

Calibration of Sprayers (using a knapsack sprayer as an example)

Step 1. Measure volume application rate (VAR)

Before a farmer can be sure he/she is using the correct dose of pesticide on a particular crop, the VAR must be known. For example, if he/she knows his field is 0.7 hectares and that he/she must apply the product at a rate of 1 litre per hectare, it is clear that he/she will need to apply 0.7 litres of the product. The concentration, and more practically, the volume to add to the spray tank, depends on how many litres of spray will be applied (i.e., the VAR). If the VAR is not known, it needs to be determined by spraying a small area. The way to do this for a backpack lever operated sprayer is described below. A similar method using a larger area would be fine for a vehicle-mounted sprayer.

- Measure out a square area of the crop which is 5 big paces (steps) long and 5 big paces wide (use a bigger test area for a tractor-mounted sprayer). This will give an area of approximately 25m² or 1/400th of a hectare. Mark the corners with sticks.
- Now put the sprayer on a level surface and put water into the tank (no pesticide) up to a level which corresponds with one of the volume markings on the sprayer tank.
- Spray the marked out area of crop with water, as if it was the pesticide.
- Put the sprayer back onto the same level surface and, using the volume markings on the sprayer, estimate the volume sprayed onto the crop.

If the volume used was 1 litre, this corresponds to a VAR of around 400 l/ha. If the volume used was 1/2 (0.5) litre, this corresponds to a VAR of around 200 l/ha, and if the volume used was 2.3 litres, then the VAR was $2.3 \times 400 = 920$ litres per hectare.

Step 2. Adjust volume application rate (VAR)

For a lever operated knapsack sprayer, if the volume used on 25 m² was more than 1 litre, this will give a VAR which could be considered too high (more than 400 l/ha) and in some cases, wasteful of pesticide. The farmer should either fit a smaller nozzle to the sprayer, or, if the nozzle is already small enough (giving a flow rate of less than 800ml/min), he/she should modify the spraying technique to apply less spray to each plant, in other words spend less time spraying it. After

these equipment and/or technique adjustments, the farmer should measure VAR again to make sure it is less than 400 l/ha.

If spraying equipment is not capable of producing such low VARs - in other words if a smaller nozzle is not available, or the flow rate is set high - the farmer must then make adjustments to the tank dose to compensate for this. For example, if the sprayer is putting a VAR of 800 l/ha on a medium-sized crop (many experts consider that this is twice the volume required) then the tank dose (e.g. 150 ml per knapsack spray tank) can be reduced to half of what the pesticide label recommends (in this case it would be reduced to 75 ml per spray tank) without any risk of applying too little active ingredient. If the tank dose instruction is 20ml of pesticide per 10 litres of water, put 10ml of pesticide into the instead.

Step 3. Put in the right tank dose

The label will usually give a volume (or weight) of concentrated pesticide to put in each 10 litres of water. Sometimes, the advice is given for 15 litre sprayer or for 100 litres of water and in theory, the amount required for a particular tank volume can be worked out fairly simply. For example, if the label recommendation states that 20ml of pesticide concentrate must be put into every 10 litres of water and the farmer is using a sprayer which contains 15 litres of water, the amount of pesticide to be added can be worked out as follows: 15 litres is one and a half times the volume of 10 litres which the tank dose recommendation is based on. Therefore one and a half times the tank dose recommendation for 10 litres must be added each time the tank is re-filled. One and a half times 20ml = 30ml.

Once the volume required per sprayer tank has been calculated, the farmer needs a small measuring cup to make sure the amount added is correct. A measuring cup should be provided by the shop when the pesticide is bought but if it is not, the farmer should borrow one or make one using a borrowed cup as a reference. The cost of a measuring cup is much less than the cost of mistakes in application - either wastage of pesticide, poor spray results or dangerous pesticide residues in vegetable produce. Fertiliser volumetric measuring cups can also be used. Sometimes the number of the cup indicates the volume of liquid it contains. For example in some countries, a number 12 cup contains 12ml of liquid. Such cups can also be used as a guide to weights of wettable powders - a number 30 cup generally holds approximately 15 - 20 g of powder.

Using a bulk drum

If there is a large area of crop to treat, a large batch of spray liquid can be mixed in a drum and then knapsack sprayers filled from that. If the drum is 200 litres, this will fill a 10 litre spray tank 20 times, so add 20 times the amount of concentrated pesticide recommended for each 10 litre sprayer tank. Mix only enough for a maximum of 4 hours spraying so that the pesticide mixture does not have to be left overnight.