

Why use it with your defoliant



D-C-Tron[®] Cotton is the benchmark spray oil for Dropp[®] Ultramax, Etee[®] and Resource[®] cotton defoliants. This Tech Note explains how D-C-Tron[®] Cotton works and why it is a crucial part of your defoliation program.

Defoliation

An efficiently performing defoliant should drop, or abscise, green leaves from the plant without browning or “freezing” them onto the plant - the cleaner the drop, the cleaner the pick and the happier the gin.

Defoliation might need several applications depending on how dense the canopy is and how much penetration is achieved by the first application. In effect, defoliation is done in layers, as the uppermost leaves are removed to clear a direct pathway to the lower parts of the canopy for subsequent applications.

How do defoliants work?

Being hormones, defoliants drop leaves by stimulating the activity of enzymes located within the abscission zone of the leaf stem. Older leaves, being closer to natural fall, are easier to drop than young leaves. Regrowth is younger and greener again and so is even harder to drop cleanly from the plant.

To act, the defoliant's active ingredient must get inside the leaf. It can penetrate either through open stomata or directly through the leaf cuticle but this is problematic without a good adjuvant.

The leaf cuticle

The leaf cuticle forms the protective boundary between the epidermal cells and the atmosphere. Cotton leaves have a striking appearance when viewed through an electron microscope. Their long cuticular folds are arranged in parallel rows (Figure 1a) and consist of cutin interspersed with wax molecules which are encrusted onto the epidermis.

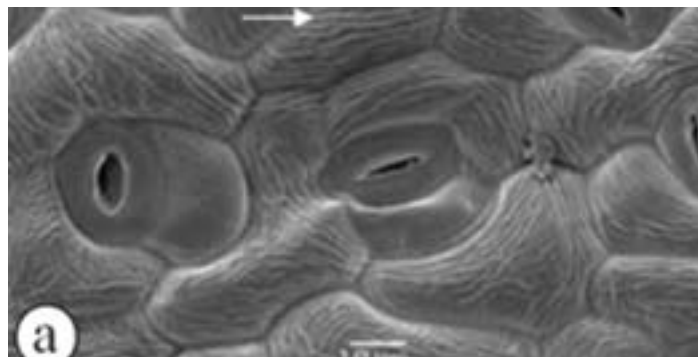


Figure 1a: The long cuticular, parallel folds of cutin interspersed with wax molecules of an unsprayed cotton leaf.

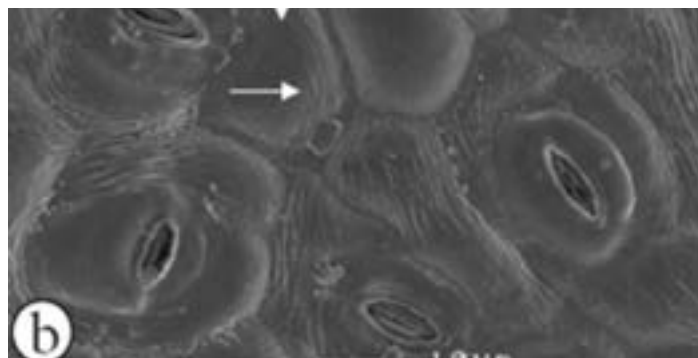


Figure 1b: When sprayed with D-C-Tron[®] Cotton, the cuticular folds protecting the leaf are disrupted and made more fluid for easier defoliant penetration (see text below).

What conditions affect defoliant performance?

Cuticular waxes

The foliar uptake of chemicals is strongly influenced by the properties of the cuticular waxes. Wax structures are affected by temperature, light intensity and humidity. The waxes in a cotton leaf consist of a variety of components and so they gradually liquefy over a wide temperature range. Waxes become less fluid, and therefore harder to penetrate, as the temperature falls.

Water logging

Water-stressed cotton has been found to produce higher levels of cuticular wax than unstressed cotton. Because the roots of water logged cotton shut down in anaerobic conditions, field inundation can produce water stressed cotton just as if drought conditions prevailed.

