189 Fluro Concentration Dye

This product can help determine spray coverage • Dosage on plant foliage / Off target deposits • The extent of contamination of equipment with agricultural sprayers • Stable in Sunlight and UV Light

The following is information on how hot weather can influence your painting projects.

189 Leaf Check is an ideal product to determine spray coverage and dose on plant foliage, off target contamination, and the extent of contamination of equipment and personnel, with agricultural sprayers. Resin based fluorescent pigments are ideal for determining the efficiency of spray coverage and chemical dose on plant foliage.

They are also ideal for studying off target deposits such as run off onto soil and spray drift onto non target foliage, and the contamination of tractors, implements, protective clothing and personnel. Topline’s Fluorescent Pigment suspension concentrates are stable in sunlight and under ultra violet (UV- A) illumination, unlike water soluble fluorescein type products, in which fluorescence degrades rapidly.

Formulation of Topline’s Fluorescent Pigments is similar to typical agricultural chemical suspension concentrates, and they mix easily with water with no pre mixing. Simply measure out the required spray volume and pour directly into the spray vat. They do not have the problems of difficult pre-mixing, suspension and blocking of spray lines, filters and nozzles commonly experienced with dry powder forms of fluorescent pigments.

Following spraying, deposits are easily removed from equipment with a hose of damp cloth, provided they are not left to dry and harden.

For spray coverage and dose determinations, deposits are assessed on natural foliage surfaces. Problems with reduced impaction efficiency, which may occur on smooth artificial targets and finding and retrieving them following spraying. Similarly, spray deposits can also be examined on no target surfaces such as clothing, skin and implements.

**Colours:** Yellow & Pink

**Dilution rates:** The following dilution rates are generally used:
- Dilute, high volume spraying: 500ml – 1 litre in 100 litres of water
- Concentrate (low volume) spraying: 2 litres in 100 litres of water

The above rates, however, are only guidelines.
Evaluate several dilution rates to test the particular techniques, spray equipment, laboratory analysis equipment etc before conduction extensive trials.

**Pack sizes:** 1 litre and 4 litre bottles are available. The product is a suspension concentrate. It is important to stir or vigorously shake before use as with many paint products.

Various shades of orange and gold can be obtained by mixing yellow and pink. Yellow is the preferred colour for most applications. However, some plants, such as some vegetables, corn and cereals fluoresce bright blue, due to high concentrations of carbohydrates such as starch.

In these situations pink or orange is easier to see. Other plants, such as citrus, can have natural red or orange fluorescence, making pink or orange very hard to see. In these situations, yellow works better. Before ordering pigment it is a good idea to examine the target foliage under black light illumination to check for any natural fluorescence.

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Customers need to appreciate that as Topline Paint cannot control the conditions under which our products are used, we therefore are unable to guarantee suitability or accuracy in every situation. If any doubt exists, do check with our technical people. Before large-scale use always test on a small sample and ascertain suitability. No warranties express or implied are made. The risks and liability arising from handling, storage, use and compliance with legal restrictions, rests with the buyer.
Yellow and pink are pure colours, and therefore preferable to mixtures for fluorimetric analysis. The optima for fluorimetric analysis using the yellow pigment are: Excitation 468 nm & Emission 502 nm

Deposit assessment: Visual techniques: The number of droplets per cm² and their mean size can be rated by the use of a chart (back cover), or counted, and droplet diameters measured, with the use of a microscope, with the field of view adjusted to a unit of area such as 1 cm²

Computerised image analyses techniques can also be used for more precise work. When rating, a high and a low rating should be given for both upper and lower leaf surfaces (4 ratings per leaf), and for other foliage (E.G. fruit) or non target surfaces.

When rating for scientific work, observers should be trained and tested to ensure that their ratings are reasonably accurate and to determine observer variability. Our experience suggests that visual ratings for droplet number are considerably more accurate than visual ratings for the proportion of target surface covered with spray. We also propose that classification of spray deposits by number per cm² and droplet size is more useful and practical than specification based on the proportion of target surface covered, which may become the current standard for scientific work.

