

Should I monitor air or product (pulp) temperature?

Temperature during storage and transportation is the main environmental factor influencing quality loss in perishable horticultural products between the farm and the consumer.

Recording fluctuations in temperature during transit using temperature loggers can help identify where any failures occur along the cold chain.

There are two main types of temperature loggers:

1. Air temperature loggers
2. Product (probe) temperature loggers

Use air temperature loggers:

- When probe damage to the product or the package is not acceptable.
- When cost is a major consideration.
- During prolonged storage, when there is little difference in temperature between the air and the product, or there is relatively little air movement around the product. In these instances the product temperature is similar to the temperature of the air near the product.



Example air temperature logger

Product temperature loggers use a temperature probe to measure changes in pulp temperature, and are generally more expensive than air temperature loggers.

Autonomous loggers that continually upload to the internet the time, temperature and preferably location history of the product have several advantages over loggers that need to be retrieved to obtain the data (e.g. USB or NFC loggers).

The question is, when are the more expensive product temperature loggers necessary and when will the cheaper air temperature loggers provide the required level of information?

Use product (probe) temperature loggers:

- When it is important to record product temperatures over short periods and when there is a big difference between air and product temperature. Air temperature changes more quickly than product temperature, especially with larger products such as mango.
- When all the product in the batch needs to be cooled quickly to a similar temperature. In these circumstances product temperatures can vary across the load during the first few hours of cooling.
- When quarantine protocols such as cold disinfestation against fruit fly require the core flesh temperature to be recorded using a probed temperature logger.
- When the packaging of a high respiration product restricts the transfer of heat from the product to the cold air.



Example product (probe) temperature logger

Logging cold chain temperature – A case study

Figure 1 shows the temperature data recorded in a consignment of Calypso mangoes rail-freighted from Katherine (NT) to Adelaide (SA). Data was recorded using air and product (probe) temperature loggers placed in the middle of a packed pallet that was located in the middle of the container (mid inside), and in another that was the second last pallet from the door (rear).

This study showed that product (probe) temperature loggers were required when the product was being rapidly cooled (e.g. during forced air cooling). Under

these conditions there is a big difference between the air and product temperature, and there is rapid air movement. The graph shows that the measured air temperature did not accurately represent pulp temperature during the rapid cooling phase.

Once the required temperature had been achieved and stabilised, and there is less air movement (e.g. during the transport phase), then air temperature fairly accurately represents pulp temperature. Therefore, air temperature loggers are suitable for use during the transport phase.

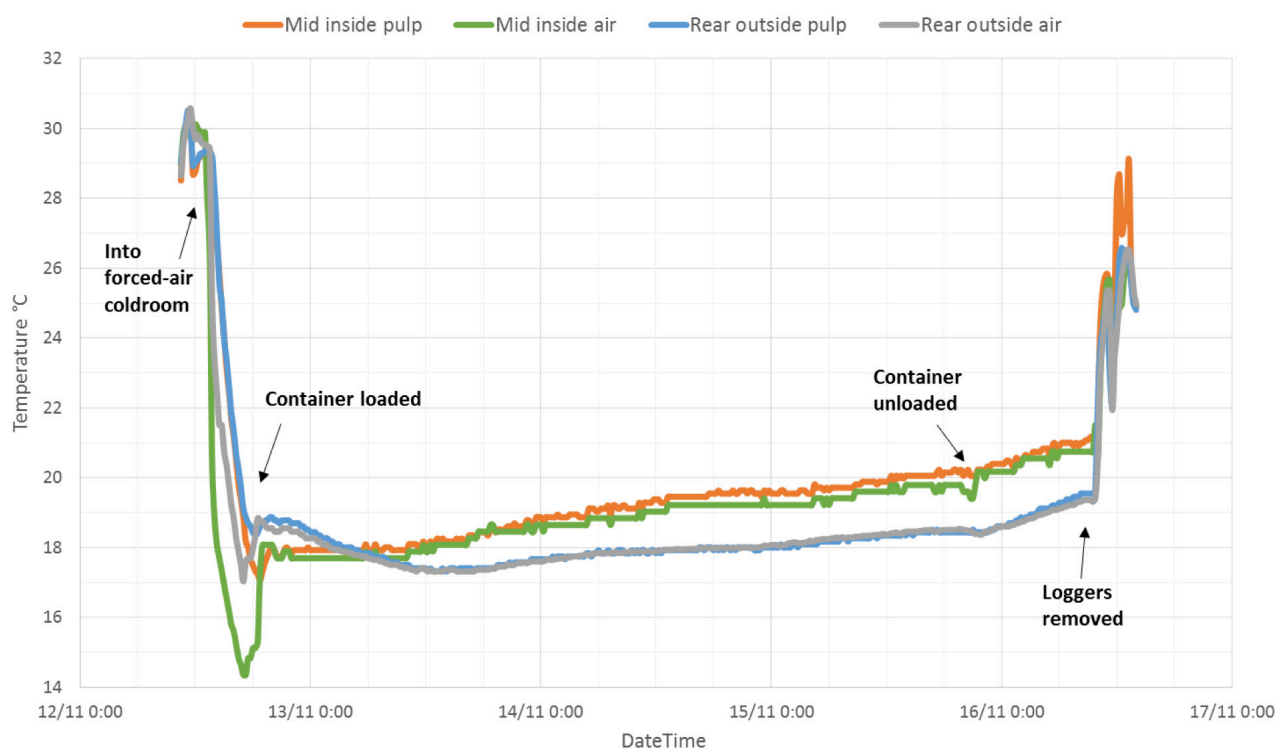


Figure 1: Product v air temperature of two Calypso mango trays during forced air cooling and transportation

More information:

Noel Ainsworth
Principal Supply Chain Horticulturist,
Department of Agriculture and Fisheries

T: 07 3708 8563 M: 0409 003 909

E: noel.ainsworth@daf.qld.gov.au

<https://www.daf.qld.gov.au/business-priorities/plants/fruit-and-vegetables/supply-chain-innovation>