# Sunburn – Causes and Management Options

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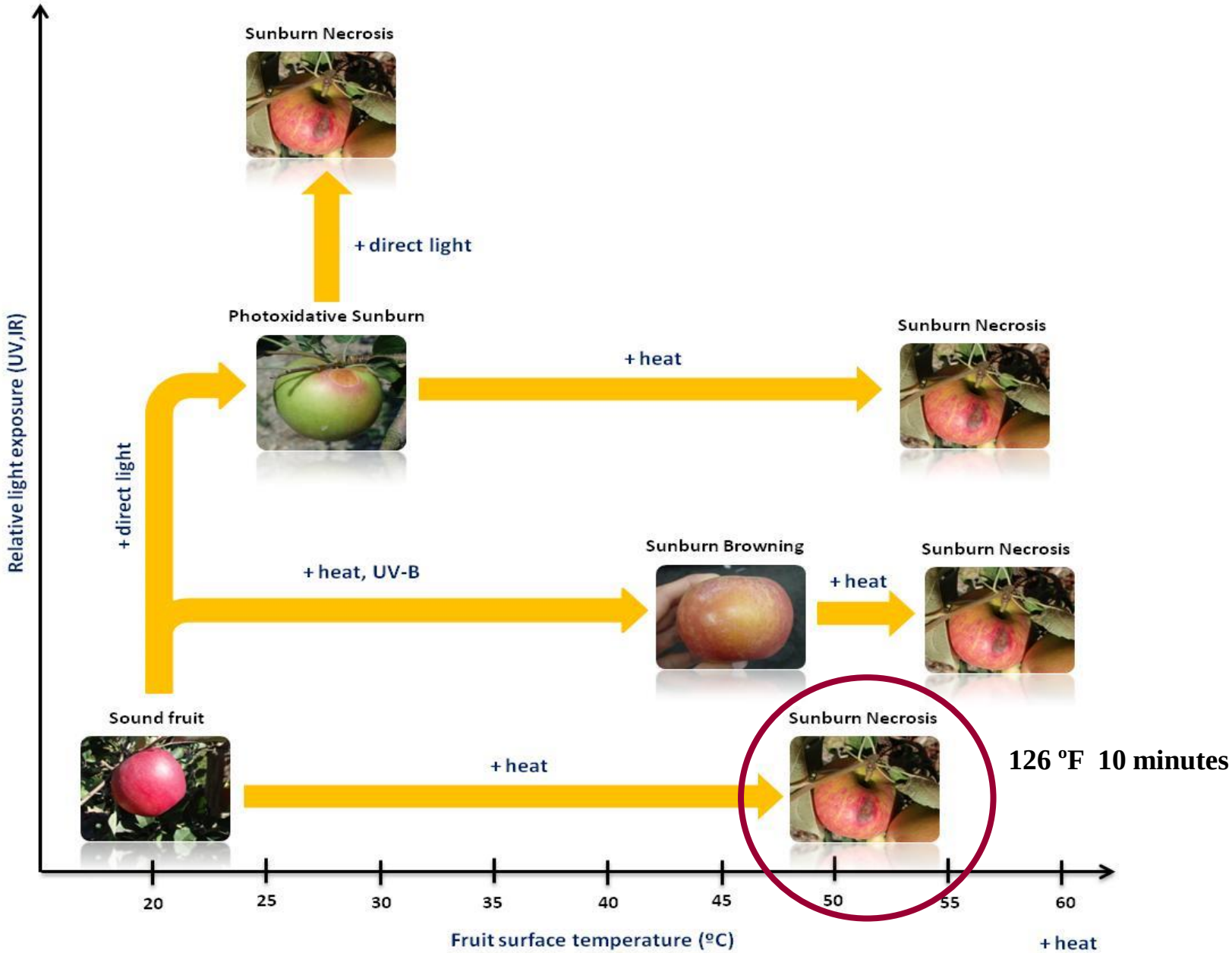
Hudson Valley Research Laboratory

Lake George, 2017

# Physiological disorder of apple fruit caused by excess solar radiation and/or high FST




Source: Rackso and Schrader, 2012

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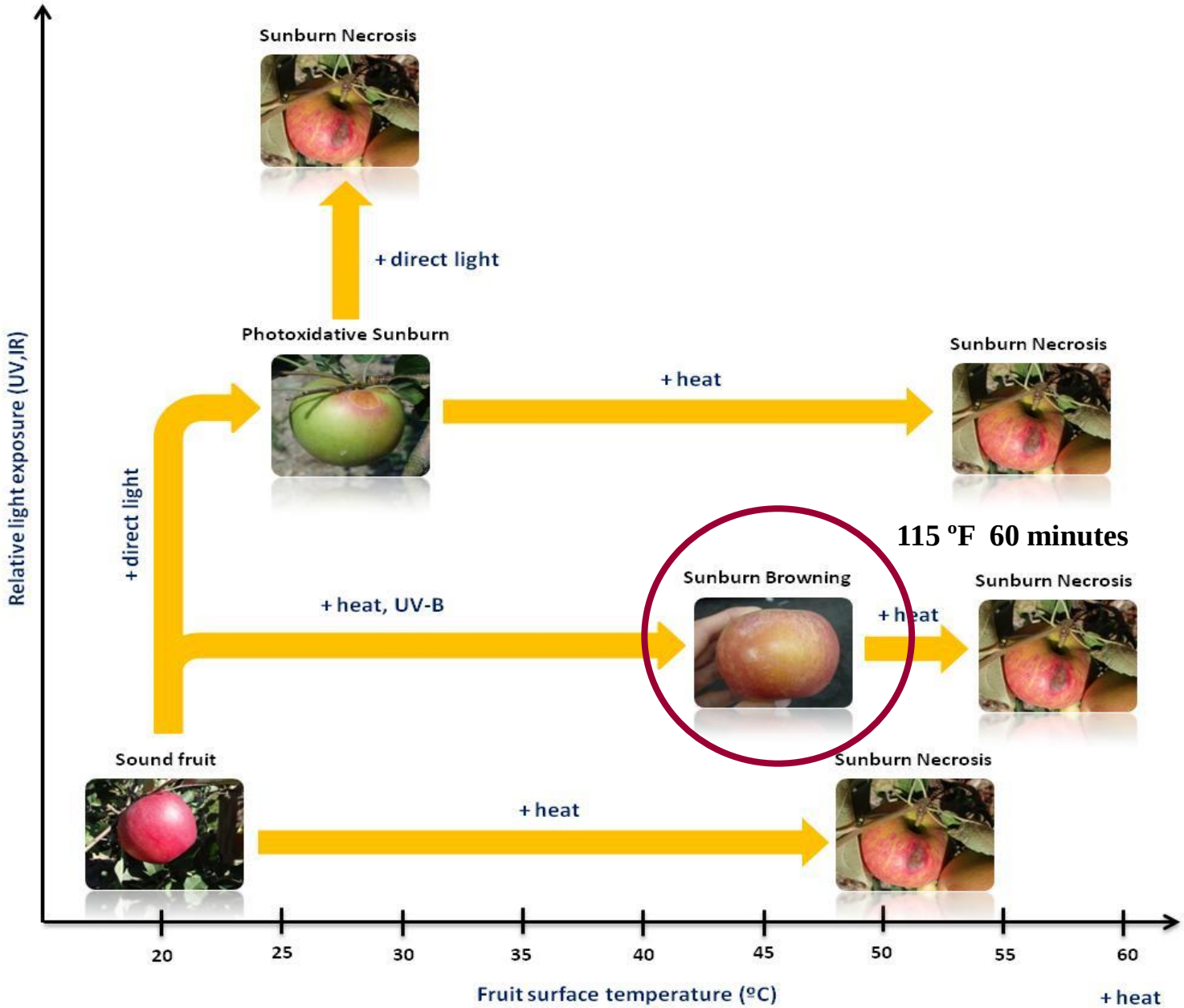


