

4a. MAKE SPRAY PROGRAM IMPROVEMENTS

- ❖ How to use insecticides effectively and safely
- ❖ Rotate to avoid resistance
- ❖ Spray if pests too high
- ❖ Check plants after spraying
- ❖ Get expert advice on persistent problems
- ❖ Trouble shooting and insecticide properties



**Fluorescent dye used to test
spray coverage**

The effective use of insecticides is essential for sustainable pest control so you must ensure that the following things are done correctly:

- ❖ Appropriate selection of the legal chemicals for the job
- ❖ Follow all requirements of effective insecticide application, taking careful note of the different application requirements of some chemicals
- ❖ Check pest control results as soon as safely possible after application
- ❖ Manage the threat of resistance by proper rotation of chemical groups

- ❖ Appropriate selection of the legal chemicals for the job

Be sure to use suitable chemicals rather than just familiar ones

When choosing a chemical several factors are important – not just price alone. Is it effective against that pest? Will the with-holding period or other safety issues fit with your harvesting schedule? Can it cause any damage to the crop? Will it kill beneficial insects you are trying to protect? Do you know how to use the chemical to its full effectiveness? Do you have the right equipment and application methods for that chemical? Is it legal to use it on your crop?

To avoid worker and food safety issues use only approved chemicals

There are different legal forms of permission to use an insecticide. Here are some definitions to clarify their meaning.

1. Registered Chemicals:

Before they can be supplied distributed or sold anywhere in Australia an agricultural or veterinary chemical product must be registered for use by the APVMA by way of a product label. Variations to the formulation of a currently registered product must also be approved, as must proposed new patterns of use and new labels. This includes changes to the current use pattern or the products claims. All agvet products can only be used as per label instructions. Find registered products on the APVMA web site at: <http://www.apvma.gov.au/>

2. Off Label Permits:

Chemicals shall be used in accordance with relevant State Legislation for off label use. Once the APVMA has registered a product for use, the states and territories are responsible for control of its use. Due to differences between states in their regulatory requirements not all uses are bound by permits to use chemicals off label but all uses must comply with the Food Standards Code and abide by a maximum residue limit(MRL) for the chemical in the code. This allows growers in to use products in compliance with food standards and quality assurance (QA) systems required by their markets.

In general an “Off-Label” permit allows a person or an organisation to use registered Agvet products in situations that would otherwise be an offence either against certain provisions of the federal legislation (Agvet Code) or of appropriate State control of use legislation. Permits can only be issued, in response to an application for:

- a minor use
- an emergency use
- research purposes.

Generally, permits to allow off-label and emergency uses can be viewed as additional or an addendum to the use pattern or instructions on an approved label Find current permits on the APVMA web site at: <http://www.apvma.gov.au/>

4b. SPRAY IF PESTS TOO HIGH

- ❖ Follow all requirements of effective insecticide application, taking careful note of the different application requirements of some chemicals

If your crop monitoring tells you the pests have reached a level where spraying is required then follow the requirements of effective insecticide application:

- Select an insecticide from the right chemical group according to your chemical rotation plan
- Note all important legal and safety requirements (e.g. protective gear, re-entry time and withholding period from spray to next pick)
- Examine and closely follow all guidelines for effective use of the chemical (e.g. use of a wetting agent if required, avoidance of high temperatures etc.)
- Ensure you are mixing the correct rate and volume for the crop and pest
- Avoid using any other additives in the tank mix unless certain that it is a safe and effective combination
- Mix and apply the chemical promptly, at the best time of day for a good kill - usually morning or late afternoon
- Check pH of the mixture before adding the chemical to make sure it is between 6.0 and 8.0 (6.5 is best)
- Find out how long it should take the chemical to work (minutes or days)

Apply the chemical to achieve good coverage by

- Making sure the spray equipment is calibrated to deliver the correct volume for the crop area and growth stage and that the jets and pressure setting are delivering the right droplet size and penetration to get good coverage
- Making sure that your movement of the spray nozzles is achieving good coverage from top to bottom, between plants and under leaves.
- Avoiding run off with most chemicals as this often leads to leaf burn and can actually leave less chemical on the leaf for insects !

