Better Growing

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GEM Avocado Fruit Scarring Causes and Preventive Measures

The GEM avocado is becoming more popular every year in California, and for good reason. It is a compact tree well suited to high density plantings, the fruit are well covered with foliage protecting them from sunburn, and it produces early, high yields of large fruit. However, every new variety has its quirks — some may say flaws — which sometimes do not become evident until significant acreage has been planted and many growers have had their eyes on the variety.

GEM Scarring

For the GEM variety, one such quirk is peel scarring. Several years ago, a number of growers started talking about the sensitivity of GEM fruit to avocado thrips (*Scirtothrips perseae*), which caused large scars to develop on the fruit as they matured. However, not everyone agreed the scarring was caused by thrips.

In May 2018 while visiting Westfalia Technological Services in South Africa, we were shown GEM trees planted in a large screenhouse (see the Fall 2018 issue of *From the Grove*). The region where these trees were located is subject to hailstorms and high winds. An analysis by Westfalia in 2016 showed that 25% of fruit loss (downgraded fruit) in this region was due to wind, exceeded only by sunburn (32%). Maximum average wind speed outside the screenhouse was 4.5 miles per hour compared with less than 1 mile per hour inside the screenhouse. Westfalia told us the screenhouse resulted in a 6.2% increase in grade #1 fruit compared with the non-screened control, and a 17% reduction in wind scar.

A large screen structure constructed in a grove in Soekmekaar, Limpopo Province, South Africa to protect trees from hail and wind damage.

At the same time David Holden was observing increased scarring in GEM plantings in wind prone areas adjacent to Hass plantings that had little scarring and both cultivars were treated for thrips at the same time. With that knowledge, Holden suggested and started a private study in spring of 2019 to investigate if the scarring that was being seen on GEM was due to the wind and not thrips.

In late 2019, Dr. Jonathan Dixon from Seeka Ltd. in New Zealand visited California and talked about his company's experience with GEM avocados. He noted the difficulty they experienced getting GEM trees established in high wind areas and how using small screen shelters around each tree has been beneficial (see the Winter 2019 issue of *From the Grove*).

It is important to note that neither South Africa nor New Zealand have avocado thrips. This information from South Africa and New Zealand, along with observations of California plantings in different areas led some to believe the scarring was more wind damage — occurring at a very early stage of fruit development — than thrips damage. Thus, in 2020, the California Avocado Commission funded David Holden to establish a two-year trial to determine for certain the cause of GEM fruit scarring in California.

GEM Scarring Trial

In spring 2020, two growers, Bryce Bannatyne and Gary Nichols, with GEM plantings in wind exposed and wind sheltered areas, agreed to cooperate with CAC for the trial. Bannatyne's Orr Ranch in Santa Paula is subject to regular afternoon west winds, whereas Nichols' Rancho Largo in Somis is much more sheltered from the strong afternoon west winds. At each location, plots were established with and without added wind screens. Additionally, within each wind screen treatment trees were either treated or untreated for thrips control. The treatment details are shown in Table 1. Wind speed measurements and thrips counts were both conducted weekly at each site.

Year One Trial Results

Wind speed data collected weekly in the early afternoon from spring through early summer 2020 at each site showed that, on average, the Santa Paula location experienced nearly 50% greater wind speed than the Somis location. Wind speed outside the grove averaged about 6.6 miles per hour in Santa Paula but only 4.5 miles per hour in Somis. Similarly, wind-speed measurements inside the grove averaged 2.4 miles per hour in Santa Paula, but only 1.5 miles per hour in Somis.

