Raspberry rescue – increasing storage life with SO_2 sheets

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The raspberry storage challenge

Fresh raspberries are surely one of the most perishable of all fruit. Before new varieties became available and turnover increased, major supermarkets would report losses of up to 80% of raspberries in store. While waste has been greatly reduced and turnover increased, postharvest loss remains a major issue for these delicate, soft fruits.

Moreover, storing fruit for longer periods could help extend the season for raspberries, stabilising supply and capacity to meet demand. This could be particularly useful at Christmas, as surely no pavlova is complete without raspberries on top.

Raspberry storage life is often ended by disease, the primary culprit being Botrytis cinerea (grey mould). Although infection often occurs at flowering, it is only once the ripe, harvested fruit lose their ability to defend themselves that the fungus strikes. Grey mould is particularly difficult to manage as continues to grow at temperatures as low as 0°C and is encouraged by the high humidity conditions needed during storage.

Sulphur dioxide (SO_2) release sheets are commonly used to control grey mould on stored table grapes. They are also already registered for blueberries, having been demonstrated to increase storage life. But, can they provide an answer for raspberries?

Our trials

We have conducted preliminary trials examining the effect of a brand of SO_2 sheets on storage and shelf life of packed raspberries. Sheets were added to the top layer of punnets or both the top and bottom layers. In trial 1 the sheets were added immediately after harvest at the farm, while in trial 2 berries were simply sourced from wholesale for treatment.

Trial 1 – Sheets added at the farm

Method

The sheets were added as the field packed trays arrived at the packhouse. The trays were then forced air cooled, stacked and cling wrapped. This was designed to replicate a wrapped pallet; wrapping treated pallets is an effective way to both reduce water loss and softening and improve SO_2 treatment effectiveness during extended storage.

Punnets were assessed after removal from “commercial” conditions (13 or 19 days), then again once the sheets were removed and punnets stored for a few extra days in a domestic fridge – as consumers would keep them after purchase. Assessments were destructive, with all berries removed and closely examined for mould. Percentage rots was then simply calculated from the weight of mouldy fruit.

Results

Not only were these raspberries very good quality to start with, the cold chain was maintained throughout – maximising storage life. After nearly two weeks at 2–4°C half of the punnets were removed for assessment. All of the punnets were still in excellent condition, with minimal rots regardless of treatment. However, after five days in the fridge differences started to emerge, with noticeable rots in the untreated controls.

The remaining punnets had been left in the cool room for an extra 6 days before they too were unwrapped, assessed and moved to a normal fridge. Rots now accelerated. Not only did the untreated controls have more rots on removal, after two days in the fridge up to 50% were inedible. In contrast, both of the SO_2 treatments were almost rot free on removal, the raspberries remaining largely firm and fuzz-free after two days in the fridge.

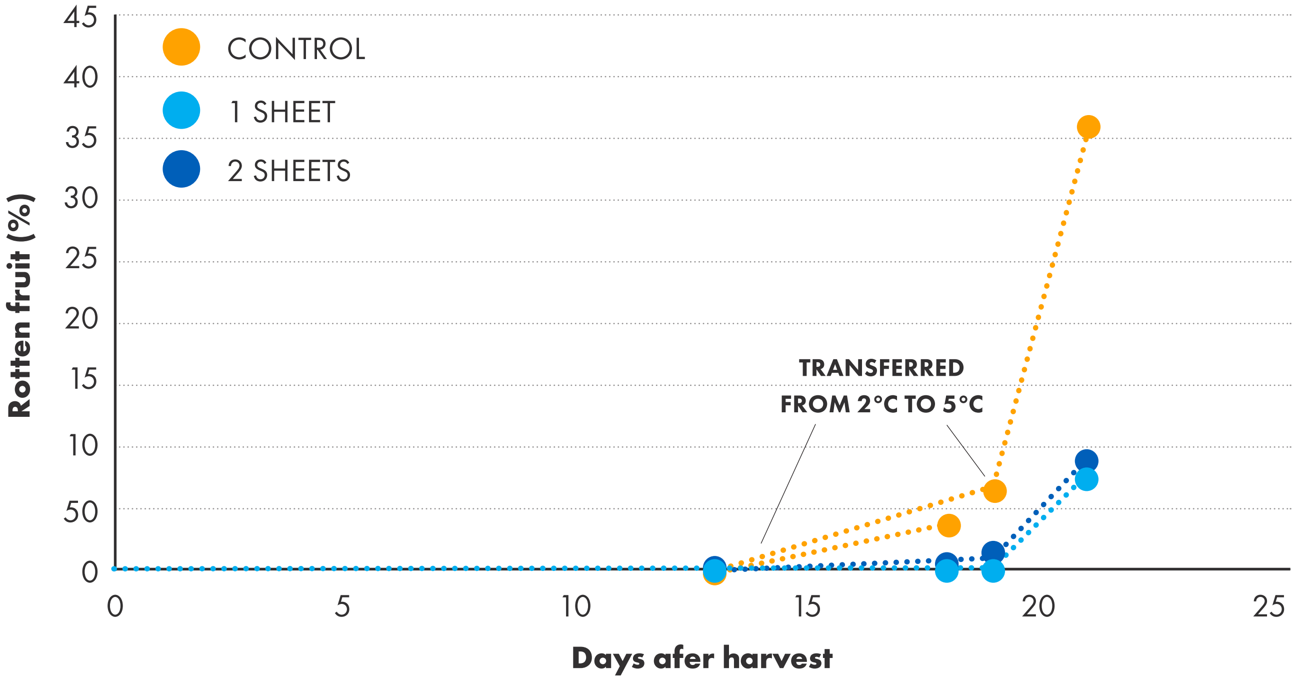

Figure 1. Percentage of rotten berries in punnets that were left untreated (control) or had one or two sheets added to each tray. Solid lines indicate cold storage (2°C), dotted lines show changes after removal of the sheets and transfer to a domestic fridge (5°C). Bars indicate the standard error of each mean value.

