Watermelon Production & Personal Sized Watermelon Cultivar Trial Results

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Origin/History

- Prehistoric evidence of cultivation in Southern Africa
- Extensively cultivated in ancient Egypt
- 1850's, David Livingston found watermelons growing wild in Kalahari Desert
- Domestication
  - Egypt & India
- Distributed throughout the rest of the world

- Important source of water in dry periods

Site Selection

- Soils that hold water well
- Soil test
  - Adjust P, K, Mg, pH (Ca)
- pH 6.0-6.6
- Rotation 5-7 years
- Soilborne disease Fusarium Wilt (FON)
  - Races; 0, 1, 2, 3
  - Chlamydospores survive for 15 years
  - Grafting
    - Squash or gourd

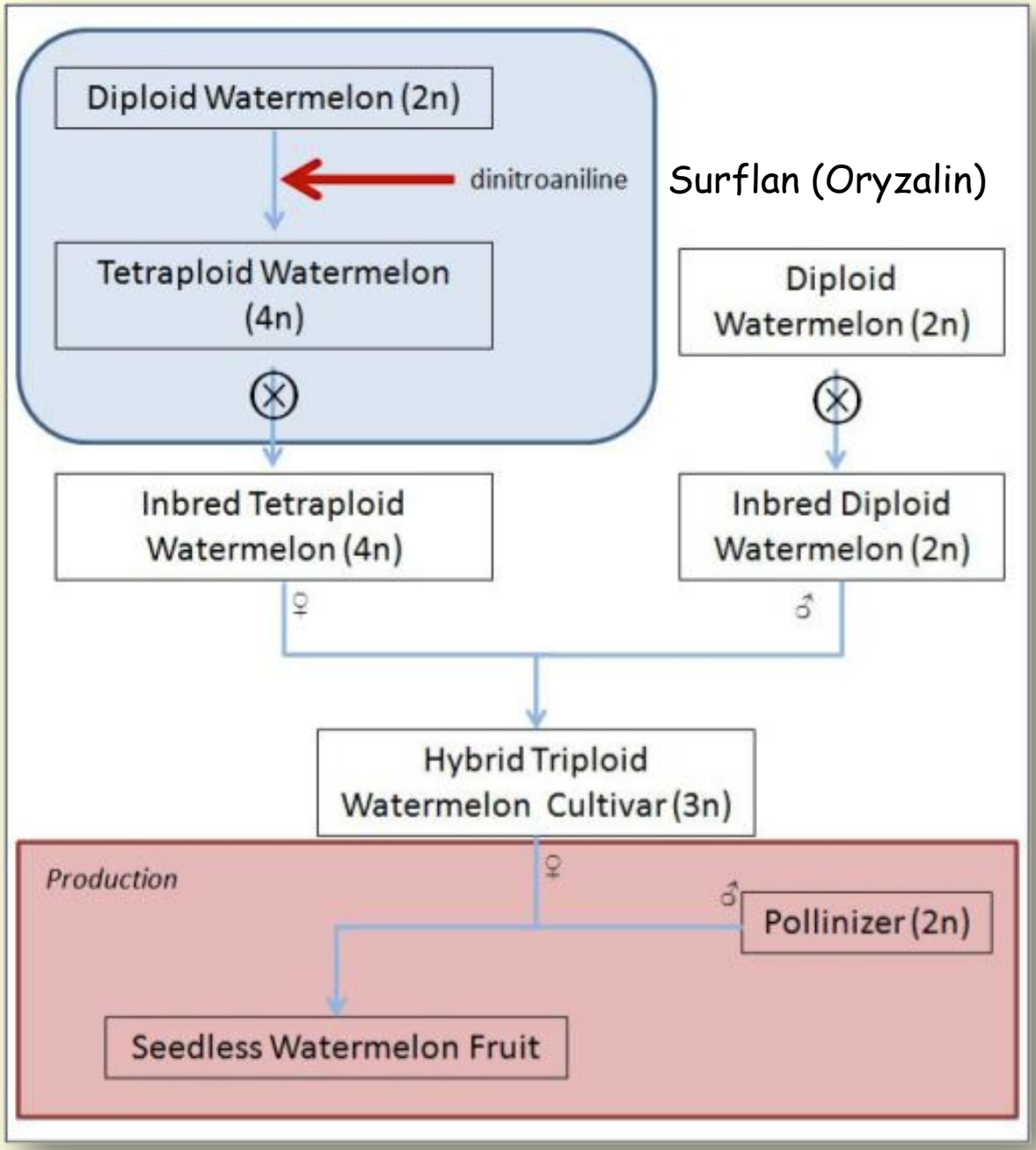
Fusarium Wilt

Photo: S. Langston

Triploid (Seedless) Watermelon

- 95% of U.S. market

- Transplant requirements more precise
  - Reduced seed germination
    - $.36-$.60/seed
  - Uneven seed germination and variable transplant size
  - Leggy transplants
  - Weaker plants reduce yield



http://plantbreeding.coe.uga.edu/index.php?title=File:Fig20-6-3.png

Triploid Watermelon Pollination (Sterile)

- Pollinator variety (2n)
  - Planted between every 3-4 triploid plants
    - SP-6, Ace, Ace Plus, Wild Card Plus (Co, Fon)
  - Seeded watermelon (2n)
    - 33% of field
      - Every 3rd row seeded
      - Outside rows should be seeded
    - Distinct different shape and/or appearance

Diploid pollinator 'Ace'
No Fusarium wilt resistance

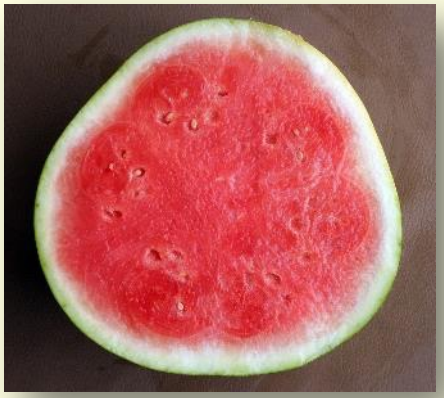
https://www.seedway.com/product/ace-plus-pollinator-not-treated

Pollination

- Male & female flowers on same plant
  - Few with both parts
- Flowers only open for one morning
- Ideally every ovary pollinated
- 1 hive of bees/acre
  - 7 visits/flower

