

Minimising pesticide residues in greenhouse and hydroponic crops

Pesticide residues in food crops are a problem if the residue level is above the legal limit (maximum residue limit or MRL) at harvest. Persistent low levels of pesticide residues are also a problem as they can result in pest and disease resistance to the chemical being used. Pesticide residues can behave differently in some hydroponic and greenhouse systems compared with field grown crops. This can result in residue levels above the MRL even when the label withholding period is followed.

The potential for pesticide residues in crops grown in greenhouse and hydroponic systems can occur in two ways.

1. Hail netting, shade cloth or greenhouse covers can reduce the rate of pesticide residue breakdown from sunlight, wind and rain.

Research has shown that the crop environment will affect the degradation rate of pesticides. Crop covers can slow degradation of some pesticides compared with exposure to full sun, wind and rain. Pesticide degradation will also be reduced in the shorter daylight hours of winter compared to other seasons.

2. In some hydroponic systems the nutrient solution can become contaminated with pesticides and then taken up by plants.

Hydroponic systems are soil less with nutrients being delivered to roots in the irrigation water (nutrient solution). In some hydroponic systems the nutrient solution is delivered to plant roots then collected and reapplied on a continual basis (recirculating system). The same batch of nutrient solution can be recirculated for several months

or longer until it is discarded. If the recirculated solution is contaminated with pesticides, these are also being continuously applied to plant roots. This can lead to uptake of pesticides resulting in residues which could persist in the crop for some time. The MRL could be exceeded and there is a risk of pest and disease resistance to the pesticide.

Nutrient film technique (NFT) is one hydroponic system where the nutrient solution is recirculated. The plants grow in sloped channels and the roots are bathed in the recirculating solution. Research has shown that spraying mature lettuce in an NFT system according to label directions can result in contamination of the nutrient solution and residues in the lettuce.

Management strategies to minimise pesticide residues

Growers need to take into account their own greenhouse or hydroponic production system in order to develop the most appropriate pest and disease management plan for their crop. There are a number of strategies which can be used to minimise pest and disease problems and avoid pesticide residues in hydroponic crops.

- **Keep the farm clean**

A clean farm usually has fewer pest and disease problems. Keep the farm free of weeds and carefully dispose of diseased plants and old plant matter. These can be buried, composted with animal manures, or if the material has a high water content (e.g. lettuce) plants can be placed in black plastic bags, sealed and placed in the sun. After the plant matter has broken down it can be used as mulch.



- ***Avoid calendar spraying***

Calendar spraying is when pesticides are applied on a schedule without considering the actual presence or extent of pests and diseases in the crop. This practice can result in pesticides being applied when they are not needed, can increase pest and disease resistance and be a waste of time and money.

- ***Monitor pests and diseases***

Regularly check your crop for pests and diseases by carefully checking plants with a magnifying glass or hand lens for the presence of pests and disease. Sticky traps can also be used to check for the presence of specific pests. Regular monitoring ensures problems are found early, making control easier and saving you time and money. Additionally, monitoring records will allow you to evaluate the effectiveness of control methods and identify the time of the year for particular pest and disease issues.

- ***Use pest and disease thresholds***

The presence of a pest or disease does not automatically mean financial loss. In some situations, the cost of applying pesticides may be greater than the loss if no action was taken.

The point at which a control measure is needed to prevent economic loss is called the action threshold. For example, if you checked 50 plants and found one grub then you'd be more likely to squash it than make up a spray to kill it. On the other hand, if you checked 50 plants and found 200 grubs you may spray to control them. So, somewhere between these two situations there is a period where the crop can tolerate having pests in them before you need to spray. Action thresholds for certain pests and diseases are available for some crops. If there is no recommended action threshold then you need to use your own experience to develop them and make decisions. By using action thresholds you can more accurately time pesticide applications and may even reduce the number of applications made. This can also reduce the risk of pesticide residues.

- ***Choose the right control measure***

Use a combination of measures to control pests and diseases, including cultural, biological and

chemical measures. There are a wide range of beneficial insects commercially available to control pests. They can be used in conjunction with pesticides but the choice of pesticide is critical to ensuring that these natural enemies survive. Where possible, choose pesticides that have a low impact on beneficial insects.

- ***Use separate production systems***

Set up the production site using multiple separate ground tanks and systems. Although this increases the initial set up cost it allows you to manage batches of plants separately. This is particularly valuable in managing root diseases especially when planting out new transplants. Transplanting young plants into a system containing older plants already infected with root diseases almost always results in high mortality of the younger plants and significantly affects growth rates.

Similarly, if the nutrient solution becomes contaminated with pesticides the problem is confined to only one section of the system. Sections can also be shut down separately for cleaning and maintenance, without disrupting overall production.

- ***Prevent spray drift***

Preventing spray drift between young and old plants and different crops is also critical in reducing the risk of pesticide residues. Make sure there is adequate protection (i.e. screens and windbreaks) between production areas to reduce spray drift onto non-target plants from within the site and from any neighbouring farms.

- ***Increase the withholding period (WHP)***

Increasing the recommended withholding period is one way hydroponic and greenhouse growers can reduce the risk of pesticide residues. You need to be confident that your produce does not exceed the MRL for the chemicals you use. Testing your produce for residues will help you determine if the recommended withholding period needs to be increased for your method of production.

- ***Dump the nutrient solution***

Dumping the nutrient solution following the application of some pesticides is another strategy to ensure pesticides do not get into or remain in the

nutrient solution. In order to reduce environmental contamination, dumped nutrient solutions need to be cleaned using artificial wetlands. Alternatively they can be collected by a waste disposal contractor.

More information

More information on using farm chemicals is available from the series *Spray Sense – safe and effective use of farm chemicals*. The series is available on the NSW Department of Primary Industries website at www.dpi.nsw.gov.au

ALWAYS READ THE LABEL

Users of agricultural chemical products must always read the label and any Permit, before using the product, and strictly comply with the directions on the label and the conditions of any Permit. Users are not absolved from compliance with the directions on the label or Permit by reason of any statement made or omitted to be made in this publication.