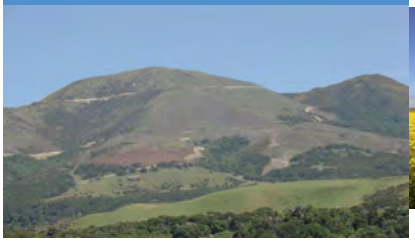
Info Sheet

Force® Penetrant

spray adjuvant

SPECIALTY FLUIDS - AGRICULTURE



Force® Penetrant spray adjuvant is a superspreading surfactant based on a trisiloxane alkoxylate. Force® Penetrant can help lower the surface tension of spray solutions, beyond that which is achievable with conventional adjuvants.

Typically, Force® Penetrant (@ 0.1 wt %) gives an aqueous surface tension of ~22 mN/m. On the other hand, an octylphenol ethoxylate containing 10 EO units (a commonly used nonionic surfactant) at 1.0 wt % gives a surface tension of only 30 mN/m.

The bottom line? Force® Penetrant helps lower the aqueous surface tension more effectively than conventional spray adjuvants.

Because Force® Penetrant is a superspreading surfactant, the contact angle of spray solutions on leaf surfaces is reduced, leading to an increase in spray coverage (Figure 1).

Additionally, under specific conditions, Force® Penetrant promotes rapid uptake of agrochemicals into plants via stomatal infiltration. Spray solutions taken into plants in this way become rainfast, thereby improving application reliability.

The low foam properties of Force® Penetrant may make it easier to handle than other organosilicone based spreading agents (Figure 2).

Force® Penetrant is nonionic in nature, making it useful with a broad range of agrochemical formulations.

Key Features and Typical Benefits

- superspreader
- helps improve rainfastness
- help promote rapid uptake of agrochemicals
- help promote spray volume reduction
- low pour point for low temperature applications
- low foaming
- nonionic
- meets EPA 40 CFR §180.910 requirements(1)

Typical Physical Properties

Property	Result
Surface Tension (0.1%, mN/m)(a)	21.5
Cloud Point (0.1 wt%), °C	<10
Critical Micelle Concentration (wt%)	0.003
Pour Point, °C	–30
Viscosity (cSt @ 25°C)	35
Specific Gravity (25/25°C)	1.002
Flash Point(b) °C	143

(a) Surface Tension by Wilhelmy Plate Method.
(b) Pensky-Martens Closed Cup, ASTM Method D93.
Typical data are average data and actual values may vary.
Typical data shall not be used as product specifications.

Potential Use

In Agrochemical Formulations

Force® Penetrant may be used as a component in agrochemical formulations. Although organosilicone surfactants are subject to hydrolysis under acidic or basic conditions, optimum performance is achieved by buffering the formulation to pH 6.5 -7.5. Additionally, it is recommended that Force® Penetrant be used at a concentration of at least 5%, based on the total formulation.

As A Tank Mix Adjuvant

Force® Penetrant, when used as a tank-side adjuvant may be used to improve spray coverage, improve uptake or to allow for a reduction in spray volume. Force® Penetrant is most effective as a tank-side adjuvant when spray mixtures are 1) within a pH range of 5-8, and 2) used within 24 hours of preparation.

High spray volumes, coupled with high surfactant rates, are not required to achieve sufficient coverage with Force® Penetrant . In fact, Force® Penetrant may provide adequate coverage in many low volume spray applications at rates between 0.025% and 0.1%.

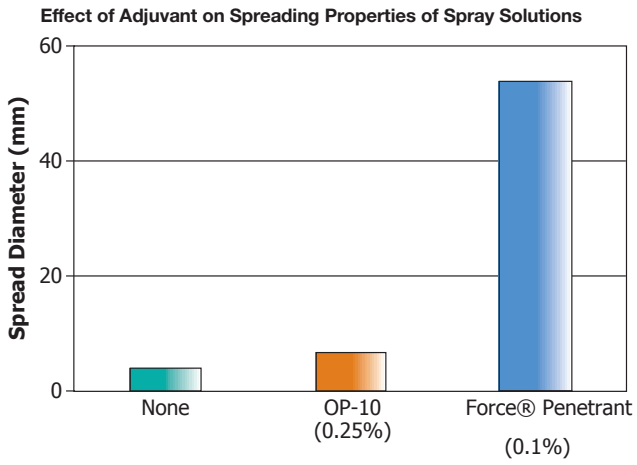
Potential Applications

Force® Penetrant has been used successfully in spray applications . Typical applications include a range of

Application	Typical Use Rate[(a)]
Plant Growth Regulators	0.025% to 0.05%
Herbicide	0.025% to 0.15%
Insecticide	0.025% to 0.1%
Fungicide	0.015% to 0.05%
Fertilizers and Micronutrients	0.015% to 0.1%

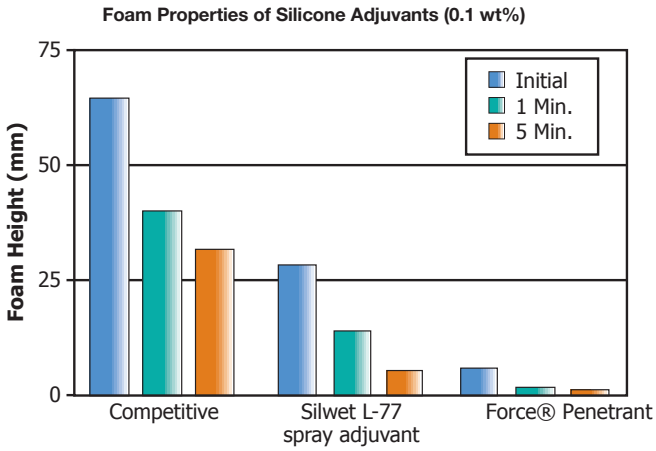
(a) Note: use rates are dependent on crop, agrochemical and spray volume requirements.

Figure 1: Spreading



Spreading on polyacetate film; OP-10 = Octylphenol Ethoxylate, 10 EO.
Note: Test data. Actual results may vary.

Figure 2: Foam Properties



Note: Test data. Actual results may vary.

Product Safety, Handling and Storage

Customers considering the use of this product should review the latest Material Safety Data Sheet and label for product safety information, handling instructions, personal protective equipment if necessary, and any special storage conditions required. Material Safety Data Sheets are available at **www.grosafe.co.nz** or, upon request, from any Grosafe Chemicals representative. Use of other materials in conjunction with Grosafe Chemicals products may require additional precautions. Please review and follow the safety information provided by the manufacturer of such other materials.

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