# POTATO AUSTRALIA

VOLUME 2 JUNE 1991 ISSN 1036-8558

Published by the Australian Potato Industry Council

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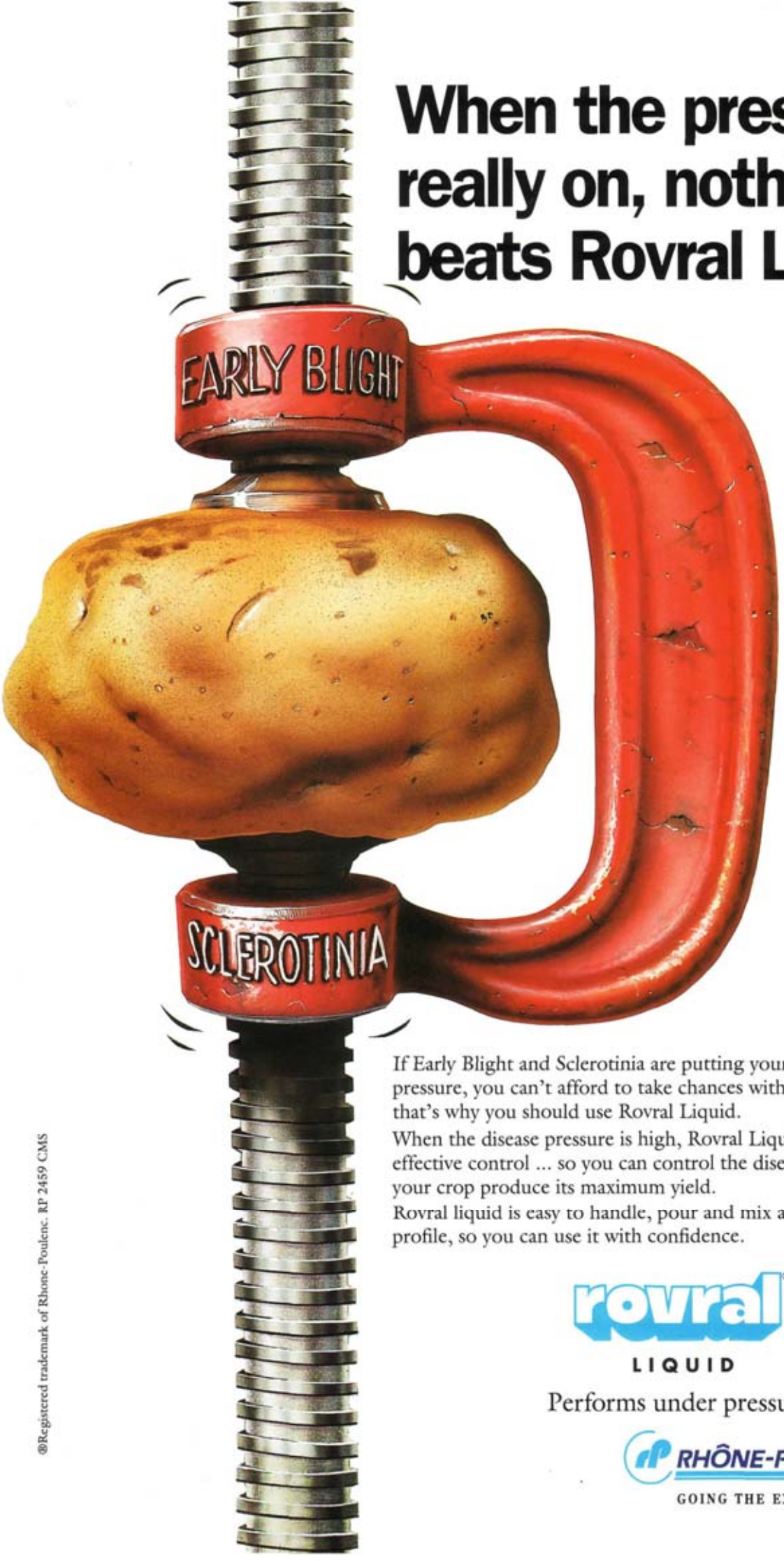


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# POTATO AUSTRALIA

**Published by the**
**AUSTRALIAN POTATO INDUSTRY COUNCIL**

**VOLUME 2, JUNE 1991**
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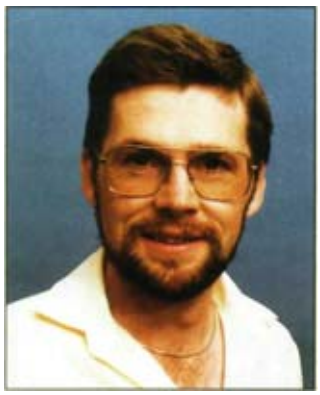
*is a District Horticulturist specialising in vegetables at Griffith with NSW Agriculture.*


**JONATHAN ECCLES**
*is a Special Horticulturist (Vegetables) at Gosford with NSW Agriculture*


# EDITORIAL

A warm welcome to readers of the second edition of Potato Australia. The magazine is technology based and provides information of interest and value to everyone associated with the industry.

Articles of importance to the potato industry from throughout Australia are included in this edition.

We appreciated your comments to our first edition and would value further input so that subsequent publications may provide a true reflection of your needs and ideas for an industry publication in the 1990's.

**EDITORS**

JOHN SALVESTRIN

JONATHAN ECCLES

**INVITATION TO CONTRIBUTORS AND ADVERTISERS**

This magazine will be published annually in June. Articles are welcomed on any topic related to potatoes. Please submit copy of articles and advertising to: The Editor, Potato Australia, P.O. Box 1087, Griffith, NSW 2680. Phone (069) 620274 Fax (069) 630255.



# CONTENTS




**ACKNOWLEDGEMENT:**
*Front cover photograph—*
*Romic Pajak and John Farrow of the Department of Primary Industry, Hobart, Tasmania.*

# A.P.I.C. CHAIRMAN'S REPORT

**Wayne Cornish, Chairman of the Australian Potato Industry Council.**

Our potato industry has not received any good news in the last 12 months. To say it was a lack-lustre season is perhaps an understatement, as most of us have suffered. There are no isolated reasons but many reasons why this has occurred. The industry generally is suffering under the pressures of the current economic climate. High interest rates, increases in production costs and many government policies involving fiscal and trade issues have not helped. Excessive plantings combined with excellent growing conditions have had a negative effect on viability.

Our industry needs a positive change in the economy. Responsible plantings and government policies which help our exporters of both fresh and value added produce to get out and be successful are required.

We are producing a commodity which we are allowing to be presented for fresh sale relatively unheralded. With the potato being low fat, high fibre, vitamin packed and microwave freely, perhaps we should be telling consumers just how good potatoes are.

APIC has strongly voiced its concern over the threat of withdrawing our last remaining 10 percent tariff on processed potato product entering Australia. It has made recent written and verbal submissions to the Senate inquiry concerning this matter.

While Australia remains relatively disease free, unfortunately the earlier introduction of potato cyst nematode in Western Australia, and the recent discoveries in the lower regions of the Dandenong Ranges of Victoria have meant serious consequences for our industry. Protocols aimed at facilitating responsible movement of potatoes in and out of Victoria have been established. APIC believes it is crucial that strong effective educational programs are mounted by State Agricultural Departments and directed at all sectors to allow the industry the knowledge and management practices vital for a PCN free future.


**WAYNE CORNISH**

Toolangi Research Station in Victoria has been Australia's centre for excellence in potato breeding and research. It is now under threat due to the Victorian Department of Agriculture & Rural Affairs financial reforms and restructuring. The National industry will put up strong resistance to any discounting of Toolangi's important role.

The Horticultural Research and Development Corporation provides the potato industry with an excellent opportunity to further National research and development. The negotiations for industries joining with the Horticultural Research and Development Corporation and statutory levy arrangements through the Department of Primary Industries and Energy are nearing completion and we look forward to the benefits of that initiative. A levy will be collected at the first point of sale at the rate of 50 cents per tonne on both fresh and processing potatoes. A similar contribution will be made by processors. These funds will be matched by the Federal Government to yield approximately $1.5 million. Merchants too are prepared on a voluntary basis to be part of a new national approach to industry. They have strong views on the importance of fresh market promotion, and to that end a committee comprising merchants and growers has been established to study all aspects and will report by late September 1991.

These are important issues and will be reported further through your state and local industry organisation or association. We hope you will be involved in determining the direction of research by making your concerns known. Similarly any promotion initiative will require your support and input.

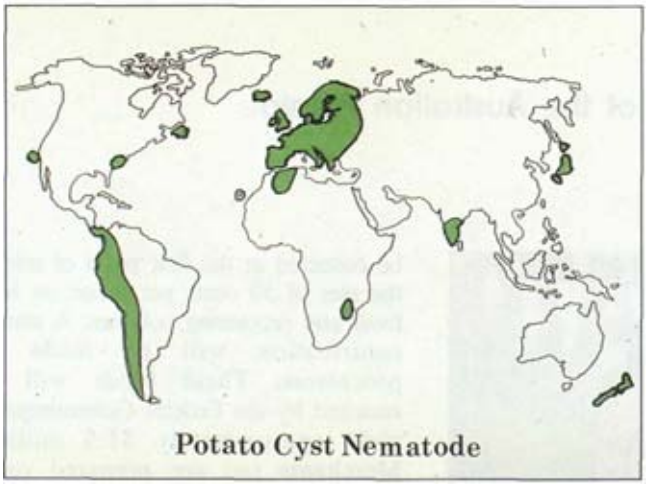
In our industry, it is so important that as individuals, regardless of sector, we be active in our industry structure to make sure industry direction is positive and representative.

Our magazine 'Potato Australia' has been well received and I thank those who contributed to its successful launch. APIC's policy is to foster information transfer by utilising 'Potato Australia' and by producing a periodic newsletter, to be introduced this year.

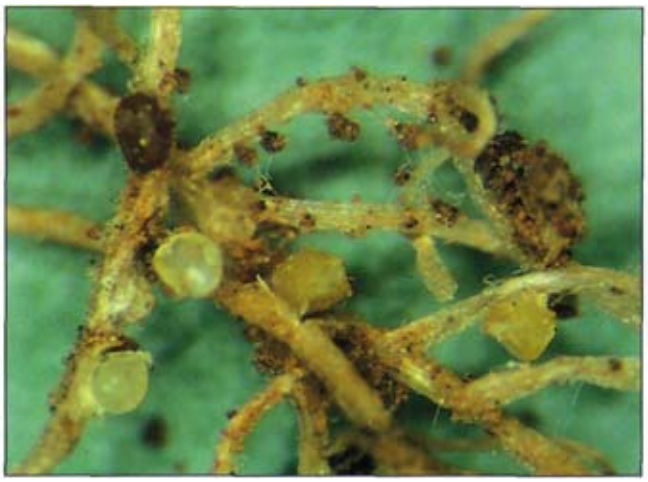
Finally I extend APIC's best wishes to all and hope when next we report the industry will be working under more satisfactory economic circumstances.

# Potato Cyst Nematode

**Spread of Potato Cyst Nematode in the 1980's.**



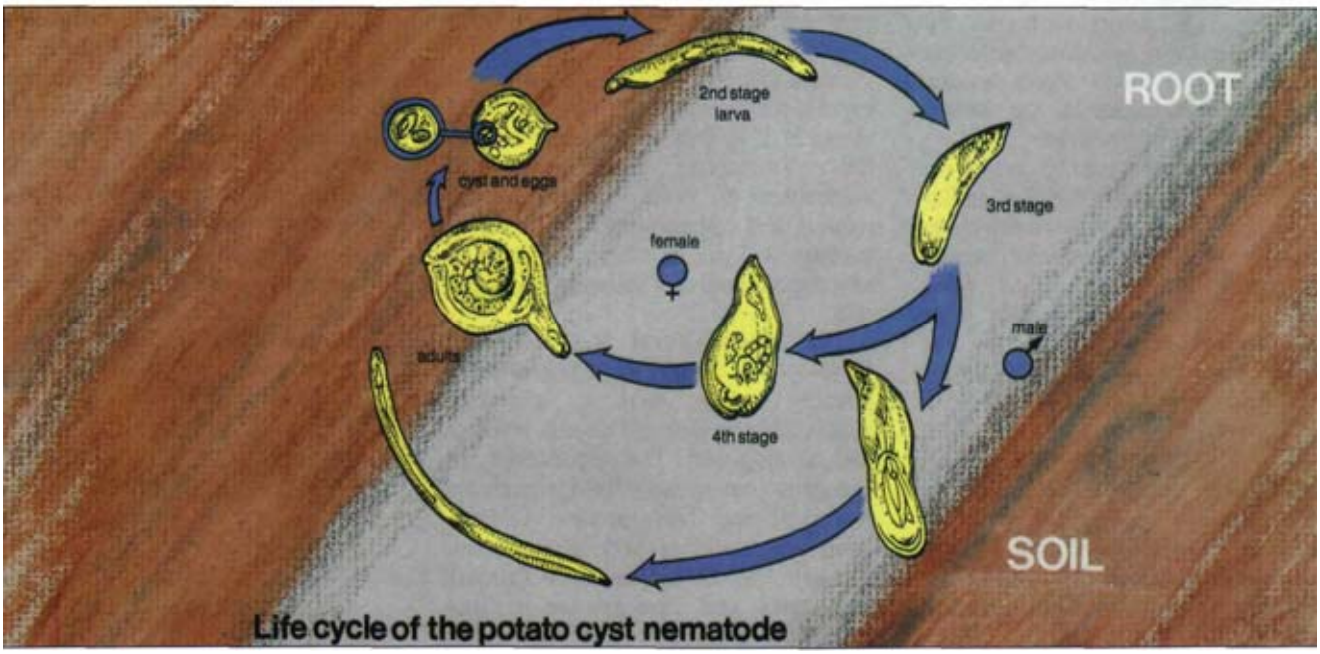

**Spread of Potato Cyst Nematode in the 1980's**



**Potato Cyst Nematode**

**Crop damage caused by Potato Cyst Nematode**

**PCN is too small to see in the early stages of an infestation. However, after the crop flowers, female nematodes turn into cysts and are visible on roots as small white to golden yellow, to dark brown, to black spheres that are attacted to roots. Contact your state Department of Agriculture if you suspect PCN in your crop.**



# Potato Cyst Nematode Outbreak

**Peter Ward is the Potato Cyst Nematode Liaison Officer based at the Institute of Plant Sciences, Knoxfield, Victoria.**

Potato Cyst Nematode (PCN), *Globodera rostochiensis* or *G. pallida*, a tiny eelworm, is one of the most damaging potato pests and poses a major threat to Victoria's potato industry.

