



VEGE *notes*

Your levy @ work

Lettuce Integrated Pest Management (IPM)

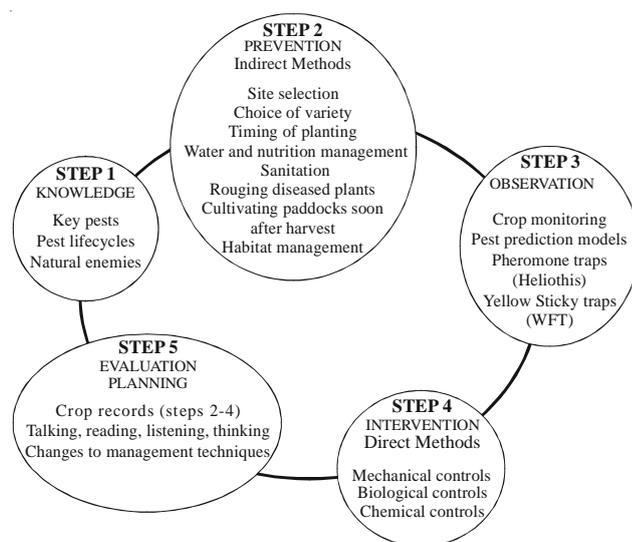
Lettuce Integrated Pest Management (IPM) helps growers select the best tool to manage pests. There are five steps in this strategy:

1 - identify key pests and understand their lifecycles, including what naturally eats/kills them (natural enemies and climatic conditions).

2 - prevent pests from being in your crop or increasing in numbers to the point of causing economic damage. It may be that the pest is: not present at particular times of the year, unable to develop on specific varieties (best choice for disease prevention), or is worse when crops are over or under watered or fertilised.



3 - monitor crop for pests and numbers. Pheromone traps help identify which of the two heliothis species is dominant (*Helicoverpa armigera* is resistant to synthetic pyrethroids and carbamates but *H. punctigera* is not). Yellow sticky traps help monitor thrips species and numbers. Prediction models should be used to indicate periods when pests or diseases are most likely to be present if available.



4 - control the pest when numbers are causing economic damage. This can involve: mechanical methods (chipping weeds or diseased plants); biological methods (introduce a beneficial insect or use biological spray - Bt or NPV); or chemical methods (pesticides).

5 - evaluate immediate effectiveness of direct controls and overall success of the program. Identify potential areas for improvement and develop a plan for future plantings.

The bottom line

- Select disease resistant varieties
- Understand and identify key pests
- Monitor crops for pest and numbers regularly
- Control pests with mechanical, biological or chemical interventions
- Record all controls used
- Evaluate the effectiveness of controls
- Plan to improve pest management for future crops

KNOWLEDGE

Develop an understanding of key and minor or occasional pests that are found in lettuce in your area. The most likely candidates are in the table below.

Key Pests		Minor or Occasional Pests	
Insects:	Diseases/Disorders:	Insects:	Diseases:
Heliiothis	Sclerotinia	Cutworm	Anthraco nose
Western Flower Thrips	Big Vein virus (cool wet conditions)	Loopers	Downy Mildew
Silverleaf whitefly (QLD)	Tomato Spotted Wilt Virus (TSWV)	Cluster caterpillars	Damping-off
Aphids (when virus levels high)	Tipburn (Werribee)	Wireworm	Septoria spot
Other Thrips (when virus levels high)		False Wireworm	Botrytis or Grey Mould
		Rutherglen bugs	Black root rot
		Leafhoppers	Bottom rot
		Aphids (when virus levels low)	Bacterial leaf spot
		Other Thrips (when virus levels low)	Varnish spot
		Vegetable Weevils	Bacterial soft rot
			Corky root
			Lettuce Mosaic Virus
			Necrotic Yellows Virus

Lettuce pests.

PREVENTION

Where possible prevent pest problems. The measures used will depend on the particular situation and which pest or disease is most serious. Potential prevention strategies for lettuce and other leafy vegetables:

- Select disease resistant varieties is the best option for prevention. Contact seed companies for the best varieties for your growing window and the diseases they are resistant to.
- Avoid having lettuce in the ground when populations tend to peak in your area. Heliiothis caterpillars tend to be in large numbers in late summer, with some local variation, so avoid if possible.
- Remove flowering weeds to assist with reducing thrips numbers, especially in areas where thrips, particularly WFT, is a problem. Flowering plants and unsprayed vegetation may provide a nursery for beneficial insects but they can also be a source of thrips.
- Remove sow thistles to reduce the potential for infection with Necrotic Yellows virus.
- Source seedlings from nurseries with an active pest management strategy to reduce the likelihood of introducing pests and diseases.
- Chip out and remove (roughing) diseased plants.

