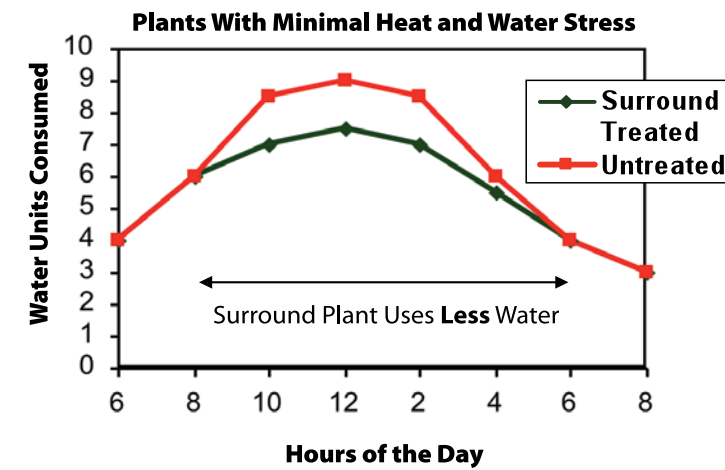


Less Extreme Conditions and/or a More Heat-Tolerant Plant

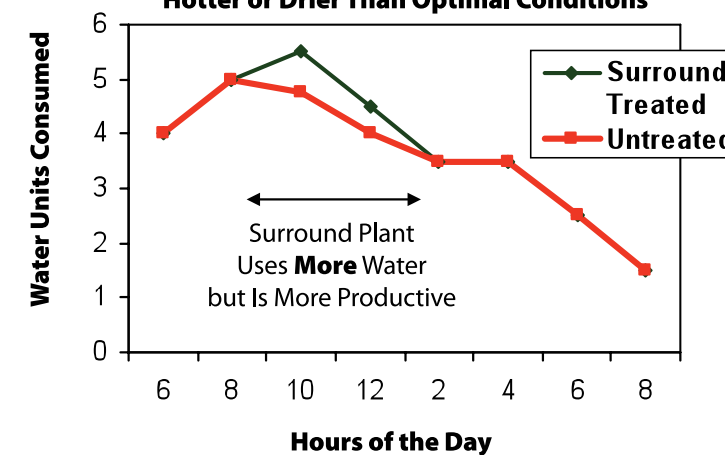
(Stomata closure is not reached by either the Surround-treated nor the untreated plant)



- Under these conditions the Surround-treated plant remains cooler all day and uses less water than the hotter, untreated plant. The environmental demand for water in the Surround-treated plant is reduced due to the lower canopy temperature.

More Extreme Conditions and/or a Less Heat Tolerant Plant

Hotter or Drier Than Optimal Conditions



- Under these conditions both plants get hot enough that their stomata close down because they cannot meet the environmental demand for water. But because the Surround-treated plant remains cooler, it reaches the shutdown temperature later in the day than the untreated plant. In this example the Surround-treated plant will use more water during midday but will be more productive and will suffer less damage.



Surround Test Plot in a California Vineyard.

Washing Considerations

Kaolin, the active ingredient in Surround Crop Protectant, is approved for use as a food additive at levels up to 2.5 percent, according to the United States Food and Drug Administration (FDA). It is also exempted from the requirement of a tolerance by the United States Environmental Protection Agency (EPA), under CFR 40, 180.1001(c).

Fruits and vegetables that are to be marketed fresh but have a white film of Surround remaining at harvest can be washed to remove the film. Though Surround is designed to have moderate adhesion to fruit surfaces, the film is normally removed with common washing techniques found in packing houses. Perform a wash test under your packing house conditions before applying Surround to fresh market fruit.

Field-packed fruit that will not be washed may be sprayed early in the season for heat stress. The sprays should be discontinued when the fruit are still small. The remaining film coating will eventually loosen and fall off due to the expansion of the fruit and from rain and wind attrition. This attrition will be more pronounced in rainy climates. Remember, when Surround sprays are discontinued and the crop begins to “grow out” of its protective coating, sunburn protection will be lost. Consult the Surround Wash Guide for more information.

Contact Us

For more information on Surround visit www.novasource.com or call 1.800.525.2803.



protection from sunburn

Surround®

Crop Protectant

protection from heat stress

plant health

improved water use efficiency

insect suppression



TESSENDERLO KERLEY, INC.
2255 North 44th Street
Suite 300
Phoenix, AZ 85008-3279

Customer Service:
1-800-525-2803

www.novasource.com

For more information visit www.novasource.com.

