



Know-how for Horticulture™

**Developing a pests
and disease crop
monitoring program
for Western
Australian seed
potato crops**

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Department of Agriculture
Western Australia

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Purpose of the report:

Seed potato crops in Western Australia were monitored during the 2002/03 season to assist both experienced and the increasing number of new farmers protect their crops from pests. While the emphasis was on monitoring aphids with a view to managing leafroll virus, other insect pests were included. This report provides the results of the monitoring for pest abundance and recommendations concerning the future of monitoring seed potato crops in WA.

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Horticulture Australia



Department of Agriculture
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Media summary

This is the second consecutive season where seed potato crops in Western Australia were monitored by WA Department of Agriculture personnel and trained casual staff for insect pests and disease. A number of new growers were included in this monitoring.

The monitoring was conducted weekly, with recommendations reported back to growers on the need for action against pests. This primarily to assisted growers to reduce the abundance of insect vectors of virus diseases, and also reported on other pests that might otherwise reduce crop health or yield. The program was to provide back-up for growers already monitoring for pests and to encourage other growers, especially those new to this segment of the industry to introduce monitoring as a means of decision making for pest control actions.

Key outcomes of the project were:

- ⌘ The weekly reports of pest abundance and associated recommendation for action kept pest numbers below levels that could affect the quality and yield of crops.
- ⌘ Across the regions in WA where monitoring was undertaken, the timing and abundance of pests differed.
- ⌘ The value of monitoring individual crops to provide crop specific advice was evident.
- ⌘ Growers gained information on the arrival time of pests for strategic spraying and a check on the effectiveness of spraying on target pests.
- ⌘ For growers already undertaking a monitoring program, the information provided confirmation of their findings. Other growers gained confidence in the information provided and stated they were able to reduce the number of sprays required to protect their crops.
- ⌘ New seed potato growers gained confidence in pest management.

In end of season review of the monitoring, growers commended the monitoring as providing timely and relevant information to take appropriate action to protect their crops from pests. They recommended the program be continued for another season and that financial support be provided by the WA Potato Producers' Committee.

Technical summary

The insect transmitted virus diseases potato leafroll virus and tomato spotted wilt virus occur in WA. Both virus diseases rely on insect vectors to introduce them to uninfected crops and spread them within crops. Also, both diseases can be introduced into crops through infected seed. Infection of WA seed potato crops in the past requires that seed potato growers be vigilant with respect to these viruses and their vectors. Only some seed potato growers in WA rely on a crop monitoring program to base their decisions on actions to protect their crops, both from insect vectors of virus and other pests.

For each seed potato grower, only one crop was monitored at any one time for each farm. Growers were invited to take part in the project. Monitoring commenced at crop emergence and was undertaken weekly for three weeks, and the grower responsible for the monitoring for the fourth week. This pattern continued to crop senescence or spray-off. Monitoring consisted of (a) examining 50 lower leaves per crop, (b) tapping foliage over a container at 10 location per crop and (c) general observations for pests along a designated path, which varied with crop age. Pest abundance was recorded on a detail score sheet. Using this information, a summary report and recommendation for action as appropriate, was sent to the grower within 2 days of the monitoring.

There was no indication that for the week in which growers were requested to undertake their monitoring, that this occurred as a general rule. This situation may be rectified with the introduction of a training program for growers to build their confidence to undertake their own monitoring. Alternatively, growers should be questioned as to whether they would pay for crop scouts to undertake the activity.

The actual details of the monitoring were found to be adequate and no recommendations regarding changes to the monitoring program were suggested by growers at the end of season review of the project. If such an industry based scheme were to be repeated, growers suggested that details of pesticides applied be matched with pest abundance records to assess the effectiveness of control actions.

Seed potato growers found the monitoring program useful, both in support of their own monitoring or providing feedback on pest management based on their own assessment for control action or the recommendation from the current project. Growers were in favour of the program being run for another season.

Incremental Gains Expected from Project and Gains Achieved

Seed potato crops in Western Australia were monitored during the 2002/03 season to assist both experienced and the increasing number of new farmers protect their crops from pests. While the emphasis was on monitoring aphids with a view to managing leafroll virus, other insect pests were included.