4c. CHECK PLANTS AFTER SPRAYING, ROTATE CHEMICAL GROUPS EVERY 2-3 SPRAYS

- ❖ Check effectiveness of the spray application

You must check the effectiveness of the spray application by comparing before and after spray pest numbers:

- Check fruit flowers for a comparison of pest numbers in 1-3 days depending on how long the chemical takes to work
- Check sticky traps twice over the next week for pest build up (at 2 and 5 days)

- ❖ Manage the threat of insecticide resistance

By following these procedures you will help to reduce the risk of increasing the level of resistant insects in the pest populations through:

- Rotating the chemical according to your chemical group rotation plan
- Making sure that the chemical is correctly mixed and used under the right conditions (additives (+/-), temperature, pest threshold level etc.)
- Making sure that you get good coverage to get the maximum kill
- Not spraying more often than you need to

Example spray rotation planner

Crop 1. (e.g. cucumber)

Chemicals with permits for this crop:

Active ingredient	Chemical group	Available brands
1.
2.
3.
4.

Rotation plan:	1. Main chemical	2. Backup chemical (same group as first choice)
July
August
September
October
November
December
January
February
March
April
May
June

Reserve chemical for infrequent use on heavy infestations:

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Crop 2 (e.g. lettuce)

Chemicals with permits for this crop:

Active ingredient	Chemical group	Available brands
1.
2.
3.
4.

Rotation plan:	1. Main chemical	2. Backup chemical (same group as first choice)
July
August
September
October
November
December
January
February
March
April
May
June

Reserve chemical for infrequent use on heavy infestations:

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5. IF PROBLEMS PERSIST GET MORE INFO. OR EXPERT ADVICE

Information on chemical permits and chemical use:

- ❖ For information on Registered products and Minor use permits go to the APVMA web site at:
 - *Minor use permit search:* <http://www.apvma.gov.au/permits/search.php>
 - *Registered products search:*
<http://services.apvma.gov.au/PubcrisWebClient/welcome.do>
- ❖ PIRSA legislation on farm chem. use:
http://www.pir.sa.gov.au/pirsa/more/factsheets/farm_chemicals?SQ_DESIGN_NAME=printer_friendly
- ❖ Your preferred reseller

Advice on spray coverage

- ❖ Your preferred reseller
- ❖ Commercial consultants

Insect and disease diagnostics:

- ❖ Your preferred reseller
- ❖ Commercial consultants
- ❖ SARDI (Plant diseases: Barbara Hall 8303 9562)

Advice on using beneficial insects

- ❖ JAMES ALTMANN - Biological Services; 0427 846 977; info@biological services.com
- ❖ LACHLAN CHILMAN - Manchil Services; 0403 727 252; lachlanchilman@hotmail.com
- ❖ Tony Burfield (0401 120 857)

General agronomy

- ❖ Your preferred reseller
- ❖ Commercial consultants

Spray program supplement

- A. Diagnosis and correction of spray failures
- B. Possible chemicals for rotation to manage resistance risks
- C. Key insecticide properties

A. Diagnosis and correction of spray failures

Skilled insecticide application will improve chemical effectiveness, reduce the risk of resistance, reduce crop losses, and probably reduce the quantity of chemicals and labour required to do the job.

1. INCORRECT TIMING FOR PEST LIFE CYCLE

Diagnosis:

Pests have life cycle intervals for laying eggs and hatching new generations that generally shorten in warm weather and lengthen in cold weather. This creates an ideal interval between sprays to have maximum effect and avoid letting new generations escape a badly timed spray. Generally recommended spray intervals for most pests range from about 6-7 days in winter and 3-4 days in summer. You must read labels to know which life stages are targeted and how long the chemical takes to kill those life stages

This information is critical to know for when to time sprays and when to check the plant and what you expect to find to decide whether the spray application is working or not.

Corrective action:

Read the label and check the crop accordingly for the results that should be achieved – life stage and time to kill.

2. INSECTICIDE RESISTANCE

Diagnosis:

Insect samples can be tested for resistance by NSW Agriculture. Contact

Corrective action:

To reduce the risk of increasing the level of resistant insects in the pest populations:

- Set up a chemical rotation plan of effective chemicals from different chemical groups (save some chemicals with shorter withholding periods for harvest time)
- Don't mix chemical groups together. Use one at a time and rotate after 3-4 back to back applications. Use 3 consecutive sprays of a single group if a key pest like WFT is breeding in the crop. Vary the spray interval to fit the life cycle of the pest.
- Don't spray more often than you need to. This can promote resistance more quickly

Make sure that you get good coverage to get the maximum kill

Many pest control failures are not due to resistance and are in fact correctable. Before testing for resistance it is worth making sure that other factors (as covered in the information below) can be eliminated as causes of pest control failure.

