



Know-how for Horticulture™

**The monitoring of
potato crops for insect
movement on a
district scale**

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Ag-Challenge

Project Number: PT02045

PT02045

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Final Report

**Monitoring of Potato Crops
for Insect Movement
on a District Scale**

PT02045 (August 2003)

Prepared by
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July 2005

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Media Summary

District based monitoring services for potato growers can save money and increase the amount of information available for decision making.

The Gippsland certified seed potato growers pioneered a project in conjunction with Horticulture Australia in 2002/2003 to determine how a district based crop monitoring program would operate and what sort of information and benefits it would generate for improved crop management.

Seed potato growers have reported that the informal observations that form part of the weekly report are a valuable management tool. Information from this informally collected data is as valuable to them as formally collected data. The weekly report helps the growers to make decisions for the rest of the week and enables them to anticipate and predict problems before they occur. The data undoubtedly increases the awareness of aphid movements and prompts seed growers as to when they need to inspect their own crops for renewed or new aphid activity.

A guideline for the siting of aphid traps and weekly servicing has been produced as an outcome from this project. A format for a weekly report on crop monitoring has been developed and growers have had significant input in determining what sort of information and presentation of data would be useful for their crop management decisions.

1. Technical Summary

Eight yellow water traps suitable for the monitoring of winged aphids were installed on pairs on four farms in west, south and central Gippsland. This provided the formal data for a district based crop monitoring service that operated in Gippsland for Gippsland seed potato growers during the 2002/2003 cropping season

The crop monitoring service was developed with guidance from a four member farmer steering committee. The service produced a weekly report which was faxed to each certified seed potato grower in Gippsland and contained four sections:

- Key weekly findings
- Aphid trap results
- Entomologists report from monitored crops
- General comments and information

The weekly reports were well received by the farmers and were used in the decision making process for their crop management. Feedback from farmers indicated that the informally gathered information on pest and disease problems around the district was as useful as the more formally and more expensively gathered data from the water traps. The water trap information was useful in creating awareness of aphid movements generally around the district. Not a lot of use was made of the individual entomologist's report for each crop. This information was specific to the particular crop from which it was collected. Away from this crop the data was of general interest only.

The project has generated a standard procedure for the installation and location of yellow water traps for the collection and monitoring of winged aphids. It is recommended that this be adopted as a technical bulletin for use throughout the potato industry for future district or individual monitoring of winged aphids.

District crop monitoring and reporting has continued since this project was initiated and is operating currently as a statewide scheme under the guidance of Seed Potatoes Victoria. It will continue to be modified and improved with emphasis on cost effectiveness of collection and distribution of relevant information. Procedures have been developed whereby the farmer or family members can be actively involved in servicing of the water traps. There will be other improvements, and the reporting mechanism needs to be kept simple and relevant to the needs of the growers.

2. Introduction

The Gippsland Certified Seed Potato Growers Association had been concerned at the apparent resurgence of potato leaf roll virus (PLRV) in Gippsland during the growing seasons of 2000/2001 and 2001/2002. While a small number of growers used private consulting services to monitor the insect populations within their crops, most growers do not. Very little information is available to them during the growing season on which they can base decisions which could be quite important for crop management.

PLRV creates special problems for seed potato growers. The aim of the seed grower is to provide seed which is true to type and has low or minimal levels of seed borne disease present which may adversely affect the productivity of the next crop. Because potatoes are a vegetatively propagated crop, they are particularly prone to the transmission of virus diseases in planting material. There is no *true seed* process in the crop cycle which helps to eliminate viruses from spreading to the next crop via seed.

Infection from PLRV is difficult to detect visually when the transmission occurs in the current crop, and skill is required to be able to diagnose infected plants in the field. These plants generally have very mild visual symptoms with a slight rolling of the uppermost leaves and are referred to as primary infections. Sometimes there may be no apparent visual symptoms and yet the plant and its seed tubers are infected. When potatoes from infected plants are used as seed and replanted, the symptoms are much more severe and are apparent to any observer. The symptoms are a severe rolling of all leaves and a stunting of the plant. The tubers are small. The effect on crop productivity is also severe. Hence the concern of seedgrowers, - the disease can be difficult to detect in the seed crop, and yet cause major loss of potential productivity for the commercial grower who has inadvertently used infected seed.

