Potato Australia

PUBLISHED BY THE AUSTRALIAN POTATO INDUSTRY COUNCIL

VOLUME 6 AUGUST 1995 ISSN 1036 - 8558

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Target Spot attacks leaves, progressively defoliating the plant if left uncontrolled.

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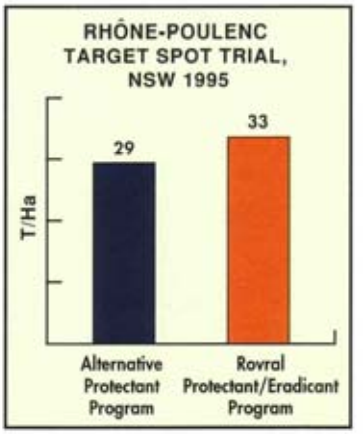

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Potato Australia

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Editorial

This year we have a bumper issue of Potato Australia.

It is great that Potato Australia is receiving so much support from all sectors of the industry. The higher number of articles contributed has been matched by increased advertising, allowing us to produce a larger magazine this year.

This level of support demonstrates that Potato Australia is recognised as an effective means of transferring research results and other information rapidly to those involved in the potato industry throughout Australia. Such recognition has led to the Horticultural Research and Development Corporation providing financial support to help offset preparation and distribution costs.

It is good to see an increasing number of articles coming from the private sector as this allows the production of a magazine which is truly representative of the whole industry. Thank you to all contributors and advertisers and we welcome your contribution next year.

If any readers wish to suggest topics for future issues or would like to comment on any aspect of this magazine, you are welcome to contact the editors at the address below.

The Editorial Panel — Bruce Beattie, Nathalie Jarosz and John Fennell

INVITATION TO CONTRIBUTORS AND ADVERTISERS

This magazine will be published annually in August. Articles are welcome on any topic related to potatoes. Please submit copy of articles and advertising to: The Editor, Potato Australia, PO Box 303, Devonport, Tasmania, 7310 Phone: (004) 217637 Fax: (004) 245142

Contents

ACKNOWLEDGEMENT:

Front cover: John Fennell and Romic Pajak of the Department of Primary Industry & Fisheries, Tasmania

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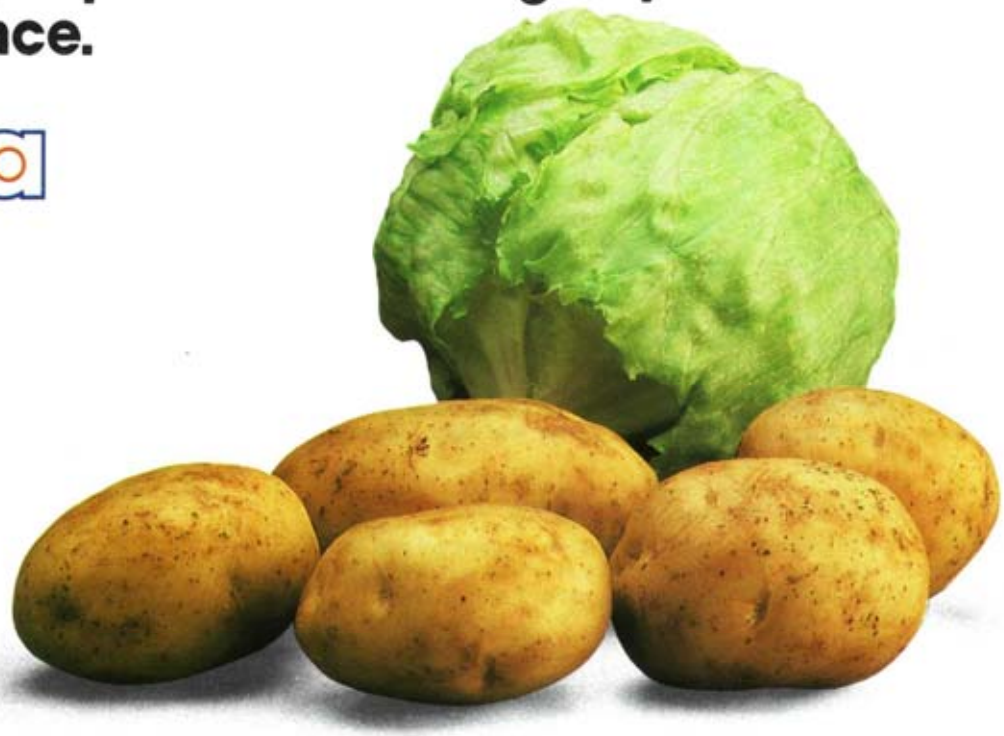

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From the Chairman's Desk

WAYNE CORNISH
is the Chairman of the
Australian Potato Industry Council

There must be a message in the extremes in market conditions endured over the past twelve months.

When supply more closely mirrors demand the industry very quickly becomes more viable and confident.

It's to be lamented that the turn-around which did occur late in 1994 was at the expense of growers gripped by crop failures due to drought. Nevertheless, it proves once again that a small percentage reduction in supply has a huge percentage increase in returns and if the industry is smart it will work towards becoming truly market pulled rather than simply production pushed.

Speaking of marketing, the "road show" which APIC hoped to launch to extend to industry the findings of the HRDC funded marketing project carried out by *Richard Marketing* is unfortunately unlikely to proceed.

Despite the firm commitment given by the majority of states (Queensland, Victoria. Tasmania and South Australia), we have so far been unable to secure a commitment from New South Wales. In Western Australia the view is that it is unnecessary due to its own present marketing arrangements.

We were prepared to proceed without Western Australian involvement but a lack of resolve in New South Wales leaves a financial dilemma which at this point is unresolvable.

Catastrophic is not too strong a word to use if we see this initiative fail due to lack of industry resolve. The impact of the research findings are substantial and it is critical that industry be afforded the opportunity to judge for itself how best we take a pro-active approach to the future.

Marketing is the *Achilles Heel* of the fresh potato industry. There are major self help principles which can be harnessed along with tangible government and agency support areas. We must overcome the present agro-political stalemate. APIC is committed to somehow crashing through to allow the overwhelming responsible view to succeed.

WAYNE CORNISH

Research and development continues to become more and more focussed under the watchful eye of the APIC-HRDC Advisory Committee. We welcomed Mr Jack Meagher to the Chair of that group recently and look forward to Jack's input. Expenditure annually has levelled out at approximately $1.6M. Efficiencies in the system combined with a truly national approach has changed the potential for positive outcomes dramatically. If only we could action a similar mindset for marketing.

New faces not only grace the R&D table but also APIC itself. The fire horse from Tasmania, Max Walker, has responded to the bell and become the Secretary Treasurer of APIC. Max, a long time supporter of the potato industry, brings a wealth of knowledge with him.

He replaces Tony Biggs who through increased pressures of business decided to step aside. Tony gave great service to APIC as its inaugural secretary and was always of tremendous support to me as Chairman. My best wishes to Tony and Frances in the future.

APIC has made representation to the Industry Commission regarding R&D funding and is presently doing likewise in relation to their packaging and labelling inquiry.

APIC has also made a submission to the National Food Association seeking a more realistic cadmium standard to be set for our product. The standard set should better reflect the Australian position and be consistent with International CODEX standards.

The Horticulture 2000 group was established recently to help qualify and implement the recommendations which flowed from the Horticultural Task Force. This group in my view must come to grips with the real issues such as waterfront transport, labour, taxation, air freight, farm inputs, etc if real reforms are to be put in place to achieve true international competitiveness. It is no longer acceptable to focus only on farm gate areas when it is most apparent our total infrastructure is out of step internationally. John Rich and myself are members of Horticulture 2000 and we will be pushing the real issues.

APIC's charter is to further the collective multi-sectorial interests of the potato industry. The advances made over APIC's short history are very significant and I hope as we proceed into the future even greater gains can be achieved. By aiding a consultative, less parochial approach, I believe we can best tackle meaningful strategies to further advance.

One of the areas requiring such an approach is an industry Code of Practice on hygiene. This concept was developed after the outbreaks of PCN in Australia. APIC has a committee in place which will be bringing in its final recommendations shortly. A respected comprehensive code would have many advantages which would impact positively across the industry reducing disease outbreaks, increasing awareness and quality and reducing input costs.

Keep your eyes open for information on the next Industry Conference to be held in Queensland in 1996. This promises to be a very comprehensive vegetable industry event not to be missed.

My gratitude to the Tassie team who compiled the 1994 edition of *Potato Australia* as well as this 1995 edition. Well done and thank you from all in the industry. *Potato Australia* makes an important contribution to the Australian potato industry and is sought after and respected. It is the official organ of APIC and we are proud of it.

There are many topics dealt with by APIC and I have touched on but a few.

I wish you all a good season with a satisfactory outcome to those more vexed questions such as contract prices and marketing information transfer. ■

How the Potato Levy Funds R&D

JONATHON ECCLES is Industry Program Manager with the Horticultural Research and Development Corporation

In 1994-95, 37 research and development projects were funded totalling $1.66 million.

It is now nearly four years since the potato industry introduced a levy to fund research & development for the benefit of the industry. The decision followed an industry workshop which decided the priorities for R&D.

The levy is paid by growers and processors, based on 50 cents/tonne and is collected at the first point of sale. In most cases the levy is collected by market agents or merchants when potatoes are sold on the fresh market and by processors for potatoes destined for processing.

All collectors are legally required to forward the levy to the Levies Management Unit, a designated section within the Commonwealth Department of Primary Industries & Energy. The Levies Management Unit then forward the levy to the Horticultural Research and Development Corporation (HRDC).

Levies collected in any one financial year are used to fund R&D projects in the following financial year. This ensures that industry is able to fund projects with knowledge of the total amount of levy available from the previous year. The levy is matched by the Commonwealth Government dollar for dollar at the time when the levy is spent on R&D.

FUNDING R&D PROJECTS TO MEET THE INDUSTRY'S NEEDS

HRDC has placed increasing emphasis on funding projects which will provide commercially adopted outcomes and researchers must take into account both the ability of industry to apply R&D findings and the changing market place. New project selection procedures require researchers to demonstrate an understanding of industry cost factors, resources and avenues for communication.

HRDC believes the best way of ensuring the rapid adoption of R&D outcomes - the results that put money in the pockets of growers - is to encourage the development of strong links between the research community and industry. These links in many cases are already strong, however HRDC is now looking for a much more in depth understanding of industry by research applicants.

HRDC is well aware of the need for industry to have a research program that is directed at meeting their needs and ensuring a return on the R&D investment. The HRDC approach is expected to have the added benefit of ensuring the investment return is visible and clearly apparent to industry. At the same time it will encourage more submissions on post farm gate issues such as value adding, improving quality, market research and economic studies and waste management.

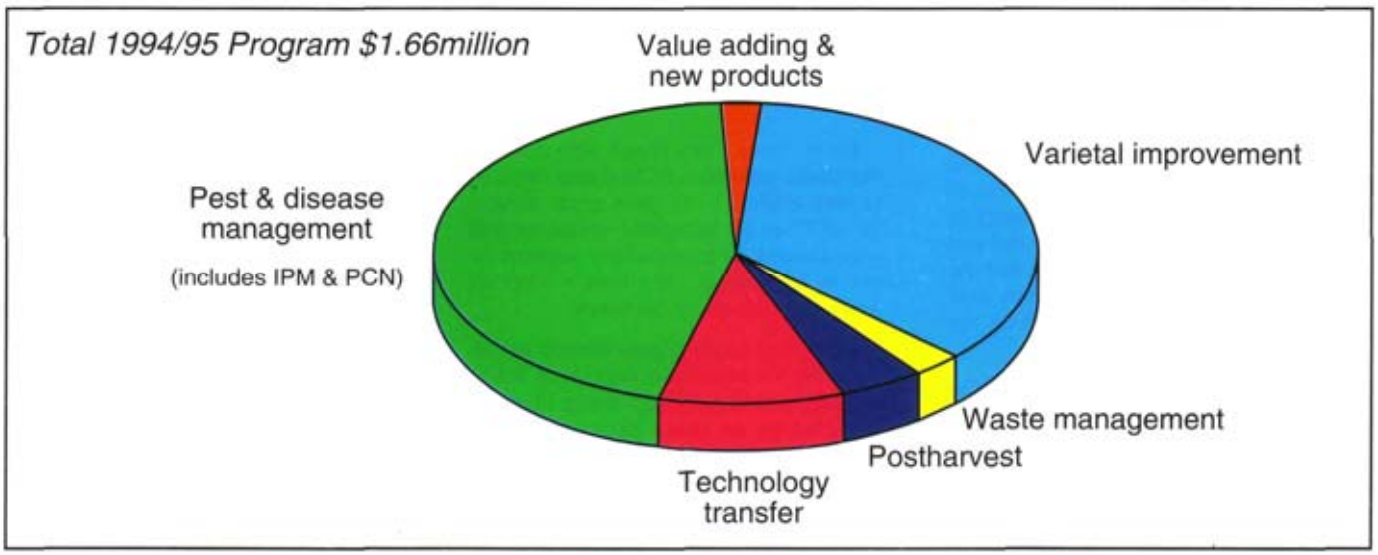
HOW PROJECTS ARE SELECTED

Each year HRDC advertises the R&D priorities for the potato industry which results in private and public research organisations submitting applications to the Horticultural Research and Development Corporation by the following February.

Applications are first considered by the Australian Potato Industry Council Research & Development Committee (APIC R&D Committee) which meets in March. The Committee decides on the applications to be funded taking into account the stated R&D priorities of the industry, the ability of the project to deliver a return on the levy invested and the amount of levy funds available.

In the last two years the total amount of funding requests exceeded the actual funds available from the levy by over $1 million. It is often the case that the R&D Committee would like to fund a project but are unable to recommend it due to a lack of money. Once the applications have been fully considered, the Committee makes recommendations on funding priorities to the HRDC Board.

Another important task for the APIC R&D Committee is to identify gaps in the research which are not being covered by any project. The Committee can ask HRDC to commission a specific project setting out the outcomes and objectives of the



Potato Levy R&D Projects showing $$ invested in program areas in 1994/95

work to be undertaken. This ensures that all R&D priorities are addressed. Such a project was carried out earlier this year to establish how growers wanted to receive information on projects as transferring new technology to growers.

Projects funded by HRDC can run for up to three years. It is important to remember that by the very nature of research, not all projects will provide an immediate return on investment. Projects longer than one year are reviewed annually by the R&D Committee to ensure individual R&D projects remain focused on industry outcomes and are progressing at a satisfactory rate.

The allocation of matched levy funds to research areas is shown in Figure 1. The majority of funds is spent on projects dealing with pest and disease management and varietal improvement. HRDC would prefer to see less of an imbalance with more projects being funded in the other areas.

The introduction of the levy has resulted in better coordinated and better funded research and development to meet the needs of the potato industry. Increasingly, more effort is being made in communicating research outcomes to industry, whether it be growers, processors or marketers.

However, communication is a two way street. It is equally important that industry participates in activities that support this communication. After all. the aim is to ensure the rapid adoption of R&D outcomes to improve the prosperity of the industry. ■

The APIC R&D Committee

The R&D Committee represents the potato industry and plays an important role in maintaining an appropriate industry focus for the R&D program. The Committee, a sub committee of APIC, is the national body representing growers, processors, and merchants. It is made up of six growers, two potato processor representatives and one potato merchant.

The Committee is independently chaired by Dr Jack Meagher and consists of six grower representatives - Lawrie Eldridge (Cuthbert, WA), Geoff Moar (Oaklands, NSW), Craig Wilson (Redland Bay, QLD), Lawrie Shaw (Beech Forest, VIC), Wayne Cornish (Gumeracha, SA), Max McKenna (Gawler, TAS); two processor representatives - David Waterhouse (Edgell-Bird's Eye) and Jeff Peterson (The Smith's Snackfood Company); and one merchant representative - Les Horsfield (Thorpdale, VIC).

Welcome to Jack Meagher

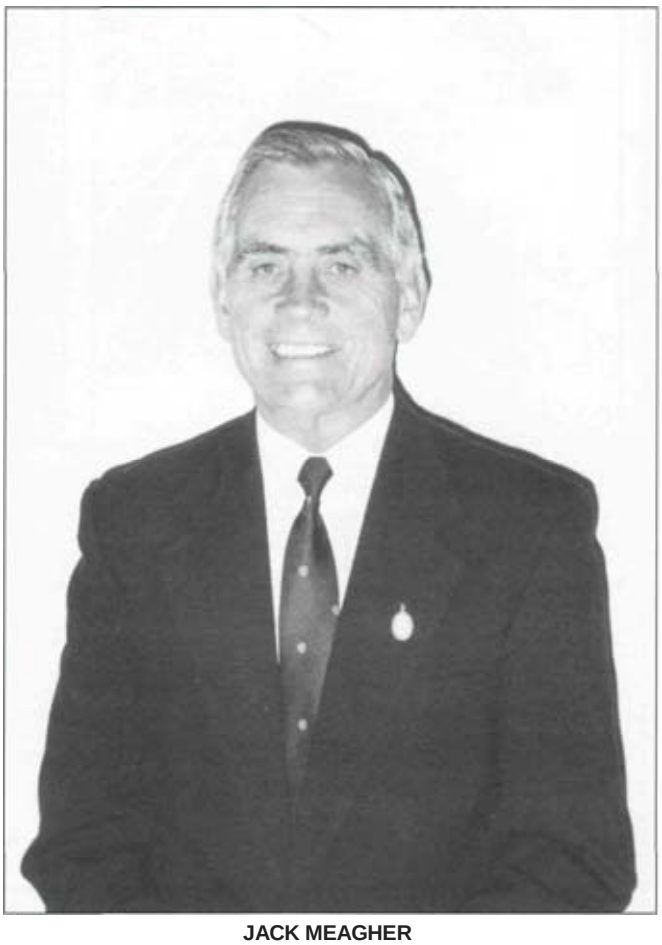
Dr Jack Meagher has recently been appointed chairman of the Australian Potato Industry Council's Research & Development Committee.

He was officially welcomed to the position by the APIC Chairman, Mr Wayne Cornish, at a meeting of the R&D Committee during March in Melbourne.

Jack Meagher brings to the position wide ranging experience in agriculture and horticulture. Jack started his career as a Plant Pathologist at the Plant Research Institute at Burnley, Victoria, and eventually became Chief of the Division of Plant Research and Development with the Victorian Department of Agriculture and Rural Affairs with responsibility for twelve research institutes and field stations.

He has served on a large number of Research Councils, Committees, Trusts and Boards relating to a range of commodities including potatoes, wheat, barley and dried fruits.

Jack has also been awarded the honour of "Trustee Emeritus" of the International Potato Centre (CIP) in Lima, Peru, the headquarters for world research on potatoes and sweet potatoes for improved production in developing countries. This award was for distinguished service as Chairman of the CIP Board of Trustees. ■



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The Tasmanian Farm Best Practice Program

STEWART BROWN
is the Program Leader of the Farm Best Practice Program, and is based at the Department of Primary Industry and Fisheries, Devonport, Tasmania

The Tasmanian Farm Best Practice Program encourages farmers to adopt practices which will maximise their profits from the production of potatoes and processed vegetables on a sustainable basis.

Established in October 1993. the Tasmanian Farm Best Practice Program arose from the desire of the processing company, Edgell-Birds Eye to access export markets following a major investment in upgrading its potato processing plant in Ulverstone to a world class facility with increased capacity.

A benchmarking study in New Zealand, USA and Europe highlighted the fact that to be competitive on world markets, the company will have to source product from a farm sector which is efficient and cost effective by world standards.

The initial objective of the program was to set up local farmer discussion groups in all areas of the State where potatoes are produced and this has been achieved with 24 groups in operation.

At the first meeting of each group the members identified aspects of production which were perceived as limiting factors and a program was formulated to address these issues.

Most groups, with 10-12 participants, meet monthly for 1-2 hours on a local property with expert input drawn from both the public and private sectors to discuss a subject which is relevant and topical. The meetings are as interactive as possible, using practical examples and demonstration techniques.

A full range of topics have been discussed relating to potato crop husbandry. In particular, group members have:

- discussed the importance of efficient crop establishment and dug up sets behind a planter to check spacings
- benefited from expert input relating to seed cutting and storing, irriga tion management, crop nutrition, soil management and disease and pest control
- participated in farm walks and field days
- had demonstrations of an instrumented sphere which diagnoses where bruising occurs on harvesters
- discussed alternative harvester technology with an overseas expert

A recent initiative of the program is the introduction of a crop costing service whereby each grower will complete a simple record of crop inputs and yields. From this, and supplementary information on fixed costs, Farm Best Practice staff will calculate the crop profit using a computer program developed by the Department of Primary Industry and Fisheries, Tasmania.

