



Surround® crop protectant for Plant Surface Protection



Change the nature of things. ■

ENGELHARD

Surround®

Crop protectant



Plant surface protection means better quality grapes for higher quality wines

Sunburn, heat stress and insects take a toll on wine grapes at predictable times nearly every year—and that can mean loss of wine quality. As part of a **planned** treatment program, Engelhard Surround® crop protectant can reduce sunburn and heat stress damage while suppressing harmful insect pests. Beneficial results can be a healthier vineyard with less damaged berries for higher quality wine.

Protection you can see. Performance you can trust.

Surround represents a breakthrough opportunity for plant surface protection. Surround covers plant surfaces with a protective white film—a layer of highly engineered kaolin particles that reflect harmful infrared and ultraviolet radiation. The advanced Particle Film Technology behind Surround crop protectant was co-developed by the U.S. Department of Agriculture and Engelhard Corporation, the world leader in surface and materials science.

Engelhard particle scientists designed the formulation specifically for its ability to:

- Reflect the sun's heat without inhibiting photosynthesis
- Provide good coverage
- Provide controlled adhesion to the plant canopy and fruit
- Provide strong insect repellency
- Mix easily in water and have negligible abrasion on sprayers

Reduce sunburn for better wine quality

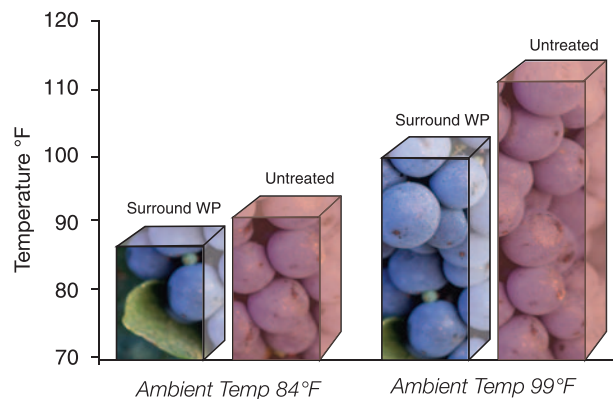
Although sunlight is beneficial to grape composition, excessive sun exposure can harm grapes. Depending on the intensity and length of sunlight exposure, and the variety and type of grapes, sunburn damage may range from faint browning to dark brown scalds accompanied by softening or even collapse of the berry. A study of Chardonnay wine quality showed that wine made from sunburned grapes was darker with bitter characteristics. Overall, sunburn significantly reduced wine quality.

Less heat stress means better color and flavor

Prolonged exposure to high temperatures and intense solar radiation can damage fruit and stress the entire plant. Studies show that when temperatures reach 100°F for more than six hours a day, anthocyanins in the berry skin are reduced. These higher fruit temperatures can result in reduced berry color and flavor, berry desiccation, and will aggravate sunburn.

Surround is proven to keep plants cooler. In trials where temperatures regularly exceeded 89 to 95°F, Surround reduced the temperature of treated leaves by 8 to 10°F.

The Effect of Surround® on Grape Leaf Temperature



Surround® reduces the leaf temperature of Cabernet Sauvignon leaves.

Excessive heat can also impair photosynthesis by causing plants to close their stomates. Studies have shown that under hot conditions, plants treated with Surround keep their stomates open longer. Microscopic gaps in the Surround unique protective film layer allow gases and water vapor to pass in and out unimpeded. Treated plants continue to photosynthesize at higher levels than the untreated. This can increase carbon fixation levels, leading to increased plant vigor, higher soluble solids (Brix) and color.

Surround® helps control leafhoppers and sharpshooters

The Surround protective film provides multiple mechanisms of protection against insect damage. Surround strongly interferes with leafhopper and sharpshooter feeding and egg laying. Surround works well against both variegated leafhopper and grape leafhopper; and against sharpshooters such as glassy winged (GWSS), blue green, and red headed sharpshooters. In several studies in California and Washington, leafhopper adult and nymph counts were significantly lower in blocks treated with Surround compared to untreated blocks. Best results are obtained when Surround is applied during the early stages of insect development and infestation. (For more information on sharpshooter and leafhopper use, contact us and ask for “Be Ready for Sharpshooters and Leafhoppers” brochure.)



