FACTSHEET

MEASURING TEMPERATURE

MushroomLink

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Measuring temperature is not as straightforward as you might think.

Temperature cannot be measured directly. Temperature measurements record the effect of heat energy on a thermometer or probe.

It is essential to ensure that the probe is correctly calibrated, so that the measurement is accurate.

Managing temperature is critical to maintain postharvest quality. It is also essential to meet retailer specifications, which often require that mushrooms are delivered below 5°C. Given a usual storage temperature of 2-3°C, followed by transport and potentially some 'self heating' inside the punnets, pulp temperatures at delivery can easily approach that 5°C limit.

A correct measurement method with a reliable probe is vital.

KEY POINTS

- Mushrooms must be delivered to retailers' DCs below 5°C
- Self-heating during transport can bring mushrooms close to this limit
- Given this tight range, it is very important that temperature probes are working properly
- When calibrating:
  - Liquids provide the best medium for calibration.
  - A slurry of melting ice provides a reliable and accurate measurement of 0°C
- When measuring:
  - As the probe may transfer some heat, insert into the mushroom or punnet and allow the reading to stabilise
  - Remove and re-insert, ensuring the tip of the probe has good contact with the mushroom flesh
  - Wait at least 10 to 15 seconds before recording temperature

STEP 1 - PROBE CALIBRATION

The best way to calibrate a probe is in liquid, using a melted ice slurry.

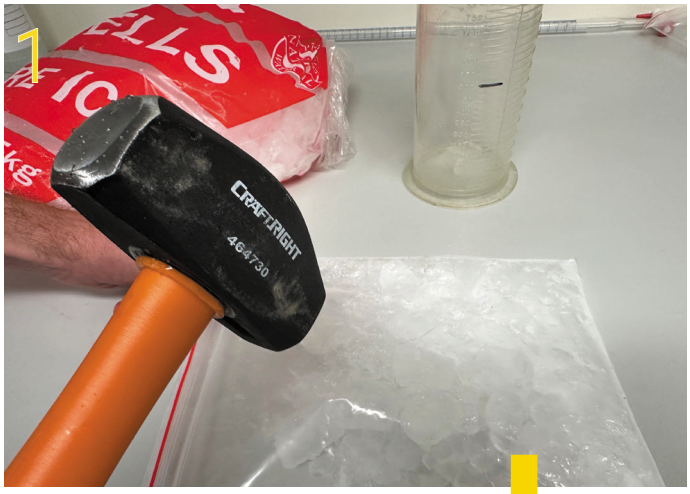
Calibration in air is **not recommended** as air is a poor conductor of heat. If a reference thermometer is used to calibrate in air, significant gradients can exist between it and the probe being assessed, no matter how close together they may be.

In contrast, water is a good conductor of heat, being 24x more efficient than air. Gentle stirring further eliminates any potential temperature gradients within the medium.

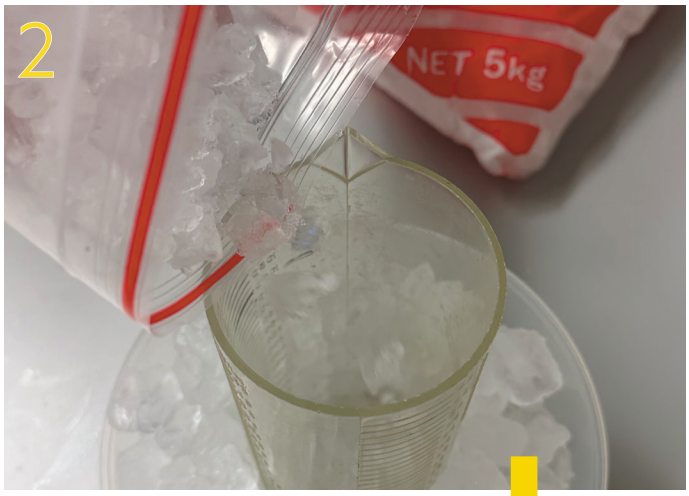
Probes should be calibrated at temperatures close to those expected in the product; calibrating a probe at room temperature will not necessarily translate to an accurate measurement at 3°C.

The best medium to calibrate probes is a slurry of melting ice. This provides a reliable and accurate measurement of 0°C, so is close to the target temperature of the mushrooms.

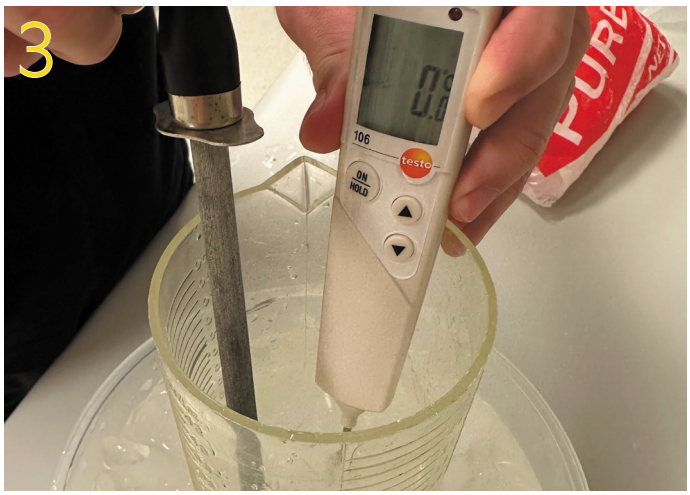
- Obtain a large thermos or construct a double insulated vessel for the calibration
- Crush some ice and place in the thermos or in the central part of the double vessel (fill the outside of the vessel with ice to insulate the inner part)
- Add just enough water just to cover the ice, stir, and allow to equilibrate for at least 5 to 10 minutes
- While continuously stirring the ice slurry, place the probe into the ice and wait for the reading to stabilise
- If the probe does not read zero, record the variation (+/-) and calibration date on a sticker and attach it to the probe



