

Impact of Sunscreen (Oasis) Applications on Cotton Development and Yield

Location

Dryland field trial, Southern Rolling Plains Cotton Growers Association and AgriLife Extension Farm, Wall, Texas, 31.372035, -100.310810. Received 1 inch/acre water of furrow-irrigation at plant to ensure good stand and then 1 inch at 8 nodes above cracked boll to prevent an objective failure caused by drought.

Methods

8-row split-plot (Spray vs. Non-Spray), Phytogen 332 variety, 40 in rows, at 42,000 seeds/acre, on May 15.

- Foliar sprays made with a Lee-Agra Spider Machine Sprayer calibrated for 15 GPA, 20-inch nozzle separation, and at 3MPH.
- Treatments of 10% OASIS v/v (6 total):
 1. Cotyledon stage
 2. 8 True Leaves (8TL)
 3. White Flower (WF)
 4. 8 True Leaves & White Flower (8TL & WF)
 5. 8 True Leaves & 5 Nodes Above White Flower (8TL & 5NAWF)
 6. 5 Nodes Above White Flower (5NAWF)
- Plant mapping (10 plants per plot) and yield (40ft x 13.3ft per plot).

Results and Discussion

Sunscreen applications at specific growth stages influenced plant architecture, square retention, and yield, with variable results across treatments. Data from 40 replicates per treatment show trends in plant height, nodes, bolls, internode spacing, and yield (with/without sunscreen). Yield data includes Gaines County comparisons for context.

Data Summary for Cotton

- Treatments x 4 replications: Cotyledon, 8TL & WF, White Flower, 8 True Leaves & 5NAWF, 8 True Leaves, 5NAWF
- Variables: Yield with Sunscreen vs. Yield without Sunscreen (lbs/acre).

ANOVA Results (Bulk With vs Without Sunscreen)

- F-statistic: 0.2100
- p-value: 0.6489
- Interpretation: No significant difference in yield between sunscreen-treated and untreated plots overall ($p > 0.05$). Sunscreen application did not statistically impact yield.

Tukey HSD Results

- With Sunscreen:
 - All pairwise comparisons between treatments were non-significant ($p\text{-adj} > 0.05$).
 - Largest difference: Cotyledon vs. 8 True Leaves (+8.25 lbs/acre), but not significant.
 - Interpretation: No treatment stood out as superior when sunscreen was applied.
- Without Sunscreen
 - All pairwise comparisons were non-significant ($p\text{-adj} > 0.05$).
 - Largest difference: 5NAWF vs. 8 True Leaves (+10.55 lbs/acre), but not significant.
 - Interpretation: Natural variation between treatments without sunscreen; no clear winner.

Paired t-test (With vs Without Sunscreen Overall)

- t-statistic: -1.0071
- p-value: 0.3244
- Interpretation: No significant difference between paired with/without sunscreen yields ($p > 0.05$). Trend toward slightly lower yield with sunscreen (-1 to -5 lbs/acre in some treatments), but not statistically meaningful.

Treatment Averages, Wall, TX.

Treatment	Avg Plant Height (inches)	Avg Total Nodes	Avg Harvestable Bolls	Avg Internode Spacing	Avg Plot Yield with Sunscreen (lbs/acre)	Avg Plot Yield without Sunscreen (lbs/acre)
Untreated	25.6	15.4	3.0	1.65	N/A	N/A
Cotyledon	23.1	15.1	3.7	2.05	18.9	20.5
8TL & WF	21.1	15.4	2.9	1.83	10.9	11.6
White Flower	22.3	15.0	2.8	2.03	15.3	16.0
8 True Leaves & 5NAWF	22.9	15.1	2.6	2.13	17.7	21.1
8 True Leaves	23.3	14.8	2.9	2.06	10.6	9.5
5NAWF	23.6	15.4	2.8	2.31	16.8	20.0

Gaines County Yield Data (Subset Data)

Treatment	Avg Yield with Sunscreen (Gaines, lbs/acre)	Avg Yield without Sunscreen (Gaines, lbs/acre)
Cotyledon	6.6	5.7
White Flower	6.8	6.3
8 True Leaves	6.6	6.3
5NAWF	6.0	6.0

Data Summary for Corn Leaf Temperature (Wall, TX)

- Recorded Max, Min, and Spot temperatures for 20 random plant samples per treatment at 3 different time points
- Spot temperatures taken from the 3rd uppermost true leaf, centered on the midrib and centered on the leaf.
- Only leaves with obvious whitewash

Max Temp (ambient highs): Sunscreen: Average ~87.5°F, Without: Average ~87.8°F. Essentially identical—no treatment difference in air temp (as expected).

Min Temp (ambient lows): Sunscreen: Average ~81.2°F, Without: Average ~81.5°F. No meaningful difference.