The nematode is indigenous to South America where cultivated potatoes have their origin. It has spread all over the world to wherever potatoes are grown. Until its discovery in Western Australia in 1986 it had not been detected in Australia. In early 1991 several outbreaks were detected in market gardens in Victoria.

Victoria is Australia's premier potato producing state. About 60 percent of the seed potato crop is sold outside Victoria and it is a major producer of ware, crisping and processing potatoes. The control of PCN is vital to the industry's safeguard.

## LIFE CYCLE

Soil infested with PCN contains small spherical bodies or cysts (white, yellow or reddish brown in colour) the size of a pinhead. Inside each cyst there are up to 500 eggs which will hatch if potatoes or tomatoes are planted. (Solanaceous weeds will also stimulate egg hatch).

The eggs hatch into juvenile nematodes which move through soil and attack and penetrate potato roots. Nematodes feed on root cells triggering damage and abnormal cell enlargement. Nematodes which establish enlarged feeding sites become swollen females, bursting through roots where they are fertilised in the soil by male nematodes. The fertilised females die and their bodies become the cysts or egg-sacs. The cysts fall easily from the potato when the plants are lifted from the soil.

## SYMPTOMS

Plants infested with PCN reduces yields by about five tonnes per hectare in mild infestations. Numbers and size of tubers are reduced in heavy infestations. Crop damage varies from no observable above ground symptoms to small patches of poor growth. Heavy infestations can result in total crop failure. Infested plants have poor root systems and minute cysts may be observed on roots some two weeks after flowering.

## CONTROL

As the nematode can survive for up to 30 years in the absence of a host, control is difficult to achieve. However, soil fumigation and nematicides can reduce numbers of nematodes. Potatoes are not permitted to be grown on infested land although resistant varieties may be recommended in some cases. Surveys of plants and soil are carried out to determine the number of infestations and to define areas which are free of the nematode.

The spread of PCN can be controlled by:

- only growing certified seed
- not using secondhand containers
- not sharing farm equipment
- reporting any poor crop growth to your State Department of Agriculture or Primary Industry.

## EXISTING INFESTATIONS AND CONTROL MEASURES IN PLACE

Nematodes found in a 0.5 ha potato crop near Wandin in the Dandenong Hills were positively identified on 5th February this year as the Potato Cyst Nematode, *Globodera rostochiensis*, commonly called the "Golden Nematode".

A second infested property was confirmed on 8th March, a third on 11th April and a fourth on 15th April.

With the exception of the third property where cysts were found in a home vegetable patch, the potatoes of which have been given to them from the second property, all properties shared common characteristics and were within a few kilometres of each other.

The properties were typically small market garden concerns growing carrots, strawberries, zucchinis etc and a few potatoes. The potatoes were grown either without or very short rotations and marketed in banana boxes.

With the discovery of the first infestation the property was immediately placed in quarantine and a high risk area of 5 km from the property described. On the property itself action was taken to destroy the infested potato crop in situ and fumigate all potato cropping lands.

Farm buildings and equipment were disinfected and restrictions were placed on the movement of any machinery, equipment or produce which may transport soil. A ban on the growing of any future potato crop or other solanaceous crops has also been imposed. The main crop of carrots have to be washed and inspected by Departmental Officers before they can be sold.

Within 5 km of the infested property all properties growing potatoes were identified and as an interim measure no movement of potatoes from these properties was allowed without written approval of the Chief Quarantine Officer.

These properties had to be fork tested before harvest. Within the 5 km circle over 500 properties were surveyed with only 13 found to be growing potatoes. Over 30 Departmental staff were involved in the survey and ensuing fork and soil testing with a small management group nominated to deal with the problem on an ongoing baasis.

At a Commonwealth level the Chief Quarantine Officer with the Australian Quarantine Services advised other countries of the situation in accordance with international phytosanitary requirements.

With subsequent discovery of PCN on the other three properties all these properties were placed in quarantine with the same restrictions applied and a 5km circle drawn around each of these with again the same restrictions within this area. Because of the closeness of the properties these circles overlapped giving only "bumps" on the first original circle.

## INTERSTATE RESTRICTIONS ON THE MOVEMENT OF POTATOES AND OTHER PRODUCE FROM VICTORIA

As a result of a meeting of Chief Quarantine Officers from each state and recommendations from industry groups the following restrictions were placed on the interstate movement of potatoes and other produce in early March.

### TASMANIA:

Entry of potatoes from whole of Victoria prohibited. Certification protocol to be negotiated for entry of nursery stock and bulbs grown within 20km of infested properties.

### WESTERN AUSTRALIA:

Entry of potatoes from whole of Victoria prohibited. Entry of potatoes from other states is subject to inspection/treatment.

### NEW SOUTH WALES:

Entry of potatoes from within 20km of infested properties prohibited. Certification protocol to be developed for entry of nursery stock, bulbs, root crops etc. grown within 20km of infested properties and which could carry soil.

Certification protocol to be developed for secondhand containers that may be suspected of carrying PCN. Seed potatoes from the whole of Victoria must be brushed and practically free of soil.

All bulk bins, tonne and half tonne bins must clearly show both the growers and the packers name and address. The word "Potatoes", their variety and class must also be clearly marked. Produce which does not conform to these labelling conditions could be seized and fines imposed on the grower.

The Chief Division of Plant Industries may from time to timme exempt produce from these restrictions if satisfied that the produce is from areas not affected by PCN, or has not come within the 20km described. A deputation of Gembrook growers met the NSW Minister's Chief of Staff on 6th March and presented proposals on protocolss for the controlled entry of Gembrook potatoes into NSW.

The NSW Department made a technical assessment of the protocols and discussed the issue with the industry in NSW before making recommendations to the Minister. This protocol has just been accepted and is currently being implemented.

### QUEENSLAND:

Regulations identical to those in NSW.

### SOUTH AUSTRALIA:

Entry of potatoes from within 20 km of infested properties prohibited. Certification protocol to be developed for entry of nursery stock, bulbs root crops etc grown within 20 km of infested properties and which could carry soil.

Outside the 20 km zone, certified seed must be brushed and packed in new containers and fork or soil testing must be introduced to the certification scheme as soon as possible.

Ware potatoes must be washed or brushed if from a recognised Potato Protection District. Processing potatoes must go into registered processing premises under a defined protocol.

## HIGH RISK AREAS AND STATEWIDE SURVEYS

If PCN were to be found elsewhere in Victoria it would likely be in a high risk type of property. This would be basically a property that grew potatoes with either very short or no rotations at all, and marketed their potatoes in banana boxes.

These boxes were felt to post a threat not just with PCN but with any soil borne pest or disease. They are recycled to other properties by fruiterers, green-grocers and other dealers. A survey of these boxes in the Melbourne fruit and vegetable wholesale market gave an indication of areas that had a definite box trade and so teams were then allocated to these areas to check properties that could be considered at risk.

Another group of high risk properties were defined that had any contact with infested properties, such as buying produce from them, sharing machinery, irrigating from a common water source, family connections etc. All these properties were and still are being checked for PCN.

## ESTABLISHMENT OF POTATO PROTECTION DISTRICTS

Regulatory measures to eradicate and contain PCN are likely to fail unless individual growers are prepared to protect themselves. One way of achieving the level of protection needed would be to establish a number of Potato Protection Districts (PPD's) in which all potato growers are required to abide by management practices and testing protocols to minimise the risk of introducing and spreading PCN.

# PCN resistant varieties for Western Australia

**Allan McKay is a Research Officer with the Western Australian Department of Agriculture at the South Perth headquarters. Peter Dawson is an Adviser, also with the Department but based at Bunbury. Both officers specialise in vegetables.**

The first recorded finding of potato cyst nematode (PCN) in Australia was at Munster, south of Perth, in 1986. Continuous cropping with the PCN susceptible variety Delaware was the standard practice. This area was important in producing fresh market potatoes from autumn and early winter plantings.

Fork testing showed the infestation was localised and so an eradication program commenced.

## ERADICATION OF PCN

The pest can be eradicated by continuous cropping with a resistant variety. A resistant variety causes hatching of dormant cysts.The emerging larvae cannot complete their life cycle in the resistant host and so perish. One planting of a resistant crop can be expected to reduce cysts by 80 percent. A much slower decline in the population of cysts occurs when the land is left fallow.

The success of this eradication strategy depends upon there being just one strain of the nematode present. The findings of PCN at Munster indicate a single introduction occurred and only one strain of PCN, the RO1 strain, is present.

## THE PROBLEM

The resistant variety strategy was adopted in 1990. All potato crops planted within five kilometres of a finding of PCN had to be of a resistant variety. Atlantic was the only variety resistant to PCN, strain RO1, which was available in commercial quantities. While Atlantic is the preferred fresh crisp variety it has serious shortcomings for the fresh market. This variety will disintegrate when boiled and it has a netted skin not suited to the wash pack trade.

A replacement for Atlantic was needed for autumn/winter planting in the quarantine zone. The search for such a variety is not easy. The potato must be high yielding, attractive, and boil well. It is desirable for the variety to chip fairly well and to have some resistance to powdery scab and early blight. Its maturity cannot be too late and its dormancy must be suitable for both marketing and seed production. The perfect potato is of course unobtainable but one that betters Atlantic for the fresh market should be readily found.

## RESISTANT VARIETIES

Thirteen PCN resistant varieties were tested at Len Mahaljevich's property at Munster. These varieties are listed in Table 1. They were planted in mid May and harvested in late October.

All varieties except Elba had broken dormancy at planting and all except Elba had reached 50 percent emergence by mid June. Omega and 7-87 were sensitive to the herbicidelinuron but recovery was swift. The crop grew slowly in cold and frosty conditions. Good management using sprinklers prevented serious injury from an extraordinary run of frosts in late June and early July. By the end of September most varieties had started to 'go-down'. Elba was the exception and it had not reached maturity when the crop was sprayed off in mid October.

## YIELDS

Yield results are presented in Table 1. Nadine, Aminca and 6-87 had the highest marketable yields. 6-87 had a low proportion of grade 1 tubers due to poor shape. Alhamra, a pink skinned,

**TABLE 1: Yield (marketable and total), specific gravity, boiling score, and crisp colour for PCN resistant varieties planted at Munster.**

| Variety | Marketable yield (t/ha) | Total yield (t/ha) | Specific gravity | Boiling/ sloughing score* | Crisp colour score** |
|---|---|---|---|---|---|
| Alhamra | 0.0 | 38.2 | 1.072 | 2.3 | 7.0 |
| Aminca | 41.0 | 44.6 | 1.075 | 3.0 | 5.3 |
| Atlantic | 34.5 | 35.3 | 1.091 | 3.7 | 3.0 |
| Elba | 31.1 | 34.2 | 1.087 | 3.3 | 6.3 |
| Marijke | 34.5 | 38.0 | 1.079 | 1.7 | 7.3 |
| Morene | 25.5 | 30.1 | 1.071 | 2.3 | 6.0 |
| Nadine | 43.4 | 46.0 | 1.060 | 1.3 | 8.7 |
| Omega | 33.1 | 35.5 | 1.083 | 3.3 | 6.0 |
| Rosa | 34.1 | 36.3 | 1.075 | 3.0 | 3.7 |
| Yankee Chipper | 37.1 | 38.7 | 1.073 | 3.3 | 6.7 |
| 6-87 | 40.0 | 44.2 | 1.084 | 3.0 | 4.3 |
| 7-87 | 25.7 | 42.3 | 1.074 | 2.3 | 5.3 |
| 9-87 | 32.5 | 35.8 | 1.091 | 3.3 | 4.0 |
| LSD (P=0.0.5) | 5.1 | 5.9 | 0.003 | 0.9 | 1.8 |

* Sloughing score: 1 = none; 5 = severe, soupy after boiling.
** Crisp colour score: 1 = white to 10 = black. Over 6 is unacceptable.

yellow fleshed variety had no marketable yield because of a netted scab-like disorder. This problem also reduced the grade 1 yield of Elba. 7-87 and Morene produced the next lowest yields and both these varieties suffered from stem end rots. Most of the other varieties produced marketable yields similar to Atlantic.