This information will provide growers with a valuable management aid. It will also enable growers within groups to compare results on a confidential basis and the practices which account for both high and low profits will be identified. This type of comparative analysis has been used with success in other industries but never before in the Tasmanian vegetable industry.

The Farm Best Practice Program is managed by a Steering Committee chaired by the Executive Officer of the

Department of Primary Industry and Fisheries Soils Officer, Bill Chilvers, demonstrating how the simple technology of digging a hole can help growers learn just what is happening in a particular crop

Members of a Farm Best Practice group checking the performance of a potato planter

Tasmanian Farmer and Graziers Association and comprising representatives of growers, Edgell-Birds Eye and the Department of Primary Industry and Fisheries. This broadly based management structure has achieved the desired result of the program being regarded as independent and grower driven. As a result it has achieved solid grower support.

A firm base has been established by concentrating on basic husbandry and crop production issues as identified by the participants but as growers become conversant with these, the program must develop further initiatives to ensure that the objectives are met and growers maximise their productivity.

Discussion group members have readily accepted the suggestion that they undertake local trials/demonstrations into an aspect of production they consider relevant. The Farm Best Practice Program will organise and co-ordinate this work and then collate and disseminate the findings to group members and industry.

In future, the present discussion group structure will be complemented by group trials and the 'Crop Cost' project where individual growers will be able to benchmark their physical and financial performance and thus identify the practices which maximise profit. ■

ACKNOWLEDGEMENTS:
The Farm Best Practice Program has been funded by Edgell-Birds Eye ($400,000), Tasmanian Department of Primary Industry and Fisheries ($200,000) and the Commonwealth Agribusiness Program ($200,000) for a three year period.

The Search for Improved Potato Varieties

ROGER KIRKHAM & GRAEME WILSON, Agriculture Victoria
CHRIS WILLIAMS, South Australian Research and Development Institute
BEN DOWLING & STEPHEN WADE, New South Wales Agriculture
KEN JACKSON, Queensland Department of Primary Industry
BRUCE BEATTIE, Department of Primary Industry and Fisheries, Tasmania
PETER DAWSON Department of Agriculture, Western Australia

A network of potato trials throughout Australia is selecting new and improved varieties.

Breeders lines from the potato breeding program at Toolangi and new varieties imported from overseas are being tested in trials with commonly grown varieties through the National Potato Improvement and Evaluation Scheme (NaPIES).

Trials are located in major production areas and most are grown on private properties within commercial potato crops. This allows new varieties to be compared with common varieties when grown under commercial conditions. As well as measuring disease resistance, marketable yield etc, the quality of new varieties is measured in conjunction with processing companies or packing houses.

Peter Craig inspecting potato variety trial at Colac, Victoria

Inspection of new varieties in a grower trial at Stowport, Tasmania

During the past five years, a number varieties have been released from this testing program to the Australian industry including *Nadine, Evans, Snowgem, Wilstore, Wontscab and Wilwash.*

VICTORIA

Trials were grown at Colac, Koroit, Koo Wee Rup and Ballarat. Most varieties tested were for French fry processing or for the fresh market. The main French fry and crisp trials include tests for processing quality after storage during winter and spring. The best performing varieties include:

Fresh: With a bright white tuber skin, *90-105-14* is suitable for the wash packing market. It has a short dormancy and short growing period. *87-57-9* has a dark red, slightly netted skin which holds its red colour after plants mature, long dormancy and fairly long growing period.

Crisp: *89-88-3* produces many tubers per plant, high dry matter and light fry colour after storage.

French fry: *Ranger Russet* has a very even and long tuber shape, susceptible to tuber damage and is suitable for direct processing only. *89-27-33* has an even and long tuber shape, high dry matter and light fry colour after storage.

Harvesting potato variety trial at Gary Willis's, Thorpdale, Victoria

These varieties and others are also being tested in large plantings by commercial growers for final commercial assessment. Seed of all advanced lines is being grown by some certified seed growers in Victoria in anticipation of release to the industry.

SOUTH AUSTRALIA

Trials were grown at the Northern Adelaide Plains, Adelaide Hills and Riverland, testing both fresh and processing varieties. French fry trials have also been grown in the south east. The best performing varieties in trials in recent years include:

Fresh: *Wilwash, 87-44-8* and *85-2-1* have performed well in all three regions and each have a bright white tuber skin with high yields.

87-13-3 has good yields of elongated tubers and a smooth red skin, darker than *Pontiac.* Its growing season is at least 14 days longer than *Pontiac,* and it has a high resistance to metribuzin and some resistance to wind damage. It will be tested in large commercial plantings with possible release in 2-3 years.

Crisp: *87-5-7* performed well in the initial trial in the Riverland whilst 88-4-29, 86-34-4 were top performers in the Northern Adelaide Plains and Adelaide Hills.

French fry: *88-102-24* was the highest yielding in the Riverland trials whilst *88-102-12* was best at the Northern Adelaide Plains and Adelaide Hills sites. *88-59-12* was the best line tested at the Adelaide Hills site in 1994-95 for both yield and processing quality.

In the south east trials were grown on both loam and sand. The variety *85-30-12* performed well in both trials while *89-27-33* performed well in the loam trial.

Ranger Russet was grown in bulk trials for direct processing and has indicated commercial potential.

QUEENSLAND

Early generation clones and varieties were tested at Gatton Research Station in the Lockyer Valley while advanced lines were tested in the Lockyer Valley, Redland Bay and Kairi Research Station on the Atherton Tablelands.

Fresh: *Alhamra* and *CIP Clone 92* produced the most consistent yields within the advanced varieties. *Alhamra* is a pink skinned variety with light yellow flesh and has more even tubers than Desiree. *CIP Clone 92* is a yellow skinned and fleshed, multi-purpose variety that has export potential into SE Asia. Both varieties demonstrated excellent tolerance to powdery scab. *Wilwash* appears unsuited to North Queensland, but may have a small role in the Lockyer.

Testing of red skinned varieties, *87-12-8* and *87-57-9,* will continue as they have superior shape and colour to *Pontiac* although their yields are lower.

A number of *Sebago* strains were also tested but showed no significant yield differences.

Crisp: In a small district trial, the commercial standard, *Atlantic,* produced superior yields to *Evans, Wilcrisp* and *Wilstore.*

WESTERN AUSTRALIA

Commercial demonstrations and the increased production of Nadine were highlights of the evaluation program.

Fresh: *Nadine* consolidated its position with its market share increasing from less than 1% in 1992-93 to 8% in 1994-95. *Nadine* has improved cosmetic quality, tuber size and uniformity, yield and disease resistance over the standard *Delaware.* Demonstration of the performance of *Nadine* at Manjimup has led to production of 28ha in this 'new' area. *Nadine's* even tuber shape and size and its freedom from scurf benefits growers in this area renowned for poor *Delaware* samples. A further demonstration at Busselton has led to growers in this area testing *Nadine.*

The adoption of *Nadine* is an example of the benefits that can come from new varieties. Last season *Nadine* (3,005 tonnes delivered) produced a better packout than *Delaware* (29,381 tonnes delivered). *Nadine* had 20% premium while *Delaware* has just 8% and this led to increased returns to growers of at least $1500/ha. *Nadine* showed a similar improvement in performance over *Coliban.*

The yellow flesh variety *Mondial* was demonstrated at four sites last year and we plan to test this commercially in conjunction with the WA Potato Marketing Authority.

Crisp: *89-22-4* produced a more even sample that *Atlantic* with higher dry matter and lighter fry colour in a crisp demonstration harvested in May at Manjimup. This breeding line was badly affected by stem end rot. This has not been a problem in other plantings and further commercial demonstrations will show whether this is a consistent fault.

French fry: Minitubers of two French fry varieties, *88-31-5* and *88-78-4* are being produced to provide high quality seed for commercial testing in 1996. *Ranger Russet* is currently being demonstrated in a commercial crop.

TASMANIA

Fresh: A group of fresh market growers and packers selected ***Morene,*** *Maradonna* and *Wilwash* for further evaluation.

French fry: In the 1993-94 season there were three main trials, two on the red loam krasnozems and one on the lighter sandy soils of the north Midlands. Material originated from

Planting variety trials in Western Australia

breeding programs in Victoria, the United States, New Zealand and Holland. *Russet Burbank, Kennebec* and *Shepody* were used as standards.

Following selection and discussion with the processing companies the following cultivars progressed for further evaluation.

Gladitor was very late but very resistant to target spot. *A8602-2, A8602-1, A8519-5, Russet Nugget* and *Ranger Russet* were considered suitable whilst *88-102-2* out-yielded *Russet Burbank* by 50%.

Other high performing lines were *88-23-1, 88-59-30, 88-43, 89-12-1, 88-102-22* and *88-102-24* which is being retrialled despite high bruising scores.

The Cressy trial on sands was badly affected by nematode. *Kennebec, A8602-2* and *Gladiator* were the least affected whilst *Russet Burbank* was the worst affected.

NEW SOUTH WALES

An autumn harvest trial was grown at Blayney and both summer and winter harvest trials were grown in the Northern Riverina at Narrandera and the Southern Riverina at Berrigan and Cobram. These trials mainly tested fresh market varieties for the washing market but included some processing varieties.

Fresh: *Coliban, Pontiac* and *Crookwell White Flowered* were the highest yielding varieties at Blayney.

In the Riverina summer harvest best performing varieties were *Wilwash*, *Sebago, 90-105-14* (white skin) and *90-77-4* (red skin).

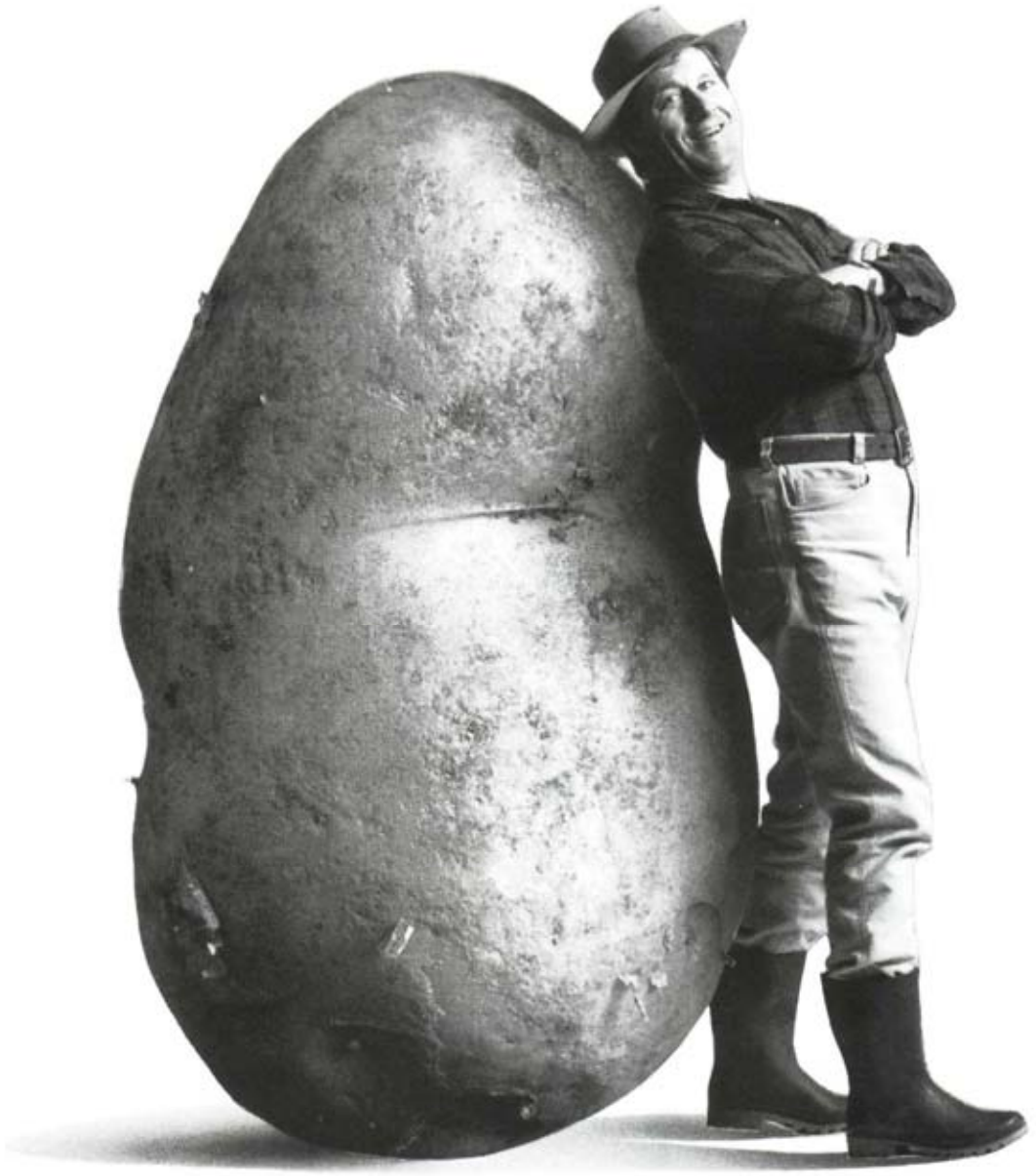
In the winter harvest trials, the best varieties in the Northern Riverina were Wilwash, *Sebago* and *Sebago New Brunswick selection* and in the Southern Riverina *90-77-4, 90-40-1* (red skins) and *90-105-14, 91-110-3* (white skins).

Crisp: *Evans, Catani* and *Wontscab* were the best performing crisp varieties in the Blayney trial.

These varieties are being tested in larger bulk trials by commercial growers this season. ■

ACKNOWLEDGEMENTS:

This article reports the variety evaluation component of NaPIES which was set up in 1993 by HRDC and potato industry and is partly funded from these sources.
We wish to thank the growers and other industry sectors who have helped with variety testing including the financial support from the national potato levy, HRDC and State Departments of Agriculture.



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PIVOT PROMOTING PRODUCTIVITY

PVH 2850

Farm Hygiene is Your Future

THE FARM HYGIENE TEAM is with the Department of Primary Industry and Fisheries, Tasmania

Farm hygiene is about securing the quality of our rural resources and products.

Farm hygiene is to farms what quarantine is to Australia. To demonstrate this point we could consider the common cold or 'flu (or worse):

- If you haven't got it... you don"t want it
- If you do have it. you have a moral and social obligation not to spread it around
- By preventing its spread you can also stop other diseases

Substitute any potato pest or disease for the 'flu and you have the best possible reasons for adopting best hygiene practices... your future!

Farm hygiene is a new initiative by the Department of Primary Industry and Fisheries in Tasmania. It is being managed by a project team which has brought together officers from both plant and animal backgrounds to promote adoption of best hygiene practices. This broad approach to the problem of poor hygiene recognises that very few farms produce only stock or only crops.

With the help of industry, the Farm Hygiene Team is aiming to ensure that:

- All new stock brought onto the farm are isolated, inspected and treated for diseases.
- All machinery is clean when it comes onto a farm and is clean when it leaves.
- There is 100% awareness of farm hygiene by the Year 2000.
- Farm hygiene is a part of every day life for farmers and agribusiness alike.

Did you know that up to 500 kg of soil may be carried on a dirty potato harvester? What happens if that soil is full of common or powdery scab, PCN, clover or nightshade seeds or white-fringed weevil... or worse? What if that soil has onion white rot, clubroot or barnyard grass in it?

We are all aware of the good works being carried out by Landcare in Australia. But what is being done to correct biotic degradation of the soil - not being able to grow what you need to grow, when you want to?

That is where farm hygiene comes in. For the potato industry everywhere there are some practices that are absolutely critical to sustainable production:

- Keep all soil where it is supposed to be - in your paddock!
- At least scrape, if not wash, all equipment that comes out of a paddock caked in soil.
- Be sure to keep crop diseases and insect pests in check. No disease this year means there is less to carry over to next year.
- The same goes for weeds – remember the old adage "one year's seeding is seven years weeding".
- Always use clean seed - certified is best.
- If you share equipment, make sure it goes out and comes back clean.
- Clean up after each crop so that there is no regrowth to harbour insects or diseases.
- Supply clean bins or bags for your seed supplier.
- Make sure your seed cutting contractor is cleaning his machinery between each line of seed.
- •Ask that all field staff inspecting the crop have clean boots - supply some for them that stay at the front gate.
- Lead by example and others will follow.

Always remember - it is your farm and your future at stake. You do have the right to protect both! ■

An increasing number of Tasmanian farmers are not accepting poor hygiene practices

Seed Potato Production in Asia

PETER BATT
is Senior Lecturer in Horticulture with the Curtin University in Perth WA

Over the ten year period from 1980 to 1990, the area of potatoes cultivated in Asia has increased by more than one million hectares.

The average yield of potatoes in Asia is 13.6 t/ha, which although it compares favorably with the world average of 14.8 t/ha, is less than half the average yield achieved in the USA (29.9 t/ha) or Oceania (29.8 t/ha).

SEED QUALITY THE MAJOR CONSTRAINT

Many constraints impede production in Asia including differences in environmental conditions, inadequate infrastructure development, differences in prices. However it is generally agreed that the poor yields are the direct result of poor quality seed and the absence of an adequate system of seed production.

In the history of the South-east Asian Program for Potato Research and Development (SAPPRAD), the shortage of good quality seed is recognized as the single most important factor inhibiting potato production in South East Asia. After 13 years, none of the SAPPRAD countries have achieved stability in seed production, because of;

- variety mixtures
- seed borne diseases
- oversized tubers
- dormant seeds

The traditional seed systems employed in Asia are all very similar; clean seed tubers are imported from temperate countries, multiplied for several generations until they deteriorate, then fresh importations are made.

However, imported seed is expensive and generally beyond the financial resources of the average grower. Seed is the most expensive component of potato production in much of Asia, usually constituting about half the production costs.

Furthermore, in many South East Asian countries, there are quantitative restrictions, limiting the importation of seed tubers to as little as 50 tonnes per annum.

Modern tissue culture, in-vitro clean up and multiplication techniques have allowed many countries to satisfy their national requirements for healthy, high quality foundation seed material. However the amounts of seed needed to substantially improve productivity per hectare cannot be produced. Even under the most favorable agro-ecological and phytosanitary conditions found in Asia, four to five multiplications will cause the progressive deterioration of seed through an accumulation of viruses and various soil and tuber borne pathogens.

In many instances, seed potatoes have to be stored for up to nine months before planting. This storage period coincides with the hottest season of the year. Seed storage conditions and facilities to treat tubers are seldom available or are limited, due to both technical and financial constraints.

Furthermore, the majority of the potatoes cultivated in Asia are derived from imported varieties, selected for more temperate conditions. The number and incidence of viruses found in farming situations is rapidly increasing and is attributed to the European origin of most material, where the climate is totally different to that experienced in Asia.

The shortage of finance has often resulted in inadequate facilities and resources to monitor seed quality and the management of seed tubers has also proven extremely difficult, due to farmers freely exchanging seed tubers, without regard to the control of virus and diseases.

DEVELOPING A NEW SEED SYSTEM

Potato scientists in Asia now agree that a new approach is necessary to overcome the continuing constraint of obtaining sufficient amounts of high quality seed.

Although the importation of high quality seed potatoes may never stop completely, sourcing large quantities of European or North American varieties for the production of potatoes in Asia is because of the high cost of imports and the unsuitability of many of the varieties for production in Asia.

Because of these limitations, the International Potato Centre (CIP) has taken the lead to look at seed potato growing areas in South East Asia that might be a suitable substitute for imports from Europe and the USA and that might also be used to multiply its own selections.

CIP has made a significant contribution to potato production in Asia, through the introduction of new germplasm and germplasm management, but the adoption of the improved clones by the farmers is constrained by the lack of sufficient quantities of foundation material for large scale production.

One growing area that has been identified is southern Western Australia where seed potatoes are produced under ideal climatic and phytosanitary conditions. Bacterial wilt, potato cyst nematode, late blight and potato virus Y are not found in seed potato growing districts. Potatoes can be planted and harvested in nine out of twelve months.

Leading scientists from SAPPRAD, the Philippines and Vietnam, visited WA in February, 1995, and had extensive discussions with growers and representatives of the WA Potato Marketing Authority, the Department of Agriculture of WA and Curtin University of Technology.

It is proposed that selected CIP clones will be introduced into Australia for clean up, pathogen testing and the production of mini-tubers for multiplication by selected growers in WA. This material will then be exported from WA to countries in South East Asia for further multiplication in their National Seed Programs.