PLRV requires aphid vectors for the disease to spread within a crop. The two aphid species that are associated with its spread in Australia are the green peach aphid (*Myzus persicae*) and potato aphid (*Macrosiphum euphorbiae*). There are other aphid species that may also be important, such as the foxglove aphid (*Aulacorthum solani*) and the melon aphid (*Aphis gossypii*), but green peach aphid is regarded as the principle vector for PLRV in Australia (P Ridland, pers. comm.). In order for PLRV to be spread by aphid vectors, the aphids have to be present in sufficient numbers to create a risk of spread and they need to be infective.

As well as a resurgence of the incidence of PLRV, there has also been concern of the increased incidence of tomato spotted wilt virus (TSWV) which is spread by onion thrip and tobacco thrip. It is not spread by plague thrip and the distinction between infective and non infective thrip species requires skill and a dissecting microscope. Occasionally the Gippsland area gets small outbreaks of purple top wilt virus which is spread by leafhoppers, and there are other seasonal problems such as early blight (*Alternaria solani*), late blight (*Phytophthora infestans*) and potato tuber moth (*Phthorimaea operculella*). More information of the level of activity of any of these disease or pest threats would be potentially useful in the decision making process for crop management.

**Monitoring of Potato Crops for Insect Movement on a District Scale
PT02045 Final Report**

There is historical information on insect and disease development in Gippsland that is relevant to the monitoring service. Previous studies by the then Victorian Department of Agriculture (now Department of Primary Industry, Victoria, or DPI Vic) have established that aphids are more common in spring and autumn periods and decline in mid summer. Aphids can be winged or wingless, population density in individual crops being critical in determining whether they develop wings. Monitoring for winged aphids in the late summer and autumn period often detects a general rise in winged aphid numbers in traps some weeks before population explosions in crops in general (P Ridland, pers comm.) and a general rise in aphid numbers also often precedes a rise in green peach aphid numbers in traps. These observations could be useful for implementing management strategies from district monitoring programs. However conversely, the number of aphids present in any specific crop may be quite unrelated to the results of district monitoring, as there are many types of aphid predators, such as lacewings and ladybirds. Sufficient numbers of insect predators can quickly suppress any general increase in aphids from winged aphids moving into a crop. There are other considerations, such as the isolation of an individual crop from other crops, and whether there is any small amount of PLRV present in the crop or in other paddocks nearby.

At their annual general meeting in September 2002, the Gippsland Certified Seed Potato Growers Association resolved to contract with Ag Challenge P/L and IPM Technologies to develop a district based monitoring service. Ag Challenge P/L agreed to act as the coordinating agency and an approach was successfully made to Horticulture Australia Limited to match Commonwealth Government funds with industry contributions towards developing a district based monitoring service. IPM Technologies would install, maintain and interpret the water traps. Ag Challenge would collate the trap information with other information from ViCSPA inspectors and crop observations. The growers formed a steering committee to direct the type of information required. Ag Challenge would send out the information and coordinate the project.

The aim of the project was to implement a service for the 2002/2003 season at comparatively low cost, making use of existing information and observations that were available from a multiple of sources. How such a service would work, what sort of information could be relatively inexpensively obtained, and how the information would be used by growers were all uncertain. Whether there were significant benefits from operating a service and would growers be able to use the information to make better decisions were not known.

3. Strategies and Activities

The project was developed under the guidance of a steering committee of four farmers. They were:

- Paul Myers, Bloomfields Road, Nilma North
- Gordon Jones, Bull Swamp Road, Warragul
- Des Jennings, Jennings Road, Thorpdale
- Don Di Sisto, Moe South Road, Moe South

**Monitoring of Potato Crops for Insect Movement on a District Scale
PT02045 Final Report**

During the first few weeks of developing the service they provided advice and feedback as to what they thought would be useful and what they as growers were looking for in the way of information and advice that could be potentially generated through the monitoring service.

Eight yellow water traps suitable for monitoring winged aphid movements were prepared and installed in pairs at four sites in central south and west Gippsland. The selection of sites was based on paddocks that were already part of individual client monitoring services that were being provided by IPM Technologies. This meant that the paddock was already being visited by an entomologist on a weekly schedule for the purpose of conducting crop sweeps and making predator and pest observations. Because the crops were already part of a visit schedule, this helped to save cost of travelling to trap sites for the weekly collection of samples. The farmers whose fields in which the traps were located were agreeable to having the individual results of their crop monitoring made available at a district level, so that the observations of pest numbers and predator numbers in each individual crop were available for reporting alongside the results of insect trapping from each pair of water traps.

