

A person wearing blue jeans is working on a tree branch, possibly pruning or maintaining it. The background shows dense green foliage.

PACKING HOUSES - OUTSIDE CALIFORNIA

02 A GUIDE TO
BEST PRACTICES

A close-up view of a tree trunk with a metal support stake. The ground is covered with dry leaves and twigs.

PACKING HOUSES OUTSIDE CALIFORNIA

The majority of Hass avocado fruit sold in the USA originates in countries other than the USA. The quality of this fruit at the point of final sale is to a large extent dependent on the entire logistics chain from field through packing house, shipment to the USA and finally within the distribution chain in the USA. It is therefore useful to consider the operations of packing houses within the major supplier countries to the USA market.

Section 1 of this manual considered handling protocols from picking to fruit departure from a Californian packing house. The majority of these protocols are generic and based on preserving the physiological integrity of the fruit, so as to create the best possible shelf life and defect free quality at final point of sale. These protocols can thus be used in any packing house, and should be referred to for any fruit origin. However, fruit from different origins may be physiologically different due to different climatic conditions during the growing season, and the shipping time and conditions from packing house to the port of arrival in the USA. Because of these differences between major suppliers to the USA, the issues of particular importance will differ. Issues of note for packing houses in Mexico, Peru and Chile are therefore outlined, to be considered in addition to the generic handling practices in section 1.

MEXICO

Mexico is in the unique position that there are a number of flowering periods (as many as four, known as flora loca, advanced, normal and marceña which span a period from summer through winter), which together with altitude differences in the major production areas, make it possible to pick and pack throughout the year. However, this also means that many packing houses will have fruit delivered from both the same and different producers which is of differing physiological maturity. This makes it more difficult to pack a consistent product and to decide on appropriate cooling and shipping temperatures. Climatically, the season, with particular emphasis on the rainfall pattern, considerably changes through the year, and with it the sensitivity of the fruit to post harvest defects such as lenticel damage and chilling injury. The following issues are highlighted as important quality affecting protocols to consider:

Harvesting

Due to the changing maturity conditions of fruit as well as weather conditions, a number of factors relating to final fruit quality should be taken into account.



The first is the effect of mixed maturities, especially notable when the fruit of one flowering period is coming to an end (with high maturity) and fruit of the next flowering period (low maturity) are picked at the same time, because fruit size is similar. If this fruit is mixed on the pack line and packed together, not only will the choice of cooling temperature likely be incorrect for some of the fruit, it is well known that checkerboard ripening is likely to occur at final destination. This is of particular problem to fruit ripeners. The best way to separate this fruit is, where possible, to start at the harvest point. Fruit harvest contractors should train the pickers to separate obviously different fruit set groups (such as can be seen by the most mature fruit starting to change color while less mature fruit is still green).

The second issue pertains to picking during periods of cold and wet weather. These conditions increase the potential for lenticel damage and as a result possible increased sensitivity to cold damage. Where it is possible, do not pick in the rain or when fruit is wet. If possible delay picking until fruit is dry, or if it is not possible to do this, delay transporting fruit to the packing house for a few hours to allow the fruit to lose some water and become less turgid and therefore less susceptible to damage during packing.

The third factor relates to the effect of leaving fruit on the trees for extended periods. It is more likely that fruit will have increased cosmetic damage, possibly decreasing packed quality as well as percentage pack-out.

Arrival at Packing House

Due to phytosanitary regulations, fruit must be delivered to the packing house and immediately stored in a holding area surrounded by and separated from the packing house entry by insect proof screens. These need to be regularly checked for damage. It is essential that the Mexican/USDA work plan (as related to article 82 of the phytosanitary regulations as signed on 17 March 2011) be vigorously followed.

If it is cold and wet, or the fruit arrives wet due to rain, it should be allowed to dry and stand for a number of hours to become less turgid before packing, to decrease the risk of lenticel damage. The fruit arrival area should at least be shaded to reduce fruit temperature, and ideally should be cooled. If cooling is possible, a temperature of approximately 15°C (59°F) would be suitable.

If fruit of different maturities is present, dry matter testing should be done separately for each maturity so as to optimize later handling, especially cooling. Sufficient sampling needs to be done to ensure results are representative of the fruit being packed. Hand Held Near Infrared (NIR) equipment may allow for rapid non-destructive testing.

Pack Line

Where possible, fruit of similar maturity should be packed, so that low maturity and high maturity fruit is not mixed in the same boxes. If separation at picking has been done, fruit can be dumped onto the pack line in accordance with the separation. If not, it is desirable to separate such fruit on the pack line such that the different maturities end up in different pallets which where possible can be cooled differently and even sent to different markets. Where possible, more mature fruit should be sent to closer, southern USA markets while less mature fruit with a longer potential shelf life, to more distant northern USA markets.

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MEXICO

- Separate fruit from different flowering periods at harvest if possible or on the pack line.
- Avoid where possible picking wet fruit or allow to wait a few hours before transporting to packing house.
- Allow cold and wet fruit to dry before packing. Do not let fruit wait more than 24 hours before packing.
- The fruit arrival area should be at least shaded, and preferably cooled.
- Ensure that phytosanitary protection mechanisms are always in place.
- Avoid wherever possible, mixed maturities in both the boxes and in the same pallets.
- Treat fruit in accordance with the maturity of that fruit wherever possible.

