

SUNCROPS PLUS™ USER GUIDE

ABIOTIC STRESS MANAGEMENT TECHNOLOGY



SUNCROPS PLUS the latest generation Nutriprove™

SUNCROPS PLUS heat stress and sunburn management

Heat and light stress are economically important problems in agricultural production primarily in hot climate countries although even in more temperate regions, wide fluctuations in temperature or light intensity, can lead to significant damage to plant tissues. Heat and light stress cause losses by reducing overall plant productivity and quality.

The most commonly observed symptoms are wilted or otherwise unhealthy looking plants and physical injury to limbs, leaves and fruits, generally referred to as "sunburn". These symptoms are caused initially by damage to the photosynthetic apparatus, followed by damage to other tissues. Even if a plant looks healthy, heat and light stress can reduce or completely halt photosynthesis, leading to loss of productivity.

Water stress is complex and is intricately involved with heat and light stress. Shortage of soil water can initiate and exacerbate heat and light stress. When soil moisture is limiting, a plant's ability to cool itself through transpiration, is impaired. Stomata are closed and leaf temperature increases. The photosynthetic machinery closes down and the plant is no longer able to process the light energy entering its cells. This leads to photo-inhibition, a build-up of free radicals (oxidants) and ultimately to tissue destruction and cell death i.e. the symptoms of heat and light stress damage.

In the case where heat stress is initiated by high temperature, the plant will attempt to cool itself by means of increased transpiration. Once the soil moisture becomes limiting the same sequence of-events as described above will take place.

When to apply SUNCROPS PLUS

Using SUNCROPS PLUS for Heat Stress & Sunburn Reduction

SUNCROPS PLUS, may increase plant vigor, total yield and quality in many crops. Under high ambient temperatures, SUNCROPS PLUS reduces canopy temperature, reducing heat, light and water stress.

The reduction of stress results in increased fruit quality e.g. (TSS/Brix) and fruit size. Other benefits include improved color and reduced russet, fruit drop, sunburn and cracking. Best results are obtained from the "Season Long" treatment program. Using SUNCROPS PLUS for Late Season Sunburn Management:

Apply to sunburn-prone fruit, leaf, limb and trunk surfaces before conditions leading to sun damage occur. Apply the initial application at the full rate and a second at the half rate, at no more than a 10 day interval. Subsequent applications may be made at the half rate (but do not reduce volume). Depending upon the length of the heat period, repeat applications may be needed at intervals of 15 to 21 days.

Using SUNCROPS PLUS for Heat Stress Management (Crop Water Use Management):

For heat stress reduction, spray plants with a full rate of SUNCROPS PLUS based upon the "Season Long" rate schedule found in the crop tables on pages 4 and 5. Make subsequent applications to maintain film coverage and to treat new growth. These applications also help reduce crop water usage by reducing crop temperature and transpiration. SUNCROPS PLUS reflects damaging UV and IR radiation and heat, while still allowing photosynthesis and the uptake of nutrients and crop protection products. Independent trial results indicate that the use of SUNCROPS PLUS can reduce transpiration and improve soil moisture status by as much as 30%.

SUNCROPS PLUS directions for use

General Information

SUNCROPS PLUS has two modes of action for the protection of crop plants against abiotic stress. The first is a visible particle film that reflects harmful UV and IR light, reducing the temperature of the plant. The second is a naturally occurring compound, found in all crop plants, that triggers the innate stress response mechanism. When SUNCROPS PLUS is applied to plants, a visible, grey film results. For best performance a thorough, uniform, and consistent coverage is essential throughout the stress period.

Rates:

For tree crops: unless otherwise specified in crop instructions, use 12,5 Kg of SUNCROPS PLUS per ha, in 1000 lt of water, using sufficient spray volume to obtain thorough, near-drip coverage.

For field grown vegetables: use 8 a 12 kg per ha. Apply an additional spray if coverage is insufficient. Spreading on waxy plant surfaces is usually better when the plant surface is warm.

Application timing: SUNCROPS PLUS can be used anytime from planting through to Post Harvest. If visible residues at harvest are a concern, refer to the instructions under "*Post-harvest Packing and Washing Directions*".

Plant Response Precautions: SUNCROPS PLUS keeps plant surfaces cooler and an advance or delay in maturity may result. Pome and stone fruit may have maturity delays of 3 to 7 days, especially in cool regions or cool seasons.

