Mega Pests

The Basics of Protecting Your Crops

Integrated Crop Protection
PROTECTING CROPS

Vegetable crops can be exposed to significant pressure from insects, diseases and weeds. These pressures can be reduced by using an integrated approach to crop protection. Integrated Crop Protection (ICP), is an effective combination of chemical, cultural and biological methods to keep pest pressure and other crop production problems low enough to prevent significant economic loss.

Good decision-making on crop protection requires consideration of the:

- Crop
- Potential and present threats – insects, diseases and weeds
- Beneficial organisms
- Growing environment and wider environment
- Farm workers
- Market requirements.

The ICP approach provides practical alternatives to reliance on chemical products applied on a calendar basis.

This fact sheet outlines the:

- Key ICP principles
- Components of ICP
- Specific ICP steps
- General management tools and options in ICP.

For specific information on soilborne diseases, foliar diseases, chewing/biting insects, sucking insects (which sometimes carry and transmit viruses), and some stories of growers who have successfully applied ICP, see all the fact sheets in this Mega Pests Series. These may be accessed at: http://ausveg.com.au/rnd/fact_sheets.htm.

Key ICP Principles

- **Gain confidence in ICP through education, observation and action. Seek trusted, qualified advisers to get you started**
- **Be proactive - aim for prevention rather than eradication. Don't wait for a crisis in pest control before you act**
- **Commit time, effort and resources to ICP implementation. Use available resources – consultants, researchers, books, factsheets and the internet**
- **Know the history and nature of the pests in the seedling nursery and on your farm**
- **Insects have natural enemies. Preserve and increase them. If they are available from an insectary, consider releasing reared natural enemies (known as 'beneficials')**
- **Make sanitation on-farm your first priority after worker safety**
- **Monitor your crops and growing environment often**
- **Record crop and pest observations e.g. populations of insects and beneficials, susceptible varieties and stages of growth, weather events**
- **Review treatment effectiveness: chemical coverage, performance, and resistance development**
- **Understand why the 'integrated' approach increases your chance for success.**

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Why adopt ICP?

Growers have reported that adopting ICP strategies has allowed them to:

- Regain control over chemical-resistant pests
- Minimise worker and environmental impacts
- Minimise synthetic pesticide use and residues
- Satisfy consumers and the marketplace
- Reduce costs
- Meet quality assurance requirements.

Implementation of the basic principles of ICP (below) with the assistance of ICP experts is your best starting point. Embedding the principles into your practices, will maximise the benefits.

What is 'integration'?

Integration means combining two or more different management practices that are compatible, i.e. practices that work well together, not against each other. For example, an effective ICP system might include cultural measures like changing varieties or planting times, the release of beneficial organisms and the use of 'soft' insecticides. The aim is not zero pests, but rather sustainable pest management.

Use an experienced expert to get you started

The most appropriate and effective crop protection programs are developed by teams that include growers, and researchers and/or consultants experienced in ICP. They have specific knowledge and understanding of the stages of crop growth, key threats, impact of environmental conditions, and options available for protecting a crop from adverse events and organisms. Growers and their advisers recognise prevention efforts are preferable to eradication attempts, and that biological balance is more sustainable than a 'zero pest' environment. Take steps that allow specifically-targeted decisions and actions.

ICP programs are unique to each season, each crop, and each region. The relative importance of pests varies year-to-year and you and your advisers will become skilled in evaluating the relevance and potential effectiveness of each step and what strategic adjustments are required to ensure continued improvement and timely responses.

The key components of an ICP Program

Knowledge – learn about the key pests, their enemies and how they enter, grow, establish, spread, survive and affect your crop, in your growing environment.

Prevention and minimisation – learn about the other factors that affect the relationship of the pests and the crop – planting time and location, variety planted, crop rotations, and irrigation and nutrient management. Make decisions that reduce the potential impact of the pest, while promoting the crop's chance to avoid, tolerate or resist it, and economic levels of damage.

Monitor and observe – Look at your crop often and learn how, when and where to look for signs of the pest, symptoms of disease, the pest itself, and its natural enemies.

Respond - Keep records of what you observe and learn how to interpret them. Know the relevant response options (including synthetic and soft pesticide treatments), the treatment thresholds (i.e. conditions or potential damage levels that indicate a treatment is required) and the critical timing of the responses.

Some key steps along your ICP pathway

Knowledge

- Know your suppliers (transplants, seed, compost) and keep good records
- Know your pests – have their identity confirmed, know their biology and behaviour, how they compete and their competitors, and the conditions conducive to their presence and spread
- Understand and practise high-level site sanitation and worker and equipment hygiene
- Know the effect of registered inecticides (chemicals used to control insects, including synthetic or biologically-derived biopesticides) on natural enemies and beneficials
- Know the block history – previous crops, soil health, and the impact of pests, nematodes, weeds and diseases.

Using a hand lens to monitor crops

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Prevention

- Conduct pre-plant soil tests for soilborne pests, when appropriate
- Only plant suitable material – resistant varieties, treated seed, disease-free and insect-free seed, seedlings or cuttings
- Do not plant new susceptible crops near older crops of the same crop family (e.g. crops in the Solanaceae family - tomato, potato, eggplant, capsicum), or if the older crop is infested with pests, or is about to be harvested
- Recognise 'normal' and 'abnormal' organisms, plant appearance, and responses to treatments
- Minimise plant stress – optimise soil preparation and soil health, water and nutrient applications
- Avoid mechanical damage to plants
- Remove plant debris, non-commercial vegetation and weeds that harbour.