This project sought to continue the monitoring program undertaken the previous season to provide back-up information on pest occurrence for those growers monitoring crops and to encourage other growers to adopt the program.

The results of the monitoring showed that pest pressure and the need for action varied between regions and within regions on individual farms – as expected. In this sense the

monitoring was regarded as being successful in providing farm specific information and recommendations. Pest control measures were implemented in a timely manner and excessive levels of pests were extremely rare. Although not all seed crops were monitored, growers reported that the information provided was useful in decision making for other nearby crops. Growers undertaking monitoring themselves found the information provided by the pilot program supported their own assessments.

Financial gains are difficult to quantify but the existence of the program contributes to a reduction in the level of virus in seed potatoes coming out of WA seed quality schemes and therefor prevents significant losses to the industry.

Introduction

Virus diseases in potato crops can reduce the yield of potatoes and adversely affect the quality of tubers in susceptible varieties by causing discolouration in the flesh. In the case of seed potatoes, quality is judged also by the level of virus and limits exist under certified seed potato scheme rules (Anon (a), 2001). It is important that seed potato crops have no or minimal virus levels because these diseases can be introduced to the larger areas of commercial potato crops through infected seed.

The main virus diseases in WA crops are potato leafroll virus and tomato spotted wilt virus. These diseases can also be introduced into potato crops and spread within them by the insect vectors aphids and thrips respectively. Problems with virus infection of seed potato crops in WA in the past require that growers remain vigilant regarding the abundance of these insect vectors. For aphids, a threshold for crop rejection and therefore a guideline as an action threshold for applying insecticides to crops is included in the WA Certified Seed Potato Scheme rules (Anon (b), 2001).

While there are other important aspects to producing seed potatoes with minimal virus levels, the subject of this current project was minimising the abundance of insect virus vectors. In this way growers of seed potatoes and their customers will have more confidence that seed crops will at least have minimal virus spread within them by insects. The variation in aphid abundance in different cropping regions within WA, both within a season and among crops (Berlandier, 1997, 1999), indicates that individual crop monitoring for aphids is appropriate for growers to achieve effective aphid management. Apart from monitoring for disease vectors, other pests including disease could be assessed concurrently.

The aim of this project was to consolidate the positive response by WA seed potato growers to the first year of a pest monitoring program introduced in the 2001/02 season (Learmonth and Guthridge, 2002). The incorporation of a monitoring program in the WA seed potato industry is seen to be an important aspect in producing seed of high quality for both the domestic and increasingly important export sectors of the WA potato industry.

Materials and methods

Most aspects of the monitoring program were the same as that reported for the 2001/02 season in a report to Horticulture Australia Limited (Learmonth, 2002). The only differences for the 2002/03 season program were in relation to monitoring frequency and pheromone traps for loopers (*Chrysodeixis* spp.) were not used.

For monitoring frequency, on each fourth week, the grower was advised they were to be responsible for monitoring. This had a two-fold objective – to give those growers who do not regularly check their crops the opportunity to undertake the monitoring and secondly to meet expenditure constraints given an increase in the number of seed growers compared to the previous season.

The procedure for monitoring was unchanged. It was based on (a) examining 50 lower leaves, (b) tapping foliage over a container at ten locations and (c) general crop observations primarily for mobile insects not readily sampled by the other two methods and checking for disease.

The monitoring program was reviewed at a grower meeting at the end of the season.

Results

The number of growers from each region involved in the monitoring and other information on the size of the monitoring program are given in Table 1. Despite the Albany region being the principal seed potato producing area in WA, most visits were made to crops in the Lower South-west region, where the number of seed potato growers increased considerably over the previous season.

Table 1. Information to indicate the size of the monitoring exercise undertaken in WA seed potato crops in the 2002/03 season, compared with the previous season.

