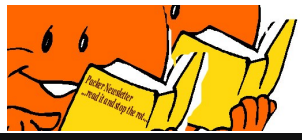
CITRUS POSTHARVEST
INFO NOTE



Subject information from Packer Newsletter articles

October 2014

REDUCED RISK FUNGICIDES

Reduced risk is a special classification approved by the United States EPA for 'specific uses of pesticides that have low risk to human health, low toxicity to non-target organisms, low potential to contaminate water or other environmental resources, and/or that broaden the adoption and effectiveness of integrated pest management strategies.' (M. T. McGrath, Cornell University)

The Reduced Risk Pesticide Program expedites regulatory decisions on pesticides that pose less risk to health and the environment than current practices. There is no comparable regulatory program in Australia but we can use this USA program to identify products that pose less risk to us and the environment. Scholar and Philabuster are two 'reduced risk' products registered in Australia, for postharvest use in citrus. Recently, I proposed Integrated Postharvest Management (IPHM) as a broader interpretation of IPM. Anyone leaning towards IPHM should consider these products for relevant markets.

There are other good reasons for using these two new fungicides. Imazalil (IMZ) and thiabendazole (TBZ) are typically overused and therefore more prone to developing resistance . Integrating these new products into existing practices by resting different actives should forestall resistance. The IPHM approach would be resistance management by preferentially replacing IMZ & TBZ for lengthening periods during the season. Saving IMZ & TBZ for high disease pressure periods.

"Integrated postharvest management (IPHM) is an packing process-based strategy that focuses on maintaining product quality and shelf -life while minimizing risks to human health and the environment."

- Peter Taverner

Sole reliance on one or two fungicides can lead to resistance and decay

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Blue and green mould can produce masses of spores on a single fruit

Integrating Philabuster

Packing for Domestic or Export

If you are running domestic, you can introduce Philabuster (PYR + IMZ) at any time. Ideally, use it as a tool to rotate TBZ out for a while. This mixture can also reduce the risk of IMZ resistance developing. Let's assume you have a small line with a TBZ cascade followed by IMZ in wax. You could switch to a PYR + IMZ cascade. If you were using chlorine for sanitation with your TBZ; they would not be compatible with PYR + IMZ. If you require sanitation, peroxyacetic acid is compatible and would also help the IMZ sulphate by increasing the acidity of the solution. Monitoring pH is essential. You could also add PYR + IMZ in wax, check fruit residues after the two applications and adjust rate to meet your residue targets.

If you are running an export line; PYR is widely accepted but check with your importer. Japanese supermarkets may not accept fruit treated with PYR.

Currently, you may be using a TBZ drench, heated IMZ+TBZ cascade and IMZ in wax. Firstly, it would be ideal to use PYR + IMZ at either side of the Japan trade period to break the resistance cycle for TBZ.

Using TBZ in the postharvest drench is a core treatment. Sodium bicarbonate (SBC) is an mixture option to help alleviate fungicide resistance. TBZ + SBC would be an obvious choice to reduce resistance risks but doesn't rest TBZ. Using Philabuster in the drench is possible depending on markets. PYR + IMZ has good protective and curative properties and would rest TBZ.

[Please note: Consider other risk factors before resting a fungicide. e.g., TBZ controls stem-end rots and alleviates chilling injury]

The cascade options are similar to the domestic line. If you're cautiously moving to reduced risk fungicides ; IMZ + SBC will still rest TBZ. Otherwise, you could use PYR + IMZ. PYR and IMZ are both very responsive to heat resulting in markedly higher residues. The rates must be adjusted by trial and error on your system to meet fruit residue targets.

Lastly, you could also add PYR + IMZ in wax. Check fruit residues after the two applications and adjust rates to meet residue targets.

Philabuster

Janssen PMP produce Philabuster, which in a mixture of IMZ sulphate and pyrimethanil (PYR). You cannot substitute IMZ out using Philabuster but you are applying 20% less IMZ (Philabuster high volume rate is 400 ppm IMZ). The PYR combines to provide decay control despite the lower IMZ rate.

