

Case Study: Quality Assurance for Melons

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QUALITY CRITERIA

Important quality characteristics for all melons are sweetness, firm but juicy pulp, and aroma and flavor typical of the particular melon type. Melons ripen from the inside and blossom end first. Melons have no starch reserves, and *the sugar content does not increase after harvest*. Sugar content is estimated by measuring soluble solids; the soluble solids content of melon pulp is about 80% sugar. For excellent eating quality in melons, therefore, it is critical to harvest them at a sufficiently advanced stage when the sugars have already accumulated in the fruit. Although the external color may change after harvest, pulp color changes very little.

The key quality issues for melons are:

1. harvesting at the proper stage of maturity
2. careful handling to reduce physical injury (mostly internal)
3. storing at the correct temperatures

Maturity and Harvest Criteria. Harvesting melons at the ideal stage is especially critical to their storageability and eating quality.

Cantaloupes may be harvested when:

- the fruit begins to separate from the stem (called abscission zone or the “slip”)
- the external color beneath the netting begins to change from green to yellow-green
- the net is well developed with a waxy covering (scrape to determine how tough it is)

Most of the sugars have accumulated in the fruit once the fruit begins to slip. The fruit should have a minimum of 8% soluble solids and has much better eating quality if the soluble solids content is 10-12%.

Fall and winter melons grown under lower and less light can have lower soluble solids contents. Fall and winter melons may be ripe on the inside but have a green peel color.

Honeydew and other melons. Honeydew, orange flesh and other smooth-skinned melons are difficult to harvest correctly. **Table 1** shows a maturity and ripeness class categorization for honeydew melons. These classes may also be applied to other specialty melons (although soluble solids contents may differ).

Table 1. Maturity and ripeness classes of honeydew melons

Class	Characteristics	Internal ethylene (ppm)	Pulp * Firmness (kg-force)	Soluble Solids (%)
0= Immature	Greenish external color, peel fuzzy/hair, no aroma; may be harvested by mistake	—	—	—
1=Mature, Unripe	External color white with greenish aspect; peel slightly fuzzy/hair, no aroma; melon splits when cut, pulp is crisp; minimum commercial harvest maturity; minimum 10% soluble solids	0.8	3.1	10-11
2=Mature, Ripening	External color white with trace of green; peel not fuzzy, slightly waxy, slight to noticeable aroma; melon splits when cut, flesh crisp; harvest for long-distance markets	5.2	2.1	11-12
3=Ripe	External color creamy white to pale yellow, peel waxy; noticeable aroma; stem may begin to separate from fruit; flesh firm, when sliced does not split; ideal eating, harvest for local markets	27.1	1.5	12-14
4=Overripe	External color yellow, soft at blossom end; very aromatic; fruit is separated from stem; flesh soft, somewhat water soaked in appearance	29.4	1.1	14-15

* firmness measured using a 1.1 cm probe.

Watermelons. The principal criteria for watermelon maturity are yellowing of the ground spot, browning of the leaf next to the fruit, fruit density (the heavier the watermelon, the more developed and sweeter it is), and the sound of the fruit when thumped. Watermelons need to be ripe when harvested. Watermelon typically have 10-11% soluble solids when ripe.

REDUCING PHYSICAL DAMAGE

Cantaloupes and other melons are packed in the field or transported in trailers to a packinghouse. Field packing reduces physical handling but may make it more difficult to have uniform quality. In a packinghouse, fruit are typically dry-dumped, washed, selected and packed according to size. Fruit are generally uniform within a box, but are often handled excessively. Scuffing is a common problem on cantaloupes. The scuffed areas are often difficult to see at harvest but show up later as water is lost from the damaged areas. Scuffing occurs more easily on less mature fruit. Damage due to dropping, vibration, etc. may not be seen on the outside of the fruits but will show up internally as water-soaked areas that break down quickly. Excessive handling also causes “shaker” melons, where the seeds have separated from the pulp. Avoid drops, excessive rolling. Internal damage can also occur to packed melons, so boxes should not be dropped.

TEMPERATURE MANAGEMENT

Cooling

It is critical that cantaloupes be cooled as soon as possible after harvest (within 4 hours is good). Both hydrocooled and forced air cooling can be used effectively for cantaloupes.

The final temperature after cooling should be 2-2.5°C (34-36°F). Honeydew and other specialty melons should also be cooled (room or forced air cooled), although it is not as critical to cool them as rapidly as cantaloupes. Melons should not be loaded into refrigerated trailers without precooling.

Storage temperatures

Cantaloupes can be stored at 2.5-5°C (36-41°F) for 2-3 weeks and are considered only slightly chilling sensitive. Storage in high carbon dioxide atmospheres (10-15%) can help retard decay development if melons are stored longer than 2 weeks.

Water loss from scuffed areas is a mayor cause for quality loss in cantaloupes. This leads to

sunken discolored areas on the fruit surface and is often seen in melons at retail displays. Water loss is a cumulative process and the warmer the temperature, the greater the water loss. Low temperatures and high humidity are required to maintain the cantaloupe fruit firm during handling.

