

Problem Solver:

A California strawberry shipper had arrival problems in berries packed in new, lidded, clear-plastic baskets. The fruit were more subject to decay than those shipped in traditional open-mesh plastic baskets.

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Recommendation

Keeping strawberries near 0°C (32°F) is the most important method of retarding fungal growth on strawberries. Initially the shipper asked if the new basket was influencing the cooling of the berries. Laboratory and field tests have shown that the clear plastic baskets can cool as fast as the older open mesh baskets, although the specific design of the baskets and the corrugated tray in which they are placed have a significant influence on cooling times for a particular packaging system. The shipper's package could have slowed cooling compared with the old design he was using, but without testing relative cooling rates there was no way to be certain. However, the simplest solution to the problem of inadequate cooling is to just leave the product on the cooler long enough for it to reach desired temperature.

Further discussions revealed that the shipper's forced-air cooler never operated with air temperatures below about 2°C (36°F), so it was not possible to adequately cool the fruit no matter how long it was left on the cooler. The cooler utilized an air-washer heat exchange system. It cools air by placing it in contact with a spray of refrigerated water. The system cooled the air to about 2°C (36°F) and fruit was rarely cooled below 3°C (38°F). Strawberries should be cooled to near 0°C (32°F). Many strawberry coolers in California are operated with air temperatures of -1.0 to -0.5°C (30° -31°F) and fruit are cooled to about 0.5°C (33°F). The shipper needed to reduce the air temperature in the cooler and ensure the strawberries were properly cooled.

Outcome

Air washer heat exchangers can be operated at temperatures below the freezing temperature of water, if a freezing temperature depressing chemical is

added to the water. Sodium chloride, calcium chloride or propylene glycol are commonly used for this. But the refrigerated water for the air washer was also used in a hydrocooler, so the shipper decided against adding chemicals to the water. Instead he installed a separate direct expansion refrigeration heat exchanger for the berries, allowing them to be cooled to near 0.5°C (33°F).

Before this change the shipper could not market strawberries beyond the Mississippi River, about a two-day travel time. The cooler berries can now be shipped at least four days to locations such as Montreal and Florida.

Comment

We did not determine whether there was a difference in decay susceptibility between strawberries packed in the clear plastic baskets compared with the open mesh baskets. The clear baskets have vent areas of 5 to 10% of their total surface area and could have higher humidity conditions around the berries compared with the mesh baskets that are very open. If there was a difference in humidity conditions between the two basket styles, shipping at proper temperature was able to overcome the decay problems in the clear baskets.

Key words: forced-air cooling, temperature management, refrigeration, strawberry, decay