As well as the water trap information and the insect pest and predator information, additional data was generated in an informal way by a weekly meeting of the ViCSPA certification officers for Gippsland with private consultants from Ag Challenge. Both groups of people were regularly visiting seed and commercial crops for certification work and for nutritional and general recommendations to grower clients. Whenever possible, telephone engagement of IPM Technologies was added to this informal meeting. This created an interchange of district observations, such as what was happening with potato tuber moth, or where early blight was active in the district. The information generated from this interchange was documented and combined into weekly monitoring reports when considered to be sufficiently relevant.

Timely communication of the weekly report was a priority for the project. Most of the growers regularly use fax machines for communication, and this was considered to be the preferred way in which the report was to be transmitted to each farmer. There were two farms that did not have fax machines and their reports were posted each week by mail. After some initial feed back from growers, the preparation of the weekly report was scheduled for Friday each week. This allowed for fax scrolling by computer late on Friday when most fax machines are not busy, and the report was available over the weekend for each farmer to consider and plan the next weeks activity.

The report format was developed with consideration that all the relevant information had to be on a single A4 page, it had to be in a consistent style, it must be easy to understand and quick to read, and it needs to avoid making specific recommendations.

**Monitoring of Potato Crops for Insect Movement on a District Scale
PT02045 Final Report**

Figure 1 Specimen Weekly Report, Final Version

GIPPSLAND CERTIFIED SEED POTATO GROWERS ASSOCIATION
No.A16925.Z ABN: 46 580 596 422

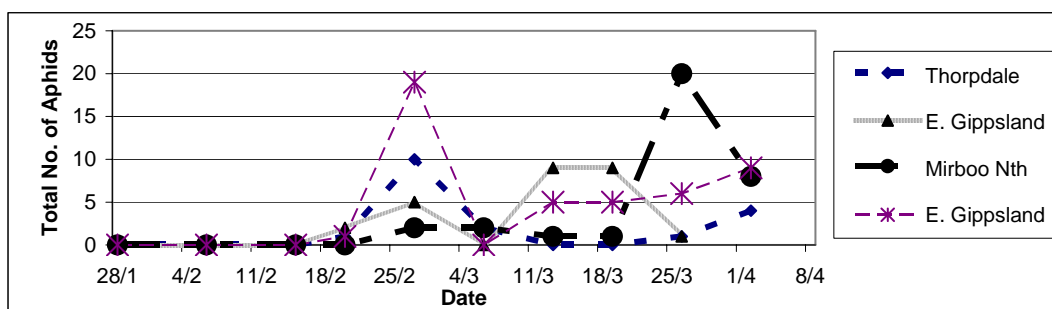
Crop Report No. 03-12

Date: April 14, 2003

Key Weekly Message:

This will be the final crop report for this season.

Aphid Trap Results:



Insect Monitoring Results (Last week's results are in brackets):

	E. Gippsland	Mirboo Nth	Warragul
Aphids within crops (% of plants with wingless aphids)	4 (4)	0 (0)	4 (0)
Thrips	N/A	N/A	N/A
Potato tuber moth (adults/trap)	800 (400)	300 (425)	310 (225)
Other <i>pests</i> observed	Green leaf hoppers		Green leaf hoppers
Beneficial Predators	Brown lacewings, parasitic wasps & spiders		Parasitic wasps, brown lacewings & spiders

Around the Grounds:

No green peach aphids were recorded this week at any of the trap sites.
Potato tuber moth numbers are still high.

Season Summary

Although a few aphids have been recorded at all trap sites this season it could be said that aphid numbers have been relatively low throughout this season. ViCSPA have recorded very few cases of potato leaf roll virus, while tomato spotted wilt virus has been a serious problem in most areas. It has been an extremely dry year, which has also increased the threat of potato tuber moth damage.

Additional Information:

As per the prediction in the last crop report, it is now raining!!!

4. Outcomes and Impact

The placement of water traps within a field and the weekly servicing of these traps emerged as an area where some standardization was required. The position of a water trap in relation to the prevailing wind direction, location of shelter belts, the height above ground, and the proximity of the crop and bare soil are all known to have some influence on aphid activity in and around the water trap. Following advice from the entomologist group with DPI Vic a standard for the placement of water traps in potato crops was prepared. This standard is provided in the guidelines for operators of water traps that has been prepared as a result of this project and is reproduced in Appendix I. The standard was developed with the objective that individual farmers or a member of the farm family may be able to become trap operators, thus removing the travel costs associated with the provision of a district monitoring service.