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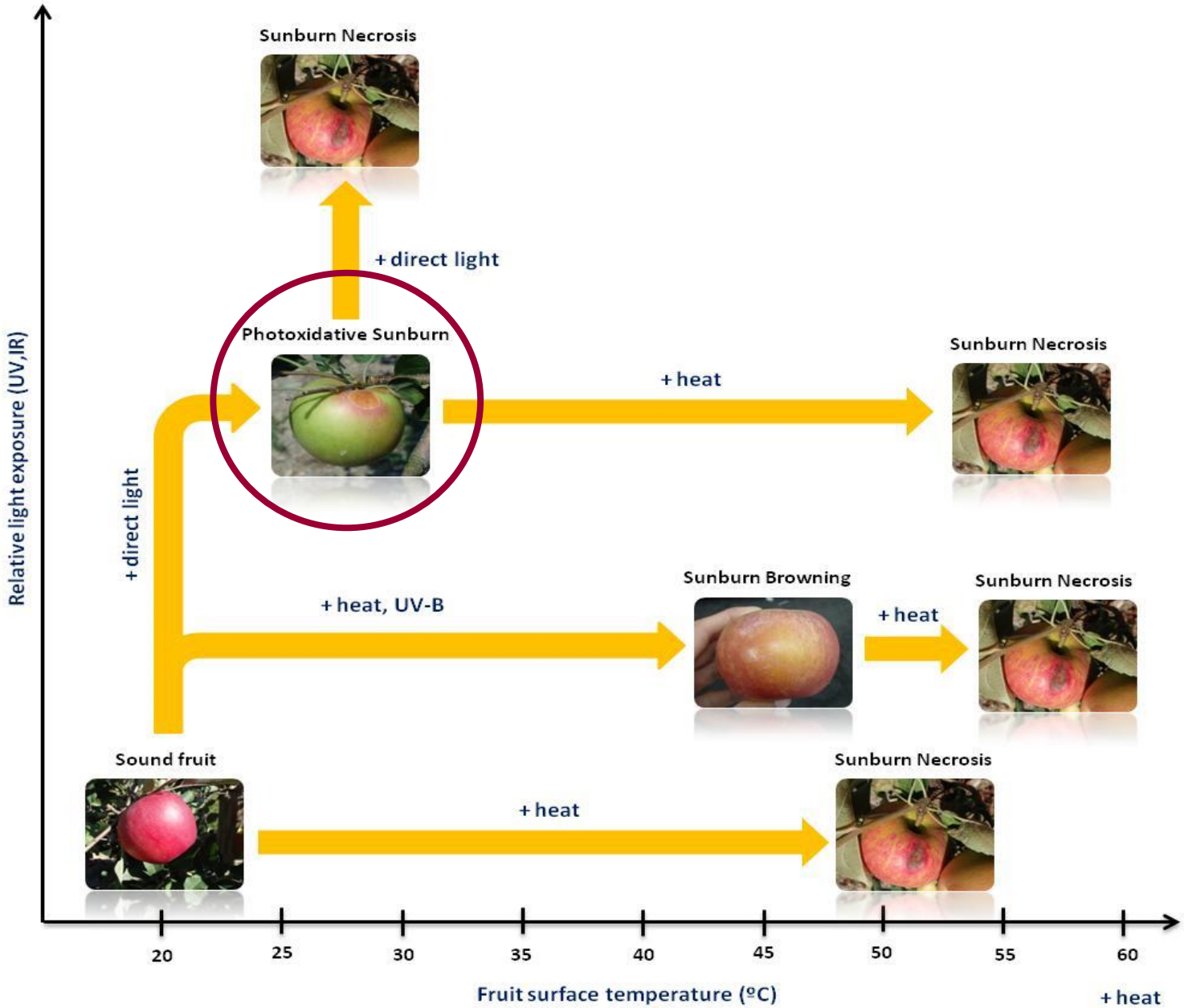


