

# Banana

## Recommendations for Maintaining Postharvest Quality



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### MATURITY INDICES

Degree of fullness of the fingers, i.e. disappearance of angularity in a cross-section. Bananas are harvested mature-green and ripened upon arrival at destination markets since fruits ripened on the plant often split and have poor texture.

### QUALITY INDICES

Maturity (the more mature the better the quality when ripe); finger length (depending on intended use and demand for various sizes); freedom from defects, such as insect injury, physical damage, scars, and decay. As bananas ripen, their starch content is converted into sugars (increased sweetness). Other constituents that influence flavor include acids and volatiles.

### OPTIMUM TEMPERATURE

13-14°C (56-58°F) for storage and transport

15-20°C (59-68°F) for ripening

### OPTIMUM RELATIVE HUMIDITY

90-95%

### RATES OF RESPIRATION

Temperature	13°C (56°F)	15°C (59°F)	18°C (65°F)	20°C (68°F)
ml CO <sub>2</sub> /kg·hr <sup>1,2</sup>	10-30	12-40	15-60	20-70

<sup>1</sup>Low end for mature-green bananas and high end for ripening bananas.

<sup>2</sup>To calculate heat production multiply ml CO<sub>2</sub>/kg·hr by 440 to get BTU/ton/day or by 122 to get kcal/metric ton/day.

### RATES OF ETHYLENE PRODUCTION

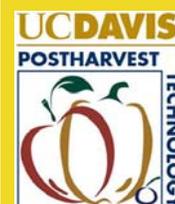
Temperature	13°C (56°F)	15°C (59°F)	18°C (65°F)	20°C (68°F)
µl C <sub>2</sub> H <sub>4</sub> /kg·hr <sup>1</sup>	0.1 - 2	0.2 - 5	0.2 - 8	0.3 - 10

<sup>1</sup>Low end for mature-green bananas and high end for ripening bananas.

### RESPONSES TO ETHYLENE

Most commercial cultivars of bananas require exposure to 100-150 ppm ethylene for 24-48 hours at 15-20°C (59-68°F) and 90-95% relative humidity to induce uniform ripening. Carbon dioxide concentration should be kept below 1% to avoid its effect on delaying ethylene action. Use of a forced-air system in ripening rooms assures more uniform cooling or warming of bananas as needed and more uniform ethylene concentration throughout the ripening.

Produce Facts



## RESPONSES TO CONTROLLED ATMOSPHERES (CA)

- Optimum CA: 2-5% O<sub>2</sub> and 2-5% CO<sub>2</sub>
- CA delays ripening and reduces respiration and ethylene production rates.
- Postharvest life potential of mature-green bananas: 2-4 weeks in air and 4-6 weeks in CA at 14°C (58°F)
- Exposure to <2% O<sub>2</sub> and/or >7% CO<sub>2</sub> may cause undesirable texture and flavor.
- Use of CA during transport to delay ripening has facilitated picking bananas at the full mature stage.

## PHYSICAL DISORDERS

**Skin abrasions.** Abrasions result from skin scuffing against other fruits or surfaces of handling equipment or shipping boxes. When exposed to low (<90%) relative humidity conditions, water loss from scuffed areas is accelerated and their color turns brown to black.

**Impact bruising.** Dropping of bananas may induce browning of the flesh without damage to the skin.

**Creased Stems.** Creasing of the finger stem during handling is a common injury that, along with cut surfaces of hands and clusters, and permits initiation of the crown rot disease complex.

## PHYSIOLOGICAL DISORDERS

**Chilling injury.** Symptoms include surface discoloration, dull or smoky color, sub epidermal tissues reveal dark-brown streaks, failure to ripen, and, in severe cases, flesh browning. Chilling injury results from exposing bananas to temperatures below 13°C (56°F) for a few hours to a few days, depending on cultivar, maturity, and temperature. For example, moderate chilling injury will result from exposing mature-green bananas to one hour at 10°C (50°F), 5 hours at 11.7°C (53°F), 24 hours at 12.2°C (54°F), or 72 hours at 12.8°C (55°F). Chilled fruits are more sensitive to mechanical injury.

