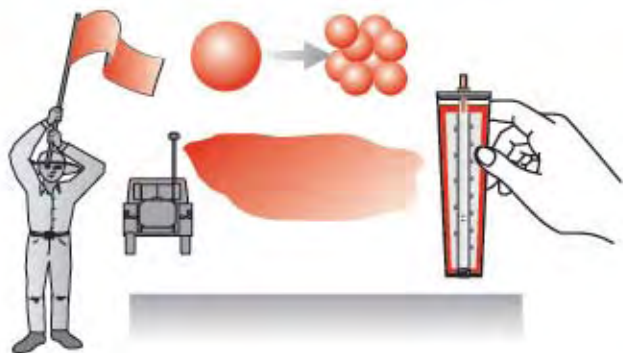


Standard Operating Procedures (SOP) for Desert Locust Ground Control



Food and Agriculture Organization Of The United Nations

Standard Operating Procedures (SOP) for Desert Locust Ground Control

Objective

The objective of the Standard Operating Procedures (SOP) for Desert Locust Control is to give concise instructions for good insecticide application against the Desert Locust. These instructions are intended for use by the field staff who are involved in Desert Locust operations (including Locust Officers and technicians) in order to help them to avoid dangerous, ineffective or wasteful control operations. They are based on the **FAO Desert Locust Guidelines** where more detailed information and references are available.

The instructions focus on:

- ULV insecticide spraying
- ULV spray equipment
- Techniques for safe and efficient operations

1. Control process

A series of steps needs to be followed before, during and after control operations.

PREPARATIONS three months before control operations

- Select competent control teams and provide them with training or refresher training
- Check and service the vehicles
- Check and test all spray equipment and check that commonly needed spare parts are available
- Distribute the required quantity and type of insecticides to the likely spray sites
- Make sure that operational funds are allocated for the proposed control period to cover field allowances, fuel, etc.
- Make sure that aircraft are available in the country and can be contracted by the MoA for control operations. Check that airstrips have been maintained
- Ensure that enough copies of the *FAO Spray Monitoring Form* are available

BEFORE control operations

- Step 1.** Choose appropriate control method (equipment, insecticide and technique), which depends on infestation size, urgency of action and work rate required.
- Step 2.** Calibrate your spray equipment in order to assure the correct amount of insecticide is applied in the right way and in the right place.
- Step 3.** Ensure that local inhabitants are informed about the date, time and location of control operations, so that they can move their livestock, beehives and families to safety.
- Step 4.** Find the wind direction in order to establish a spray direction at right angles to it and demarcate the infested area.
- Step 5.** Make sure that temperature, wind and rainfall conditions are suitable for the control operation.

DURING control operations

- Step 6.** Make sure that:
 - All staff who are handling or applying insecticide use full protective clothing
 - All spraying equipment and personnel are at the downwind edge of the area to start spraying (from downwind towards upwind)
 - All other non-spraying personnel, vehicles and equipment are at the upwind edge of the target area to avoid contamination by the sprayed insecticide
 - Start spraying cross-wind (at right angles to the wind direction), moving upwind after each spray pass, making sure to measure the correct track spacing using flagmen or other means
 - Make an extra spray pass upwind of the target area to prevent under-dosing at the upwind edge
 - Stop spraying if the wind drops (less than 1 m/s) or becomes very strong (more than 10 m/s) and wait for the right conditions
 - Stop spraying if it starts to rain or seems likely to rain soon
 - Stop spraying if the wind direction changes by more than 45 degrees, adjust your new spray line and spray the remaining area

AFTER control operations

- Step 7.** Monitor and record all relevant details on the *FAO Spray Monitoring Form*.
- Step 8.** Empty any insecticide remaining in the sprayer back into the original insecticide container. Clean and maintain equipment, and store the sprayers, the insecticide and the empty containers in safe places.
- Step 9.** Wash yourself and the protective clothing as soon as possible.

2. Control team and field equipment

Control Team: two locust officers, two drivers and two vehicles, plus support staff such as assistants and skilled labourers.

