SOP for Use of Pressurised Sprayers in Experimental Hut Studies

Purpose: The use of pressurised sprayers in the field shall comply with full SOP documentation and procedures

Definitions

IRS Indoor residual spray
SOP Standard operating procedure

Scope

1. Overview

This SOP outlines the procedures to be followed for the application of insecticides as an indoor residual spray using manually operated compression sprayers for the generation of study data.

Accuracy of applications is ensured through the proper selection of equipment and at-use calibration, as well as routine inspections and maintenance.

All equipment will be conspicuously and uniquely identified with an equivalent number. Application equipment inspection, calibration data and equipment decontamination will be documented and recorded in accordance with appropriate SOPs. . All maintenance, malfunction or repair of application equipment will be recorded on Equipment Maintenance and Repair Log forms. All records and equipment log forms referred to in this SOP will be archived at least once per year.

Supplemental SOPs are to be followed (not detailed in this SOP) to ensure accuracy of application to include:

- Sprayer Calibration
- Sprayer Cleaning and Decontamination
- Sprayer Maintenance and Repair
- Safe Handling of Pesticides
- Calculation of Application Rates
- Collection of Spray Samples for Chemical Analysis

2. Sprayer selection

- Equipment for insecticide application in experimental hut studies will conform to WHO Equipment for Vector Control Specification Guidelines (WHO/HTM/NTD/WHOPES/2010.9) and

will be fitted with a Constant Flow Valve (Red CFValve, flow rate 150ml/minute) and the correct nozzle (e.g. 8002E Flat Fan Spray Tip Nozzle) and screens for the intended application.

- Sprayers are to be calibrated following the appropriate SOP before use. Immediately before use, verify that the flow rate is within +/- 5% of that calculated in the calibration prior to use. If the flow varies significantly from that calculated for the application then adjust the spraying speed by using the following formula:

$$\textbf{Lance Speed (m/sec)} = \frac{\textbf{Flow Rate (ml/min)}}{\textbf{Volume Rate (ml/m2) x Band (m) x 60}}$$

- Prior to use, all application equipment should be visually inspected and run with clean water or untreated material to ensure that the equipment is in good working order

Responsibilities

1. The Study Director, Biologist or Technician is responsible for ensuring these procedures are followed. Appropriate personal protective equipment (PPE) must be worn at all times during the handling of insecticides.

Instructions

1. Using the sprayers

1.1. The tank should be filled with aqueous solutions only. Care must be taken not to fill above the maximum volume indicated on the container; space must be left to compress the air.

1.2. Prepare the insecticide spray according to the manufacturer's instructions. Wherever possible, insecticide should be mixed in the sprayer to minimize the possibility of spillage. Water soluble sachets, tablets and insecticide granules and other more soluble formulations are typically added directly to the water filled tank. However, the insecticide may be mixed separately with water in an appropriate container (e.g. bucket) and poured into the sprayer.

1.3. Use clean water for insecticide dilution. It must be uncontaminated, clear of sediment and preferably tap or well water.

1.4. Once the required volume of insecticide mixture has been transferred into the sprayer, fit the lid and turn the handle to lock the sprayer. Check that the lid is correctly locked in place before pressurising the sprayer.

1.5. Using both hands, operate the pump to pressurise the spray tank. Pump the tank until the pressure has reached approx. 4 bars on the pressure gauge.

1.6. Agitate the spray pump immediately prior to use to mix the insecticide with the water; check that the sprayer pressure is at the desired level and that the tank is holding pressure.

1.7. Begin spraying at the bottom corner of the wall to the right of the door. If you are right-handed, go to the right. If you are left-handed, start spraying to the left of the door and go to the left.

