

Workflow: Packhouse Management

Toolkit 4.5

Fruit Treatment

target audience

Packhouse managers, and supervisors.

what it is

Once fruit enters the packhouse for processing it is treated with fungicides and wax.

why it is important

Blue moulds and green moulds are two of the most prevalent and damaging fungal diseases threatening the quality of citrus fruit delivered to market. Sour rot is another fungal disease responsible for significant post-harvest losses. Fungicidal treatments, and to a lesser degree wax treatment, counter these risks and improve the shelf-life of the fruit.

success factors

The key success factors are as follows:

➤ **The correct fungicide and its application** – The key considerations are:

- The correct fungicide as recommended by the CRI. The CRI publishes regular fact sheets and recommendations regarding fungicidal registered actives. On these fact sheets, you will find the name of the active ingredient and its formulation, the FRAC code, the target disease, the dosage and parts per million concentrations.
- CRI also publishes a protocol for fungicide treatments, updating it regularly with the latest research findings. It is critical to adhere to these recommendations. Fungicides must always be used as per their registrations, in accordance with the residue levels allowed by the target market. Following the recommendation and protocols from the CRI and your target market will ensure that the packhouse is compliant.
- Compliance to MRLs (minimum residue levels) as prescribed by the target market. These thresholds change, as do the chemicals allowed. Therefore, follow the updates from the CRI carefully. Residue levels are influenced by:
 - The temperature of the solution.
 - The concentration level of the fungicide.

- The pH of the water.
- Contact time of the solution.
- And the citrus type.

Temperature influences the effectiveness of the fungicide, with higher temperatures improving the uptake of fungicides in small fruit injuries and improving the drying process. If the solution is too hot it can damage the fruit rind and increase the residue level.

- **Reducing the risk of fungicidal resistance** – It is important to comply strictly to the fungicidal application protocol. Poor compliance not only reduces the efficacy of the fungicide but also promotes mutation of the pathogen and allows the number of spores that survive fungicidal treat to increase. The risk is that if the trend persists, the load of fungicidal resistant spores will increase to a point where your fungicidal regimen is rendered ineffective. Just like it is important for you to complete a regimen of antibiotic treatment, it is vital that you comply to the fungicidal protocol meticulously.
- **Fungicidal treatment systems** – There are two fungicidal treatment systems, the fungicidal bath and the in-line drench system. Key considerations include:
 - Fruit must be dry and clean.
 - Contact time is important.
 - Correct dosage and pH are both critical, and automated dosage machines assist in maintaining the correct levels.
 - In-line systems are easier to manage regarding the pH, temperature, exposure time and fungicide concentration in flooders than in baths. They are also smaller and more energy and water efficient.
 - Do not rely blindly on the automated dosage systems and ensure that you check the dosage and the pH manually, every 2 hours to ensure that all is correct.
- **Wax treatment** – The key success factors are:
 - The correct wax as specified by the target market.
 - The correct storage of the wax. Wax containers need to remain tightly sealed.
 - Fruit must be dry enough without water droplets. Slightly damp fruit helps with the even spread of wax, but water droplets will compromise the efficacy of the wax treatment.
 - The correct protocol is vital.
 - The frequent cleaning and maintenance of brushes is vital.

execution steps

See success factors above.

assessment questions

Please Note: There is no minimum / maximum number of questions you can add.

1.	Are you using only accredited and recommended fungicides?
2.	Are you applying the fungicide in the compliant manner, and do you have the quality control process to assure this?
3.	Are you sure that your fungicidal process limits the risk of fungicidal resistance amongst spores?
4.	Do you use the correct wax treatment as accredited and recommended?
5.	Does the waxing process meet the set standards?

resources

1.	Chlorine management in the packhouse (CRI Postharvest Workshop, S3 / P16)
2.	Chlorine management in the packhouse (CRI Postharvest Workshop, S3 / P16)
3.	Imazalil and alternatives: Aqueous application research (CRI Postharvest Workshop, S3 / P17)
4.	Imazalil and alternatives: Aqueous application research (CRI Postharvest Workshop, S3 / P17)
5.	Imazalil and alternatives: Wax application research (CRI Postharvest Workshop, S3 / P18)
6.	Imazalil and alternatives: Wax application research (CRI Postharvest Workshop, S3 / P18)
7.	Guidelines for optimal wax maintenance and application (CRI - Cutting Edge 344/2022)
8.	Removing propiconazole residue from citrus packing lines (CRI - Cutting Edge 314/2021)
9.	Chlorine use in packhouses (CRI - Cutting Edge 271/2019)
10.	Imazalil EU MRL Update (CRI - Cutting Edge 266/2019)
11.	Resistance monitoring in the packhouse (CRI - Cutting Edge 246/2018)
12.	Fludioxonil in wax (CRI - Cutting Edge 234/2017)
13.	Further Update on Citrus Waxes and Declarations (CRI - Cutting Edge 209/2016)
14.	Wax application 2015 (CRI - Cutting Edge 197/2015)
15.	Fungicide bath (CRI - Cutting Edge 197/2015)
16.	Chlorine application (CRI - Cutting Edge 197/2015)
17.	CRI Pre-Packhouse Drench
18.	CRI Fungicide Bath In-line Drench
19.	CRI Wax Application
20.	CRI Registered Actives – Wax Application
21.	CRI Registered Actives – Water Application
22.	CRI Recommended Usage Restrictions (MRLs) 04/2022
23.	Citrus Packhouse Module 5 – Fruit Treatments (Citrus Academy)
24.	Citrus Packhouses – Fruit Treatments (Citrus Academy)