Monitor and observe

- Understand the weather forecasts of relevance
- Monitor your crops and use experienced crop scouts to follow populations of pests and beneficials, and to identify and assess severity of diseases.
- Use sticky traps, pheromone traps, leaf wetness sensors, disease prediction models, and insect development models to assist.

Monitoring potato crops for pests and beneficials

Respond

- Set your goals! Plan and define your measures of 'success' and 'failure'
- Consider planting schedule and crop sequence changes
- Protect the environment – maintain and protect soil and water resources
- Use chemical products only as needed. Do not rely solely on them.

What management options are available?

Cultural, physical or mechanical options – these options assist crops in avoiding, resisting or delaying interaction with the pest. They include site selection, fallow periods, crop-free periods on a regional level, planting date changes that consider pest flights and/or weather, minimising old/new crop overlaps, resistant varieties, crop rotation, roguing (removal of sick/dying plants), insect screens, positive greenhouse pressure, removal of pest habitats, establishment of refuges for beneficials and restricted people movement.

Chemical options – these options involve using natural, biological, 'soft' or narrow-spectrum chemicals to alter insect behaviour, to attract insects for early warning and predictive purposes, to reduce the presence or impact of insects, or to change the attractiveness of the host crop. 'Chemical' options suited to ICP include pheromones, Bacillus thuringiensis (Bt) and biofumigation.

Spraying with 'soft' pesticides may be necessary to protect and maintain beneficial organisms

Resistance options – resistant varieties limit the impact of pests and should be used whenever available and horticulturally-acceptable.

Biological options – these options rely on natural enemies or introduced organisms that limit the impact of an insect, e.g. practices that boost or extend the habitats and populations of beneficials, parasitoids, antagonists and predators or that promote a crop's acquired resistance. Beneficials include all predatory insects, mites and spiders; parasitic wasps, nematodes and flies; and fungi or bacteria that attack pests or outcompete with them for potential infection sites. Commonly seen beneficials include: ladybird beetles, damsel bugs, Aphidius (a wasp that parasitises aphids), Trichogramma (a wasp that parasitises moth eggs), brown and green lacewings, Persimilis predatory mites, and native earwigs. These beneficials all play a significant role in ICP.

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A Selection of helpful resources

In addition to the other Mega Pest fact sheets, there are many useful resources that can be accessed within the secure area of the AUSVEG website. Go to the 'InfoVeg' page where you can initiate a Search using Key Words.

Available resources include:

1. **Pests, diseases, disorders and beneficials in greenhouse vegetables.** To order from the NSW DPI website: http://www.dpi.nsw.gov.au/aboutus/resources/bookshop/pests,-diseases,-disorders-and-beneficials-in-greenhouse-vegetables
2. **Thrips and Tospovirus – A Management Guide.** Download from: https://www.daff.qld.gov.au/plants/health-pests-diseases/a-z-significant/thrips-and-tospovirus
3. **Guide to using native plants on the Northern Adelaide Plains to benefit horticulture.** Download from: http://www.sardi.sa.gov.au/ data/assets/pdf_file/0005/103469/SARDI_Reveg_Guide_2009.pdf
4. **Identification of insects, spiders and mites in vegetable crops – Workshop manual (second edition)** Download from: http://era.deedi.qld.gov.au/1904/
5. **Identification of insects, spiders and mites in vegetable crops – Trainer's handbook - 2010, DEEDI.** Download from: http://era.deedi.qld.gov.au/1924/1/5441_Insect_ID_trainer_handbook_web1.pdf
6. **Keep It CLEAN - Reducing costs and losses in the management of pests and diseases in the greenhouse.** A book free to all Australian vegetable-levy-paying greenhouse growers. Request via the following link: http://www.dpi.nsw.gov.au/agriculture/horticulture/greenhouse/pest-disease/general/preventing/keep-it-clean
7. **Factsheets produced in conjunction with '"Keep it Clean" provide excellent start-up information for both greenhouse and field producers.** Access via: (http://www.dpi.nsw.gov.au/agriculture/horticulture/greenhouse/pest-disease/general/preventing) and click on the titles.
8. **Improving Soil Health for Yield and Profit in Vegetables. 2010. Factsheet produced by the VIC DPI Vegetable Soil Health Team.** Download from: http://www.vgavic.org.au/pdf/VG07008_Soil_Health_brochure.pdf
9. **Soil Health for Vegetable Production in Australia. 2010. Factsheet produced by DEEDI.** Download from: https://www.daff.qld.gov.au/plants/fruit-and-vegetables/vegetables/soil-health-for-vegetable-production-in-australia
10. **Controlling Invertebrate Pests in Agriculture. 2012. Book by Paul Horne and Jessica Page of IPM Technologies Pty Ltd.** Order from CSIRO Publishing via the following link: http://www.publish.csiro.au/pid/6734.htm

A Bug's Life - ABC Landline

- **See how other producers have implemented an ICP approach on their property. This segment which aired on 3/04/2011 can be viewed by clicking on the image.**
- **Discussions about vegetable IPM begin about 4 minutes into the video.**

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