

USE GUIDE SCALDFREE®

SCALDFREE; handling postharvest physiological disorders in apples, with an impact on fruit storage



SCALDFREE, new technologies Nutriprove SA®

Many cultivars of apples may develop symptoms associated with $T^{\circ} s$ storage at below $5^{\circ} C$.

They alter the permeability of cell membranes, causing release of solute accumulation of toxic compounds and modifications, loss of enzyme activity. Finally, cell disruption occurs and the occurrence of damage.

Among the manifestations to cold stress, find browning of pulp and skin. In the pulp can be diffuse ("low temperature breakdown" left photo), or located in the area near the carpels ("core flush" right photo). In the skin lesions appear brown-edged ("soft scald") or diffuse browning as superficial scald (pictured below).

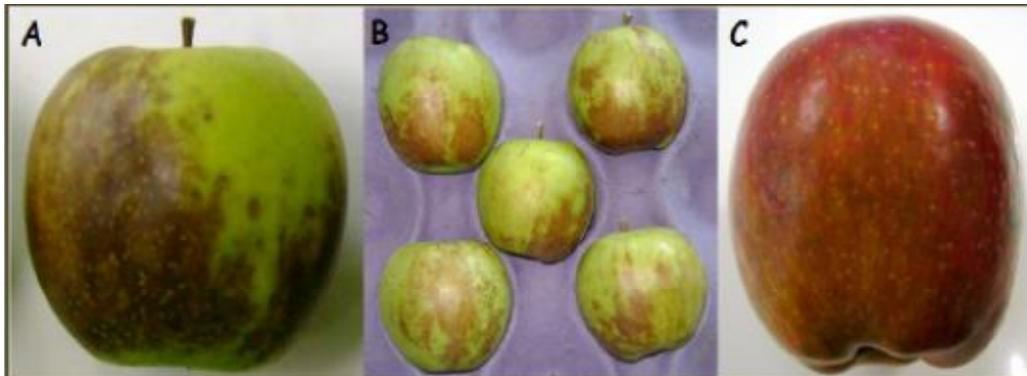


Some varieties susceptible to cold, like McIntosh, Yellow Newtown, Cox's Orange Pippin, Jonathan, Grimes Golden and Granny Smith and Pink Lady.

The superficial scald is one of the most detrimental physiological disorders in apples and pears. Thus, the cultivars. Granny Smith, Fuji and Red Delicious apples and Packhams, Triumph, Anjou and Bartlet pears, are most affected.

Granny Smith in Chile is undoubtedly the most susceptible and the one with the highest incidences commercially. Oxidative damage is superficial, so it usually does not compromise the pulp of the fruit appears as brown spots

on the skin. And appear during the exposure period in supermarket, post cold stores (A, B, C).



The situation that complicates the postharvest handling of these varieties, as the T° s that cause damage are those with which you get the greatest benefits in terms of decreasing the respiratory rate, and thus prolong storage.

We have designed strategies that would help to reduce the incidence of these abnormalities. Among these, we can say: flashing T° ("intermittent warming"), that is, the alternation of storage ($0^{\circ} C$), with short high T° (for example, cycles of 5 days at $15^{\circ} C$), but the commercial application of this technique is difficult, given the risks of condensation of water on fruit delay development and progress in maturity, and slow or gradual cooling ("delayed cooling" or "step wise cooling"), which consists in lowering T product $^{\circ}$ gradually until you reach the desired, within a certain time. This procedure would give the fruit time to develop defense or tolerance mechanisms that protect against low temperatures.

Of the symptomatology mentioned under our conditions the highest occurrence correspond to internal browning in Pink Lady (left) and superficial scald in Granny Smith.

Also, it has been observed a darkening level pedicle, which usually is associated with the pulp browning under this zone. Such alteration is called browning peduncular (right).



When applying SCALDFREE

Preventing superficial scald in both apples and pears is until today almost exclusively carried out using synthetic antioxidants, when applied to crops. The Diphenylamine (DPA) is registered for use on apples and pears in most producing countries these species. In USA have a record for use on apples since 1960.

By contrast, and depending on the market pears, DPA or ethoxyquin is applied, which is less phytotoxic to this species. In Chile ethoxyquin is not registered for use on fruit.

DPA inhibits the oxidation of alpha-farnesene in TC, avoiding the occurrence of damage during and post-storage.

Other post-harvest handling to reduce scalding, are guards in controlled atmosphere (CA) and ULOS (Ultra Low Oxygen, dynamic controlled atmosphere (ACD)), application of 1-MCP (under certain conditions of maturity); handling temperature in storage. They exert varying degrees of control of disorder, in some cases to higher costs or unwanted side effects. Storages in atmospheres with even lower concentrations of O₂, such as ACD, presented more effective not only for reducing the oxidation of alpha-farnesene, but also for reducing ethylene biosynthesis, which is affecting its synthesis and accumulation of TC. These technologies could potentially produce fruit internal disorders as a result of low levels of O₂.