## POWDERY SCAB

The low level of powdery scab was found on tubers of some varieties. The level of the disease was neither high nor consistent enough to allow screening for scab tolerance. 7-87 had the highest scab level (7 percent of tubers with more than 10 percent of their surface affected) while Marijke, Yankee Chipper, Omega, Rosa and 9-87 had low levels of scab (less than 4 percent). In Victoria Marijke has been shown to be tolerant of powdery scab while Rosa was found to be highly susceptible (R. Kirkham, D.A.R.A., Victoria).

## COOKING QUALITY

Cooking quality results for the varieties are also shown in Table 1. Atlantic had the highest sloughing score after boiling. Note that Atlantic had the equal highest specific gravity (Table 1) and it is this high dry matter content which causes tubers to disintegrate when boiled. Sloughing of Atlantic is shown in Figure 1.

Nadine had the best boiling quality (and the lowest specific gravity) but did not fry well. The fry colour was so dark as to cause problems with home-made French fries. In a French fry test Atlantic produced light yellow fries, Marijke, yellow fries and Nadine dark brown fries.

Next to Nadine, Marijke had the best boiling quality (Table 1) although slight after cooking darkening was apparent. Aminca and Rosa had better boiling quality than Atlantic and acceptable colour after frying.

## THE BEST PROSPECT

Marijke is the best prospect as a general purpose PCN resistant potato to replace Atlantic for the fresh market at Munster. Marijke has the added benefits of having a smoother skin than Atlantic and shallow eyes. Minitubers of Marijke are now being produced and seed bulking will occur over this summer. This will provide sufficient seed for commercial scale trials at Munster in the 1992 season. This season growers must continue with Atlantic or shift production away from Munster.

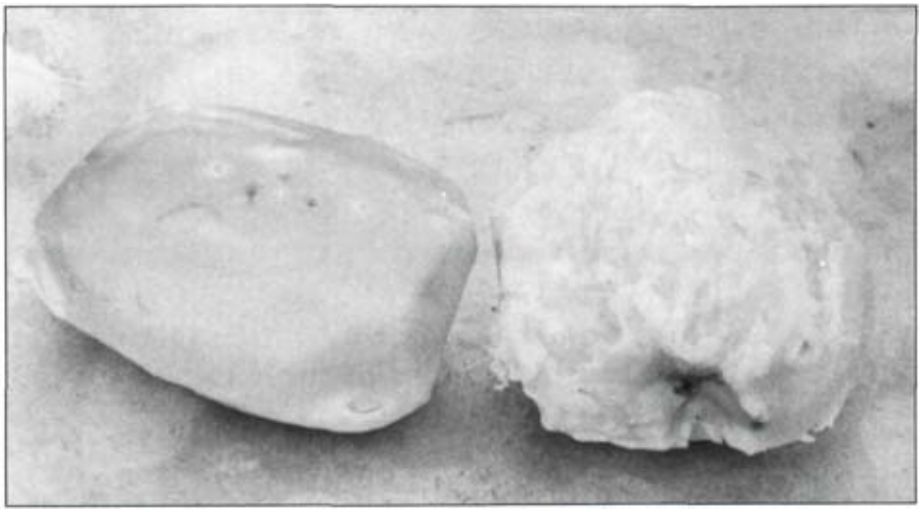


**FIGURE 1: Tubers of Marijke (left) and Atlantic after boiling. Marijke shows some slight sloughing and after cooking darkening. Atlantic shows severe sloughing, this tuber has not been fully cooked.**

## FUTURE WORK

In the short term further testing of other varieties will continue at Munster. New varieties available include Cardinal, Darwinia, Diament, Fresco, Hampton, Hudson, Islander, Junior, Nicola, Pentland, Javelin, Premiere and Primura.

In the longer term resistant varieties will be sought to replace susceptible varieties grown in areas of Western Australia using short rotations. Success is certain due to the worldwide interest in varieties resistant to PCN. Breeding programs in Europe, North America and New Zealand produce resistant varieties. The Victorian potato breeding program also uses resistant parents in many crosses and so locally produced resistant material is available too.

## ACKNOWLEDGMENTS

This work was possible due to the establishment of a potato evaluation program in WA. Already available were the 13 PCN resistant varieties discussed while another 13 are available for trial this season. This program is funded by the Potato Growing Industry Trust Fund of Western Australia and the Horticultural Research and Development Corporation. Some seed was also kindly supplied by the Institute of Plant Sciences, Toolangi, Victoria.

# WILWASH: New fresh market potato

**Roger Kirkham and Graeme Wilson are potato breeders at the Institute of Plant Sciences, Toolangi in Victoria.**

Wilwash was released in April 1991 as a new potato variety for the fresh market. This variety was developed by the Department of Agriculture in Victoria which has the only potato breeding program in Australia based at the Institute of Plant Sciences (IPS) campus at Toolangi.

HISTORY

Wilwash was tested as breeding line 80-98-14. It was grown in the field for the first time in 1980/81 as part of a large seedling population. Initially, Wilwash was grown and selected for three years at Toolangi and was also tested in winter trials at the IPS, Frankston.

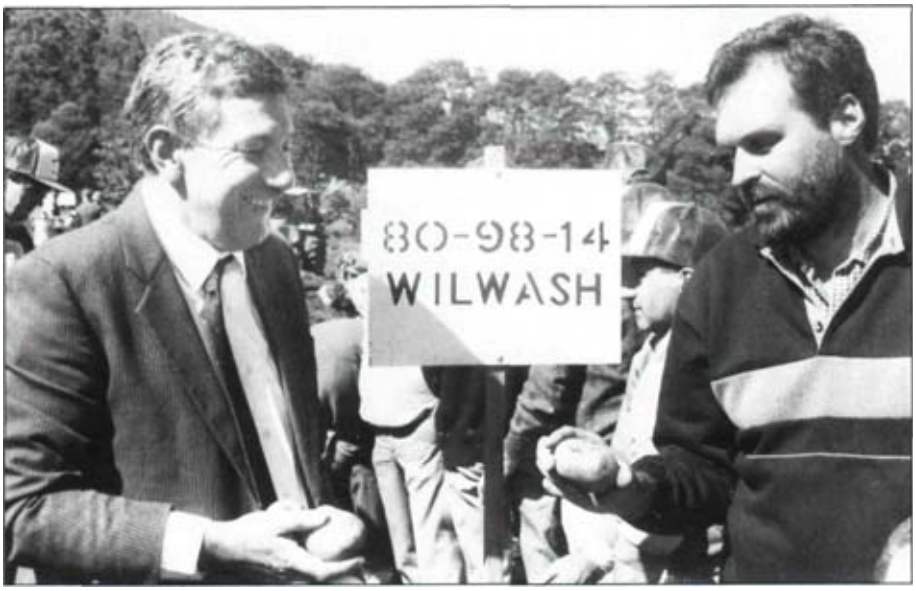
Wilwash produced good results in these initial trials and was then grown in the second stage of the potato breeding program. This involved variety trials on commercial potato farms in each of the production areas of Victoria for three years.

The final part of the potato breeding program tested Wilwash in variety trials throughout Australia as part of a national potato variety testing program.

PEDIGREE

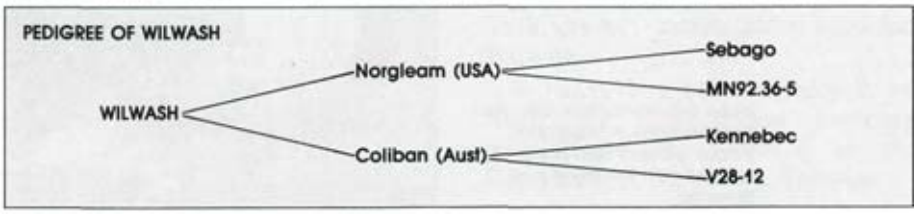
Wilwash was produced by crossing the varieties Norgleam and Coliban.

- NORGLEAM was released in North Dakota, USA in 1957. It is high yielding with round shaped tubers which have bright white and smooth skins.Norgleam was produced by crossing the variety Sebago with a local breeding line.
- COLIBAN was released in Australia in 1973 and was produced by the Victorian Department of Agriculture's potato breeding program at Toolangi. It is high yielding with flat-round tubers which have bright white and smooth skins. Coliban was produced by crossing the variety Kennebec with a local breeding line.




**Ras Lawson and Rogar Kirkham of the Victorian Department of Agriculture at the release of Wilwash.**

**Wilwash was released at Institute of Plant Sciences, Toolangi in April 1991.**

## DESCRIPTION

Wilwash tubers have medium-short dormancy. Wilwash plants emerge fairly quickly and have early maturity similar to Pontiac.

Tubers are round to slightly oblong and have shallow eyes. They have smooth, bright white skin and are suitable for washing prior to sale. Tuber lenticels are small.

Wilwash plants produce slightly more tubers than Sebago and tuber size is usually larger as shown in Table 1.

## PRODUCTION

Wilwash consistently produces high yields of tubers in the No. 1 grade. The results in table 2 includes yields of No. 1 grade (80-450g) and oversize grade (more than 450g). Trials during 1989/90 were grown in Victoria, Queensland, New South Wales, South Australia and Western Australia.

Wilwash averages 17 percent yield advantage of No. 1 grade over Sebago, the commonly grown fresh market variety.

**TABLE 1: Tuber number per plant (6 trials during 1989/90)**

| District | Month* | Wilwash Tubers/plant | Sebago Tubers/plant | Kennebec Tubers/plant |
|---|---|---|---|---|
| Gembrook | Nov | 7.4 | 6.3 | |
| Colac | Oct | 8.2 | | 5.6 |
| Toolangi | Nov | 9.4 | 8.3 | |
| Gatton | Jun | 6.1 | 6.0 | |
| Gatton | Jul | 4.5 | 5.0 | |
| Gatton | Feb | 8.0 | 5.1 | |
| ** Average | | 7.1 | 6.1 | |

* month trial planted
** Wilwash average for trials which included Sebago

**TABLE 2: Yield (tonnes/hectare) (14 trials during 1989/90)**

| District | ** Month | Wilwash No. 1 | Wilwash Oversize | Sebago No. 1 | Sebago Oversize | Kennebec No. 1 | Kennebec Oversize |
|---|---|---|---|---|---|---|---|
| Gembrook | Nov | 40.8 | 0.0 | 35.7 | 0.0 | | |
| Colac | Oct | 57.6 | 0.6 | | 0.0 | 53.2 | |
| Toolangi | Nov | 68.2 | 0.7 | 52.0 | 0.0 | | |
| Berrigan | Sept | 45.6 | 0.0 | 30.8 | 0.0 | | |
| Berrigan | Feb | 19.1 | 0.0 | 28.9 | 0.0 | | |
| Castlereagh | Aug | 39.4 | 0.0 | 37.1 | 0.0 | | |
| Gatton | Jun | 50.0 | 8.5 | 43.7 | 2.4 | | |
| Gatton | Jul | 42.5 | 2.6 | 40.0 | 1.7 | | |
| Gatton | Feb | 32.3 | 0.0 | 20.0 | 0.0 | | |
| Medina | Jun | 64.1 | 0.9 | | | 49.4 | 0.0 |
| Medina | Feb | 52.4 | 0.6 | | | 45.6 | 11.9 |
| Manjimup | Nov | 50.5 | 1.3 | | | 57.6 | 3.5 |
| Gawler R | Jul | 43.2 | 0.0 | 33.6 | 0.0 | | |
| Lenswood | Nov | 76.6 | 4.4 | 69.4 | 1.5 | | |
| Average* | | 45.8 | 1.6 | 39.1 | 0.6 | | |

* Wilwash average for trials which include Sebago
** month trial planted No. 1 grade = 80-450g

**Potato berries, the start of a new potato variety.**

**Bruce Ure Gembrook (left) and Merv Mullens of Thorpdale, potato growers who have assisted with the release of Wilwash.**

**Potato boiling and chipping tests at the potato cooking laboratory, Institute of Plant Sciences, Tooiangi**

## COOKING QUALITY

Wilwash has excellent boiling quality and remains white when boiled with little or no discolouration. Wilwash does not slough or disintegrate during boiling and has a firm texture when boiled.

Wilwash is not suitable for processing into crisps or French fries as the dry matter content is low and fry colour is dark (Table 3).

## DISEASE TOLERANCE

Wilwash has a high level of field resistance to Target Spot, *Alternaria solani* and Late Blight, *Phytopthora infestans.*

Wilwash is susceptible to Powdery Scab, *Spongospora subterranea,* Common Scab, *Streptomyces scabies* and to Silver Scurf *Helminthosporium solani*

**TABLE 3: Dry Matter and Crisp Colour* (9 trials during 1989/90)**

| | | Wilwash | | Sebago | | Kennebec | |
|---|---|---|---|---|---|---|---|
| District | ** Month | %Dry Matter | Crisp Colour | %Dry Matter | Crisp Colour | % Dry Matter | Crisp Colour |
| Gembrook | Nov | 17.5 | 7.0 | 20.5 | 5.0 | | |
| Colac | Oct | 18.0 | 6.3 | | | 21.4 | 5.3 |
| Toolangi | Nov | 19.1 | 8.3 | 22.9 | 6.7 | | |
| Berrigan | Sept | 16.3 | | 19.7 | | | |
| Berrigan | Feb | 14.7 | | 16.7 | | | |
| Castlereagh | Aug | 14.7 | 4.6 | 17.5 | 4.3 | | |
| Medina | Jun | 15.9 | | | | 18.9 | |
| Manjimup | Nov | 14.2 | | | | 16.6 | |
| Lenswood | Nov | 16.2 | | 19.0 | | | |
| Average*** | | 16.4 | 6.6 | 19.4 | 5.3 | | |

* scale 1-10, 6 = borderline more than 6 = too dark
** month trial planted
*** Wilwash averaged for trials which included Sebago

## SUMMARY

Wilwash is a high yielding variety that is suitable for washing prior to sale. It is not suitable for processing and is recommended for the fresh market only. It has excellent boiling quality but is not suitable for fry processing.