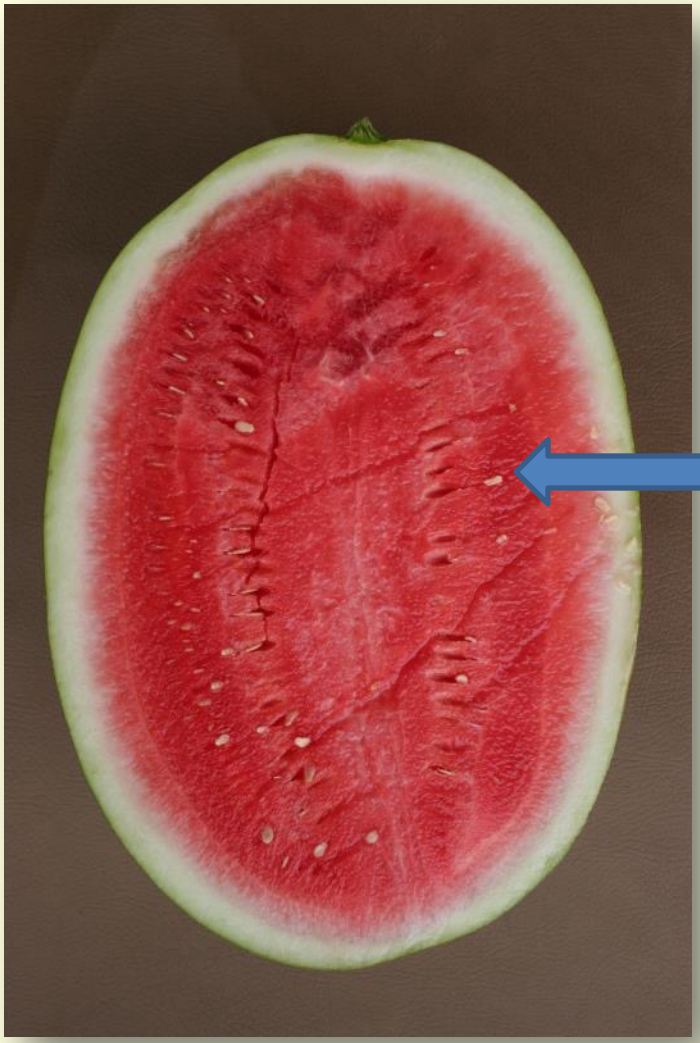
Male flower

Female flower

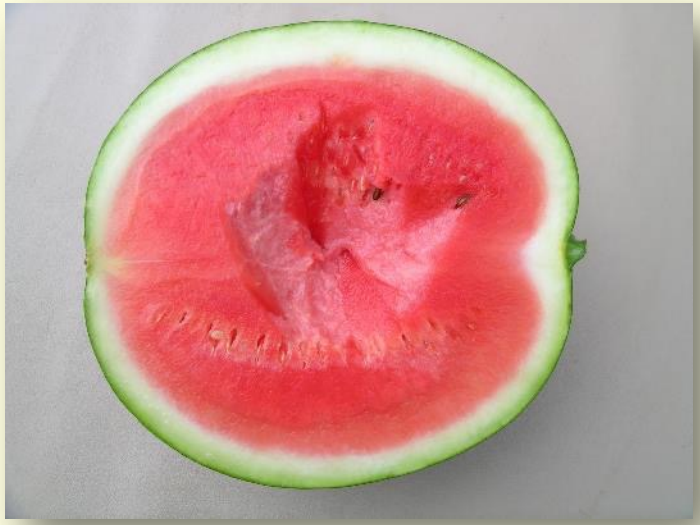


Less than ideal pollination

Seedless Triploid Watermelon



Pips



Triploid Transplant Production

- Seed trays
  - Square cells
    - Round cells = root girdling
  - Cell depth at least 2"
  - Width typically 1-1.25"
  - Smaller diameter cells require more attention
- Disinfect trays with bleach if they are reused

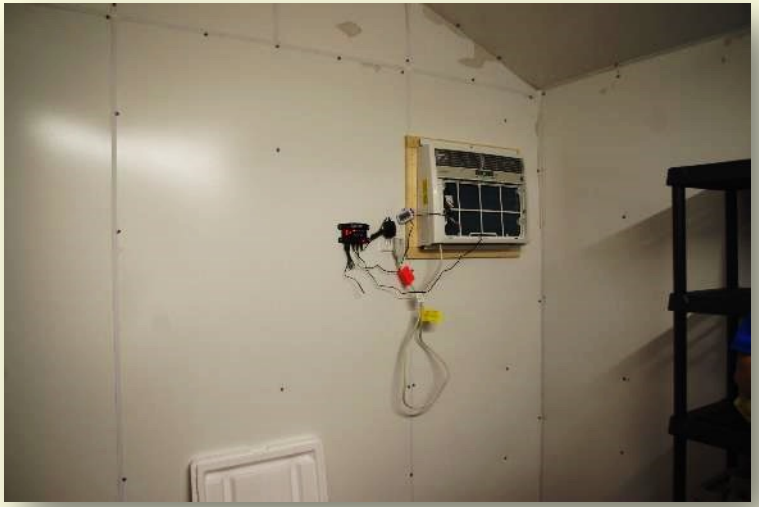
- Soil mix
  - Coarse mix, not a plug mix
    - Pro-Mix BX
    - Metro-Mix 300

Tray Preparation & Seeding

- Fill trays 24 hours prior to seeding
- Wet trays completely
  - Warm water if possible
- Let stand for 24 hours to drain excess water
- Keep in area where temperature is at least 85°F
- Plant seeds at least 1" deep with pointy end up
- Cover seed with warm moist mix
- **DO NOT ADD WATER!**

Germination

- Put trays back in warm germination area right after seeding
- Stack trays as long as there is air movement around trays



- Remove trays after 48 hrs
  - More than 48 hrs leads to too much hypocotyl extension
  - If seedlings are visible…too late!
- Germination chambers work best
  - Vegetable cooler
    - Cool bot controller
    - Humidity control

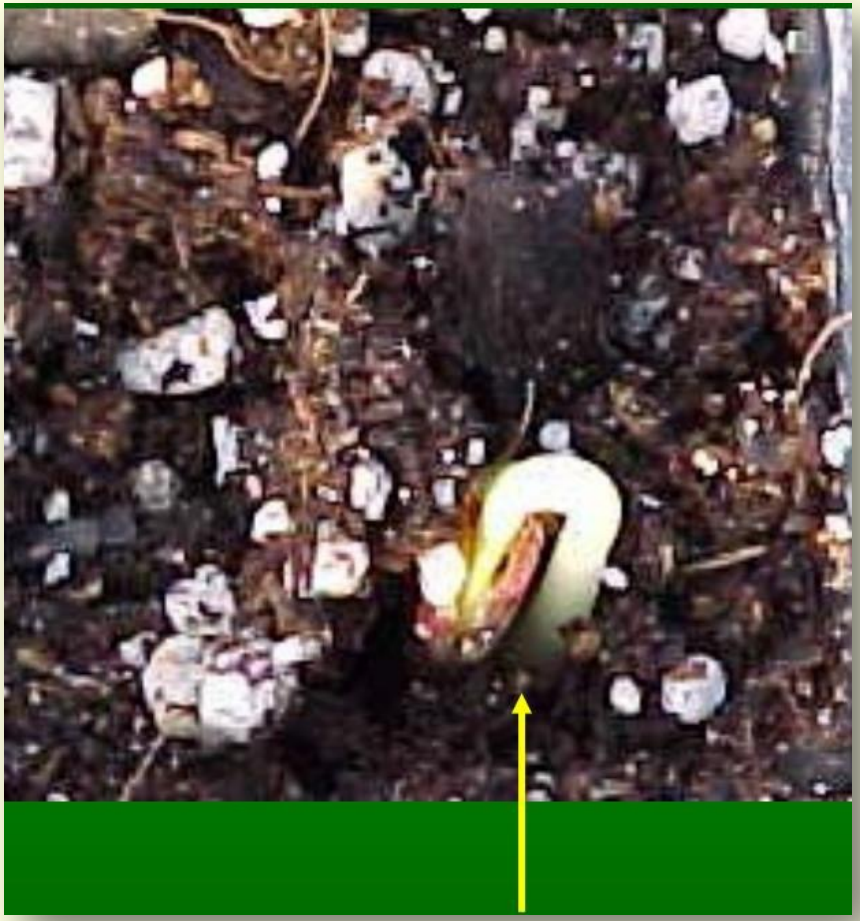
Conditions for Germination

- Stages
  - Root emerges
    - Germination room
  - Hook appears
    - Greenhouse only
- Temperature
  - Seedless watermelons need 85°F maintained in germination room
- Moisture
  - Too much reduces oxygen
  - Too little prevents seed swelling