Surround® forms a protective film layer on sprayed surfaces. The coating interferes with insect feeding and egg laying, so pests avoid treated surfaces. Spray throughout the season as needed to maintain consistent coverage.

Multiple benefits without compromising wine quality

Studies in California and Oregon demonstrate that Surround may enhance earlier sugars and has no adverse effect on pH, titratable acid, color, fermentation or wine flavor.

Table 1. Site I Merlot grape evaluation

| Treatment | Sept. 29, 2001 (Harvest) | | | Oct. 6, 2002 (Harvest) | | |
|-----------|--------------------------|-----------------|----------|------------------------|-----------------|----------|
| | Brix | Titratable Acid | Juice pH | Brix | Titratable Acid | Juice pH |
| Surround | 24.8 | 0.323 | 3.8 | 24.0 | 0.757 | 3.6 |
| Untreated | 24.8 | 0.317 | 3.8 | 24.0 | 0.713 | 3.6 |

Table 2. Site II Pinot Noir grape evaluation

| Treatment | Sept. 29, 2001 (Harvest) | | | Oct. 6, 2002 (Harvest) | | |
|-----------|--------------------------|-----------------|----------|------------------------|-----------------|----------|
| | Brix | Titratable Acid | Juice pH | Brix | Titratable Acid | Juice pH |
| Surround | 23.0 | 0.557 | 3.5 | 22.3 | 0.773 | 3.5 |
| Untreated | 23.3 | 0.557 | 3.5 | 22.6 | 0.663 | 3.4 |

Juice/Wine Harvest 2001 & 2002: No Differences were detected between treatments in color or flavor before going into barrel fermentation.

Apply Surround early for maximum plant surface protection

For protection against heat stress and sunburn:

Per label instructions, begin applying Surround early in the season, before a heat event. To protect against heat stress, the first application should be made after fruit set—typically around bunch closing. To lower costs, this application can be made at the same time as other products. A second application should be made within two weeks, depending on weather and the amount of Surround remaining on the plants from the first treatment. For sunburn protection, fruit and other plant surfaces should be thoroughly covered with one to two full-rate applications before conditions leading to sunburn occur. For improved berry coverage, use a surfactant. Ask your Engelhard salesperson for details.

For insect suppression:

Per label instructions, begin applying Surround at first sign of adult leafhopper or sharpshooter activity to disrupt feeding and egg laying. Repeat applications on a 7-14 day schedule depending on population pressure. This timing is also effective in reducing thrips feeding. To suppress summer leafhopper generations, make the first application as nymph counts reach economic levels and make a repeat application in 7-14 days if the population remains at economic levels.

Application recommendations

Surround can be applied using conventional application equipment, and Surround can be tank-mixed with fungicides or pesticides. Rates are 25 pounds per 50 to 100 gallons/acre.

- Calibrate sprayer and spray according to tree/plant row volume.
- Spray to “near drip” coverage (before the point of runoff).
- Reapply to reestablish coverage after heavy rain, wind, erosion or new growth.
- Always add Surround before other tank mix materials.

Surround residues

Surround is made from specially formulated kaolin, an inert, naturally occurring mineral that is used in cosmetics and toothpaste. Kaolin is approved by the Food and Drug Administration (FDA) for use as a food additive up to 2.5 percent.

Because the ingredients in Surround are inert, they do not affect juice or wine color or flavor. Any scant residues are filtered or settled out during normal processing.



From the world leader in surface and materials science

Surround is made by Engelhard Corporation, the Fortune 500 leader in surface and materials science. Together with our customers, we affect the world by cleaning the air we breathe, producing the fuels that power our cars and heat our homes, and bringing vibrant colors to life.

No wonder companies turn to Engelhard to change the nature of their products. They get results that change their markets and our world.



ENGELHARD

Change the nature of things.

Surround®. Protection You Can See. Performance You Can Trust.

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Important: Always read the label before buying and follow label instructions when using this product.



Surround WP is listed in the United States by the Organic Materials Review Institute (OMRI) and certified by the Washington State Department of Agriculture (WSDA) for use in organic production.

The use of Surround® WP in agricultural crop protection applications is covered by US Patents 6,027,740; 6,069,112; 6,110,867 and 6,156,327.

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