This will provide much larger amounts of clean foundation material and be thus able to reduce the number of multiplications before seed can be distributed to farmers for ware production. ■

Biofumigation

JOHN MATTHIESSEN
is a Principal Research Scientist in entomological ecology and pest management with the Division of Entomology at the CSIRO Centre for Mediterranean Agricultural Research in Perth

JOHN KIRKEGAARD
is a Senior Research Scientist in cereal agronomy and cropping systems with CSIRO Division of Plant Industry in Canberra

JIM DESMARCHELIER
is a Senior Principal Research Scientist in fumigant analytical chemistry with CSIRO Division of Entomology in Canberra

Biofumigation is a concept for 'clean and green' management of soil-borne pests and diseases

Some groups of plants, notably *Brassica* species, naturally produce biocidal chemicals in the same groups as the active products of the well known synthetic fumigant metham sodium.

'Biofumigation" is a term coined by our group to describe the concept of using such plants as rotation or break crops to alleviate pest and disease problems in a less costly and more environmentally gentle way than using synthetic chemicals in heavy one-hit doses.

FUMIGANTS IN POTATO PRODUCTION

Metham sodium is a chemical which is widely used around the world as a soil fumigant. It has long been used in the Netherlands against potato cyst nematode. In WA and SA, it is used primarily to control the whitefringed weevil, an unpredictable and potentially devastating soil insect pest that appears to be spreading.

Metham sodium is essentially a soil sterilant and has the potential to affect soil biotic diversity and disrupt the natural balances between beneficial and pest organisms.

While metham sodium is generally the most effective control agent for soil-borne pests and diseases, it does produce variable results. It is most effective in lower pH soils, and those that are not too wet and cold but it is dangerous and unpleasant to use. It must be carefully applied to ensure that the active components are not prematurely lost.

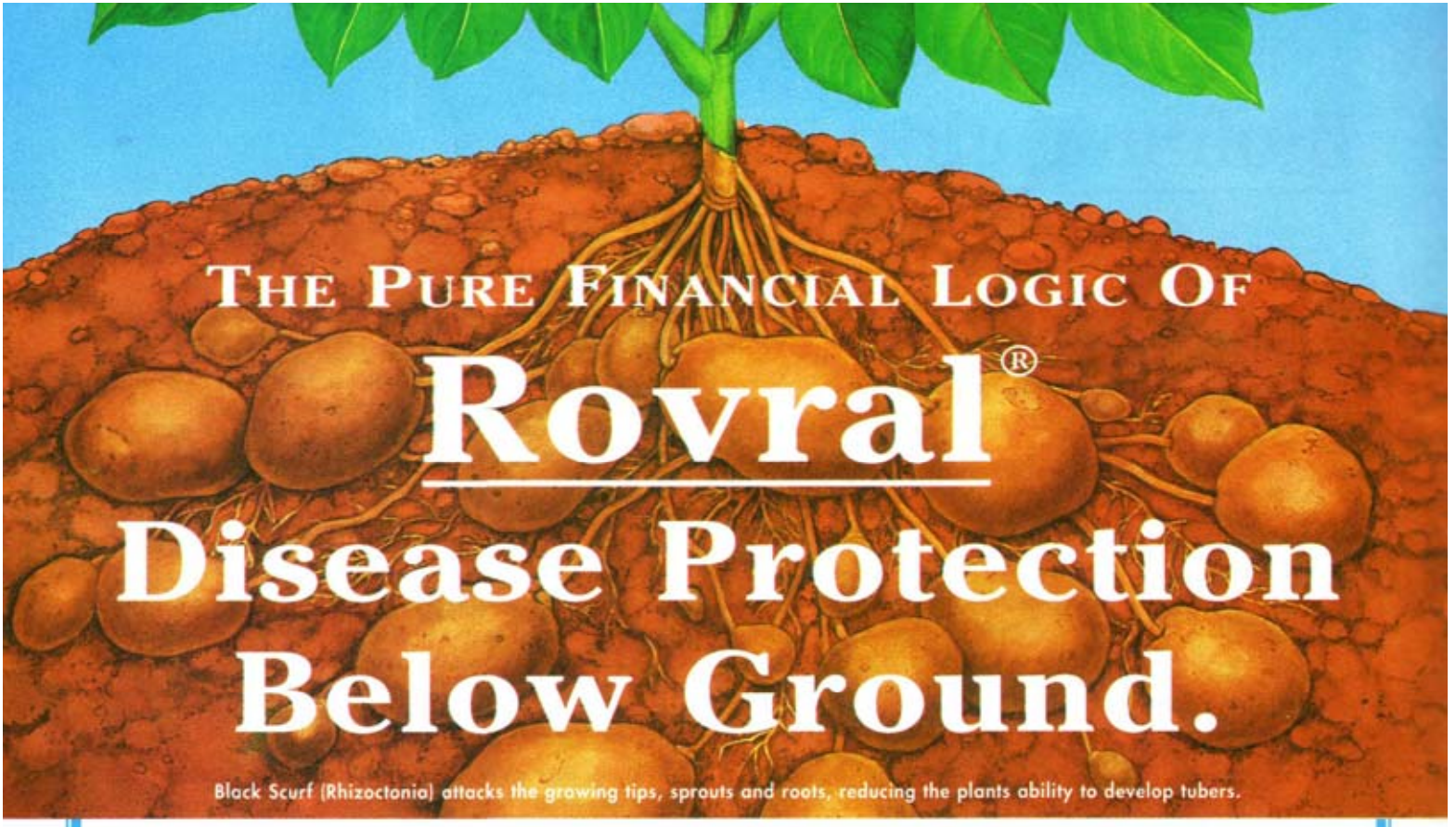
It is also very costly (around $700/ha) and in many potato production areas it is uneconomic to use.

The primary active compound that emanates from the liquid metham sodium as it fumes in the soil is **methyl isothiocyanate,** the most highly toxic fumigant agent commercially available against whitefringed weevil. About 1.5 mg/litre/hour kills 95% of just-hatched larvae.

ISOTHIOCYANATES: NATURALLY-OCCURRING BIOCIDES

The methyl form is only one of many forms of isothiocyanate that occur in nature. The main natural source of these compounds are the many different types of *Brassica* plants -

Incorporating synthetic biocides into soil with a rotary hoe. Can we place total reliance on such methods of soil-borne pest and disease control in the longer term?



ROVRAL PROTECTS POTATO PLANTS FROM RHIZOCTONIA, THE DISEASE THAT REDUCES YIELD AND QUALITY BY ATTACKING ROOTS, STEMS, SPROUTS AND STOLONS.

Irregular and delayed emergence, reduced germination and irregular growth are all signs that Rhizoctonia, a soil borne disease, is probably attacking your crop where you can't see it - under the ground.

Applied at planting to the seed piece and in conjunction with good crop trash management, Rovral dramatically reduces the incidence and impact of this yield-crippling disease.

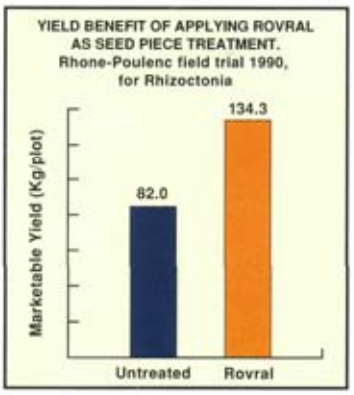
Field tests have shown that significant yield increases (up to 60% under high pressure and 10-20% under moderate pressure) can be obtained. Rovral also helps to produce more evenly sized tubers, further increasing marketable yields.

SIMPLE, DUST FREE APPLICATION

Seed pieces must be sprayed as they fall into the furrow.

A simple 12 volt spraying rig can be easily set up and calibrated to produce convenient, effective spray coverage giving you optimum Rovral protection from Rhizoctonia.

Your Rhône-Poulenc Territory Manager will be happy to take the time to help you set up your own system. (Free call 1800 811 146 and ask for Kate).



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members of the cabbage family, including such plants as cauliflower. canola (a form of rape), mustard and turnip.

Isothiocyanates are produced naturally in brassica plants from compounds called glucosinolates that occur throughout the tissues of the plants. High levels of these compounds are generally undesirable in parts of the plants grown for food, so vegetables and oilseed brassicas such as modern canola varieties have been selected to have low levels of glucosinolates, at least in the desired plant parts. On the other hand, high glucosinolate levels are a desired characteristic of pungent condiment plants such as mustard and horseradish.

When brassica plants are broken apart, as they might be if ploughed in. and during subsequent decomposition, the glucosinolates are broken down by enzyme action to release volatile isothiocyanates. The type and amount of the isothiocyanates released will depend on the species or variety of *Brassica.*

Measurements of wheat crops grown after canola showed that they grew healthier root systems and yielded more. The effect was even more apparent where wheat followed a mustard bred to have a particularly pungent oil, and consequently higher in glucosinolates. It has also been noticed that better potato crops are grown following a fodder rape.

Recent studies by our group, in collaboration with pathologist Percy Wong at NSW Agriculture, Rydalmere, have shown that volatiles emitted from brassica seed meal mixed with water are toxic to certain cereal-infecting fungi. These fungi are in the same groups of fungi that are pathogens of potato, such as *Rhizoctonia, Pythium* and *Fusarium.*

In Germany, there is a breeding company that breeds brassicas as cover crops specifically for biological control of nematodes in sugarbeet rotations.

Very recent studies in the USA have shown that some of the isothiocyanates produced in brassicas are many times more toxic to insects than the methyl form.

All of this information suggests that appropriate brassica plants could have the potential to be harnessed or developed to provide a biological means of fumigating soil.

RESEARCH DIRECTIONS

While in the past it has been recognised that rotations with brassicas have improved the yield or quality of crops, the reasons have been obscure. Only recently have the factors behind these observations begun to find a sound scientific basis.

These findings suggest that biological means of reducing the burden of soil-borne pests and diseases could be developed. It is, however, very early days and biofumigation remains a concept that we believe is worthy of systematic basic scientific study to reveal its full potential, and to ensure effective application in the many and varied production systems around Australia.

The first priority has been to canvass the concept around the nation in the grains and horticulture industries to identify potential target pests and diseases and the production systems in which they occur.

A researcher has recently been appointed to measure the glucosinolate profile of a wide range of *Brassica* species and cultivars. Such questions as which and how much of the many glucosinolates occur, where in the plant, and when during its growth cycle, need to be answered to ensure a sound scientific footing for future development of the concept.

Studies of the patterns of release of the various compounds, and their toxicity to target organisms will also need to be carried out in order to make the most appropriate selections, and to define ideal characteristics to aim for.

Such sound basic information will set in place criteria for selection and breeding of appropriate species or cultivars for use in the field. Application of the concept in the field will in turn require a good understanding of agronomic requirements, and careful evaluation to ensure that any selections do not become weeds.

Researched systematically and thoroughly, and applied care fully as part of an integrated approach to crop management, we believe that the concept of biofumigation offers potential to be developed as a means of managing soil-borne pests and diseases in potato production without the severe one-hit heavy-dose approach of synthetic fumigant applications, and hopefully at less cost. ■

ACKNOWLEDGEMENTS
This work is supported by the Horticultural Research & Development Corporation and the Grains Research & Development Corporation.

The effect of volatile toxins from various amounts of mustard seed meal (A-E: 0, 2.5, 5,10, 25 mg) mixed with water and sealed in dishes with cereal-infecting forms of *Fusarium*

Gladiator:

New French Fry Variety

HOWARD BEZAR
is the Communications Manager with Crop & Food Research, Lincoln, NZ

Industry interest in a new French fry variety to replace Russet Burbank is high. One of the strongest candidates for this role on both sides of the Tasman is the new white blocky shaped cultivar *Gladiator.*

Released by the New Zea\and Institute for Crop & Food Research Limited in 1992, *Gladiator* produces consistently good yields with excellent processing quality for French fries and good disease resistance.

It was the most consistent performer over all sites in the 1994 trials of the National Potato Improvement and Evaluation Scheme and is also proving a success in commercial production in New Zealand.

Gladiator tubers are long, white-fleshed and resistant to most diseases including potato cyst nematode and powdery scab. *Gladiator* also has a reasonable level of resistance to early and late blight.

In observation plots grown this year in Ballarat (Vic) and Penola (SA), *Gladiator* looked much more vigorous and less disease prone than *Russet Burbank.* In both trials *Gladiator* was still actively growing late in the season when *Russet Burbank* had almost died off.

Potato breeder, Russell Genet inspected these trials and commented on the deeper rooting habit of *Gladiator.* Deeper roots mean that the inputs needed to grow a good crop are reduced. This means higher levels of fertilizer and irrigation may not be necessary to attain high yields.

Well grown crops of *Gladiator* will produce blocky, oblong tubers which result in less waste in the factory. It has medium high dry matter and low sugars. In the six Tasmanian trials, *Gladiator* had slightly higher dry matter (23.7%) compared to *Russet Burbank* (22.7%) and a slightly better colour score after frying.

Gladiator also has potential as a second early potato when dug slightly immature. In cooking tests, it has been relative]y free from after-cooking dark-ening and stem-end blackening. Sloughing has not been a problem in tests and the cultivar has been rated very good for flavour.

Heinz Wattie in the lower North Island of New Zealand have trialed *Gladiator* commercially for two years. Farmers and processors have been pleased with yields and solids. Heinz Wattie Technical Manager, Graham Bunkenburg, reported the need to modify some management practices to ensure after-cooking darkening and greening do not occur. The tuber set in *Gladiator* is slightly higher than some cultivars and an extra late moulding will reduce the risk of greening occurring.

Gladiator is being trialed in Australia by Edgell-Birds Eye and McCain Foods. ■

Editors note: *Gladiator* is protected by Plant Breeders Rights in Australia and New Zealand. For more information on this cultivar contact Tony Stratton, Crop and Food Research, Albury, NSW, Ph: 06 0214230.

A sample of *Gladiator* tubers

A New Image for Potatoes

BRYAN MATTHEWS
is the Chief Executive Officer with the Western Australian Potato Marketing Authority

Problems in the areas of handling, storage and packaging of potatoes have contributed to the decline in popularity of potatoes.

Market research carried out by the Western Australian Potato Marketing Authority in May 1994. and the research conducted by Mr Ian Lewis on behalf of the Horticultural Research and Development Corporation (HRDC) towards the end of 1993. spelt out quite clearly that our industry has problems in the areas of handling, storage and packaging of potatoes. These were all part and parcel of the fall in the popularity of potatoes as a consumer product, particularly in the under 35 age group.

Part of the role of the Authority is to provide consumers in Western Australia with freshly dug potatoes all year round and there is little doubt that there are difficulties in achieving this, particularly during the months of January. February and March. The reason is, of course, the difficult growing conditions for Delaware, the variety most popular with growers, coupled with hot weather during the time of digging.

However, much progress has been made by growers in testing other available varieties and next year consumers will have a better selection available, offering much improved cosmetic appearance. This includes both white and red skinned potatoes.

KEY ISSUES

We drew conclusions from our research which were very similar to those put forward by HRDC. It was imperative that we started to tackle a number of key issues as quickly as possible. These were:-

1. To raise the standard of quality, not only by improving crop management techniques but by setting performance standards right through the chain of transport, storage, grading, washing, packing and delivering to store.
2. Consumers want a choice that gives them not only consistent quality but also meets specific cooking needs and includes much better sizing.
3. A complete revamp of the current image of potatoes to make them much more relevant to today's lifestyle, particularly amongst younger people.
4. The development of new cooking ideas, education, recipes, storage and packaging presentation, not only for the person who cooks at the home but also for the major growth area of food service and hospitality.

A lot of work is now in place aimed at dramatically improving the sales of fresh potatoes in Western Australia over the next three years.

QUALITY STANDARDS

We are committed to putting in place new quality standards. A recent Federal Government committee has reported that ISO9000 is too inflexible for many small businesses but we believe that it can apply, particularly to packhouses. In addition, other standards appropriate to individual stakeholders ought to be agreed within an industry such as ours.

If a packhouse does not have any quality systems in place, ISO certification can bring benefits such as less handling of potatoes and lower operating costs that allow for investment in more up to date machinery. This not only gives a competitive edge, but more importantly leads to improved customer satisfaction.

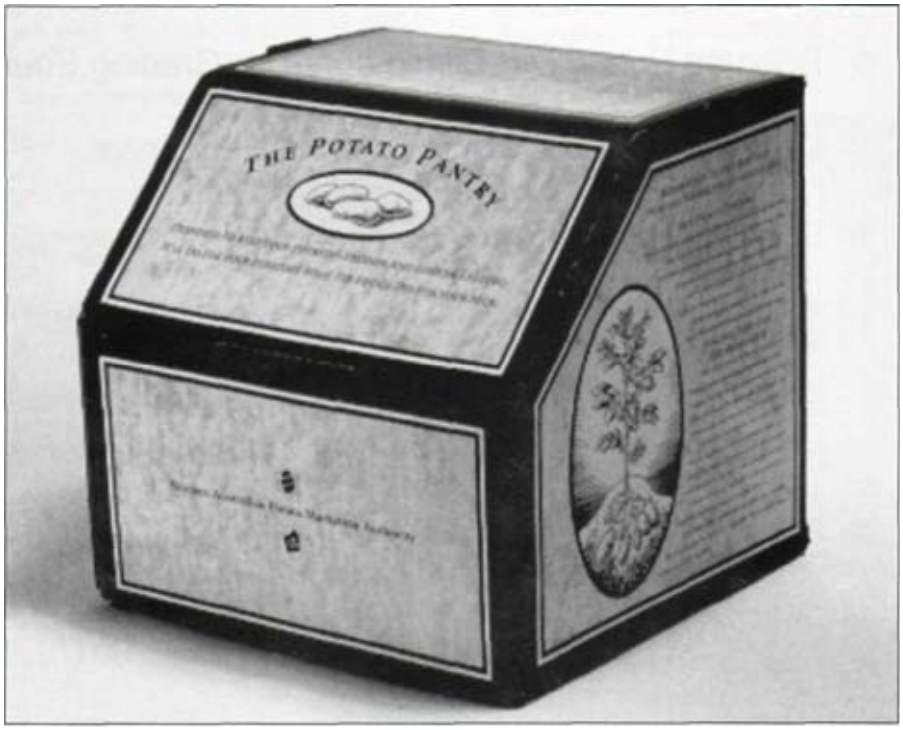
The Western Australian Potato Marketing Authority has now agreed to new quality standards for the grading of potatoes grown in Western Australia with the Potato Growers' Association, the Retail Traders Association of Western Australia and the WA Potato Merchants Association. We will shortly be publishing a manual and commencing a training programme for the industry that will help make these standards a reality.

TACKLING THE IMAGE PROBLEM

The end of 1994 was considered a crucial time of year to highlight the storage issue from paddock to plate . It was seen as important to start getting the message over to consumers that they need correct storage facilities in the home. What better way to do this than providing them with the opportunity to purchase a unit in which to store potatoes?

We came up with the idea of a *"Potato Pantry"* large enough to store up to 10 kgs of potatoes yet compact enough to sit comfortably in the average home pantry. The unit had to look

Potato Pantry



attractive, be user friendly and be capable of being printed with relevant messages.

A number of test units were produced and these were issued to a group of willing guinea pigs for an in-home trial in December. By the middle of January we were in a position to make modifications before going into our first production run of 5,000 units.

Whilst the in-house trial was going on, the head offices of major retailers were approached for their input and to assess their willingness to participate and merchandise the units instore. Only one major retailer declined and we were able to sell into the trade at a price which recouped 90% of our costs and allowed participating outlets to retail the *"Potato Pantry"* at just $2.95 each, showing a return on sales to them of some 47%.

Our advertising agency came up with an excellent copy line for a media campaign - "It will do for your potatoes what the fridge did for your milk". This was used in conjunction with a pictorial representation of the *"Potato Pantry"* and got us a very high level of awareness for a comparatively small spend.

As part of our initial publicity activity around the *"Potato Pantry"* we issued 80 pantries filled with potatoes to people of influence such as food writers and others in the media. This led to a great deal of excellent PR in press and on radio. Indeed ABC radio ran a St Valentine's "Potato Lovers" competition in support of the *"Potato Pantry"* that called for a short verse about "Your Potato Love Affair".

We were quickly inundated with repeat orders with the initial run selling out in the first week. Between the 12 February and 31 March 1995, a total of 20,000 units were sold. It is a very nice thought that 20,000 Western Australian homes now have our own "potato ambassadors" working for our industry 24 hours per day.

