



Melon Quality & Ripening

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Melon Quality & Ripening

The **key to good final eating quality** in melons is to **harvest at proper stage of maturity/ripeness**.

Melons harvested at the proper stage of maturity/ripeness **are already undergoing the ripening process**.

Temperature can be used to manage ripening and quality changes



Melons are very Diverse Ripe fruit Characteristics



	Cantaloupe			Watermelon
	HoneyDew	HoneyLoupe	Canary	Casaba
Days from anthesis	55	53	43	60
Weight, g	2200	1400	2250	3000
Respiration, $\mu\text{L/g}\cdot\text{h}$	16	23	17	15
→ Internal Ethylene, ppm	4-15	25-45	<1	<0.1
Firmness, kg/cm^2	3	4	6	3
→ Soluble solids, %	15	14	13	11

Melon Storage Conditions

- **Cantaloupes**
 - 2.5°C (36°F), 90-95% RH
 - 3-5% Oxygen + 10-15% carbon dioxide
 - 2-4 weeks
- **Honeydew, Specialty Melons**
 - 5 to 15°C (41 to 59°F), 80-90% RH
 - optimum temperature depends on ripeness
 - 2-6 weeks
- **Watermelon**
 - 10-20°C (50-68°F)
 - Sensitive to **ethylene**
 - 1-3 weeks

Melon Quality Attributes

- Flavor-sugar
- Color
- Texture



These quality attributes may vary due to:

- varieties,
- growing conditions,
- season,
- maturity at harvest,
- number of harvests,
- harvest & handling,
- storage conditions and duration

**Focus on maturity/ripeness at harvest;
This continues to be a challenge!**

Cantaloupe Maturity/Ripeness

- Fruit begins to separate from stem
 - abscission zone; “slip”
- External color between net
- Net well developed with wax
- Subtending leaf dries up
- Internal color, firmness, soluble solids



The slip is a very useful attribute; some new LSL varieties are cut

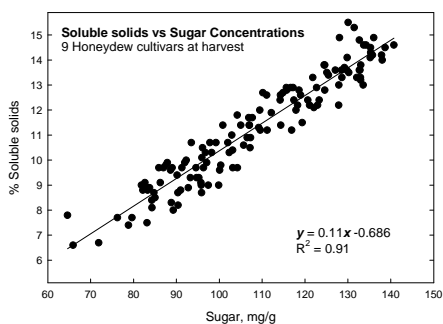
Characterization of cantaloupe melons (cv. Laredo) harvested at 2 maturity stages. Data are averages of 12 melons per stage.

Attribute	Half slip	Full slip, hard ripe	LSD.05
Weight (g)	1367	1398	ns
External color score ¹	2.8	3.3	ns
Internal CO ₂ (%)	1.02	1.08	ns
Internal ethylene (ppm)	2.42	4.24	0.7
Internal color (chroma)	35.2	35.4	ns
Pulp firmness (N-f, 5mm probe)	12.7	13.1	ns
Soluble solids (%)	12.5	12.2	ns

¹ external color score 1=green, 2=slight yellow, mostly green, 3=yellow-green, 4=greenish yellow 5=yellow or yellow-orange