Research has shown the effectiveness of 1-MCP in controlling superficial scald. This is due to the close relationship between ethylene and synthesis / accumulation of alpha-farnesene, mentioned above. 1-MCP conduct its action through ethylene gas.

There are several studies on the effect of various natural antioxidants such as vitamin C and E, in the development of superficial scald. However, effective results are variable and less than necessary to replace commercially DPA.

For some years now there is concern worldwide for the use of DPA, given its synthetic nature and potential negative effects on human health. The November 30, 2009, the European Union (EU) rejected the inclusion of DPA in Annex I of the directive of products for the protection of plants (91/414/EEC), because it was not possible to make a reliable assessment of the effect of DPA on human health. That, given the presence of unidentified metabolites of the substance, with the possible formation of nitrosamines (which could cause chemical carcinogenicity) during storage of the active substance and then treated apples. Furthermore, no data were available about the possible degradation products or the reaction of DPA residues in processed commodities. It was concluded that all assets with DPA.

For these reasons, the use of natural products as SCALDFREE is a need for the market.

Using SCALDFREE

Complexes of dicarboxylic acids and glycine betaine, work by reducing or attenuating the browning phenomenon and delaying the ripening process, presenting less degradation of chlorophyll and carotenoids.

Also acts to promote protein synthesis and phenols, protecting the photosystem II. The action level is SCALDFREE osmotic adjustment, membrane stabilizing, so it does not trigger metabolic disturbances caused by cold.

SCALDFREE, indications for use

General Information

SCALDFREE is a product of vegetable organic origin, which acts on the metabolism of the plant, reducing the effect of stress periods

SCALDFREE, further containing a naturally occurring compound, that acts as bio-stimulant in situations of low-temperature stress.

SCALDFREE when applied to plants, the visible result is an odorless and colorless translucent film. For best results in protection against low temperatures, it is important to achieve good coverage and uniformity throughout the period of susceptibility, accompanied by a sequence of application, as indicated on the label and data sheet.

Dose

Unless otherwise specified in the instructions for use are:

Start applications with fruit ripening, use SCALDFREE; 500 g per hectare, 1,000 liters of water, repeating every 14-21 days until 10 days prior to harvest.

Mixing Instructions

SCALDFREE; add in the spray tank with recirculating water, making sure to maintain vigorous stirring. Spray tanks are preferred with strong agitation.

For optimal use of the product, it requires the use of surfactants to achieve a better distribution on the blade. For this purpose, nonionic surfactants are recommended or organo-silicone. Additionally, we recommended applications to slightly acidic to neutral pH (pH 5.5 to 7.0).

At the end of the application and flush the system with fresh water sprinklers, periodically check that the filter is clean and clean if necessary. Then discard the water used, according to local regulations.

It is not recommended to reapply after heavy rains but prefer to apply without high humidity conditions or rain.

Applying, just the foliage is dry.

SCALDFREE, is compatible with other chemicals in a mixture, however compatibility tests are recommended. Application to wet foliage, are not recommended for effectiveness and excessive runoff. Under hot, dry conditions, it is recommended to increase the volume of water and the droplet size to improve the deposition.

Spraying methods

Air blast sprayers, high pressure spray guns, or more turbo tower, in all cases, for best results; Use of low diameter nozzles and high pressures to produce a fine droplet spray to form a uniform film on the surface of the treated plant.

A visual inspection of the film deposition (immediately after application) and uniformity of coverage is vital for good performance of the product.

Dose and comments

Crop	Dose	RECOMMENDATIONS
Pome	<p>500 gr / (volume of water applied) / Ha.</p> <p>Ex: 500 gr/1000 L of water per hectare) per application.</p> <p>Applications must be repeated every 14-21 days at the same dose of 500 g / ha.</p> <p>first applications, from the period of fruit set fruit on until 10 days before harvest.</p>	<p>In all varieties, start with fruit low size (1 mm).</p> <p>Ideal, applications 5-8, in the season. Depending on the length of the phenological period of the variety and their susceptibility to have postharvest physiological disorders.</p>

Postharvest; washing

No washing required after harvest, the fruit no waste.

SCALDFREE™, is available in bags or jars of 2.5 kg. It is important to discard the bags or empty containers in an approved location according to local authority guidelines.

SCALDFREE™ is a registered trademark of SA Nutriprove

Nutriprove SA, researches and develops technologies for the management of environmental stress in fruit trees, vegetables and vineyards.

The products developed by Nutriprove SA, are tools that allow farmers to profitably reduce losses in yield and quality of crops that are exposed to environmental conditions of heat, cold, radiation, or suffer water shortage. In combination abiotic stresses are the cause of 50-60% of the yield losses in modern agriculture.

For more information visit: www.nutriprove.com