Equipment: to be available in each vehicle:

- Hand-held GPS ⁽¹⁾
- Maps
- Compass
- FAO forms ⁽²⁾
- Clipboard, paper and pen
- Anemometer
- Hygrometer
- Oil sensitive paper to sample ULV droplets
- Bucket and plastic measuring cylinder or jug
- Vibrating tachometer
- Stop watch
- Hand lens (x10)
- Sweep net
- Tool kit
- First aid kit
- HF radio
- Cages for mortality assessment
- Water and soap for washing
- Sets of protective clothing for all staff handling insecticides

(1) extra batteries, cigarette lighter adapter, remote antenna

(2) Survey & Control Forms and Spray Monitoring Forms

3. Principles of ULV application

Ultra low volume (ULV) spraying uses small amounts of concentrated insecticide. In locust control, about 0.5-1.0 litre/hectare is applied. The insecticide is not mixed with water or solvent. It is oil-based to prevent evaporation and is usually applied ready to spray.

Droplets of spray are carried by the wind. In full coverage treatments, the insecticide is sprayed as overlapping swaths onto the control target so that a uniform deposit is achieved and the locusts receive enough insecticide. Remember:

- Do **not** spray during the hottest part of the day (1100-1600 hr) when convection may occur and carry the spray up into the sky instead of down onto the locusts
- Do **not** spray at low wind speeds less than 1 m/s
- Do **not** spray at high wind speeds more than 10 m/s

4. ULV spray equipment

A good ULV sprayer uses rotary atomizers (spinning discs or rotating cages) to produce droplets in a small size range (50-100 μm). If droplets are too large or too small, control will be poor and insecticide wasted.

ULV sprayers can be carried by an operator (portable) or mounted on 4x4 vehicle (vehicle-mounted sprayer), airplane or helicopter (aircraft-mounted sprayer). The principles of use are the same for all of them, but the scale and speed of operation are different.

Portable sprayers

- For small areas (15 ha/day)
- For situations where a slow work rate is acceptable
- In rocks and hills
- On soft sands
- For single hopper bands only (not for swarm control)

Vehicle-mounted sprayers

- For medium-sized areas (100 ha/day)
- For situations where a medium work rate is required
- For single bands
- Not recommended in rocks and hills
- Not recommended on soft sand
- Difficult to spray swarms

Aircraft-mounted sprayers

- For large areas (5,000 ha/day or more)
- For situations where a fast work rate is required
- In rocks and hills
- On soft sand
- To control swarms (settled and flying)
- Not efficient for spraying single bands

5. Calibrating ULV spray equipment

Spray equipment must be calibrated before the actual spraying takes place.

What is calibration?

The sprayer needs to be adjusted in order to apply the recommended amount of insecticide, in the right size spray droplets, to the right place.

Calibration should always be carried out by using the actual insecticide that will be applied

When do you calibrate spray equipment?

- When the sprayer is new
- When the insecticide formulation or concentration is changed
- When the volume application rate (VAR), track spacing or forward speed is changed
- Before the beginning of the campaign and on a daily basis during it

How to calibrate a sprayer

Step 1. Find the recommended dose of the insecticide (g a.i./ha) from the drum label, FAO Guidelines, etc. If it is given as litres/hectare, go to step 3.

Step 2. Calculate the required Volume Application Rate (VAR).

$$\text{VAR (l/ha)} = \frac{\text{Recommended dose (g a.i./ha)}}{\text{Formulation concentration (g/l)}}$$

Example: If the recommended dose for chlorpyrifos is 250 g a.i./ha and its concentration is 450 g/l what is the VAR?

$$\text{VAR (l/ha)} = \frac{250}{450} = 0.55 \text{ l/ha}$$

If the formulation concentration is expressed as percentage of weight to volume (% w/v), convert the concentration to g a.i./l by using the formula:

$$\text{Concentration (g a.i./l)} = \frac{\text{Concentration given} \times 1000}{100}$$

Example: If the concentration given for bendiocarb is 10%, then this must be converted by using the formula:

$$\text{Concentration in g a.i./l} = \frac{10 \times 1000}{100} = 100 \text{ g a.i./l}$$

In short, multiply the given percentage concentration by 10.

Step 3. Calculate the required Flow Rate (FR).

$$\text{FR (l/min)} = \frac{\text{VAR (l/ha)} \times \text{speed (km/h)} \times \text{track spacing (m)}}{600}$$

Example: What flow rate is required from a vehicle mounted sprayer moving at 10 km/h using a 30m track spacing in order to apply 100 g a.i./ha of bendiocarb 10% ULV?

$$\text{FR (l/min)} = \frac{1 \text{ (l/ha)} \times 10 \text{ (km/h)} \times 30 \text{ (m)}}{600} = 0.5 \text{ l/min}$$

It is important to remember that if one of the parameters (flow rate, track spacing or forward speed) is altered, then one or more of the others have to be changed in order to maintain the correct Volume Application Rate and Dose.