PERU

The climatic conditions under which the majority of Peruvian fruit is produced are considerably different to most other production areas of the world. The desert climate with no or almost no rainfall is moderated by sea breezes from the Pacific ocean. During winter (picking season), these sea breezes cause heavy fog to move in over the adjacent land resulting in cool and damp conditions, and wet fruit.

The net result of these climatic conditions is that the fruit develops a very rough skin texture and lenticels which are easily damaged. The cool and damp conditions also result in very turgid fruit if picked when still wet, increasing the potential for damage during transport to the packing house and on the pack line. If lenticels are damaged, dehydration of the lenticel area can cause small black spots, which may also enlarge to form larger black spot areas after chilling and may be deemed to be chilling damage. These symptoms may be considerably decreased by careful pre-harvest conditioning, harvest and handling in the packing house.



Harvesting

Prior to harvest, especially during periods when cool, cloudy and morning fog conditions are common, irrigation should be decreased so that fruit loses some turgidity and are therefore less likely to be damaged. Irrigation should be decreased or stopped from one to two days before harvest. If the block to be harvested requires a number of days to harvest, a decreased irrigation schedule can be used until the harvest of the block is complete.

If fruit is wet due to cold foggy conditions, then where possible, harvesting should be delayed until fruit has dried. If this is not possible, then extreme care needs to be taken not to damage fruit. This can include leaving fruit in the orchard or at assembly areas for a number of hours before transport to the packing house. Fruit must be shaded during this period.

Arrival at Packing House

On arrival at the packing house, fruit should be placed in a holding area, where it may be left for not longer than 24 hours. Some fruit water loss to make the lenticels less susceptible to damage on the pack line, especially during periods of cool foggy weather is advantageous.

Ideally, the holding area should be cooled so that fruit respiration decreases. The holding temperature may be between 10°C and 15°C (50°F to 59°F) depending on environmental temperature, with the lower temperature applicable to colder environmental temperatures. This will help extend shelf life. It will also help fruit acclimatize to the lower temperatures which will be applied during cooling after packing. To control the rate of water loss, the area should ideally also be humidified.

Pack Line

The greatest problem on the pack line relates to lenticel damage. Care should be taken to eliminate as far as possible all points of potential lenticel damage. The most likely points of damage are at fruit dumping on the line and in the washing and drying section of the line. Brushes within this section are the most likely cause of damage, and should be kept to the minimum.

Containerization

The same general requirements as previously described for truck loading should be adhered to.

In addition to this, all shipping containers departing Peru for the USA use a controlled atmosphere system. A number of different systems are available. In all cases after all pallets are loaded, a plastic curtain needs to be applied at the door end of the container to ensure the container is sealed. Correct fitting is essential for operation of the controlled atmosphere system. There may also need to be other specific actions depending on container type, and packing houses need to check the requirements and certify completion.

The controlled atmosphere gas settings vary slightly depending on container type used and packing house preference. There is presently no clear data to determine if any concentrations are superior in terms of final fruit quality. The choices generally used are:

- 5% O₂ and 5% CO₂
- 4% O₂ and 6% CO₂

However, some companies use other combinations within the range of O₂ at 5% to 12% and CO₂ at 6% to 10%.

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PERU

- Decrease irrigation prior to harvest.
- Where possible avoid harvesting cold and wet fruit.
- If harvest is required during cool and foggy periods allow fruit to stand for a few hours before transporting to the Packing house.
- Allow fruit to stand at the packing house for not longer than 24 hours with some water loss allowed to decrease turgidity.
- Preferably cool the holding area to 10°C and 15°C and humidify to control water loss.
- Eliminate as far as possible potential lenticel damage areas on the pack line such as during fruit dumping and washing and drying.
- Load containers correctly in accordance with CA requirements pertaining to the CA system being used.
- Set CA gas conditions in accordance with required protocols relevant to the CA system being used.

CHILE

In Chile, production occurs in a number of regions, many characterized by hot and dry summer inland valleys. Some production also occurs in milder coastal areas. Due to climatic conditions during fruit development, part of the crop is harvested during the hot and dry summer period. This requires special consideration during harvesting up to final fruit cooling.

Due to the distance from market, controlled atmosphere shipping is also used.

Harvesting

High temperature and very dry conditions during part of the fruit harvesting period require that care be taken to keep the fruit as cool as possible until arrival at the packing house. Picking bins need to be placed in the shade, and when full covered to keep the fruit out of direct sun. Fruit needs to be transported to the packing house as soon as possible. The objective is to minimize fruit water loss and reduce fruit temperature as soon as possible.

Arrival at Packing House

Due to the high temperatures prevailing during summer, fruit needs to be cooled as soon as possible. No fruit should wait in the holding area before packing for more than 24 hours, and preferably should be cooled before then.

Cooling before packing varies between packing houses. The holding area can be cooled, and at least 15°C or lower is suggested. A further option used by many packing houses is hydro cooling. Fruit should be cooled to between 6°C and 10°C and held at that temperature until packing. Cooling water needs to be suitably filtered and sterilized using an acceptable sterilant such as chlorine dioxide.

Other procedures are as required elsewhere. Controlled atmosphere procedures are also as used elsewhere. See section on Peru for CA conditions.



PACKING HOUSES OUTSIDE CALIFORNIA

CHILE

- Ensure fruit is kept as cool as possible after harvest.
- Transport fruit to packing house as soon as possible after harvest and minimize fruit water loss.
- Cool fruit as soon as possible after arrival at the packing house.
- Apply CA conditions in accordance with required protocols relevant to the CA system being used.