Wilwash is susceptible to silver scurf disease. To avoid silver scurf growers should use certified seed, have long rotation and harvest as soon as the crop matures.

Growers should ensure that large potatoes are not produced as oversize potatoes may not be able to be sold for fry processing.

## ACKNOWLEDGMENTS

We would like to thank all the growers who have tested Wilwash on their properties.

We especially thank Mr Bruce Ure, Gembrook, who has been involved in trials specifically testing varieties for the fresh market which have included Wilwash.

Wilwash has been developed by Australia's only potato breeding program which is based at the Department of Agriculture, Tooiangi.

# Breeding Potatoes in Australia

**The Department of Agriculture Victoria operates the only potato breeding program in Australia.**

This program provides potato varieties to all states in Australia for testing in local production areas.

The program is mainly government funded and receives limited industry funding, mainly from the crisp industry in Victoria and some from the french fry industry in Victoria. These industries have only recently provided funds commencing during the 1990/91 season.

Prior to this the potato breeding program relied entirely on Victorian Government Funds. During this period the Breeding program has produced a number of successful new varieties which are being grown commercially Australia wide.

| | | | |
|---|---|---|---|
| Some recent varieties are: | • COLIBAN | released | 1973 |
| | • TARAGO | | 1983 |
| | • ATLANTIC | | 1985 |
| | • BISON | | 1987 |
| | • CRYSTAL | | 1987 |
| | • DENALI | | 1988 |
| | • NORCHIP | | 1989 |
| | • SNOWCHIP | | 1989 |
| | • WINLOCK | | 1990 |
| | • WILWASH | . | 1991 |

The breeding program has a number of varieties under final tests before release. These varieties include crisping varieties, french fry varieties and fresh market varieties. However, industry funding is needed to ensure that potato breeding continues at the same level in Australia.

# Quality assurance for certified seed production

**Keith Blackmore is the Senior Seed Potato Certification Officer at Toolangi with the Victorian Department of Agriculture.**

Quality Assurance (QA) systems aim to increase the probability that high quality fruit and vegetables will be produced and released to the market. It recognises that all involved have an important contribution to make in "getting it right the first time".

QA is a planned approach to ensure the quality of the end product. It begins with identifying all points in the production line where quality could be lost, and requires appropriate checks and records to be made to ensure that quality standards are maintained at these points. Thus, quality is checked throughout production rather than relying on "end point inspection". Each shed takes over the responsibility of the post-packing inspection for quality and pest and disease infestation. A Department of Agriculture inspector will continue to carry out the field inspections.

Criteria to be met before the Department of Agriculture will hand over responsibility for inspection are:

- Quality specifications are formulated and include farm management practices, hygiene requirements, tolerance limits of pest and disease problems.
- A manual documenting how the group produces potatoes to comply with their quality standards is established.
- Each grower must keep records which include a farm diary, hygiene records of their machinery and shed and a checklist to show every load is inspected.

The Department will check the manual to make sure that the grower's quality system is adequate. The grower will then have an initial audit. Qualified auditors will visit the farms and check that growers and their staff are following the requirements and producing potatoes that comply with the quality specifications. They do this by checking records and talking with all the people involved.

When growers pass the initial audit, they will take over the responsibility of post-packing inspection. Audits are held throughout the season, both announced and unannounced.

All growers in a pilot programme attended a QA training workshop. The concept of QA and the requirements of the QA system were explained. A discussion was also held on the quality specifications and the feasibility of the proposed scheme.

The benefits of a QA scheme for the certified seed potato group are:

- Greater flexibility: Growers carry out their own end point inspection and do not have to arrange this with the Department for every load.
- Cost savings: QA systems are more efficient as quality checks are builtin throughout production. There is less chance that a rejection will occur at the end of the production where produce has greater value from additional labour and materials.

The costs of a QA scheme are:

- Labour: Additional record keeping and staff training.
- Audit costs: Although there is no charge for the initial audit, follow up audits are on a similar rate as those of the present inspections. However, there are fewer audits per year.

# HOW TO BAG THE PERFECT POTATO.

New RIZOLEX® 100 D from Shell Agriculture is the perfect way to protect your potato crop from being ravaged by Black Scurf and Stem Canker, caused by Rhizoctonia solani infections.

RIZOLEX is a unique new fungicide which is applied to seed potatoes at sowing. It assists in obtaining a full crop of even-sized tubers, free from skin blemishes, as well as improved germination.

This means improved quality and greater acceptability of the potato crop, resulting in a higher market value.

RIZOLEX is easy to apply and is very cost effective.

**Rizolex®**

**Stop Black Scurf and Stem Canker and bag the perfect potato with new RIZOLEX from Shell Agriculture.**

Shell Agriculture

*Registered trademark of Sumitomo Chemical Company Japan.

Samuelson Talbot 1388B

# Are pesticide residues a problem?

**Jonathan Eccles is a Special Horticulturist specialising in Vegetables with NSW Agriculture & Fisheries, at Gosford.**

NSW Agriculture & Fisheries and the Sydney Market Authority are carrying out a three year survey looking at pesticide residues in a range of fresh fruit and vegetables. The survey began in January 1989.

The objectives of the monitoring program are:

- to sample fresh fruit and vegetables sold at the Sydney Markets and analyse them for a range of pesticide residues;
- to trace back to the grower any sample which is found to contain unacceptable pesticide residues;
- to reassure consumers that pesticide residues are not a health problem with fresh fruit and vegetables.

SAMPLING PROCEDURE

Each week an average of 10 fruit and vegetables are purchased from the Flemington Markets according to a monthly schedule designed to take into account seasonal availability and different production areas.

Each sample comprises a complete package such as a tray of peaches or a carton of lettuce. The name and address of the grower are also obtained when the produce is being purchased for any tracebacks which may be necessary.

After purchasing, the produce is taken to the NSW Agriculture & Fisheries' Biological & Chemical Research Institute (BCR). The samples are subsampled according to international analytical standards, processed by blending into a slurry and extracts taken for the various tests.

Samples are analysed for residues of up to 22 pesticides. Not all samples are analysed for every pesticide. To minimise cost, analyses are carried out for pesticides likely to be used on a particular crop. See Table 1.

**Staff at BCRI, Rydalmere preparing fruit and vegetables for testing.**

**TABLE 1: Chemicals tested**

| Chemical Group | Pesticide | Trade Name Example |
|---|---|---|
| Organchlorines | BHC<br>DDT<br>Dieldrin<br>Endosulfan<br>Heptachlor<br>Lindane | Endosan, Thiodan |
| Organophosphates | Azinphos ethyl<br>Chlorpyrifos<br>Demeton-S-methyl<br>Dichlorvos<br>Dimethoate<br>Fenamiphos<br>Fenthion<br>Methamidaphos<br>Methidathion<br>Omethoate<br>Parathion<br>Prothiofos | Gustathion<br>Chlorfos, Lorsban<br>Metasystox<br><br>Rogor<br>Nemacur<br>Lebaycid<br>Monitor, Nitofol, Prefect<br>Supracide<br>Folimat<br>Folidol<br>Tokuthion |
| Synthetic phrethroids | Fenvalerate<br>Permethrin | Sumicidin<br>Ambush |
| Carbamates | Methiocard | Baysol, Mesurol |
| Miscellaneous fungicides | Captan<br>Furalaxyl<br>Metalaxyl | <br>Fongarid<br>Ridomil |

## CHOOSING SAMPLES

Samples are purchased at random from the Market. However, by choosing crops which receive relatively numerous pesticide applications and targeting production districts where growers are preceived to be high users of pesticides, the survey is bias toward finding residues.

The choice of produce sampled also takes into consideration what the more popular fruit and vegetables the average consumer would buy. Potatoes have been the largest commodity sampled.

The fruit and vegetables sampled so far in the survey are listed in Table 2.

## TRACE BACKS OF SAMPLES

Trace backs are carried out when a pesticide residue exceeds the maximum residue level (MRL). The MRL is the maximum allowable legal level of a pesticide in food and is different for each pesticide and crop. Trace backs aim to find out why the residue is excessive and to prevent such produce from being marketed in the future.

For produce grown in NSW, trace backs of samples are also carried out when residues exceed half the MRL suggesting the grower needs to improve his pesticide application.

## RESULTS

Of over 1,000 samples tested, no excessive residues have been detected in fruit but 15 vegetable samples contained a residue which exceeded the MRL. Of these, 6 zucchini samples contained residues of dieldrin for which there is no legal level and the MRL is taken to be zero. The detected levels were very low and suggests that the zucchinis have come in contact with soil containing dieldrin residues.

A lettuce sample contained a residue of the insecticide, fenvalerate, which has no MRL in Australia for that crop. Similarly, another lettuce sample (hydroponically grown) contained residues of the fungicide, furalaxyl. This chemical has no MRL in edible crops.

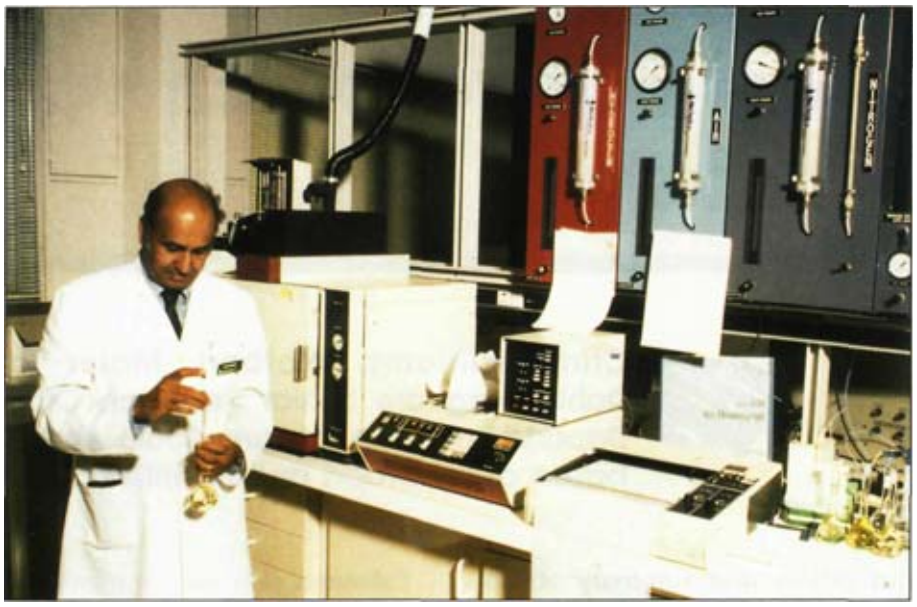
The remaining samples of lettuce, Chinese cabbage and onion contained excessive endosulfan residues which exceeded the MRL. Excessive residues could be attributed to the misuse of pesticides. It suggests that crops are either being harvested well within withholding periods or excessive rates of pesticide are being applied.

## RESIDUES IN POTATOES

Potatoes have been the major crop surveyed with 136 samples analysed for 18 pesticide residues. No samples contained any chemical residue greater than the MRL. The percentage of samples (less than 1.5 percent) in this survey which contained an excessive residue is consistent with other state surveys.

Surveys show that consumers are greatly concerned with chemicals in food. Whether they are justified or not is only part of the issue. Consumers must have confidence in produce they buy and it is in the interests of growers and industry to have an active part in maintaining consumer confidence. Regular monitoring of pesticide residues is one aspect of ensuring consumer confidence.

Using registered pesticides and following the directions on the label will guarantee that consumers can be assured that fresh produce is nothing other than wholesome and good.



**David Singh, Senior Chemist preparing sample for analysis by gas liquid chromatograph.**

**TABLE 2: Number of samples January 1989 to January 1991**

| CROP | NUMBER OF SAMPLES | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | NSW | Qld | Vic | SA | Tas | WA | USA | Total |
| Apple | 40 | 9 | 13 | — | 4 | — | — | 66 |
| Avocado | 1 | — | — | — | — | — | — | 1 |
| Banana | 16 | 7 | — | — | — | — | — | 23 |
| Beans | 12 | 22 | 1 | — | — | — | — | 35 |
| Bok choy | 13 | — | — | — | — | — | — | 13 |
| Broccoli | 19 | 13 | 17 | 10 | — | — | — | 59 |
| Cabbage | 33 | — | — | — | — | — | — | 33 |
| Capsicum | 16 | 26 | — | 1 | — | — | — | 43 |
| Carrot | 36 | 15 | 9 | 1 | — | — | — | 61 |
| Celery | — | 10 | 25 | 2 | 1 | — | — | 38 |
| Cherries | 9 | — | — | — | — | — | — | 9 |
| Chinese cabbage | 10 | 1 | — | — | — | 1 | — | 12 |
| Citrus | 25 | 1 | 5 | 3 | — | — | — | 34 |
| Cucumber (greenhouse Lebanese) | 7 | — | 1 | — | — | — | — | 8 |
| Grapes | 11 | — | 20 | 1 | — | — | — | 32 |
| Lettuce | 52 | 17 | 14 | — | — | — | — | 83 |
| Lettuce (hydroponic) | 7 | — | — | — | — | — | — | 7 |
| Lettuce (organic) | 2 | — | — | — | — | — | — | 2 |
| Mushrooms | 22 | — | — | — | — | — | — | 22 |
| Onion | 22 | 24 | 1 | 25 | 6 | 1 | — | 79 |
| Peach | 40 | — | 4 | 2 | — | — | — | 46 |
| Pear | 7 | — | 26 | — | — | — | — | 33 |
| Potato | 56 | 38 | 27 | 14 | 1 | — | — | 136 |
| Strawberries | 12 | 8 | 5 | — | — | 2 | 3 | 30 |
| Tomato | 25 | 38 | — | — | — | — | — | 63 |
| Zucchini | 30 | 23 | 2 | 1 | — | — | — | 56 |
| State Total | 523 | 252 | 170 | 60 | 12 | 4 | 3 | 1024 |

# Nutrition research valuable to Industry

**Chris Williams, Norbert Maier and Adrian Dahlenburg are Senior Research Officers with the Department of Agriculture, South Australia. They are based at Lenswood and Northfield, respectively.**

**This article is a summary of the address presented by Dr Chris Williams which won the inaugural National Potato Industry Research Award. The address was given at the 9th National Potato Industry Conference, held at Warragul.**

The main aim of potato nutrition research in South Australia is to develop strategies which optimise yield and quality. A subsidiary aim is to calibrate soil and plant tests to predict tuber yield and quality responses.

