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# Citrus Packhouse

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## Module 1: Packhouse Overview

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### Learner Guide

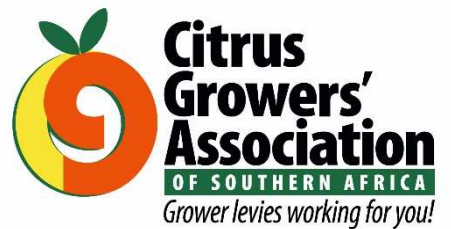
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## Introduction

Citrus packhouses are vital in producing citrus fruit that is marketable, healthy, and ready for export. The packing process involves many different activities, from washing, de-greening, and treating fruit, to sorting, grading, labelling, wrapping and packing. This means that there are a lot of people and machinery involved in the process, and there are many places where things can go wrong. Understanding the components, personnel, equipment and machinery involved throughout the packing process is the first and most important step to owning, supervising, managing or working in a packhouse efficiently and effectively.

Every citrus packhouse is different – there are no standard designs or rules about what a packhouse should look like. Packhouses are designed based on the volume of fruit they handle, the types of citrus and other fruit they pack, the needs of the growers whose fruit is being packed there, and the requirements of the markets the fruit will go to. In South Africa we get packhouses that range from packing 50,000 export cartons per year, to packhouses that pack almost 3 million cartons per year.

Whether the packhouse packs a few hundred boxes or thousands of boxes every day, it really does not make much of a difference to the packhouse process. The aim of all packhouses is the same: to process fruit coming from the orchard and deliver the best quality product possible.

It is critical to remember that we are all exporting under Brand SA and that we are all responsible for how South African fruit is perceived in the overseas market. Every action that every person in the packhouse takes, or neglects to take, can impact how fruit from South Africa is perceived overseas. Never allow a product to leave the packhouse that you are not happy to call proudly South African.

## Production and Picking

Producing export-quality citrus fruit starts in the orchard. Best practices for the production of quality citrus is well-established, and the Citrus Academy has a range of programmes, learning material and audio-visual modules available on this subject.

When the fruit is physiologically mature, it is picked and taken to the packhouse. Picking export citrus is a specialised task, and care must be taken to preserve the fruit quality and safety while being picked. Please see the Citrus Academy audio-visual modules on Citrus Harvesting to learn more.

Poor picking practices cause problems in the packhouse. For instance, if pickers leave long stems on the fruit, it can damage other fruit in picking bags and bins during transport to and handling in the packhouse. The packhouse must give fast, accurate, and regular feedback to the farm management and picking teams so that picking practices can be improved if necessary.

Always remember: a packhouse is not a hospital for sick fruit. It is not possible to heal sick fruit or improve fruit quality in the packhouse. External and internal fruit quality is determined during pre-harvest production. The purpose of the packhouse is to preserve the quality of the fruit while preparing it for export, by cleaning it, treating it to prevent the development of postharvest diseases, improving the fruit's appearance and shelf-life, separating it into size and class categories, and packaging it as per market requirements.

## Packhouse Process Flow

Let's take a look in more detail at all these activities that make up the packhouse process. The model that we use here includes all the actions and processes in a typical export citrus packhouse, even though how this looks in practice might differ from packhouse to packhouse.

The packhouse process can be divided into three parts, namely receiving and initial processing, treatments and separation, and packaging, after which the fruit is inspected and transported from the packhouse.

There are also general operations that apply throughout the packhouse process. The packhouse must be kept clean and sanitary, the fruit must meet food safety standards, the quality of the process must be monitored, and all workers have to maintain a high level of personal hygiene and adhere to health and safety regulations.

### Receiving and Initial Processing

The fruit arrives from the orchard in picking trailers or in bulk bins stacked on trucks or trailers. It is essential to record all relevant details of each delivery on arrival, such as the date, time, weight, citrus type and cultivar, production unit details and orchard details, as well as the details of the grower in packhouses where fruit of more than one grower is packed. If the fruit has to be de-greened, the colour of the fruit on arrival must also be noted, and the bins must be marked.

At this point, depending on the destination market, it may be necessary to conduct a packhouse delivery inspection for false codling moth and fruit fly infestation. Citrus black spot monitoring is also done in areas where it is a risk. Please see the Citrus Academy audio-visual module on Monitoring and Inspection for Phytosanitary Markets for Citrus for more information.

De-greening is a process which can be applied to fruit that complies with internal quality requirements, which means that they have reached the minimum sugar and acid levels, but have not yet achieved the right colour. De-greening allows growers to get fruit to the market early and before the fruit would develop colour naturally. It is also used when waiting longer for fruit to colour naturally may result in deterioration of the internal quality. It is used mostly towards the start of the harvesting period of each citrus type, but the decision to de-green primarily depends on fruit colour and it can therefore be done at any time.

