

Part 1 of a Series of Informational Articles about Forced-Air Precooling

Dear Friend:

We are pleased to present an article by Jim Thompson, who has been an adviser to our company for a number of years, and a great help to us. (To contact Jim, eMail to jamfthompson@gmail.com, or see UC Davis page [here](#)).

Temperature and Produce Quality

by Jim Thompson

Temperature is the most important factor controlling the postharvest life of fresh produce.

Holding produce at its lowest safe temperature will reduce:

- 1) Flavor and nutrition loss caused by respiration,
- 2) Weight loss caused by transpiration through the surface of the product,
- 3) Decay caused by mechanical damage and fungal infection, and
- 4) Color, flavor and premature ripening caused by exposure to ethylene gas, a common pollutant in produce cold storages.

The general rule is to cool produce to its lowest possible temperature as quickly as possible after harvest and keep it cold throughout the handling chain.

What is the lowest safe temperature for produce?

Most green vegetables should be cooled to near 32°F (0°C). Many fruit-type vegetables (for example tomatoes, peppers) are chilling sensitive and should be kept at 45° to 55°F (7° to 13°C). Melons vary in their optimum temperature, but most are held in the range of 40° to 50°F (4°C to 10°C). Fruits and berries should be held at 32°F (0°C) with the exception of tropical origin fruits like bananas, mango, papaya, etc. Actually, most fruits have a high sugar content and can be held a few degrees below 32°F without being subject to freezing injury. For the optimum

temperature of a specific produce item consult <http://postharvest.ucdavis.edu> or <http://www.ba.ars.usda.gov/hb66/contents.html> .

How quickly after harvest should produce be cooled to its storage temperature?

This varies from a few hours to a day depending on the item. The table below gives some examples of acceptable cooling delays. However these times assume the product is kept out of direct sun and near room temperature, and is healthy fruit harvested in favorable weather.

Acceptable cooling delay (hours)	Fruits & Melons	Vegetables
2	Strawberry, grape if >30°C	
4	Apricot, cantaloupe	Asparagus, mushroom, leafy green vegetables, sweet corn
8	Avocado, grape if <20°C, kiwifruit, mandarin, peach, nectarine,	Artichoke, bell pepper, cauliflower, carrot, summer squashes, cucumber, eggplant, green bean, green onion,
16	Honeydew, orange, pear, persimmon, plum	Garlic, dry onion, peppers, potato, sweet potato, tomato
24	Apple, grapefruit, lemon,	

A few items, like bananas, pears, avocados, stonefruit, and tomatoes, are held near room temperature before marketing to condition them or initiate ripening. This is a specialized process and must be carefully managed to get good market quality.

What if my facility is not capable of cooling my product to recommended temperature?

Partial cooling is much better than no cooling at all. Some people start with cooling only the product that must have the longest shelf life. Others cool all of their product to an intermediate temperature. This shows them how temperature management can increase profit and later they invest in facilities that can provide optimum temperature management.

If my product is going to rewarm in handling, is it better to not cool it rather than subject it to cooling and then reheating?

Best quality is obtained by keeping produce as cold as possible as long as possible. Rewarming is not desirable, but not cooling at all is even worse. END OF THIS ARTICLE.



Illustration 1: It's not important that you start to precool "fancy" or "big", only that you get started. Then each season, you can improve your equipment and systems.