Nitrogen (N), phosphorus (P) and potassium (K) were the major nutrients studied.

## NEW TECHNOLOGIES GENERATED

This work now provides a useful tool for potato growers to accurately predict K, P and N fertiliser requirements through the use of soil and plant tests. It can be used not only to correct nutrient deficiencies but also to avoid excess applications of nutrients and so reduce potential problems of pollution of the environment and contamination of foodstuffs such as nitrate toxicity.

The calibrating of the soil test for potassium, for example allows the grower to ensure that the potato crop is not deficient in K and is a major factor for the grower deciding on K fertilisers (Table 1).

Calibrating plant tests on oven dried potato petioles is used to define adequate and deficient nutrient levels. These levels were based on field experiments, crop surveys and additional information.

We have also developed and calibrated a rapid sap nitrate test which was modified to be used by the grower in the farm kitchen or workroom for a range of crops. This test is outlined in the next article.

## BENEFITS TO INDUSTRY

The general benefits to the potato industry of nutrition research are listed below.

- **Increased efficiency of fertiliser use.**

  Growers can save many dollars by only applying the amount of fertiliser that the crop needs.

- **Minimised wastage and pollution effects.**

  Excessive use of fertilisers can lead to both ground and surface water contamination.

- **Development of nutrition strategies for sustainable production systems.**

- **Increased productivity.**

  By optimising plant nutrition levels maximum yield per hectare can be obtained. The latter is essential for growers to remain competitive and for consumers to have access to cheap potato products.

- **Increased quality.**

  This is one great benefit especially to processors. For example, the higher the dry matter content of tubers, the less oil absorbed during frying.

- **Product assurance** (food purity).

**Foliar sampling in a potato crop.**

## SUMMARY

Soil and plant analyses technology is expected to become the basis for nutritional management in all successful potato growing enterprises over the next decade.

Effective plant nutrition research is a significant factor involved in ensuring a bright future for the potato industry and consumers of its products.

Nutrition research is aimed at developing technologies which help meet the economic, environmental and health issues challenging the industry.

**TABLE 1: Recommended rates of potassium for potatoes in South Australia.**

| Soil test value (ppm) | Rate of potassium (kg/ha) |
|---|---|
| Less than 120 | 160 to 320 |
| 120 to 200 | 80 to 160 0 |
| More than 200 | |

*Source: Maier (1986) Aust Journal of Exp. Agric. volume 26, issue 6.*

# Using the Rapid Nitrate Test

**Chris Williams is a Senior Research Officer specialising in Potatoes with the SA. Department of Agriculture at Lenswood Horticultural Centre**

## WHY DO SAP TESTS?

Correct management of nitrogen is essential since excess or deficiency of nitrogen may reduce potato yield and/or quality. In addition excessive applications of nitrogen may lead to pollution of water supplies.

Growers need a method which provides an objective basis for their nitrogen fertiliser management. By using accurate, calibrated on-the-spot sap tests growers can

- achieve same day turn-around time,
- side dress or withhold nitrogen depending on crop requirements before deficiencies or excessive levels of nitrate occur in the potato crop,
- monitor crops weekly to locate and correct nitrogen deficiencies before significant yield or quality losses occur and
- assist establishment of sustainable, efficient fertiliser programs to achieve maximum yield and quality.

## THE SAP NITRATE TEST

Norbert Maier and I have developed a rapid sap nitrate test calibrated for potatoes at different stages of crop growth. This technology has been modified into a kit form and commercialised as the Nitraquik® test kit for on-farm use. The system has also been extended to test water supplies and a range of cereal, vegetable and vine crops. Over 250 are used throughout Australia.

## THE METHOD

In the Nitraquik test kit, a garlic crusher is used to extract plant sap from potato leaf petioles of the youngest fully expanded leaves. Merck® test strips are then dipped in diluted sap and inserted in the simple hand held Nitrachek® reflectometer. An accurate reading of nitrate concentration can be seen on a screen. Each test of collected petioles takes only 10 minutes.

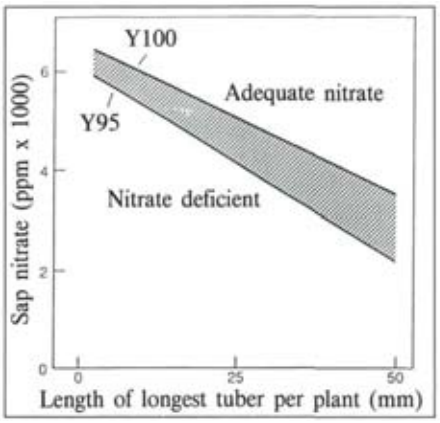
**Components of the Nitraquik Sap Test Kit (garlic crusher, syringes, beaker, Nitrachek meter, Merck® test strips and standard nitrate solution).**

Costs of equipment and materials for a run of 500 samples (with 3 test strips per sample) were approximately $2.00 per sample.

## USES

Sap test results are of limited value unless growers have the knowledge to interpret the nitrate readings. Figure 1 allows the readings to be interpreted for potatoes. It shows sap nitrate values at different stages of crop growth for 95 and 100 percent of maximum yield.

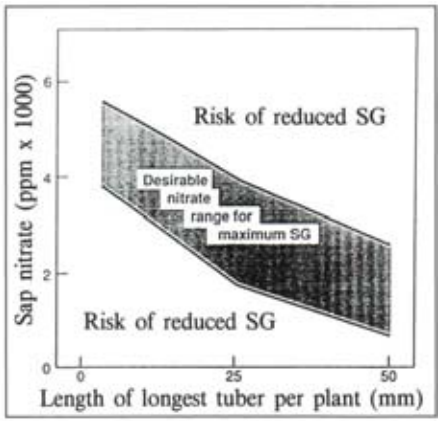
**FIGURE 1**
**The relationships between sap nitrate for 95 and 100% of maximum yield (termed Y95 and Y100, respectively) and length of the longest tuber per plant.**




Growth stage is shown by the length of the longest tuber per plant. Readings in the deficient zone indicate more nitrogen is required. In all cases it is necessary to test several times during crop growth to ensure that a deficiency does not develop.

A similar method is used to monitor specific gravity (S.G.)—a quality factor of vital importance to the profits of crisp processors and growers. Figure 2 relates sap nitrate levels and S.G. readings for the variety Kennebec.

**FIGURE 2**
**Showing the desirable sap nitrate concentration range for maximum SG at different stages of growth.**



# Victorian french fry Issues

**Rene de Jong is a Research Officer specialising in potatoes att Ballarat with the Victorian Department of Agriculture.**

Ballarat is the centre of the french fry industry in Victoria. The climate is mild but is frequently interrupted with periods of harsh conditions.

This can cause checks in the growth of potatoes resulting in disorders and can have an effect on yield and quality. The french fry industry has shifted to the Russet Burbank variety which is more susceptible to environmental stress than almost any other variety. Russet Burbank has a relatively poor developed root system compared to the large amount of top growth which goes a long way to explaining its capacity to cope with stress.

The most common disorders of Russet Burbank potatoes include:

- hollow heart
- stem end or internal discolouration
- bruising.

• HOLLOW HEART is caused by mild conditions interspersed with cold and wet conditions which check the growth of developing tubers during the first month or so after emergence. The mechanism is not conclusively known.

• STEM END or internal discolour ation of tubers is believed to be caused by moisture and/or heat stress during any time of the season. If early season stress occurs the problem will develop at the "rose" end of the tuber. Mid season stress will show up problems at the "stem" end of the potato. Moisture as the underlying stress only, is unlikely unless the tuber has visual evidence of stress by way of "pear" or "female" shaped tubers.

• BRUISING of Russet Burbank potatoes is largely a mechanical harvesting problem, but is likely to have its origins due to moisture stress late in the season.

Although the Russet Burbank has many defects, it is still the favoured variety for french fry use as it has many good characteristics including favourable length, dry matter and excellent cooking quality.

Growers have also taken a positive attitude and most have vastly superior irrigation systems and general management skills compared with five years ago when the Russet Burbank variety was being phased in.

This has improved the capacity of the industry to grow good yields of high quality potatoes for french fry use.

# Potato growth and development in the Lockyer Valley

**Ken Jackson is a Senior Agronomist and Alan Duff a Temporary Experimentalist at the Gatton Research Station in Queensland.**

Approximately 50 percent of the potatoes grown in Queensland are produced in the Lockyer Valley in SE Queensland. Potatoes in this district may be either growing or stored in the ground in every month of the year. Over the year, the major environmental factors affecting potato growth fluctuate widely. Daylength hours increase from 10.7 (June) to 14.1 (December). Minimum temperatures range from 6.3°C (July) to 18.7°C (January) while the range of maximum temperatures is 20.7°C (July) to 31.5°C in December. Solar radiation (MJ/d/$m^2$) ranges from 11.4 in June to 23.5 in December.

As part of the potato variety assessment project being conducted in Queensland at Gatton Research Station in the Lockyer Valley, a study is being undertaken to determine the effects of these varying environmental factors on potato growth and development.

The study involves the growing of six diverse potato varieties (Table 1) in terms of end use and climatic adaptation at approximately two monthly intervals. Three plantings were completed in 1990 and the remaining three plantings are being undertaken in 1991. An additional two plantings are planned for Kairi Research Station on the Atherton Tablelands in June 1991 and April 1992.

**Alan Duff (left) and Ken Jackson (right) observe potato planting nearing maturity.**

The effects of the differing environments resulting from the varying planting dates are being recorded. These measurements include the time taken from planting to the various developmental stages which include emergence, tuber initiation, tuber growth (largest tuber is lcm in diameter), tuber bulking and maturity. Light interception of the plant canopy which later can be related to tuber yield is being measured at weekly intervals from tuber initiation to maturity (Figure 1). From tuber initiation to maturity, dry matter of tops (including the components of leaf and stem) and that of the tubers is measured.

At 14, 16, 18 and 20 weeks after planting cooking tests (boiling and crisping) are being done on the tubers. In addition, the reducing and total sugar contents are being determined at these harvest dates as potatoes are sometimes stored in the field beyond the normal maturity date of 16 weeks.

The data base being generated from the various measurements will be used to compare the performance of potatoes in Queensland with other areas of Australia and overseas where similar data are available. These comparisons will indicate where improvements in varieties and management of the potato crop can be made.

In general, observations to date indicate that Atlantic is much more widely adapted than previously

**TABLE 1: Details of potato varieties being assessed in growth and development study**

| VARIETY | END-USE | ADAPTATION |
|---|---|---|
| Sebago | Dual purpose | Sub tropical |
| Dalisay | Ware | Sub tropical |
| Atlantic | Crisping | Temperate |
| Pontiac | Ware | Temperate |
| Netted Gem | French Fry | Cool temperate |
| Winlock | Dual purpose | Cool temperate |

recognised. It appears the most heat tolerant of all the varieties being examined.

The other general observation is that the vigour of the Sebago plant is poor in comparison to the other varieties resulting in premature lodging of the shoots and invasion of the collapsed stems by Sclerotinia. This prevents optimum yields being obtained in this variety. In contrast are the robust shoots of Pontiac and Winlock which are both high yielding varieties.

Much of the data will not be analysed until all the plantings are completed. However, to indicate how planting times influence light interception, data for Sebago is presented in Figure 1 and to indicate how varieties can differ at one planting date, tuber dry matters of various varieties at consecutive sampling dates are presented in Figure 2.

The difference in the pattern of light interception in Figure 1 is probably due to wind damage in the March planting.

In Figure 2 the greater decrease in dry matter with time beyond 8 weeks after tuber initiation in Sebago compared to Atlantic indicates that Sebago should not be stored in the field beyond maturity if it is to be used for crisping.

In contrast Atlantic maintains a high dry matter beyond maturity when stored in the field. Crisping tests indicated that Atlantic remained suitable for this end use despite the delayed harvest.