- Cultivate paddocks immediately after harvest or if abandoned to reduce the potential of harbouring pests and diseases and spreading to other plantings.
- Use crop records to identify practices that may encourage pests or diseases.

OBSERVATION

Routine crop monitoring is important to record pest and beneficial numbers and assess crop health.

This can be completed by a contract professional or yourself, with the following factors in mind:

- When identifying key pests, beneficials and diseases send specimens away if in doubt.
- Keep crop monitoring records.
- Follow a systematic protocol for monitoring so direct comparisons can be made of numbers found between monitoring dates and plantings.
- A basic protocol involves visually assessing: four lettuce at ten sites within a crop, from seedling to pre-heart stage; two lettuce at ten sites from hearting until harvest. Spread the sites widely throughout the crop, include some near paddock edges and change sites each monitoring.
- Monitor at least once a week.

Other monitoring tools include: Pheromone traps for assessing the proportion of each of the two Heliiothis species and to indicate flights. Be aware, the traps attract male moths but female moths deposit the eggs into the crop. Yellow sticky traps are also useful for accessing thrips species and pressure, particularly important for crops in or near areas with Western Flower Thrips.

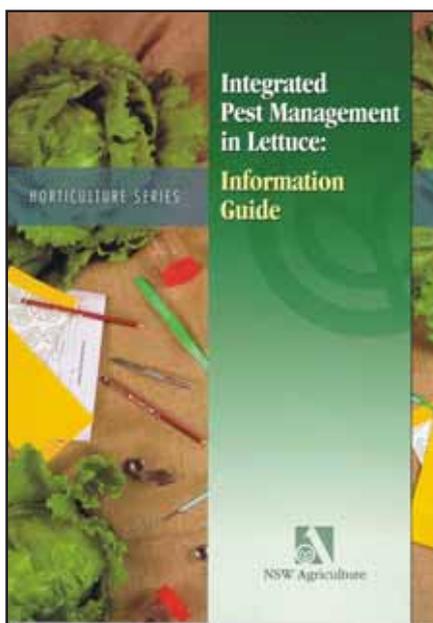


Yellow sticky trap, used particularly in areas prone to Western Flower Thrips.

Doing a visual preharvest assessment of 100 plants for key insects or disease types can give a better indication of planting quality to compare with other years or blocks than actual marketed product, given the market can accept differing quality depending on supply.

INTERVENTION

Crop monitoring information, past crop records and any pest action thresholds (some are contained in the IPM in Lettuce Information Guide) will help with deciding if pest numbers warrant active intervention.



The factors most likely to affect disease control decisions are: varietal susceptibility; disease found; if weather conditions favour spread or development; if transmitted by an insect, the numbers and source of the insect; crop vigour; irrigation methods; crop destination (export, domestic, fresh, processing); and effectiveness of control options.

Disease	Prevention	Environmental	Management
Sclerotinia	<p>Rotate with non-sclerotinia hosts</p> <p>Apply fungicide at thinning or transplanting stage when crop is likely to be infected</p>		Roughing early infected plants
Tomato Spotted Wilt (TSWV)	Removing surrounding weeds that may harbour TSWV		Controlling thrips will reduce within-paddock transmission of the virus
Big Vein	<p>Some varieties are less susceptible than others</p> <p>Good drainage</p>	Cold-wet conditions favour Big Vein	None

Diseases that affect lettuce.