Ideal germination after 48 hrs

https://www.clemson.edu/cafls/research/coastal/documents/seedlesstransplantquide.pdf

Greenhouse Production



Seedling emergence

- Temperature control
  - 65°F night temperature
  - 70-75 °F for cooling
    - Hypocotyl stretching if too warm
- Watering
  - Do not water until seed emergence
  - Excess water causes hypocotyl stretching

https://www.clemson.edu/cafls/research/coastal/documents/seedlesstransplantquide.pdf

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Greenhouse Production

- Fertilization
  - Wait until first true leaf is visible before fertilizing
  - Begin fertilization with continuous feed of 25 ppm N
    or
  - 100 ppm N twice per month
- Slow growth desirable
- It takes 4-6 weeks from seeding to transplanting

Seedless Seeded

Hardened off

Spacing

Field	Type	In Row (ft)	Between row (ft)
Plastic mulched*	Mini	1.5-2	5-6
Plastic mulched*	Larger	3-4	6-8
Bare ground		4	12

*Irrigated

Transplanting

- Raised beds
- Plastic mulch
  - Black, IRT, silver
- Drip tape
  - Buried 2-3" deep in bed
- Transplanting
  - 60°F 3" below surface
  - Starter fertilizer
    - High phosphorus
    - 3 lb 10-52-17/50 gal. water

Nitrogen Fertilization

- 120 lb/A Total for season
  - 60 lb/A Preplant
  - 60 lb/A Fertigated
  - 12 Week growing season

Fruit Size	Actual/Wk	$CaNO_3$/A/Wk	$CaNO_3$/1,000 plants/Wk
Standard*	5 lb/A	32 lb 4 oz	17 lb 12 oz
Icebox, Mini	5 lb/A	32 lb 4 oz	8 lb 14 oz

*Amount for 1,000 plants is based on a plant population of 1,815 plants/A (3' x 8' spacing)

Begin fertigation ~2 weeks after transplanting or when vines begin to run.

Harvest

Seeded

- Dull fruit surface
- Tendril death
- Thumping tends to detect over-maturity
- Ground spot color change

Harvest

Cut melons from the vine

Seedless

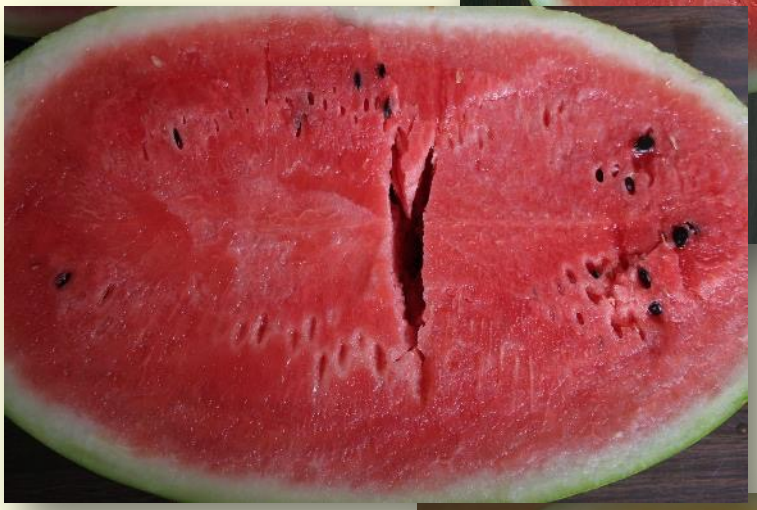
- Ground spot color change
  - Varies between varieties
- Cut open a few melons
- Refractometer testing

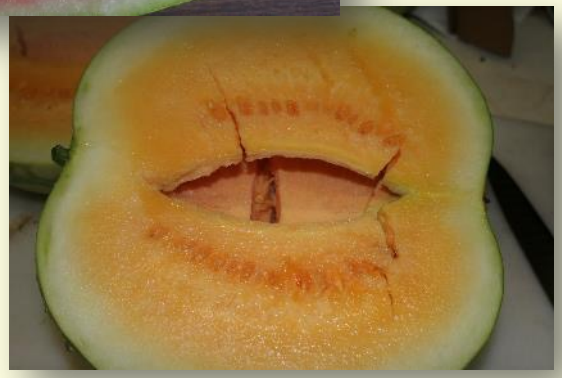
- Sugar content does not increase after harvest
- Interior color will increase some on slightly immature fruit

Hollow Heart

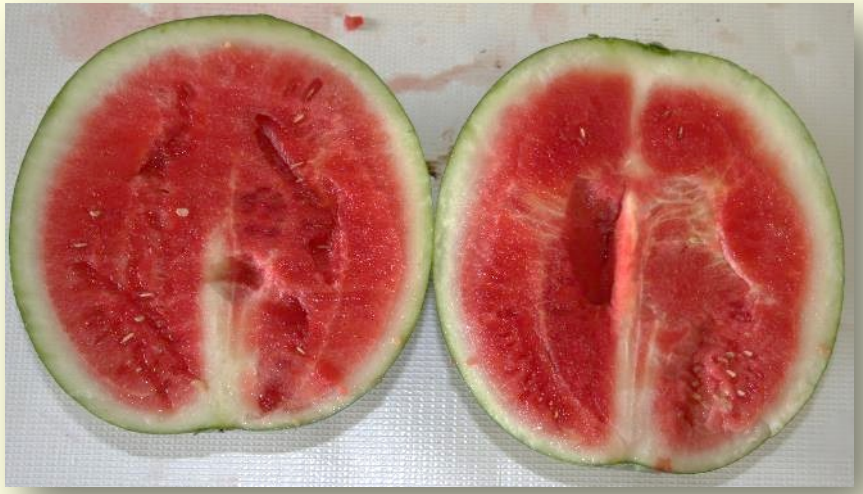
- Primarily caused by poor pollination
  - Lack of bees
  - Cool temp
- Excessive fertility
- Soil moisture fluctuation

- More common in
  - Crown fruit
  - Softer fleshed fruit
  - Some varieties
  - Seedless melons
  - Yellow and orange fleshed fruit





