Citrus Packhouse

Module 3:
Packhouse Sanitation

Learner Guide

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Introduction

Packhouse sanitation is critical to preserving the quality and safety of citrus fruit during the packhouse process. Every person working in a packhouse must take responsibility for maintaining a high standard of sanitation to prevent fruit contamination in the packhouse, and especially to prevent fruit from becoming re-contaminated after it has been treated.

Spores and Fruit Infections

In citrus packhouses, spores are the major cause of fruit contamination. Spores are reproductive propagules of certain plants, fungi and algae. They are microscopic and cannot be seen with the naked eye – you will only know that they are present in the packhouse when fruit develops infections, and by then it is too late. The only way to prevent spores from building up in the packhouse and infecting fruit is by having an effective sanitation plan.

In citrus packhouses, most infections are fungal and it is therefore those spores that are of concern. Fungal spores are mostly associated with mould, such as green mould, blue mould, and sour rot.

Fungal spores settle on fruit and surfaces in the packhouse. They start growing and multiplying as soon as conditions are warm and humid enough. De-greening rooms, for example, present just such conditions, as do ambient storage areas. Many spores are unable to penetrate the thick citrus rind on their own so they need an injury to begin the decay process. It is important that the packhouse takes great care never to do anything that can cause injuries to the citrus they pack.

As spores start multiplying, they spread to other fruit and surfaces, thereby increasing the spore load in the packhouse and causing more and more infections. Fruit is treated with fungicides to kill spores on the fruit, but the more spores present, the less effective the treatments.

The main aim of packhouse sanitation is to keep the spore load in the packhouse as low as possible, by not allowing infected fruit into the packhouse, by immediately removing and destroying infected fruit, and by keeping the equipment and work area sanitary. Extractor fans and canopies can also be positioned in the packhouse for optimal airflow to reduce spore load.

Pre-Sorting

Preventing infected and decayed fruit from entering the packhouse is the first packhouse sanitation action. In de-greening rooms fungal diseases develop faster because of the warm, humid conditions. There is often decayed fruit in bins coming out of de-greening rooms, and there might also be decayed and infected fruit in bins coming from the orchard. This infected fruit is referred to as "green bombs" because they cause an explosion of infection in the packhouse if they are allowed inside. They must be removed during pre-sorting, preferably before the fruit enters the washing system. Even though the fruit washing system contains a sanitiser, green bombs will contaminate the water and the rollers and brushes due to the massive spore overload, thereby infecting the system itself.

The golden rule is: if it is not going to be exported, it must not be in the packhouse. Pre-sorting procedures are discussed in greater detail in module 4, which deals with receiving and initial processes.

Sometimes severely contaminated fruit is missed during pre-sorting. If such a fruit is found on the grading line, in a packing bin, or anywhere else in the packhouse, immediately remove the fruit, report it to the supervisor, disinfect the area and equipment and, at the first available opportunity, clean and sanitise the line.

Removal of Fruit

Infected fruit removed during sorting, grading or anywhere else on the packline must not stay inside the packhouse. Remember that fungal spores are spread through the air, the water, and even by vinegar flies. Even if infected fruit is left for only a short period of time, it can spread infections and increase the spore load in the packhouse. All such fruit, along with any fruit that has fallen on the floor or has been discarded for any other reason, must be removed from the packhouse as soon as possible.

Fruit that is destined for the local market or processing should preferably be stored outside the export packing area, especially if the fruit has been treated with fungicides, as active spores on these fruit are likely to be resistant to those fungicides. Infected fruit that cannot be sold on any market must be destroyed away from the packhouse, either by being finely chopped up and spread out in the sun to dry, or by being buried. Waste fruit can also be used for animal feed.

It is best not to store export fruit in the packhouse for too long after being packed, especially in hot conditions – remember that many postharvest diseases develop faster at higher temperatures. Either pre-cool export fruit at the packhouse immediately to stop the development of diseases, or dispatch it to pre-cooling facilities.

Equipment and Workspace Sanitation

The next essential action in packhouse sanitation is keeping the workspaces and equipment in the packhouse clean and sanitary. Remember that you cannot sanitise a dirty surface, so this is a two-step process – wash, and then sanitise. There are three important things here: the sanitising agents that are used, the method of application, and the frequency of application.

Sanitising Agents

There are many available products that can be used as sanitising agents in packhouses. It is important that the product chosen is used correctly according to the manufacturers specifications, that the product is effective against spores, and that the product does not leave a residue that is restricted by the target market.

Chlorine is commonly used for sanitising, but it is important to use the right chlorine products. Swimming pool products are not suitable for sanitising in packhouses – they are formulated specifically for swimming pools, with UV stabilisers, granulators, and slow release of the active ingredient, and should never be used with fresh fruit.

