

Chapter 10 – Postharvest Handling

10.1 Background

Vegetables and fruit are living organisms that continue to change after harvest. While some of these changes are desirable, most are not, and growers must be aware of effective ways to minimize undesirable changes, increase shelf life, and decrease postharvest losses. For most vegetables, maintaining cool temperatures and high humidity are the most effective means of preserving quality.

Once picked, vegetables will respire, meaning they use their stored sugars to produce carbon dioxide and heat. The more rapid the rate of respiration, the faster a vegetable will use up the stored food supply; the greater the heat produced, the shorter the postharvest life of a given commodity.

Vegetables also give off ethylene, a ripening hormone which promotes senescence. Detrimental effects of senescence include loss of green color; abscission of leaves or flowers; toughening of asparagus spears; russet spotting in lettuce; sprouting of potatoes; bitterness in carrots; and general weakening of the vegetable, which greatly reduces the natural resistance to decay organisms. The effect of ethylene is influenced by the amount present, the length of time the vegetable is exposed, and the temperature. Exposure to a specific concentration of ethylene for a given time will have much less influence at 32°F than at 85°F. The sensitivity of many vegetables to ethylene increases with maturity or age.

Transpiration, the loss of moisture from living produce, is one of the primary determinants of postharvest life and quality. The rate of moisture loss depends on both the commodity and the environment and is influenced by many physical and morphological factors. These factors include storage environment, surface to mass ratio (e.g., leaf lettuce has much more surface area per weight than winter squash and is more subject to weight loss), and injury. High humidity also helps to limit moisture losses. See specific crop chapters for best storage temperature and humidity recommendations.

10.2 Washing and Chlorination

Decay is usually the most obvious postharvest problem. Many decay organisms (bacteria and fungi) cannot invade sound, undamaged tissue, but as the tissue becomes older, it becomes weaker and more subject to invasion. To control postharvest losses, it is recommended that produce be washed in chlorinated water before storage or shipping (see Table 10.21). The wash temperature should be about 10°F warmer than the produce temperature to ensure that decay organisms are not sucked into the tissue. Since chlorine is most effective at a slightly acidic pH, it is important that wash water is buffered to adjust the pH to between 6 and 7.

Chlorine in the wash water is often inactivated when the wash water becomes dirty. Use filtering devices to remove soil and organic material, and check the chlorine concentration often. Produce should be subjected to the chlorinated wash from one to ten minutes. After it is removed, allow it to drain for several minutes before packing.

10.3 Cooling

Cooling is important for most commodities and a quick cool down or precooling is desirable for highly perishable products that are harvested or packed in warm weather. In general, a vegetable that has a storage life of 30 days at 32°F will have a storage life of about one to three days at 90°F or three to six days at 70°F. Precooling methods are usually dictated by the product and the available facilities or resources.

10.4 Chilling Injury

Chilling injury is caused by low, nonfreezing temperatures and generally affects vegetables with a higher recommended storage temperature. See individual crop chapters. Symptoms of this disorder include decay; failure to ripen properly or uniformly; pitting of the surface; discoloration (russetting on the surface or darkening of the flesh); and watery consistency. Not all symptoms are obvious, and several vegetables have specific symptoms that are not described. The injury incurred is dependent on time and temperature. The lower the temperature below the recommendation, the quicker and more severe the injury. Chilling injury is particularly troublesome because symptoms do not appear until after the injury has occurred. Produce that looks healthy in the cooler may develop symptoms during transit or marketing that were caused by chilling before it left the farm.

Table 10.2.1. Amount of sodium hypochlorite to add to wash water for 50 - 150 PPM dilution.

Target PPM	ml/L	Tsp/5 gal	Cup/50 gal
<u>Sodium Hypochlorite, 5.25%</u>			
50	1.0	3 2/3	¾
75	1.4	5 ½	1
100	1.9	7 ¼	1 ½
125	2.4	9	2
150	2.9	11	2 ¼
<u>Sodium Hypochlorite, 12.75%</u>			
50	0.4	1 ½	1/3
75	0.6	2 ¼	½
100	0.8	3	3/5
125	1.0	3 ¾	4/5
150	1.2	4 1/2	1