Thrips count data for both sites from early May through early July are shown in the accompanying figures. In Somis, the thrips treatments were applied on May 20, 2020, and in Santa Paula the treatments were applied on May 28, 2020. At both locations, the untreated control trees, with or without windscreens, had the highest thrips counts. At the Santa Paula site, the thrips treatments generally held the pest populations below five nymphs per five leaves, which is generally regarded as the treatment threshold for this pest, while the untreated controls with and without windscreens had populations that well exceeded the treatment threshold. Results were similar at the Somis site; however, the organosilicon only treatment without windscreens did not control the thrips population. Also, at the Somis site, all treatments saw a sharp rise in thrips populations in early July, with all treatments exceeding the treatment threshold except for the abamectin/oil with windscreen treatment.

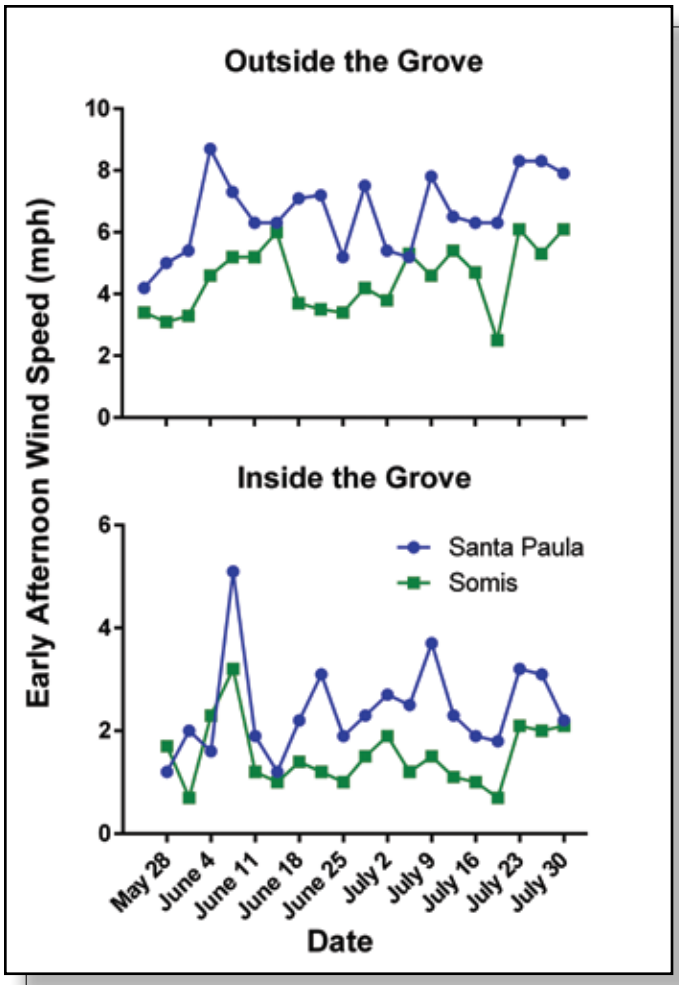
Table 1. Treatments for assessing damage to Gem avocados.

Treatment		Rate[1]	Spray volume[1]	Application timing
No windscreen	Untreated	N/A	N/A	
	Abamectin 415 Oil	15 fl oz/ac 1% v/v	75 gal/ac	Approx. petal fall
	Organosilicon spreader	48 fl oz/ac	75 gal/ac	Approx. petal fall
With windscreen	Untreated	N/A	N/A	
	Abamectin 415 Oil	15 fl oz/ac 1% v/v	75 gal/ac	Approx. petal fall
	Organosilicon spreader	48 fl oz/ac	75 gal/ac	Approx. petal fall