Our observations and the results of other researchers suggest the following:

- ◊ Typically, aqueous solutions yielding 1-2ppm fruit residues are effective.
- ◊ PYR is protective and curative due to its systemic translocation properties (effective up to 24 hours after infection).
- ◊ Efficacy is improved with mild heat or when mixed with SBC or potassium sorbate.
- ◊ PYR is incompatible with chlorine but stable with peroxyacetic acid.
- ◊ Provides some sporulation control but is inferior to IMZ.

Overall, a PYR + IMZ mixture provides superior resistance management. It ensures the proportions are correct and stable when used as directed. But, a propriety combination may sometimes limit flexibility.

For instance, Philabuster contains IMZ sulphate, which is not suited for application under alkaline conditions. SBC creates alkaline conditions. Thus, Philabuster with SBC may pose a problem.

Scholar

Syngenta Australia produce Scholar, which contains the active fludioxonil (FLU). FLU is primarily a protectant; its curative effect is reduced when period from inoculation to treatment >12 hours.

Our observations and the results of other researchers suggest the following:

- ◊ FLU controls blue & green mould and stem-end rots (>1ppm fruit residue)
- ◊ Excellent control on lemons. However, control is inferior to IMZ on mandarins and oranges.
- ◊ FLU compatible with chlorine.
- ◊ FLU in wax can control sporulation but inferior to IMZ.
- ◊ Sodium bicarbonate (SBC) improves the efficacy of FLU.
- ◊ Adding SBC also improved control when treatment was delayed (24hrs after inoculation).

FLU has successfully been used to control TBZ-resistant mould on lemons. But, FLU is not recommended on its own. A two stage (dip & wax) combination of TBZ + FLU was effective on a TBZ/IMZ resistant mould isolate. Recent work shows enhanced efficacy using TBZ + FLU + SBC mixtures.

Integrating Scholar

Packing for Domestic

If you are running domestic, you can introduce Scholar at any time. It could be used to give IMZ or TBZ a rest. However, its pretty clear that you shouldn't run Scholar on its own for long periods: This probably means using mixtures.

Let's assume you have a small line with IMZ cascade sometimes followed by IMZ in wax (only at times of high disease pressure). You could switch 'cold turkey' to a FLU + SBC cascade. Unfortunately, aqueous FLU alone doesn't provide the sporulation control of aqueous IMZ. So, using nothing in wax may be a bit too risky! A FLU +SBC cascade followed by IMZ does still rest TBZ.

Unfortunately, FLU is not registered for use in wax; FLU would work better as a 2 stage application (cascade + in wax) and you could then rest IMZ. If TBZ was registered in wax, I could then recommend TBZ + FLU in wax. Oh well! It appears we still have some 'use' gaps to fill before implementing more flexible rotations.

[Please note: I would recommend using a compatible sanitiser for recirculating solutions. This may be problematic for some fungicide and SBC combinations]

Packing for Export

Another scenario is an export line (Japan during most of the navel season) and using TBZ drench, IMZ+TBZ and IMZ in wax. Firstly, it would be ideal to use FLU at either side of the Japan trade period to break the resistance cycle. It would be difficult to remove both fungicides. Let's work on one or the other at each application.

Using TBZ in the postharvest drench is a core treatment. TBZ + SBC would be an obvious option to reduce resistance risks but doesn't rest TBZ. FLU + SBC is an option that needs further verification. FLU is relatively poor when treatment is delayed (curative) unless SBC is added. Bins need to be treated promptly. Otherwise, IMZ (EC only) + SBC would rest TBZ.

[Please note: SBC creates alkaline conditions which can strongly influence IMZ sulphate and the consequent residues on fruit. Use of IMZ sulphate and SBC mixtures is discouraged, unless strict pH monitoring and adjustment is adhered to]

The cascade options are similar to the domestic line. You could use FLU + SBC but if you're cautiously moving to reduced risk fungicides &/or disease pressure is high; TBZ + FLU + SBC will still rest IMZ. The option to rest TBZ by using FLU + IMZ EC + SBC needs to be verified.

Lastly, if you are resting TBZ in other stages, then continue using IMZ in wax. If resting IMZ in other applications, then your options in wax are limited. If FLU was register in wax, you could use FLU in two stages; cascade and in wax: Allowing you to rest IMZ. If TBZ was registered in wax, I could recommend TBZ + FLU in wax. Not possible, in Australia. But, you can use Philbuster in wax .

Key References

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Read the packer newsletter and stop the rot

Acknowledgements

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