

Ethylene May Accelerate Deterioration of Horticultural Perishables

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The promotion of senescence in harvested horticultural crops by ethylene (1 ppm or higher) results in acceleration of deterioration and reduced postharvest life. Ethylene accelerates chlorophyll degradation and induces yellowing of green tissues, thus reducing quality of leafy-, floral-, and immature fruit-vegetables and foliage ornamentals. Ethylene induces abscission of leaves and flowers, softening of fruits, and several physiological disorders. Specific examples of the detrimental effects of ethylene are included in Tables 1 and 2.

Accelerated ripening and softening of fruits during transport and storage when not desired result in shorter postharvest life. Kiwifruits are the most sensitive fruits to ethylene action even at low temperatures. As low as 50 parts per billion (ppb) ethylene enhance kiwifruit softening at 0°C (32°F). Avocados and 'Fuyu' persimmons are also very sensitive to ethylene action ; exposure to 1 ppm (or higher) ethylene increases chilling injury symptoms. Use of ethylene to degreen citrus fruits can accelerate their senescence and increase their susceptibility to decay-causing pathogens.

Ethylene may increase decay development of some fruits by accelerating their senescence and softening and by inhibiting the formation of antifungal compounds in the host tissue. In some cases, ethylene may stimulate growth of fungi, such as *Botrytis cinerea* on strawberries and *Penicillium italicum* on oranges.

The incidence and severity of ethylene induced deterioration symptoms depend upon temperature, exposure time, and ethylene concentration. For example, yellowing of cucumbers can result from exposure to 1 ppm ethylene for 2 days or to 5 ppm ethylene for 1/2 day at 10°C (50°F). Also, ethylene effects are cumulative throughout the postharvest life of the commodity.

Source: Management of Fruit Ripening, Hort. Series #9. POSTHARVEST TECHNOLOGY, Department of Pomology, University of California, Davis, CA. <http://postharvest.ucdavis.edu>

Table 1. Examples of detrimental effects of ethylene on postharvest quality of vegetables.

Commodity	Symptoms of Ethylene Injury
Asparagus	Increased lignification (toughness) of spears
Beans, snap	Loss of green color
Broccoli	Yellowing and abscission of florets
Cabbage	Yellowing and abscission of leaves
Carrots	Development of bitter flavor
Cauliflower	Abscission and yellowing of leaves
Cucumber	Yellowing and softening
Eggplant	Calyx abscission, browning of pulp and seeds, accelerated decay
Leafy vegetables	Loss of green color
Lettuce	Russett spotting
Parsnip	Development of bitter flavor
Potato	Sprouting
Sweet Potato	Brown flesh discoloration and off flavor detectable when cooked
Turnip	Increased lignification (toughness)
Watermelon	Reduced firmness, flesh tissue maceration resulting in thinner rind, poor flavor

Table 2. Examples of detrimental effects of ethylene on ornamentals and nursery stock

Commodity	Symptoms of Ethylene Injury
Cut Flowers	
Carnations	Failure to open or closure of open flowers ("sleepiness")
Roses	Abnormal flower shape during opening, failure to open, or abscission of petals and leaves (depending on cultivar)
Snapdragons	Floret abscission
Flowering plants	Flower abscission or flower closure (wilting), depending on species and cultivar.
Foliage plants	Abscission of leaves, leaf chlorosis, epinastic responses (downward curvature of leaves).
Flowering bulbs	Inhibition of shoot and root elongation, formation of abnormal flowers, induction of gummosis in tulips, flower and bud abscission in lily.
Transplants	Leaf chlorosis, poor growth after planting
Dormant nursery stock	Reduced budbreak, greater mortality after planting rose plants and fruit trees.