The Go-to People for Innovative Spraying Equipment
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A NEW WAY TO SPRAY

SPRAYERS GUIDE TO DROP SIZE

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Any spray consists of a spectrum of droplet sizes and when comparing different sprays, the average droplet size across the spray needs to be analysed.

There are a number of different ways to measure average drop size. DV0.5 is the type of average used for agricultural products and sprays. This is theoretical drop size of which half the volume of spray consists of drops smaller than this drop size and, obviously, half the volume is bigger than this.

So what affects the DV05 droplet size for a given spray? There are 4 main factors.

1 FLOW RATE: The flow rate and size of the nozzle.

The bigger the nozzle orifice is, the higher the flow rate and the bigger the average droplet size will be. Agricultural nozzle tips are generally colour coded and this colour indicates the flow rate of the nozzle. In order of size they are Orange (01), Green (015), Yellow (02), Blue (03) and Red (04). The droplet size will get bigger as we move up this colour sequence.

2 PRESSURE: The pressure at which the nozzle is sprayed at greatly affects the droplet size.

Higher pressures will result in smaller drop sizes from any given nozzle; a nozzle spraying at 1 bar pressure might produce a 500 micron average drop size. Spray the same nozzle at 3 bar and it might produce 350 micron average drop size.

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It is important to note that at the same time, the flow rate will increase as we increase the pressure as well. For any given nozzle, if pressure is increased, the flow rate increases and the drop size is reduced.

3 SPRAY PATTERN: The type of spray pattern produced by the nozzle will affect droplet size.

In order from smallest to largest drop size:
1. Hollow cone nozzles
2. Full cone nozzles
3. Standard fan nozzles
4. Deflector fan nozzles

So, for example, yellow 01 spray nozzles with a hollow cone pattern sprayed at 1 bar pressure, would produce significantly smaller droplets than a yellow 01 fan nozzle spraying at the same pressure even though they would have the same flow rate.

4 SPRAY ANGLE: The actual spray angle of the nozzle does have an effect on drop size with wider spray angles producing finer drop sizes than narrower ones.

For example, a green (015) tip comes in both an 80 and 110 degree spray angle. The 110 degree version will produce a slightly smaller drop size than the 80 degree version. That holds true for all other nozzles as well.

So, why is drop size important when it comes to agrochemical spraying?

There are many situations where droplet size is important. On the next page are five examples of why droplet size is important.

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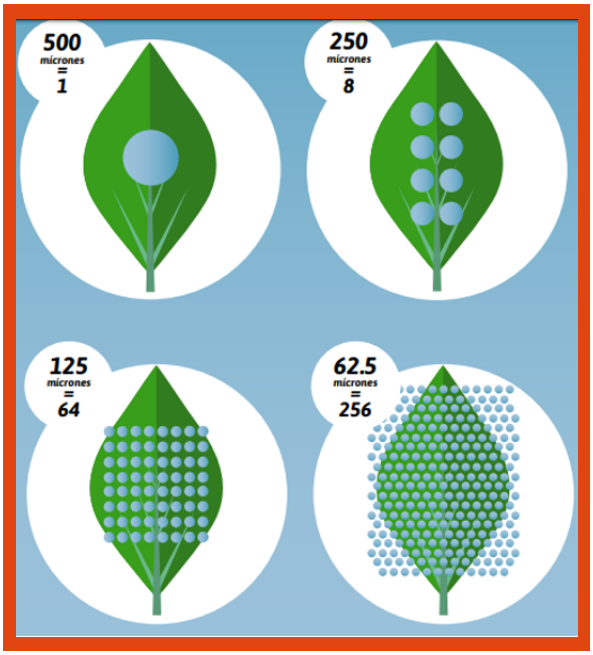

1. LEAF COVERAGE

Having a small average drop size improves the coverage of the spray over a leaf. If you wanted to get a herbicide into a plant to kill it or cover a leaf of a plant with an insecticide to kill the pests, an even coverage of the spray would be required all the way over the leaf to ensure it penetrates further or kills all of the bugs on the plant. So, a small droplet size improves coverage and reduces run off. In short, it reduces waste of expensive agrochemicals.

2. PENETRATING THICK FOLIAGE

Another important reason to have small drop size is to penetrate thick foliage. When dealing with rosebushes or something with thick foliage, a fine spray is needed to move on the air currents and penetrate the foliage rather than hitting the outer parts of it.

3. SPRAYING FLUIDS MORE VISCOUS THAN WATER

Spraying viscous fluids may also require a nozzle that can deliver a small droplet size. This is because the viscosity of the fluid tends to increase droplet sizes. If the liquid properties, like viscosity, make it hard to atomise, the spray might not form properly and will result in a spluttering nozzle. So, it would be advisable to select a spray set up that can produce a natural smaller droplet size. However, we must also use relatively high flow rate nozzles with larger orifices to prevent clogging. As such, we need to keep the pressure and spray angle up when delivering viscous fluids.

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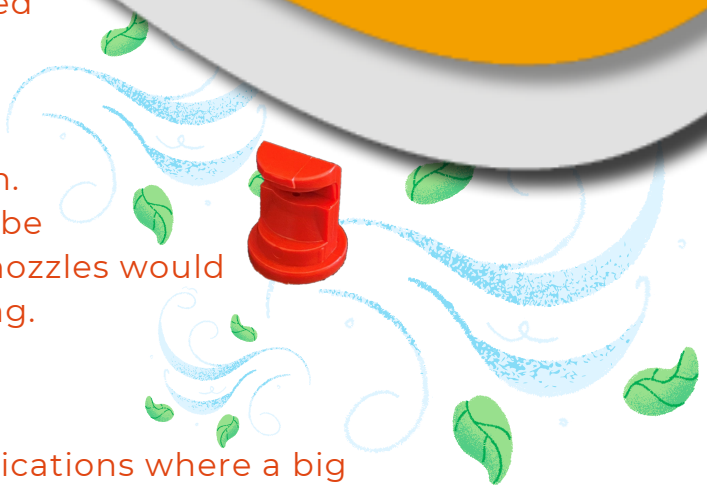
4. AVOIDING SPRAY DRIFT

A situation where bigger drops are wanted and spray drift is a concern during windy conditions, (fine sprays tend to waft around and get blown off course), a deflector nozzle would be the best option. The pressure on the application can also be lowered and the use of higher flow rate nozzles would keep the drop size big and avoid it drifting.



5. SPECIALIST APPLICATIONS

Lastly, there may be some specialist applications where a big drop size is considered. An example of this would be when spraying nematodes which are live microscopic worms that are sprayed as a bio control system. Nematodes are extremely delicate; it is important to avoid atomising the solution they're in too much as this would damage or kill them. A low pressure and high flow rate will keep the drop size big. Minimal atomisation would be required to just form the spray pattern and nothing more.

General advice

When the four factors that affect droplet size are understood, it is possible to start making sensible decisions about how to achieve the correct droplet size for your spraying application.

Understanding how these factors affect each other spray characteristics (e.g. changing pressure also changes flow rate), is also important in nozzle selection.

If you have any questions about how to achieve the correct droplet size, please contact The Professional Sprayers People.