

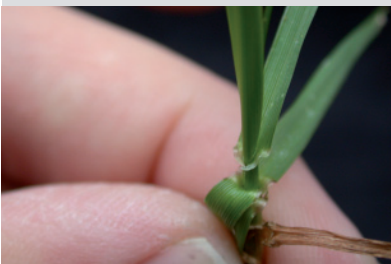
# Understanding spray oils, surfactants and other adjuvants

Adjuvants are materials added to herbicide tank mixes to improve the performance of the spray mixture. Adjuvants can minimise or eliminate many spray application problems associated with herbicide stability, solubility, incompatibility, suspension, foaming, drift, evaporation, degradation, adherence and penetration.

## Spray oils and crop oil concentrates

Spray oil adjuvants are combinations of petroleum oil and a low level (<5%) of surfactants (e.g. D-C-Trate®).

Crop Oil Concentrates (COCs) are combinations of high levels (>15%) of surfactants with either petroleum (e.g. D-C-Trate® Advance) or esterified seed-crop oils (e.g. Rocket®). In this way, it is possible to get the advantages of both oil and surfactant in the one formulation. The type and level of surfactant added to oils can significantly affect performance.



## Surfactants

Surfactants, also referred to as wetting agents and spreaders, are 'soap-like' molecules which work as adjuvants by changing the surface tension of a spray droplet. They allow lipophilic and hydrophilic substances to mix readily to form an emulsion. The most common type used are non-ionic block copolymers of fatty alcohols, alkylphenols and amines. Silicon based 'superwetters' are very effective at lowering surface tension. Anionic surfactants like phosphate esters, can act as buffering agents.



## Specialist adjuvants

Other chemicals like fertilisers (ammonium sulphate), buffers (salts of organic acids), acidifiers (organic acids) and drift retardants (polyacrylamides) can be used to modify the way a spray mixture behaves in the tank.

**All surfactants are adjuvants, but not all adjuvants are surfactants**



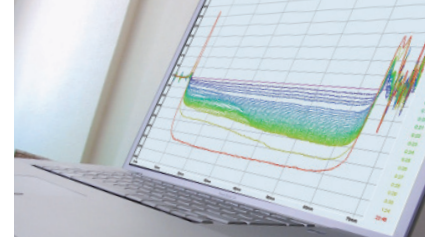
Annual ryegrass images courtesy of Glenn Hardebeck (Turfgrass Research Agronomist), Purdue University Plant and Pest Diagnostic Laboratory

Adjuvants in our Precision Spray Oils™ range are formulated with either highly refined mineral oil or high grade esterified canola oil. They are combined with specialised surfactant systems selected after exhaustive leaf-penetration studies using our R&D laboratory's imaging chlorophyll fluorescence instrument and green-house studies, oil compatibility and phytotoxicity screening, and finally both efficacy and crop safety field trials.

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## Tank mix compatibility

The compatibility of a tank mix can be accurately predicted using our spray-tank simulator that mimics the dynamic environment of the commercial spray tank, in cold or very cold conditions. Our laboratory's turbiscan analyser can also measure microscopic incompatibilities long before they are visible to the eye.

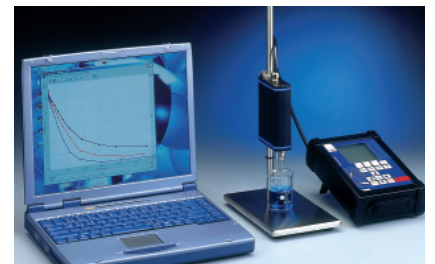


Turbiscan analyser

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## Droplet retention

Two adjuvants in our Precision Spray Oils™ range are premium COC adjuvants, D-C-Trate® Advance (DCTA) and Rocket, which contain surfactants to cushion droplet impact by reducing the antagonism between the leaf surface and droplet. Their emulsions also cushion impact because of good shock absorbance. We use a bubble tensiometer to measure both static and dynamic surface tension during the development of our adjuvants.



SITA T360 Tensiometer image courtesy of SITA, Germany

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## Droplet spreading

The high level of surfactant in our premium COC adjuvants promotes droplet spreading by continually replenishing the surfactants which get attached to the leaf surface at the advancing edge of the droplet.

Our adjuvants contribute to anti-evaporation by increasing the penetration rate of the active ingredient (a.i.) into the leaf. This reduces the amount of a.i. that can be lost through evaporation to the atmosphere.



Ryegrass seedling image courtesy of Utah State University Archives, Utah State University

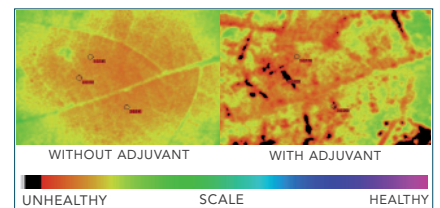
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## Cuticle penetration

Specialised surfactants added to our premium COC adjuvants assist cuticle penetration, initially by maintaining the a.i. in liquid form. The oil then softens the cuticle by swelling the cutin polymers allowing easy passage of the a.i. Using our premium adjuvants in your spray mixes means an increased range of weeds are susceptible to this process.

Our spray oil adjuvants may also assist activity if dirty water or dusty spraying conditions are encountered. They can reduce the impact of rain and UV light by getting the a.i. into the plant faster. The faster it's absorbed, the less chance rain has of removing it or sunlight has of breaking it down.

Our chlorophyll fluorescence imaging instrument, PAM, allows an instant view of the activity of a herbicide in a leaf. We use this instrument to ensure our premium spray adjuvants offer optimum penetration of the weed cuticle.



Chlorophyll fluorescence image: the dark areas (brown, red and black) indicate where herbicide activity is taking place within the leaf