White Heart

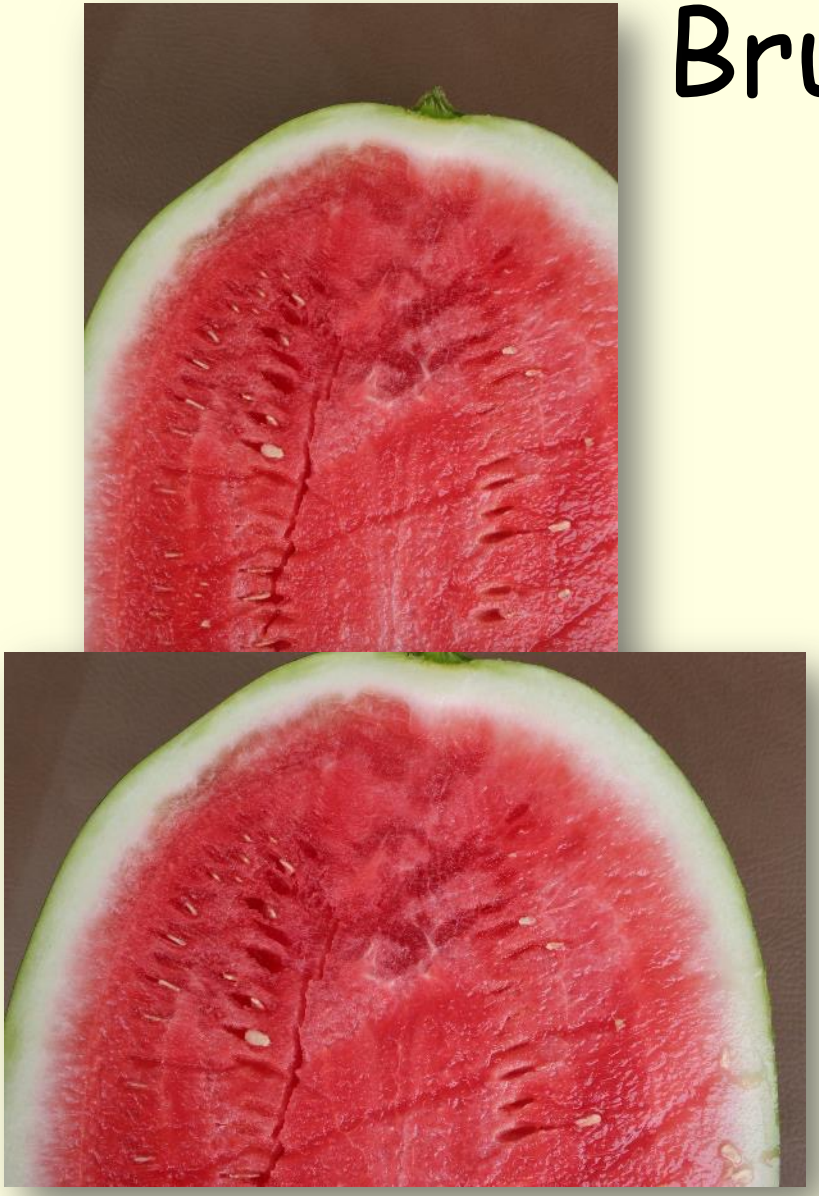


Hardened white to
yellow vascular traces
Tissue is chewy

- Associated with
  - Excessive moisture
  - Excessive nitrogen
  - Low calcium
  - Low phosphorus during maturation.

Blossom-end-Rot

- Poor Ca nutrition
  - Low soil Ca levels
- Moisture stress
  - Hot dry winds
  - Nematode damage
  - Excessive fertilizer
  - Pruned roots from late cultivation



Bruising

- Handle carefully
- Don't stand melons on their ends
- Haul melons from field on straw padded vehicles
- Don't ride on top of the load
- Try to reduce handling

Sunburn

Prevention
Kaolin based products, shield from sunlight
- Surround WP®

Calcium Carbonate products, reflect sunlight
- Purshade®

Check label

- Lack of foliage
  - Fungal diseases, downy mildew
- Spraying fungicides mid-day on mature fruit
  - Chlorothalonil (Bravo, Echo etc.)
- Harvested fruit left with underside exposed
- Sunburned fruit may mature a little earlier
- Does not affect taste

Ozone Injury

- Photochemical degradation of nitric oxide
- Power plants, car exhaust, high temperatures and sunlight
- First on older leaves progressing as chlorosis, mottling, bleaching and necrosis
- Triploid melons more resistant

Bacterial Rind Necrosis

Photo Nathan Howell

- Brown dry, hard, discolored areas in rind
- Usually, no external symptoms
- Bacteria in fruit
- Some association with drought stress
- Has been selected against in newer varieties
- No control measures

Eastern Ky Mini Watermelon Variety Trial 2021
Shawn Wright, Robinson Station, Jackson, Ky

Seed planted week of:

- May 3, 10 seedless
- May 10, 8 seeded + Ace
- 4 reps, RCBD
- Transplanted
  - May 29-June 1
- Spacing
  - Seedless 1′ 11.5″ X 9.5′
    - 2 Ace pollinator plants interplanted per seedless plot
  - Seeded 3′ 11.2″ X 9.5′

Table 1. Varieties and seed sources of watermelons in the 2021 cultivar trial at the Robinson Center for Appalachian Resource Sustainability in Jackson, KY.

Cultivar	Seed Source
Pollinator	
Ace	Johnny's Selected Seeds
Seeded	
Sangria	Seedway
Walker	Seedway
SSX8585	Clifton Seed Company
Stargazer	Rupp Seeds
Sweet Fashion	Holmes Seed Company
Sweetheart	Seedway
Top Gun	Clifton Seed Company
Seedless	
Cheetah	Seedway
Extazy	Rupp Seeds
Gentility	Johnny's Selected Seeds
Leopard	Seedway
Lynx	Harris Seeds, Hazera
Nectaro	Seedway
Ocelot	Seedway
Sirius	Rupp Seeds
Tigris	Seedway, Hazera

Seedless Watermelons

Seedless variety	Day's maturity	Disease resistance
Sirus	74	Fon:1
Gentility	80	
Nectaro	84	
Ocelot	84	
Extazy	85	
Leopard	85	
Tigris	85	
Cheetah	86	

Fon = Fusarium wilt

Seeded Watermelons

Seeded variety	Day's maturity	Disease resistance
Top Gun	83	Co:1, Fon:1
Sweetheart	84	IR: Fon:1
Walker	85	Co, Fon:1
Stargazer	85	IR: Co:1, Fon:1
Sangria	87	IR: Co, Fon:1
SSX8585	90	Co:1, Fon:1
Sweet Fashion	90	Co, Fon

Co = Anthracnose
Fon = Fusarium wilt

Plot Specifics

- Plots 20' long
  - 11 seedless plants
  - 6 seeded plants
- Raised, black plastic mulched beds
- Drip irrigated and fertigated
- Weed control
  - Strategy pre-transplant beneath plastic
  - Teff 2 weeks after transplanting in drive rows
- 2 hives of honeybees
- 4 fruit collected for evaluation from each plot

