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Vegetable Industry Development Program

Mega Pests

The Basics of Protecting your Crops

Cultivated crops are exposed to pressures from pests and the general environment. These pressures can be reduced by using an integrated approach to crop protection. Integrated Crop Protection (ICP), also referred to as Integrated Pest Management (IPM), focuses on good decision making and requires consideration of the:

- Crop
- Pests
- Beneficial organisms
- Growing environment
- Farm workers
- Market requirements

ICP provides practical alternatives to conventional pest control that often relies on synthetic chemicals 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 are sometimes vectors of viruses), and the success stories of growers who have successfully applied ICP, see the rest of the fact sheets in this Mega Pest Series. These can be accessed at http://ausveg.com.au/rnd/fact_sheets.htm.

Why adopt ICP?

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

- Re-gain 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 (outlined in the box below) is the best starting point. Integration of these principles for your specific crop and pest situation will maximise their benefit.

Key ICP Principles

- **Know the history and nature of the pests in the seedling nursery and on your farm.**
- **Be proactive - aim for prevention rather than eradication.** Don't wait for a crisis in pest control before you act. Pests have natural enemies – aim to preserve and increase them, and if they are available from an insectary, consider releasing reared natural enemies (also known as 'beneficials') in your crops.
- **Make sanitation on-farm your first priority after worker safety.**
- **Monitor your crops and growing environment often.**
- **Record crop and pest observations.** Review your chemical effectiveness and resistance development.
- **Gain confidence in ICP through education, observation and action.** Seek trusted, qualified advisers to get you started and to assist with implementing ICP.
- **Access training in the ICP principles for yourself and your staff.**
- **Use available resources** – consultants, researchers, books, factsheets, internet.
- **Understand why the 'integrated' approach is essential for success.**



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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, release of beneficial organisms and the use of 'soft' pesticides when required to ensure that the beneficial organisms are not harmed.

Use an adviser 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 is preferable to on-going eradication of pests, and therefore 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, survive and affect your crop, in your growing environment.



Using a hand lens to monitor crops

Prevention – 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 or resist the pest.

Monitor and Observe – Look at your crop often and learn when and where to look for signs of the pest presence, 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 chemical treatments), the treatment thresholds (i.e. conditions that indicate a treatment is required) and the effective timing of the responses.

Some key steps along your ICP pathway

Knowledge

- Know your suppliers 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 that are conducive to their presence and spread
- Understand and practice high-level site sanitation and worker and equipment hygiene
- Know the effect of registered pesticides (chemicals used to control pests, including synthetic or biologically derived insecticides, fungicides and herbicides) on natural enemies and beneficials
- Know the paddock history – previous crops and their soil insect, nematode, weed and disease loads

Prevention

- Conduct pre-plant tests for soilborne pests
- Only plant suitable material – resistant varieties, treated seed, disease-free and insect-free seed, seedlings or cuttings
- Do not plant new crops near crops of the same type that are about to be harvested or that have unmanageable pest problems, and do not plant consecutive crops that are in the same family (eg crops in the Solanaceae family such as tomato, potato, eggplant and capsicum) in the same patch or paddock
- Recognise 'normal' and 'abnormal' - organisms, plant appearance.



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- Minimise plant stress - optimise soil preparation and soil health, water and nutrient applications
- Avoid mechanical damage to plants
- Remove plant waste and non-commercial vegetation that harbours pests; promote vegetation that harbours beneficials

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.



Growers, researchers, consultants and advisers working together to develop an ICP system for wasabi

Respond

- Set some goals, plan and define your measures of 'success/failure'
- Consider schedule changes
- Protect the environment – maintain soil and water resources, minimise chemical reliance
- Use pesticides as needed but do not rely on them

What management options are available?

Cultural, physical or mechanical options – these options often allow the crop to avoid, resist or delay interaction with the pest. They include - suitable 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, restricted people movement.

Chemical options – these options involve using natural, biological, 'soft' or narrow-spectrum chemicals to alter pest behaviour, to attract pests for monitoring purposes, to reduce the presence or impact of pests, or to change the attractiveness of the host crop. Examples of chemical options used in ICP include pheromones, *Bacillus thuringiensis* (Bt) and biofumigation.



Spraying with 'soft' pesticides will help maintain natural enemies

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

Biological options – these options rely on natural enemies or introduced organisms that limit the impact of a pest, 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 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

There are many additional useful resources that can be accessed within the secure area of the AUSVEG website. Go to the 'Technical Insights' page and then to the 'R+D Insights Database (search engine)' where you can initiate a 'Search' using 'Key Words'. Resources include:

1. Insect Pest Guide: a guide to identifying vegetable insect pests and their natural enemies in the dry tropics. To order, contact: John.Brown@deedi.qld.gov.au
2. Pests, diseases, disorders and beneficials in greenhouse vegetables. To order from the Industry & Investment NSW (I&I NSW) website, go to: <http://www.dpi.nsw.gov.au/aboutus/resources/bookshop/veg-ipm-field-id-guide>
3. Thrips and Tospovirus – A Management Guide. Download from: http://www.dpi.qld.gov.au/4790_11607.htm
4. Revegetation by Design. May be downloaded at: http://www.sardi.sa.gov.au/__data/assets/pdf_file/0008/44945/reveg_by_design_guidebook.pdf
5. Identification of insects, spiders and mites in vegetable crops – Workshop manual (second edition), and Identification of insects, spiders and mites in vegetable crops – Trainer's handbook - 2010, DEEDI. May be downloaded at: http://www.dpi.qld.gov.au/26_19983.htm
6. Lettuce Leaf newsletters: Download from: <http://www.dpi.nsw.gov.au/aboutus/resources/periodicals/newsletters/lettuce-leaf>
7. Keep It Clean. Free to all Australian vegetable-levy-paying greenhouse growers. May also be purchased. Request or purchase via the following link: <http://www.dpi.nsw.gov.au/agriculture/horticulture/greenhouse/pest-disease/general/preventing/keep-it-clean>

Factsheets produced in conjunction with "Keep it Clean": these fact sheets provide excellent start-up information for both greenhouse and field producers. Go to the Keep it Clean web page and click on the titles to download copies.

8. Improving Soil Health for Yield and Profit in Vegetables. 2010. Factsheet produced by the VicDPI 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: http://www.dpi.qld.gov.au/26_17025.htm

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