

Mango Ripening

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Assessing Maturity & Eating Quality Potential

- Maturity at harvest determines eating quality potential
- Skin color
 - Dark green to light green in some cultivars
 - Red color is not related to maturity or ripeness
- Fruit shape
 - Fullness of cheeks
 - Shape of shoulders
- Internal flesh color*
 - Greenish-white to yellowish-orange
 - Consider that advances in skin and flesh color should have occurred during transit

Skin Color



Skin color is not always related to internal color and ripeness!

Cultivar Differences



Tommy Atkins Mango



Kent Mango



Keitt Mango



Haden Mango



Ataulfo Mango

Fruit Shape

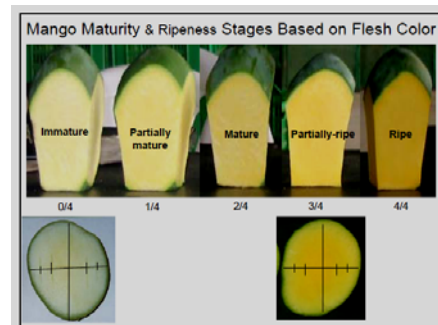


Immature

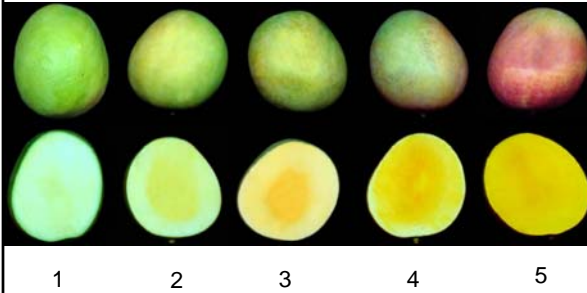
Mature

- Fullness of cheeks
- Elevation of shoulders above the stem attachment

Flesh Color



Kent Mango Ripening Stages



Changes Associated with Mango Ripening

- Skin color changes from green to yellow (in some cultivars)
- Flesh color changes from greenish-yellow to yellow to orange (in all cultivars)
- Decrease in flesh firmness and increased juiciness
- Starch conversion into sugars
- Increase in soluble solids content
- Increase in carotenoids and decrease in chlorophyll content
- Increase in characteristic aroma volatiles

Eating Quality

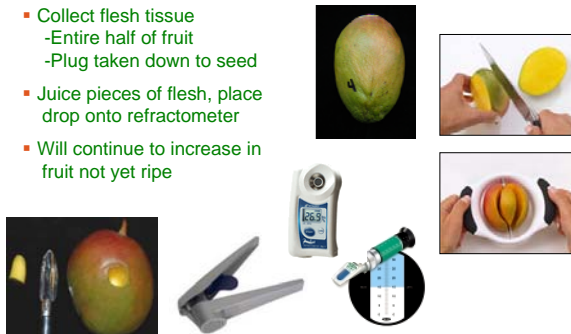
- Soluble solids content
 - Indication of sugar content
 - Approximately 7-9% at harvest; 13-20% in ripe fruit
 - Depending on growing conditions
 - Measure with refractometer
 - Increases with ripening from starch conversion
 - Affected by harvest maturity
- Firmness and texture
 - Degree of softening
 - Measured by hand or with penetrometer
 - Fibrousness
- Aroma
 - Related to ethylene production

Tools to Assess Quality and Ripeness

1. Refractometer – estimate of sugar content
2. Penetrometer – fruit firmness, degree of ripeness
3. Visual color – for skin and flesh color

Soluble Solids Content

- Collect flesh tissue
 - Entire half of fruit
 - Plug taken down to seed
- Juice pieces of flesh, place drop onto refractometer
- Will continue to increase in fruit not yet ripe



Firmness

Penetration Force



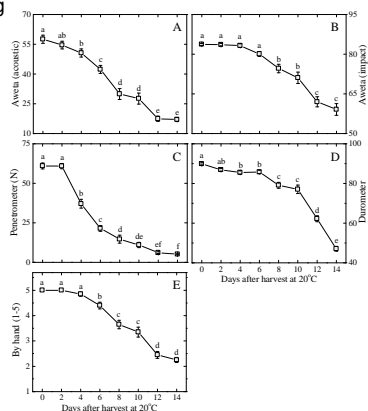
Use 5/16-inch (8-mm) tip



Fruit Texture Analyzer (FTA)
Güss Manufacturing

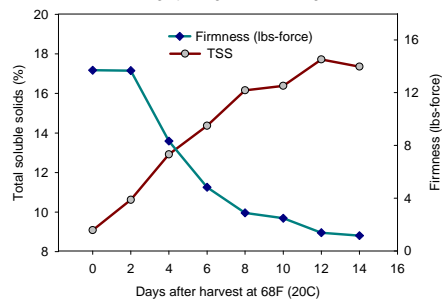
Source of Equipment: <http://postharvest.ucdavis.edu> Yellowpages

Methods of Measuring Mango Firmness



Changes with Ripening

Changes in total soluble solids content and firmness during ripening of 'Keitt' mangos



Relationships Among Quality & Maturity Factors

- Upon fruit arrival, check internal color, firmness and soluble solids content
 - Penetrometer will be much more accurate than hand feel
- Internal flesh should be at least yellow in color; better with 50% orange-yellow color
- Soluble solids content will vary depending on stage of ripeness
 - Remember, soluble solids increase as the fruit soften further
 - Very firm mangos should have approximately 7 to 9% SSC
 - Fully ripe mangos generally have as much as 13 to 20% SSC
- Check for defects, especially chilling injury

Optimal Conditions for Mango Ripening-1

Best temperatures for ripening mangos 68 to 72°F (20 to 22°C)

Ripening at 60 to 65°F (15.5 to 18°C) may result in the most attractive skin color, but flavor remains tart
 - additional 2-3 days at 70-75°F (21-24°C) will attain sweet flavor.

Ripening at 80-86°F(27-30°C) may result in mottled skin and strong, undesirable flavor

Ripening is retarded above 86°F(30°C).

Optimal Conditions for Mango Ripening-2

Relative humidity range is 90 to 95% to prevent excessive water loss and shrivel.

Ethylene (100 ppm) for 24 to 48 hours, depending on maturity
 keep CO₂ <1%

After triggering ripening with ethylene for 24 hours, mangos kept at 65-72°F(18-22°C) will ripen in 5-9 days.

Once ripened, mangos can be held at 50-55°F(10-13°C) and 90-95% relative humidity for up to one week.

Flesh Firmness vs Ripeness Stage of Mango Fruit

Ripeness Stage	Flesh firmness*	Notes
Mature-green	>14	Treat with ethylene for 48 hours
Partially-ripe	10-14	Treat with ethylene for 24 hours
Firm-ripe	6-10	Best stage to send to retail stores
Soft-ripe	2-6	Best stage for eating
Over-ripe	<2	Good for juice

*pounds-force with 8-mm tip penetrometer

Mango Storage Temperatures

- Mature green mangos
 - Store/ship at 54°F (12.2°C)
- Ripe mangos
 - Store/ship at 46 - 50°F (8 - 10°C)