Region	<i>Crops Monitored</i>		<i>Weekly Visits</i>		<i>Leaves Checked</i>	
	01/02	02/03	01/02	02/03	01/02	02/03
Esperance	7	2	46	12	2450	600
Albany	40	13	161	121	16300	6050
Lower South West	8	21	74	193	3950	9650
South West	9	9	79	85	4950	4250
All areas	64	45	360	411	27650	20550

The pests found for which either a recommendation to apply insecticide was made or where action was considered but not necessarily undertaken were: aphids, loopers, potato moth, thrip and wingless grasshopper. The number of times such occasions arose for aphids, and the rest of the pests mentioned is shown in Tables 2 and 3 respectively. Also included in the information on aphids in Table 2 is the proportional representation of these occasions in relation to the total number of farm visits made within each region, to take into account the large differences in crop visits among the regions.

Table 2. Number of times recommendations to protect seed potato crops from aphids were made to WA seed potato growers in the past two seasons and the percentage of crops monitored these number of recommendations represented.

Region	<i>No. recommendations</i>		<i>% plots monitored</i>	
	01/02	02/03	01/02	02/03
Esperance	5	0	10	0
Albany	27	7	8	6
Lower South West	4	12	5	6
South West	0	7	0	8
All areas	36	26	7	6

Table 3. Number of times recommendations to protect seed potato crops from a range of foliage pests were made to WA seed potato growers in the past two seasons.

Region	<i>Esperance</i>		<i>Albany</i>		<i>Lower South West</i>		<i>South West</i>		<i>All areas</i>	
	01/02	02/03	01/02	02/03	01/02	02/03	01/02	02/03	01/02	02/03
Pest										
Heliothis	0	0	4	0	0	0	0	0	4	0
Loopers	0	0	15	0	0	3	0	0	15	3
Potato moth	0	0	3	0	0	0	3	2	6	2
Thrips	0	0	0	0	0	0	1	2	1	2
Wingless grasshopper	1	2	0	3	0	0	0	0	1	5
Rutherglen Bug	0	0	13	0	2	0	0	0	15	0

The pest most commonly the subject of recommendations for action was aphids. Foliar pests were of minor importance during the season. The abundance of aphids was reasonably consistent among regions – see Fig. 1. In general terms, aphids were most abundant in spring and autumn, with some crops infested during summer. This seasonal abundance of aphids is consistent with results from monitoring WA potato crops in other years (Berlandier, 1997, 1999). In general, aphid abundance was held in check at levels below the WA Seed Potato Scheme threshold (Anon. (b), 2001).

As was the case for the previous season, information from the monitoring was sent to growers in a timely manner.

The changes to the monitoring protocol involving a skip week where the grower was responsible for monitoring generally had little impact on the timely advice to growers of pest incursions. However, on one occasion an infestation of aphids did arrive during the skip week. For this reason, it is recommended for any future monitoring program that the skip week be dispensed with. The sentinel monitoring aspect of the program where only one crop per farm was monitored did not appear to have any negative effects on the effectiveness of the monitoring.

During the 2002/03 season, no seed potato crops were rejected by seed inspectors on the basis of excessive aphid numbers. In the situations where aphid pressure was present at excessive levels during crop growth, numbers were reduced as soon as practicable before inspection. This is considered acceptable in view of the fact that aphids acquire and transmit potato leafroll virus over a few days.

There were no occasions where foliar diseases that might have been important to crop health were noted.

A review of the monitoring was held with the WA Seed Potato Sub-Committee of the WA Agriculture Produce Commission, Potato Producers Committee. Growers felt the monitoring program was achieving the objectives of timely warnings for pest control and maintaining high quality of seed potatoes. At this review, growers recommended that funding be made available so that monitoring can be undertaken for a further season.