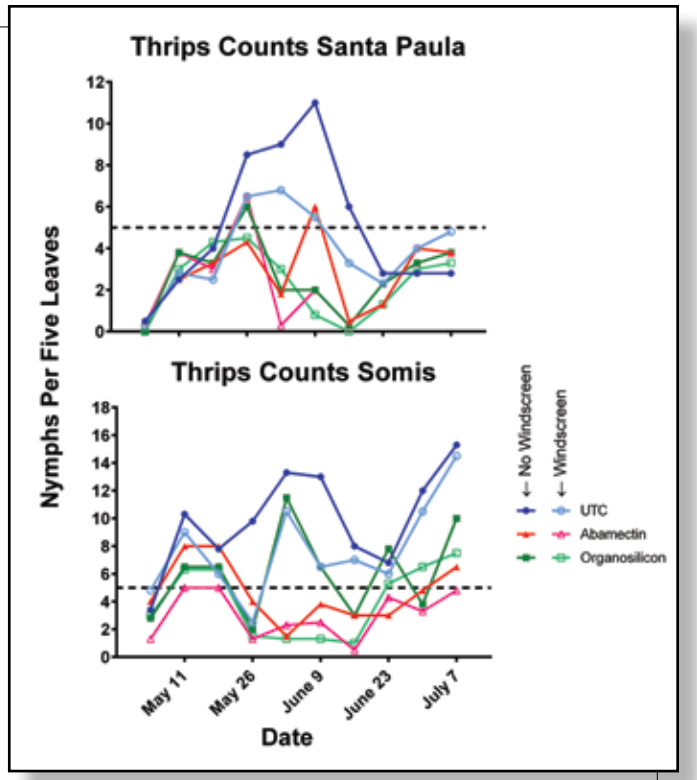
[1]Rate and spray volume are per acre equivalents. The actual treatments were applied by hand to each treatment plot.

An example of GEM fruit with damage from wind rub (left) and avocado thrips feeding (right). Note the difference in the texture of the damage from the two different sources as well as the position of the damage.

On September 30, 2020, fruit from all treatments at both locations were rated for the percentage of fruit with damage as well as the severity of damage. In Santa Paula, the percentage of fruit showing thrips damage was low in all treatments, and there was no statistically significant difference among the treatments. Wind scar damage was quite high in all treatments, with no treatment having less than 15% wind scar damage. That said, there was a large separation between treatments with windscreens (20% average damage) compared with treatments without windscreens (34% average damage). Damage severity was rated on a scale from 0 to 3 (0=no damage, 3=severe damage), with fruit having a se-



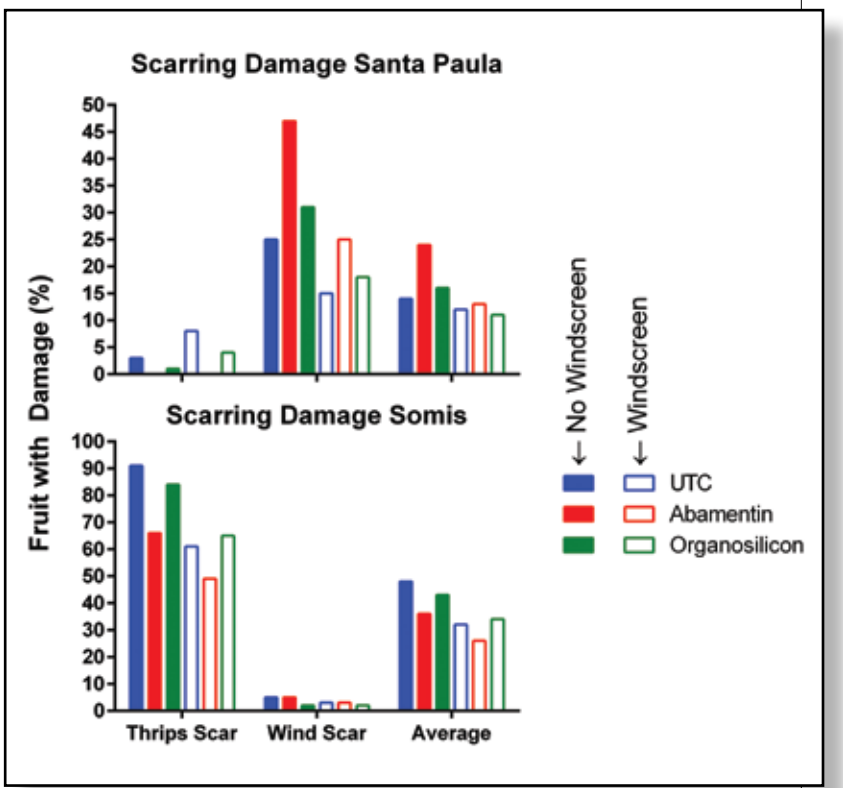
Wind speed data outside and inside the two trial locations in Santa Paula and Somis.