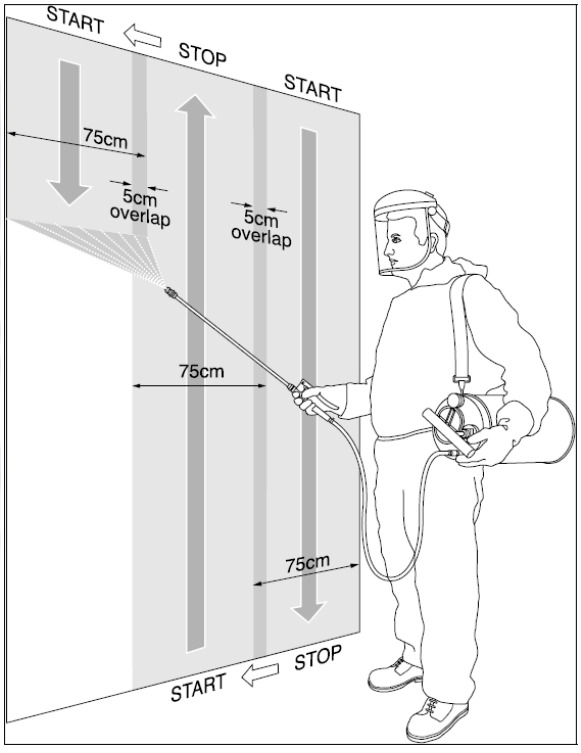
1.8. Start spraying by moving the sprayer lance steadily from the floor up to the ceiling.

1.9. To ensure the correct swath width, keep the spray tip about 45 cm from the wall. Lean forward slightly as you spray the top of the wall and move back as you bring the nozzle downward so as to maintain the correct distance between the spray tip and the wall at all times while the application is being made.

1.10. Using a stopwatch, time your spray speed to cover one meter every 2.2 seconds (4.5 seconds for a 2-meter-high wall).

1.11. Move a step to the right equal to the width of the spray swath (70 cm in the case of 8002E spray tip, allowing a 5cm overlap), and spray from the ceiling to the floor. Continue this procedure across each hut wall, until you reach the starting point at the front door.

1.12. Agitate the spray pump every two to three minutes to ensure the insecticide remains mixed.



2. Cleaning the sprayers

2.1. After use the sprayer must be emptied and cleaned thoroughly. Any excess chemicals must be disposed of according to SOP AVECNET EH 009.01 (Insecticide Waste Disposal).

2.2. The sprayer must be thoroughly rinsed with water and filled with a warm water and weak detergent solution. After the contents have been passed through the sprayer, the procedure should be repeated with clean cold water and triple rinsed.

2.3. Records of use and cleaning of the sprayers should be recorded in the log book for the sprayers located in the locked cabinet outside the facility manager's office.

3. Disposal Nozzle Output Calculation:

3.1. At 1.5 Bar pressure with the Red CFValve the flow rate should be 560 ml/min.

3.2. The formula to calculate the required flow rate from the sprayer is as follows:

FORMULA

Flow (ml/min) = Volume Rate (ml/m^2) x Band (m) x lance Speed (m/sec) x 60

where

Flow Output from nozzle in 1 minute at constant pressure

Volume rate Volume in ml applied per m^2 (e.g.30 ml/m^2)

Band Width of spray band 0.7m (75cm less 5cm overlap)

Lance Speed in m/sec that the lance (wand) sprays up or down a wall. Usually 2m is treated in 4.5 seconds or 0.44m/sec.

E.g To apply 30 ml/m^2 with a 70cm band (75cm less 5 cm overlap) treating a 2m vertical strip every 4.5 seconds we have

Flow Required = 30 x 0.70 x (2m / 4.5 sec) x 60 (ml/min)
= 30 x 0.70 x 0.444 x 60
= 560 ml/min

Application Parameters with 1.5 Bard Red CFValve and 8002E nozzle							
Pressure (Bar)	Flow Rate (ml/min)	Spray Time	Vol. Rate (ml/m^2)	Band (m)	Speed (m/sec)	Time to treat 2m strip	Total Area (m^2 per fill)
1.5	560	13min	20	0.70	0.67	3.0	375

		24s	30 40	0.70 0.70	0.44 0.33	4.5 6.0	250 187.5