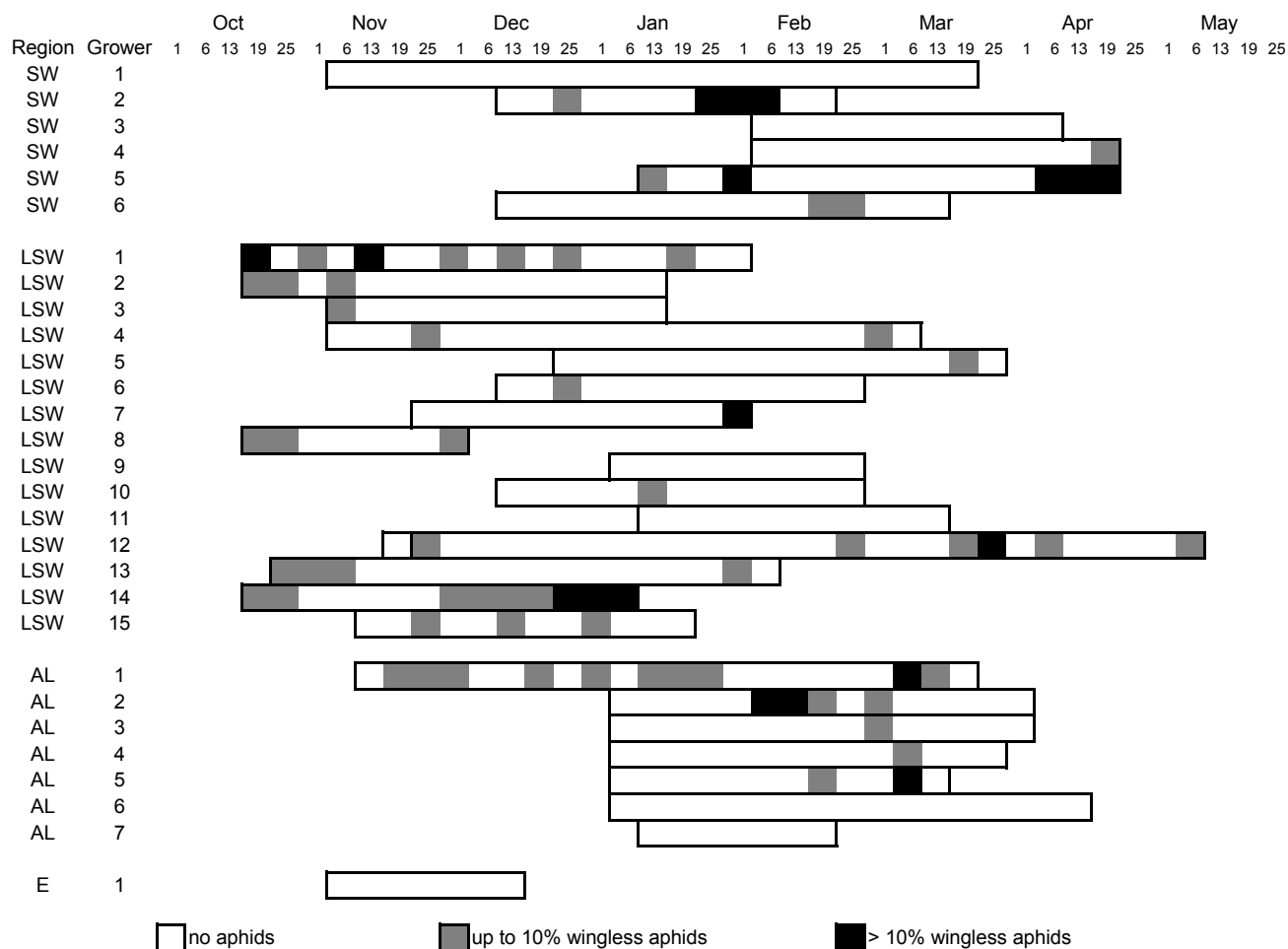


Fig. 1 Abundance of wingless aphids in seed potato regions in WA in 2002/03. The regions are: SW = south west (Kirup, Busselton and Margaret River); LSW = lower south west (Manjimup and Pemberton); AL = Albany; E = Esperance.

Discussion

For potato leafroll virus, which has been of concern in the WA seed potato scheme in the past, monitoring and controlling the most important vector, green peach aphid is a mandatory part of growing quality seed. The current project sought to reinforce to existing growers and to introduce to a large group of new growers the value of a monitoring service to assist in growing crops with aphid levels below the locally accepted threshold of aphid abundance (Anon. 2003).

The monitoring of seed potato crops in WA in the 2002/03 season showed that aphids were the main insect pest. Other foliar pests were present, but at low numbers with few recommendations for control being made to growers.

Growers were advised of the occurrence of foliar pests in a timely fashion that allowed them to take action to prevent sustained pest presence. The modified protocol for the

monitoring where a skip week was introduced worked well but with a notable exception. An aphid infestation occurred during that week in one crop. The infestation was not detected. This occurred at a time when aphids were generally at a low level of abundance in the region, but emphasises the need for regular crop monitoring.