- Rated for
  - Black seed number
  - Hollow heart
  - Rind thickness
  - Flesh firmness
  - Soluble solids
  - Fruit number
  - Fruit weight

Seedless Watermelon Weight Range

Cultivar	Min-max weight (lb)	Catalogue weight (lb)
Ocelot	2.1-10.4	3-5
Lynx	0.8-8.4	2-4
Sirius	2.4-10.5	5.5-6.5
Extazy	3.7-13.3	4.5-6.5
Gentility	2.0-12.2	6-7
Nectaro	3.6-13.8	5-7
Leopard	1.2-12.3	2.5-3.5
Cheetah	2.1-11.0	4-6
Tigris	3.0-13.7	2.5-3.5

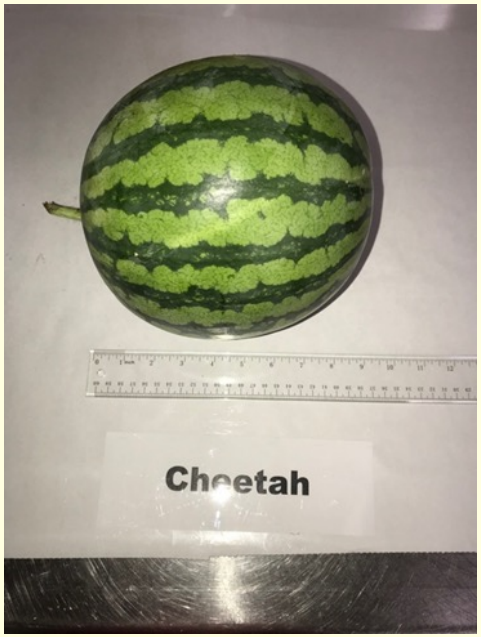
Photo: Nathan Howell

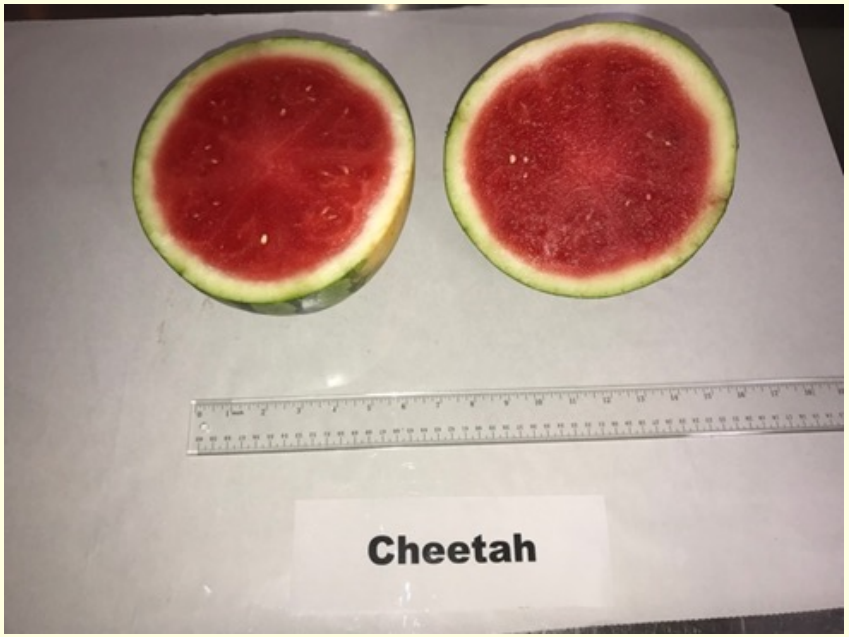
Seedless Watermelon Comparisons

	* *Cheetah*	* Extazy	Gentility	Leopard	Lynx	* Nectaro	* Ocelot	Sirius	Tigris
Black Seeds			X					X	X
Hollow Heart					X				
Rind		Thick	Thin		Thick				
Firm	*Very*						Very		
Brix			High						Low
Avg. wt.					Low		Low		High
Total melons				Low	High				Low
Total wt.				Low					High

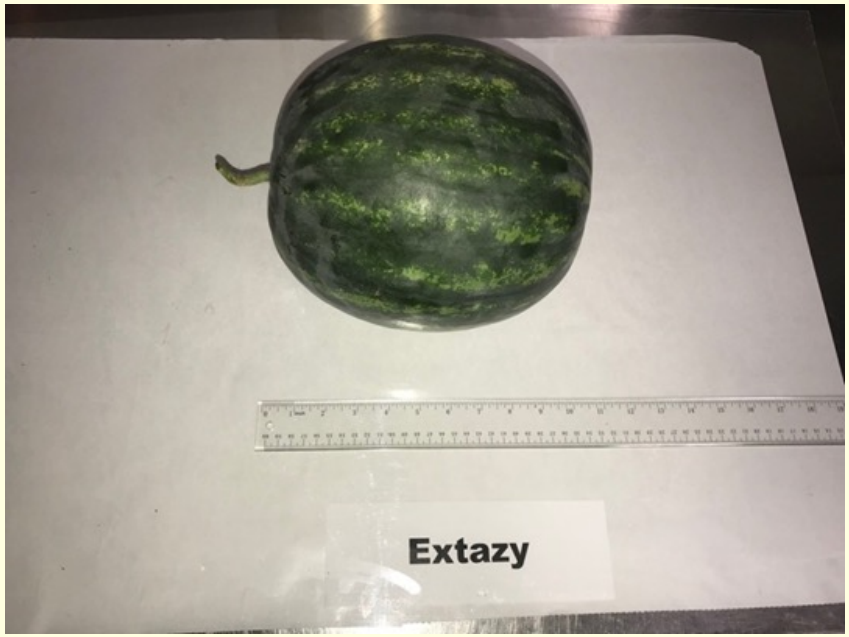
*No preferred best tasting variety by the RCARS Farm Crew