Just prior to the end of the promotion, a simple questionnaire was mailed out to our "people of influence" list, together with all participating retailers asking for their ideas on how the Mark I *"Potato Pantry"* could be improved.

As a result of responses we have had to our questionnaire, we will now be in a good position to make improvements to the design of a Mark II *"Potato Pantry"* and confidently expect to exceed the established 20,000 total in a second promotion.

The need for our industry to get together and pool resources either on a state or national basis behind promoting potatoes is of vital importance. Innovative ideas such as the Western Australian *"Potato Pantry"* cannot be developed in isolation and most packhouses and individual growers simply do not have the resources to embark on an exercise such as this. To be carried out effectively, it needs management with the right skills and the financial resources.

We, in Western Australia, have proved yet again the benefits of having a marketing authority be it legislated or as a result of a strong cooperative movement. The sooner other states follow our example the better it will be for all of us. ■

Your Potato Love Affair

The three winning entries

My Valentine
It truly meets my deepest wish
when I eat with you our chips with fish.
The chips must be of Delaware
potato flavour rich and rare.
They're better if they've just been grown
in West Australia's sand or loam.
Oh happy home, spuds on the table,
eat up darling all you're able.

By Margaret B Forrest
Bunbury

Aztec & Incas potatoes grew
Their aphrodisiac gifts they knew
Therefore my beloved true
Daily will I give to you
And then in modern days we'll prove
If 'taters be the food of love
Eat on!

By Eleanor Siviter
Northcliffe

My love on a couch does oft recline
Whilst there on chippies he likes to dine
Firm, white and dimply
It's true, I love him simply
My avid couch potato

By Jannelle Smith
Boddington

SA Growers Look at Irrigation Efficiency

PAM STRANGE
is a consultant with Scholefield Robinson Horticultural Services, Adelaide

To maximise plant growth and hence tuber yield and quality, irrigation should match the crop's water requirements.

A potato crop has its highest water requirement during the stage of rapid tuber growth. This also corresponds with the time that the plant's canopy covers the rows and sheds water into the furrow, away from the main root system. Hot weather during this time can see the crop running out of water \erv quickly. Soil moisture monitoring at several depths clearly shows crop water use and the wetting and drying cycle.

This information can take away the guess work of deciding how much to irrigate and when to start. Together with simple early-season delivery measurements under the irrigation system, the grower can be sure that water stress doesn't limit the crop.

seasons the Crisping Group of South Australia are focussing on irrigation efficiency as a primary factor of crop production.

The 1994-95 summer was a very hot and dry season. The preceding two winters were also dry. Growers commented that this season they could see the typical blue stress rings in their crops irrigated with solid set overhead sprinklers. In centre pivot systems, growers noticed dry rings around the crop when sprinklers were not delivering the correct amount of water.

This has been a perfect season to look more closely at the efficiency of irrigation systems in our potato crops. Growers could see water stress in their crops and that converts to lost production and lost profits!

Distribution uniformity was calculated from the catch in cans set up in a grid pattern under a solid set system.

Cans were placed under the irrigation system to calculate the distribution uniformity

Under a pivot the cans were set every 3 metres along the length of the span. Sprinkler pressures and flow rates were also measured.

Two EnviroSCAN and one DRW system were installed into three separate crops and soil moisture measurements were logged during the summer. Crop monitoring continued as part of the integrated crop management approach of this project.

On growers' properties we found low pressures due to the mains lines being too long. We found incorrect sprinklers on relatively new pivots and we identified wet and dry areas within irrigation patterns. From the monitoring data we have picked up signs of water stress and evidence of over and under irrigation.

Next season the Group will continue to look at the different soil moisture monitoring systems. Irrigation systems will continue to be assessed and the necessary adjustments made to improve the distribution uniformity and to match the flow rate to the soil absorption rate. ■

ACKNOWLEDGEMENT:
This project is funded by HRDC.

Downloading the EnviroSCAN system in the paddock with a laptop computer

Control of Potato Pests, Now and in the Future

PAUL HORNE
is an Entomologist, and
JOANNE RAE
is a Scientist;
both are with the Institute for Horticultural Development, Knoxfield, Agriculture, Victoria

IPM offers pest control with less chemicals.

The primary insect pests of potato crops around Australia are aphids, potato moth, whitefringed weevil, wireworms and African black beetle. Over the last few years, research has focussed on these pests with the aim of developing efficient controls with less reliance on chemical insecticides.

Advances in the control of foliar pests, particularly potato moth, are the basis for a new stage of control. This involves the compatible use of different types of control measures, a strategy known as integrated pest management (IPM).

INTEGRATED PEST MANAGEMENT

An important part of the IPM strategy for potato moth is the improved use of biological control agents such as tiny parasitic wasps that are effective in preventing uncontrolled population increases in potato moth populations.

Potato moth will typically pass through two or three generations in Victorian potato crops, so there is great potential for a rapid increase in numbers of this pest. The parasitic wasps lay their eggs in the larvae so a wasp emerges from the pupae instead of a moth, thus reducing the moth population and increasing the wasp population. Other species of wasps will also help in controlling aphid populations but usually not quickly enough to prevent them transmitting viruses.

Together with cultural measures such as overhead irrigation and soil management (to prevent tuber exposure through soil cracking or shallow hilling), hygiene, use of clean, certified seed and rotations, **effective control of pests can be achieved in most cases without reliance on insecticides.**

Research trials on potato moth over 6 years in Victoria have confirmed this in every district studied, even in hot, dry seasons such as we have just experienced.

Conventional control of insect pests with broad-spectrum insecticides will kill the beneficial insects as well as the pests. This means that biological control is ineffective in sprayed crops. Total pest control with one spray is difficult to achieve and unless the chemical control is 100% effective then further sprays will be unavoidable.

A consequence of repeated spraying is resistance to insecticides by potato moth. Resistance is established in parts of Queensland and this further reduces the likelihood of total control with one spray.

CURRENT RESEARCH

Growers can assess for themselves whether irrigation water is available to prevent soil cracking, whether certified seed is used or not, soil management undertaken and degree of control of self-sowns required.

However, before we can confidently rely on biological control agents in all areas, it is necessary to know that they are present. A national survey of the distribution of parasitic wasps that attack the potato moth was therefore undertaken. At this stage, there are at least one or two of the three common species of parasitic wasps well established in every state.

In addition to relying on the beneficials already existing in a district, a trial mass-release of one of the three con ion species of wasps, using insectary reared wasps is being carried out. This is proceeding well and will be tested fully in the 1995-96 season.

Control of aphids, and the associated viruses, remains a concern for many growers. Current research at IHD is aimed at developing thresholds for aphids, i.e. determining the number of aphids, particularly green peach aphid, that can be tolerated before spraying is required. Specifically, the project is studying the different aphid monitoring techniques with the aim of developing an efficient local method. The project is also investigating the link between numbers of aphids and leaf-roll virus, and the influence on occurrence of leaf-roll virus of other factors such as seed-source and insecticide applications.

Other current research involves several post-graduate students at LaTrobe University/IHD and at the University of Adelaide whose work aims to (i) identify the most compatible insecticides and fungicides for use in IPM strategies, (ii) improve the effectiveness of beneficial wasps,

The parasitic wasp *Orgilus* stinging a potato grub inside a leaf.

The parasitic wasp *Copidosoma* stinging potato moth eggs.

(iii) develop myco-insecticide formulations to control aphids and (iv) develop predictive models for potato moth development and distribution in potato fields.

NATIONAL IPM SURVEY

As most growers will remember grower attitudes to Integrated Pest Management (IPM) and pesticide use were surveyed nationally. Surveys of growers in Queensland, South Australia, Western Australia, New South Wales and Victoria have included questions on grower awareness and use of IPM, particularly in relation to potato moth. These surveys have complemented similar work in Tasmania.

The response from all States was good with a total of 394 replies received (an average response rate of 28%).

State	Growers who have heard of IPM (%)	Growers who used IPM in latest season (%)
National Average	40	18
South Australia	47	25
Western Australia	42	25
New South Wales	60	15
Victoria	33	14
Queensland	15	30

Adoption of IPM across Australia.

Healthy green peach aphid and parasitised aphid.

The survey also highlighted problems that growers experienced in using or finding out about IPM. For example, the source of information apparently influenced the adoption of IPM. In those areas where information was received from direct (face-to-face) sources such as crop consultants or grower meetings, more growers seemed to feel comfortable with understanding and using IPM, compared with areas serviced mainly by the media. This is probably due to the greater amount of information required for effective IPM compared to conventional chemical insecticide application.

Analysis of these surveys is continuing. Any differences between potato growing areas within states will be addressed. From this, it is hoped that the most appropriate information sources within each area can be identified and used to provide details of IPM more effectively. Meanwhile, research is continuing to improve IPM methods and include them in an overall crop management strategy.

THE FUTURE

Research trials in the 1995-96 season will assess the potential of mass-rearing and releasing beneficial wasps for the control of potato moth. A commercial insectary in Queensland *(Bugs for Bugs Pty Ltd)* will be involved in the pilot programme to determine the feasibility of such an approach in potato crops.

Research to develop monitoring methods and thresholds for levels of aphids will lead to better use of insecticides for control of vectors of leaf-roll virus. This research, combined with the information resulting from potato moth and parasite research will offer growers far more precise control of the main foliar pests of potatoes.

In Victoria, interest in monitoring insect pests and beneficials in potato crops has been expressed by *Cropwatch Pty Ltd).*

The results of the coming seasons trials could lead to a full commercial service offering pest monitoring, beneficials monitoring, beneficial insect release services and advice on insecticide sprays for crops for potato growers.

Certainly the project will result in the latest information on how growers may monitor crops for themselves being provided.

Growers wanting specific information should contact their State Department of Agriculture entomologists, or contact the Institute of Horticultural Development, Knoxfield. Ph: (03) 9210 9222. ■

ACKNOWLEDGEMENT:
Much of this research has been supported by funds from HRDC.

Australian Growers give Score® the

VICTORIA

Jack McDonald
Bayles

"This year, I wanted to satisfy my own curiosity as to whether the money I was spending on Target Spot control was money well spent. Generally, once Target Spot gets in, the potatoes can go down almost overnight. I thought by leaving a row unsprayed, I may be able to pick up a visible difference.

"The results with Score® speak for themselves!"

"I'm not about to rubbish the other products, but the Score treated area just stood out.

"Other products will hold the disease up for a while. But eventually the crop succumbs to Target Spot. Whereas, the Score treated crop really held on. I'd say we got an extra couple of week's growth out of it."□

A disease stricken row of unsprayed potatoes on the property of Jack McDonald shows what would have happed, had he not sprayed Score. "On digging, the yield of the Score treated crop was very impressive compared to the untreated."

TASMANIA

Rex and Lloyd Richardson
Latrobe

"We've always tried to get at least a 20 week growing period out of our potatoes. In the past few years this has reduced to approximately 16 and a half weeks before they get Target Spot, and within 10 days the crop has died. This year, by using Score®, we had up to 22 weeks growth out of some of the crops, and I'd say they put on about an extra 4 tonne to the acre in yield. The size was up also."□

SOUTH AUSTRALIA

Don Ferguson with Chris Brown

Don Ferguson
Kalangadoo

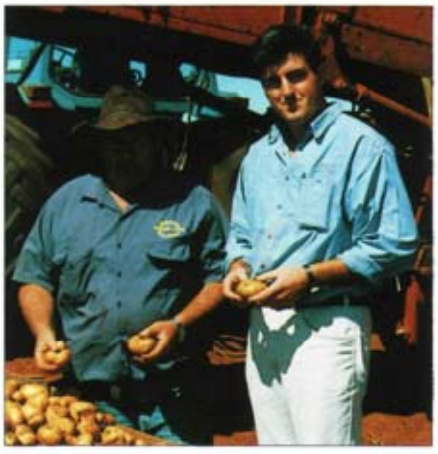
"In this area, we have trouble keeping the potatoes alive late in the season, especially the Russet Burbank's where we're looking for 150 days of growth. Normally at about 130 days they're dying off. This year, at 150 days, they were still too green to harvest. We put that down to the use of Score® and also the fact that we had an unusually dry season."□

For growers, Target Spot means slower tuber growth, usually premature plant death, and as a consequence, lower yield and poorer quality potatoes. It all adds up to reduced income at the end of the season.

In its first year of full commercial release, Score® has shown to deliver outstanding Target Spot control.

Dr Brian Gunn, Ciba Australia's Business Manager for Fungicides, said in Ciba trials, and on many properties throughout Australia, Score has performed impressively. "One of the main advantages with Score is that the product can achieve Target Spot control, even if the spray interval is extended to 14 days. This will reduce damage to the crop due to less boom spray traffic, it will lower application costs, reduce wear and tear on equipment, and reduce the fuel bill. It will also release more of the grower's time to do other equally important tasks." Dr Gunn said he was pleased with the excellent results achieved by growers with Score.□

QUEENSLAND



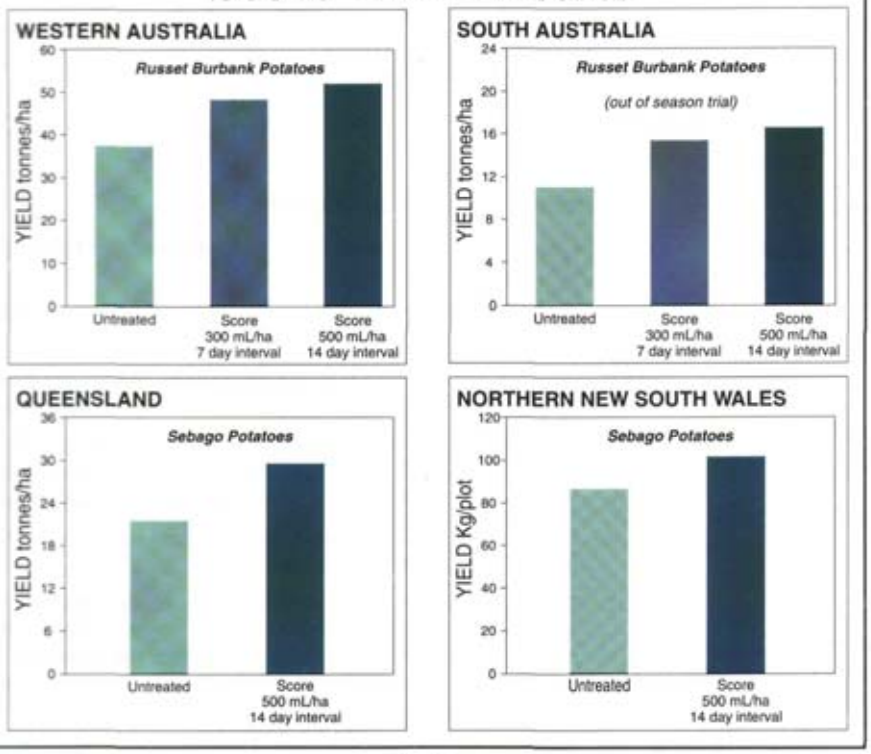
Peter Wickham (L) and Tony Carr

Peter Wickham
Wickham Farm Killarney

"We're about 1,000 metres above sea level. In January we can get foggy days for up to a week. Even if we only get 20 points of rain, it's ideal for Target Spot. This year we had about three weeks of misty weather so at the very first sign of Target Spot starting to creep in, we sprayed with Score®. I think it's about the first time I've seen such positive results from a fungicide."□

"thumb's up" for Target Spot control

Score Trial Results



Score the benefits!

Score delivers powerful control of *Alternaria solani* (Target Spot/ Early Blight) in Potatoes.

Application rates of 300 to 500 mL/ha at 7 to 14 day intervals. The longer spray intervals enable:

- **less boom spray traffic with less crop damage;**
- **lower application costs;**
- **less fuel;**
- **less wear and tear on equipment;**
- **more time to do other things.**

Easy to mix and measure liquid formulation.

Compatible with a wide range of fungicides and insecticides commonly used on potato crops.

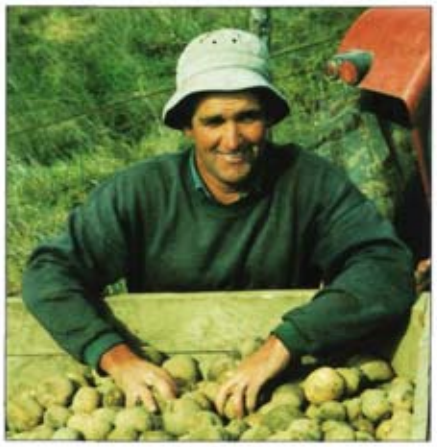
WESTERN AUSTRALIA

Ken's property from the air

Ken Cuthbert
Busselton

Flying over Ken Cuthbert's Busselton property before harvest in 1993 would have revealed about 4 hectares of lush green potato crop, in amongst 16 hectares of brown, dead plants. The lush green area was a Score® trial. "I sprayed Score four times that year," he said. "Experience since then has shown that Score has been the best product by far for controlling Target Spot."□

SOUTH AUSTRALIA

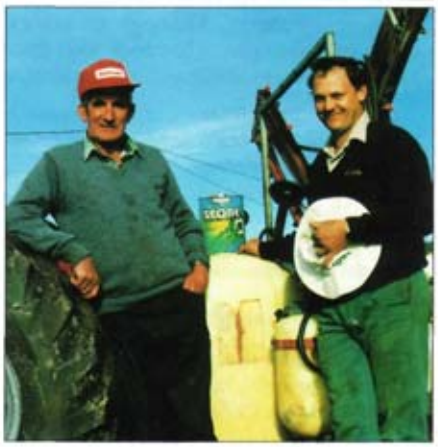


John Mundy

John Mundy
Adelaide Hills

"I employed a crop monitor this year and he detected Target Spot fairly early. Normally, in that situation, I'd spray with a preventative. However, this year I decided to treat half the paddock with Score® and the other half with the usual spray. I had excellent results with the Score. Where I used the preventative product the disease wasn't controlled anywhere near as well."□

TASMANIA



Noel (R) and Ron Whelan

Noel Whelan
Scottsdale Spraying Service

"After seeing the results with Score® this year, I'd have to say it proved to be an outstanding product. We sprayed crops for a lot of growers and when they put Score on at the right time, as the crop closed over, they got a much longer life out of their crop. I think if you wait until you see Target Spot in your crop, it's a bit like shutting the stable door after the horse has bolted. It's too late!"□

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Black Dot - A Disease of the Past

Back in Front

RAMEZ ALDAOUD is a Plant Pathologist;
BUZ GREEN is the Managing Director;
IAN MCLEOD is the Research and Development Manager;
PETER AIRD is a Senior Agronomist;
all with Serve-Ag Pty Ltd, Tasmania

Black dot is known to infect potato crops worldwide. It has attracted renewed interest due to reports that it affects quality as well as yield.

Black dot is caused by *Colletotrichum coccodes,* a fungus that produces tiny black fruiting bodies (microsclerotia), resulting in a black-dot appearance on affected tissues. Microsclerotia are highly resistant to adverse weather conditions, therefore providing the fungus with an excellent means of survival.

The disease has been considered of minor importance by many researchers. Although its association with premature dying of potato plants has been well documented, its effect on yield has been variable and inconsistent.

More recently interest in the disease has again come to the attention of the potato industry and researchers. This was triggered by the pioneering work of Davis and his associates in the USA. They were able to prove that *C. coccodes* is not only capable of reducing yield, but also it seems to adversely affect tuber quality. Thus a new era of investigating black dot as an important disease affecting potato production has begun.

TASMANIAN SURVEY

In Tasmania, the disease has been shown to be prevalent in all potato growing areas, as indicated by a survey commenced by Serve-Ag in 1990 and continued by ongoing work.

The survey also showed that only paddocks with no previous history of potato were free of the disease, and that where black dot was found potato plants tend to die prematurely (up to four weeks ahead of time).

Due to the complexity of field conditions, field trials to link the disease to premature dying or to yield reduction have been unsuccessful. However, the link between black dot and stem end browning was well established.

POT TRIALS

To increase the understanding of black dot, Serve-Ag conducted pot trials in the 1993-94 season in a semi-controlled environment. Disease incidence and its effect on yield and quality were examined using two pure cultures of *C. coccodes* and innoculum from field-infested haulms. The effect of foliar versus soil inoculation and the effect of *Gliocladium roseum,* a fungus frequently found in combination with *C. coccodes,* were also investigated.