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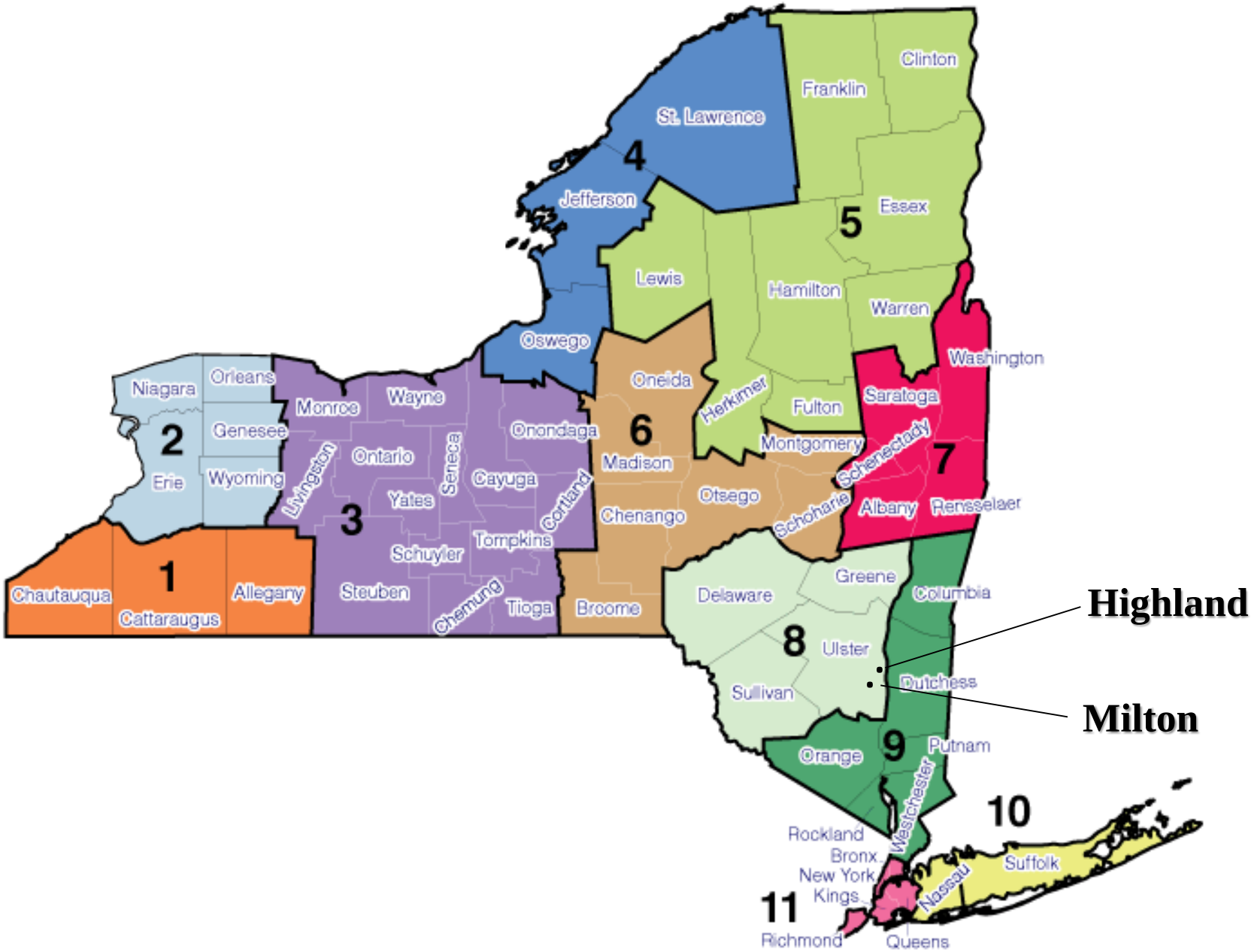
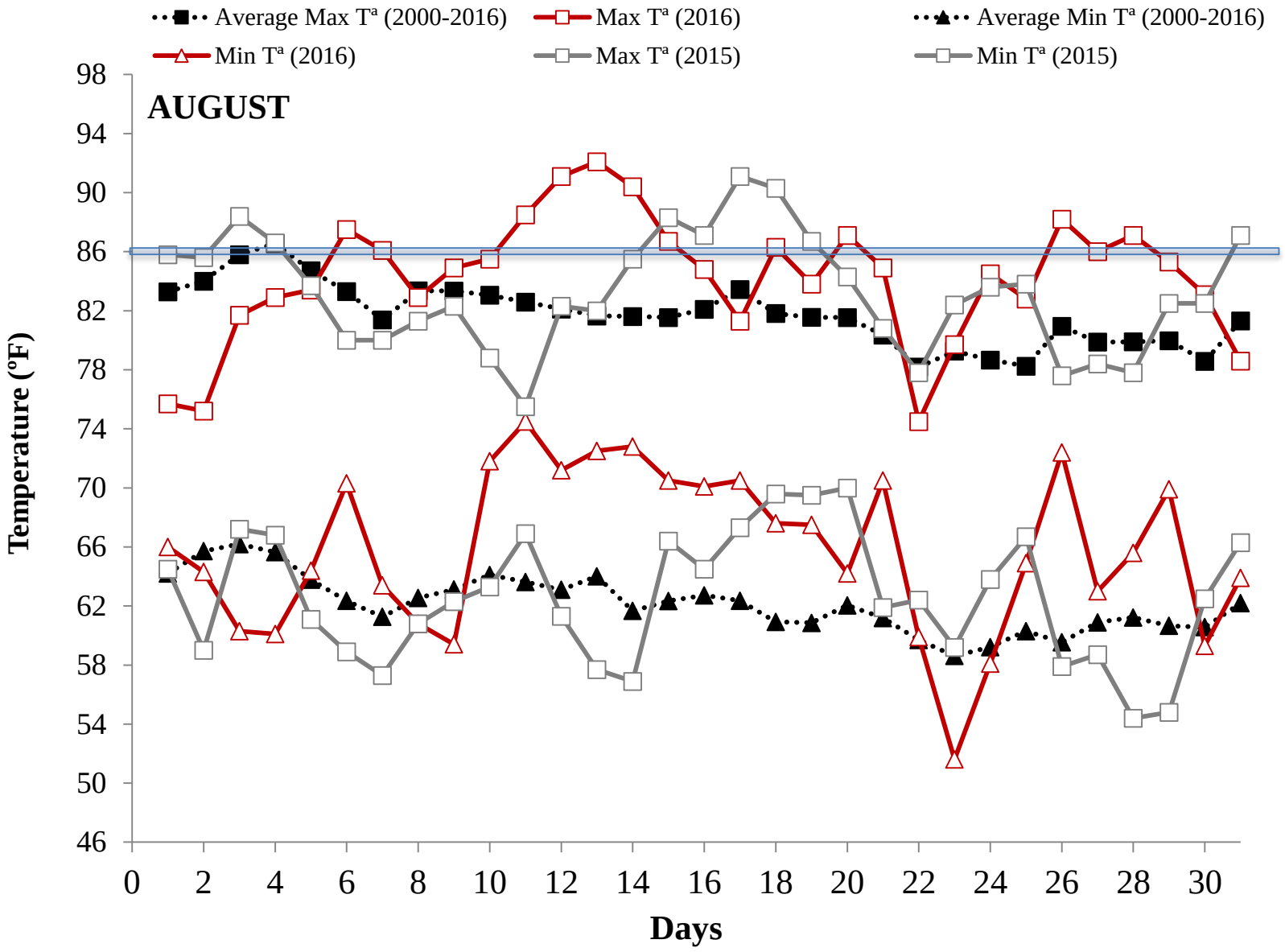
**Evaluate differents strategies to reduce incidence and severity of Sunburn in 'Honeycrisp'**