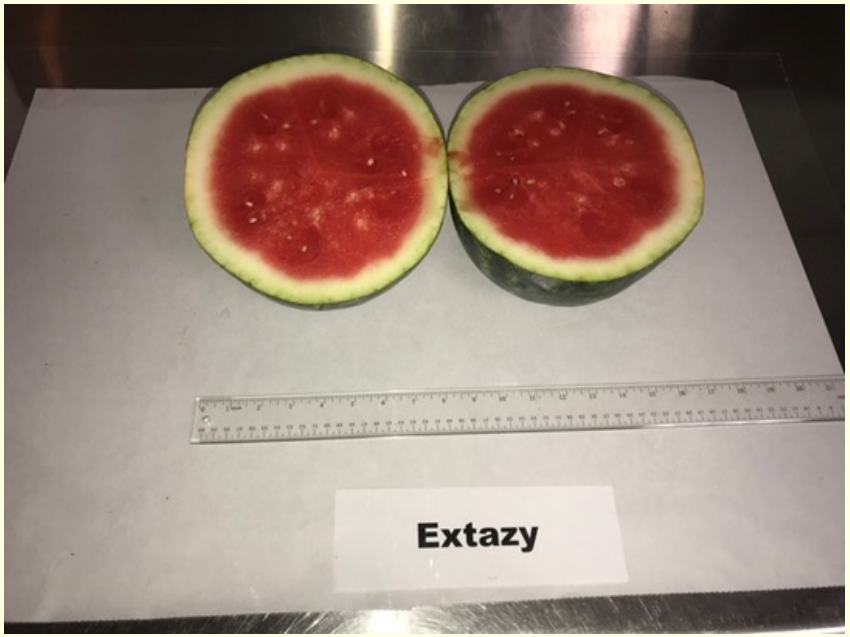
'Cheetah' – 1 of 2 consistently firmest



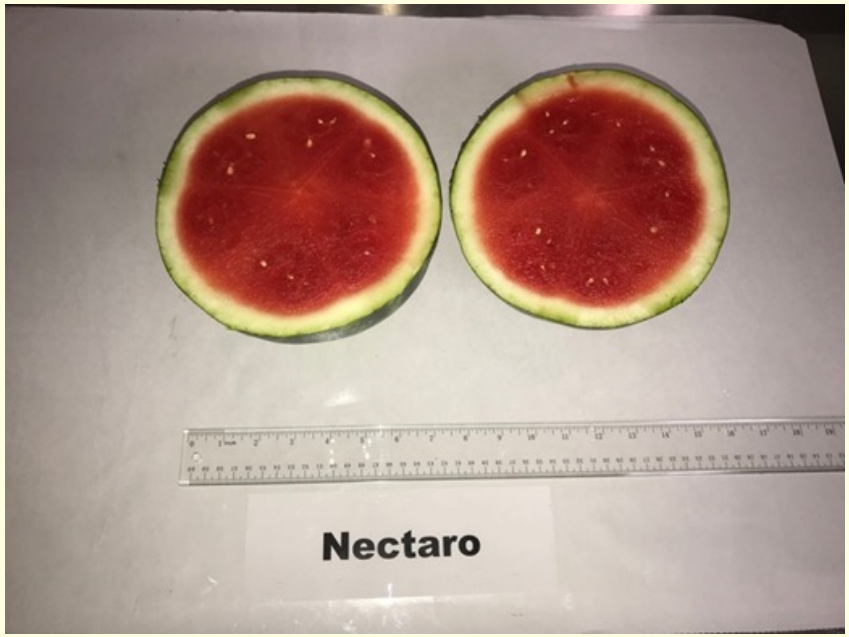


'Extazy' – 1 of 2 with greatest average rind thickness

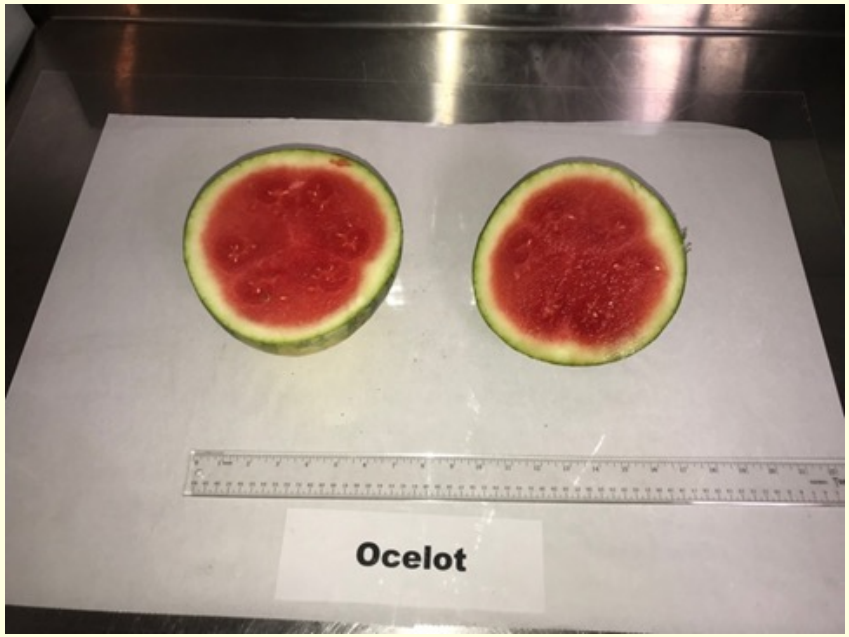


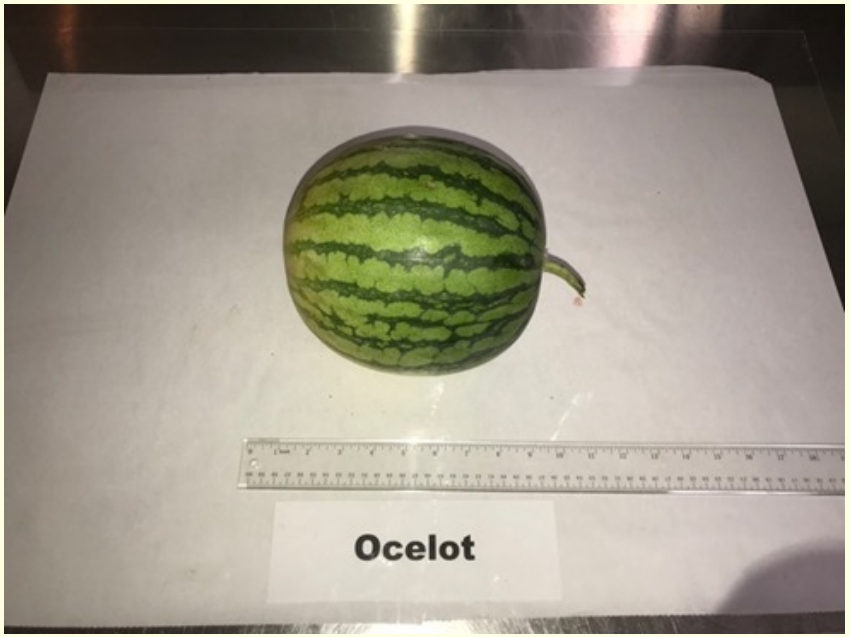


‘Nectaro’



'Ocelot' – 1 of 2 consistently firmest, 1 of 2 smallest





Seeded Watermelons

Cultivar	Min-max weight (lb)	Catalogue weight (lb)
Sweet Fashion	10.1 – 39.2	20-25
Sangria	5.4 – 31.2	20-23
Stargazer	6.5 – 40.1	24-28
SSX8585	6.8 – 32.2	22-25
Sweetheart	10.6 – 34.3	24-28
Top Gun	9.7 – 34.1	21-24
Walker	13.3 – 35.4	26-30

Seeded Watermelons

Table 2. Total soluble solids (TSS) for seeded watermelon grown in 2021 in Jackson, KY.