PATHOLOGY AND EPIDEMIOLOGY

Findings from the pot trials have emphasised the following points:

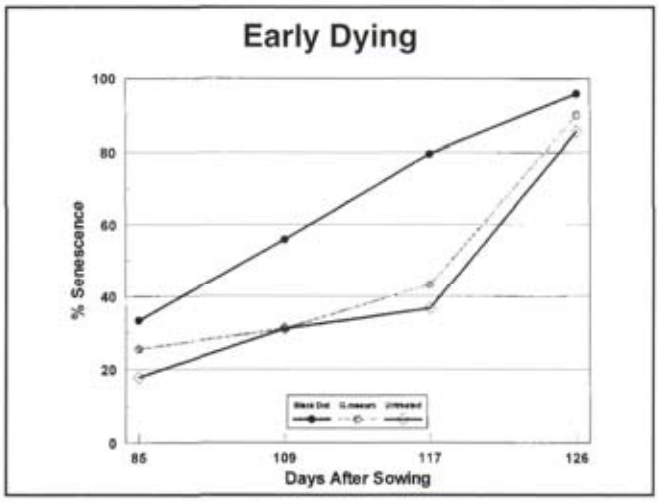
1. There is a direct association between *C. coccodes* and premature dying of potatoes in Tasmania.
2. *C. coccodes* contributes to poor quality of processing potatoes by increasing the percentages of tubers with dark ends.
3. *C. coccodes* has been shown to reduce yield by 10-12%. There may also be an indirect effect on yield by predisposing tubers or plants to infection by other micro organisms.
4. Infected potato seed and infected haulms are equally important in producing disease.
5. *C. coccodes* appears to operate as a soil-borne pathogen on potatoes even when introduced by foliar spray. Early soil-borne infections appear to be necessary for the induction of pathological effects (eg. early dying or tubers with dark stem ends).
6. Infection of haulms or other dead parts later in the season appears to be non-pathological. Its role, however, can be important in both building up inoculum levels and in disseminating black dot disease to new paddocks.

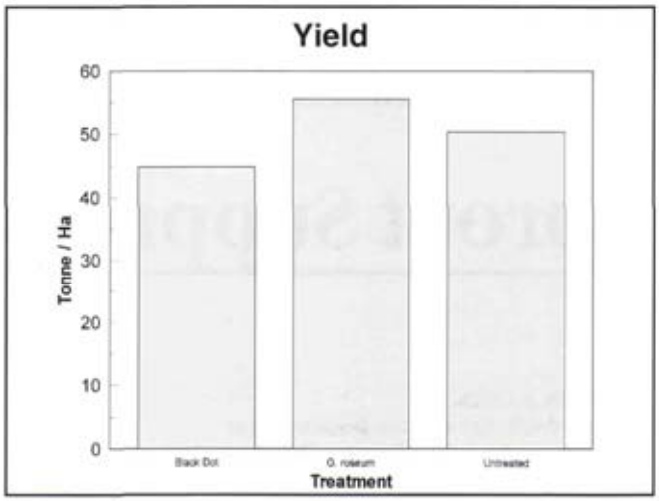
CONTROL STRATEGIES

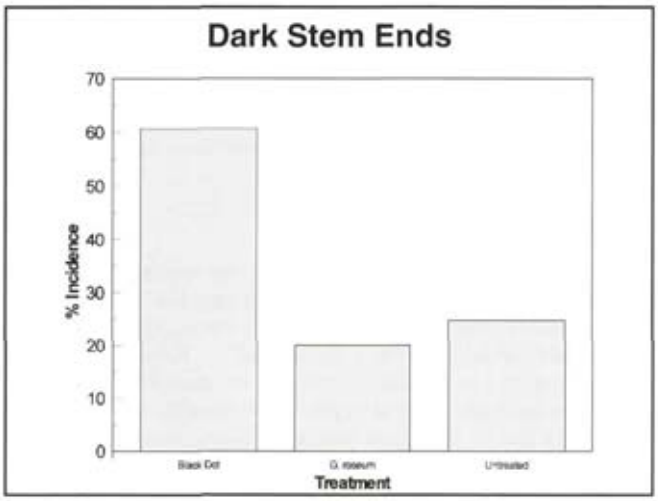
In the 1994-95 season more emphasis was put into investigating control strategies for the disease and the following conclusions were made.

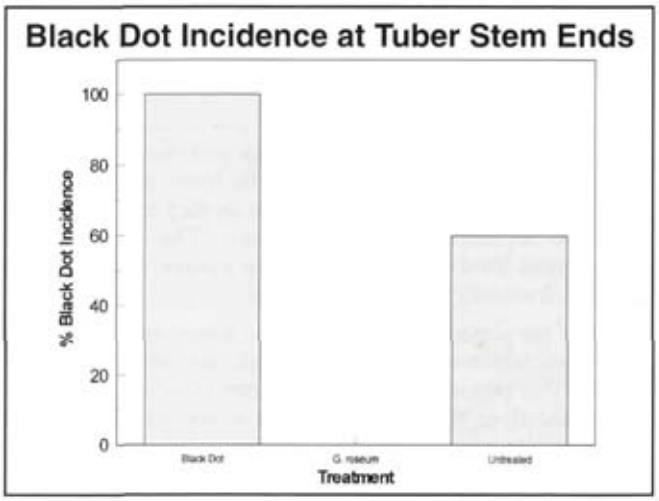
1. Strategies to control the disease should aim at minimising or preventing early infections (combination of disease-free seed, seed treatment, and soil treatment).
2. Special control measures should be included to prevent or reduce foliar infestation of haulms (eg. late foliar sprays with effective chemicals).
3. In a pot trial investigation three chemicals were identified and shown to provide complete protection up to 70 days from the time of planting. These have the potential for application as seed or soil treatments to prevent early soil/seed-borne infection, the pathological phase of the disease.
4. *Gliocladium roseum* has shown to be harmless to potatoes (the yield of this treatment was higher than all others including the control), but appears to have antagonistic activity against black dot. This finding may lead to the use of this fungus as a bio control agent against black dot. ■

ACKNOWLEDGEMENTS
This project has been funded by HRDC. We would like to thank the staff of DPIF, Tasmania for their contribution and comments and Bruce Beattie in particular for the provision of minitubers. We are also very grateful for the help and support by the potato industry and potato growers in Tasmania.









Carvone as a Potato Sprout Suppressant

ANDREW BAKER
is a Horticulturist with the Department of Primary Industry and Fisheries, Tasmania

Sprout suppressants extend the storage life of tubers.

Sprouted potatoes are unsuitable for processing and lead to dehydrated, unattractive tubers in the fresh market. Sprout suppressants are applied to potatoes as they are loaded into stores or in-store after a curing time. The type of sprout suppressant used is dependant on the storage system and the state of dormancy of the stored tubers.

After the potato plants die back the tubers enter a period of dormancy which will vary between cultivars and storage conditions. This period is practically defined from when tubers are separated from the mother tuber or at top death through to when sprouts greater than 2mm long appear on tubers.

The Australian potato industry, particularly the French fry industry require potatoes to be stored out of the ground for periods up to seven months. This is beyond the dormancy period of most cultivars and sprouting must be prevented in order to preserve the quality of fries produced.

Australian potato stores generally operate at temperatures greater than 8°C. At temperatures below 5°C good sprout suppression can be achieved, but this sharply increases the respiration rate of the tubers which leads to progressive conversion of stored starch to sugars.

Potatoes with high levels of sugars produce unacceptable fries due to darkening upon cooking. The build up of sugars is also concurrent with the end of dormancy and is a major reason for sprout suppression during storage.

Two other major reasons for suppression are the build-up of alkaloids, similar to those found in greening potatoes and water loss through sprouts.

CIPC

Currently CIPC (chloropropham) is the major chemical used to suppress sprouting during storage and the most effective chemical registered in Australia. This chemical has been used in the potato industry since the mid 60's. Recently CIPC has been subjected to intense scrutiny by environmental protection agencies and agricultural registration authorities world-wide. This was due to the identification of carcinogenic by-products produced when CIPC is degraded by soil bacteria. This triggered the examination of existing, and the collection of further, residue data. In addition, research into alternative chemicals began in a number of centres through out the world.

ALTERNATIVE SPROUT INHIBITORS

There are several alternatives to CIPC. Chemicals such as maleic hydrazide and tecnazine were developed around the

Developing sprouts are blackened by the addition of carvone to the storage atmosphere

1950's. Maleic hydrazide is registered in Australia but commercial storage with this chemical has lead to variable results. Tecnazine is suited to box storage systems in the United Kingdom but not to the bulk storage systems in Australia.

During the 1970's British workers identified a group of compounds in the headspace of potato stores that actively inhibited sprout growth. These chemicals were methylated naphthalenes and are found on the surface of potato skins. It was thought that these compounds were the potato's own natural sprout inhibitors. Two similar chemicals DIPN and DMN are synthesised by the petrochemical industry; these are commonly used as degreasers. A purified form of DMN is now registered in the USA as a potato sprout inhibitor.

The most interesting and perhaps the safest group of chemicals are those found in natural plant oils. This is not a new idea, South American Indians used to store their potatoes in pits lined with muna leaves *(Mentha spp).* Extraction of these leaves showed that certain compounds (known as monoterpenes) which are found within oil glands are potent potato sprout inhibitors.

Research workers in the Netherlands have in recent years developed carvone (a monoterpene) as a natural sprout suppressant.

CARVONE

Carvone is the major monoterpene found in caraway seed, dillweed seed and various *Mentha spp.* It is the form peculiar to caraway seed and dillweed seed that have been developed in the Netherlands. Carvone can be extracted by steam distillation of plant oils and purified by fractional distillation. Alternatively it can be produced synthetically by converting limonene found in orange and mandarin oils.

Carvone can be applied through the conventional application equipment used for CIPC. The formulation is fogged into the store at loading and every subsequent six weeks. The mode of action appears to be twofold; any emerging sprouts are burnt off and regrowth from auxiliary buds or lower nodes appears to be retarded. The biochemical reasons for the latter is not understood, but unlike CIPC, sprout inhibition does not appear to be permanent.

Other possible benefits from the use of carvone are its broad spectrum fungastatic properties against some major storage diseases.

FUTURE FOR CARVONE

The efficacy of carvone appears to be similar to CIPC. In trials conducted by the Department of Primary Industry and Fisheries, Tasmania, during 1994, no difference in quality parameters were detected. Residue and efficacy data was also collected. The outcome of this project was to produce a viable alternative in the event that the use of CIPC was prohibited by the National Registration Authority in Australia.

Progress with registration procedures in the USA and Europe now make this event unlikely. No evidence of carcinogenic by-products has been detected in recent residue or feedlot studies. Registration with a complete data package is expected during 1996 in the USA.

Although a viable alternative to CIPC, carvone is some fifteen times more expensive using the Dutch label recommendations. This fact would ensure its use is restricted to high value niche products within the fresh market sector or as a sprout suppres sant for the emerging export seed potato industry. ■

ACKNOWLEDGEMENT:
This project has been funded by HRDC, McCain Foods, Edgell-Birds Eye, Smiths Snackfoods Pty Ltd and FritoLay Aust.

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THE FRANCIS AGENCY 6647

Rhizoctonia on Potatoes

TREVOR WICKS
is the Senior Plant Pathologist with the South Australian Research and Development Institute

Rhizoctonia is a widespread disease of potatoes worldwide. Both soil borne and tuber borne phases of the disease are important and most potato cultivars are susceptible.

THE FUNGUS

The disease of potatoes known as black scurf or rhizoctonia canker is caused by the fungus *Rhizoctonia solani.* Different strains of the fungus attack a wide range of crops such as cereals, cabbages, beans and tomatoes. While some of these strains also infect potatoes, in general they are not as debilitating as the main strain that attacks potatoes.

Rhizoctonia is carried over from one season to another on potato seed tubers and also survives in the soil on dead organic matter.

THE DISEASE

Rhizoctonia is most obvious as black masses of fungal cells called sclerotes. These develop on the surface of tubers as they mature. The sclerotes are often tightly bound to the tuber surface and are difficult to remove when the tubers are brushed or washed. The fungus also causes surface cracks, malformation and stem end pitting of tubers. Microscopic examination of the surface of tubers usually shows brown strands of the fungus particularly around the eyes and in surface cracks. Infected tubers either with or without the presence of sclerotes are the main means of introducing the disease into a new planting.

The other main symptoms of *Rhizoctonia* infection are the elongated reddish brown dead areas 2mm to 20mm long on the underground stems and the rotted tips on stolons.

The dead areas on the stems are usually superficial and do not cause much damage although in severe cases young developing shoots can be girdled and killed by the fungus resulting in reduced stands and emergence.

Severe *Rhizoctonia* infections girdle underground stems causing plants to wilt and on some occasions the infection restricts the movement of carbohydrates into the tubers and results in the development of tubers above ground. Although *Rhizoctonia* rarely causes total crop failures or reduces total crop yields significantly, crop losses do occur as a result of down grading in tuber quality. The development of scurf and malformed tubers is a problem particularly in fresh market potatoes.

INFECTED TUBER SEED

Recent surveys have shown that over a third of the potato tubers from some seed producing areas are infected with *Rhizoctonia* and in some batches of seed, no tubers were free of *Rhizoctonia.* Because of the high incidence of this disease some potato certification schemes no longer reject seed

Potato tuber covered with black mass of *Rhizoctonia* known as sclerotia

Potato stems with brown dead areas on the underground stem and stolons pruned off by *Rhizoctonia*

infected with *Rhizoctonia.* This is unfortunate as tuber borne inoculum is the main means of introducing the disease into new ground, or into areas with low levels of soil inoculum such as fumigated soil.

Recent work from Holland showed that after a potato crop is sprayed off or slashed, the roots continue to take up moisture and nutrients some of which are exuded from the tubers. These exudates plus volatile compounds released from the decaying above ground potato stems stimulate the production of sclerotes on the tuber surface. Therefore to reduce the incidence of *Rhizoctonia* in tuber seed, potato seed crops should be lifted soon after vine kill and not stored in ground.

DISEASE DEVELOPMENT

Rhizoctonia is mainly a problem in young plants, often causing damage before emergence. Any factor that delays emergence increases the likelihood of attack. Thus planting too deep, or planting in cool wet conditions or compacted soils can increase the severity of *Rhizoctonia.* Planting in soil with high levels of undecomposed plant residues also gives rise to problems as the *Rhizoctonia* levels in soil increases due to the fungus growing on decaying residues.

A simple test to determine the level of *Rhizoctonia* in the soil has not yet been developed.

CHEMICAL CONTROL

A number of tuber seed treatments are available but these are only warranted if new land or land with low levels of soil borne *Rhizoctonia* is to be planted. Using treated tubers in old potato soil is probably a waste of time as seed treatments are not effective in soil with high levels of *Rhizoctonia.*

Fungicides such as Rizolex, Rovral and Monceren control *Rhizoctonia* on tubers, provided the chemicals are evenly spread over the tuber. This is best achieved by applying fungicides over a roller conveyor before planting or by using several spray nozzles arranged to spray tubers on the planting machine. Spraying fungicides into the planting furrow does not cover the tubers and gives varied results.

Dipping tubers in a 2% solution of formaldehyde for 20 minutes also controls tuber borne *Rhizoctonia* but this chemical is highly corrosive, is difficult to dispose of and is dangerous to use.

Soil fumigation using metham sodium at rates of 500 to 750 1/ha reduces the levels of *Rhizoctonia* in soil, but is only effective if the soil has been carefully prepared and the chemical injected into the soil using specialised equipment. Fumigated soil should not be planted with untreated seed.

BIOLOGICAL CONTROL

A number of biological treatments are being evaluated for the control of both the tuber borne and soil borne phases of *Rhizoctonia.* In recent tests, Tri-D-25, a commercial formulation of the fungus *Trichoderma* was not an effective seed treatment, but further work is continuing to evaluate the use of this fungus as a soil treatment.

Another fungus identified as *Verticillium biguttatum* shows potential as a biocontrol agent. This naturally occurring fungus attacks and kills *Rhizoctonia* and was found to be as effective as chemicals when applied to tubers.

Another area under investigation is the use of green manure crops such as Indian mustard and rape. When these crops are turned back into the soil, a chemical similar to metham sodium is released during the breakdown of plant material. It seems that green manure crops of these plants may be useful as biofumigants to reduce soil levels of *Rhizoctonia.* However, further work needs to be done to determine the feasibility of this tech nique. ■

Chemical & Biological Control of *Rhizoctonia* on Potato Seed Tubers

TREVOR WICKS
is the Senior Plant Pathologist,
BARBARA MORGAN & BARBARA HALL
are technical officers; all are with the South Australian Research and Development Institute

Rhizoctonia is particularly serious on fresh market potatoes where it lowers the quality of tubers because the scurf is not removed during washing.

Studies have been in progress in South Australia to determine if biological methods could be used to control the disease.

We tackled this problem by treating tubers with biological agents and chemicals and planting them in fumigated and unfumigated soil to evaluate their efficacy. We also aimed to determine the relative importance of tuber borne versus soil borne transmission in disease development.

Some of the findings with this project so far are:

- High levels of *Rhizoctonia* occur on some tuber seed
- Microscopic hyphae of *Rhizoctonia* are present on tubers even in the absence of black scurf
- Dipping tubers in a 2% solution of formaldehyde for 20 minutes and evenly dusting tubers with Rizolex or Rovral devitalised *Rhizoctonia* on the tuber surface
- Dipping tubers in sodium hypochlorite was not as effective as formaldehyde
- New chemicals such as Monceren and Beret controlled tuber borne *Rhizoctonia* as well as formaldehyde
- Dusting tubers with Tri-D-25, a commercial formulation of *Trichoderma* promoted as a useful biological control agent was not effective on *Rhizoctonia*
- Other potential biocontrol agents such as the fungus *Gliocladium* and a *Bacillus* bacterium were also ineffective as tuber seed treatments
- *Verticillium bigutattum,* a naturally occurring fungus that attacks and kills *Rhizoctonia* has been isolated in South Australia
- Spores of *Verticillium bigutattum,* applied to tubers as a spray or dip effectively controlled tuber borne inoculum of Rhizoctonia
- Tuber seed treatments were only effective when treated tubers were planted into fumigated soil or soil with low levels of *Rhizoctonia*

Studies are continuing to search for other biological agents and to determine the best method of using the *Verticillium* fungus. In particular, work needs to be done to determine if the fungus can be mass produced and developed as a commercial formulation.

ACKNOWLEDGEMENT:
This study has been funded by the Horticultural Research and Development Corporation.

Technology Transfer - an Urgent Priority

RICHARD DE VOS
is a marketing and communications consultant with Richard Marketing, NSW

A recent study has revealed deficiencies in technology transfer throughout the potato industry - particularly for fresh market growers. Now, as a priority, HRDC has taken steps to address the situation.

A national study, ***A Needs Assessment and Strategic Recommendations for Technology Transfer in the Fresh Potato Industry*** was carried out by marketing and communications consultant, Richard Marketing, in January and February this year for the Horticultural Research and Development Corporation (HRDC). The consultant examined existing technology transfer systems in each state and recommended activities and programs that will effectively meet the current and future needs of growers.

While the study's focus was on the fresh market, the recommendations will clearly support both the fresh and processed sectors.

Research was conducted in a number of stages:

- 10 group discussions with growers at Finley, Atherton/Lockyer Valley, Mt Gambier; Ballarat, Busselton/ Donnybrook, Warragul, Gatton, Manjimup, and Adelaide Hills
- 51 telephone interviews with growers from all states
- extended personal interviews with senior industry and Department of agriculture people in each state
- Discussions with the managers of very successful technology transfer programs in two other agricultural industries.

WHAT HAPPENS AT PRESENT?

The short answer is, not much.

Most fresh market growers surveyed said they knew very little about the various research and development (R&D) projects being managed by HRDC. They expressed the view that they were getting little 'return' for their R&D levy contribution. Why? Because to date there have been no industry-wide formal programs to get the information out to them.

However there are notable exceptions, particularly in some areas where Industry Development Officers are active. Similarly, the situation is not so bad for growers in the processing industry. Information and support programs developed by processing companies, most with HRDC support, seem to be working well.

This increasing need to communicate effectively with growers has come at the same time as traditional channels for communication have been closed off. In every state the role, numbers and activities of Field Officers has sharply declined. Previously Field Officers and other departmental staff gathered information, and then communicated it to growers in their areas (via meetings, visits, field days etc). But State Departments, for their own fiscal and policy reasons, have pulled back from this area and nothing has been developed to take their place.

There is a social implication of this too. Growers talked of hardly ever getting together these days for meetings to learn about new things, or discuss mutual problems. Contact with other growers has decreased sharply, something which some described as a loss of fellowship, or camaraderie. This surely can not be good for any horticultural industry, particularly one facing so many challenges.