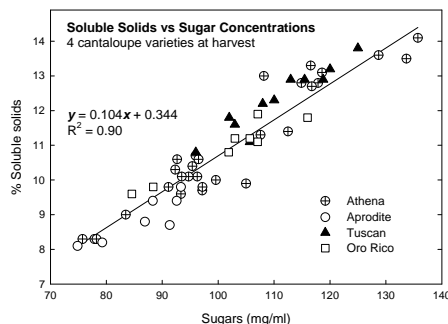


Cantwell, 2003 MCP#3

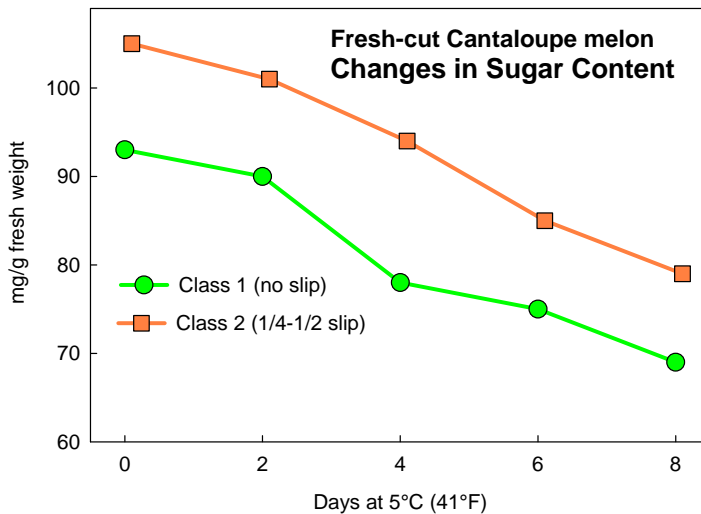


Soluble solids are well correlated with sugars in melons at harvest.

The correlation is less when fruit are stored and cell wall softening contributes to the soluble solids readings



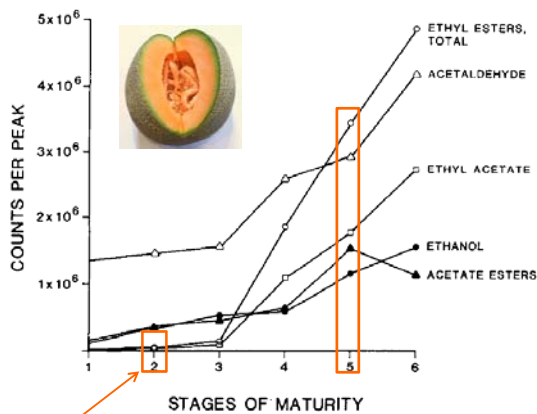
Sugar content declines with time, while soluble solids may remain the same or decrease only a little. WHY?



López and Cantwell, UC Davis

Cantaloupe maturity & aroma volatiles

Aroma formation linked to ethylene production



2=1/4 slip, 5=full slip
 Analyzed 24 hours after harvest at 20°C
 Horvat and Senter, 1987

Melon Aroma Volatiles
 Maturity at harvest
 Storage Temperature



Melon aroma research
 Profiling; genetics;
 Florence Negre-Zakharov
 UC Davis

Melon Maturity & Quality Factors

- External Color
- Firmness (blossom end)
- Surface hairs, smoothness, wax
- Aroma
- Internal cavity condition
- Pulp color and firmness
- Sugar content (soluble solids)
- Aroma and flavor



Maturity and Ripeness Classes Honeydew melons

Class	Int. C ₂ H ₄ , ppm	Pulp firm., N	Sol. solids, %
0 = Immature	<0.2	39	<10
1 = Mature, Unripe	0.8	32	10
2 = Mature, Ripening	5.2	21	11-12
3 = Ripe	27.1	15	12-14
4 = Overripe	29.4	11	14-15

firmness: 1.1 cm probe

(average 4 cultivars; Cantwell, unpublished)

Honeydew and Orange Flesh Melons

Maturity and Ripeness Classes

- **Class 0: Immature**
- **Class 1: Mature, but Unripe:** Ground color greenish-white; peel fuzzy; no aroma; 10% soluble solids; flesh crisp, melon splits when cut; minimum commercial harvest maturity
- **Class 2: Mature, Ripening:** Ground color white; begins to develop surface wax; pulp crisp, melon splits

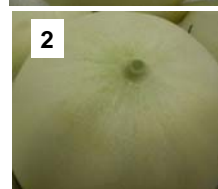
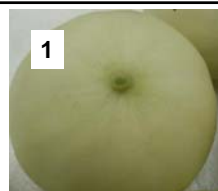
Minimum Eating Quality



