Mango Ripening
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Flavor Quality
Harvest Maturity

- Mangos harvested immature will never develop good flavor quality and will disappoint consumers
- Mango maturity can be difficult to determine
- Internal color is the best indicator

Mango Maturity At Receiving

- At receiving, you can expect the mangos to be mature, but not necessarily ripe
- A mature mango will ripen normally with increasing soluble solids content (degrees Brix) and decreasing firmness (lbs. force) to become ready to eat within about 10 days at ambient temperatures

Harvest Maturity
Mangos should be harvested at a minimum internal color stage of 2.

- At least light yellow internal color, not green or white
- Fruit will still be firm
- Refer to the National Mango Board Maturity & Ripeness Guide as a reference to harvest maturity for each variety

Skin Color
Skin color is not always related to internal color and ripeness!
Fruit Shape

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

Mango Maturity At Receiving

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

<table>
<thead>
<tr>
<th>Days after harvest at 68°F (20°C)</th>
<th>Firmness (lbs-force)</th>
<th>Total soluble solids (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>16</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>12</td>
<td>8</td>
</tr>
<tr>
<td>8</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>12</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>16</td>
<td>4</td>
<td>14</td>
</tr>
<tr>
<td>20</td>
<td>0</td>
<td>16</td>
</tr>
</tbody>
</table>

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

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)

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

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 below 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

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**Questions?**

![UC Davis Postharvest Technology](http://postharvest.ucdavis.edu)

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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

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**Flesh Firmness vs Ripeness Stage of Mango Fruit**

<table>
<thead>
<tr>
<th>Ripeness Stage</th>
<th>Flesh firmness*</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mature-green</td>
<td>&gt;14</td>
<td>Treat with ethylene for 48 hours</td>
</tr>
<tr>
<td>Partially-ripe</td>
<td>10-14</td>
<td>Treat with ethylene for 24 hours</td>
</tr>
<tr>
<td>Firm-ripe</td>
<td>6-10</td>
<td>Best stage to send to retail stores</td>
</tr>
<tr>
<td>Soft-ripe</td>
<td>2-6</td>
<td>Best stage for eating</td>
</tr>
<tr>
<td>Over-ripe</td>
<td>&lt;2</td>
<td>Good for juice</td>
</tr>
</tbody>
</table>

*Pounds-force with 8-mm tip penetrometer

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**Mango Maturity At Receiving**

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- A mature mango will ripen normally with increasing soluble solids content (degrees Brix) and decreasing firmness (lbs. force) to become ready to eat within about one week at ambient temperatures
- Maturity can be judged by a combination of factors, including internal color, firmness, degrees Brix and fruit shape
- Red skin is not an indicator of maturity, quality or ripeness and should not be used to evaluate mangos at receiving
**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


**Methods of Measuring Mango Firmness**

![Graphs showing methods of measuring mango firmness](image)