With the exception of a few crops where aphid pressure was high and required multiple insecticide applications to achieve these desired aphid levels, normal grower practice resulted in good aphid control. This was achieved both in response to the monitoring and by growers adopting their usual aphid control program. In the case of the latter approach, the monitoring scheme is building confidence in seed potato growers that reduced levels of spaying can be introduced without compromising seed potato quality.

By continuing such an industry funded program, growers' confidence can be enhanced to the point where spray on demand becomes an acceptable practice. This not only applies to managing aphids, but for other pests as well. The importance of this aspect is seen where other pests invade crops and other control options, including different insecticides, can be selected. In this way, treatment on demand can incorporate the specialist approach to pest management with the objective of reduced use of broad spectrum insecticide use.

A review of the results of the season's monitoring by grower representatives, recommended that the monitoring service be continued for a further season.

Technology Transfer

This pilot monitoring program was devised for the benefit of WA seed potato growers. They were provided with information on pest abundance and related management recommendations on a weekly basis throughout the season.

The results of the season's monitoring activities was presented at a meeting the WA Seed Potato Subcommittee of the WA Potato Producers' Committee on 5 June 2003 by Technical Officer, Ian Guthridge.

Financial Analysis of the Project

	Actual \$	Budget \$	Variance \$
Funding from HAL	38182	38182	0
Expenditure			
Travel and Accommodation	3433	4000	+567
Operating	36918	34182	-2736
Total Expenditure	40351	38182	-2169
Net Surplus/loss			-2169

Variances are minor and to be expected with a project of this nature. Savings in travel occurred where regional inspectors were able to combine certification inspections with aphid monitoring.

Recommendations

- The monitoring program be continued for a further season.
- Encourage the WA seed industry to be responsible for a pest monitoring program as a basis for producing quality seed potatoes with minimal virus levels. A manual for production of seed potatoes is being developed.

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The co-operation and interest of the WA seed potato growers involved in the project made it that much more satisfying to implement and review the monitoring program.

The interest and enthusiasm of Mark Stanaway, Dale Spencer, Steven Meyer and Sheena Lyons who undertook the monitoring, contributed to the smooth running of the project.

Appendix 1. Field score sheet used in the monitoring program

POTATO SEED CROP MONITORING

FARM: _____ VARIETY: _____ PLOT/PADDOCK: _____

FAX: _____ DATE: _____

Pheromone traps (where placed): ERI= _____ ARG = _____

TRANSECT / EDGE MONITORING
(circle monitoring method)

LOWER LEAVES															
Leaf #	APHIDS			pm	tble	tblg	heli	rb	tp	lh	wgh	wf			OTHER
	W	W/L	M												
1															
2															
3															
4															
5															
6															
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41															
42															
43															
44															
45															
46															
47															
48															
49															
50															
Average / 100 leaves															
% Leaves infested															

Insects per Container															
Bash #	APHIDS			pm	tble	tblg	heli	rb	tp	lh	wgh	wf			OTHER
	W	W/L	M												
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
Total															

COMMENTS: _____

WA SEED POTATO CROP MONITORING 2001/02 - An Industry Initiative



WA POTATO PRODUCERS' COMMITTEE



FARM: _____

DATE: _____

FAX: _____

Insect numbers scoring system:

X
XX
XXX

Absent
 Present at very low numbers: 1 to 10% leaves infested
 Moderately abundant : 10 to 40% leaves infested
 Widespread and easily found >40% leaves infested

Enquiries:

Ian Guthridge Tel. 97770139; 0427 778039
 Stewart Learmonth Tel. 97770167; 0417 959319.

Paddock name	Sowing month	APHIDS			OTHERS												Monitoring method (tick box)				
		winged	wingless	*mummy	potato moth	looper egg	looper grub	heliathis	Rutherglen bug	thrip	leafhopper	wingless grasshopper	white fly							TRANSECT	EDGE

*mummy = aphid parasitised by a wasp.

SUMMARY ON INSECT NUMBERS:

ACTION RECOMMENDATION:

