

Use of Surround® WP crop protectant on walnuts

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With high prices and a good crop on the trees, walnut growers are interested in maintaining nut quality to ensure the highest return. Sunburn and heat stress negatively impact quality, but growers have traditionally regarded these as unmanageable factors. Research has shown that Surround® can improve quality and crop value.

Surround is a naturally occurring clay mineral, kaolin, used in many consumer products including toothpaste and cosmetics. Kaolin is mined from the earth and processed into superfine particles. When mixed with water and sprayed on walnut trees, the particles link together to form a protective white film that reflects the sun's heating infrared wavelengths as well as the burning ultraviolet rays, resulting in cooler trees and less sunburn. USDA apple researchers found that the material does not block the stomates and, in fact, increases photosynthesis. The material has also been shown to suppress codling moth and walnut husk fly and is OMRI approved for use in organic production.

Research conducted by Dr. Bruce Lampinen showed that Surround was effective in lowering leaf and nut temperatures and preventing sunburn damage in walnuts. Tiny temperature sensors, called thermocouples, were taped on untreated and Surround-sprayed sun-exposed leaves and nuts and temperatures were continuously recorded over a several day period in midsummer (see photo). Results indicated that exposed Surround-treated walnuts were 4–8°F cooler than untreated nuts, enough to keep them below the estimated sunburn damage threshold of around 122°F. Tem-

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peratures, of course, never get this high, but surprisingly, exposed walnuts were found to be up to 20°F warmer than the surrounding air.

Studies over a four-year period in Stanislaus County compared untreated and Surround-treated nuts in well-managed Vina, Howard, Tulare, and Chandler orchards. The quality of harvested nuts was evaluated by Diamond Foods, Inc. and showed that Surround improved the percentage of large sound, external damage, mold, offgrade and edible yield and increased relative value (Table 1).

Results varied among varieties and years. Quality and value increases were seen consistently in Vina. Improvements with Howard and Tulare were more variable while Chandler value was not

increased in any of the years. The material and application costs of multiple full-canopy sprays, however, can exceed the increase in crop value when calculated on a 60 cents-per-pound basis. Feasibility improves with increasing nut prices. In an effort to reduce costs, half-canopy sprays, applied to the south or west sides of the tree rows were evaluated. Results showed that Surround sprays applied only to the side of the canopy receiving afternoon sun were effective (Table 2).

For optimum protection, thorough, uniform and complete coverage is required for best results. Label rates for ground applications currently range from 25–75 lbs per acre in 100–200 gallons of water. In varying the amount of material and water, do not go under the effective dilution rate of 1 lb of Surround in 2–4 gallons of water. Spray trees to wet. Three applications of Surround at 50 lbs per 200 gallons of water per acre gave good results in Stanislaus County trials. Improve coverage by changing the direction of travel on alternate applications. For example, if you start in the first row and move east on the first application, alternate directions and start on the west side of the first row for the second application.

The label says to make the initial application before a forecasted damaging heat event. The trials indicated that in most years in the Central Valley, timing the initial application in early to mid-June works well. One application will not provide sufficient protection. Reapply Surround as needed to maintain sufficient coating during hot weather. In trial work, the intervals were determined by the degree of material weathering and high temperature forecasts. The second



Photo by Bruce Lampinen

Tiny temperature sensors were taped on treated and untreated leaves and nuts and temperatures were continuously recorded over a several-day period in midsummer.

application was typically made within 10 days to three weeks depending on conditions. Spray intervals between the second and third application ranged from three to four weeks. The total number of applications was limited to three per season, which in some years resulted in poorer coverage in mid-to-late August when damaging temperatures occurred. The label recommends repeating applications on a 21-day schedule, which ensures good coverage through August. With larger trees, experience shows that shutting off lower nozzles and directing the spray to the upper canopy improves

efficacy. On tall trees with exposed nuts only on the top of the canopy, three aerial applications at the rate of 30 lbs in 20 gallons of water per acre have given good results in non-trial situations. The label recommends aerial applications at the rate of 25–35 lbs of Surround WP in 25–35 gallons of water per acre.

A real benefit of Surround is that you can use it to evaluate spray coverage by assessing the evenness of the white coating on the trees. As with all materials, apply at label rates and consider a tankload of Surround in your next round of spraying.



Photo by Bruce Lampinen



Photo by Kathy Kelley Anderson

Thorough, complete coverage is required for best results. Photo at top shows the effect of incomplete coverage; photo above shows good coverage obtained by three applications of Surround at 50 lbs per 200 gallons of water per acre.

Table 1. The effect of full-canopy Surround treatments on nut quality and relative value of Vina, Howard and Tulare (2004)

| | Treatment | % Large | % Large Sound | % External Damage | % Mold | Relative Value |
|---------------|-----------|---------|---------------|-------------------|---------|----------------|
| Vina | Surround | 0.99** | 0.95* | 0.01 ns | 0.00 ns | 0.87* |
| | Untreated | 0.97 | 0.93 | 0.01 ns | 0.01 ns | 0.85 |
| Howard | Surround | 1.00** | 0.91* | 0.00** | 0.00** | 0.91** |
| | Untreated | 0.91 | 0.88 | 0.01 | 0.02 | 0.85 |
| Tulare | Surround | 1.00** | 0.90 ns | 0.00** | 0.00** | 0.96 ns |
| | Untreated | 0.96 | 0.90 ns | 0.01 | 0.01 | 0.94 ns |

Students Paired t Test **P ≤ .05 *P ≤ .10 ns=no significant difference

Table 2. The effect of full and half-canopy Surround treatments on nut quality and relative value of Vina, Howard and Tulare walnuts (2005)

| | | % Large Sound | % External Damage | % Mold | % Offgrade | % Edible Yield | RLI | Relative Value |
|-----------------------|------|---------------|-------------------|-------------|-------------|----------------|--------------|----------------|
| Vina Orchard 1 | Full | 82.1 a | Full 0.8 a | Full 0.0 a | Full 1.0 b | Full 48.4 a | Full 47.6 ns | Full 0.84 a |
| | Half | 82.8 a | Half 1.0 a | Half 0.0 a | Half 1.3 b | Half 47.8 a | Half 47.8 ns | Half 0.83 a |
| | None | 64.4 b | None 2.4 b | None 0.5 b | None 2.8 a | None 46.1 b | None 47.9 ns | None 0.80 b |
| Vina Orchard 2 | Full | 94.6 a | Full 1.3 b | Full 1.0 ns | Full 2.4 c | Full 48.8 a | Full 47.7 ns | Full 0.85 a |
| | Half | 87.6 b | Half 1.5 b | Half 1.3 ns | Half 3.9 b | Half 48.3 a | Half 48.2 ns | Half 0.85 a |
| | None | 84.6 b | None 5.8 a | None 3.3 ns | None 7.0 a | None 45.5 b | None 48.1 ns | None 0.80 b |
| Howard | Full | 91.6 ab | Full 1.9 ns | Full 2.9 ns | Full 6.0 ns | Full 47.2 ab | Full 50.0 ns | Full 0.86 ab |
| | Half | 94.4 a | Half 1.9 ns | Half 1.1 ns | Half 4.3 ns | Half 49.4 a | Half 49.8 ns | Half 0.90 a |
| | None | 88.9 b | None 3.0 ns | None 2.0 ns | None 6.7 ns | None 46.5 b | None 50.2 ns | None 0.85 b |
| Tulare | Full | 95.1 a | Full 1.5 b | Full 1.3 b | Full 3.3 ns | Full 51.7 a | Full 50.7 ns | Full 0.94 ns |
| | Half | 95.2 a | Half 1.4 b | Half 0.8 b | Half 3.7 ns | Half 50.7 ab | Half 50.7 ns | Half 0.94 ns |
| | None | 90.0 b | None 7.4 a | None 2.7 a | None 6.0 ns | None 49.5 b | None 50.6 ns | None 0.91 ns |

Mean values followed by the same letter are not significantly different ns = No significant difference

Duncan's Multiple Range test for mean separation (P ≤ 0.05)