Midrib UPTL (leaf temperature): Sunscreen: Average **84.9°F**, Without: Average **86.2°F**. **Cooling effect:** Sunscreen lowered leaf temperatures by an average of **~1.3°F** (with some readings showing 2–5°F reductions in hotter periods). The primary effect was observed to be **reduced leaf heating** in the sunscreen treatment. Variability is high (as expected in field data), but the consistent ~1–2°F cooling aligns with published kaolin sunscreen trials. No ambient temp differences confirm the effect is plant-specific and correlated in PCA analysis (reflective particles reducing solar absorption).

Key Observations and Analysis

Untreated plants had the tallest height (25.6 inches) and consistent nodes (15.4), while sunscreen treatments slightly reduced height (21–23 inches) but increased internode spacing in some. There is certainly an effect on cotton physiology since all sprayed plots resulted in statistically shorter plants. Harvestable bolls were highest in Cotyledon (3.7) and lowest in 8TL & 5NAWF (2.6).

- No Statistical Effect: Sunscreen applications showed no significant benefit (or detriment) on yield.

Yield Impact

Yield with sunscreen varied widely (10.6–18.9 lbs/acre), often lower than without (9.5–21.1 lbs/acre), suggesting sunscreen may have reduced photosynthesis or caused stress in some treatments. Cotyledon and 5NAWF showed higher yields without sunscreen, while 8TL treatments had mixed results.

- a) Gaines County subset showed lower overall yields (5.7–6.8 lbs/acre), probably due to regional effects from drought and heat.
 - b) Tom Green County only experienced 2 days over 99 degrees throughout the growing season.
- Treatment Efficacy: Cotyledon and 5NAWF applications retained more bolls and yield in some cases, but 8TL combinations showed reduced performance. Square retention was strong overall, but leaf curl and square shedding increased in later treatments.
 - Regional Notes: In Wall, TX (dryland, clay loam soils), extreme moisture stress and then 15-inch rainfall-induced flooding on July 4th likely amplified effects.
 - Yield Trends (Average lbs/acre):
 - a) Cotyledon: With 18.9, Without 20.5
 - b) 8TL & WF: With 10.9, Without 11.6
 - c) White Flower: With 15.3, Without 16.0
 - d) 8 True Leaves & 5NAWF: With 17.7, Without 21.1
 - e) 8 True Leaves: With 10.6, Without 9.5
 - f) 5NAWF: With 16.8, Without 20.0

Recommendations

Insignificant data to demonstrate and/or predict outcomes. Weather was extremely moderate this year and we remained cool throughout the season with only a few days over 99°F. Environmental stress was lower in Concho Valley than in Gains County due to increased heat stress in Gains.

Future Planning

Plans for next year aim to replicate and expand the 2025 sunscreen study by incorporating additional priorities identified by growers in the Southern Rolling Plains Cotton Growers Association and AgriLife entomologists. The expanded effort would include evaluations of deer feeding incidence as well as thrips and fleahopper efficacy or deterrence in both cotton and wheat.

Deer browsing pressure will be measured through visual counts of clipped terminals within treated plots to determine whether the sunscreen product provides any repellency or masking effects.