Honeydew Melon Maturity/Ripeness

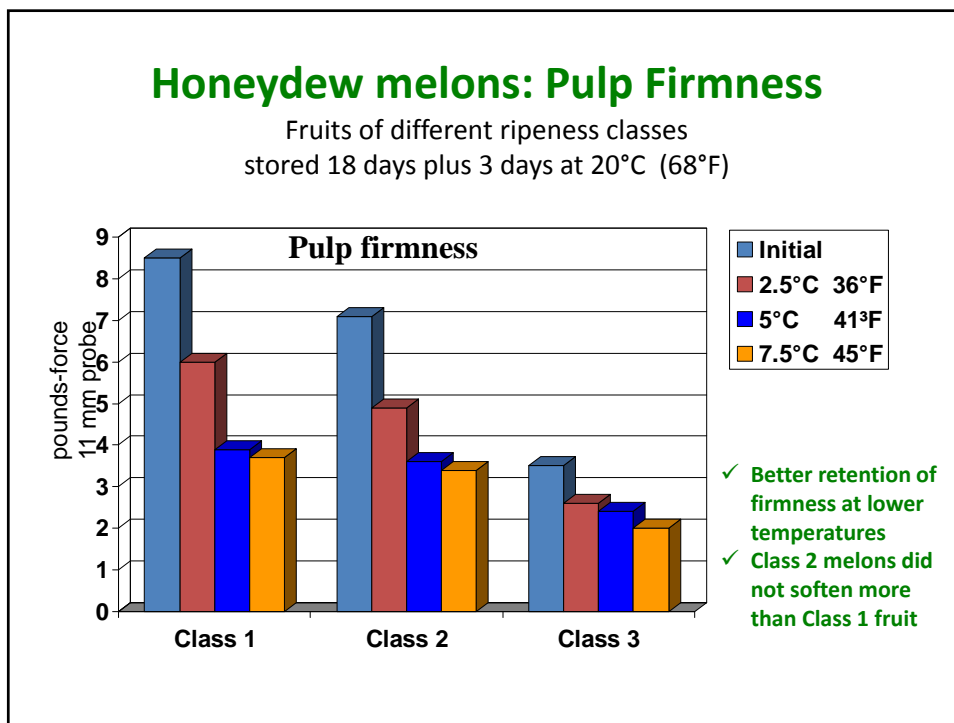
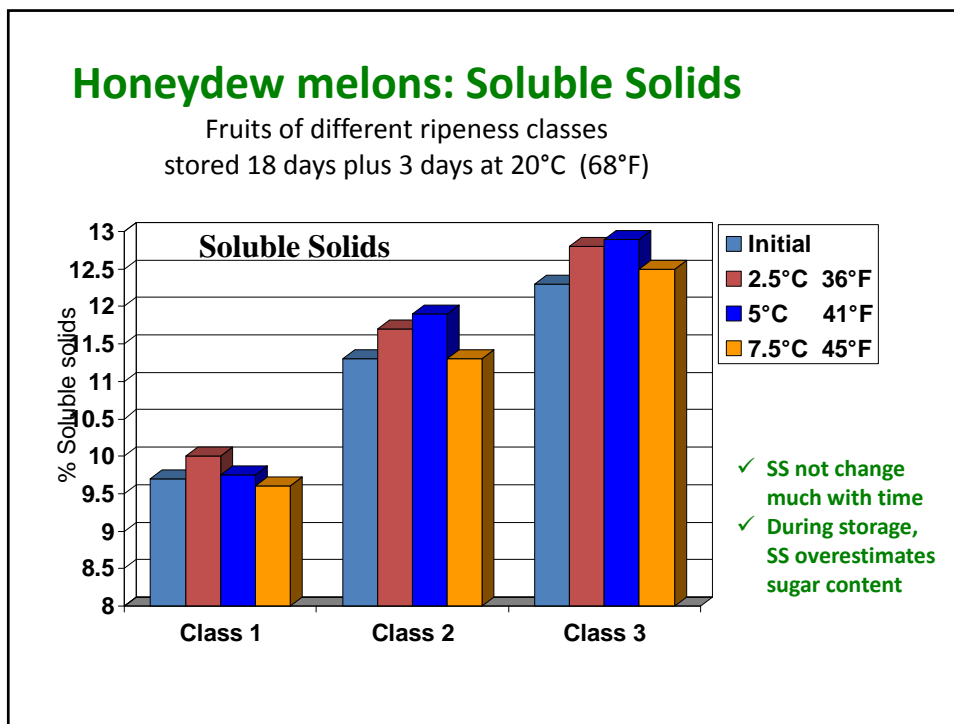
Quality attributes of honeydew melon (cv HMX1605) harvested at 4 stages of maturity/ripeness.