- If flow rate increases VAR increases (and vice versa)
- If track spacing increases VAR decreases (and vice versa)
- If forward speed increases VAR decreases (and vice versa)

Example: If the wind becomes stronger, it might be possible to increase the track spacing to allow a faster work rate. In order to maintain the correct VAR and dose, either the spray forward speed must be decreased or the flow rate must be increased. In order to achieve a faster work rate from the wider track spacing, the flow rate must be increased, rather than the forward speed being decreased.

How to measure the flow rate

When measuring the flow rate from a ground-based sprayer, the collection technique can usually be used since the spray liquid can in most cases be collected easily as it is emitted:

- Step 1.** Calculate the required flow rate (see page 11).
- Step 2.** Make sure that the valves are in the correct position (refer to the sprayer manual).
- Step 3.** Fill the sprayer, place a bucket under the atomizer and make sure to get rid of the air and that the tubes are full of liquid. Return the emitted insecticide to the tank. For vehicle-mounted sprayers, the engine should be running at normal operation speed to ensure that the correct voltage is being supplied to the battery and the sprayer.
- Step 4.** Place a measuring cylinder under the sprayer atomizer and allow the insecticide to flow via a funnel for one minute. **Only the pump should be switched on; never switch on the rotating atomizers.**
- Step 5.** Measure the volume of insecticide collected, then empty the cylinder back into the sprayer tank.
- Step 6.** Adjust the flow rate to bring it closer to the required rate calculated previously. Repeat steps 4 and 5 until this rate has been achieved to within about 5% error.
- Step 7.** When the required flow rate has been achieved, recheck it two more times to ensure that it is correct.

How to estimate work rate

A rough estimate of the work rate can be calculated from the formula:

$$\text{Work rate (ha/h)} = \frac{\text{Forward speed (km/h)} \times \text{track spacing (m)}}{10}$$

Note: this formula does not take into account the time required for turning at the end of each spray pass, which can be considerable for aircraft.

Typical track spacings

- handheld spinning disk sprayers 10 m
- vehicle-mounted drift sprayers 30 m
- vehicle-mounted airblast sprayers 50 m
- aircraft-mounted sprayers 100 m

6. Recording and reporting

Monitoring is very important in order to document the activities and to allow later analysis of the successes and failures of any campaign. Most of the information concerning the control operations and their efficacy and the efficiency of the campaign are covered in the *FAO Spray Monitoring Form*.

The form should be completed together with the *FAO Locust Survey & Control Form* in order to include details on the location, rainfall, ecology and locusts. Both forms should be returned to the National Locust Unit headquarters as soon as possible for review. Any problems (lack of protective clothing, overdosing, poor efficacy, non-target effects, etc.) can be noted on the form so they can be addressed later.

Field staff recording the details of each control operation should use these forms

7. Cleaning, storing and disposal

Spray equipment should always be clean and ready to use. Properly dispose empty containers.

Always wear protective clothing while handling insecticides

Sprayers

- Drain unused insecticide back into the original containers
- To clean the sprayer, put some kerosene or diesel into it and spray it over the target area or waste ground, away from water bodies or supplies used by people or livestock; never dump this liquid in one place such as a pit
- Carry out any repair or required maintenance
- Wash the outside of the sprayer with a cloth soaked in diesel or kerosene
- Store the cleaned sprayer safely in a store

Insecticide storage

- Keep insecticide in original containers in a cool locked store to reduce deterioration caused by high temperatures
- Use older insecticides first (first-in-first-out system)

Disposal of empty insecticide containers

- Clean empty insecticide containers three times inside and out with diesel or kerosene
- Collect the small volume of washings and dispose of by adding them to the insecticide in sprayer tanks during the next control operations or, if it is the end of the season, pour them into insecticide containers that are not full
- Never use empty containers for any other purpose than insecticides
- If they are to be recycled, they should be transported back to manufacturer
- Containers for disposal should be punctured, crushed and sent back to national authorities for appropriate disposal

**Refer to the
FAO Desert Locust Guidelines 4. Control
for more details**