The proportion of area covered can be calculated from the droplet number and size if required. For example 200 droplets per cm² with a mean impacted size of 250 microns will cover about 10% of the target area, and 100 droplets per cm² with a mean impacted size of 500 microns will cover about 20% of the target area.

The droplet number/cm², size and concentration required for good efficacy against pests and diseases with most agricultural chemicals is not generally known.

More research is needed. However, as a general guide (based on experience only) we suggest it is best to aim for 200 droplets per cm² or better with fine droplets, or 25-50 droplets per cm² or better with medium sized droplets on all parts of the plant with most contact chemicals in dilute high volume applications.

(Note: droplet densities for good efficacy with herbicides are generally considerably lower than this). When droplet numbers fall below these levels on more than 30-50% of the sheltered inner (and/or upper canopy foliage on tree crops with airblast sprayers), poor efficacy may occur. On exposed outer canopy foliage, about 90% or better of the foliage. Surfaces should have those levels or better. However, the numbers we have suggested are not a guarantee of efficacy, they are based on limited experience with a limited number of chemicals on a limited range of crops. Lower droplet numbers may be adequate for chemicals that can penetrate and translocate to some extent in plant tissue (eg partly systemic chemicals such as DMI fungicides), and with concentrate applications. However, the droplet number required for good efficacy is affected by the chemical dose per cm² as well as the number. When attempting concentrate spraying it is a good idea to consult with the agricultural chemical companies and obtain advice from experts in spray application as the number of droplets per cm² required and the dose.
Calculating dose: With a given droplet size, the number of droplets per cm² is directly related to the dose. The chart also provides the volume of liquid for each rating. The dose of chemical can be calculated from this volume and the concentration of the chemical in the vat by using the following formula:

\[ \text{Amount of chemical deposited (micrograms or microlitres (ul) / cm²) = Deposit volume (ul/cm²) \times chemical concentration (gm or litres/100 litres) ÷ 100} \]

The formula gives the total amount of chemical deposited. If the amount of active ingredient (ai) deposited is required, an adjustment for % ai from the label will have to be made.

For example, if the rating is 200 droplets per square cm and the droplets are fine, then the amount of liquid in that deposit is approximately 0.20 ul/cm². If the amount of chemical in the vat is 2kg (2000gm)/100 litres then the amount of chemical deposited is: 0.20 x 2000 ÷ 100 = 4 micrograms/cm².

If the product contains 75% ai, then the amount of ai deposited is: 4 x 75 ÷ 100 = 3 micrograms/cm². (Note: 1 gm = 1 000 000 micrograms, 1 litre = 1 000 000 microlitres) Ideally, dose should be confirmed by chemical or fluorimetric analysis (see below).

The chart can also be used for droplets slightly outside the droplet size ranges provided. Work has shown that the eye rates for brightness rather than droplet number. If two areas of foliage have the same overall brightness, they will be given a similar rating and will contain a similar amount of chemical. With droplets that are a lot different in size to that in the chart, doubling the droplet diameter means that it contains 8 times the amount of liquid and chemical for a given number per cm². Conversely, halving the size reduces the amount 8 times. However, the number per cm² would have to be counted and the diameter measured under a microscope for an accurate rating.

Concentrate, low volume deposits on grapevine leaves showing discrete droplet pattern of fine droplets and the typical variability encountered.

Black Lights: After spraying, spray deposits on target surfaces can be examined under the illumination of a “black light” in situ at night or alternatively on picked foliage or targets in a darkroom. Black lights emit non harmful UV-A light in the 365 nm region. (Note, shorter wavelength UV light sources should be avoided because the radiation is harmful to the skin and can cause eye damage).

Three main types of UV-A black lights are normally used:

- **Black glass fluorescent black light tubes**: These are standard fluorescent tubes with dark black glass. Note that white, blue or purple glass black light fluorescent tubes give poor results. Small DC black light tubes do not emit enough light for good results. Large diameter ac tubes give the best results. They are used with standard ac fluorescent tube fittings. In the field a portable generator set is required.