So, the industry must take the initiative to correct the situation. No-one else will.

THE MOST EFFECTIVE TECHNOLOGY TRANSFER

The study suggests growers are most likely to adopt recommendations if they trust the communicator - and the information itself. Building that trust takes time, but it is essential to success.

Secondly, local networks are important. Information imparted to local groups that have the opportunity to discuss and question as a group, will be more readily accepted.

Lastly, the format. Growers said the most effective ways of getting information across to them were local meetings, workshops, field days, farm visits and the like. All those involve personal presentation, and the opportunity for interaction, questions, discussion and debate (ie. two-way communication).

Beyond this, there are two levels of written communication considered essential if technology transfer is to be effective.

1. Growers want *Potato Australia* upgraded and issued more regularly. It is a popular publication - but problems with it's timely production, and efficient distribution are all too evident.
2. Some form of regular newsletter or update dealing with R&D and other technology matters is necessary. Something that highlights key points or findings and identifies where to go for more information.

RECOMMENDATIONS FROM THE STUDY

Following the grower research and industry consultations, the consultants made 15 specific recommendations. Principal among these were:

1. Establish the full-time position of Potato Industry Technology Transfer Manager, and recruit an appropriate person to fill that role.
2. By means of a separate HRDC project, take over publishing the industry publication *Potato Australia* increasing the frequency of issues to two per year in the first year and consider four per year in the second.
3. By means of a HRDC project, develop the format for, and then publish and distribute as appropriate, special Potato Industry Technology Transfer Bulletins.
4. By means of a HRDC project, establish and maintain a comprehensive

database of all growers and other relevant industry contacts.

5. Establish an active national program of meetings, field days and work shops as an integral part of the technology transfer process.
6. Wherever possible, utilise the resources and assistance of existing people, structures and publications to support the technology transfer process.
7. Wherever possible, through media releases, interviews etc., utilise local and specialist rural media to:
   - Communicate research outcomes
   - Support particular planned tech nology transfer activities
   - Promote the new technology transfer structures and strategies
8. The Potato Industry Technology Transfer program should include a broad range of information drawn from various sources in Australia and overseas.

Each recommendation was supported by explanatory notes and suggestions for implementation.

Of course it is not expected that all recommendations would be implemented immediately. However the consultants strongly suggested that a start must be made as soon as possible, and that all the recommendations ought to be scheduled for commencement, within a two year period.

APIC & HRDC RESPONSE

The research results and recommendations were presented to, and considered by a meeting of APIC's Research & Development Committee which will further consider the matter at its next meeting in October '95.

In the meantime, at its Board Meeting in April, HRDC moved swiftly in response to the report.

The Corporation has recognised and embraced the importance of the issue, by ensuring that effective Technology Transfer communication is now the specific responsibility of its Program Managers.

Also, HRDC has already

- Established Potato Australia as a separate R&D project, thus providing adequate funding to ensure it is upgraded and, produced and distributed on time.
- Undertaken to produce a quarterly R&D newsletter for distribution throughout the potato industry.
- Agreed to support the various state organisations in updating and main taining an accurate database of growers and others in their industry.

INDUSTRY AND GROWER RESPONSIBILITY

Better technology transfer calls for action on the part of the whole industry. APIC's R&D Committee has an important role to play in recommending and supporting new programs. And throughout Australia, grower organisations must encourage their members to take an interest and participate.

Unless this is done the industry will not be getting the most from its con siderable annual investment in R&D work. ■

Technology Transfer - What is it?

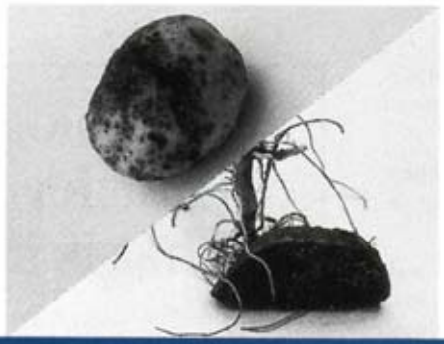
In 1994 the Horticultural Task Force looked at the importance of what it called 'Technology Adoption'. Its report, *"Strategies for Growth in Australian Horticulture"* carried the recommendation

"Recognising that slow adoption of technology is a significant impediment in the horticultural industry, the task force recommends that the Horticultural Research and Development Corporation develop a clear strategy, as a matter of priority, for the increased adoption and commercialisation of horticultural research findings".

The key word is **adoption.** HRDC managed research projects are, and will continue to, generate information and recommendations of great value to the industry, particularly growers. Various programs of activities can be developed to communicate that information.

The effectiveness of those programs must be measured in terms of how many growers (and others) actually adopt the recommendations. That is, how many change their practices in line with the recommendations.

The higher the adoption rates, the greater is the benefit from, and return on funds invested in research and development.



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New Vic Seed Board Established

TONY PITT
is the Executive Officer of the Victorian Certified Seed Growers Committee

The new board is an arms length from growers & state seed committee.

After two years of negotiation between the Victorian Department of Agriculture and the potato industry, the new Victorian Certified Seed Potato Authority Incorporated (ViCSPA) was finally born in late 1994 and took over the responsibility for the Victorian seed potato scheme in January 1995.

ViCSPA is a stand alone Authority which has been established independent of other organisations.

The new Authority is quite separate from the Victorian Certified Seed Potato Growers Committee (VCSPGC) which is a growers organisation representing 130 certified seed potato growers. The VCSPGC has been advising the Department of Agriculture for many years on matters relating to the seed scheme, amongst other industry activities, and will continue its activities in marketing, promotion, grower representation, and assisting in scheme coordination as required. The continuation of the VCSPGA will enable ViCSPA to maintain an important level of independence from seed growers.

ViCSPA gains its authority from Section 14 of the Vegetation and Vine Diseases Act in Victoria, which states that the Minister may nominate a scheme for the production of seed potatoes. The nominated scheme in Victoria is that under the management of ViCSPA.

A separate constitution specifies that all business affairs be controlled by the Board of Management. The Board has been established from a procedure set out in the rules and consists of four seed potato growers, four other persons active in the industry, an independent chairperson and a nominee from the Department of Agriculture. The inaugural Board is comprised of the following persons.

Dr Peter Smith (Chair), a virologist formerly with ACIAR, and prior to that at Burnley
David Graham, seed grower at Thorpdale
Russell Simpson, seed grower at Meerlieu in East Gippsland
Laurie Shaw, seed grower at Beech Forest
David Sewell. seed grower at Smeaton near Ballarat
Russell McKay, processing growers and seed grower at Newlyn near Ballarat
Milton Rodda. Field Manager for McCains Foods
Frank Rouse, processing grower at Cora Lynn near Koo Wee Rup
Doug Marshall, Southern Region Manager with Combined Rural Traders
John Blackstock, Principal Analyst, Plant Industries, Department of Agriculture

VCSPGC - In Summary
* Growers organisation, representing 130 growers from 4 seed districts
* Delegates are appointed by the growers in each district
* Contract specifications, seed category specifications, quality parameters
* Coordinates varieties and clones of varieties for inclusion in the scheme
* Management of PVR of selected varieties
* Industry liaison and market intelligence
* Export facilitation
* Preparation of the Seed Buyers Directory and Industry displays

Setting the rules of the scheme, standards for certification, appointing and training seed inspectors, provision of field and tuber inspection, Quality Assurance services, accreditation of laboratories producing mini tubers and arranging for the production of minitubers are the key activities of ViCSPA. ViCSPA contracts with the Department of Agriculture for some of these services. The board of management are keen to preserve their independence and have maintained an "arms length" approach to marketing and promotion.

Recommendations for seed prices, contract specifications and decisions on the varieties to be offered for sale through the scheme are key activities for VCSPGC. The seed industry maintains important communication linkages with all sectors of the industry through the VCSPGC and these will be maintained. Annual production of the seed directory and varietal displays at workshops and field days are other important activities.

If you wish to communicate concerns or ideas to the seed industry there are several channels available. The executive officer for VCSPGC is Tony Pitt and he can be contacted on (056) 22 3025. Seed prices, contract specifications, varietal information, queries on Plant Variety Rights and assistance in contacting seed growers or merchants are all services provided by the committee. If you have a more specific query on seed certification it may be best to contact Keith Blackmore, the Manager of ViCSPA who can be reached on (059) 62 9218.

The seed industry welcomes ideas and communication from industry groups as to how it can better service the needs of potato growers throughout Australia. This can be done through your own local association or by direct contact to either ViCSPA or VCSPGC.

These changes to the management responsibility of certified seed potato production in Victoria are significant behind the scenes, but in terms of the product there will be little visible change. Most commercial growers would not be aware that changes have taken place.

It is intended that the new arrangements with an industry based Board will make the scheme more responsive to industry needs and more effective in responding to change as a whole. Overall the integrity of seed production in Victoria will be preserved for the long term. ■

ViCSPA - In Summary
* Authority to run Victorian Certified Seed Potato Scheme
* Independent, non-profit, incorporated
* Broad based Board of Directors
* Experienced support from the Institute for Horticultural Development (Toolangi and Knoxfield)
* Responsible for seed scheme rules
* Provision of inspection services
* Conduct of Quality Assurance Program
* Management of all regulatory aspects of the seed scheme
* Arms length from seed potato growers to preserve independence

Brilliant package for fungal disease control in potatoes

Potato growers looking for effective control of fungal diseases in their crops should look no further than Bravo® and Sumisclex® fungicides.

"Bravo and Sumisclex are a brilliant package for managing common diseases in potatoes," said Dr Peter Taylor, Fungicide Research Manager with Crop Care.

"Not only do these products provide excellent control of diseases such as target spot, late blight and *Sclerotinia minor,* but this program is also highly cost-effective compared with other programs which are currently being recommended," he said.

"Used in a program, Bravo and Sumiclex are ideal for keeping diseases out of crops while minimising the risk of disease resistance to fungicides".

Dr Taylor explained that the two products came from different chemical groups and had different modes of action, making them an ideal combination.

"A protectant program based on Bravo can therefore be supported by Sumisclex at strategic times to cure any existing disease", he said.

"Sumisclex, however, should not be applied alone for more than two consecutive foliar sprays, in line with the Avcare Resistance Management Strategy which should become the standard adopted widely throughout the potato industry in the future.

HOW BRAVO WORKS

Dr Taylor described Bravo as a multi-site fungicide which, when used in a protectant program, is effective against both target spot and late blight.

"Because of the tenacity of the formulation, Bravo readily adheres to plant surfaces", he said.

"This means that growers can apply Bravo before or after rain or irrigation, confident that the fungicide will stick to the plant leaves and give more effective protection.

"With Bravo, there's no need to add extra wetter because it is already included in the formulation".

HOW SUMISCLEX WORKS

Dr Taylor said growers could enhance their disease management programs with the strategic use of Sumisclex to complement Bravo.

Sumisclex has recently been registered for use in potatoes for the control of target spot and *Sclerotinia minor,* giving both curative and protective control of these diseases.

"Because Sumisclex penetrates the leaf, its protectant activity against new infections is both rainfast and long lived", he said.

"This is important because wet conditions encourage disease activity.

"In addition, the ability of Sumisclex to penetrate plant tissues and stop active fungal growth gives potato growers the flexibility to time sprays when bad weather interrupts their normal spray schedules".

A PROGRAMMED APPROACH

Dr Taylor said that where *Sclerotinia minor* was a problem, the recommended program for disease management began with soil sprays of Sumisclex pre and post-hilling to control *Sclerotinia minor.* This is because Sumisclex has proven to be highly effective on *Sclerotinia minor,* a soil-borne disease which attacks crops any time after emergence.

"From flowering onwards, a protectant program of foliar sprays based on Bravo is recommended for control of target spot and late blight", he said.

"However, when bad weather favours the build-up of target spot or delays the normal spray program, growers can call on the eradicant ability of Sumisclex to stop existing infections.

"Under these conditions, Sumisclex should not be applied for more than two consecutive sprays to adhere by the guidelines of the Avcare Resistance Management Strategy. If more than two consecutive sprays are required, we recommend growers tank mix Sumisclex with Bravo. "

"When using Sumisclex for target spot control, a wetter such as Agral® should be added".

Editorial provided by Crop Care

Dalmore and *Catani*,

Two New Processing Varieties

ROGER KIRKHAM
is the Potato Breeder, &
GRAEME WILSON
is a Scientist and are both with the Institute of Horticultural Development, Toolangi, Victoria

Two new potato varieties have been produced by Australia's only potato breeding program which is located at Toolangi, Victoria.

This program produces tens of thousands of new varieties each year and selects the best of these for testing in trials on growers properties in potato growing areas. This network of trials extends throughout Australia and has produced 7 new varieties during the past 5 years.

Two new varieties were released at a field day at Toolangi in 1995 after extensive testing for many years in the Koo Wee Rup area east of Melbourne.

Dalmore is recommended for crisping and produces good yields of round, medium sized potatoes preferred by processing companies. The dry matter content is medium to high and crisp colour is light when processed immediately after harvest or after short term storage. *Dalmore* is resistant to tuber damage during handling.

Catani is recommended for French fry processing where companies will accept oblong shaped potatoes. This variety does not have a long shape and will not be accepted by the large French fry processing companies. *Catani* may also be grown for both French fry and crisp processors where smaller potatoes are graded out for crisp processing and larger potatoes are sold for French fry processing.

Catani produces high yields and tubers have high dry matter content and light fry colour when processed immediately after harvest or processed after long term storage. *Catani* has smooth white tuber skin and attractive oblong shape and is suitable for selling in the fresh potato market.

Dalmore was developed with help from the crisp processing companies Smith's Snackfoods and Frito-Lay and also with help from the Giles family who grow potatoes at Dalmore near Koo Wee Rup.

Catani was developed with help from potato processing companies and from Ron Chatfield who grows potatoes at Catani in the Koo Wee Rup district. ■

Summary of seven Victorian trials in 1989-90

Variety	Yield tonnes/hectare				Tuber Number /plant	%Dry Matter	% Crisp colour *
	Size Grade, (g)						
	0-80	80-250	250-450	>450			
Dalmore	5.0	26.6	5.8	0.5	6.3	21.2	5.4
Kennebec	3.3	28.7	13.8	3.3	5.2	19.8	5.7

***Crisp colour at harvest, score 1 -10, 6 = borderline >6 = too dark**

Summary of six Victorian trials in 1991-92

Variety	Yield tonnes/hectare				Tuber Number /plant	%Dry Matter	% Crisp colour *
	Size Grade, (g)						
	0-80	80-250	250-450	>450			
Catani	3.2	30.0	8.7	1.2	5.5	22.9	4.6
Kennebec	3.2	27.3	18.0	2.6	5.2	20.6	4.96
Atlantic	4.0	33.0	6.5	0.3	7.2	22.6	3.7

***Crisp colour at harvest, score 1-10, 6 = borderline >6 = too dark**

Graeme Wilson, Merv Mullens and Vern Laidlaw with a seed crop of *Catani* grown at Thorpedale, Vic

World Potato Congress 1994

JOHN RICH
is an Executive Officer with the Tasmanian Farmers and Graziers Association

The 1994 World Potato Congress was held at Harrogate, England.

The World Potato Congress is a world wide potato industry forum to enhance world potato industry development through greater international understanding, co-operation, promotion and trade.

The Congress is intended to enable potato industry representatives to discuss critical issues, develop ideas and plans for dealing with current and emerging challenges and opportunities facing the potato industry.

The Congress is seen to be an opportunity to meet, exchange ideas and experiences and develop business relationships with key potato industry people from many different countries.

Over 600 delegates attended from 48 countries including representation from growers, marketing boards, government, machinery, scientists, researchers, retailers, processors, exporters and traders.

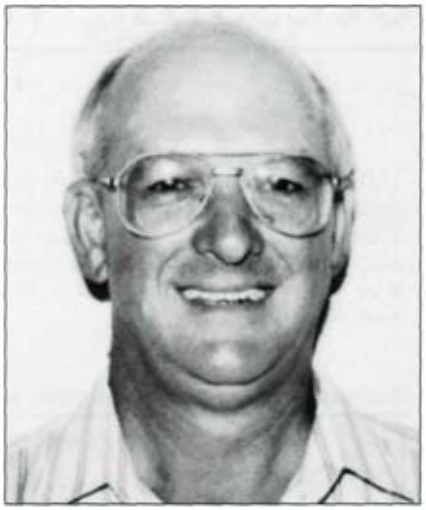
The following is a brief summary of some of the many interesting papers presented.

DIET, HEALTH AND POTATOES:

Dr Sabatier, a French nutritionist spoke about the importance of potatoes in the diets of populations in developing countries. The potato was depicted as a good and relatively inexpensive nutritional food source.

RETAIL POTATO MARKETING IN THE 21ST CENTURY:

Mr Andrew Batty from Tesco, one of the United Kingdom's major Supermarket Chains, advised of the need for growers to be aware of the requirements of the consumers. Reference was made to the fierce competition from products such as pasta, rice, etc. Consumers will pay for quality. Tesco will try to develop closer links with growers, possibly with a contract system, buying in bulk to an established product specification.



POTATOES AND THE FAST FOOD INDUSTRY, CHALLENGES AND OPPORTUNITIES:

McDonalds' Resource Manager for International Purchasing, Mr Craig Marotz, talked on the subject of the world-wide expansion of the company. It was stated there are 14,400 McDonalds restaurants in 72 countries throughout the world and the number of new stores being opened was in the vicinity of 1,200 per year. This level of growth was expected to continue into the foreseeable future.

The current French fry intake for McDonalds world-wide was quoted to be 793,000 tonnes and by 1998 this figure is expected to reach 1.5 million tonnes.

McDonalds emphasis will be to require suppliers to provide an even higher quality product and downwards pricing pressure will be maintained.

AGRICO:

Mr van Arendok from AGRICO spoke of the Dutch based producer's co-operative, with 2,000 members. The co-operative is engaged in the planning, production and marketing of potatoes. The co-operative is a marketing company.

Around 1.2 million tonnes of potatoes is handled annually, currently in the following ratio;

325,000 tonnes for seed,
600,000 tonnes for French Fries,
125,000 tonnes for crisps,
100,000 tonnes for fresh market and
40,000 tonnes for small potato sales and other processed product.

FEDERATION OF GROWERS OF POTATOES FOR PROCESSING, FRANCE:

Even though the growers form themselves into selling groups, Mr Simphal commented that growers do not get paid enough for their product and it was seen to be necessary for processors to have more regard for the growers efforts in producing a higher quality product and to recognise the cost of keeping up with technology.

Reference was made to the need for growers to now cope with the environmental aspects which add to the financial burden and erode the farmers terms of trade.

CHALLENGES AND PROSPECTS:

Mr P. Hijma from the Netherlands Commodity Board informed the Congress there was a need to maintain food production (potatoes), and a need to maintain an adequate level of income and yet conserve the environment.

Growers were being required to reduce the application of chemicals and fertilisers. It was necessary to balance the ecological and economic objectives through and into the next century. Consumers want environmental standards to be set.

Mr Hijma stated that growers will be required to explore and be supportive of new growing methods which will lead to the reduction of the application of chemicals and fertilisers. Growers may need to have a greater understanding of pests and diseases in order to develop control mechanisms.

There are 500 farms in Holland working with integrated farming systems and the industry has committed to specific goals to reduce the environmental burden and to safeguard incomes.

LATE BLIGHT:

Dr D van der Zaag gave emphasis to the world wide problem of late blight. The severity of the problem is such that a concerted international effort is being undertaken to overcome the threat from this problem. Some funding support has been obtained and a detailed research proposal is being prepared by a group of blight specialists in an endeavour to seek further funding. A special conference on late blight will be held in Dublin in September 1995. ■

Potato Harvest '94

JOHN MCPHEE is an Agricultural Engineer with the Department of Primary Industry and Fisheries, Tasmania

A two day event, featuring static displays and active demonstrations of potato production equipment followed the World Congress.

Although the focus of the exhibition was on harvest, handling and grading, a wide range of potato production technology was presented, covering topics from seed to packing. There were 147 different exhibitors present, and 21 harvesters were demonstrated as part of the programme.