Thirteen weekly reports were prepared and sent to Gippsland seed growers through the summer and autumn of 2002/2003. The report was divided into four sections:

- Key findings and reminders
- Data from the water traps collated into a graph
- A table to present the results of individually monitored crops
- More general data of relevance to growers, but not specific to the particular week

An example of one of the weekly reports is provided in Figure 1. Further examples of the weekly reports are provided in Appendix II

Grower feedback was regular throughout the thirteen week period of the project, and this enabled the project to be continually refocused and oriented to provide the growers with the sort of information that they preferred. Some of the comments that were received are noted here:

- ❖ *The information on the aphids gave me confidence that what I was doing was the right strategy*
- ❖ *I used the information at the start of each week to review what I was doing for the rest of the week*
- ❖ *The predictions about target spot and potato tuber moth made me aware of these problems before they became established in my crops and I was able to take preventative action.*
- ❖ *I didn't make much use of the information, but it made me aware of what was going on and prompted me to look for certain things in my crops.*
- ❖ *The service was good value for money and should be extended to the commercial growers in the district.*

There was no apparent pattern between the numbers of aphids detected within a crop and the number of winged aphids detected in water traps placed adjacent to the crop during the 2002/2003 season. The aphid activity in some of the monitored crops was significant but appeared to be more dependant on the numbers and types of insect predators building up in response to the aphid presence and the balance that was achieved between them.

Monitoring of Potato Crops for Insect Movement on a District Scale PT02045 Final Report
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The monitoring of water traps alone could thus potentially give misleading information as to whether there were significant numbers of aphids within a crop. Individual crop inspection was still required.

Very low numbers of green peach aphids and potato aphids were recorded from the water traps throughout the season. The graphs that were prepared for the weekly report represented all aphid numbers and thus indicated favourable climatic conditions for population expansion. Aphid numbers in the traps did increase with some consistency across all monitoring sites on two occasions through the monitoring period. The first increase was in the third week of February, and all trap sites recorded a substantial increase in numbers. The second increase was less marked and was in the second week of March. This would seem to imply that there was a substantial population expansion for aphids in the weeks leading up to and including these events, and also that the risk of new aphid colonies establishing in crops is significant following these events. This is useful crop management information for seed potato growers. They can use this information in a number of ways but to really be effective the growers need to take the extra step and observe each individual crop to see whether aphids are present in their own crop and determine whether they are as either winged or wingless forms.

The weekly exchange of crop observations between staff of ViCSPA, Ag Challenge and IPM technologies was able to successfully produce timely crop warnings about potato tuber moth activity and early blight. There were a number of examples where growers had usefully deployed this information into crop management strategies.

The crop monitoring service has been continued in 2003/2004 and in 2004/2005. In 2003/2004 Ag Challenge was unable to provide the manpower to run the weekly service in Gippsland but was able to provide a similar service for seedgrowers and interested commercial growers in the Ballarat district. The 2003/2004 service in the Ballarat district was partly funded by McCain Foods (Aust) and partly by the Ballarat seed growers. In 2004/2005 Seed Potatoes Victoria resolved that as the state body responsible for seed growers livelihoods they would endeavour to develop the crop monitoring service as a statewide resource. This has occurred and was fully funded from within the resources of Seed Potatoes Victoria. A review of the effectiveness of this monitoring as a statewide service will be undertaken by Seed Potatoes Victoria prior to the 2005/2006 planting season.

5. Recommendations

The crop monitoring service that was pioneered through this project is now in the commercial arena and is likely to be continued and improved with grower feedback and review of the most cost effective way of collecting and distributing the relevant information. The following specific outcomes have resulted from this project:

- ❖ The main benefit from operating district based monitoring programs is in creating an awareness of the movement and population expansion of winged aphids. This would potentially precede new infection sites within seed potato crops and

**Monitoring of Potato Crops for Insect Movement on a District Scale
PT02045 Final Report**

provides the grower with the information that it would now be appropriate to look for these pests. It does not provide definitive information that it now time to implement an insecticide spray program or to remove the vegetative growth. The grower needs to undertake his own investigations to determine what action is required. **District crop monitoring services should be recognized as desirable for the general awareness that they create and should also be recognized that they will not provide crop specific information upon which management decisions can be made.**