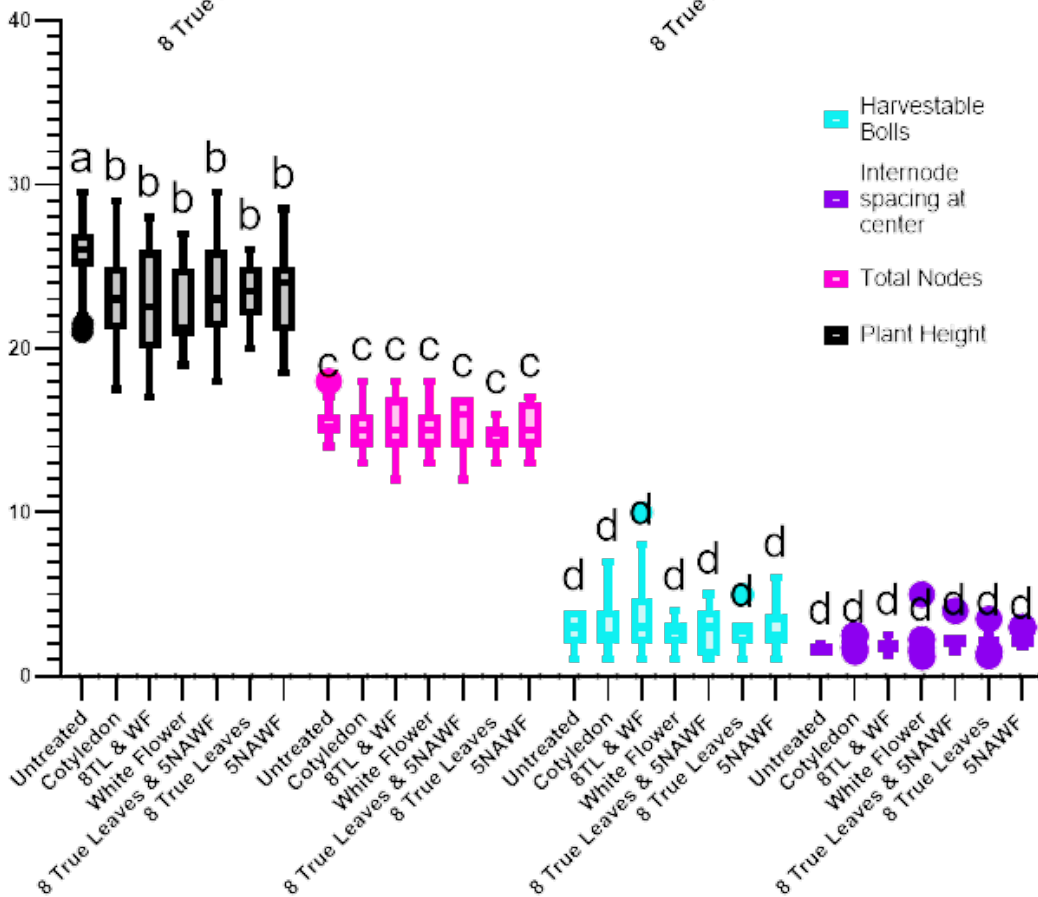
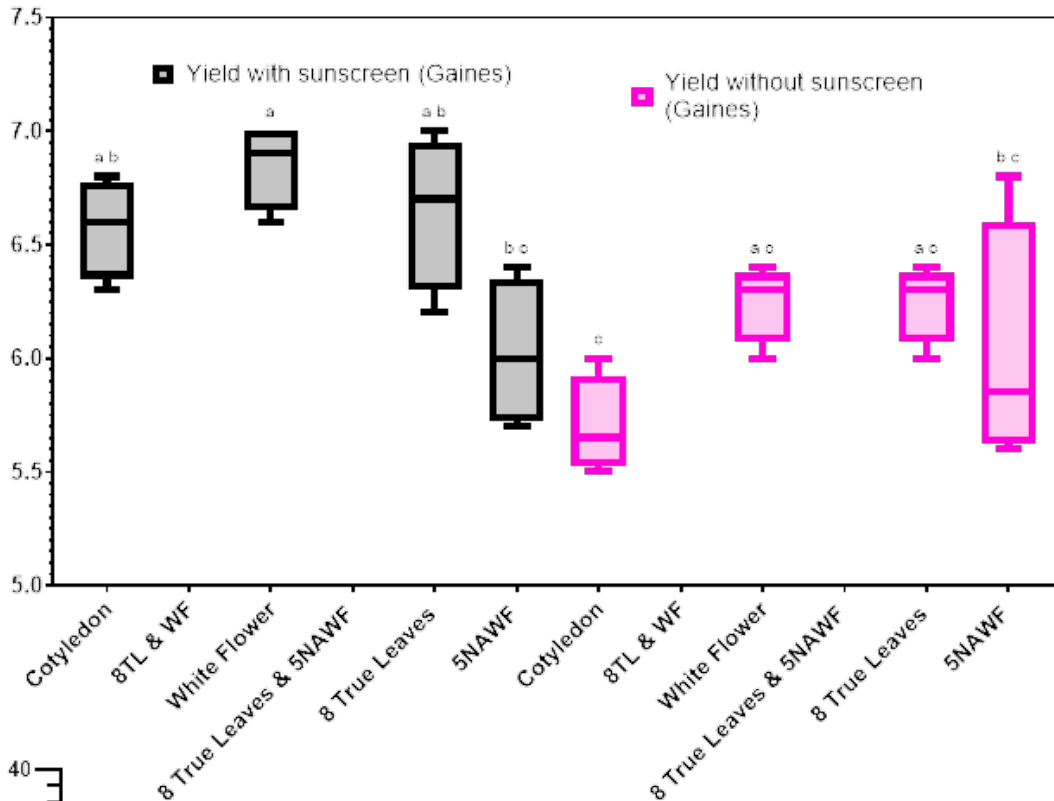


Thrips populations and associated damage will be assessed using kill-jars containing 250 mL of ethanol; each jar will be labeled by treatment, filtered onto paper for processing, and examined under a microscope to distinguish adults from immatures and quantify deterrence.

Fleahopper activity will be monitored through vacuum sampling, using 10–15% infested squares as the action threshold and documenting any reductions in nymph establishment or adult feeding duration. In addition, Oasis will be incorporated into concurrent pesticide efficacy trials in 2026 to better demonstrate its activity under field conditions.

While ad hoc observations and 2025 data for the product are positive, further data needs to be generated on heat stress to better demonstrate that sunscreen applications offer primary (heat management), secondary (yield outcomes), and alternative (pest deterrence) benefits, ultimately informing cost-effective management strategies for West Texas dryland cotton production. The SRPCGA and AgriLife have expressed interest in continuing this research if desired.

Sunscreen Split-Plot, Plot Yield vs Yield



Bulk Tukey Comparison of 120 samples of Corn Leaf Temperature with AMES Thermal Camera at 3 time points (40 ea: 8am, 4pm, 7pm)