New sanitising products and innovations are often introduced to the market, and many promises are made by its manufacturers. It is important to look critically at new products and to ask questions about them. Efficacy, long term impact, and costs are just some of the factors that should be taken into account.

CRI is constantly researching existing and new sanitising products, looking objectively at various factors, such as short term viability and long term effects. They publish details of recommended sanitising agents, and update these regularly. It is best to use

only recommended products and at the recommended concentrations. CRI is objective in its research and always presents its findings without favouring any commercial entity.

Use the following principles when deciding which sanitising agent to use:

- The product should have the right active ingredients;
- The product should be registered by the South African Registrar and approved by CRI;
- The product must be effective;
- The product must be food grade; and
- The product should not be overly corrosive and cause damage to equipment or surfaces.

Even the safest, most highly recommended sanitising agent can be rendered ineffective, on the one end of the scale, or toxic on the other end, if used in the wrong concentration. The concentration of the active ingredient must be managed very carefully when mixing a cleaning solution to ensure effective sanitation. Always follow the manufacturer's recommendations for each specific product, as the volume of active ingredients can be different between products.

Cleaning and Sanitising Methods

It is important to clean all equipment and work areas thoroughly. Cleaning solution must be applied to all surfaces in the packhouse, including the floors and the walls, and especially surfaces that come into contact with fruit, such as grading tables, brushes, rollers, sizer cups, and packing tables.

The best way of applying cleaning solution is to douse equipment using knapsack sprayers, and to wipe down surfaces with a clean cloth dipped in the solution. Follow the manufacturer's recommendations for the concentration and contact time of the solution on surfaces.

Scheduling

It is important to sanitise the packhouse regularly. Sanitisation costs time and money, and it should therefore be done efficiently and effectively, but neglecting to do it or skipping scheduled sanitisation, can cost the packhouse much more. Develop a cleaning and sanitising schedule that is widely circulated and ensure that it is implemented.

Other Cleaning and Sanitising Procedures

Automated packlines with optical sorters and graders sometimes have automated cleaning and sanitation programmes. Use these programmes as directed by the manufacturers, and make sure that you use the correct concentration of cleaning agents.

Apart from the machinery, equipment and surfaces in the packhouse, picking bins and trailers must be washed and sanitised after they have been emptied and before they are returned to the orchard. Contaminated bins can easily become a vector for spreading infections from one batch of fruit to the next. Bins can be washed in a specialised bin washer or with high-pressure sprayers, which can also be used for trailers.

Emergency Cleaning Procedures

Preparation and protocols must be in place for emergency cleaning operations. If decayed fruit is found anywhere in the packhouse, the immediate area must be cleaned and sanitised without delay to ensure that spores are eliminated. There may also be accidents, such as chemical spills, that require emergency cleaning.

Microbiological Laboratory Testing

It is best practice to engage professional laboratory services to test for microbes and pathogens in the packhouse environment on a regular basis. These laboratories can perform any number of tests at points along the packline to determine the spore load, presence of harmful pathogens, and the risk of infection.

The tests include taking samples of the treatment solutions from the washing systems and the fungicide treatment system, and taking swabs at points along the packline that fruit regularly comes into contact with, such as conveyor belts, sorting tables, grading lines, and packing tables. The spore load in the air is determined by using settle plates, which are left in place for a minimum of 10 minutes before being collected for analysis.

Apart from giving the packhouse management an accurate assessment of the spore load in the packhouse and the risk of contamination, microbial analysis is also a useful tool to measure and monitor the overall sanitation and hygiene of the packhouse environment.

Personal Hygiene

Good personal hygiene practices are part of an effective packhouse sanitation strategy. Every person working in a packhouse must have short nails and clean hands, and no open sores or injuries. Jewellery, such as rings, watches and necklaces, are not allowed in the packhouse, as jewellery can injure fruit, fall off and land in machinery or on lines, or it can be lost in packed boxes, and be a source of contamination.

Protective clothing must be worn by every person in the packhouse, specifically hair coverings, overalls, and, where necessary, gloves. Visitors must also be issued with jackets and hair coverings. Workers must remove their protective clothing when going on a break. If workers wear their protective clothing during breaks there is a risk of the protective clothing becoming contaminated. Protective clothing should be kept clean and well-maintained. It is best to have laundry facilities available in the packhouse for this purpose.

Notices should be posted in locker rooms and bathrooms to remind workers to maintain their personal hygiene, and especially to wash their hands regularly. Check all workers before they are allowed in the packhouse to ensure that they adhere to these practices.

Recordkeeping

Recordkeeping is essential in managing packhouse sanitation. Records should show the frequency of cleaning, the sanitising products used, and the concentrations of those products in the cleaning solutions. Keep records of personal hygiene inspections, and any emergency or unscheduled cleaning that takes place. Records should also include feedback from pre-sorting to enable feedback to the farm.