The process involves exposing fruit to ethylene gas in de-greening rooms for a specific period, until they have reached the right colour. Because the rooms are warm and humid, they offer favourable conditions for the development of fungal diseases, which is why fruit destined for de-greening is drenched with a fungicide treatment before de-greening. Fruit that is stored for extended periods before being processed in the packhouse is also drenched to protect it against decay.

Fruit enters the packline and is washed in a wet or dry tip system. In a wet tip, bins are emptied into a bath of water containing a sanitiser. In a dry tip, bins are emptied onto a conveyor belt after which the fruit is washed with brushes and a spray, using a sanitising solution to control harmful microorganisms. A similar washing system may also be found on lines that use wet tipping.

After fruit has been washed, it is pre-sorted before being processed further. Pre-sorting has two main aims. The first is to remove all fruit that is clearly infected with diseases – if such fruit is let into the packhouse it will infect other fruit and contaminate the

system. The second aim is to remove fruit clearly not suitable for export because of size, colour or blemishes. Any further treatment or processing of such fruit is a waste of money and time.

## Treatments and Separation

After pre-sorting, fruit is treated with fungicides in a bath or a flooder to cure young infections that can cause postharvest decay. These young infections cannot be seen with the naked eye, so pickers and pre-sorters may miss them. After this treatment, the fruit is put through a drying tunnel so that it is dry before being waxed. Wax is applied to fruit to prevent moisture loss through the rind, to enhance their appearance, and, sometimes, to apply fungicides that offer long-term protection. After the wax application, the fruit goes through another drying tunnel.

Fruit of the same grade and size is packed together, so before it can be packed, the fruit is separated according to size and quality. At the same time, fruit not fit for export is redirected to local market packline or processing lines. Sophisticated machinery is used for this purpose, but in most packhouses manual sorting is also used, either before or after treatments. In some packhouses, there can be as many as three manual sorting stations if we include pre-sorting.

## Packing

Once fruit has been sorted and graded, they are labelled, if required by the destination market. Fruit labelling machines are used for this purpose in most packhouses, although manual labelling is still used in some cases.

Fruit is now ready to be packed in size and grade categories, and according to the requirements of the market. The market requirements also determine what size and type of carton the fruit is packed into, and whether the fruit is wrapped or not. In some packhouses, automatic packing machines are used. Cartons are labelled in accordance with market specifications.

Cartons are stacked on pallets, with the stacking patterns depending on the type of carton. Corner pieces and strapping are used to stabilise and secure the pallets. For open-top display cartons, securing sheets and pallet caps are also used.

## Inspection and Transport

After palletisation, inspectors from the Perishable Products Export Control Board, or PPECB, inspect the packed and palletised fruit to make sure that it complies with the minimum requirements for export to the destination market. The pallets are then stored until they are loaded for transport to the harbour, either by road or rail. In some cases, shipping containers are stuffed with pallets at the packhouse, and then secured and transported to the harbour. Alternatively, loose pallets are loaded and transported.

## General Operations

Maintaining the quality and safety of the fruit as it goes through the packhouse process is critical to successful packhouse operations. To achieve this, the packhouse environment and all the equipment used in the packhouse must be kept clean and sanitary at all times. Packhouse workers must also adhere to strict personal health and hygiene standards.

Quality control checks must also be in place, to ensure that treatment protocols are adhered to, grading and sizing are being done correctly, that fruit is not injured during the packing process, and that the right fruit ends up in the right place.

A packhouse can be a dangerous working environment, with the machinery, equipment and chemicals that are used in the packhouse process all posing risks. Packhouse management must ensure that all workers in the packhouse environment understand what is expected from them with regard to occupational health and safety, and adhere to protocols and standards at all times.

## Citrus Industry Extension Services

The requirements of overseas markets are constantly evolving, as is our technical knowledge and understanding of packhouse processes, treatment chemicals, and packing materials. Packhouses need the support of dependable, objective research and extension services to enable them to keep abreast of the latest developments and maintain the standards required by export markets.

The Citrus Growers' Association of Southern Africa is a non-profit organisation that is funded through a levy on all export citrus. From this levy, the CGA funds Citrus Research International, a world-class scientific research organisation. CRI belongs to the citrus growers, and their mandate is to support and grow the citrus industry through reliable and applicable research, and accessible extension services. Aside from citrus production practices, CRI also invests in extensive research on postharvest practices, including the packhouse process.

CRI regularly issues information and recommendations to packhouses in southern Africa on packing practices, protocols and chemical use. CRI also sets minimum standards for packing material to ensure that fruit can be transported safely and securely once packed.

CRI is an invaluable source of information and assistance available to all citrus packhouses in southern Africa. CRI has no profit motive, and only has the best interests and welfare of the citrus industry at heart. Their recommendations and advice can always be trusted.