# HVRL – Weather Data



# <u>Strategy:</u> Particle film spray

**10 years old trees**

**3.5 ft × 14 ft**

**4 reps (3 trees x rep)**

SCREEN™ Duo

**Season Long (Preferred)**

1. Apply 10 lbs/100gals water every 10-14 days beginning at petal fall (cap fall). If rainfall or high temperatures occur, re-apply Screen Duo to re-fresh film.

Aluminum Silicate
(**Kaolin-based product**)

Raynox Plus®
SUNBURN PROTECTANT

**When to apply:** Apple fruit surface area expands very rapidly between 7 and 9 weeks after full bloom (WAFB). Most effective sunburn protection requires the first application at 7 WAFB with a second application 7 to 10 days later. The third application should be made 3 weeks later (i.e. 11 to 12 WAFB), and a fourth application should be applied 4 weeks later (i.e. 15 to 16 WAFB) on all but a few early maturing cultivars (e.g. Gala). Apples are most vulnerable to sunburn on clear, calm days with air temperatures that are generally above 85°F and with low humidity.

Wax
(**Sunscreen**)

**<u>Strategy:</u> Particle film spray**

**10 years old trees**

**3.5 ft × 14 ft**

**4 reps (3 trees x rep)**

| Treatments | Rate | Description | Date of application |
|---|---|---|---|
| Control | - | - | - |
| Raynox-1 | 2.5 gals acre$^{-1}$ | Label recommendation | 06/18, 06/25, 07/16, 08/11 |
| Raynox-2 | 2.5 gals acre$^{-1}$ | 1-3 days before a heat event ($\geq$ 86 ºF) | 06/18, 07/15, 08/11 |
| Raynox-3 | 2.5 gals acre$^{-1}$ | Label recommendation (W side) | 06/18, 06/25, 07/16, 08/11 |
| ScreenDuo-1 | 10 lb acre$^{-1}$ | Label recommendation | 06/08, 06/18, 07/02, 07/26, 08/03, 08/17 |
| ScreenDuo-2 | 10 lb acre$^{-1}$ | 1-3 days before a heat event ($\geq$ 86 ºF) | 06/18, 07/02, 07/26, 08/05, 08/17 |