Figure 2. Condition of raspberries that were untreated (left) or had 1 (centre) or 2 (right) SO_2 sheets added at harvest. Raspberries were stored for 19 days at 2°C (top row) followed by 2 days in a domestic fridge (bottom row).

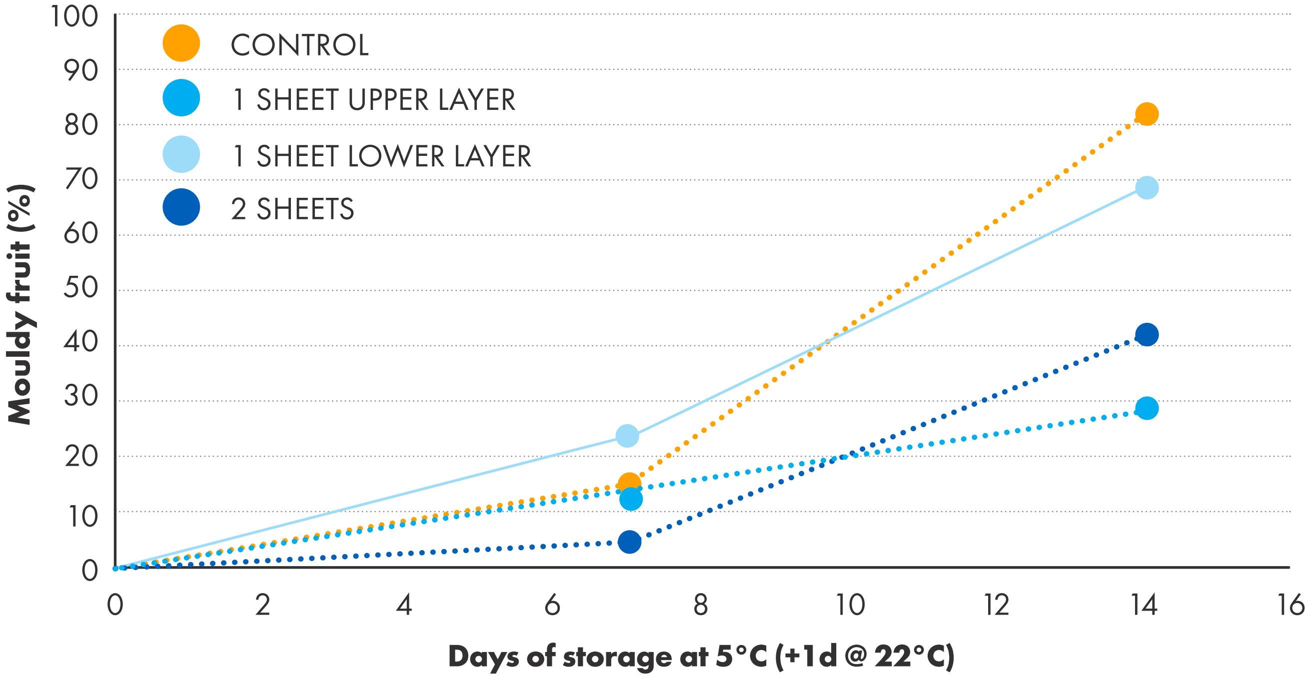

Figure 3. Percentage of rotten berries in punnets that were left untreated (control) or had one or two sheets added to each tray (results from upper and lower layers presented separately for the single sheet treatment). Punnets were stored at 5°C for 6 or 13 days. The sheets were then removed, and punnets assessed after 24 hours at 22°C. Bars indicate the standard error of each mean value.

Trial 2 – Sheets added at wholesale

Method

Not only were these raspberries already a few days old by the time they were purchased, but the cold chain was not optimally maintained. The fruit deteriorated relatively quickly as a result.

In this case the trays were not cling wrapped, but simply stored at 5°C for 5 or 12 days. The sheets were then removed, and punnets assessed after a further 24 hours at 22°C, simulating a retail store.

Results

Despite this poor handling, the SO_2 sheets still provided some benefit, particularly when two sheets were used. While a single sheet provided good control of rots in the upper layer of the tray, punnets on the lower layer were no different to the untreated controls. This is likely due to SO_2 diffusing into the storage room air rather than the lower layer of punnets, limiting its effectiveness.

By the second assessment, virtually none of the untreated raspberries were edible. However, rots were approximately halved when the punnets were directly overlaid with a SO_2 sheet.

Conclusions

These trials suggest that raspberries respond well to storage with SO_2 sheets. The "bleaching" that can occur with blueberries was not observed for raspberries, and limited "taste testing" (by our lab staff) could not detect any flavour effects. A single sheet on top of each tray is likely to be enough to provide a good result if the pallet is wrapped. However, sheets may need to be added to each layer of punnets if the trays are not wrapped. This not only adds cost, it also adds difficulty, as the sheets must be removed before the trays go onto retail display. One really interesting result was that the benefits of the SO_2 sheet continued even after the sheet was removed. We envisage that this is what would happen commercially when trays are transferred to retail display. This suggests that SO_2 sheets could not only reduce waste in the supply chain, but also improve customer satisfaction with raspberries overall. It should be noted that SO_2 release sheets are not yet registered for use on raspberries and these trials were limited in scope. However, these promising results suggest that SO_2 could definitely be a useful device in the future postharvest toolbox.

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