Cultivar	TSS (°Brix)	Mean Grouping[z]
Sweet Fashion	12.5	A
Sangria	12.4	AB
Stargazer	12.2	ABC
SSX8585	11.8	ABC
Sweetheart	11.7	BC
Top Gun	11.6	C
Walker	10.7	D

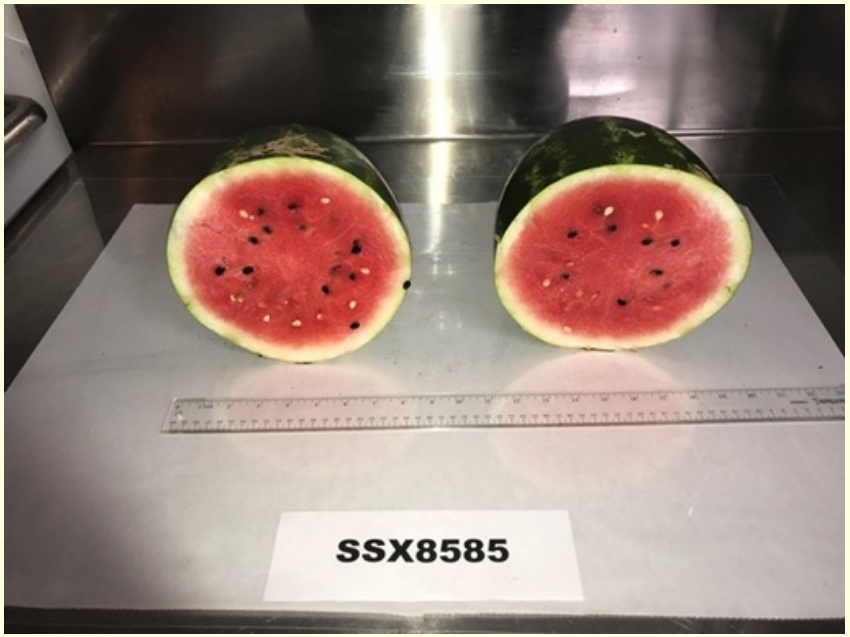
[z]Varieties followed by the same letter are not significantly different at $P < 0.05$.

Seeded Watermelon Comparisons

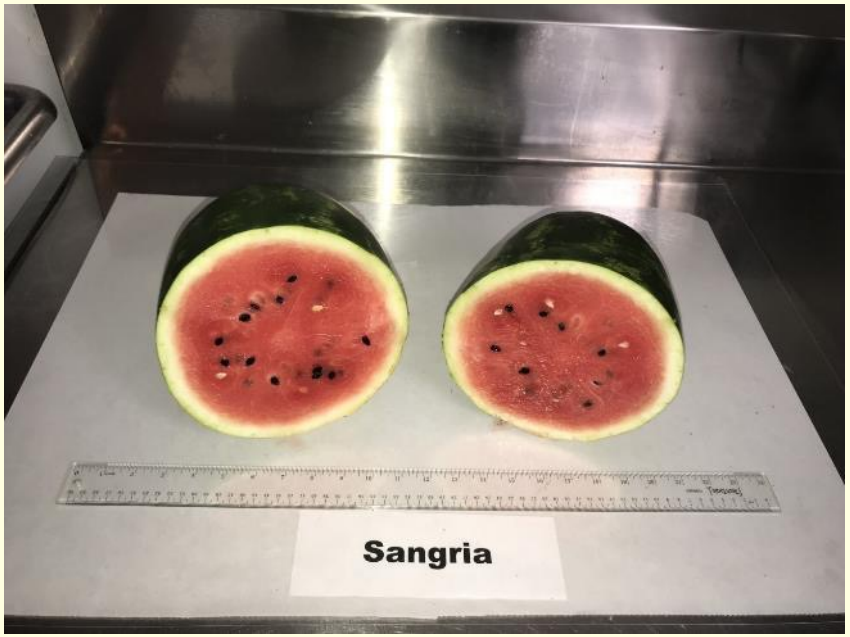
	Sangria *	SSX8585 **	Stargazer *	Sweetheart *	Sweet Fashion *	Top Gun **	Walker
Hollow Heart	none	none		none		2 melons moderate	
Rind							
Firm						least	
Brix	highest	highest	highest		highest		lowest
Avg. wt.							
Total melons		most			least		
Total wt.		most					least