Water stress

Plants under stress do not function efficiently so their response to hormone stimulation is suppressed. So for best performance the moisture in the soil should be balanced – not so much that new growth is stimulated and not so deficient that the plant is water stressed. Defoliation timed for when the next irrigation would be due is ideal.

Humidity

Low humidity closes stomata and dries spray droplets quickly. (Technical thidiazuron, the active ingredient in Dropp[®], is a solid at room temperature and solids don't penetrate cuticles very well.) So applying the defoliant with some humidity left in the atmosphere is another good aim.

Nutrients

Residual nitrogen and moisture in the plant system can affect defoliation performance as they can counteract the effect of the defoliant in stimulating abscission zone enzymes.

How does D-C-Tron[®] Cotton aid defoliant performance?

D-C-Tron[®] Cotton acts in several important ways to assist the defoliant's active ingredient:

- It improves droplet deposition on the leaf
- It improves coverage of the leaf by spreading and wetting the leaf surface.
- Once the water from the droplet has evaporated it maintains the deposit in a fluid state which improves the chances of the active mixing with the cuticle (Figure 1b).
- By limiting the heat transfer capacity of the leaf, it increases leaf temperature making the cuticle more pliable than it otherwise would be, and
- It interacts with the epicuticular and cuticular waxes of the cuticle and causes alterations to their structure resulting in a loss of cuticular integrity allowing penetration of the active ingredient into the leaf (Figure 2).

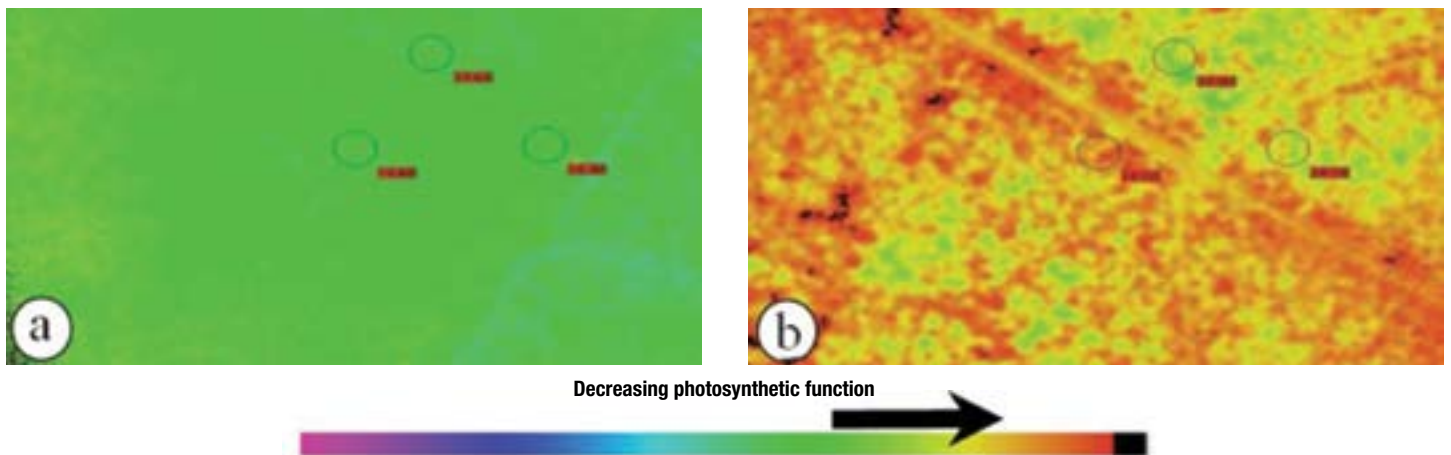


Figure 2: The photosynthetic function of a leaf can be measured using a device called an Imaging-PAM. This study shows that a previously unsprayed cotton leaf immersed in a solution of the active ingredient of Dropp[®] (a, LHS) has no disruption to the cuticle after 9 minutes exposure while a leaf sprayed with D-C-Tron[®] Cotton (b, RHS) and then exposed to the Dropp[®] solution demonstrates comprehensive action within the same timeframe.

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D-C-Tron[®] Cotton
SPRAY OIL

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