**Airblast sprayer** calibrated at 70 gals per acre with TRV 200 gals acre$^{-1}$

# <u>Strategy:</u> Particle film spray

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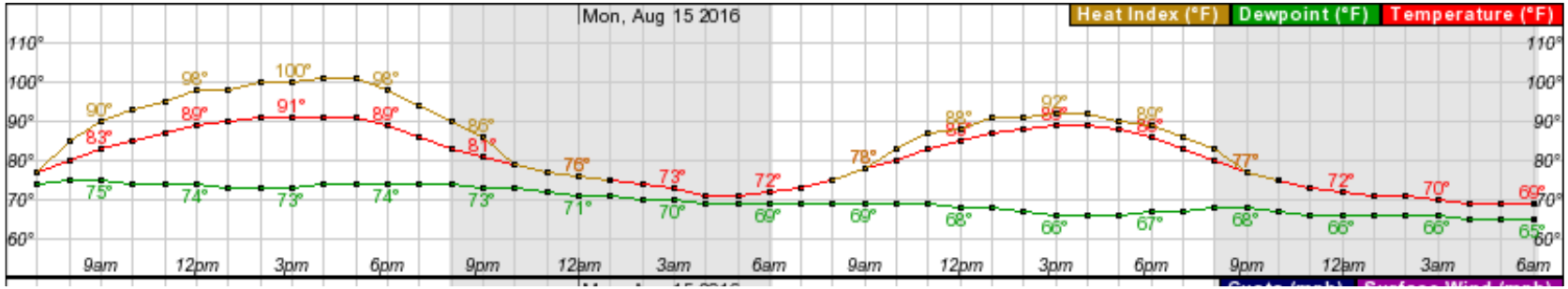
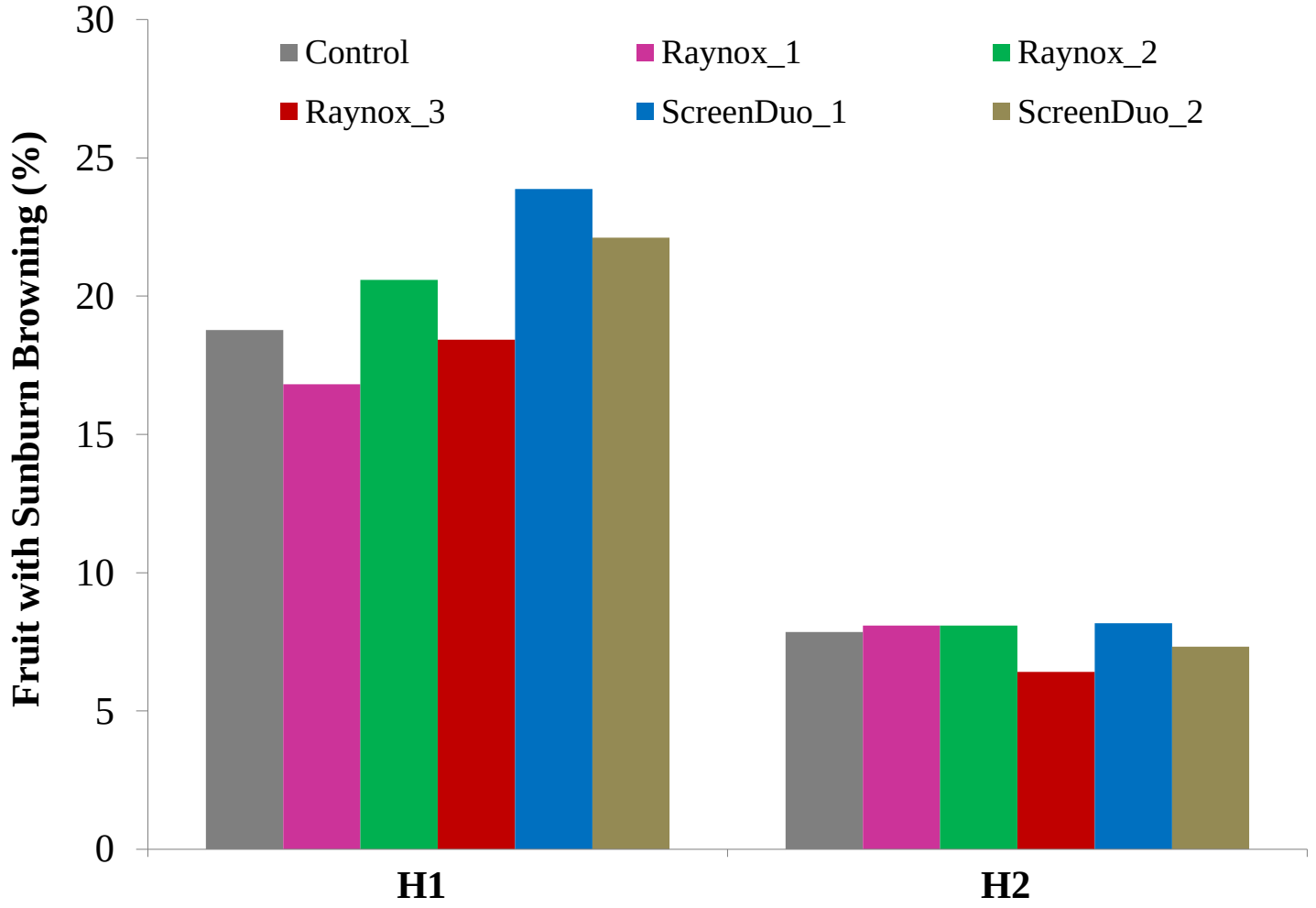
**4 reps (3 trees x rep)**