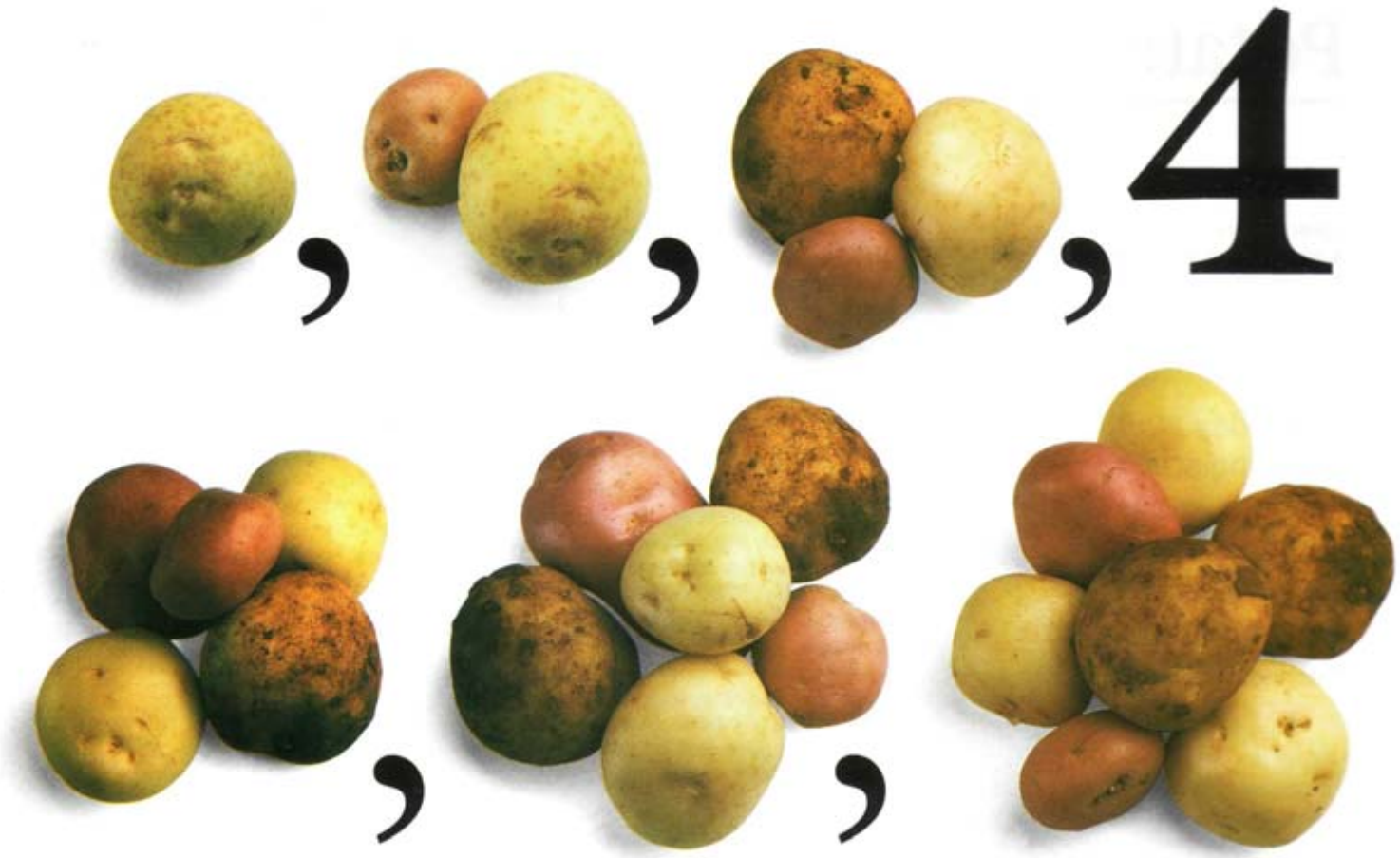
Twin row harvesters using tractor drawn chaser bins were the dominant type of machine demonstrated. These harvesters usually, but not always, operate with no on-board labour.

All but one of these harvesters offered the spiral roller clod separation system which has become widespread in the European harvester market in recent years. The use of these clod separation systems has allowed the use of smaller web pitches for more effective retrieval of small tubers. The rollers are able to separate dirt and clods without loss of tubers. Stone windrowing systems have enabled the wider use of this clod separation system.

Another feature of the UK harvest approach is the aspect of whole crop recovery. Because most of the harvest is done without on-board labour, post-harvest grading is an important element of the system. This means that the full range of tuber sizes and qualities is taken from the paddock and subsequently graded to meet different end use specifications.

Although there are differences between the Australian potato industry and those overseas, events like Harvest '94 provide good opportunities for people in the industry to keep up with advances in potato production technol ogy, and to make assessments of which technologies are appropriate for local use. ■

2 Row Harvester



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Powdery Scab -Can it be Controlled?

RUDOLF DE BOER & MEGAN THEODORE
are Plant Pathologists
with Agriculture Victoria
Institute for Horticultural Development, Knoxfield

Powdery scab is one of the most serious soil-borne diseases of potatoes in Australia today.

Caused by the fungus *Spongospora subterranea,* powdery scab is widespread throughout most of the traditional potato growing districts of Australia. The majority of the commercial cultivars grown today are susceptible to scab and there are no simple control measures for the disease.

Powdery scab is also a serious problem in other countries, most notably Switzerland, United Kingdom (particularly Scotland) and New Zealand where research programs on control are under way. Current research overseas includes the development of bioassays to detect the fungus in field soils and the evaluation of chemical treatments to control seed and soil-borne scab.

Research at the Institute for Horticultural Development (IHD) in Victoria is investigating the effects of alternative hosts and rotations on powdery scab as well as evaluating new fungicides for control. Also, the screening of new potato cultivars for resistance to scab is a routine part of the potato breeding program at IHD, Toolangi.

WHAT FACTORS FAVOUR THE DEVELOPMENT OF POWDERY SCAB?

Powdery scab is favoured by cool (12-18°C, optimum about 15°C), and periods of soil saturation after rain or irrigation. However, tubers are only susceptible to infection for a short period during early tuber set. If tuber set is defined as the stage when 50% of the new tubers developing on the stolons are the size of a pea, then tubers can only be infected by the fungus when cool and wet conditions occur during a period of about one week before tuber set to about two weeks after tuber set. After that stage tubers are essentially resistant to infection.

The severity of scab in a crop is also affected dramatically by cultivar. Powdery scab can almost completely cover the skin of one of the most susceptible cultivars *Kennebec,* but may occur as only a few scab pustules on the skin of one of the least susceptible cultivar *Russet Burbank.*

Soil pH can also affect scab and, generally, the disease is found to be less severe in the more acidic soils. Furthermore, researchers in Scotland have found that soils with more than six milligrams per kilogram of zinc tended to have a low incidence and severity of disease.

Other factors that are less understood include rotation, alternative hosts and paddock history. Powdery scab may occur consistently in some paddocks but not in others but we do not know what factors determine this.

CAN WE MANAGE THE DISEASE?

Some of the factors affecting scab can be manipulated, thereby providing some options towards managing the disease.

Resistant cultivars: The use of a resistant cultivar is the best option for control. However, only *Russet Burbank* and *Wontscab* can be considered relatively resistant. Most growers are forced to grow moderately to highly susceptible cultivars because of market demands. This is a particular problem for seed and ware markets which have low tolerances for scab. However, choosing a cultivar that has a relatively low susceptibility of scab can have a dramatic effect on the expression of disease in a crop.

Chemical control: There is renewed optimism for the chemical control option with the development of some new fungicides from Japan. In trials in the United Kingdom, New Zealand and Australia, fungicide treatments significantly reduced scab severity and increased marketable yields when applied to soil prior to planting.

Indications are, however, that fungicides will not be as useful when applied to highly susceptible cultivars planted in soil heavily infested with scab. They provide better returns when used with moderately susceptible cultivars in less severely infested ground.

Irrigation management: By managing the timing of irrigation we can exploit the critical period of susceptibility of potato tubers to infection by the scab fungus.

In several experiments, powdery scab was successfully reduced to very low levels by withholding irrigation over the critical 3 week period of susceptibility. The crop was watered up until one week before tuber set (as defined above) and not irrigated again until two weeks after tuber set without a significant yield penalty.

It is easy to dismiss irrigation management as a control option by saying that it is going to rain anyway. It is important to remember, however, that the critical infection period at tuber set only lasts three to four weeks. Rain in that period is not necessarily guaranteed.

However, there are limitations to this method of control. It is more suited to districts with a relatively low risk of early season rainfall. Some cultivars can be adversely affected by an irrigation deficit during early tuber set. Also, the timing of tuber set can vary from plant to plant in some crops and the critical infection period is spread out over a longer time.

More research is required to determine how the amount and frequency of rain or irrigation during tuber set affects the level of scab. This information will help us to predict more accurately the effect of water on the disease.

TOWARDS THE INTEGRATED MANAGEMENT OF POWDERY SCAB

There are options for managing powdery scab. However, for most growers there is no simple solution. In the absence of a range of resistant cultivars to choose from, growers should aim to manage the disease within acceptable tolerances using culti-

vars with low to moderate susceptibility. This should be integrated with other potential control options such as rotation, fungicides and irrigation.

An important step in deciding possible options each season is to assess the risk of growing a particular cultivar in a paddock that has had powdery scab. The Scots have been developing a prototype risk assessment scheme for powdery scab. By assigning points to different risk factors that contribute to scab, such as paddock history, cultivar, drainage, rainfall etc., they are hoping to be able to provide guidance on the risk particular paddocks present for the occurrence of scab. Systems being developed at IHD, Knoxfield, and in other countries, for testing soils for powdery scab could also help in this process.

In order to better manage powdery scab, farmers will need to understand something of the factors that govern disease development. It is up to the researchers to fill the gaps in our knowledge, particularly in the areas of rotation, chemical control, irrigation and on predicting disease in a particular paddock.

Various options for integrated control need to be evaluated in the field. These studies should be conducted with cultivars of varying susceptibility in a range of soil types with both high and low levels of infestation by the fungus so that the effects of the different management options can be predicted with more confidence. ■

ACKNOWLEDGEMENT:
Research on the epidemiology and control of powdery scab and the screening of new cultivars for resistance to scab is funded by the Horticultural Research and Development Corporation.

Powdery Scab

A New Direction for Integrated Pest Management of Potato Tuber Moth?

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The development of integrated pest management tactics requires detailed studies which investigate the effects of any one technique on other methods being employed in order to ensure the overall success of the strategy.

One technique used in many crops is breeding resistant varieties, where a chemical or physical attribute of the plant is exploited to increase its resistance against a specific pest or possibly a range of pests.

One approach being used to increase resistance in potatoes is based on increased densities of sticky glandular hairs on the foliage. These hairs are relatively scarce on existing potato varieties, but some wild species have a dense covering on leaves and stems. These hairs have been shown to confer resistance to a number of surface feeding insects including aphids, leaf hoppers and spider mites.

This defence mechanism works by the ability of the gland, situated at the tip of the hair, to rupture on contact with an insect, releasing a sticky material. Eventually, insects can become glued to the leaf or fall from the plant, unable to walk or feed since the sticky substance covers the feet and/or mouthparts.

Unfortunately, our observations suggest that this defence mechanism may not be effective against potato tuber moth since adult moths are covered with readily detached scales which prevent them from getting trapped, and larvae minimise their exposure to leaf surfaces by mining inside leaves. However, these sticky hairs can pose special hazards for beneficial insects which search plant surfaces for their host or prey but lack suitable defences against entrapment.

Dr. Paul Home has discussed the possible use of an egg parasite *(Copidosoma koehleri)* as a part of an integrated control strategy for the potato tuber moth *(Potato Australia 1992).* However any future use of varieties with sticky hairs could impede the function of this beneficial wasp, particularly as it does much of its searching by walking over plant leaves.

This has led to speculation that the potato moth may actually prefer to lay eggs on the leaves of such varieties since they may afford the greatest security from egg parasites. In one experiment we observed that the greatest number of potato moth eggs were laid on leaves with the most dense glandular and plain hairs.

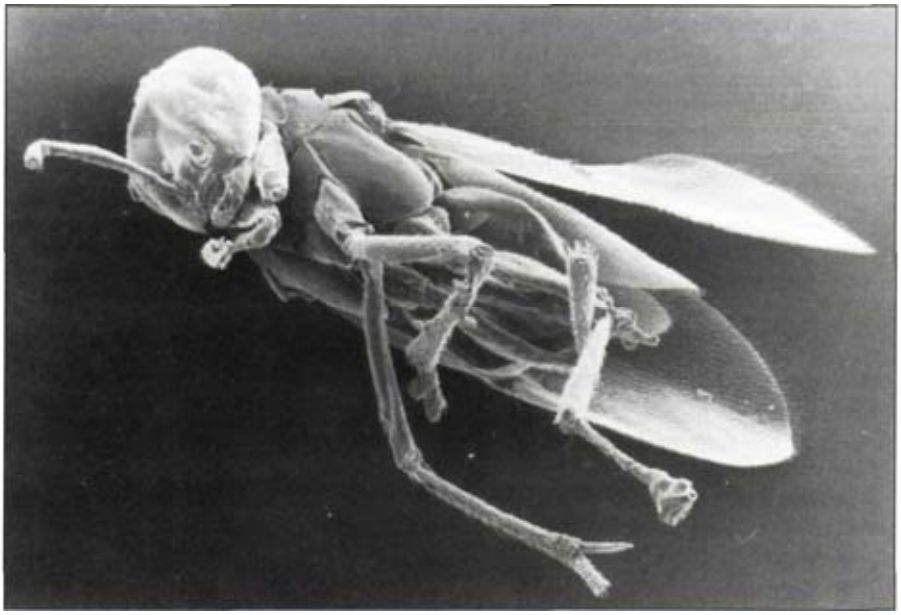
To investigate whether such behaviour by the potato moth may be partly explained by a lethal effect of sticky hairs on *Copidosoma,* we caged adults of these wasps on leaves of tomato, a plant with moderately dense sticky hairs. This revealed that an average of 2.4% of wasps were entrapped over a 24 hour period. As the wasps are likely to live considerably longer than 24 hours in the field, entrapment levels could well be higher following exposure to glandular hairs over several days.

This effect could be further exaggerated if new potato varieties have even more dense sticky hairs than existing tomatoes. It is also possible that wasps are affected in more subtle ways which our tests did not quantify. Consequently, we are currently collaborating with researchers from Monash University to determine the severity of any such effects on wasp searching efficiency.

Though the jury is still out, our results so far indicate that an over reliance on sticky hair based resistance in new potato varieties may not be fully compatible with using *Copidosoma* for biological control. This would be unfortunate since *Copidosoma* is already well established in many potato growing districts of Australia and is well suited to laboratory rearing and subsequent inundative release in the field.

The interactions which our experi ments have examined offer a fascinating glimpse at the ongoing struggle between plants, pests and parasitic insects, and illustrate the need for better understand ing of these if we are to develop effective integrated pest management strategies for profitable and sustainable potato production. ■

Parasitic wasp *(Copidosoma koehleri)* a useful biological control agent for potato tuber moth, but this specimen had been trapped on foliage by sticky plant hairs and has gum on one hind leg.



Cadmium - Why be Concerned About it?

LEIGH SPARROW
is a Soil Scientist with the Department of Primary Industry and Fisheries, Tasmania

Cadmium (Cd) is a metallic element that occurs naturally in our environment, including soils and plants.

Cadmium is not essential for living organisms. Instead, it is a potential toxin capable of causing kidney damage after long term exposure.

It seems that the amount of Cd is increasing in agricultural soils and that the main reason for this is that there is Cd in the phosphorus (P) fertilisers which we use Cadmium is a natural impurity in rock phosphate, the raw material for P fertilisers.

Some of this Cd can find its way into the food we grow. The National Food Authority (NFA) therefore regularly surveys the Cd content of a range of Australian foods as part of its Market Basket Survey.

The Market Basket Survey has shown that potatoes and potato products make up a substantial proportion of the Cd in the average diet. In the 1992 survey the proportions for an adult male and a two year old were estimated at 13% and 29% of their respective totals. This is partly because we eat quite a lot of potatoes and potato products, and partly because potatoes are relatively high accumulators of Cd compared to many other foods.

The industry has therefore supported research to learn more about how Cd uptake by potatoes can be minimised and how we might better manage Cd additions in fertiliser in the future.

HOW CAN CADMIUM UPTAKE BE CONTROLLED?

There are four main means which have been investigated by researchers in Australia in the last five years. They are:

- liming
- decreasing Cd in fertilisers
- adding zinc
- changing cultivars

LIMING

In laboratory and pot experiments, increasing soil pH has been shown to increase the strength with which Cd is held by the soil and, therefore the availability of Cd to plants. However, several field trials in South Australia and in Tasmania have shown no benefit of lime in the year of application.

Why hasn't the lime been beneficial? One reason might be that it takes more than one season for the lime to significantly increase pH through the potato root zone, even with cultivation.

When potatoes were grown at two of the Tasmanian lime sites, two and three years respectively after their first crops, lime decreased tuber Cd by 20-30%. Soil pH measurements at this time showed differences at depths of 250 mm. These were unlikely to have been present when the first potato crops were grown. Perhaps the harvest of the first potato crops gave the deep mixing of the lime necessary to affect Cd uptake in the second crops.

Many growers fear an outbreak of common scab should they lime. However, with a return period of at least 5 years between successive crops we think the common scab risk from liming will be minimised. Our observation that many growers produce scab-free potatoes on soils of pH > 6.0, is further reassurance.

ADDING LESS Cd IN FERTILISERS

We use a lot of P fertiliser when we grow potatoes. Rates of 100-200 kg P/ha are common. We therefore add a lot of Cd as well. For example, growers adding 100 kg P/ha of a high analysis product like diammonium phosphate, which might have about 10 mg Cd/kg, would add 5 grams of Cd/ha. Growers applying the same rate of P as single superphosphate at about 25 mg Cd/kg, would add about 28 grams of Cd/ha.

When these additions are compared with the amount of Cd removed in the tubers of an average crop (50 t/ha at 0.04 g Cd/t = 2 g Cd/ha), you can see that fertiliser Cd additions, coupled with the Cd already in the soil, have the capacity to swamp the crop. It is no surprise therefore to learn that field experiments have shown little or no immediate effect of up to 6-fold decreases in the Cd concentration of P fertilisers.

However, the use of low Cd fertilisers is a sensible long term measure which minimises Cd accumulation.

It is worth noting that the fertiliser industry already supplies potato growers with P fertilisers which are as low in Cd as current commercial technology allows. Whether high or low analysis, the P fertiliser is made from phosphate rock which is selected for its low Cd content.

ZINC

Zinc and Cd have a similar chemistry. It is therefore possible that adding Zn might cause less Cd to be absorbed by potatoes because they will absorb the Zn instead. Only a limited amount of field work with potatoes has been done, and this has shown that the decreases are only about 10-15%, even with rates of Zn as high as 100 kg Zn/ha. Zinc had no effect on yield in these experiments.

CHANGING CULTIVARS

Cadmium analysis of tubers from cultivar trials in several states has shown considerable variation in Cd concentration betwen cultivars. The differences which exist between cultivars are large enough for Cd to have been included as a factor in current breeding programs. Changing cultivars may be difficult in some regions because of climate or market demands. The French fry industry is fortunate that its main cultivar, *Russet Burbank,* is a relatively low Cd accumulator.

OTHER FACTORS INFLUENCING CADMIUM UPTAKE BY POTATOES

Much of the research above has shown that, while treatments like liming and applying Zn may have a noticeable effect on tuber Cd, other seasonal and site factors still seem to be exerting an even greater effect.

Research by CSIRO in South Australia has shown that soil salinity, particularly chloride, can strongly influence tuber Cd concentrations. High

salinity can result from rising saline groundwater and from the use of saline irrigation water. The effect of chloride can dominate other effects like soil pH (these soils generally have pH>7), cultivar and fertiliser strategy, and will be difficult to control even in the long term.

In Tasmania, where soil and water salinity is generally not significant, knowledge that chloride increases Cd availability has been used to find another means of decreasing Cd uptake. Switching from potassium chloride (muriate of potash) to potassium sulphate as a potassium fertiliser decreased tuber Cd by an average 20% at 4 out of 6 field sites. Again, the unexplained site to site differences are striking. Potassium sulphate is more expensive than potassium chloride, so ideally it should only be recommended when it is likely to be needed.

CURRENT WORK

Still to be answered is the question "how long does Cd added to soil in P fertiliser remain active in soil?" Studies of long term fertiliser trials are being conducted to see if Cd from old applications has become less available to plants with time.

Work is also in progress to evaluate a number of potential soil Cd tests as indicators of paddocks which may produce high Cd potatoes. A reliable soil Cd test would allow these paddocks to be identified in advance and give growers the option of either changing paddocks or adopting some of the strategies above to minimise Cd uptake.