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

CONDITIONS OF SALE – LIMITED WARRANTY AND LIMITATIONS OF LIABILITY AND REMEDIES

Failure to strictly follow label directions may cause injury to crops, animals, man or the environment. Tessenderlo Kerley, Inc. (TKI) warrants that the product conforms to the chemical description on the label and is reasonably fit for the purpose referred to in the directions for use when properly applied in normal weather conditions. TKI makes no other warranty or representation of any kind, express or implied, concerning the product, including no implied warranty of merchantability or fitness for any particular purpose. The exclusive remedy against TKI for any cause of action relating to the handling or use of the product is a claim for actual out-of-pocket damages, and in no event shall TKI be liable for special, indirect, incidental or consequential damages or expense of any nature, including, but not limited to, loss of profits or income, whether or not based on the negligence of TKI, breach of warranty, strict liability in tort, or any other cause of action. TKI and the seller offer the product, and the buyer and users accept it, subject to the foregoing conditions of sale and limitations of warranty, liability and remedies.

Surround and NovaSource are registered trademarks of Tessenderlo Kerley, Inc.

©2009 Tessenderlo Kerley Inc. All rights reserved.

NSBRUS 08/09

Shielding Crops From Nature's Harmful Elements

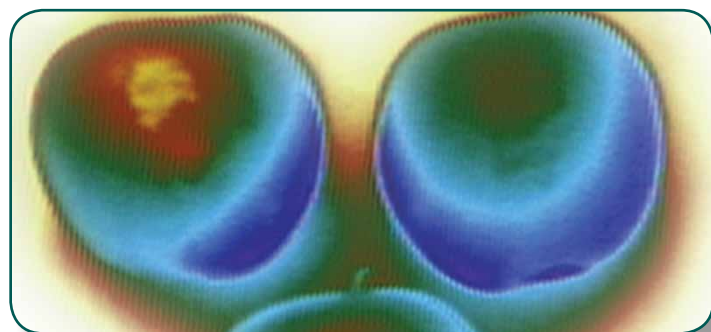
Surround Crop Protectant represents a breakthrough opportunity to improve plant health and maximize crop yields. Surround covers plant surfaces with a protective film – a layer of highly engineered calcined kaolin particles – providing protection from some of nature's most damaging elements and allowing the plant to achieve its full yield potential.

Developed in conjunction with the United States Department of Agriculture (USDA), Surround is an advanced plant health technology that can significantly reduce losses from sunburn and heat stress and can lead to greater rates of photosynthesis and potentially enhanced yields. And Surround protects crops from harmful insects.

Benefits of Surround

PLANT HEALTH

Light and heat are necessary for plant growth. Too much or too little light/heat can reduce crop growth and yield. When plants experience conditions outside their optimum temperature and light conditions, they expend energy to adapt. However, plants' adaptive mechanisms often are slow to adjust to environmental change. If conditions go too far beyond the optimum, critical plant processes can slow, and imbalances can occur that result in damage.



The apple treated with Surround (right) is cooler – and therefore less prone to sunburn damage – than the untreated apple (left), which shows a pronounced hot spot in this thermal infrared photograph.

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

One very sensitive process in the plant is photosynthesis. It has long been known that too much light can shut down photosynthesis, a phenomenon known as photoinhibition.

Excessive heat also has been shown to negatively impact photosynthesis. Work at the USDA and elsewhere suggests that there is an interaction between heat stress and light intensity in causing photosynthesis to be reduced or even shut down. When this happens, light energy, normally turned into plant nutrients such as carbohydrates, is instead wasted, and can even cause the development of free radicals that are damaging to the plant cells.



Surround Can Help Reduce Sunburn and Heat Stress in Two Ways:

1. Surround scatters light, greatly reducing the transmission of harmful ultraviolet and infrared light into the leaf.
2. Surround reduces leaf/canopy temperatures.

Benefits of Using Surround

- Achieve higher rates of photosynthesis in plants under heat stress.
- Keep plants cooler. A cooler plant may use less water.
- Reduce water stress, which can result in higher rates of photosynthesis and greater yields.

The net benefit is that more carbohydrates are available to be stored in the fruit and to build healthy roots and other structures, and less energy is used to maintain and repair damage. This is measured as increased fruit size, more yield, higher oil content, increased soluble solids and more vigorous plant growth. For perennial crops, one result may be a more vigorous, healthier plant, which is often not visible until the year after Surround treatment.

