Nova Scotia Environmental Farm Plan

factsheet

Field Sprayer Calibration

Using a Calibration Bottle

Introduction

It is important to properly calibrate your sprayer for maximum performance. Improper spray application can be costly in terms of poor pest control, crop injury and possible environmental contamination. Sprayer output can vary from season to season due to nozzle wear, change in pressure, tractor speed or the use of a different tractor. Therefore, your sprayer should be calibrated at the beginning of each growing season. Proper calibration requires little time and can produce substantial economic and environmental benefits.

Pre-Calibration Checklist

1. Determine nozzle type and size based on the chemical to be sprayed and the desired application rate (See Page 3).

2. Ensure that the sprayer is in good operating condition. There must be no leaks and the boom should be level and stable.

3. Determine correct boom height based on the nozzle discharge angle and height of the crop installed (Table 1).

Nozzle Type	Boom Height
65 discharge angle	55 cm - 60 cm (*22 in - 24 in above crop*)
80 discharge angle	45 cm - 50 cm (*18 in - 20 in above crop*)
110 discharge angle	37 cm - 45 cm (*15 in - 18 in above crop*)

Table 1. Sprayer Boom Heights

4. The nozzles must be the same size and type across the entire boom.

5. The nozzles are normally spaced 50 cm (20 in) apart.

6. Flat fan nozzles should be installed at a 5 offset to ensure that the spray pattern from one nozzle will not interfere with that from the next nozzle.

7. Make sure your sprayer nozzles are spraying uniformly with an even spray pattern and output volume. To do this, follow these steps:

Run sprayer at operating pressure and rpm
Visually check to see that all nozzles have an even spray pattern
Collect water from one nozzle
Record reading from the scale on the bottle
Collect water from all other nozzles for the same number of seconds
If the average volume varies by more than 5%, replace nozzle. However, before replacing nozzles ensure that all nozzles and screens are clear of any debris or chemical residue. Debris or residue could be causing the variation.

8. Tractor tachometer **must** be working. This is necessary to maintain proper operating speeds obtained from the calibration process.

9. Sprayer pressure gauge **must** be working properly.

10. Make sure the sprayer has proper tank agitation. This is necessary to keep the

chemicals suspended in solution. **Never** leave the chemical solution in the sprayer over night. The water and the chemical can separate and uniform application **will** be affected.

11. Travelling at speeds greater than 8 kph (5 mph) can affect spray distribution under the boom and can also increase the risk of drift.

Sprayer Calibration

1. Measure off 45.7 m (150 ft) with two stakes.

2. Add clean water to half fill the sprayer tank.

3. Record the time (in seconds) required to travel 45.7 m (150 ft) at the desired spraying speed. Do this three times to get an average.

4. Hold the calibration bottle under a nozzle for the same number of seconds that were required to travel the 45.7 m (150 ft) at the same rpm as the timing run (Fig. 2).

Fig. 1. Sprayer calibration

5. Read the application rate in litres per hectare (L/ha) or gallons per acre (gal/ac) from the appropriate scale printed on the bottle.

6. If liquid is above the calibrated scale or overflows the bottle, use a test run of 22.5m (74 ft) and multiply by 2.

7. Repeat this to verify results.

8. Record your results and keep records of your spray program. The results can be appropriately placed in a crop record book.

If the desired results are not achieved, the application rates can be changed by adjusting the following:

- nozzle size;
- tractor speed; or
- boom pressure (minimal effect).

End of Season Maintenance

1. Remove and clean all screens and nozzles.

2. Thoroughly wash and drain the sprayer.

3. Add antifreeze to prevent freezing and cracking of sprayer components.

4. Remove pump and store in a warm dry place.

Recommendations

It is essential that the sprayer is accurately calibrated at least once a year and/or when changes are made in the spraying program.

Fig. 2. Field sprayer

Conversions

L/Ha x 0.089 = Imp. gal./ac
L/Ha x 0.4 = L/ac
L/Ha x 0.11 = US gal./ac

Choosing the Proper Nozzle for your Sprayer

Introduction

An important step in having an accurate spray program is choosing the correct nozzle. Nozzle selection should be based on type of application. The pesticide manufacturer will state the water volume on the label. By using this information, a proper nozzle size can be chosen from the spray catalogue. It is essential to have a knowledge of the various types of nozzles in order to choose the correct nozzle type for your particular application.

Flat Fan Nozzle Types

Flat fan nozzles are recommended for herbicide application. They produce a mid-size droplet that is suitable for herbicides. Fine droplets will readily drift from the target and coarse droplets will not provide a sufficient coverage of the plant for good control. Flat fans are used with a pressure range of 206-344 kPa (20-50 p.s.i). Water volumes range from 110-250 L/ha (10-40 GPA). Volumes below this can reduce the chance of adequate plant coverage. Volumes above this can dilute the pesticide and cause the chemical to run off the plants. It is important that the nozzles on the boom not be lined up straight but rather offset 5 so that the spray pattern from each nozzle will not interfere with each other. There are several types of flat fan nozzles and they include:

Standard Flat Fan

They produce a tapered edge which is overlapped for an even broadcast application. For example, nozzles should be 50 cm (20 in) apart and 43-50 cm (17-20 in) above the target area. Pressures of 172-275 kPa (25-40 p.s.i.) should be used for optimum droplet size (Fig. 4).