**March planting of Sebago showing the commencement of tuber growth.**

**FIGURE 1: Patterns of light interception by the canopy of Sebago when planted at different planting dates.**

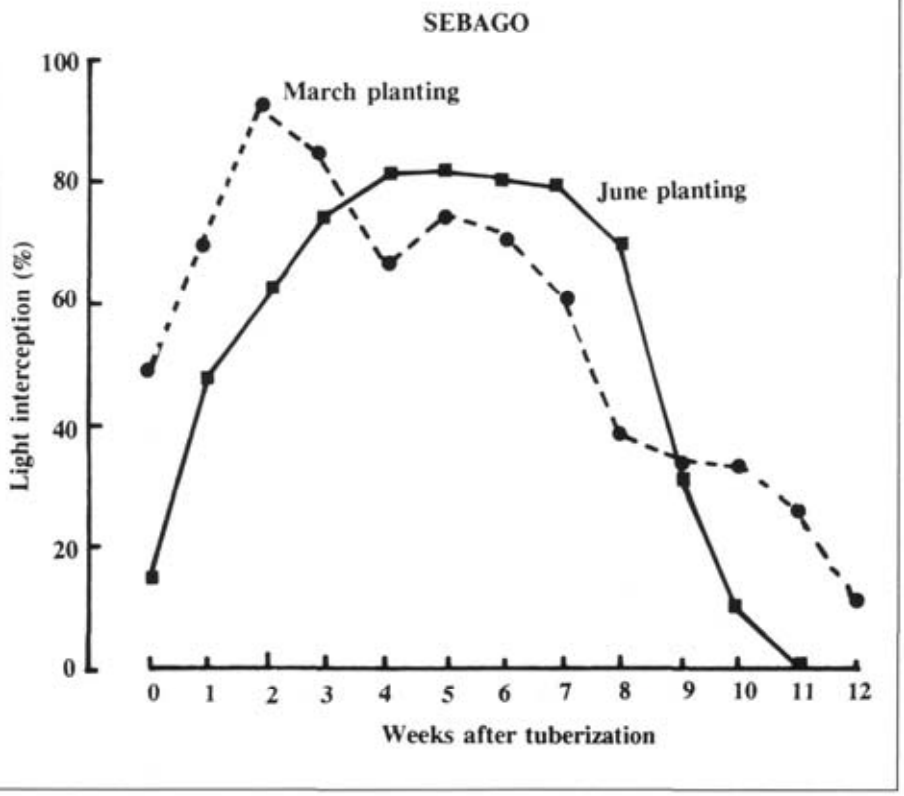
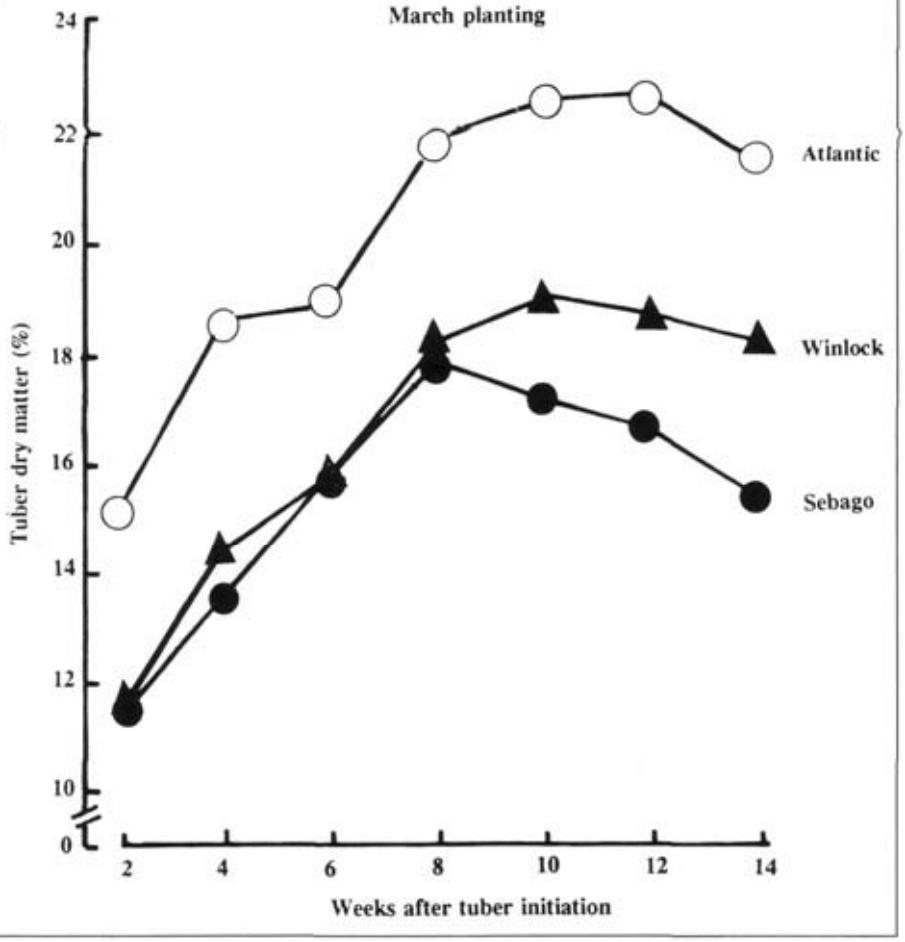



**FIGURE 2: Effect of time after tuber initiation on tuber dry matter of different potato varieties.**



# Developing South Australia Processing Industry

**Sandra Lanz is a Potato Processing Development Officer with the SA Department of Agriculture.**

There has been an increasing demand for processing potatoes in South Australia over the past three years. This demand has been generated by expansion of both crisping and frozen French fry factories within the state. The increased demand for processing potatoes led to the development of an extension project by the S.A. Department of Agriculture to assist growers to supply suitable high quality potatoes to the crisping and fresh chipping industries.

The Processing Industry Development project commenced in November 1989 with the appointment of Sandra Lanz as its operative. Funding for the three year project has been provided from crisping and fresh chip grower and processor levies and from the Horticultural Research and Development Corporation.

There has been a considerable amount of technical information about the influence of variety, soil type, nutrition and irrigation on tuber yield and quality generated by the S.A. Department of Agriculture over the past 10 years. The main objective of this project is to assist processing potato growers to adopt this technology and improve yield and processing quality.

A consultative approach has been used whereby detailed crop monitoring is undertaken with a small group of 3-5 growers in each production district. Crop monitoring and advice is provided to participating growers on a crop by crop basis every 2 to 3 weeks through the season, with regular group meetings and farm walks held to compare crop performance between growers.

Detailed records are kept and include:

- **Pre plant soil analysis and fertiliser programming**

Pre plant soil samples were taken and analysed for pH, total soluble salts, extractable phosphorus and potassium, organic carbon, copper, zinc, manganese, and soil texture. This data

**Sandra Lanz discussing irrigation management techniques with Mundulia processing potato grower, Colin Muster.**

is used to develop appropriate fertiliser programmes with the grower.

- **Crop monitoring**

A uniform area is identified within the monitored crop from which a 2m (row length) sample was dug every 10-14 days, beginning at tuber initiation. Tops and tubers are weighed, and the tuber number and size distribution are recorded. Specific gravity is measured once tubers reach approximately 30mm in length. Sample tubers are also cooked to assess after cooking darkening (ACD) and crisp colour.

Petiole samples are also taken at the same time for petiole sap nitrate determination. The "Nitraquick" rapid testing method developed by Dr Chris Williams and Norbert Maier is used to give growers immediate data.

Petiole samples are also taken for full laboratory dry matter analysis when the longest tuber reaches 10mm and again at 50mm.

- **Pest disease monitoring**

At each property visit, sweeps are made to estimate the number and variety of insects present in the crop. Visual inspection to assess the presence of foliar diseases is also made.

- **Irrigation**

Irrigation design, output and distribution uniformity are assessed at the beginning of the season on all properties. Soil moisture is measured on selected properties using tensiometers and Wesdata electronic recorders.

- **Grower records**

Growers are encouraged to maintain a crop diary and record application rates and timing of fertiliser, pesticide, irrigation and all cultural operations.

A laptop computer has been used to record this and all monitored data. Results have been entered into a Lotus 123 computer program developed for this project. Graphing data helps growers to easily understand how their crop is performing and how cultural treatments affect crop development throughout the season.

- **Results to date**

This detailed crop monitoring has identified some interesting trends. Fertiliser applications often far exceed crop needs. Irrigation is an area of crop production which needs more attention, with poor distribution uniformities suggesting many irrigation system designs need overhauling. Measurement of soil moisture and irrigation scheduling is also an area of concern to growers.

- **Future work**

It is planned that work with individual growers will continue over a further two seasons. This will expose all growers producing crisping potatoes to this technology during the life of the project. Further field days, farm walks and workshops will be organised to deal with the problems identified from the crop monitoring and to help growers become familiar with available technology. Further development of the computer decision support software will also occur in another project.

Response from growers and industry has been very good. The close co-operation needed between growers, processors and Department of Agriculture staff has enhanced communication and assisted in the development of an industry "team" spirit.

# The Hollow-heart dilemma

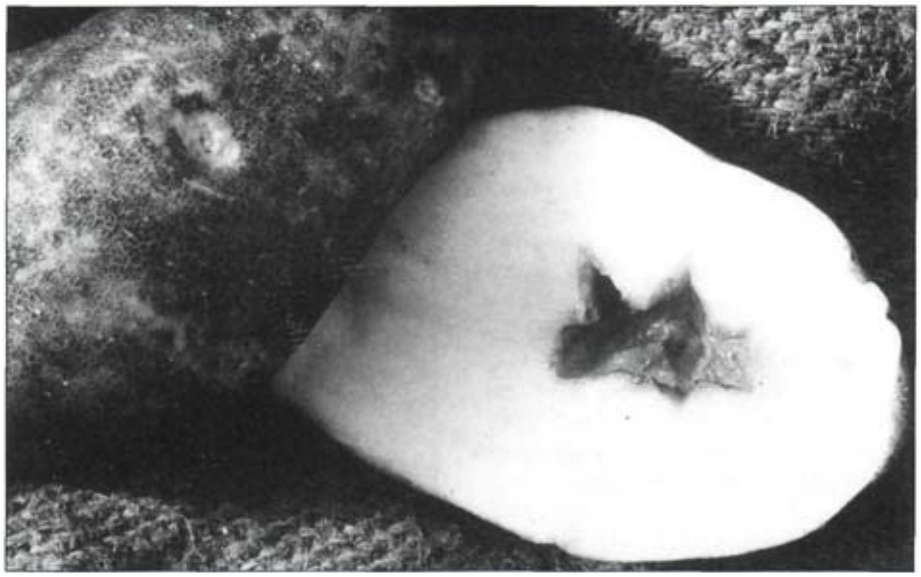
**John Fennell is the Deputy Chief Horticulturist with the Department of Primary Industry at Devonport, Tasmania.**

## THE PROBLEM

Hollow-heart is not a disease but is a physiological disorder occurring in some potato crops. In Tasmania it is frequently encountered but not in every season. However in bad years it may affect up to 70 percent of tubers in some crops. The problem is not restricted to Tasmania, it occurs to a lesser extent in other Australian States and is known to be a problem in parts of Europe and in certain states of the USA.

Hollow-heart results from cell breakdown in the centre of the growing tubers. In the early stages the disorder appears as a brown stain inside and towards the stem end of the tuber. Later the cell structure breaks down leaving an irregular star shaped hollow often lined with brown suberin tissue. Whatever the degree of severity of the internal disorder there are no external signs.

Whether occurring in potatoes for fresh market or for processing this problem is undesirable and at high levels can cause considerable economic loss either through crop rejection or through the costs of sorting. Electronic sorting is possible with scanning devices that detect hollow-heart tubers, which can then be removed by hand, or in the case of the processed product there are fully automated systems that can identify defective French fries and eliminate them from the batch. However these machines are expensive and more significantly the detection system slows down the handling procedures. Avoidance of hollow-heart or brown centre is therefore preferred.



**Hollow-heart disorder in a Russet Burbank potato.**

## THE CAUSES

There are several factors implicated in the initiation of hollow-heart.

- Certain cultivars are more prone to the disorder than others. In Tasmania the preferred cultivar for processing is Russet Burbank and it is particularly susceptible. The fresh market cultivar Brownell is also regularly affected. However even with the use of susceptible cultivars the expression of hollow-heart or brown centre is dependent upon a wide range of agronomic or environmental factors. It is usually initiated early in the tuber growth stage with the defect developing at the stem end of the tuber. Less frequently it is initiated at a later growth stage with the hollow forming at the bud or 'rose' end.
- Soil temperatures at or below 15°C at the time of tuber initiation, or shortly after, have shown to be causal in the USA. In north-west Tasmania most of the Russet Burbank crops for processing are planted in October and tubers initiate in early November. At this time soil temperatures are at this critical temperature and only warm at a relatively slow rate. Later planting would reduce the problem but also results in delayed crop maturity which in turn can reduce yields and lower the specific gravity of tubers rendering them unsuitable for processing.
- Wet areas of the paddock generally have more hollow-heart. Although irrigation practice *per se* does not seem to affect the problem it is possible that wet soil at tuber initiation may reduce soil temperatures below 15°C in some instances.
- Growers in some parts of the USA are advised to apply minnimal nitrogen early in the growth stages, especially at tuber initiation as high levels promote hollow-heart. Pre-plant nitrogen is sometimes avoided and applied later as top dressing. This practice may be appropriate for soils low in organic matter but research in Tasmania has shown that high levels of soil nitrogen are available at the time of tuber initiation through mineralisation.
- Low levels of potassium have also been suggested as causing hollow-heart but there has been no relationship shown in Tasmania. It seems unlikely therefore that nutrient management will be a practical control method on the krasnozem soils in Tasmania.
- Fast bulking tubers appear to be most at risk of getting hollow-heart due to the slow mobility of calcium needed to cement the cell walls. The bulking rate varies between the

tubers on a plant, which may in part explain why some tubers are affected whilst others are not. Large tubers over 400g are most likely to show the disorder and there appears to be a strong correlation between hollow-heart and knobby tubers.