## PATHOLOGICAL DISORDERS

**Crown rot.** This disease is caused by one or more of the following fungi: *Thielaviopsis paradoxa*, *Lasiodiplodia theobromae*, *Colletotrichum musae*, *Deightoniella torulosa*, and *Fusarium roseum* - which attack the cut surface of the hands. From the rotting hand tissue the fungi grow into the finger neck and with time, down into the fruit.

**Anthraxnose.** Caused by *Colletotrichum musae*, becomes evident as the bananas ripen, especially in wounds and skin splits.

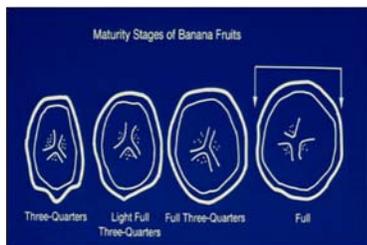
**Stem-end rot.** Caused by *Lasiodiplodia theobromae* and/or *Thielaviopsis paradoxa*, which enter through the cut stem or hand. The invaded flesh becomes soft and water-soaked.

**Cigar-end rot.** Caused by *Verticillium theobromae* and/or *Trachysphaera fructigena*. The rotted portion of the banana finger is dry and tends to adhere to fruits (appears similar to the ash of a cigar).

**Control strategies.** Minimize bruising; prompt cooling to 14°C (58°F); proper sanitation of handling facilities; hot water treatments [such as 5 minutes in 50°C (122°F) water] and/or fungicide (such as Imazalil) treatment to control crown rot.

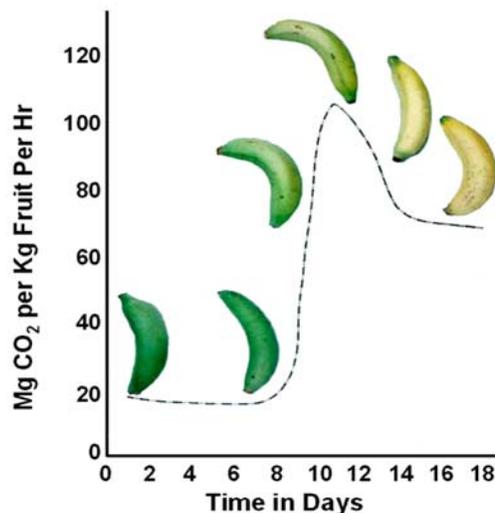
POSTHARVEST PHOTO GUIDE

MATURITY AND QUALITY

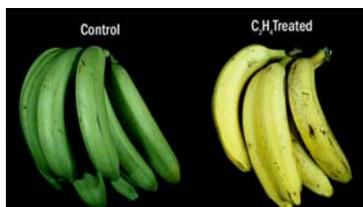


MARTURITY STAGES OF BANANA

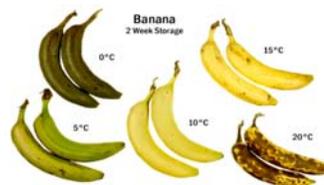
BANANA RIPENESS CHART



DISORDERS



ETHYLENE EFFECTS



CHILLING INJURY



SKIN ABRASIONS



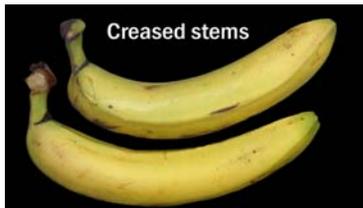
CROWN ROT



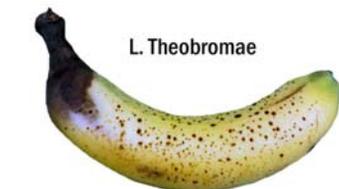
IMPACT BRUISING



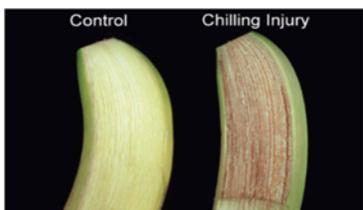
ANTHRACNOSE



CREASED STEMS



CIGAR-END ROT



CHILLING INJURY



GREY MOLD



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