Place ice in a ziplock bag and crush with a hammer



Add crushed ice to thermos or double insulated vessel and just cover with water



Stir melting slurry and allow to equilibrate. Keep stirring while the probe stabilises, record variation from 0°C

STEP 2 – MEASURING TEMPERATURE IN PUNNETS

Note that some probes come with a default 'hold' mechanism. Once the temperature is stable for five seconds, the probe will keep that temperature on the display. However, five seconds may not be long enough for true temperature stabilisation.

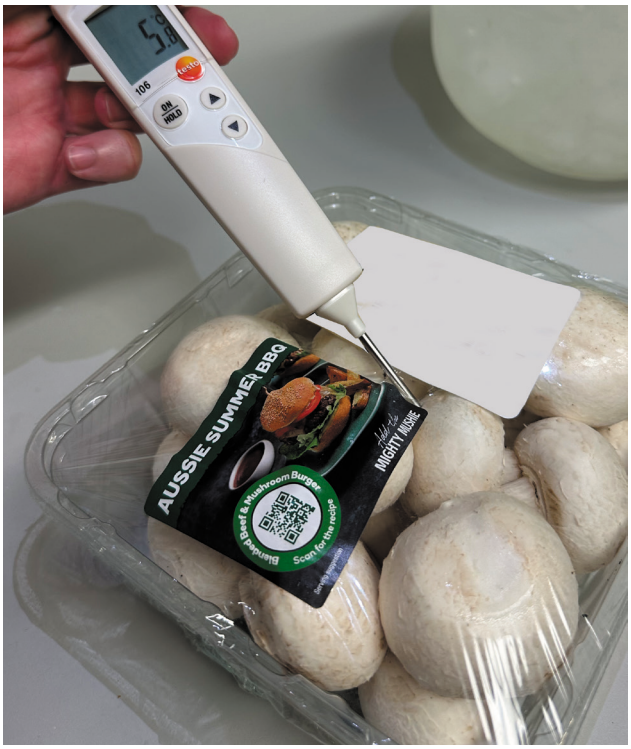
It is recommended that either the hold feature is turned off, or that it is increased to a longer period, say 10 to 15 seconds.

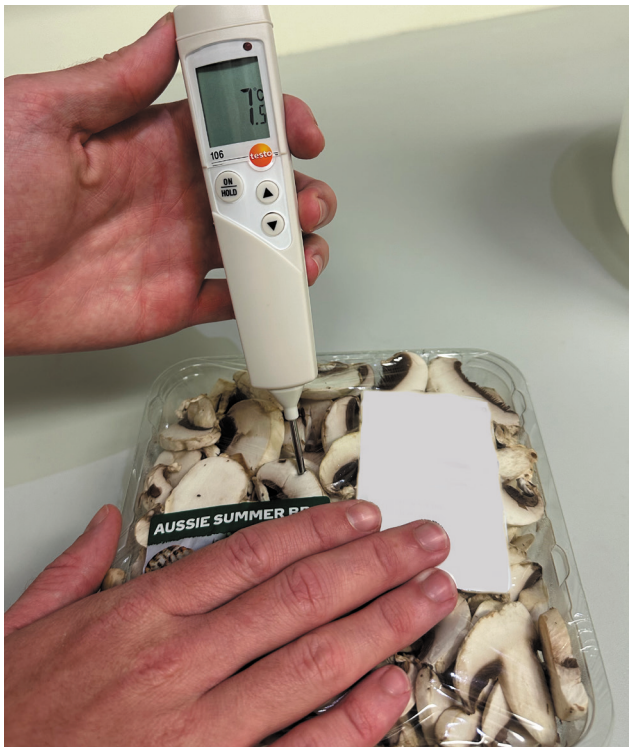
Temperature probes often work by measuring the different expansion coefficients of metals in response to temperature. This measurement occurs right at the tip. It is important that the tips of probes are treated carefully, and not forced into or through hard objects.

The tip of the probe needs to be placed in the core of the mushroom measured. However, the probe itself may also transfer some heat. To ensure this does not impact the measurement:

- Insert the probe into the core of a mushroom and allow it to stabilise
- Remove the probe and re-insert into a different mushroom, choosing one at the centre of the punnet
- Record the temperature once temperature is stable for at least 10 to 15 seconds

In the case of sliced mushrooms, it is virtually impossible to measure pulp temperature. The best method is therefore to press down lightly on the punnet, ensuring good contact between the probe tip and the flesh. Make sure the probe tip is right in the centre, not touching the base or walls of the punnet, as this is where the actual temperature measurement is taken.





To make sure the probe is the same temperature as the mushrooms, always take one measurement, allow the probe to stabilise, then take a second measurement of a different mushroom or location in the punnet. Ensure the probe tip is in the core of the mushroom or centre of the punnet.