Low plant density will influence the size of tubers produced and so does low stem number as this influences the number of tubers formed. Stem number can be affected by the number of eyes on a set piece (stem-end sets and small sets may have fewer eyes) or by the physiological age of the seed tuber.

- Research in the USA with the cultivar Norgold Russet showed that hollow-heart was more likely if sets were cut from large seed tubers compared to the use of small seed tubers. It was claimed that the lowest levels resulted when whole round seed tubers were planted. This work was repeated in Tasmania using Russet Burbank over two seasons. Fifty gram sets were cut from 100g, 200g, 400g and 800g seed tubers and their performance compared with 50g whole round seed. In this work the rose-end, stem-end and middle sets were also planted separately to investigate their influence.

In 1988-89 an overall level of 9 percent hollow-heart and 9 percent brown centre occurred. The effect of seed size was not significant but there was a trend for higher levels with the use of sets cut from larger seed. Rose-end sets gave lower levels than stem-end or middle cut sets even though stem numbers were similar.

In 1989-90 much lower levels of hollow-heart and brown centre occurred and the results for the effect of seed tuber size were the reverse of the previous year.

It seems unlikely therefore that choice of seed tuber size will help solve the hollow-heart problem but there are other reasons for avoiding large seed tubers such as the difficulty in cutting good blocky set pieces.

Sets were planted in 810mm rows but at different within row spacings to give densities of 2.5, 3.7 and 5.0 plant per square metre. In both seasons the use of close spacing dramatically reduced the levels of hollow-heart. Although the different spacings did not significantly affect total yields they were higher from the closely spaced plants, but tuber size was reduced. The average weight of tuber at 5.0 plants/$m^2$ was only 209g whereas it was 282g and 326g from the plots grown at 3.7 and 5.0 plants/$m^2$ respectively.

**The monitor showing a tuber being scanned.**

**A hollow-heart scanner in use in a fresh market packhouse in the USA.**

To produce Russet Burbank tubers of the size preferred by the processors the current plant spacings of 3.5 to 4.0 plants/$m^2$ are optimum. Widely spaced crops or gaps in the crop are likely to worsen the incidence of hollow-heart.

## SOLUTIONS

The odds seem to be loaded against the industry. No single factor can definitely be implicated as being the major cause of hollow-heart and it remains a sporadic and frustrating problem. The environmental influences are probably all inter-related and many factors may in the end influence tuber bulking rate and the rish of hollow-heart.

It is clear that growers should pay close attention to getting their planters calibrated to achieve the correct density. All the factors that can cause gappy crops (rocks, empty cups in planters, set piece decay) may also increase hollow-heart and can be controlled to some extent. Wet patches in the paddock can be avoided.

But the best hope of being able to forget the hollow-heart dilemma seems to be in resistant cultivars. This direction deserves greater attention in the coming years and is already underway.

# Developments in Victorian crisps

**Tony Myers is an Industry Liaison Officer for the Crisping Industry in Victoria based at Warragul with the Department of Agriculture.**

The Victorian potato crisping industry is changing direction with the introduction of several new and improved varieties for crisp processing.

The two main varieties Kennebec and Sebago are currently being replaced by varieties such as Denali, Norchip, Snowchip, Atlantic and Tarago. Next year three new lines bred by Roger Kirkham at Toolangi will be available to the crisp processing industry.

The breeding of these new crisping lines is being supported by the Victorian Potato Crisping Research Group which includes processing companies, contract growers and Department of Agriculture.

Kennebec has been the main crisp processing variety in the past, but now accounts for about 50 percent of crisping tonnage. Kennebec and Sebago no longer meet the crisp processing industry's requirements for smaller sized tubers with higher dry matter and light fry colour. Varieties such as Denali, Norchip and Atlantic set more tubers (seven to eleven tubers per plant) compared to Kennebec (four to six tubers per plant) with consistently higher dry matter.

The need for a higher quality raw product is the result of increased competition with other snack-foods, new products and different package sizes.

Processing companies are now paying incentive bonuses to growers above the base contract price to encourage production of high quality tubers for processing. Many growers have accepted these challenges by changing varieties and crop management, and installed grading equipment to ensure better quality potatoes.

The change to new varieties after twenty or so years of growing Kennebec is quite a challenge. While Kennebec was a relatively easy variety to grow, varieties suchas Denali, Norchip and Atlantic need very careful management to achieve optimum results.

These varieties are more susceptible to a wide range of potato diseases including early and late blights, require more even watering, specific fertiliser programs and high quality seed.

## Common scab studies

LOIS RANSOM a Plant Pathologist with the Tasmanian Department of Primary Industries has evaluated the role of seed born infection on the development of common scab *(Streptomyces* spp.) of Russet Burbank potatoes at the Forthside Vegetable Research Station.

Seed tubers from different sources with different types of common scab werre planted mid October. Tubers with minor russetting or 'freckles' were designated mildly infected; tubers with more typical raised, star-cracked lesions were classed moderately infected while severely infected tubers showed symptoms as deep, pitted scab lesions.

Tubers were assessed at harvest for incidence of common scab in the same categories. Results indicate that infected seedlines will predispose a crop to scab even when seasonal conditions and irrigation practicers are considered unfavourable for infection.

Many scab lesions were 10 to 15mm in diameter suggesting infection occurred at an early growth stage, possibly coinciding with a dry period prior to the first irrigation. Crop water requirements calculated from evaporation measurements after this time were considered adequate.

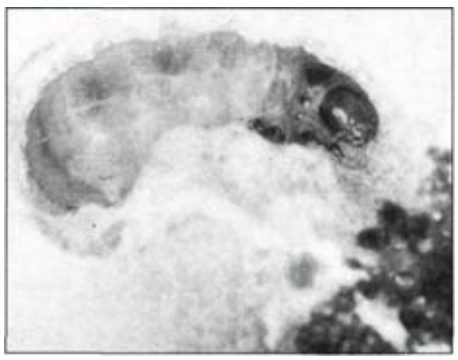
The trial area will be replanted with Russet Burbank potatoes next season to evaluate the role of soil borne infection in the carryover of common scab.

## Tuber moth biology

LIONEL HILL is an Entomologist with the Department of Primary Industries, Tasmania who has looked at two aspects of biology relevant to the integration of chemical and non chemical control of potato tuber moth.

One was a measure of the parasitism by wasps in leaf-mining populations of tuber moth larvae in unsprayed weed potatoes in vegetable crops. In the previous season two common and four rare species of parasitic wasps were found. This season three common and two rare species were recorded. The two most common species *Apanteles subandinus* and *Orgilus lepidus* also occur in Victoria. These were introduced to mainland Australia from South America by CSIRO in the 1960's. A third common Victorian species *Capidosma koehleri* has not yet been found in Tasmania. By March the three common Tasmanian parasites caused up to 88 percent mortality of potato moth larvae in unsprayed foliage. Parasitic wasps are more susceptible to insecticides than the potato tuber moth.

The other was a study of their seasonal abundance as indicated by catches of male moths in pheromone traps. In contrast to the previous season, the spring populations of potato tuber moths were not greater in milder districts, such as Northdown, than at Forthside. However, large populations were detected at Forth in a pea crop where discarded potato tubers were left in the field after the previous August harvest. These substantial catches occurred in early December whereas none of the current seasons unsprayed potato crops produced large catches until March.



**Potato moth larva tunneling in potato tuber.**

## The Australian Vegetable Growers Handbook

**was launched in Griffith N.S.W. on the 28th June.**


Editor of the handbook, JOHN SALVESTRIN, said that the publication is a handbook which enables readers to answer many of the questions involved in selecting, growing and marketing commercial vegetables.

It will be an invaluable reference to vegetable growers, advisors, consultants, lecturers, students, agribusiness and others involved in the industry across Australia.

Authors of the relevant chapters were carefully chosen and are respected Australian authorities in their field.

Every endeavour has been made to ensure the publication is as concise as possible but accessible so that readers can obtain the information they need.

**The publication is now available at a cost of $25.00 including postage from:**

**The Secretary**
**Irrigation Research & Extension Committee**
**c/- CSIRO Private Mail Bag**
**GRIFFITH NSW 2680**
**Phone 069 620550 Fax 069 63 0262**

# Chemical control of volunteers

JAMIE NICHOLLS of the Tasmanian Department of Primary Industries reports that at the Elliott Research Station the cereal herbicides Lontrel®, Glean® and Starane® were trialled at various rates and at two stages of growth for the chemical control of potato volunteers. At Forthside Vegetable Research Station, various mixtures of Lontrel and Starane were sprayed onto potato volunteers at one stage of growth only. Following digging, tubers were graded into three size categories.

At Elliott, Starane applied at tuber initiation (tubers less than 10mm diameter) significantly reduced both tuber numbers and size, regardless of the rates used. As the rate of Starane increased, the percentage of smaller tubers, less than 30g, increased at the expense of larger tubers over 150g.

Reductions in tuber yield at Forthside Vegetable Research Station from the same treatments were difficult to interpret due to the different interactions occurring.

Replanting tubers collected from the treated plants will be done to determine the effect of herbicide residues on tuber viability. This will determine the effectiveness of the three herbicides on reducing the potato volunteer problem.

**Jamie Nicholls demonstrating trial work on the control of volunteer potatoes at Elliott.**

From preliminary studies, it appears that Starane may be a useful herbicide in controlling potato volunteers in Tasmania. Starane is already registered for this purpose in cereals and poppies. Crop tolerance studies of Starane on vegetable crops is currently being trialled.

# New planter for trial work

The design and construction of a new planter by ROSS ALLEN and MERV SCHUBERT of the South Australian Department of Agriculture at Lenswood Horticultural Centre occurred recently.

The single row trial potato planter used for planting experimental potato plots in South Australia was designed to ensure greater accuracy. It is a three point linkage design, with a basic machine frame, opening and closing coulters and a planting boot modified from a single row Port 705 cup planter. A 12 compartment rotating planting head ensures accurate placement of sets in spacing trials. While commercial growers consider rotating head planters slow and labour intensive, they are ideal for accurate planting of small plot experiments. Some 18 different cultivars or plots can be planted without stopping to reload the machine.

Drive for the planting head is provided by ground wheels through a clutch and 25 speed Horwood Bagshaw combine gearbox. The wide spread of ratios enable seed sets to be planted at distances ranging from 13 to 51 cm.

Two Kimseed Machinery cone fertiliser distributors allow very accurate distribution of small quantities of fertiliser or other powder treatments over small plot lengths. Fertiliser application can be easily adjusted for 5, 7, 9 and 10m plot lengths through simply changing one drive sprocket. A large Hege fertiliser box has also been included on the machine for use when a consistent fertiliser rate is needed in planting variety, spacing or other bulk trials.

The new planter is compact enough to fit on a small 2.0m x 1.5m trailer for transporting. A special frame has been designed to lift the planter on and off the trailer using a tractor three point linkage.

This new planter will enable South Australian Department of Agriculture staff to conduct accurate and efficient experiments for its current extensive potato research and development program.

**The new SA Department of Agriculture trial potato planter is 3 point linkage mounted. Ross Allen (standing) and Merv Schubert (seated) designed and built the machine.**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# STATE ROUNDUP

## TASMANIA

**Max Walker is a Senior Horticulturist with the Vegetables and Allied Crops Branch of the Department of Primary Industries at Devonport in Tasmania.**

The 1989-90 potato crop was the heaviest for many years with some 300,000t being produced from around 6,800ha. Unfortunately, this resulted in production exceeding market demand for processed, ware market and seed crops.

Substantial tonnages of potatoes for processing were placed in storage for processing through February / March and possibly into April this year. This in turn has delayed the harvesting of substantial quantities of the 1990-91 seasons crop.

As potatoes for processing represents about 90 percent of the Tasmanian crop any change within the processing sector can have a significant impact upon the industry and indeed the vegetable industry as a whole as potatoes represent over 50 percent of the gross value for all vegetables in Tasmania.

A downturn in production has taken place with the 1990-91 crop, mainly due to a reduction in the requirements for processing and an overall estimate at the time of writing is in the order of 260,000-270,000. Furthermore, growers contracting with one major processor have recently been advised of a further cut in production. The processor and growers have worked together on the matter of compensation for the proportion of crop produced but now not required for processing purposes.

This unfortunate situation is again going to result in a significant production surplus and alternative options for disposing of the surplus are currently being investigated.

This seasons growing conditions have generally been quite favourable and to this time no significant growing problems have occurred. However, with many crops likely to remain unharvested for quite some time, damage from potato moth and disease may well become a problem, the extent of which will largely be determined by the weather experienced throughout the weeks ahead.

The Department of Primary Industry's micropropagation tissue culture unit has proven to be most beneficial to the Tasmanian industry. The currently used cultivars have been established as tissue cultures from which plantlets are produced as required. With this facility, the production of mini-tubers no longer has seasonal limitations and now allows for year round production of cultivars.