Avocado thrips count data at the two trial locations in Santa Paula and Somis. The dashed line indicates a thrips count of five nymphs per five leaves, which is generally regarded as the action threshold for this pest.

verity rating less than 1 likely being first grade fruit. In terms of damage severity, there were no significant differences among treatments for thrips damage. Treatments without windscreens had an average severity rating of 0.54 for wind scar and treatments with wind screens averaged 0.25. Holden has worked in this grove for several years and noted the wind damage was considerably less in 2020 than what he observed in 2019.

At the Somis location, fruit damage was primarily due to thrips, ranging from 49% to 91% of fruit showing thrips damage across all treatments. On the other hand, wind scar damage at the Somis location was less than 5% in all treatments. Damage severity (Table 2) at this site due to wind was negligible. Damage severity due to thrips was greatest in the untreated control without windscreens and the organosilicon only treatment without windscreens, 1.34 and 1.22, respectively. Interestingly, at the Somis location, thrips populations were lower in all windscreen protected treatments compared with those without windscreens.



Percent of fruit with thrips and wind scar damage at the two trial locations, assessed on September 30, 2020.

An example of the wind screens erected in the two trial groves in Santa Paula and Somis.

Following the first year of this trial, it is apparent wind speed does influence the damage that can occur to fruit from limb, leaf, and fruit-to-fruit rubbing. The lower average wind speeds at the Somis location and low level of wind scarring suggest there may be a wind speed threshold below which wind speed does not adversely affect the fruit. The second conclusion that can be drawn is that wind screens do reduce the level of fruit damage from winds.

Another factor that may be important, but cannot yet be concluded from these data, is the influence of tree age on wind-induced damage. There was less wind damage in Santa Paula in 2020 than was observed in 2019. Also, the trees at the Somis site are one or two years older than those in Santa Paula. Thus, it cannot be ruled out that as the trees mature, they naturally become more resistant to wind-induced fruit scarring.

Recommendations

This trial will be repeated in 2021 and until the second year of data is analyzed final recommendations cannot be made. However, growers considering planting GEM trees in areas susceptible to strong spring winds may want to conduct their own trials with wind breaks or other windscreens. Remember, wind breaks (trees, walls, or any other barrier) generally have an effective range of 10 times their height. For example, a 10 foot tall wind break will protect trees within 100 feet downwind of the wind break. When considering natural windbreaks, be sure to consider the effect those trees will have on your avocado trees since they will be competing for the same water and nutrients.

Table 2. Damage severity rating of damage caused by avocado thrips and wind at two trial locations assessed on September 30, 2020.

Treatment		Thrips Scar	Wind Scar	Average
Santa Paula Trial Site				
No windscreen	Untreated	0.03	0.33	0.18
	Abamectin 415 Oil	0.00	0.81	0.14
	Organosilicon spreader	0.01	0.47	0.24
With windscreen	Untreated	0.08	0.22	0.15
	Abamectin 415 Oil	0.00	0.31	0.16
	Organosilicon spreader	0.00	0.23	0.12
Somis Trial Site				
No windscreen	Untreated	1.34	0.05	0.70
	Abamectin 415 Oil	0.95	0.05	0.50
	Organosilicon spreader	1.22	0.02	0.62
With windscreen	Untreated	0.89	0.04	0.47
	Abamectin 415 Oil	0.64	0.03	0.34
	Organosilicon spreader	0.98	0.02	0.50