



ENGELHARD

Surround®

Crop protectant

One product protects against both UV and heat-caused sunburn—with superior performance you can see for yourself

Sunburn takes a toll on your apple orchards—possibly more than you realize. Even in a moderate sunburn season, the loss in value from unpackable fruit can be significant. You could be losing several hundred boxes of fruit per acre due to sunburn.

If you want to reduce losses as much as possible, you need a product that provides proven, effective protection against *both* causes of sunburn—heat and ultraviolet (UV) radiation. You need Engelhard Surround® crop protectant. Surround WP is proven to cut sunburn damage by 50% or more.

Surround is your best choice for protecting against both heat and UV radiation-induced sunburn damage—and it does so without leaving a waxy residue. Economical and easy to use, Surround can help increase fruit quality, plant vigor and marketable yields. And that can add up to greater profitability.

Surround® crop protectant represents a breakthrough opportunity for Plant Surface Protection

Growers should plan to apply before severe conditions set in and maintain coverage with reapplications throughout the hot season. The specially engineered kaolin particles in Surround protect fruit and leaves from damaging infrared (IR) radiation, which causes heat, and from ultraviolet (UV) radiation. The advanced particle film technology behind Surround crop protectant was co-developed by the U.S. Department of Agriculture (USDA) and Engelhard Corporation, the world leader in surface and materials science.

More advanced than other sunburn alternatives, including clear wax sprays and conventional whitewashes, Surround is specially formulated to:

- Reflect the sun's IR radiation (heat), thereby reducing heat-caused sunburn damage and improving conditions for photosynthesis
- Reflect the sun's UV radiation
- Provide controlled adhesion to fruit; yet wash off after harvest
- Provide protection against certain insects
- Be acceptable for organic production

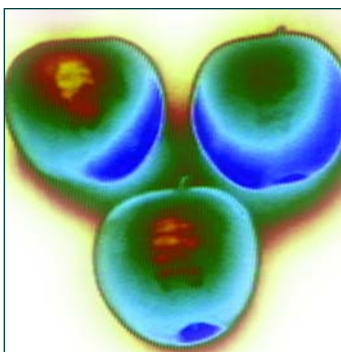
Proven protection against sunburn

Growers in the United States and elsewhere have used Surround for plant surface protection since 1999. Five years of independent studies—and widespread grower use around the world—show that Surround cuts sunburn damage by 50% or more, resulting in higher packouts of quality fruit.

The Surround particles also increase light scatter within the canopy, which can improve fruit color. Some other benefits observed have been reduced fruit cracking and russetting.

Sunburn scientists cite that high fruit temperatures are the primary cause of sunburn damage. Because fruit absorb the sun's heat, they typically are far hotter than air temperatures by midday. According to Dr. Larry Schrader of Washington State University, fruit temperatures of 114 to 120°F cause sunburn browning, and full necrosis will occur when fruit temperatures reach 126°F, even if only for 10 minutes.

Studies show that Surround WP crop protectant can lower apple skin temperatures by 10°F or more while Raynox™, a clear, wax-based product offers little fruit temperature reduction



The apple treated with Surround® WP (upper right) is cooler—and therefore less prone to sunburn damage—than either the untreated apple (upper left) or the apple treated with Raynox (bottom) which both show pronounced hot spots in this thermal IR photograph.

Surround WP can lower apple temperatures by 10°F or more, and leaves typically are 5 to 10°F cooler.

Engineered particles also protect against plant heat stress. Unlike clear, wax-based products, Surround protects against both sunburn on the fruit and heat stress on the plant. Consistent coverage with Surround can keep trees cooler, lowering canopy temperature and reducing heat stress. Ultimately, this can contribute to a net increase in photosynthesis and increased plant vigor.

In trials where temperatures regularly exceeded 90 to 95°F, Surround reduced the temperature of treated leaves by 7 to 10°F.

In light reflection measurement studies, Surround® WP crop protectant reflected significant IR and UV radiation

Treatment	Spray Applications	NIR Reflection %	UV Reflection %	UV Absorption %
Surround® WP (3%) (585 ug/cm ²)	3	27	41	0
Raynox™ (4%) (392 ug/cm ²)	3	2	0	9

When light was passed through slides on which crop protectants were deposited, Surround® WP crop protectant reflected substantially more Near Infrared (NIR) and UV light than Raynox. Surround WP reflected 27% of damaging NIR radiation and 41% of UV radiation.

In contrast, Raynox reflected only 2% NIR and no UV. In fact, unlike Surround WP, Raynox actually absorbed 9% of the UV radiation.

Only Surround WP combines effective protection with ease of use. Easily applied using conventional spray equipment, Surround is more convenient and ultimately more economical than competitive products.

Unlike wax-based products, Surround:

- May be tank-mixed and applied with almost all other pesticides and fertilizers so it does not require a separate application
- Does not require buffered water
- Won't settle during storage
- Is more easily removed from fruit after harvest (because it does not chemically bind to the fruit like wax-based sunburn products)

You can be confident that your coverage is thorough. Consistent, early, and thorough coverage gives the best results. With the Surround white particle coating, you never have to guess or wonder if it's working. You can see that your crops are protected—and know exactly when or if you need to reapply.

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Optimum coverage



Needs re-application



When it comes to coverage, the Surround® protective white particle film eliminates the guesswork. You can see whether you have achieved thorough coverage and when you need to re-spray.

No residual wax problem with Surround crop protectant

If you consider using a wax-based sunburn product, the wax will need to be removed from the fruit after harvest or you will have to decide in advance that the wax-treated apples will be sold to markets that will accept waxed fruit. That's not the case with Surround, which is acceptable for both organic and conventional agriculture. Fruit cleaning of Surround is best achieved with ample brushes plus overhead high-pressure water sprays.

Listed for organic use

Surround is listed by the Organic Materials Review Institute (OMRI) and the WSDA Organic Food Program for use in organic production. Approximately 15% of Surround is used by organic growers with 85% used by conventional or IPM growers.

You can have it all—with Surround

Engelhard Surround crop protectant gives you all the advantages: effective protection against sunburn and heat stress, easy handling, visible coverage, and easy removal at processing. That can all add up to better fruit—and bigger profits.

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

ENGELHARD

Change the nature of things.

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