Top Gun preferred by the RCARS Farm Crew over all seeded and seedless melons

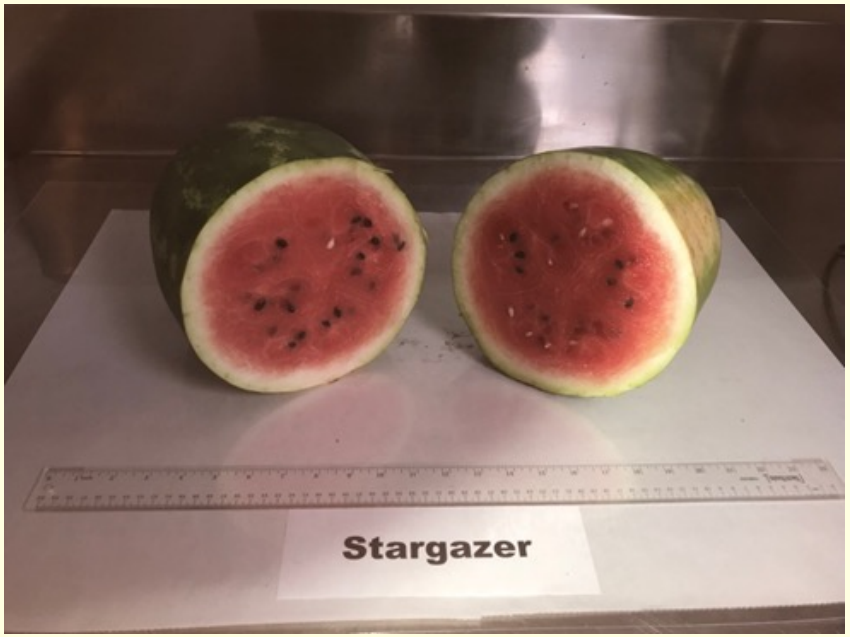
‘SSX8585’ - highest °Brix



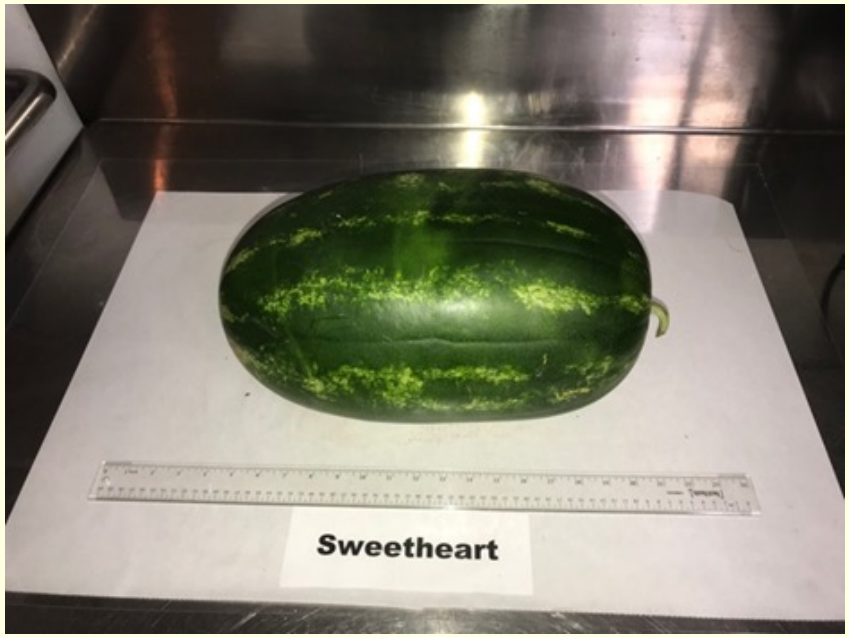
'Sangria' – highest °Brix

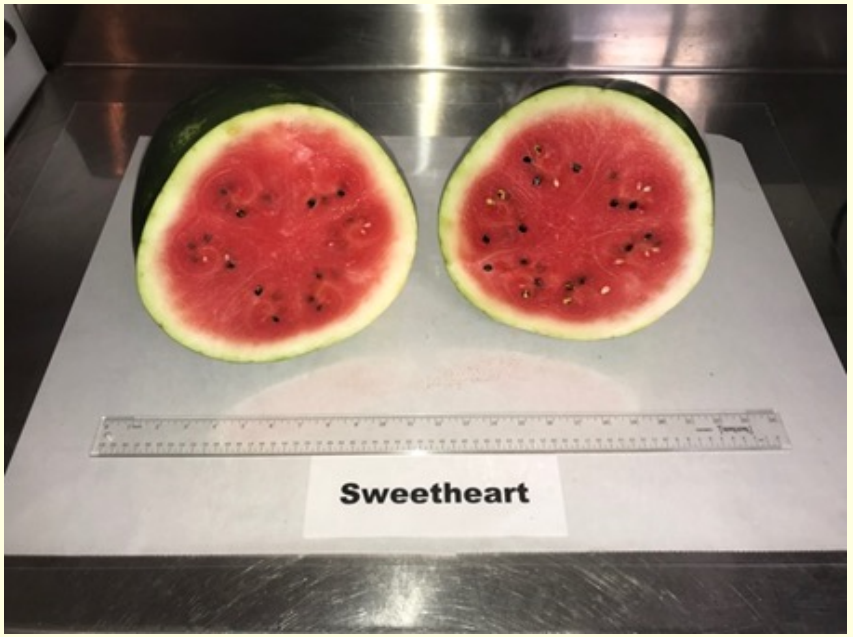


'Stargazer' - highest °Brix

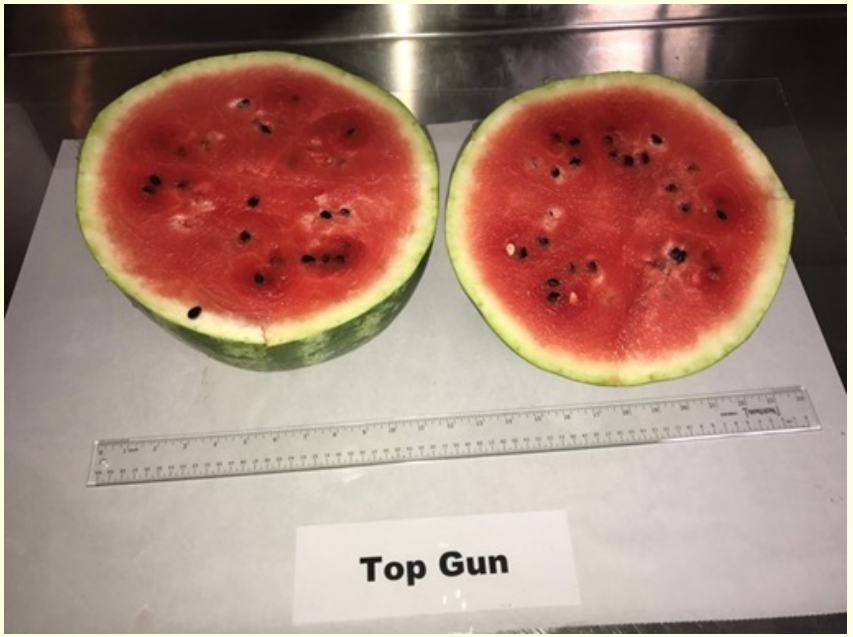


'Sweetheart'





'Top Gun' – softest flesh in 3 blocks, most preferred by farm crew

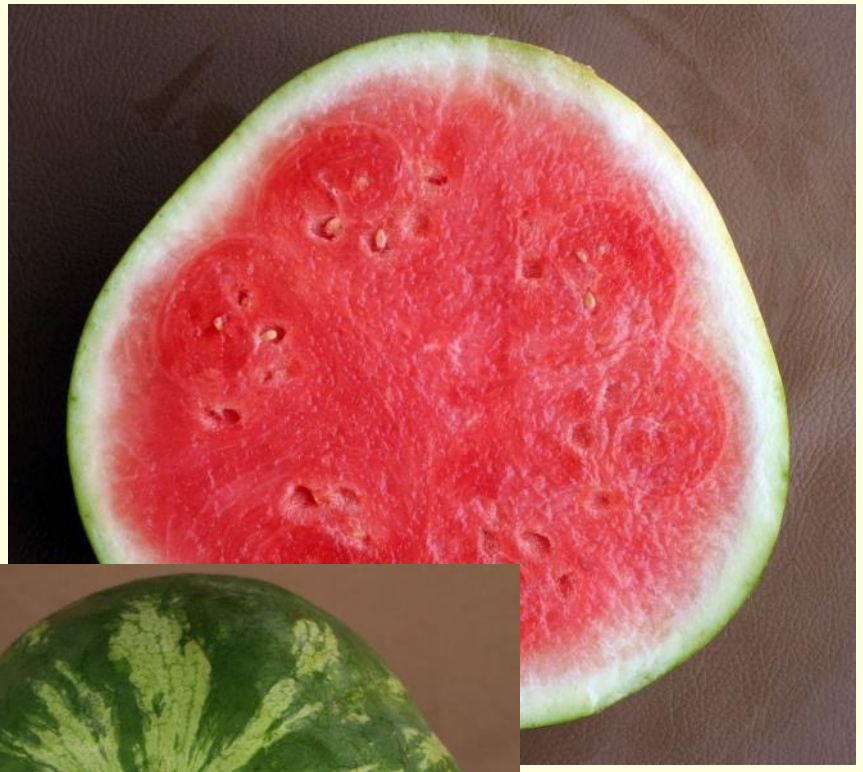


Packing

- Bulk loads
- Fiberboard bins
  - 48" long X 40" wide X 36" high
  - ~1,150 lb net weight
- Cartons
  - 25" long X 20" wide X 9" high
- 33% reduction in losses when bins used

QUESTIONS?

Poor Pollination



Bacterial Fruit Blotch

- Introduced into the US in 1989
- Early season outbreaks can result in total loss
- Adjacent fields can suffer 5-50% loss depending on environmental conditions and crop growth stage at which infection occurs