Cooling and Temperature Management for Strawberries

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Good temperature management is the single most important factor in reducing strawberry deterioration and maximizing postharvest life. The best way to slow spoilage is to quickly remove field heat and to maintain the berries as close to 0°C as possible. Any failure to maintain produce at low temperatures during handling, storage, and transportation will result in loss of quality and marketability. When the temperature of a strawberry is raised from 0 to 10°C, its deterioration rate increases two- to four-fold. This means that berries held at 20°C have only one-quarter to one-half the life expectancy of those held at 0°C. Market life will be reduced to only a few hours if strawberries are held near 30°C, as may occur in the field.

Berries should be protected from warming when they remain in the field after harvest. Due to their dark color, strawberries in direct sun exposure will absorb heat and quickly warm to above air temperature. Shading can help keep the flesh temperature of harvested berries below that of air. The amount of warming depends on the temperature difference between the berries and air, the duration of sun exposure, and the amount of air flow (breezes) over the berries.

Precooling (rapid removal of field heat) of strawberries is essential within 1 hour of harvest. Cooling delays of 2, 4, 6, or 8 hours reduces marketability by 20, 37, 50, or 70%, respectively, after holding the fruit at 25°C (Mitchell et al., 1996). The most common method to precool berries is forced-air cooling. This is the most widely adaptable and fastest cooling method for small-scale operations. Cold air is forced to move rapidly through the containers (versus around the containers as in room cooling), allowing the cold air to be in direct contact with the warm berries. Pallets of strawberries are positioned so that the cold air must pass through the package openings and around individual berries. The most common design consists of a tunnel, which is formed by leaving space between two rows of loaded pallets, and the opening is covered with a tarp. With the exhaust fan operating, air is removed from the tunnel and a slightly negative air pressure is created. Cold air from the room then flows through package openings and around warm berries to reach the low-pressure area.

The cooling rate and efficiency of the system depend on a number of factors: 1) the temperature difference between the fruit and the cold air, 2) the flow rate of the air, 3) the accessibility of the fruit to the cold air, and 4) the dimensions of the air channel. An inefficient system will increase the cooling time, thus increasing the operating cost and reducing the marketable weight and quality of the fruit.