- ❖ It should be possible to use growers or family members of growers to collect insect samples and maintain water traps on a weekly basis. This may produce some significant savings in the operating of a district scheme. **Future crop monitoring services should investigate using farmer and/or farm family members to service the water traps**
- ❖ The project has generated a standard and guidelines for the siting and installation of water traps, and also for weekly servicing and collection of samples This standard should be used for future monitoring work, and can be updated and revised as better information becomes available. **The guidelines for siting the traps and weekly servicing should be reproduced as a technical bulletin and updated from time to time as techniques are modified and improved.**
- ❖ There many benefits obtained from the informal weekly meeting of a few active field people to collect and compare notes on what they had seen during the week. This sort of meeting and information exchange will not occur without a specific purpose and the preparation of a weekly report provides this purpose. It would seem that the information generated through this informal and unstructured way was as useful to growers as the more formal collection of trap data. **Informal data collection and reporting should be part of all future district crop monitoring service. Any crop monitoring service operated by Seed Potatoes Victoria should not provide formal quantitative data alone.**

Acknowledgements

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The staff of IPM technologies agreed to install, service and interpret the water traps for the project and also provided informal information for the weekly report.

The project was jointly funded by the Gippsland Certified Seed Potato Growers Association and the Federal Government through Horticulture Australia Limited.

Significant technical guidance was provided by Peter Ridland of the Department of Primary Industry, Victoria.

The project benefited significantly from the input of information and observations from the Gippsland based certification officers of ViCSPA.

Appendix I

INSTRUCTIONS FOR OPERATORS OF YELLOW PAN WATER TRAPS

Equipment Kit

Cottonballs
1 Pen
2 yellow pan traps
1 spray bottle with adjustable nozzle
1 stainless steel strainer
2 litres of 70% methylated spirits
20 plastic sample bottles
2 sheets of sticky labels
10 pre addressed and pre stamped *post packs*
10 sealable plastic bags.

In addition to this kit you may also need –

- Suitable container for carrying water. A 20 litre plastic drum (fully rinsed) is ideal.
- Very small quantity of household detergent.
- Small teaspoon, spatula, or other blunt instrument.
- Notebook.
- Bucket (optional).
- Old towel (optional).
- Old newspaper or other padding.

Siting of Traps

Put the traps in a convenient location in the potato paddock, preferably in a headland near a gateway. Aphids tend to move fairly passively in air currents and appear to descent where there is less turbulence and less wind speed. Putting the trap near but not too close to a shelter belt of trees, possibly on the lee side, seems to be desirable, but not essential. Site both traps in the one paddock but well separated – at least 200 m apart.

The traps should preferably not sit on the ground. An upturned potato bin makes a good bench to sit them on.

Fill the trap with about 8 litres of clean water – up to just below the level of the mesh. Add 1 or 2 drops of detergent to decrease the surface tension of the water and make the trap more effective.

Collecting Samples

This should be done regularly once a week. The aim is to collect the insects that have been trapped and transfer them to a sample bottle for postage. The suggested procedure is as follows:

- Strain the water through the stainless steel strainer to collect the trapped insects. You can pick off any leaves, beetles, bees and other large unwanted insects before straining. If

Monitoring of Potato Crops for Insect Movement on a District Scale PT02045 Final Report
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you want to recycle the water, collect it in a bucket beneath the strainer. If you notice the aphids are being damaged, place a piece of paper towel in the strainer and strain through that.

- With the teaspoon, the teaspoon handle, spatula or whatever you have decided to use, carefully pick off the bulk mix of insects from the strainer and put them in a sample bottle. Wash the remaining insects off the strainer into the sample bottle with the spray bottle. If using paper towel, just pick it up and put it in the vial
- Label the bottle using **PENCIL** only. Pre-labelling in the house or shed is a good idea. Try to limit liquid on the label as it gets hard to read.
- Fill the sample bottle up to almost full with 70% methylated spirit, then top with a cotton ball.
- Replace the trap to its position and refill with clean water. It may be a good idea to give the inside of the trap a bit of a wipe down with a towel as they can develop a bit of scum or algae. You can recycle the water once or twice, but it will need to be replaced fully every 2 – 3 weeks. Add one or two drops of detergent when replacing with new water.

Personal Records & Observations

It may be useful to keep a personal log records and observations. These can then be compared with the data that comes back from the entomologist. The sorts of things you might like to record are; total numbers of aphids, whether you think any of them may be green peach aphid or potato aphid, any presence of thrips, and any other insects that you recognise.

Despatch

Before posting, put another label, inside each sample bottle with the label written in *lead pencil* on white paper. The label should show:

Your name (which identifies the site)
District
Trap number (either trap 1 or trap 2. Be consistent)
Date of sample collection

Make sure the lid is on **tight!**

Put the two sample bottles into the sealable plastic bag and then into the pre-addressed post pack. Pad the post pack with scrunched-up newspaper. Check that bottles are not near the corners of the box. Seal the box and post.

Appendix II

Examples of Weekly Crop Reports