter pit or lenticel spot may be subjected to a calcium drench such as calcium chloride or commercially available products such as Calcimax® or Stopit®. Granny Smith, Pink Lady® brand, Golden Delicious and some of the Red cultivars are prone to superficial scald and so are treated with diphenylamine (DPA) ranging from 1500 to 2500 ppm depending of the cultivar and the harvest maturity of the fruit. In some instances, yeast and Rovral® are added to the drench as a means of reducing decay potential during storage. SmartFresh™ a new post harvest application is currently benefiting the South African apple industry. Due to its ethylene blocking effect, SmartFresh™ maintains the quality of fresh produce during extended cold storage and shelf life. SmartFresh™ is applied to the fruit within seven days of harvest in an airtight cold store. Adding water to a soluble powder releases the active ingredient, which is fully distributed throughout the room within two hours. The fruit can be mixed with untreated fruit or moved to another cold store after the 24 hour treatment.

### ***Cooling and storage of fruit***

All cultivars, except for Granny Smith, must be cooled to  $-0.5^{\circ}\text{C}$  within five days. In the case of Granny Smith, the rate of cooling is extended to 10 days to reduce the potential of core flush during long term storage. Fruit may be packed directly from harvest without prior storage, in which case fruit are first cooled to below  $5^{\circ}\text{C}$  and must be packed within two hours. Apples stored under regular air (RA) are maintained at  $-0.5^{\circ}\text{C}$  until packed. Bins are tracked from the orchard to the pack house and identified by different pick codes depending on their harvest maturity. Early harvested fruit are packed first, followed by post optimum harvested fruit. Apples picked during the optimum harvest window, have the highest storage potential and so are maintained either under RA or controlled atmosphere (CA) storage and packed later. In South Africa CA regimes differ with cultivar and generally have lower  $\text{O}_2/\text{CO}_2$  levels than in the USA. Red Delicious, Granny Smith and Royal Gala are all maintained at 1.5%  $\text{O}_2$  and 1.5%  $\text{CO}_2$ ; Golden Delicious at a higher  $\text{CO}_2$  concentration of 2.5%, and Pink Lady® brand apples at 3.0%  $\text{O}_2$  and only 1.0%  $\text{CO}_2$ . Fruit are stored at  $-0.5^{\circ}\text{C}$  and an RH of 85%, except for Granny Smith, which may be stored at slightly higher temperatures. CA rooms must be at the correct gas levels within four days and fruit at the correct storage temperature within seven days. Golden Delicious and Red Delicious may be stored up to 9 months under CA, and Granny Smith, Royal Gala and Pink Lady® brand apples, 10, 7 and 6 months, respectively.

### ***Packing of fruit***

Most apple pack lines in South Africa have water flumes, which contain 25 to 50 ppm chlorine at a pH of between 5.5 and 8. Apples are not waxed in South Africa, as waxed fruit do not fetch a premium price. The average size of South African fruit is two counts smaller than fruit grown in the USA. Due to the high risk of damage to the fruit, apples are not pre-graded or pre-sized. Percentage pack out varies greatly with cultivar and season and may range from 15% to 40% in Fuji and 25% in Pink Lady® brand and Cripps Pink cv. apples. Fruit that do not make the export grade are either sold on the local market or are sent for processing. Apple cultivars susceptible to shrivel are packed in 37.5 $\mu$  or 60 $\mu$  bags. These bags also help maintain flesh firmness and skin colour. Fruit may also be packed into 800 g thrift bags that firmly hold the apples together preventing compact bruises and rub marks. Some pack houses may apply an edible coating to the fruit on the pack line. One such product is SemperFresh®, which is reputed to improve storage quality and extend shelf life of the fruit.

### ***Inspection of fruit***

Packed and palleted fruit is checked by the Perishable Products Export Control board (PPECB) to determine that the quality complies with standards set out by the different export companies. Quality checks may include flesh firmness, skin colour, external disorders including bitter pit, rub marks and bruising, and fruit temperature. Some inspection stations may also have a USDA inspector to examine fruit destined for North America. Of particular importance in this regard would be the monitoring of pests and diseases, which are controlled by strict legislation. Fruit temperatures may not exceed  $12^{\circ}\text{C}$  during the inspection process.

***Cooling and export of fruit***

After inspection, fruit must be forced-air cooled to  $-0.5\text{ }^{\circ}\text{C}$  within 72 hours if no bags are present, and to  $-0.5\text{ }^{\circ}\text{C}$  within 96 hours if fruit are packed in bags. Pallets are placed in cooling tunnels and air with a minimum inlet temperature of  $-1.0\text{ }^{\circ}\text{C}$  forced through the cartons. Pallets at the correct temperature are transported to the docks in trucks. Transport is seldom refrigerated as the distance to the closest port rarely exceeds 200 km. At the harbour, pallets are stored at  $-0.5\text{ }^{\circ}\text{C}$  until loading. No forced air facilities are located at the harbour and so it is imperative to practice sound temperature management throughout the cold chain.

The South African deciduous fruit industry has faced many new challenges since deregulation. The importance of adhering to the recommended post harvest handling protocols is essential in the continued delivery of export quality fruit, and is a vision shared across all role players.