Mix Instructions

For Agitating Sprayer Tanks (conventional, electrostatic and aerial sprayers)

1. Slowly add SUNCROPS PLUS into the water in a recirculating sprayer tank, making sure to keep agitation brisk. Sprayer tanks with strong agitation are preferred. A pre-mix tank may speed up loading operations if the sprayer does not have mechanical agitation. Add SUNCROPS PLUS directly into the mix basket if pump recirculation empties into the mix basket. If there is no mix basket, add SUNCROPS PLUS very slowly to the recirculating water. Avoid dumping SUNCROPS PLUS directly into the pump intake area as this could plug the filter or intake. Mix thoroughly.
2. Add tank mix pesticides and adjuvants after the SUNCROPS PLUS.
3. Continue agitation until the tank is empty.
4. At the end of the application flush system and nozzles with fresh water. Periodically check in-line strainer and clean if necessary. Properly dispose of rinse water.

For Non-agitating Sprayer Tanks, Such as Handheld and Backpack Sprayers

The following mixing sequence must be followed:

1. Use SUNCROPS PLUS at a rate of 1oz to 4oz of SUNCROPS PLUS per gallon of water. For sprayers those are difficult to shake, premix in a bucket per the directions below and pour suspension into sprayer.
2. Fill the sprayer to 1/4 - 1/2 full. Add SUNCROPS PLUS. Close top and shake vigorously. Add remaining water and shake to mix, as well as to break up any remaining small clumps of SUNCROPS PLUS, if found. It is not recommended to fill with a hose or shake the container while SUNCROPS PLUS is floating on top of the water.
3. Mix thoroughly by shaking the closed container vigorously for 30 seconds.
4. Add tank mix pesticides and adjuvants after the SUNCROPS PLUS.
5. Add the remainder of batch water and shake the closed container for an additional 30 sec.
6. If sprayer is motionless for 1 minute or more, shake sprayer to agitate product.
7. At the end of the application, spray until empty and flush system and nozzles. If not empty, blow air pressure out of the line and nozzle (usually by upending) and store in a cool place. Apply any leftover mix within two to three weeks to avoid spoilage. Rinse the sprayer and allow drying before the next batch. Heavy rainfall, new growth, and wind erosion will affect film quality. Reapply to re-establish coverage after heavy rain as soon as the foliage is dry. Avoid excessively thick coatings.

Foliage Dryness: Applications to wet foliage can cause inadequate film formation as well as excessive run off.

Under Hot, Dry Conditions: Under very hot and dry conditions, increase volume of water and droplet size to improve deposition.

Spray Methods: Air blast, high-pressure handgun, or boom sprayers provide the best results. For best results, use narrow diameter nozzles and high pressures to produce a light mist-like spray with fine droplets that will form a uniform film on the treated plant surface. At given concentrations, the flow rate of suspended SUNCROPS PLUS is similar to water. Strainers, preferably no finer than 40 mesh, in the spray system and behind each nozzle per normal practice helps to reduce nozzle clogging. A visual inspection of film deposition and completeness of coverage is crucial for fine tuning spray coverage.

Overhead Irrigation and Overhead Cooling: Do not apply SUNCROPS PLUS through any type of irrigation system. Overhead irrigation or cooling is not preferred over SUNCROPS PLUS treated surfaces due to the possible deposition of calcium carbonate from hard water that may form residues that are hard to remove in the pack house.

Use rates and comments

Crops	Rate	Comments
Tree crops	<u>Season long</u>	Apply in a water volume according to the tree row
Pome and stone fruit, nut crops, olives, grape wines, small fruits.	a) Apply 10 Lbs/100 gals water every 15-21 days beginning at petal fall (cap fall) if rainfall or high temperatures occur, re-apply.	Volume. Prior to the first heat event. On hard wet foliage and grape wines add a non-ionic surfactant. the same at low rate of SUNCROPS PLUS and at high water volume to the tree row volume. Prior to the first heat event.
Tropical and subtropical crops avocado, banana, mango, Papaya, Paw paw.	<u>Late season program</u> a) Initial application 20 Lbs/100 gals.	Make applications 14 days apart beginning at petal fall (cap fall).
Nursery and ornamental plants.	b) Subsequent applications at 15 day intervals at 5-10 Lbs./100 gals. (5 lbs/gals in citrus)	Cherries, stone fruit; apply only early season, up to 1/2 to 1 inch fruit diameter or post-harvest. Is recommended to apply with turbo sprayer and
Citrus		"tower". Use the sprayers available depending on the size of the orchard and the size of the trees

Field crops Peppers, Tomatoes potatoes, onions, cucurbits such as cucumber, squash, pumpkin, melon and watermelon.	<p><u>Season long</u></p> <p>a) 6 Lbs/acre beginning just prior to flowering.</p> <p>b) Re-apply at 15-21 day intervals.</p> <p>Sunburn and heat</p> <p>a) Initial application 20-25 lbs/acre.</p> <p>b) Subsequent applications 12 lbs/acre at 15-21 day intervals.</p>	<p>Apply the first two applications 14 days apart and prior to the first heat event and should be reduced if crop growth is rapid .</p> <p>Increase the volume of water used throughout the season based upon plant size.</p> <p>Re-apply at 10 day interval as required to maintain and even coverage on the fruit and foliage.</p> <p>For transplant shock reduction, apply at 10 lbs/acre to plant in trays.</p> <p>Cucurbits apply to smooth-skinned cucurbits only</p> <p>Ensure that fruit is well covered for greatest sunburn reduction.</p> <p>DO NOT TREAT TRANSPLANTS BY DIPPING</p>
Vegetable seedlings		
Pineapple		
Cotton		
Peanuts		