Where soil or irrigation salinity is not an issue, the best of these options would seem to be liming (if the soil is acid), switching to potassium sulphate as a source of potassium, and, if feasible, changing from a high to a low Cd cultivar. Paddocks which are a low Cd risk could be spared the cost of these treatments.

REGULATION OF CADMIUM IN FOOD

The current maximum permitted concentration (MPC) for Cd in potatoes and potato products as set by the NFA is 0.05 mg Cd/kg of food as consumed. For fresh market potatoes this means the concentration is determined on the raw tuber. For crisps and fries, it is determined on the processed product. Having the same limit in both situations puts the processed products at a disadvantage because processing concentrates Cd through dehydration. APIC last year applied to the NFA to have the MPC apply in all cases only to the raw potato, which will overcome this anomaly.

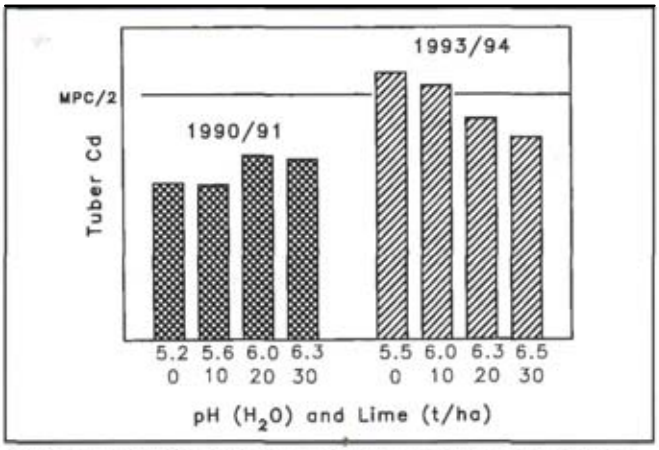
APIC's submission also called for the MPC for raw potatoes to be raised to 0.1 mg Cd/kg, a level which would considerably reduce the number of violating crops. In response to the submission, the NFA has released a discussion paper which assesses the risks of such a change, and concludes that an MPC of 0.1 mg/kg "would not lead to any deterioration in public health standards".

While the industry can be optimistic of a satisfactory outcome, any decision will not be made until later this year when submissions on the paper have been considered, and Cd standards in all foods have been further reviewed.

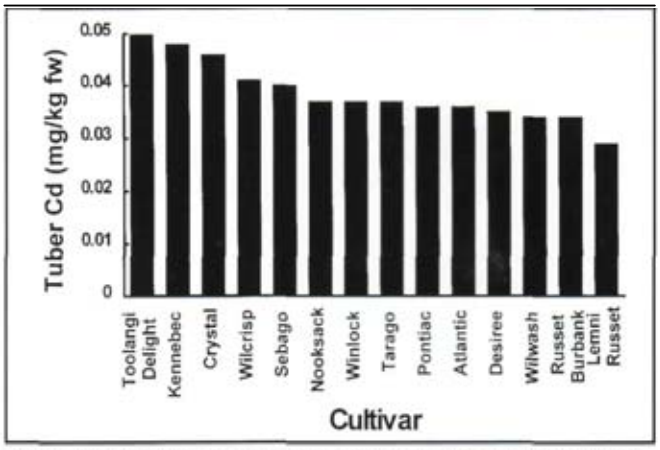
For more information on cadmium in potatoes, see the autumn 1995 edition of the CSIRO quarterly *Rural Research.*

ACKNOWLEDGEMENTS:
This work has been supported by the Horticultural Research and Development Corporation, the Fertiliser Industry Federation of Australia, Edgell-Birds Eye, EZ-Fertilisers and Pivot Agriculture.

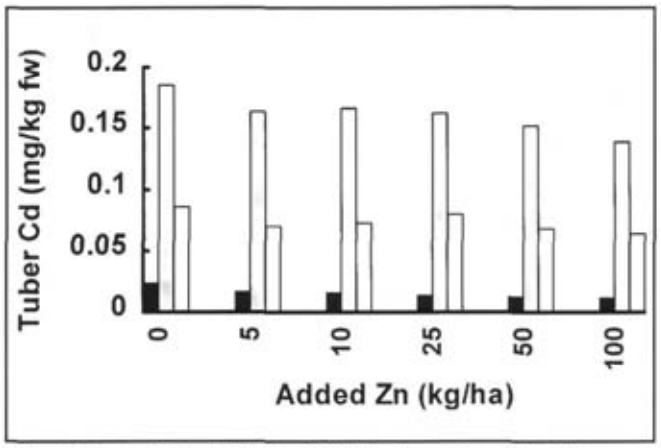
Dr Leigh Sparrow demomstrates the difference between potassium chloride (muriate of potash) and potassium sulphate at a field day.



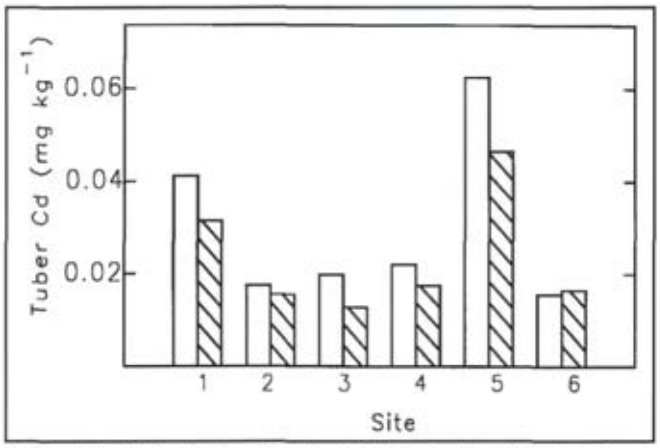
Decreases in tuber Cd three years after lime application in north-west Tasmania



Average tuber Cd in a range of cultivars from a number of cultivar trials throughout Australia (source: M J McLaughlin et al.)



Effect of zinc on tuber Cd at three field sites in southern Australia (source: M J McLaughlin et al.)



Effect of banded potassium chloride (plain bars) vs banded potassium sulphate (striped bars) on tuber Cd at 6 Tasmanian field sites

State Roundup

Victoria

TONY KELLOCK
is the Industry Manager, Potatoes at the Institute for Horticultural Development, Toolangi, Agriculture Victoria.

Optimism is returning to the fresh potato sector due to improved prices following a five year financial drought.

However, the industry has little room for complacency as it continues to face increased competition from quality washed potatoes grown in other states and consumer shifts to other products.

The past season was marked by difficult weather patterns - drought conditions during the growing season with consequent irrigation restrictions followed by heavy rain and wet conditions delaying harvest. In many cases, waterlogged soil delayed storage of processing potatoes, and some seed crops proved impossible to harvest. Overall production in Victoria was similar to the previous season with about 370,000t grown on 13,500 ha at an average yield of 27.5t/ha.

Apart from tomato spotted wilt virus in some crops, possibly associated with weed hosts such as nightshade, disease incidence was low in most crops. No new sites with potato cyst nematode (PCN) were detected and in future high risk areas will not be routinely tested. All certified seed crops will continue to be assayed to ensure freedom from PCN.

CERTIFIED SEED

There was a reduction of 27 ha in the total crop area passing inspection in the 1994-95 season, despite a very low rejection rate of only 3% of crops. The total area certified was 1865 ha with an expected yield of about 31,705t based on an average yield of 17t/ha.

Atlantic remains the major variety grown in the Victorian scheme with 312 ha planted this season, an increase of 71 ha. Other varieties to increase include *Coliban* (+36 ha), *Desiree* (+51 ha) and *Snowgem* (+18 ha), while *Pontiac, Kennebec, Sequoia, Tarago, Wilwash, Crystal* and *Bison* decreased the area passing inspection.

One of the most significant changes in the Victorian Certified Seed Potato Scheme for many years has been the transfer of management from Agriculture Victoria to an independent authority (ViCSPA).

FRESH MARKET

Despite the spring-summer drought, Victorian growers have been encouraged by improved prices of about $300/tonne compared with $60-$140/t last season. Stimulated by several years of poor returns, several marketing groups and networks have formed to facilitate new markets for Victorian potatoes. Key elements addressed by these groups will be quality assurance and improved marketing skills to increase sales in both domestic and overseas markets, particularly SE Asia.

Approximately 50% of the Victorian crop (180,000t) is produced for fresh market with a farmgate value of about $45m on average. The major issue facing this sector is increasing competition from high quality washed potatoes from other states and alternative foods such as rice and pasta.

PROCESSING

Three major companies utilise about 60% (90,000t) of processing crops for French fries and the remainder (55,000t) for crisp manufacture. Despite abnormal weather, the 1994-95 processing crops produced good quality tubers, although wet conditions affected both harvesting and storage.

Russet Burbank is the major French fry variety grown in Victoria for McCain Foods, but several new varieties are currently showing considerable promise after evaluation in the breeding program. *Atlantic* dominates the crisping sector, although new varieties such as *Wilstore, Snowgem, Dalmore* and *Catani* have been released and performed well in certain areas.

The major issues for the processing sector include more efficient productivity to reduce the overall cost of production and the development of new varieties with improved quality criteria such as disease resistance and frying characteristics.

New South Wales

STEPHEN WADE
is the District Horticulturist at Finley with NSW Agriculture

The 1994/95 season will be remembered for the severe drought experienced across the State.

Potato production dropped back during the year as a result of the drought, a cut-back in areas and the continued exodus of growers from the industry. NSW growers produced 120,000 tonnes of potatoes from 6,000 hectares during 1994-95. With reduced supplies and a smaller carry-over between districts, fresh market prices have gradually climbed.

FRESH MARKET

Planting of the 1994 spring crop was delayed by late frosts. Crop areas were down 130 hectares on last season. Digging started in November although many crops were two weeks behind schedule. Spring crop yields averaged 25 tonnes/ha in the Riverina and 22 tonnes/ha at Maitland. The lower than average yields were a result of late planting, cooler temperatures and the dry, windy weather during the growing season.

Sebago prices firmed from $220/tonne on-farm (dirty) in November to $350/tonne by the end of December. Growers received $400/tonne on-farm for potatoes in 50kg bags after Christmas. With reduced supplies, prices continued to remain firm after Christmas.

The planting of the main summer crop was delayed and reduced by the continuing drought. Harvest of the summer crop started in early February. Despite the hot weather, early crops averaged 37 tonnes/ha at Orange. Tuber quality was excellent despite some early whitefringed weevil activity in crops. Later crops had higher yields with the milder weather over January and February.

Autumn crop planting started two weeks earlier than normal with the cooler weather in late January. Areas were down 290 hectares on last year. Despite an early finish to the irrigation season in the southern Riverina, late autumn rains allowed crops to continue bulking up. However autumn crop yields are expected to

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be down in the Riverina, due to poor establishment, cool growing conditions and the onset of early frosts.

PROCESSING

New South Wales growers supplied 20,000 tonnes of potatoes for crisp production. Crisp contract prices were down on last year, with base prices ranging from $195 to $210/tonne. Tonnages also dropped with the reduced consumer demand for potato crisps during the year. The Smith's Snackfood Company has announced that its Sydney crisp processing factory will be closed during 1995-96. Further reductions in crisping tonnages have been foreshadowed.

Growers delivered 7,000 tonnes of potatoes to McCains for French fry production. Contract prices ranged from $198 to $233/tonne, depending on delivery time. Prices remained unchanged from last year. French fry production is slowly expanding in New South Wales as growers are able to supply processors with early season potatoes which produce fresher fries and reduce the need for storing potatoes.

SEED

Seed areas and production were also down due to the drought. The 1995 minimum price for Crookwell Certified Seed was set at $460/tonne. *Sebago* remains the major fresh market variety grown in New South Wales while *Atlantic* and *Shepody* are the main crisping and French fry varieties. Production of *Coliban* and *Desiree* for the ware market has continued to increase.

Queensland

JOHN KERR
is the Senior District Adviser Department of Primary Industries, Queensland

Fresh market prices up but crisping prices down

The 1994-95 Queensland potato production year for fresh market growers can be summarised as one of reduced plantings in the main growing areas, average yields and the highest prices for many years. This was in contrast to the crisp growers who have had normal production but have had to accept lower prices for their product.

North Queensland plantings last year were down due to low prices in previous years. However growers were paid better than $400/tonne and this has encouraged larger plantings for 1995. *Sebago* is still the main variety but increasing quantities of *Atlantic* are being grown for processing both local and export. The area planted to *Pontiac* is also increasing due to increasing demand for a washed red potato.

It is expected that 4,000 tonnes will be exported from the Atherton Tableland this year and this will increase in future years.

In South Queensland the water supply situation is critical in most areas particularly in the Lockyer and Fassifern Valleys. Planting in this area in 1994 was down 25% with fair to average yields and good prices for the early harvest. Later plantings were affected by hot conditions and low quality and quantity of water supplies particularly in the Lockyer Valley.

The 1995 autumn crop in this area was reduced to 60% of the previous years' plantings. Harvesting has commenced (June) with moderate to low yields with prices varying from $250 to $400 depending on quality.

Planting intentions for the 1995 winter crop in South Queensland are down to around half of the five year average and with water supplies at an all time low prospects are not promising.

PROCESSING

The 20,000 tonnes grown for the snack food industry has remained stable for a number of years. The increase in the capacity of Smiths plant in Brisbane and the closure of the Sydney factory will encourage the company to source more production in Queensland. However, the company's intention to further reduce prices over the next couple of years will make any increased Queensland production by present growers doubtful.

Western Australia

PETER DAWSON
is the Potato Sub-program Leader, with the Department of Agriculture, Western Australia

Production for the 1994-95 season is estimated o reach 112,000 tonnes with a value of the raw product of $32 million.

The break-up is: fresh market 54,000 tonnes, French fry processing 35,000 tonnes, crisp 14,000 tonnes, seed 4,000 tonnes and export 5,000 tonnes.

FRESH MARKET

The Potato Marketing Authority reduced quotas for all times of the year except for September delivery. The cuts are designed to reduce the surplus to just 5% of sales. Previously the surplus has been up to 25%. Deliveries are expected to decline from 64,000 tonnes to 59,000 tonnes. Of this, 54,400 tonnes is for domestic sales with 4,800 for export. Most of the decline has been in exports, under 5,000 tonnes compared with nearly 10,000 tonnes last season.

The good news for growers is that sales are strong and prices are good, averaging $355/t. The January to March sales were up 15% on the previous year. Better sales are due to several factors; improved quality caused by more timely harvest (no long ground-storage now that supply better meets demand), the increased production of the improved variety *Nadine,* reduced 'black-market' sales and innovative promotion. Further licence cut backs planned for next season have been abandoned as a consequence of the strong sales. The value to growers is about $20 million.

FRENCH FRY

Edgell-Birds Eye at Manjimup will produce 35,000 tonnes from 700 ha. The season was again very dry and stem end darkening has been a problem after hot conditions mid-season. The major variety is *Russet Burbank* (85%) with small amounts of *Kennebec* and *Nooksack* grown. *Nooksack* will not be processed this coming season. Price to growers was $185/t plus bonuses making the average payment around $200/t. The industry is worth more than $7 million to growers. Contracts for next season are currently being negotiated.

CRISP PROCESSING

Crisp production is 14,000 tonnes with the vast majority processed by The Smith's Snackfood Company. The raw product is worth 3.8 million dollars. *Atlantic* remains the major fresh processing variety and plantings are increasing at the expense of *Cadima.* Production occurs most of the year but acceptable fresh product cannot be supplied from September to October.

SEED

The big news for seed growers is the interest shown by the International Potato Centre in WA seed. A seminar held in Manjimup by the Curtin University Export Seed project allowed farmers to see that there is real potential for sales to Asia.

The new seed area of Scott River is expanding with Edgell-Birds Eye producing 1,200 tonnes from their 24 ha pivot.

South Australia

CHRIS WILLIAMS
is the Senior Research Officer (Potatoes) based at the Lenswood Centre South Australian Research and Development Institute

Crop production is estimated to be similar to last year despite the drought.

South Australia is the third largest potato producing state with annual production of about 200,000 tonnes from 7,000 hectares with a value of about $60 million.

FRESH MARKET

Improved prices in the fresh market in 1995 for premium washed potatoes ($500-$800/tonne in some months) has helped install some viability in the fresh potato sector after previous periods of low prices

There has been a trend for movement of production of washed winter potatoes from the Adelaide regions to Murraylands (Pinnaroo, Peebinga, Loxton, etc.) where areas of relatively cheap cereal/pasture flat land with suitable sandy soils and limited water supplies have been developed for potato production. There the main crop is sown in February for harvest through the winter months to produce a clean, light washed potato with good skin "sheen".

Production of *Coliban* and *Desiree* for the fresh market has continued to increase over recent years.

Many growers producing washed, potatoes in SA continue to be dissatisfied with the quality of interstate certified tuber seed. They are particularly concerned about levels of soil borne diseases - such as powdery scab, rhizoctonia, silver scurf and black dot in certified seedlots - which are to be sown into new land.

Solan is one of an increasing number of grower groups producing its own seed from pathogen tested starter stocks, in an attempt to reduce the above problems.

Also, there is a move to use whole tuber seed where possible to improve plant establishment especially for February plantings in hot districts.

PROCESSING

Processing growers have scraped to fill their contracts in a hard growing year. SA supplied some 18,000 tonnes of potatoes for crisp production with most processed by the Smith's Snackfood Company in the Adelaide factory. Production occurs most of the year with several districts. *Atlantic* is the main variety grown for crisps, supplemented with small amounts of *Wilstore, Tarago, Denali* and *Kennebec.*

Yields of crops grown for crisps in the Adelaide Hills were variable (some well above average, others poor) due to hot conditions and/or disease (with specific gravity lower than average). Several growers had good success with Rovral for rhizoctonia control. Target spot, is usually a major problem in the Lake Alexandrina district but Score produced good results in terms of disease control and prolonged the growth of plant tops.

Crops planted in the SA Mallee last February for all uses have mostly been well managed and look promising at present. Most of the SA crisp crop is suitable for the production of the small pockets of light crisps to supply this growing market sector.

Some 80,000 tonnes of potatoes produced in the South East of SA are mostly used for frozen French fry processing. Crops grown south of Penola produced good yields and were of excellent quality. Whereas north of Penola, crops had reduced yields and quality, especially *Russet Burbank* that had a lot of secondary growth and small tubers as such crops tended to die early mainly due to the very hot conditions experienced at critical stages of plant growth. Also, poor crop establishment occurred in several crops as cold and wet conditions at planting time facilitated *Fusarium* seed piece breakdown then plant death.

The crop management service developed by Mark Heap provided advice for 95 crops grown on about 1,000 hectares (especially plant nutrition, pests and diseases and irrigation).

Pink rot is likely to be spreading and is an ongoing and serious problem in the lower South East.

Tasmania

BRUCE BEATTIE
is the Potato Specialist with the Department of Primary Industry and Fisheries, Tasmania

Some clouds have silver linings.

This season rapidly deteriorated into drought and some growers, especially those in the central north missed the first irrigation by up to 14 days. The result was stem-end second growth which didn't help quality fry manufacturing. In some instances the choice of paddock relative to water supply was ill-chosen, and this was compounded by the drought.

Crop saving rains occurred either on the paddock or in river catchments and no crops were reported as being lost to drought. However, despite average rainfall up till now in much of the north, many farm dams are still empty. Winter rainfall is not predicted so we continue to live in hope of storage replenishment.

And now the silver lining! The low frequency of rains has allowed harvest programs to run to schedule and by the end of June, all storage was be full with about 130,000 tons of good quality tubers stored.

Most reports coming in have indicated that average tuber size and yields are up this season and the level of bruising down. Much of this would be related to the warmer season, more sunshine (up 7%) and less wind (down 20%) especially during January, the main tuber bulking month.

Top yields are a combination of growing conditions and managerial skills. One grower achieved 100 t/ha from one third of his six hectare crop which had an average of 82 t/ha. High yields like this are certainly encouraging when there is pressure to lower prices. As an indication of the industry's productivity, last season's average yield was 42.5 t/ha from 6,863 ha, grown by 610 producers.

Despite this exciting result, weeds such as black nightshade and fat hen continue to be a problem in some locations. Perhaps of more concern, has been the isolation of *Fusarium semitectum* as a pathogen of potatoes. This detection has followed losses due to dry rot in the past two seasons. At the moment Fungiflor (imazalil) has been released on permit for treatment of seed potatoes and will be used in combination with Tecto (thiabendazol).

There is again a stand-off between processors and growers regarding price. The growers have formed a growers cooperative to assist in price negotiation for the future. Meanwhile Edgell-Birds Eye, along with other food sectors of Pacific Dunlop, is on the market.

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