Insect Pest	Crop Vulnerable Stage	Environmental influences	Beneficials	Control options
Heliothis	<p>Larvae burrow into lettuce hearts, so once lettuce has hearted, control is difficult</p> <p>Ploughing in paddocks immediately after harvest</p>	<p>Eggs hatch more quickly in warmer weather,</p> <p>Rain and frosts may wash off or kill eggs</p>	<p>Specific wasps parasitize eggs, larvae or pupae;</p> <p>Generalist predators (spiders, some shield bugs, nabids etc) may eat eggs or small larvae,</p>	<p><i>H. armigera</i> is resistant to SPs (alphacypermethrin or permethrin) and methomyl particularly medium to large larvae.</p> <p>Some resistance to Success® has been reported.</p> <p>SPs & methomyl will also kill most beneficials.</p> <p>NPV virus & Bts need to be eaten by caterpillars, & are degraded by light and dry conditions.</p>
Western Flower Thrips (WFT)	<p>Seedlings tolerate less direct feeding damage than older plants</p> <p>Younger plants are less likely to be marketable if infected by TSWV</p>	Haying-off of nearby weeds can be major source of WFT in regions with WFT	Currently no important ones	WFT develop insecticide resistance quickly therefore, a strict resistance management strategy needs to be followed (see resource box)
Aphids (not including Lettuce aphid*)	Tend to be found on the undersides of outer leaves, seedlings more vulnerable to direct feeding	Survive best in mild conditions. Frosts, rain and high temperatures reduce populations	Ladybird beetles (especially larvae), Hover fly larvae and Lacewing larvae are key predators of aphids. Parasitic wasps can also kill many aphids	<p>Pirimor – is less effective when temperature is below 15 C</p> <p>Dimethoate – effective but will kill beneficials</p>

1. *Lettuce Aphid or Nasonovia is not currently found in Australia but quickly spread throughout New Zealand in 2002. Lettuce Aphid quickly infests lettuce heads but some lettuce varieties are resistant.

Insects that affect lettuce.

Other factors that can influence pest control decisions include: crop stage (Heliothis are more difficult to control once lettuce has hearted), number of beneficial insects known to predate the target pest, and regional resistance management strategies.

The control method chosen will be the one with the least negative impact on other strategies (won't kill beneficial organisms) and will accomplish the goal within the constraints. Constraints can be: product registration, market requirements, cost, resistance management strategies and current conditions. If a pesticide is selected, every effort should be made to maximise its efficacy.

EVALUATION

All spray applications should be evaluated. SPs and Carbamates should show immediate effects however, new chemistry (ie. Success® and Avatar®) and biologicals (ie. NPV and Bts) take a few days to kill caterpillars. Feeding usually ceases quickly after application.

Pre-harvest assessments are recommended for the purpose of comparing crops and seasons. Counting the number with grub or sclerotinia out of 100 will give a better basis for comparison than simply what is sent to market.



A lettuce crop with *Sclerotinia* damage.

Packouts won't explain why lettuce wasn't picked and in times of low supply the market will accept poorer quality than in periods of high supply.

It is very useful to spend some time, each year, examining crop records to evaluate why some plantings did well while others did not. The records may show that a necessary spray was missed but beneficial insects or adverse weather did the job, or alternatively the missed spray allowed grubs through and weren't able to be cleaned up at a later date.

Talking to other growers about current conditions and crop quality can provide information on how a crop is performing in comparison to others and provide ideas on ways to improve management.

Comparing records over a number of seasons may show patterns or paddock variations that weren't noticed previously, which then allows the problem to be addressed and overall performance improved.

Integrated Pest Management in Lettuce, as in any crop, continually develops as those who adopt it develop their skills, gain a deeper understanding of their situation, and in response to changing environmental, market or economic conditions.

Further Reading

Pests, Beneficials, Diseases and Disorders in Lettuce: field identification guide* (2003)

S. McDougall *et al.*, NSW Agriculture

IPM in Lettuce: information guide* (2002)

S. McDougall *et al.*, NSW Agriculture

Pests, Beneficials, Diseases and Disorders in Greenhouse Vegetables: field identification

guide (2002) S. Goodwin *et al.*, NSW Agriculture

IPM in Greenhouse Vegetables: information guide (2002) S. Goodwin *et al.*, NSW Agriculture

The Good Bugs Book 2nd Edition (2002)

R. Llewellyn *et al.* Bugs for Bugs

Insect Pests of Fruit & Vegetables (1992)

G. Swaine *et al.* QDPI

Lettuce Agrilink (1997) Editor: G. Ayling, QDPI

*all Australian lettuce growers should have complimentary copies.

Further Information

Further information regarding Lettuce IPM can be gained by contacting your State IDO.

More information and back copies of the bimonthly lettuce industry newsletter can be accessed at: www.agric.nsw.gov.au by following the links: Horticulture>Vegetables>Publications or by contacting:

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