3. POOR SPRAY CALIBRATION AND COVERAGE

Spray calibration calculations: It is vital to have the right amount of active chemical in the right volume of water (or other carrier) for the pest, the crop area and the plant growth stage to be treated. Although no growers regularly get this wrong for standard conditions many labels only give rates for standard applications of high or low volume sprays. So growers are often guessing how to interpret labels for spray applications that the label is not designed for, e.g. foggers ! A chemical applied as a conventional spray will probably behave very differently as an aerosol (fogger) or if applied through drippers. Correct droplet size is often critical for contact sprays. If the droplets are too small and conditions are very dry the chemical may dry out before contact and not be adequately absorbed.

The consequences of occasionally or consistently getting applications wrong can be very great. Under-dosing can encourage resistance in WFT (and other pests) by not killing off partially resistant strains. Just bumping it up a bit is not a good idea either. Guessing can lead to residue violations and plant damage.

Spray coverage: Insecticides, especially contact insecticides, require thorough coverage of fine droplets to be effective. For small, secretive insects like thrips this is critical. Growers found it was very useful to run a dye to test spray coverage. We used a fluorescent night dye with different spray jets, pressures and hand movements. The variation in results was dramatic! Growers made corrections for worn and oversized spray jets, increased or decreased pressure as required, modified their hand movements and then checked the results. Generally too much chemical was being applied in oversized droplets and not enough care was being taken to penetrate foliage in larger plants.

A wet plant is not necessarily a protected plant! Many growers reduced chemical output and improved pest control as a result. If you haven't tested coverage you will probably be as surprised as they were by the results.

Diagnosis:

Check that the spray equipment is set to deliver correct volumes to the target area (calibration)

Check coverage efficiency using a coloured dye at different pressure settings, jet sizes and delivery patterns (with hand held equipment) to detect weaknesses in spray coverage of the crop – under leaves, on the far side of rows, low on the plant etc.

** Methods for setting and checking differ depending on equipment used, i.e. spray boom, hand held gun, aerial application, misters, foggers etc*

Corrective action:

Correct the size and distribution of spray droplets by adjusting jet size, pressure and movement through the crop to get the most even and close packed distribution of spray drops possible. This may require:

- Changing jet size to get a better spray droplet size
- Replacing jets every 12 months (worn jets become oversized, making droplets too large and uneven to give good coverage and they waste a lot of chemical through inefficient application)
- Increasing or reducing tank pressure to vary droplet size and air pressure driving spray into the crop
- Making sure that your movement of the spray nozzles is achieving good coverage from top to bottom, between plants and under leaves by altering application patterns (not too many rows at once etc.), speed through the crop and hand movements
- Modifying the design of hand wands to get better penetration of the crop (number of jets, length, angle etc.)

Avoid run off with most insecticides as this often leads to leaf burn and can actually leave less chemical on the leaf for insects !

4. INCORRECT CHEMICAL RATE:

Diagnosis:

Make sure you check the label against your crop, pest and equipment! Under dosing can reduce pest kill and increase the risk of resistance. Overdosing is an unnecessary threat to the health of workers and consumers and is not likely to improve results in most cases and can lead to residue violations.

Corrective action:

Check the label for the rate for your pest, method of application (high or low volume), crop type and crop area. You may wish to make adjustments for changes in leaf area at different stages of crop maturity if you want to conserve chemical use on younger plants.

5. POOR UNDERSTANDING OF KEY CHEMICAL PROPERTIES, (mode of action etc.)

Diagnosis:

Sometimes a spray application appears to fail, or does fail because the grower may not fully understand how a new chemical works on the insect, or that it may break down quickly under certain conditions. Some new chemicals take time to kill, or work only on specific life stages of the pest. Some are systemic, or partly system and others need direct contact. Some last as an effective killing residue for a period of days while others do not. The chemical may not be effective, or may appear ineffective if not applied in a certain way. This can be difficult to diagnose without specific information about each chemical and its key properties and potential weaknesses.

Corrective action:

- Look for details on the label
- Consult information provided here on some chemicals under “C. Key chemical properties” (pages 34-50)
- Get expert advice

6. UNSUITABLE PRODUCT FORMULATION FOR YOUR NEEDS:

Diagnosis:

Check the label ! The same chemical may be available in different formulations that can require different mixing procedures. They also may have different application and coverage properties, storage requirements and different compatibility with other additives.

Corrective action:

Make sure that the formulation of the insecticide you have purchased is suited to your spray equipment and methods of spraying.