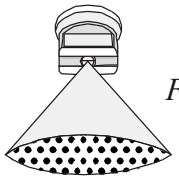

Fig. 4. Standard flat fan

Low Pressure Flat Fan

Designed mainly to operate at pressures as low as 69 kPa (10 p.s.i.). Although they operate at lower pressures, they produce the same spray performance as a standard flat fan at a higher pressure (Fig. 5). For example, a low pressure tip at 103 kPa (15 p.s.i.) will give the same spray pattern and performance as a standard tip at 245 kPa (35 p.s.i.). The lower pressure reduces drift.

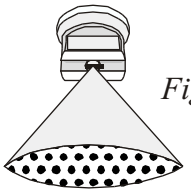

Fig. 5. Low pressure flat fan

Even Flat Fan

Similar to the standard flat fan except that the edges are not tapered. It delivers a uniform volume of product across the target area. It is designed mainly for band spraying over or between row crops (Fig. 6). When spraying for pre-emergence control (before germination), pressures of 138-275 kPa (20-40 p.s.i.) should be used to produce larger droplets. Post-emergent control (after germination) should be used at 275 kPa (40 p.s.i.) for better coverage.

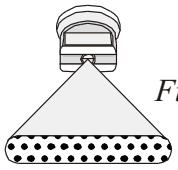

Fig. 6. Even flat fan

Twin Flat Fan

Designed with two flat fan sprays per nozzle. This helps the pesticide to penetrate dense foliage (Fig. 7). Nozzle spacing should be 50 cm (20 in) and pressures used are 206-344 kPa (30-50 p.s.i.).

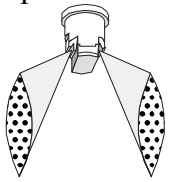

Fig. 7. Twin flat fan

Flood Flat Fan

It has a very wide flat spray pattern that is used at low operating pressures of 69-172 kPa (10-25 p.s.i.). Nozzle spacings should be 101 cm (40 in). It is widely used for soil incorporated herbicides and liquid fertilizer applications (Fig. 8).

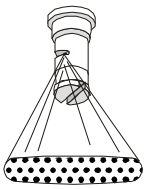

Fig. 8. Flood flat fan

Cone Nozzle Types

Cone nozzle types are generally used for fungicides and insecticides. Cone spray provides a better foliage penetration and coverage. This occurs due to the higher pressure and smaller droplet size.

Hollow Cone

Most of the spray is concentrated at the outer edge of the cone pattern (Fig. 9). Many insecticides and fungicides work best if the droplets are smaller than the droplet size for herbicides. They are also applied at much greater water volumes. Pressures of 482-758 kPa (70-110 p.s.i.) are considered optimum. The higher pressure ensures smaller size droplets.

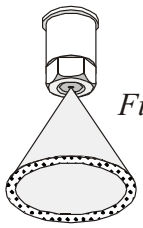

Fig. 9. Hollow cone

Full Cone

The spray covers the entire cone pattern. It produces larger droplets than the hollow cone and is used at lower pressures of 275-413 kPa (40-60 p.s.i.). It can also be used for high water volume output. Nozzles are spaced 50 cm (20 in) apart. Full cone nozzles are best used for soil incorporated pesticides (Fig. 10).

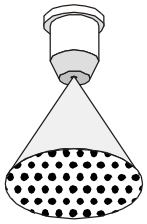

Fig. 10. Full cone

Recommendations

Never clean nozzles and screens with metal objects such as nails, wire, etc. A soft bush and clean water should be used. Failure to clean nozzles properly can result in damage to the nozzle opening and ultimately an inaccurate spray pattern.

If nozzles are plugging, it may be due to the following:

- Improper agitation in tank resulting in a poor water chemical mixture.
- Nozzle screens may not be sized properly for the size of the nozzle installed. (i.e. opening in screen may be larger than the opening in the nozzle)
- There may be an improperly sized filter on the sprayer.

Rinse and clean the tank, lines and nozzles after each pesticide application. Failure to remove chemical residue could result in crop damage during the next spray application. This cleaning and rinsing process must be carried out at least 100 m (328 ft) from wells, ditches and watercourses. If ever in doubt of the reliability of your spray nozzles, remove them, replace them with new ones and discard the old ones. If not discarded, they could become mixed with the new ones and it will be impossible to tell them apart. As the nozzle is the most important part of the complete spraying system, it is important that these recommendations be followed.

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