SUNCROPS PLUS

Traditional kaolin treatments



SUNCROPS PLUS



Untreated

Post harvest washing directions

Crops that will be processed

Thorough washing is not generally required for crops to be processed, as light traces of SUNCROPS PLUS do not affect the quality of processed products. Crops for which the skin or treated surface is removed during processing, generally do not need to be washed. Check with the processor before using SUNCROPS PLUS to ensure that treated produce is acceptable for processing.

Crops for fresh market

Post-harvest washing is required unless only early-season applications are made and no traces of SUNCROPS PLUS are present at harvest. Most traces of SUNCROPS PLUS can be washed off with packing line brushing and forced water sprays. First time users it is suggested that a small-scale field application and post harvest film removal trial be conducted before commercial use on fresh market crops to determine if any remaining traces of SUNCROPS PLUS can be fully removed.

Traces of SUNCROPS PLUS may still be visible after washing, particularly in difficult to brush areas of the produce e.g. calyx, stem end, creases etc. and modifications to the packing line can be made to improve film removal: e.g. higher pressure nozzles and different nozzle types; warm water; a longer soaking period in the dump tank; use of different brush types, including longer-haired or sculpted brushes; adjustment of brush rotation speed; using overhead brushes; using a

blanket over the top of the fruit on the brush bed to increase downward pressure and improve penetration of the bristles into hard to reach areas; increasing the number of brushes in the brush bed. Reducing the speed of the packing line to increase the residence time of the fruit on the brushes and under the high pressure water sprays.

Produce that shows traces of white film after a single pass through the washing process can be washed again. Post-harvest waxing further improves fruit appearance.

The use of a fresh produce washing detergent that is labeled for use in the packing line and/or wash tank may assist in film removal. The detergent must be approved for this purpose by the relevant authorities and potential buyers.

For fresh market crops that will not be waxed or if the washing system is inadequate to remove all traces of SUNCROPS PLUS: Unless washing facilities are adequate, cease applications sufficiently in advance of harvest to allow residue to weather off completely.

For field packed crops and fresh market crops that will not be washed and remaining SUNCROPS PLUS film would reduce crop value: Do not use this product. Special washing considerations for stone fruit: Special washing is required for fresh market stone fruit, especially for fuzzy peaches.

Most traces of SUNCROPS PLUS will wash off with brushing and forced water sprays. Use of an approved fruit cleaning detergent may improve results. Prior to brushing, a pre-soak in approved fruit cleaning detergent is needed for fuzzy peaches.

A pre-harvest washing trial is recommended as a means to determine if a detergent is necessary. If fresh market peaches cannot be washed as noted above, discontinue SUNCROPS PLUS sprays when the fruit are approximately 1 inch in diameter. Residues of SUNCROPS PLUS do not affect processed fruit quality.

SUNCROPS PLUS™ Packaging:

SUNCROPS PLUS is available in 25 kg paper bags. Dispose of empty bags at an approved land fill site or according to local authority guidelines. SUNCROPS PLUS™ is a registered trademark of Nutriprove S.A.

More protection

- Increased photosynthesis
- Increased carbohydrate
- Increased quality & yield
- Improved Brix/TSS
- Reduced flower abortion
- Crops shed less fruit
- Reduced bi-annual bearing

SUNCROPS PLUS reduces sunburn

- Increased marketable yield
- Improved skin color
- Less russet
- Improved internal fruit quality
- Higher pack outs
- Lower grading costs

DOUBLE ACTION PHYSICAL AND PHYSIOLOGICAL PROTECTION

SUNCROPS PLUS keeps crops cooler, cooler crops use less water

- More efficient water use (less used for cooling and more for photosynthesis)
- Up to 30 - 40% reduction in potential water use
- Improved sustainability of deficit irrigation
- Reduced impact of soil moisture deficits

Nutriprove S.A.; researches and develops technologies for the management of environmental stresses in crop plants.

Nutriprove's products are tools that allow farmers to cost-effectively reduce losses in yield and harvest quality that result from plants being exposed to excessive heat, cold, light, or suffer from a shortage of water in combination with excessive heat and light.

Abiotic stresses cause 50-60% of all crop losses in modern agriculture.

For further information visit:

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