**Source**: National Weather Service

# Sunburn Incidence




**4** harvest dates:

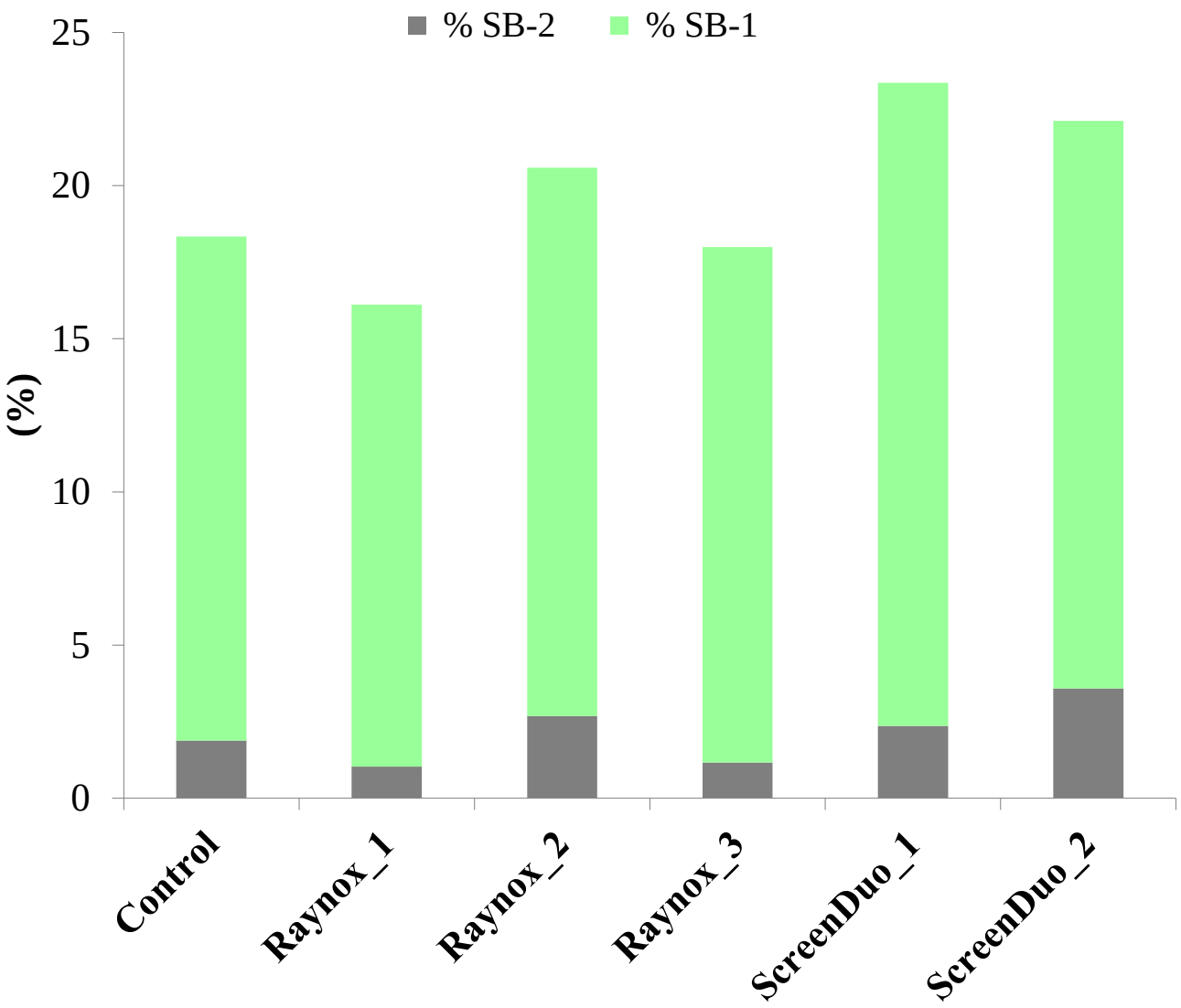
**H1:** 09/07/2016

**H2:** 09/20/2016

**H3:** 09/28/2016

**H4:** 10/10/2016

# Sunburn Severity (H1)



**<u>Strategies:</u> 1. Particle film spray, 2. Evaporative cooling, 3. Netting**

**7 years old trees**

**3 ft × 14 ft**

**4 reps (3 trees x rep)**

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**Season Long (Preferred)**

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Wax
(**Sunscreen**)

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**Overhead Sprinklers from TRICKL-EEZ Company (Michigan, USA), Model Nelson R5 Rotator.**

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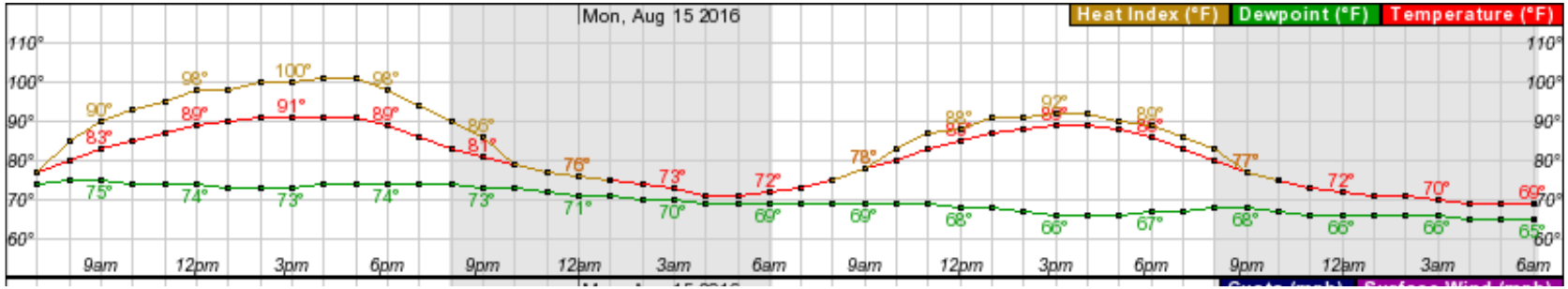


**Source**: National Weather Service

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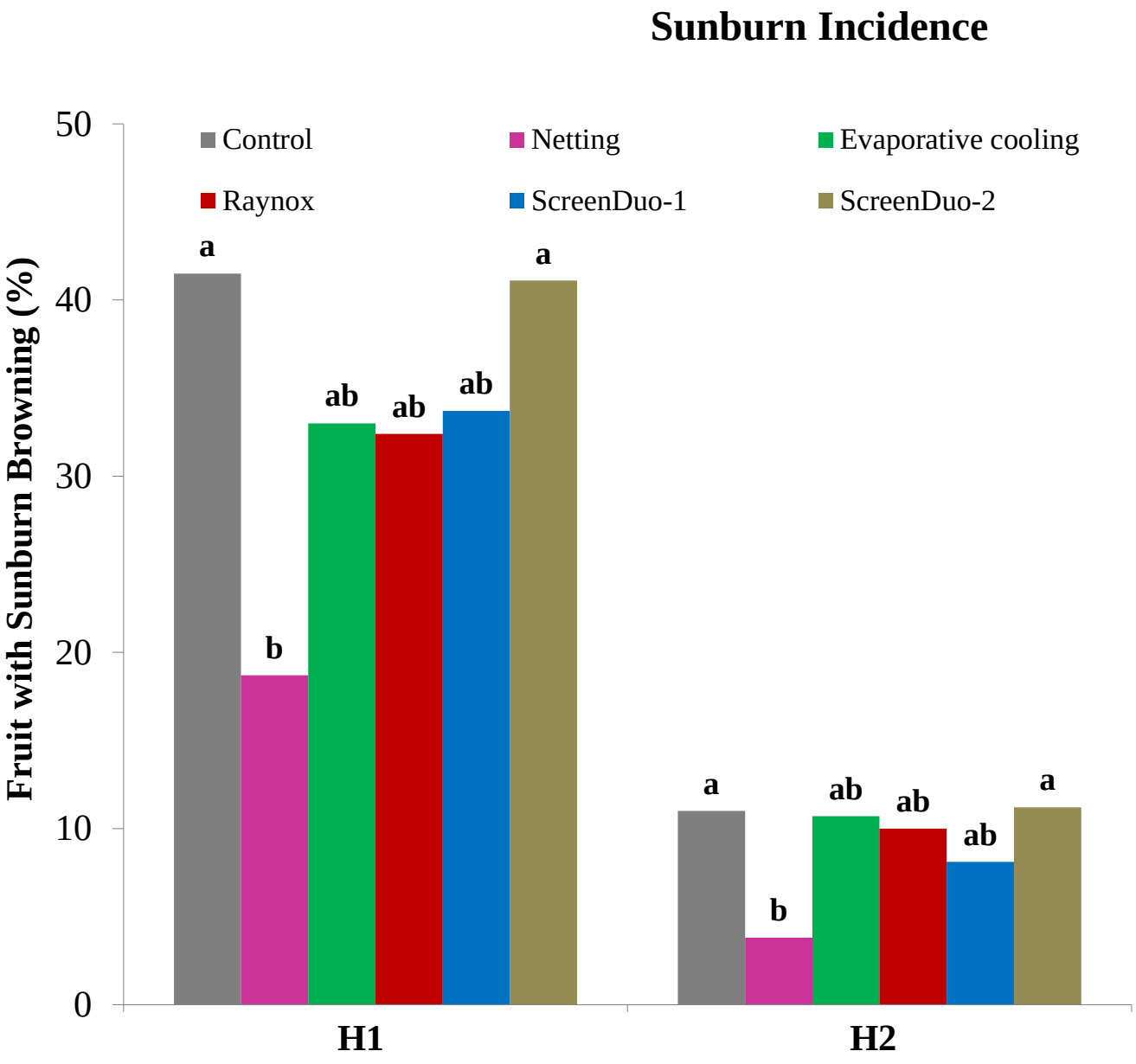
**7 years old trees**