- **Mercury vapour black light bulbs**: (eg Phillips HPW 125W) These give similar results to the fluorescent tubes, but the bulb/ reflector assembly is smaller and lighter, making them easier to use in the field. A125W mercury vapour ballast assembly (eg in Australia GEC: OMB-125 (for 240 volts)) is also required. The ballast assembly is plugged into the power source with an extension lead to the bulb for field use. The bulbs and ballast assembly are normally purchased separately and the components mounted and wired by an electrician. For the bulb, a 10 litre white plastic bucket with the...
side cut away makes an ideal reflector. Note the bulbs must be mounted sideways to the sample and the reflector. Illumination through the end of the bulb gives poor results. If accidentally switched off when in use, these bulbs will not light up again until the bulb has cooled. This takes several minutes. The bulbs get quite hot when in use, so it is important not to allow contact with skin to avoid being burnt. If the bulb is accidentally plugged directly into the ac power outlet without the ballast in the circuit, the bulb will blow. With normal sue the bulbs last many years.

“Labino” high performance flood and spot UV lamps: “Labino” Ultra Violet luminaries feature a new type of gas discharge lamp offering extremely high UV output in the 365 nm range, with very low visible light and heat emission. Due to the efficiency of the light, their power has been minimized to 42 Watts, even though output is greater than 200 W Metal Halide lamps. The flood light version is best suited to this application. These features give the following advantages over the mercury vapour and fluorescent tube black lights described above:

- Greatly improved fluorescent intensity from the sample & can be used at much greater distances from the sample, can be used in dull light conditions such as late evening, in the shade, dull rooms or heavily overcast daylight. Complete darkness is needed for mercury vapour and fluorescent tube black lights.
- Low heat emission means that they are safer and easier to use, you and the plants will not get burnt.

15 second start up and restart avoids the frustration of waiting for lamps to cool down before restarting and gives more time to inspect samples.

A number of other types of black light are available, including other flood and spot black lights. Many are designed for other applications and emit too much visible light to be useful for this purpose. They should therefore be evaluated before purchase.

Deposit assessment; Fluorimetric analysis

Quantitative measurements of the amount of pigment deposited can be made using a fluorescence spectrophotometer or a filter fluorimeter. The reading obtained has be be calibrated to obtain the actual deposit measurement. Fluorescence spectrophotometers are the preferred equipment because they have a narrow wavelength bandpass (eg 10 nm), a low and stable background signal, and because surface scanning on natural plant surfaces can be carried out. With filter fluorimeters the pigment ahs to be washed off and measured in solution, the wavelength bandpass is wide (eg 50 nm) and the background signal is high and generally unstable. Some laboratory technicians are of the opinion that filter fluorimeters should not be used for quantitative analysis, but rather presence ore absence of fluorescence only Optimum excitation and emission wavelengths for fluorescent pigments usually differ by less than 50 nm. Resin based pigments give more accurate results because of their high fluorescence stability under illumination and with time, however, they are only suited to surface scanning measurement techniques.

Surface scanning has the added advantages of more rapid and simpler analysis, and the ability to study the nature and variability of spray deposits across individual surfaces. Quenching and settling in solution means that they are poorly suited to standard solution based measurement. Water soluble fluorescein type products are generally regarded as too unstable for accurate quantitative work, but they are suited to standard solution based measurement.

The model Opti-Lux 365 has the following features and these torches are available through Topline Paint Pty Ltd.

Features:
- Choice of nominal steady-state UV-A intensity of 10,000 µW/cm2 or maximum of 4,500 µW/cm2 at 15 inches (38 cm)
- Coverage area up to 2.5 inch (6.3 cm) diameter at 15 inches (38 cm), with minimum UV-A intensity of 2,000 µW/cm2
- Anodized aluminum lamp body minimizes corrosion and stands up to years of heavy use
- Instant-on operation; lamp reaches full intensity immediately!
- Convenient on/off switch for easy, one-handed operation
- 30,000-hour LED service life
- Powered by one rechargeable lithium-ion battery with an extra battery included with the lamp. Each provides 4 hours of continuous inspection between charges.
- Meets ASTM UV-A intensity and wavelength specifications for FPI and MPI
- Both high-and-standard-intensity versions are available with internal black light filter. Externally mounted black light filter with rubber bumper can be purchased as an accessory.
- All models come with a certificate of compliance for both output and wavelength measurements.