Mini-tubers will in future form the basis of the certified seed potato scheme and will also enable the rapid production of newly introduced cultivars for field evaluation.

## SOUTH AUSTRALIA

**Chris Williams is a Senior Research Officer specialising in Potatoes at the Lenswood Horticultural Centre with the SA Department of Agriculture.**

There has been a recent expansion in the potato industry in South Australia. In 1989/90, 161,257 tonnes of potatoes were produced from 5,082 hectares with a gross value of $60.6 million. In the previous financial year, the area sown, production and value of potatoes was approximately 25 percent less than in 1989/90. Growing conditions throughout the state have been good and yields for 1990/91 have been average to above average.

Approximately 55 percent of South Australian production is marketed fresh and 45 percent is processed, mainly into frozen French fries, crisps and chips.

The South East, Northern Adelaide Plains, Mount Lofty Ranges and Murray Lands are the main areas of production. Production has increased significantly inn the past few years in the Lower South East (mainly for frozen French fries) and in the Murray Lands (mostly for the washed ware trade).

CCA Snack Food's new, high technology crisp factory in Adelaide processed approximately 25,000 tonnes of fresh potato equivalents in 1990. They are moving to source new areas in South Australia for crisping potatoes. Currency Creek, Pinnaroo and areas along the Murray River are being sourced in order to attempt to supply fresh, new potatoes to the factory all year round to reduce storage. The crisp industry is moving towards bulk handling and having fewer contract growers who supply greater tonnage per grower.

In the Lower South East of South Australia, Safries processed approximately 35,000 tonnes of potatoes into frozen French fries in 1990. A new, expanded factory complex near Penola has recently begun operations. Problems with insufficient storage capacity were experienced in the current harvest season as the two newly built stores were filled. However, the completion of a further two stores should help resolve this problem. The new plant has potential to expand to process a total of 60,000 tonnes of potatoes per year in the district by 1993. Improved cultivars to replace Russet Burbank are being sought.

The new cultivars, Crystal, Tarago, Onka, Atlantic, Desiree and Spunta have been identified for commercial use. Extensive potato nutrition research work has been conducted. This has involved calibration of soil tests (for phosphorus and potassium) and plant

tests (including a rapid sap nitrate field test) for efficient nutrient management. A potato industry development officer has been appointed to assist in the transfer of new technology to growers.

Programs are also in progress to define water erosion control systems, land management and reduced tillage for cropping high rainfall sloping land. Work has also been initiated to develop strategies for minimum chemical use.

Because of the recent outbreak of Potato Cyst Nematode (PCN) in Victoria, new restrictions applying to all Victorian potatoes have been implemented. The major one being that: "Certified seed potatoes from Victoria will only be allowed entry into South Australia provided they are brushed and in new containers provided 'fork' or soil testing becomes a mandatory requirement of the Victorian Certified Seed Potato Scheme within 12 months".

## WESTERN AUSTRALIA

**Peter Dawson is a Vegetable Adviser with the Department of Agriculture at Bunbury. Peter runs the Potato Variety Evaluation program for Western Australia.**

Potato production continued to expand though not as rapidly as expected. Over 100,000 tonnes will be produced. 50,000t is sold on the fresh market, 11,000t are used in crisp production, 36,000t are processed for French fries and 7,000t are exported.

About 350 growers work 2,700 ha. The majority of the crop is grown in the South West from Bunbury to Albany and the remaining 10 percent of production is at Gin Gin and the metropolitan area.

FRESH MARKET: The fresh market is controlled by the Potato Marketing Authority (PMA). Growers are licensed to produce specified tonnages for delivery on specific dates. The choice of variety is left to the grower. All potatoes are wash-packed and payment is according to cosmetic quality.

**Graeme Wilson, Victorian Department of Agriculture with potato berries in the potato breeding glasshouse at Toolangi.**

Aggressive promotion of the potato is carried out by the PMA.

A shift in varieties may soon occur. Delaware once made up 87 percent of production but now this has fallen 80 percent. Other varieties grown at Coliban, Geographe, Spunta, Sebago, Sequoia and Exton.

Early crops (Gin Gin and the Metropolitan) suffered the worst frosts in many years. Sprinkler systems were tested to capacity—many failed to give protection. It was reported that Spunta stood up to the conditions better than other varieties.

Strong competition from early, cheaper, bright skinned South Australian potatoes also affected growers returns. A payment of $220/t for first grade compares poorly with last years payment of $320/t.

Since December sales have increased and further increases can be expected as a consequence of the PCN find in Victoria. Temporary restrictions imposed on importing of interstate potatoes has reduced interstate competition and there are prospects of easier export to the east.

CRISPING: Coca Cola Amatil processes 11,000t for crisps. The main varieties are Atlantic for fresh and Cadima (storage). More potatoes will be sourced from new, earlier west coastal areas to increase the supply of fresh material. Production will decrease in Manjimup where most of the Cadima storage crops are grown.

FRENCH FRY: The season started poorly as cuts to the projected production of 41,000t were announced. Edgell Birds-Eye production at Manjimup rose to 34,000t, 5,000t less than expected, while Southern Processors at Albany expect to handle 2,000t. The reduced expansion is due to strong competition from imports, reduced local demand, and an oversupply caused by high yields in the previous season. Production has increased 6,000t over the previous year.

French fry quality and plant efficiency will inevitably improve because the supply of raw material now exceeds demand, although a decline in production to 32,000t is expected next year.

The season has been good for processing crops although processing is behind schedule.

The major varieties grown are Russet Burbank and Kennebec. Cadima is no longer wanted due to splitting and cooking problems.

EXPORT: The PMA will be the major exporter this season. 5,000t of wares have been sent to South East Asia and Mauritius. An order of l,000t of seed has also been received from Mauritius. Private exports are continuing, but less than l,000t can be expected to be exported from these operators.

PCN: All potatoes grown within the PCN quarantine area at Munster must be resistant to PCN (RO1). This eradication strategy started last year and led to many growers leaving the area. Returns for the remaining growers were reduced because Atlantic, the only commercially available resistant variety, is quite unsuitable for the fresh market quality packout system. It is expected that the area of potatoes planted in this zone will decline further.

Marijke is better suited for fresh production and seed of this resistant variety is being multiplied rapidly. Limited supplies will be available in 1991.

Temporary restrictions on potatoes imported from other states have been imposed due to the PCN finding in Victoria.

Overall Western Australia's potato growers should anticipate a more stable season in 1991/92.

# QUEENSLAND

**John Kerr is the District Adviser at Gatton with the Department of Primary Industries, Queensland.**

The Queensland potato industry has been mainly a ware market supplier but in recent years increasing areas have been grown for processing. In 1991 around 20 percent of the Queensland crop will be processed mainly as crisps. This is expected to double within the next five years.

Some of the increase will be grown in new production areas outside of the present main growing areas of south east Queensland and the Atherton Tableland.

The 1990 south Queensland winter crop was planted later than normal due to excessive rain. This resulted in the shrinking of the harvest period. On the Atherton Tableland the 1990 plantings were the largest ever recorded.

In addition to nearly 1,000 ha of Sebago grown for the general market, 120 ha of Atlantic were grown for the first time on contract to a crisping processor.

With progressively falling prices and higher than normal yields the market collapsed in November with many growers not completing harvest when prices fell below $80 per tonne.

Planting of the 1991 autumn crop was completed in March with no establishment problems of consequence. Hot dry windy weather in March and April has checked growth and will reduce yields. Some of the early planted areas are showing high levels of purple top, yellowing and physiological leaf roll a problem regularly recorded in the early 1980's.

Present orders for certified seed would indicate a fall in area for the main winter planting in South East Queensland. This may be due to the poor returns from the later planted crops in recent years. Many of these growers are now in the position where the cost of seed is regarded by them as a major restraint to continued potato production.

There has been little in varieties over the past few years with the exception of Atlantic which has completely replaced Sebago for crisping.

Market demand for a red skin has kept Pontiac as the main variety for the washed trade but a replacement variety is required for the early winter planting in particular.

Yields were lower than expected with an average of about 25 tonnes per hectare for Sebago and 30 tonnes per hectare for Atlantic.

Unexpected nutritional problems and a cold winter were the main causes of the low yields.

Poor soil structure after many years of continuous cropping is affecting yields in some Tableland areas. The use of forage sorghum as a soil conditioner/green manure crop prior to potatoes is helping to correct this situation.

Target Spot is the major disease on the Tableland. Green peach aphid is the major pest with tuber moth causing damage in some years.

## NEW SOUTH WALES

**Stephen Wade is the District Horticulturist, Finley, with NSW Agriculture & Fisheries.**

New South Wales growers experienced a very dry year with average yields and low prices. About 7,200 ha of crop was grown, producing over 130,000 tonnes of potatoes worth $43 million. Consumer demand for potatoes weakened during the year. Returns for the fresh market were poor, often below the costs of production.

Sebago was the main fresh variety grown, accounting for 75 percent of the State crop. Pontiac was the next most important variety, with Atlantic the main processing variety. Other varieties grown included Desiree, Kennebec, Norchip and Shepody. Potatoes were grown in the three main areas—the Riverina, the Coast and the Tablelands.

The Riverina area (4800 ha) grows over half the State's production. A spring and autumn crop is grown each year. Harvest of the 1990 autumn crop (June-October) was slowed by wet weather. Yields were average (18 t/ha) and prices dropped from $230/tonne to $140/tonne by October. Although spring crop planting was delayed by wet conditions, the warm, dry weather after October encouraged crop growth. Spring crop yields were high (30 t/ha), although prices dropped to $70/tonne. Atlantic was the only variety accepted for processing. Processing crops had high dry matter contents and contract prices ranged from $205-$220/tonne base prices plus dry matter and quality bonuses.

With the low prices, the 1991 Riverina autumn crop was reduced by 500 hectares. Crops were slow to establish and required more irrigation. There was less disease with the continuing dry weather. However yield potential remains average (18 t/ha) for the 1991 autumn crop unless there is a mild winter.

The Coastal areas also produce two crops a year. The spring crop is grown for both the fresh and crisp processing markets while the autumn crop is mainly for fresh market. Coastal areas remained the same (1500 ha), although plantings in the Hawkesbury area were reduced because of previous flood losses. Both spring and autumn crops experienced very dry weather. Yields were average and prices remained low. Internal fleck was a problem with some North Coast crops.

In the Tablelands one main crop a year is grown for fresh, crisp processing and seed production. Around 900 ha were planted this season. Tableland crops also experienced a very dry growing season. Yields were reduced on dryland crops and where water supplies were inadequate. Disease was low and insect problems were few. Main crop yields were average (30-45 t/ha) and quality was excellent. Harvesting was uninterrupted with the dry weather though fresh prices were low.

## VICTORIA

**Keith Blackmore is the Senior Certification Officer (Potatoes) at the Institute of Plant Sciences, Toolangi with the Department of Agriculture and Rural Affairs, Victoria.**

Victoria continues to be the dominant potato State with about 400,000 tonnes produced in 1990/91. Despite a minor decrease in planted area, yields are steadily increasing.

The discovery of Potato Cyst Nematode in the lower Dandenong ranges has had serious ramifications throughout the industry. Essential restrictions have been enacted affecting the potato trade out of Victoria. An exhaustive survey of all potato growing areas in Victoria has been or is being undertaken, together with an educational programme well in place.

The prices of fresh market potatoes has been very poor, normally ranging from $60 to $120 per tonne on farm, which is well below the cost of production. Two new varieties, Winlock and Wilwash have been introduced as fresh market varieties from the potato breeding programme at Toolangi.

The breeding programme at Toolangi benefits not just the Victorian industry but the Australian industry. Their current breeding programme includes

- Breeding fresh and crisping potatoes in the Riverina
- Breeding varieties resistant to Powdery Scab
- Breeding new French fry varieties in the south west of South Australia.

The French fry industry is centred at Ballarat. Over 70 percent of all potatoes are sourced from south west Victoria where the Russet Burbank variety is now favoured by processors.

The main changes in the crisping industry again has been with varieties. The swing has been away from Kennebec and Sebago to Denali, Norchip, Snowchip, Atlantic and Tarago.

Certified Seed potatoes had favourable planting conditions resulting in good crop establishment and growth this season. Crops remained healthy with a very low crop rejection occuring of only 2 percent of the area inspected. These rejections were mainly confined to the seed piece breakdown (fusarium) and stem damage with Blackleg symptoms. One small area was rejected due to Potato Leafroll virus (PLRV).

Harvesting of certified seed crops was well advanced in May with the fine and mostly dry Autumn conditions presenting few delays. Tuber moth and mechanical damage were of some concern with earlier harvested crops, however recently conditions have been ideal.

There is an increased use of 'round' seed by seed and ware growers. More seed growers are gearing up part of their program to purchase more Foundation seed to enable increased production of 'round' Mother seed. A number of Certified Atlantic crops were successfully grown to produce a 30gm to 120gm sample to meet buyer needs.

At the request of the Victorian Certified Seed Potato Grower's Committee the Department of Agriculture has introduced under grader sampling of soil into the rules of the Certified seed scheme. "Samples of soil will be collected from under machinery used for the grading of seed potatoes to test for the presence of Potato Cyst Nematode". The samples are forwarded to a specialist laboratory at the Institute of Plant Sciences, Knoxfield. With improved facilities, results of tests have been available within the week.

PHOTOGRAPH – THE IMAGE BANK

*"You visit this bloke often?"*

*"Often as he wants."*


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