Maturity Stage (Class)	Weight (g)	Internal ethylene (ppm)	External Aroma	External color (hue)	Pulp firmness (N)	Soluble solids, %
1	1866	0.09	1.0	107.7	29.5	9.6
2	2512	0.51	1.0	105.1	28.0	11.7
3	2686	2.9	1.3	102.3	22.8	13.6
4	2126	32.9	3.8	99.4	9.4	14.7
LSD.05	249	3.6	0.6	1.3	3.6	0.8



Focus on
✓ Peel smoothness
✓ Stem end changes

Cantwell, UC Davis, 2011



Modified Atmosphere - Stored Cantaloupe; Bag in Box



**Open bag to de-gas (allow CO₂ to escape)
Allow 2 to 4 days at ambient temperatures to begin change
of external color and development of typical aroma**

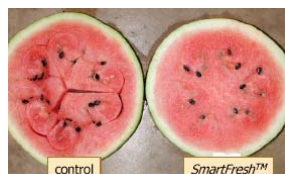


1-MCP & Melons

Blocks ethylene perception



- **Western shipping cantaloupes** - not much benefit on firmness at storage temperature, but benefit at warm temperatures.
- **Eastern shipping cantaloupes** - maintain texture and firmness at warm temperatures.
- **Galia** - extend shelf-life, reduce loss of firmness
- **Honeydew** - reduce loss of firmness at warmer temperatures
- **Watermelon** - clear benefit as fruit are easily damaged by ethylene; reduce loss of firmness and internal breakdown



Watermelon photo
D. Huber

1-MCP and Honeydew Melons

cv Summerdew, commercial maturity fruit; 15 fruit per treatment
 Stored 10 days at 7.5°C (45°F) plus 3 days at 20°C (68°F)

Treatment (1 to 4)	Visual quality	External color, Hue	Pulp Firmness, N	Soluble solids, %
T1 Cooled within 6 hr	8.9	102.6	15.3b	13.0a
T2 1-MCP and cooled within 6 hr	8.9	102.4	23.3a	12.6ab
T3 Delay 24 hr before cooling	8.8	102.8	10.8c	11.7b
T4 Delay 24 hr, then 1-MCP treat and cool	8.7	103.1	18.7ab	11.1b
LSD.05	ns	ns	5.1	1.2

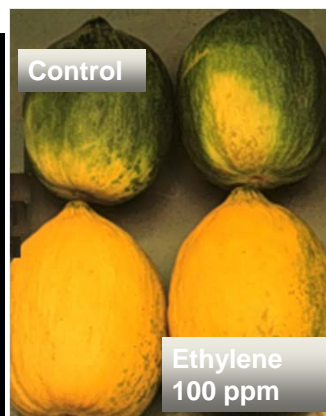
1-MCP decreased softening, but had no effect on maintaining %SS



Cantwell, UC Davis, 2011; delay at 25°C (77°F)

Ethylene effects on melons

- Improve color
- Improve aroma
- Decrease pulp firmness
- No effect or decrease sweetness



Conditioning Honeydew Melons

Conclusions from a study on cv Emerald

- 12 hours 20-50 ppm ethylene (uniform ripening)
- Hold 2-3 days at 20°C (68°F) (develop flavor and aroma)
- Maturity stage 2 (minimum ~11% SS)

- Improve external color
- Improve aroma
- BUT
- Loss of texture
- No improvement in sugars



Ethylene and LSL Cantaloupes

- Test#1
 - 2 varieties; 100 ppm ethylene for 2, 4 or 6 days at 20°C
 - No effect of ethylene on external color
 - No effect of ethylene on aroma
 - No effect of ethylene on texture
- Test#2
 - 2 varieties; 80 or 400 ppm for 2 days at 20°C
 - No effect of ethylene on external color
 - No effect of ethylene on aroma
 - No effect of ethylene on texture



Cantwell, UC Davis, 2012

Factors Affecting Quality and Ripening of Melons

- Variety and Production
- • Initial Maturity/ripeness
- Temperature
- Atmosphere
- Ethylene
- Time

Melons are in the ripening process when harvested.
Manage rate of ripening mostly with temperature.