INSECT SUPPRESSION

Surround is an EPA-registered insecticide specially formulated with calcined kaolin to suppress insect activity. To be effective, Surround must be used in a preventative program and should be sprayed before the insect appears. Surround can reduce pest pressure and may delay or eliminate the need for a conventional insecticide spray. If pest pressure reaches an economic threshold then a knock-down insecticide should be used.

NINE WAYS SURROUND MAY SUPPRESS INSECT PESTS

1. Repellency
2. Impedes egg laying
3. Reduces feeding
4. Impedes grasping
5. Restricts movement
6. Camouflages the host - prevents host recognition
7. Alters behavior
8. Induces paralysis
9. Causes mortality

Surround Insect Suppression Benefits

- Protection from insect pests is provided when used preventatively.
- Integration into an IPM program can aid in the reduction in the use of knock-down, resistance-prone insecticides.



Surround particles on an adult psylla

How to Use Surround

- Surround should be applied before high temperature/high light conditions in order to be effective as a plant health and sunburn preventative product.



- As an insect repellent, Surround's suppressant activity is most effective when applied before insects enter the field, since one way Surround protects your field is by camouflaging your crop from infestation.

- Several applications are typically necessary for complete coverage and reapplication is dependent on:
 - the coverage obtained in each application;
 - the length of time protection is required; and,
 - the reduction in coverage over time from irrigation, rain, wind and expanding new plant growth.

Application Tips

- Apply Surround to near-drip. Avoid foliage run-off.
- Surround can be tank-mixed with most pesticides. When tank-mixing, always add Surround to the tank first. A pre-mix tank is suggested for sprayers without mechanical agitation.
- The use of additional surfactants can provide enhanced coverage.
- Surround can be applied aerially using standard aerial application equipment. Consult the product label or Spray Guide for more information.



Needs Reapplication



Optimum Coverage

EFFICIENT USE OF WATER



Question & Answer

Surround Crop Protectant also represents a breakthrough opportunity to improve the water use efficiency of plants growing under conditions of high light and heat. This improved efficiency often results in improved photosynthesis, plant health and plant performance.

How Does Surround Affect Water-Use Efficiency in Plants?

Three general environmental factors affect the "demand" for water: light, temperature and relative humidity. If a plant can meet the environmental demand for water, there is no stress and the plant is very productive. However, if the plant is unable to meet the environmental demand for water, then varying degrees of stress will develop. The determining factor for whether a Surround-treated crop uses more or less water relates to if, and for how long, the plant shuts down and restricts water loss. With stomata closed, a plant will use less water, but it will also be less productive and potentially suffer damage.

When conditions are extreme, the plant's natural defense mechanism closes stomata to conserve water, and photosynthetic processes are shut down or reduced accordingly. During this period the plant is undergoing significant stress, including cell damage as sunlight continues to deliver energy that the plant's cells cannot productively absorb. During extreme conditions, entire cells and whole leaves can be killed. Or with lesser damage, the plant expends energy to repair the damage.

A Surround-treated plant will be cooler than an untreated plant because Surround reflects substantial amounts of infrared radiation. If treated and untreated plants remain below the temperature – or environmental demand – at which they will close their stomata, the Surround-treated

plant will use less water. This is because plant water loss increases dramatically with plant temperature (and the Surround-treated plant will be cooler all day compared to untreated plants).

However, if the Surround-treated plant is at a temperature below such a shutdown temperature threshold and an untreated plant is over the threshold and cannot meet the environmental demand, the untreated plant will use less water for the time period during which its stomata are closed, while those of the Surround-treated plant will be open. This might be for minutes or a few hours per day; however, during the rest of the day the Surround-treated plant will use less water than the untreated plant. And during the time of plant shutdown, significant plant stress and damage can occur in addition to the plant being non-productive.

Does a Surround-Treated Crop Use Water More Efficiently?

Yes, Surround enables the plant to withstand more severe ambient temperatures, therefore prolonging the period in which photosynthesis can take place. When photosynthesis is occurring, the plant continues to use water. In addition, the treated plant continues to grow and manufacture carbohydrates, thereby enhancing its potential for maximum yield.

How Do I Calculate the Effect of Surround on My Crop?

A theoretical example may help explain this phenomenon of how efficiently water is used. Calculating the exact benefit is difficult because conditions vary from hour to hour and day to day.



The above photo shows the increase in leaf turgor between the leaf from a Surround-treated tree (right) and the leaf from an untreated tree (left).