

Postharvest Cooling and Handling of Strawberries



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Freshness Facts

Optimum humidity: 90 to 95%

Optimum temperature: 32 F

Preferred cooling method: Forced air

Freezing temperature: 31 F

Storage life: 5 to 7 days

Why is Postharvest Management Required?

In North Carolina most strawberries are grown for the pick-your-own market. When strawberries are marketed in this way, growers need not be concerned about handling and storage because these functions are performed by the consumer.

Recently, however, strong competition and a desire to expand their operations have led many growers to consider other markets. Among these are grocery stores, restaurants, and produce terminals. To penetrate these markets, growers need the equipment and expertise to deliver a high-quality product. The first step is to grow and harvest high-quality strawberries. Equally important, however, is maintaining product quality after harvest with the right cooling, handling, and storage methods.

Why is Postharvest Cooling Important?

Strawberries are extremely perishable and have unusually demanding postharvest handling requirements. Even under ideal conditions they can rarely be kept for more than 7 days after harvest. They must be cooled immediately to their lowest safe temperature (32 to 34 F) to prevent overripening and decay, and they must not be allowed to rewarm.

Even after picking, strawberries remain alive and produce heat as a natural consequence of respiration. The amount of heat they produce depends on the storage temperature. At 32 F a ton of strawberries will produce approximately 3,300 Btu per day, whereas at 80 F, a ton will produce 41,800 Btu!

Strawberries intended for storage must be free of bruises and other injuries, as bruised berries are very susceptible to decay. Very careful handling is essential to maintaining quality. Remember that while proper postharvest cooling and handling techniques can help maintain product quality, they can never improve it. Berries without stem caps are particularly perishable and must be eliminated from any fruit to be stored.

The two most common types of decay are gray mold, *Botrytis cinerea*, and rhizopus rot. Even a small amount of infestation can quickly spread throughout an entire package. Berries that have been cooled and then allowed to rewarm (causing moisture to condense on them) are extremely susceptible to decay and must be processed or consumed immediately.

Cooling and Handling Methods

Strawberries must be cooled immediately after harvest by forced-air cooling to a temperature of 40 F or lower. Hydrocooling (flooding them with chilled water) is not recommended because wet berries are much more susceptible to decay. Cooling with crushed or "liquid" ice is even worse because the berries are likely to sustain physical damage.

The most common carton for strawberries is an open-top, single-layer tray containing 8 1 -quart or 12 1 -pint containers. Trays are stacked in layers of six to form a pallet load of 60 or 84 trays, respectively, weighing approximately 1,000 pounds. The cartons have enough open area to allow for passage of cooling air. To prevent severe bruising and a reduction in quality and appearance, care must be taken not to overfill the trays.

It is never sufficient to simply place the packaged strawberries inside a cooling room and allow them to cool gradually. For pelletized loads, the cooling process would take much too long. The fruits in the center of the pallet would not be adequately cooled and would begin to decay. Without forced movement of the

cooling air, the heat from natural respiration can destroy the fruit.

Normally, air is forced through the packages with a fan, which produces a difference in air pressure between opposite sides of the load. Through proper placement of the load and the use of baffles, cooling air is directed to flow through the containers of fruit. The air should be pulled, never blown, through the packages. The fans and cooling system must be sized to cool the entire load in 2 hours or less. For more information on this subject, refer to Agricultural Extension Service publication AG-414-3, *Maintaining the Quality of North Carolina Fresh Produce: Forced-Air Cooling*.

Humidity as well as temperature must be controlled in storage facilities. If the air inside the storage room is too dry, water will evaporate from the strawberries and they will become soft and shriveled. At a storage room temperature of 32 F, the relative humidity should be from 90 to 95 percent. Much of the water that evaporates from the fruit condenses on the inside surfaces of the room or is absorbed into packing materials. Under certain atmospheric conditions, it may be necessary to add moisture with a humidification system.

Modified atmospheres containing as much as 15 percent carbon dioxide, which retards respiration, can be obtained using plastic pallet covers. However, this technique may not be applicable or cost-effective on a small scale.

Designing a Cooling Facility

Satisfactory cooling facilities can be built by the owner or by a contractor. In either case, make certain that sound engineering principles are followed to ensure proper performance and energy-efficient operation. For more information, see Agricultural Extension Service publication AG-414-2, *Design of Room Cooling Facilities: Structural and Energy Requirements*, or contact your county Extension agent.

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