Honeydew and orange flesh melons are chilling sensitive and should not be stored below 5°C (41°F). Storage temperatures depend on how ripe the melons are. The riper the fruit, the lower the recommended temperature. Class 1 fruits can be stored at 10°C (50°F), Class 2 fruits can be stored at 7-10°C (45-50°F) and Class 3 fruits can be stored at 5-7°C (41-5°F) without causing chilling injury. Lower storage temperatures retard decay development and firmness loss.

Watermelons can be stored at 10-15°C (50-60°F) for up to 2 weeks. During this period, the pulp will lose sugars and soften. Watermelon are sensitive to ethylene (fruit may become spongy and the internal pulp may become mealy and breakdown) and should not be stored with cantaloupes and honeydew melons since they produce large amounts of ethylene gas.

Ripening melons

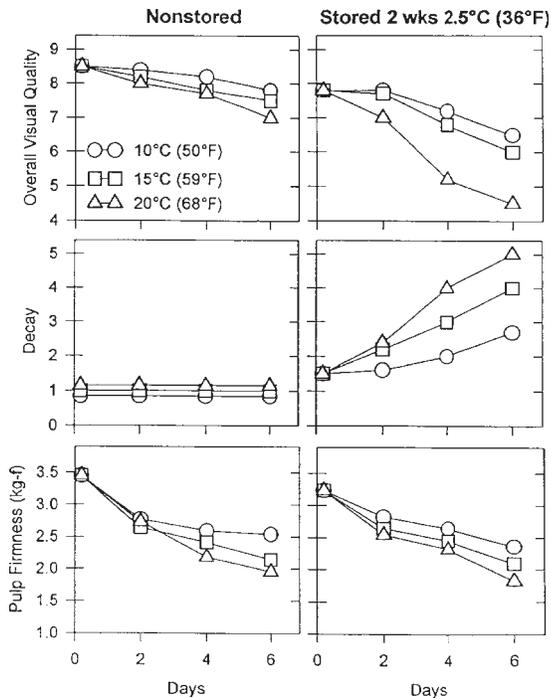
Holding melons at temperatures above storage temperatures (>10°C or 50°F) will permit aroma to develop and the pulp to soften. However the melons do not become sweeter with conditioning. See Figure 1 for quality changes in stored and nonstored cantaloupe under simulated marketing conditions. If the fruits have been stored, decay will occur rapidly during marketing and therefore the melons should be kept as cold as possible.

Treating melons with ethylene will speed up external color change, softening and aroma development, but will not improve the flavor (increase sugar content). Therefore it is *not recommended* that melons be treated with ethylene.

Common Postharvest defects

Cantaloupes: not ripe (melon pulled from the vine, green external color)—overripe (orange color, soft) — sunken areas on the surface due to scuffing and water loss—discolored areas on the surface due to sunburn or scuffing—soft area where the melon lay on the ground, often is green and has poor netting—decay on stem end decay on the surface of the net —“shaker” melons (seeds have separated from the pulp)

Figure 1. Quality changes in cantaloupes held in simulated retail conditions at 10°C(50°F), 15°C(59°F) or 20°C(68°F). Fruits were marketed immediately after harvest or after storage.



Honeydew and smooth-skinned melons—Maturity: fruit immature or overripe—Chilling injury (seen as a diffuse bronzing of the peel)—Brown blotch (sharply defined brown discolored areas on the peel; a physiological problem)—Decay on the surface—Internal breakdown due to dropping and other physical injury—Water loss on immature melons, water loss causes the fruits to lose their round shape

Quality Assurance Records for Melons (Cantaloupes & Honeydews):

In the field

Variety selection suitable for season and area—Health of vines, freedom from disease—Production practices (fertilization and watering regimes)

Field Packing

Sunburned fruit—Temperature of melons at harvest—Care in handling (no drops, no rolling)—Uniformity of packs (color, size, defect removal)—Boxes well constructed, well aligned on pallet and pallet strapped—Time from harvest to arrival at cooler—Time from arrival to complete cooling—Temperature after cooling—Time from cooling to loading on a trailer

Packinghouse/Cooler

Time delay from harvest to fruit arrival at packinghouse—Care in handling, drops, etc.—Uniformity of maturity at harvest, color, soluble solids, slip—Uniformity of maturity packed—Uniformity of quality and maturity from box to box on a pallet—Boxes well constructed, well aligned on pallet and pallet strapped—Time from harvest to cool—Temperature after cooling—Time from cooling to loading on a trailer

Loading trailer

Uniformity of maturity—Pulp temperature—Boxes on pallet well aligned and strapped—Truck condition: air delivery shut intact, floor clean, front bulkhead in place, truck precooled?—Thermostat setting—Loaded properly—Temperature recorder placed

Arrival at distribution center

Transit time—Pulp temperature—Uniformity of packs—External color/slip—Whole fruit firmness—Soluble solids—Decay (% of fruits and severity): stem, surface