**3 ft × 14 ft**

**4 reps (3 trees x rep)**

Airblast sprayer calibrated at 85 gals per acre

| Treatments | Rate | Description | Date of application |
|---|---|---|---|
| Control | - | - | - |
| Netting | - | Clear Polyesrter Net | - |
| Evaporative cooling | 11 gals $hour^{-1}$ | Every day Tª ≥ 86 ºF from 12:30 to 4:30 pm | 33 days |
| ScreenDuo-1 | 10 lbs $acre^{-1}$ | Label recommendations | 05/28, 06/07, 06/18, 07/03, 07/12, 07/26, 08/05, 08/16 |
| ScreenDuo-2 | 10 lbs $acre^{-1}$ | 1-3 days before a heat event (≥ 86 ºF) | 06/18, 07/03, 07/12, 07/26, 08/05, 08/16 |
| Raynox | 2.5 gals $acre^{-1}$ | Label recommendations | 06/15, 06/22, 07/07, 08/12 |



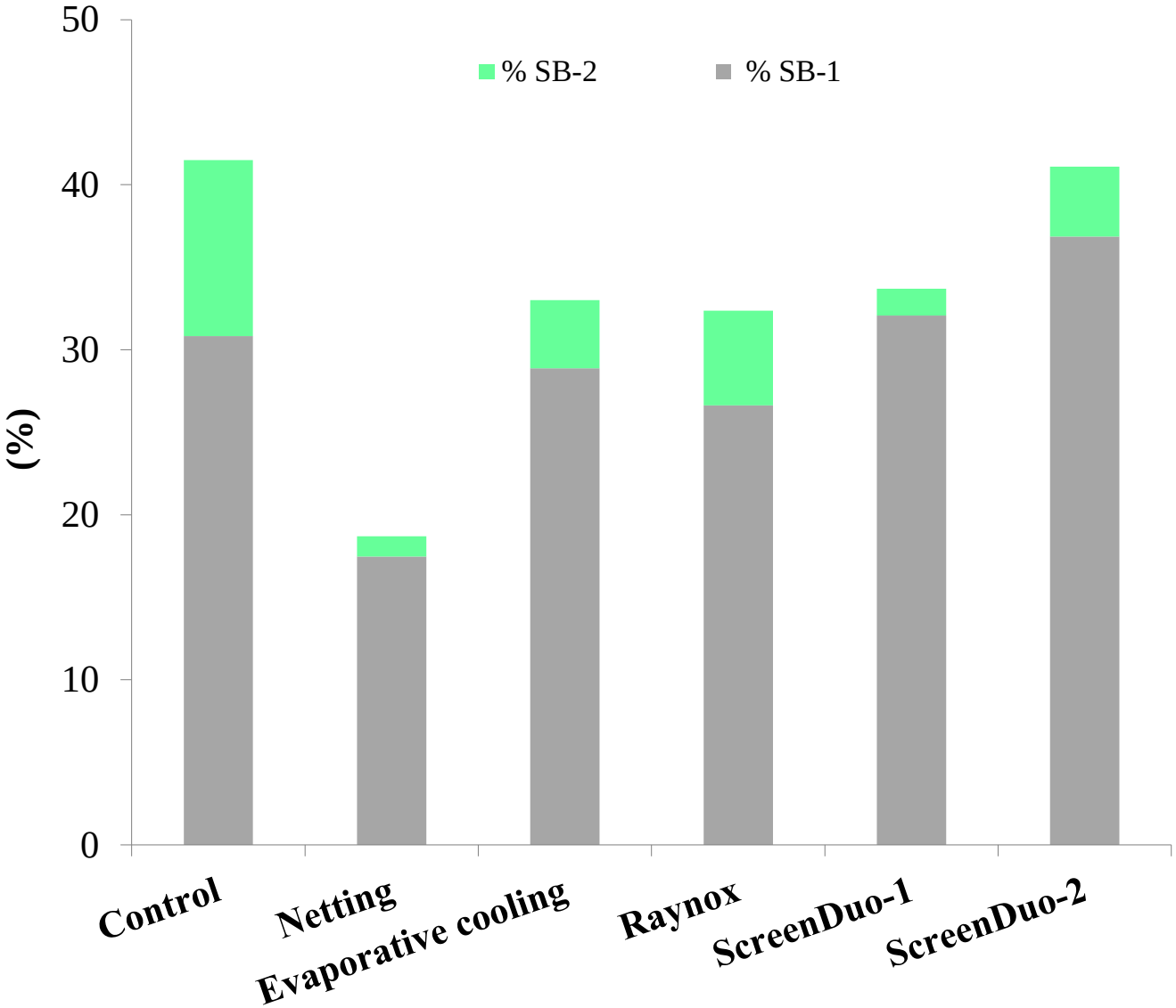

**3** harvest dates:

**H1:** 09/01/2016

**H2:** 09/08/2016

**H3:** 09/21/2016

# Sunburn Severity (H1)



# Fruit Quality

| Treatment | % Color | FF | | SSC | | TA | | a*/b* | |
|---|---|---|---|---|---|---|---|---|---|
| | | *B* | *NB* | *B* | *NB* | *B* | *NB* | *B* | *NB* |
| Control | 67.1 | 63.9 | 61.8 | 11.9 | 11.3 | 3.44 | 3.58 | 1.56 bc | 0.18 ab |
| Netting | 65.5 | 65.5 | 62.2 | 12.0 | 11.0 | 3.75 | 3.85 | 1.53 c | 0.04 b |
| Evaporative cooling | 68.5 | 65.0 | 63.1 | 12.0 | 11.3 | 3.55 | 3.59 | 1.60 abc | 0.12 ab |
| Raynox | 75.6 | 63.6 | 60.7 | 12.2 | 11.6 | 3.65 | 3.60 | 1.74 abc | 0.27 ab |
| ScreenDuo-1 | 70.0 | 65.2 | 67.9 | 12.5 | 11.8 | 3.78 | 3.61 | 1.76 ab | 0.35 a |
| ScreenDuo-2 | 74.9 | 64.7 | 61.8 | 12.1 | 11.6 | 3.79 | 3.83 | 1.79 a | 0.23 ab |

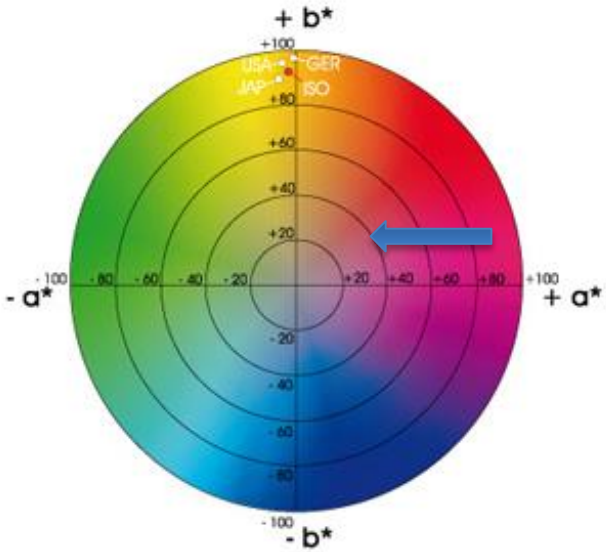
B: sun-exposed side of the fruit

NB: shaded side of the fruit

FF: Flesh firmness (N)

SSC: Sugars (°Brix)

TA: Acidity (g. malic acid $L^{-1}$)



# Grades & FOB prices

## U.S. Extra Fancy

88 or larger (201 – 316 g.) + 0% of sunburn + ≥ 40% red color: **$62 - $69 per box** **$64 per box**

138 – 100 (128 – 200.9 g.) + 0% of sunburn + ≥ 40% red color: **$40 - $48 per box** **$42 per box**

## U.S. No. 1

138 or larger ( ≥ 128 g.) + ≤ 5 % of sunburn + ≥ 10% red color: **$16 per box**

## Culls for Juice

Lower than 138 (< 128 g.) + 0 % of sunburn + ≥ 40% red color: **$0.12/lb**

Lower than 138 (< 128 g.) + ≤ 5 % of sunburn + ≥ 10% red color: **$0.12/lb**

Lower than 138 (< 128 g.) + > 5 % of sunburn : **$0.12/lb**

88 or larger (201 – 316 g.) + > 5 % of sunburn: **$0.12/lb**

138 – 100 (128 – 200.9 g.) + > 5 % of sunburn: **$0.12/lb**

## Fruit distribution (%)

H1+H2

| Treatment | U.S. Extra Fancy | | U.S. No. 1 | Culls |
|---|---|---|---|---|
| | 88 | 100 - 138 | | |
| Control | 6 | 57 | 2 | 35 |
| Netting | 15 | 61 | 0 | 23 |
| Evaporative cooling | 9 | 53 | 0 | 37 |
| Raynox | 12 | 61 | 0 | 27 |
| ScreenDuo-1 | 17 | 56 | 1 | 26 |
| ScreenDuo-2 | 13 | 60 | 0 | 27 |

## Fruit distribution (%)

H1+H2

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|---|---|---|---|---|
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## Wholesale ($)

H1+H2

| Treatment | Wholesale Value/A (FOB Packing Facility) |
|---|---|
| Control | 16,837 |
| Netting | 17,221 |
| Evaporative cooling | 18,551 |
| Raynox | 23,413 |
| ScreenDuo-1 | 22,540 |
| ScreenDuo-2 | 21,894 |

# Net Return to Grower ($/acre)

1-MCP: $0.25 / bu

Storage: $1.5 / bu

Packing: $7.5 / bu

Sales Agency: 10%

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Storage: $1.5 / bu

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**Structural Material Cost** per Application and per Acre: Net & Irrigation
. Lifespan: 20 years
. 10% annual maintenance

**Material Cost** per Application and per Acre: Netting, Raynox & ScreenDuo
. Lifespan Netting: 8 years
. 5% annual maintenance
. 20% labor handling cost

**Labor & Machinery Cost** per Application and per Acre: Raynox & ScreenDuo

# Net Return to Grower ($/acre)

1-MCP: $0.25 / bu

Storage: $1.5 / bu

Packing: $7.5 / bu

Sales Agency: 10%

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**Material Cost** per Application and per Acre: Netting, Raynox & ScreenDuo
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. 20% labor handling cost

**Labor & Machinery Cost** per Application and per Acre: Raynox & ScreenDuo

**H1+H2: 500 bu / acre**

| Treatment | Net Return to Grower after SBMC |
|---|---|
| Control | 10,719 |
| Netting | 12,617 |
| Evaporative cooling | 10,753 |
| Raynox | 12,484 |
| ScreenDuo-1 | 12,774 |
| ScreenDuo-2 | 12,428 |

**Hail?**

# THANKS TO:

- ARDP
- HVRL staff
- Crist Brothers Inc.
- Dan Donahue
- CERTIS USA, L.L.C
- CMM Inc.
- Valent U.S.A Corporation